Tafxiːm in the vowels of Muslawi Qəltu and Baghdadi Gilit dialects of Mesopotamian Arabic

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Abstract

Tafxi:m defines a post-velar place of articulation, under which it may subsume consonantal (C) and vocalic (V) Place features for consonantal and vocalic elements that are the correlates of *tafxi:m* in sounds specified as underlyingly *mufaxxama* (heavy or dark) sounds in auditory terms (Jackobson,1957), also called post-velars (PVs). A considerable amount of research on *tafxi:m* in vowels is done on dialects of Arabic of different linguistic backgrounds (Herzallah, 1990; Zawaydeh, 1999; Shahin 2003). However, not much has been done on *tafxi:m* in the vowels of Mesopotamian Arabic (MA) dialects, the Muslawi Qəltu (MQ) and Baghdadi Gilit (BG) of two different linguistic backgrounds where *tafxi:m* in vowels is thought to be driven by the dialect background.

In the dialects of Arabic including the Mesopotamian sedentary Muslawi Qəltu and Bedouin Baghdadi Gilit dialects under investigation, the post-velars (PVs) represent sounds with two locations for two manners of articulation: the pharyngeals which include the /ʕ/ and the /ħ/, and the uvulars which include the /q/, the /χ/ and /ʁ/. The third group of sounds are the pharyngealised coronals, the so-called emphatics (i.e. heavy or dark). They are represented with two places of articulation. The coronal place as their primary articulation and the pharyngeal place as their secondary articulation. The pharyngealised coronals include sounds with two manners of articulations; that is the stops /tˤ/, and the fricatives /ðˤ/and /sˤ/. They represent the dark or heavy counterparts of the plain stops /t/, /d/, and the plain fricatives /ð/, /s/ respectively (ibid).

Tafxi:m in vowels as driven by PV *mufaxxama* sounds is defined as lowering, retraction, centralisation or as rounding being conditioned by the nature of articulatory feature (constriction) in the trigger PV *mufaxxama* and is being conditioned by the presence of particular lexemes identified as secondary *mufaxxam*a. However, the featural manifestations of PVs in vowels, and the presence of secondary *mufaxxama* is phonologically governed by vowel quality and is specific to a particular language or dialect.

In this research, it is found that the featural manifestation of *tafxi:m* are presented both locally and in long domain as backing and backing and rounding in the /i/ and /a/ vowels in Baghdadi Gilit of Bedouin origin with a significant drop in F2 onset in a uvular and pharyngealised PV context conditioned by lexemes identified as secondary PVs (*mufaxxama*) and are phonologically driven by the dialect background.

On the other hand, *tafxi:m* is featured as lowering in the /a/ vowel in Muslawi Qəltu of sedentary origin with a significant rise in F1 onset in a uvular context. In MQ, a sedentary vowel feature known as *ʔima:la* (vowel fronting) of /u/ and centralisation of /i/ vowels occur in domains where it is present as lowering or retraction of /u/ in Gilit.

In long / i:, a:, u:/ vowels, *tafxi:m* is represented as lowering and centralisation with significant lowering of /i:/ and /u:/ in a uvular context in Muslawi Qəltu compared to /a:/ lowering and centralisation in a pharyngeal and pharyngealized context in Baghdadi Gilit.

Tafxi:m is also represented as a feature of harmony which is introduced in non-local vowels as /u/ vowel colouring or /a/ backing in Baghdadi Gilit when secondary *mufaxxama* sounds are present in the same phonological domain.

Dedication

I owe a very big Thank you,

To My world and the reason for why I'm here, Mom and Dad,

Your sacrifices and patience during all the years of my life were beyond all the limits!

Mom, you are the icon of love, and patience who looks for the beauty in everything in silence and put the pain aside!

Dad, you are an idol of a man who put all the obtacles behind and search for the hidden smile! I know by that you endured a lot for no words can explain!

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You were and are the reason for why my life was so much easier having you as my joy and the reason for why I smile!

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Declaration

The material presented in this thesis is the original work of the candidate except as otherwise acknowledged. It has not been submitted previously in part or in whole, for any award at any university, at any other time. Some early material of this thesis has already been presented by the author at conferences. These run as follows:

2nd UCL postgraduate conference held at University College London- 2015.

BAAP conference held at Lancaster University- 2016.

LAB Phon conference held at Cornell university-2016.

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Abbreviations

MQ Muslawi Qəltu

BG Baghdadi Gilit

MA Mesopotamian Arabic

IA Iraqi Arabic

MSA Modern Standard Arabic

OA Old Arabic

PV Post-velar

MB Muslim Baghdadi

CB Christian Baghdadi

JB Jewish Baghdadi

1st first

2nd second

Pers. person

Sg. singular

Fem. feminine

Mas. masculine

C consonantal

V vocalic

RTR Retracted Tongue Root

ATR Advanced Tongue Root

UFT Unified Feature Theory

(m.s) masculine singular

(f.s.) feminine singular

(pl) plural

PH Pharyngeals

UV Uvulars

PC Pharyngealized coronals

E Emphatics

P Plain

EV Epenthetic vowel

Chapter One: Introduction

1.1 Introduction to the research

The phenomenon of *tafxi:m* in vowels (also addressed as *tafxi:m* harmony or post-velar harmony) is driven by post-velar sounds, mainly post-velar consonants (*mufaxxama* sounds in Arabic literature) which are present in many world languages with a rich consonantal system. *Tafxi:m* in vowels has attracted the attention of many linguists working on dialects of Arabic of different linguistic backgrounds (Lehn,1963; Goad, 1991; Zawaydeh, 1999; among others) and other languages of Semitic (Hoberman, 1985; 1988; 1989; Trigo, 1991; Rose, 1996) and non-Semitic origins (Hoberman, 1989; Shahin, 2003; Wilson, 2007, Bellem, 2007) including the Semitic Mesopotamian Arabic dialects; the Muslawi Qəltu (Ahmed, 2018) of sedentary origin and the Semitic Mesopotamian Baghdadi Gilit of Bedouin background (Al-Ani, 1970). However, previous studies on Muslawi Qəltu and Baghdadi Gilit has not provided an extensive account on the nature of *tafxi:m* in the vowels of Muslawi Qəltu and Baghdadi Gilit of two different background where *tafxi:m* in vowels is driven by the dialect background.

The *mufaxxama* sounds combine the pharyngeal gutturals; the voiced pharyngeal fricative /ʕ/ which is realised as a stop [ʡ] in Baghdadi Gilit and it is realised as a fricative [ʕ] in Muslawi Qəltu; and the voiceless pharyngeal fricative /ħ/ which is realised as epiglottal fricative [ʜ] in some productions of Baghdadi Gilit speakers while it is realised as pharyngeal [ħ] in Muslawi Qəltu. Another set of *mufaxxama* sounds include the uvular gutturals which include the voiceless uvular stop /q/ in Muslawi Qəltu which is realised as the voiced velar stop [g] in Baghdadi Gilit in particular word contexts where the [g] is treated as secondary *mufaxxama* sound; and the uvular fricatives which include the voiceless uvular guttural fricatives /χ/ and the voiced uvular guttural fricative /ʁ/ and also [ʁ] variants of /r/ are present in the sound system of Muslawi Qəltu and are treated as secondary *mufaxxama*. The secondary articulated sounds; that is the emphatics which comprise the pharyngealized stop /tˤ/, and the pharyngealised fricatives /ðˤ/and /sˤ/ comprise another set of *mufaxxama* sound in both Muslawi Qəltu and Baghdadi Gilit.

It is found that *tafxi:m* in vowels is governed by the dialect background. Thus, in dialects of Bedouin origin, *tafxi:m* in vowels is confirmed to be part of the phonological system compared to dialects of sedentary origin where instances of *ʔima:la* are traced in the same environments where *tafxi:m* is supoosed to be present (cf. Bellem, 2007).

Added, the articulatory nature of the element of *tafxi:m*, the vowel system of that particular language and the phonological environment (cf. Watson, 2002); all count towards the manifestations of *tafxi:m* in vowels.

Tafxiːm is present coarticulatory in vowels. In other words, *tafxiːm* is introduced in one form of (C-V) consonant-vowel interaction where C represents one of the PV consonants. *Tafxiːm* is also an underlying element of harmony which is introduced in vowels in vowel harmony and in vowels and consonants in vowel-consonant harmony driven by the underlying element(s) of *tafxiːm* in the trigger *mufaxxama,* the vocalic context, the phonological environment (i.e. the presence of secondary *mufaxxama* underlyingly specified for harmony), and the dialect background.

Driven by the above, this research implements an experimental (auditory and acoustic) investigations on *tafxi:m* in Qəltu and Gilit in six target vowels /i, a, u/ and the their long counterparts /i: a: u:/ embedded in different word contexts with one of the elements of *tafxi:m* [ʕ], [ħ], [q], [χ], [ʁ] and [tˤ] [ðˤ] [sˤ], the pharyngealised counterparts of [t] [ð[[s]. The word stimuli are introduced to twenty participants (10 from each variety with an age range 22-45) in a carrier sentence to elicit natural production of the target words in the speakers' own variety. The words are segmented, transcribed and analysed acoustically in Praat (Boersma and Weenink, 2007. The acoustic analysis involved extracting the first two formants (F1-F2) of each of the target vowels /i, a, u/ and the their long counterparts /i: a: u:/ at the onset and mid-point of the vowel using a Praat script adopted and modified for the purpose of the study.

1.2 Aims of the study

The research aims at:

1- Addressing the typology of *tafxi:m* in vowels of both dialects as determined by the trigger element of *tafxi:m* (i.e., the PVs), the vowel identity, and the phonological environment.

2- Providing evidence of dialectal variations among the manifestations of *tafxi:m* in both dialects driven by their linguistic background.

1.3 Research outline

The research is divided into seven chapters. Chapter one is an introduction to the whole body of the research, the research aims and the research outline. Chapter two outlines the linguistic background of both Qəltu and Gilit dialects of Mesopotamian Arabic with special focus on the linguistic features that characterise both dialects in relation to their linguistic background as sedentary Qəltu and Bedouin Gilit. Chapter three covers the role of features and feature theory in the representation of *tafxiːm* introduced in the post-velar segment types (*mufaxxama*). Chapter four addresses *tafxi:m* and harmony. Chapter five is the experimental approach which includes the research aims, the quantitative research questions, and the methods applied in the research (the participants, the recording techniques, and the stimuli) in addition to the data analysis which involves the segmentation and labelling procedures of the data, the data coding, the auditory, acoustic analysis and the statistical analysis involved and the data visualisation techniques. Chapter six includes the data analysis which combines the auditory and acoustic profiling and the statistical profiling. It also provides a discussion of the phonetic, sociolinguistic and phonological implications of *tafxi:m*. Chapter seven is the conclusion.

Chapter Two: Historical and Linguistic Background

2.1 Historical background

The existence of the Arab world in the late history relates back to Arabia known as *ʔal saħraʔ al ʕarabijja* (The Arabic desert), also called *ʔal ʒazi:ra ʔal ʕarabijja* (the Arabic Peninsula). This land occupies a vast area which includes Saudi Arabia, Yemen, Kuwait, Oman, Bahrain, the United Arab Emirates, and parts of Southern Iraq and Jordan; all these countries comprise the Eastern part of Arabia (Hetzron, 2005). On the other hand, the Western part or Western Arabia includes what is known nowadays as the west of Egypt (Libya, Tunisia, Algeria, Morocco and Mauritania). Over the decades, people of different origins and ways of living have occupied this vast geographical area (Ingham, 1997). These settlements have in one way or another shaped the linguistic identity of the languages spoken in the country. The nations who settled in Mesopotamia Iraq are the Akkadians, Sumerians, Babylonians, Assyrians, Chaldeans and Persians. They occupied a long phase in the history of this region (Banjamin, 2009). Since that time, these nations have settled their linguistic and historical identities by the means of languages they spoke and wrote. Some of the spoken languages by these nations have faded away with the end of their years of monarchy, and with the early signs of the rise of other nations known as Arabs in Mesopotamia. However, their written language was literally preserved with the historical crafts found in different parts of Mesopotamia.

In the Arab world, MSA is considered the language of literature, books and media. However, it is not the language of daily communication and use (Al-Ani, 1970). People from different origins and of all social classes use one or more forms of Arabic; these are the dialects and accents of Arabic. The Arabic dialects of Mesopotamia form one of the five main groups into which the modern Arabic dialects of Mesopotamia have traditionally been clasisfied. The Mesopotamian group comprises the Arabic dialects spoken in Iraq, north-eastern Syria, South-eastern Turkey, and Iranian Kuzestan. In some accounts, the dialects spoken in Central Asia which include the Uzbekistan, Afghanistan and Khorsan in Iran are included in the Mesopotamina group since they originate in Southern Iraq which have many features in common with Mesopotamian dialects (ibid:909; Akkus, 2016). The other four groups are Syro-Palestinian, the dialects of the Arabian Peninsula. Egyptian and

Sudanese, and the dialects of North Africa (Shabo, 2012: 909).

The dialectal forms carry a cultural and social identity, and are considered in most cases as linguistically distinct from each other. If we trace the evolvement of languages, dialects and accents among the different nations that existed in this part of the world, we see that unlike other languages, there are no documented scripts by historians or linguists following the emergence of the first signs of Mesopotamian Arabic (Holes, 2007).

Within this area two large groups of dialects originate, each of which shares a number of linguistic features with a rough regional subdivision and with an ecological division (Blanc, 1964) Blanc (1959:449) defined the Mesopotmian Arabic as a generic term for two broad dialectal types which originate from Mesopotamian Arabic. The names used for the two dialects derive from the dialect reflex of the word meaning 'I said'. These are called the Qəltu dialects and the Gilit dialects (ibid:449). The latter is spoken by the Muslim population (sedentary and non-sedentary) of Lower Iraq and by the non-sedentaries in the rest of the area; the former is spoken by the non-Muslim population of Lower Iraq and the sedentary population (Muslims and non-Muslims) of the rest of the area (Blanc,1964).

Hence, Qəltu and Gilit are separated on the basis of the Bedouin/urban dichotomy as the latter has the voiced-alveolar stop /g/ replacing /q/, the Bedouin reflex of the voiceless uvular stop /q/. Thus, Qəltu and Gilit are classified as the dialect(s) of a particular region based on the linguistic background of its group of speakers living in that region. In the Southern part of Iraq, the majority of its inhabitants are of a Bedouin origin. Therefore, they are classified as Gilit speakers. The emergence of Gilit in that part of the country dates back to the time of Mongols raids in the 12th cent. The Mongols occupied many areas in Iraq. This era is thought to have brought with it the first signs of the rise of Gilit in the region with the migration of nomads from the surrounding towns and villages to the cities. As a result, Gilit originally occurred as an outcome of later process of de-urbanisation (Bedouinisaton) and tribalisation that attacked the Southern and Middle parts of Iraq during the siege of the Mongols on Baghdad in 1258 (cf. Jastrow, 1994). Baghdad, unlike other Arabic cities was bedouinised as a capital, therefore all its inhabitants were speakers of Gilit whereas Christians and Jews preserved their own Qəltu variety from being affected by Bedouinisation.The Jewish population in the country established social barriers to avoid mixing with Muslims and even Christians. Therefore, Qəltu spoken by both Christians and Jews preserved its features and disentangled its identity as sedentary, and had no features to share with the Bedouin Gilit variety. Nonetheless, all these historical facts contributed to the establishment of the linguistic identity of Qəltu and Gilit dialects of

Mesopotamian Arabic as Qəltu being sedentary and Gilit being Bedouin. The other phase that showed later signs of Bedouin Mesopotamian Arabic relates back to the time of the emergence of Ottoman Empire in the 14th cent. The rise of Ottoman Empire was in the Middle or what is known recently as Central Baghdad city, and in the Southern Iraq which includes many cities, among one of the most prosperous cities in the South is Basra (Jastrow, 2006). However, due to the types of settlements in different parts of the country, the urban-Bedouin Qəltu and Gilit dialects respectively were split across three wide regions: Northern Iraq, Middle Iraq and Southern Iraq, and across three populations or religious groups: Muslims, Christians and Jews (Blanc, 1964). The Northern region was occupied by the Muslim dwellers who are known as /ħadˤar/'settled Arabs or urban (sedentary) people', alongside its inhabitants who were Christians and Jews, and the non-sedentary Muslims who immigrated from towns and villages nearby the big cities during different periods of time. This type of immigration to inside the cities led to complete demographic changes in the country; mostly in its effect on the dialect(s) spoken by its inhabitants (Holes, 2007: 130). The urban Muslims who are the city inhabitants along with the Christians and Jews in the Northern part of Iraq are Qəltu speaker; however, the non-urban Muslims who are classified as nomads and semi-nomads living in the same area are Gilit speakers. On the other hand, the Southern and Middle regions of Iraq were occupied by non-sedentary (nomads, and semi-nomads) Muslims who established a new settlement in the country alongside the urban population from Muslims, Christians and Jews. In the Southern and Middle regions, as opposed to the Northern region of Iraq, the Muslims whether urban, nomads or semi-nomads are known as Gilit speakers whereas the Christians and Jews have been always classified as Qəltu speakers in spite of the vast area that separates the Middle and Southern Qəltu speakers from the Northern Qəltu speakers.

2.2 Arabic

Arabic is grouped among the Semitic language families: the Afroasiatic Semitic, the East-Semitic, and the West-Semitic (Watson, 2002; Owens, 2013). Arabic is part of the wide Afro-asiatic Semitic family that includes ancient Egyptian, Coptic, Cushitic, Berber and Chadic. The East-Semitic family includes the languages of Akadian and Elbaite, both which are endangered languages now. The West-Semitic family include the Aramaic, Ugaritic and the Cannanite languages (including Hebrew), ancient and modern South Arabian and Ethiopian Semitic language including Tigre, Tigrinya, and Amharic (Watson, 2002).

Arabic, as a native language is spoken by a large population in Africa with nearly 200 million speakers and in Asia with 120 million speakers. It is spoken in the east from Iraq and Khuzistan in Southwest Iran, all the way to Morocco and to Northeastern Nigeria in the west (Owens, 2013:23). It has a standardised written form called Modern Standard Arabic (MSA), and many spoken dialects in which some of them are mutually unintelligible.

In terms of the distribution of the Arabic dialects, Palva (2006:605) argues that the Arabic dialects cannot be classified without focusing on the stratification of the society. In other words, the combination of society is a reflection for the type of variety or dialects spoken in a particular region. From a sociolinguistic perspective, Arabic dialects descend from a sedentary origin or a Bedouin (nomadic) origin. In some areas, the sedentary dialects are divided further into urban and rural varietis (Ingham, 1996). As previously stated, the linguistic identity of a variety is attributed to the history of the settlements in the area whether the inhabitants are urbans, nomads, or sedentarised nomads in the wake of the Arabic conquests. Likewise, the nomads, and the sedentarised nomad Bedouins living in the different regions are classified based on their way of living, their religious background, and the variety they speak (Riaz, 2011: 259).

2.3 The Linguistic composition in Mesopotamia Iraq

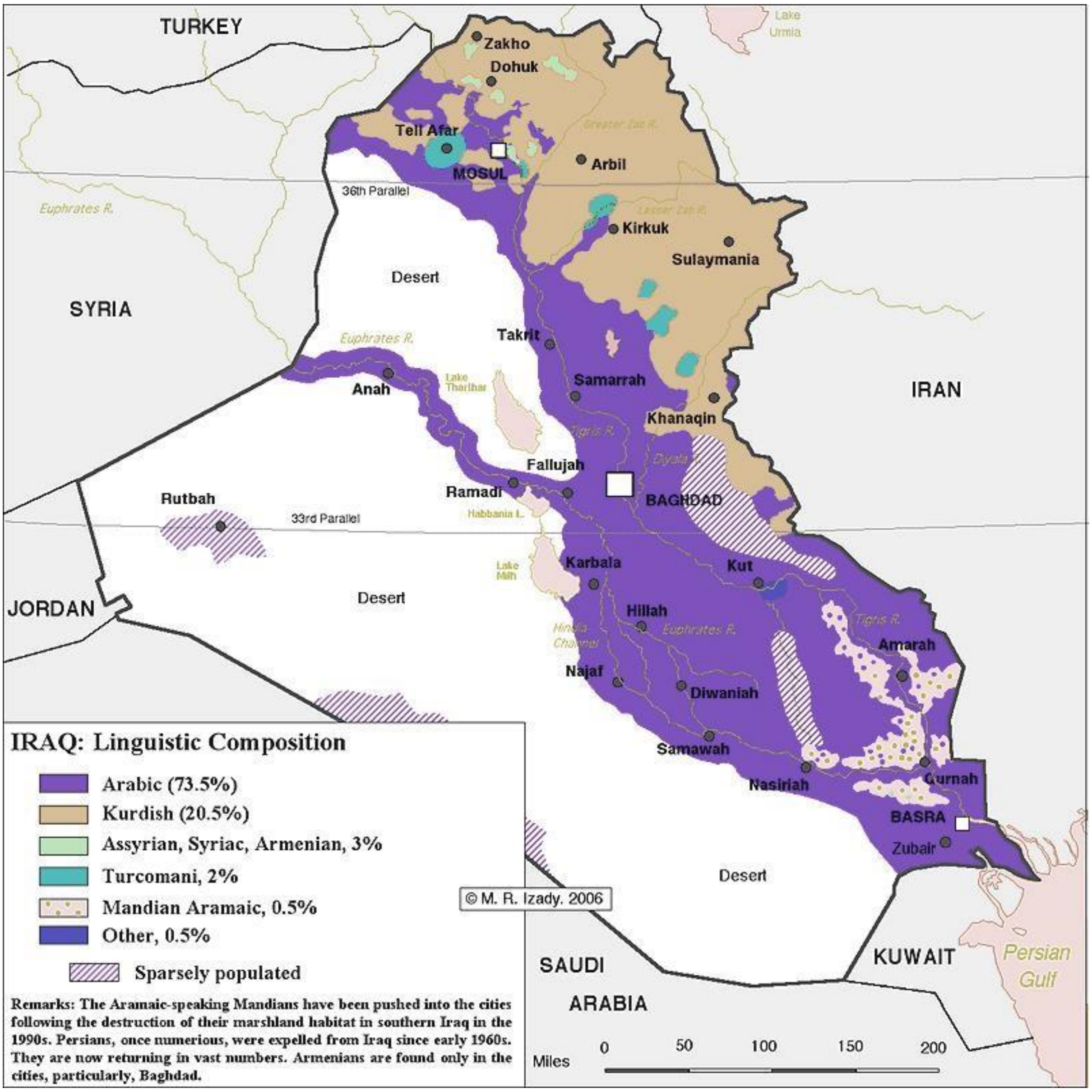

Figure 1: The linguistic composition of Iraq; adapted from Ahmed, 2018

The map above is an illustration of the recent linguistic entities or groups that occupy the multi-linguistic region Mesopotamia Iraq. We find that the linguistic composition of Mesopotamia Iraq is homogenously distributed among the vast areas and regions that can be simply divided into the Upper Iraq (the Northern, the North-eastern), and the Lower Iraq (the Middle, the Southern, and the South- eastern parts (Blanc, 1964). Arabic is the majority language spoken in the middle and southern parts of the country by Muslims and non-Muslims followed by the first minority language that is Kurdish which is spoken by the Muslims and Yezidi Kurds living in the northern and northeast regions while the lesser minority languages are Neo-Aramaic (the

Chaldean, Assyrian and Syriac) spoken by the Christians living in the northern, northeastern, middle, southern, and south -eastern parts and the Torkomani spoken by Torkomans living in the northern part of the country (Jastrow, 1997).

Dialectically-speaking, it is significantly difficult in a diverse ethnic and social population to divide the two dialects of Mesopotamia Iraq, the Qəltu and the Gilit across specific regions (Watson, 2002:9). Hence, the distribution of the Qəltu and Gilit dialects across the different parts of the country can only be delineated in broader terms as follows : (1) Upper Iraq; (2) Middle Iraq; and (3) Lower Iraq (Blanc,1964). Qəltu, is spoken by non-Muslims (Christians and Jews) in Lower Iraq and by other religious communities (Muslims and non-Muslims) in the Upper regions (Blanc, 1964, Abu-Haidar, 1991, Levin, 1994). The Gilit is spoken by nomadic, sedentarised-nomadic and Bedouinised communal groups everywhere in Iraq (Blanc, 1964; Jastrow 2006; Ingham, 2009). It is spoken in the Middle (in Baghdad and the surrounding cities) and Lower (the southern cities) in Iraq (Blanc, 1964).

Accordingly, three well-defined sub-dialects emerged from the Baghdadi variety. These dialects were the Muslim Baghdadi (MB) which belongs to the Southern Tigris Gilit group, the Christian Baghdadi (CB) and the Jewish Baghdadi (JB) which belong to the Northern Tigris Qəltu group. However, the Jewish Baghdadi nearly faded after the last immigration of the Jews during the early 1960s. The latest changes took place when the Jews left Baghdad in the early 1950s and moved to settle in Israel. During that period, Iraqis from different roots and origins started moving to Baghdad city. The city started growing with the immense population of people of Bedouin origins living there (cf. Blanc, 1964; Jastrow, 2006).

Linguistically speaking, Palva (2006) argues that the classification of Qəltu and Gilit as sedentary vs. Bedouin are impressionistic notions based on a number of linguistic variables. Arriving from that point, Palva states that compared to Qəltu, the typological linguistic differences shown in Gilit are of Bedouin type (p.17). Palva’s claim is also supported in previous documented accounts on Baghdadi Gilit dialects (Blanc, 1964; Abu-Haidar; 1988; 1991; Palva, 2006; Jastrow, 2006). The Muslim Baghdadi, and both the Christian and Jewish Baghdadi belong to two separate groups. The distinction is based on the differences in some of the sounds features. The Christian Baghdadi is quite different from Muslim Baghdadi in the following: the interdentals /θ ð/, and the pharyngealised interdental /ðˤ/ (the latter being the joint reflex of /dˤ/ and /ðˤ/ shifted to the dental stops /t, d/ and /dˤ/ respectively in /θaliʒ/<[taliʒ] ‘snow’, /ʔeðˤfer/< [ʔedˤfer] ‘nail’, /ðibil/ < [dibil] ‘wither’; and the preservation of the reflex /q/.

2.4 Qəltu and Gilit

The Mesopotamian dialects can be distinguished according to Qəltu and Gilit dichotomy. The Qəltu and Gilit dichotomy in this research is addressed with relevance to the consonantal and vocalic features of the Northern Tigris group represented in Muslawi Qəltu, and the Southern Tigris group represented in Muslim Baghdadi Gilit. The Muslawi Qəltu is classified as sedentary with sedentary consonantal and vocalic features (Blanc, 1964; Levin, 1998; Jastrow, 2006) whereas the Muslim Baghdadi Gilit is classified as Bedouin in both its consonantal and vocalic features (Blanc, 1964; Ingham, 2009).

2.5 The MSA consonantal inventory

Arabic is a language that has a rich consonantal inventory with the opposition of the different consonants on voiced, voiceless and emphatic triads, and the organisation of consonants according to the morpho-phonological constraints of root and pattern (Watson, 2002; Owens, 2013). The Arabic consonantal includes 28 consonants with gutturals being part of the Arabic consonantal inventory (Hellmuth, 2013). Gutturals include the laryngeals /ʔ, h/, the pharyngeals /ħ, ʕ/, and the uvular plosive /q/ and the uvular fricatives /χ, ʁ/ (Watson, 2002). Arabic is also distinguished from other languages by the presence of certain emphatic consonants such as the pharyngealised stops and fricatives /tˤ, dˤ, sˤ, ðˤ/ that are the counterparts of the non-pharyngealised (plain) ones /t, d, s, ð / (Newman, 2005:185).

The Arabic consonants are classified according to five different places of articulation for stops / b, t, d, k, q/, six different places of articulations for fricatives /f, θ, ð,s,z,ʃ,ʒ, χ, ʁ, ħ ,ʕ/, two different places of articulation for nasals /m, n/, one place of articulation for the approximant / j/, one place of articulation for the lateral approximant /l/, and one place of articulation for the rhotic /r/ respectively (cf. Owens, 2013). In terms of voicing, there are 15 voiced consonants, and 13 unvoiced consonants (ibid). Morphologically, Arabic prohibits consonants of similar places of articulation (homorganic sounds) in the same root, as an example, the uvulars and the pharyngeals never occur in the same root in Arabic * ʁ q t as it is the case in other Semitic languages like Tiberian Hebrew, Tigre and Tigrinya (Hayward and Hayward, 1989; McCarthy, 1991;1994).

On the other hand, there are variations in the consonantal realisations of phonemes which occupy the palatal, velar and uvular places of articulation as represented in the table below.

Table 1The consonantal phonemes in MSA and the Arabic dialects.

		Labial	Interdental plain	Interdental emp.	Alveolar, Dental emp.	Alveolar, Dental plain	Palatal	Velar	Uvular	Pharyngeal	Glottal
Nasal		m				n					
Stop	voiceless	b			tˤ	t		k	q		ʔ
	voiced				dˤ	d					
Fricative	voiceless	f	θ		sˤ	s	ʃ ~ t͡ʃ	x	χ	ħ	h
	voiced		ð	ðˤ		z				ʕ	
Approximant						l	j				
Trill Tap						r ɾ					

/w/ voiced labo-velar approximant

The Arabic language is distinctively variable with the gutturals and the emphatic consonants occupying the post-velars region. The post-velar region is the region of ‘emphasis’ or *tafxiːm* (heaviness or thickness in Arabic terms) which has been identified from an articulatory and acoustic points of views (Hassan and Esling, 2007).

Post-velars are addressed as the ‘*mufaxxam*a’ (heavy or dark in Arabic terms) (Jakobson,1957; Ghazeli,1977) (forthcoming in chapter three). They are represented with two places and two manners of articulation, that is the uvular fricatives / χ, ʁ/, and the uvular stop/q/, the pharyngeal fricative /ħ/, and the pharyngeal fricative /ʕ/ and another group represented in the pharyngealised coronals, the so-called emphatics (Watson, 2002) (forthcoming in chapter four).

There is a considerable disagreement and controversy on which of the post-velar consonants are to be counted as emphatics. Most of the arguments show that it is the nature of *tafxiːm* in the addressed consonants (Ghazeli, 1977) which determines if they are to be classified as emphatics or are to be excluded from the class of emphatics (forthcoming details in chapter four). Lehn, 1963; Delattre, 1971; Ali and Daniloff, 1972 argue that uvulars and the pharyngealised coronals excluding pharyngeals are to be classified as emphatics.

Ghazeli argues that [g] has historically developed from /q/. Thus, it shows the properties of /q/ as post-velar in place of articulation in Gilit like it is in some other Arabic dialects including Palestinian Arabic (Davis, 1995). The uvulars are also represented in the voiceless, and voiced uvular fricatives /χ, ʁ/ respectively (ibid). In Arabic literature, uvulars are referred to as ʔa*lmustaʕlijja* 'elevated' with the feature ʔ*istiʕla*ʔ. ʔ*istiʕla*' is described as elevation of the tongue towards the palate with or without *ʔitbaːq* (Sibawayh; cited in Ghazeli,1977). Further details are provided in section 4.2.

The pharyngeals include the voiceless pharyngeal fricative /ħ/ and the voiced pharyngeal stop / ʕ/ (Watson, 2002). However, the manner of articulation of pharyngeal /ʕ/ in the sound system of Gilit has been controversial (Al-Siraih, 2013). According to Al-Ani (1970), the pharyngeal fricative /ʕ/ is classified as a stop in Mesopotamian Gilit. Other scholars classified the /ʕ/ as a fricative (Blanc,1964; Ghalib, 1984; Abu-Haidar, 1988) while some classified it as an approximant (Ingham, 1982; Butcher and Ahmed, 1987). The voiceless pharyngeal fricative /ħ/ has a great deal of laryngealization since the constriction at the pharynx causes a constriction at the larynx too (Ladefoged, 2001).

Additionally, the two dialects have three phonemic emphatic (pharyngealised) coronal consonants which occupy the post-velar region and are represented with two places of articulation.

The pharyngealised coronal stops which include the /$t^ʕ$/ as the voiceless pharyngealised coronal stop, and the voiceless and voiced pharyngealised coronal fricatives /$s^ʕ$, $ð^ʕ$ / respectively, with the allophonic [$ð^ʕ$] being the reflex of /$d^ʕ$/ in most Bedouin dialects (Ghazeli,1977) including Gilit, as well as in Qəltu spoken by Muslims in Northern Iraq, and in Gilit spoken by Muslims in the Central and Southern Iraq, except for Christian Qəltu speakers who live outside Baghdad who realise it as [$d^ʕ$] (Blanc,1964; Al-Siraih, 2013:21). These consonants are also referred to as *mutˤbaqa* in Arabic literature (Ghazeli,1977). In other words, those having the feature of *ʔitbaːq*, also called *mufaxxama* (Jackobson,1957).

Mutˤbaqa, according to Sibawayah and Zamaxsari (cited in Ghazeli,1977) describe the double articulation of the consonants accomplished by the simultaneously positioning the blade of the tongue in the anterior part of the oral cavity (alveolar), and applying the back of the tongue to the "upper palate" (pharyngeal) (Ghazeli, 1977:6). The mutˤbaqa /sˤ, ðˤ/, and the mutˤbaqa /tˤ/ according to Sibawayh are the counterparts of the "*munfatiħa*" (open) voiceless and voiced alveolar fricatives /s/ /ð/, and the voiced alveolar stop /d/ (ibid) (Sibawayah:406; cited in Ghazeli,1977).

Scholars have also debated the status of a certain set of emphatic consonants in Gilit identified as secondary emphatics which include the labials /bˤ, mˤ, fˤ/, the lateral /lˤ/, and the rhotic /rˤ/ (Erwin, 1963; Youssef, 2009; Al-Siraih,2013) with /rˤ/ and /lˤ/ positions questioned in different vocalic /i/, and /a/ contexts in the Arabic dialects including Gilit (Ghazeli,1977) in addition to the labio-velar /w /, the velar / ɡ /, and the velarized approximant /j/ (Bellem, 2007). This will be discussed further in chapter four.

However in the context of vowels, we see that the presence of the secondary emphatics as phonemic contrasts is restricted to a back /ɑ(:)/, and in a few words in several Arabic dialects including Gilit. Therefore, this has led scholars to re-examine the position of the secondary emphatics in the sound systems of the Arabic dialects of Bedouin origin (Ghazeli,1977; Ahmed, 2008). Further details provided in chapter four.

2.6 The MSA vocalic inventory

The phonological system of Modern Standard Arabic (MSA) is characterised by its limited number of vowels which are described as triangular in the Cardinal Vowel System (Newman and Verhouven, 2002). MSA has three short vowels /a/, /u/ and /i/, and three long counterparts /a : /, /u : / and /i: / (Watson, 2002; Ryding, 2005). It also includes the two diphthongs or glides /aw/ and /aj/ (Al-Ani, 1970). The MSA vowels are described according to the three-way vowel system classification: 1- tongue position: front, central or back; 2- tongue height: high, mid or low; and 3-lip-position: rounded, unrounded with the long/short distinction that is applicable in the classification of the three vowels (Mitchell, 1993:138). The /i/ is a front, high, and unrounded. The /u/ is a back, high, rounded whereas the /a/ is a front, low, unrounded (ibid). Additionally, the short/long distinction is added to differentiate between the short vowels and their long counterparts.

In short, the allophonic variations which exist among the /i (ː) /, /a (ː) /, and /u (ː) vowels in MSA in the different consonantal contexts are:

1-The /a(ː)/ is retracted to [ɑ (ː)], [ɒ (ː)] in the context of the post-velars (i.e., the uvulars /ʁ/, and /q/, the emphatics /tˤ, dˤ, sˤ, ðˤ/, the pharyngealised rhotic /rˤ/, and the pharyngealised lateral /lˤ/) (Al-Ani, 1970; Thelwall,1990) whereas it is advanced to [æ(ː)] in the environment of most consonants like the labials /b, m, f/, the plain (non-pharyngealised) coronals (/t, d, s, ð /n, θ, z, l, ʃ, d͡ʒ ~ ʒ/), the pharyngeals /ħ, ʕ/, and the laryngeals /ʔ, h/. (Holes,2005).

2-The /i/ is realised as [ɪ], [e], [ẹ] in the context of the uvular / ʁ/, the pharyngeals /ħ, ʕ/, the emphatics /tˤ, dˤ, sˤ, ðˤ/, and the pharyngealised lateral [lˤ], but not in the context of the rhotic /r/ (the rhotic /r/ in Arabic is split into two allophones [r] and [rˤ] based on its presence in /a/ context or /i/ context) in MSA (cf. Younes, 1994) whereas an [ɪ] vowel realisation in all other contexts is preserved. The /u (ː) / is realised as [ʊ (ː)] in the context of the post-velars, and as /u (ː) / in all other contexts in MSA (Al-Ani, 1970).

2.7 The Muslawi Qəltu and Baghdadi Gilit consonantal inventories

The Mesopotamian dialects including the Muslawi Qəltu (MQ) and Baghdadi Gilit (BG) bear a relatively conservative consonantal system (Shabo, 2012). Muslawi Qəltu and Baghdadi Gilit consonantal inventories are identified with five different places of articulation for the stops /p, b, t, d, k, q/, nine different places of articulations for fricatives / f, θ, ð, s, z, ʃ, ʒ, t͡ʃ, d͡ʒ, χ, ʁ, ʕ[1], ħ/, two places of articulation for the nasals /m, n/, two places of articulation for the approximats / j, w/, one place of articulation for the lateral approximant /l/, and one place of articulation for the rhotics /r/[2]. Muslawi Qəltu and Baghdadi Gilit introduced some consonants like /p/, / t͡ʃ /, / g/ brought into them via loan words from languages like Turkish, Persian, English, and Kurdish (see Blanc, 1964; Jastrow, 2006). Moreover, the affricate /tʃ/ is present in Gilit consonantal inventory both as a separate phoneme and as an allophone of /k/ in words borrowed from MSA and modified in Gilit to accommodate to the Bedouin sound features (more details in section 2.9.2 Gilit linguistic features. In Muslawi Qəltu, the /k/ and /tʃ/ are separate phonemes, and have no allophones in the Muslawi Qəltu sound system (details in section 2.9.1 Qəltu linguistic features).

[1] The / ʕ/ is realised as pharyngeal fricative in Muslawi Qəltu and as epiglottal stop in Baghdadi Gilit.
[2] The /r/ is realised as tap [ɾ] in some productions of Gilit speakers.

As represented earlier, there are variations in the phonemic and allophonic representations of sounds that comprise the gutturals and the emphatics in the Muslawi Qəltu and Baghdadi Gilit. For instance, the post-velar fricative [ɣ] in Muslawi Qəltu is the allophonic variant of the rhotics /r ɾ/ from MSA in all environments except when it comes in proper names, or it causes a change in meaning when there is a phonemic /ɣ/ substitute for the word (more details on this is in section 2.9.1). Furthermore, the Muslawi Qəltu has preserved the phonetic variant of the uvular stop /q/ as [q] in its phonemic inventory which has undergone change to the post-velar voiced stop [g] in Gilit (cf. section 2.9). However, the /q/ is preserved in Gilit in some lexical borrowing from MSA or are part of everyday vernacular speech (cf. section 2.9.2) Not only has there been some question of the status of the uvular gutturals in the phonemic inventory of Muslawi Qəltu and Baghdadi Gilit, but the position of the guttural /ʕ/ in the sound system in Gilit has also been debated (Al-Siraih, 2013). According to Al-Ani (1970), it is a pharyngeal stop in place of articulation. However, other scholars classified the /ʕ/ as a pharyngeal fricative (Blanc, 1964; Ghalib, 1984; Abu-Haidar, 1988). Added, while others debated that it is both pharyngeal and epiglottal fricative in place of articulation (Delattre, 1971).

As represented above, the variations in the phonological representations of the sounds which comprise the guttural phonemic inventory in Muslawi Qəltu and Baghdadi Gilit are attributed to the linguistic background of both dialects argued for earlier in sections 2.3 and 2.4, and forthcoming in sections 2.9.1 and 2.9.2. On the other hand, the two dialects have three phonemic emphatic (pharyngealised) coronals as part of their consonantal inventory; that is the /tˤ/ as the pharyngealised coronal stop and the /sˤ, ðˤ /[3] as the pharyngealised coronal fricatives with the allophonic [ðˤ] being the reflex of [dˤ] in the Qəltu spoken by Muslims in Northern Iraq and in Gilit spoken by Muslims in the Central and Southern Iraq. Moreover, scholars have debated the position of the secondary emphatics which are identified in dialects of Bedouin origin like Gilit (Youssef, 2009). The secondary emphatics include the laterals /lˤ, rˤ/, the labials /mˤ, bˤ, fˤ/, the nasal /nˤ/, and the velars / k, g/ (Mitchel, 1956; Harrel, 1957; Erwin, 1963; Blanc, 1964; Broselow, 1976; Ghazeli, 1977; Younes, 1994; Watson, 2002).

[3] The pharyngealised coronals [dˤ] and [ðˤ] have merged into a single phoneme [ðˤ] in some Arabic varieties including Mesopotamian Arabic dialects (Blanc,1964; Jastrow, 2006).

Table 2The Qəltu and the Gilit phonemic consonantal inventories

	Bilabial	labio-dental	Interdental	Denti-alveolar	Alveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stop	b			t d			k	q		ʔ
Nasal	m				n					
Trill					r					
Tap or Flap										
Fricative		f	θ ð		s z	ʃ ʒ		χ ʁ	ħ ʕ	h
Affricate						t͡ʃ d͡ʒ				
Approximant							j			
Lateral approximant				l						
Pharyngealised stops				tˤ dˤ	sˤ					
Pharyngealised fricatives				ðˤ						

/w/ voiced labio-velar approximant

2.8 The Muslawi Qəltu and Baghdadi Gilit vocalic inventories

Previous studies of Qəltu (Versteegh, 2001; Jastrow, 2006), and Gilit (Erwin, 1963, Rahim, 1980; Mahdi, 1985; Ghalib, 1984) vowels are impressionistic and they seem to treat vowels regardless of their phonological context. Blanc (1964) identifies four short vowels /i, e, a, u/, and five long vowels /iː, eː, aː, uː, ɔː/ in the Gilit vowel system while Ghalib (1985) classifies the vowels of Gilit into three short /i, a, u/, and four long /iː, aː, uː, oː[4]/ vowels. On the other hand, Mahdi (1985) presents the vowels of the Gilit spoken in Basra in four short vowels /i, a[5], u, o/, and five long vowels /iː, eː[6], aː, uː, oː/ in which the /e:/, and /o:/ can be the monopthongisation of the diphthongs /ay/, and /aw/ of OA as in /bayt/ < /be:t/ 'home' , /mawt/ > /mo:t/ 'death'; via borrowing from other languages like Turkish, Iranian and Enlish in words like / χo:ʃ/, / tʃo:l/ 'desert'; also it occurs in open syllables as in / ðˤarabu:ni/ < /ðˤurbo:ni/ 'they hit me' (Jastrow,1994).

In Muslawi Qəltu, four long vowels / i:, e:, o:, u:/, and two short vowels / ə[7], ʌ[8](a)/ are identified in words like /ibn/ < / əbən/ 'son', /uχt/ < / əχət/ 'sister', and / ʔʌ(a) kal/ 'he ate'. The /ə/ in Muslawi Qəltu is seen to be the counterpart of /i/, and /u/ of OA (Jastrow,1994).

The long /e:/ vowel in Qəltu is a result of *ʔimaːla* of OA /a:/ as in /maka:nes/ < /make:nes/ 'sweepers' whereas /o:/ is suggested through lowering of OA /u:/ in post-velar (*muffaxxama*) contexts as in /maħfu:ra/ < /maħfo:ɣ[9]a/ 'engraved' (cf. Jastrow,1994). Also /e:/ and /o:/ in Muslawi Qəltu are identified as the monopthongisation of the dipthongs /ay/, and /aw/ of OA respectively in words like / χaytˤ/ </ χe:tˤ / 'thread' /χawf/ < /χo:f/ 'fear'.

Later studies implemented instrumental investigation; i.e. auditory (Al-Siraih, 2013), acoustic (Al-Ani, 1970; Butcher and Ahmed, 1987; Bellem, 2007; Al-Siraih, 2013) where the first and second formants (F1-F2) are adopted as acoustic cues in vowel identification while further articulatory investigations (Hassan, 2005; Hassan and Esling, 2007) observe the Muslawi Qəltu (Al-Siraih, 2013) and Baghdadi Gilit vowels (Al-Ani, 1970) in their phonological contexts, i.e. they looked in their phonological contexts). They concluded that the vowel of Muslawi Qəltu and Baghdadi Gilit are phonologically driven by their context (cf. Al-Ani,1970) some which I summarised as follows:-

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4 It can also be identified as /ɔ:/.
5 The /a/ is identified as /ʌ/ in Gilit (Bellem,2007).
6 The /e:/ is also identified as /ɛ:/ (cf. Bellem,2007).
7 Jastrow (1994) argue that the /i, u/ vowels show as / ə/ in Qəltu.
8 The /a/ in Qəltu is identified as central / ʌ/ (Bellem, 2007) or back / ɑ/ (Jastrow,1994).
9 Further details on the /r/ > [ɣ] realisation in Qəltu are provided in the sections below.

1- In Gilit, the /a (ː) / is retracted to [ɑ (ː)] in the context of the post-velars (cf. Al-Ani, 1970, Bellem, 2007). Additionally, it is retracted to [ɑ (ː)], or retracted and rounded to [ɒ (ː)], [ʊ (ː)] or [ɔ (ː)] in the environment of post-velars along with the labials (the bilabials /bˤ, m ˤ /, the labio-dental /fˤ /), the labio-velar /w ˤ /, the /j/ and the velar /g/ presented as secondary post-velars (cf. Erwin, 1963; Jastrow, 2006; Bellem, 2007 ;Youssef, 2015) in one form of consonant-vowel harmony. Further details on this with examples in sections 3.6, 4.2 & 4.8. However, the /a(ː)/ is fronted to [æ(ː)] in all other environments (Al-Ani,1970).

2- The short /a/ is also raised to [ɪ] in non-post-velar contexts word medially in Gilit whereas, it is fronted to [e] or [ɛ] word medially which Bellem (2007) referred to as *ʔimaːla* (vowel raising or inclination) in the context of post-velars (see Ghalib, 1984; Mahdi, 1985). The short /a/ is also fronted to [ə] word finally in *ʔimaːla* in post-velar and not-post-velar contexts in Gilit. It shows as complete vowel harmony (Further details on with examples in section 4.5).

3- In Qəltu, there are variations in the /a (ː)/ vowel realisations. The /a(ː)/ is centralised to [ä(ː)] or retracted to [ɑ(ː)] in the context of post-velars (cf. Abu-Haidar,1991). On the other hand, the /a(ː)/ is also fronted and raised to [e(ː)] [ɛ(ː)] in *ʔimaːla* in the imperfective verb forms, nouns, and adjectives. However, in all other non-post-velar contexts, the /a(ː)/ is fronted to [æ (ː)] or fronted and raised to [e (ː)] [ɛ (ː)] in *ʔimaːla* (cf. Jastrow, 2006) in two forms of vowel harmony. More details on this with examples in section 4.4.1& 4.5.

4- In Gilit, the /i/ is realised as [ɪ̢], [e], [ẹ], [ɛ] or [u~ʊ] in the post-velar context (Erwin, 1963; Jastrow, 2007; Bellem, 2007) whereas it is realised as [ɪ] or [e] in all other contexts (Al-Ani, 1970). The /i/ < [ʊ] vowel realisation in Gilit is detected in the contexts of post-velars with the labials, labio-velars or velars which act as secondary post-velars in the dialect when present in the phonological domain (Erwin, 1963; Jastrow, 2006; Youssef, 2015). In other words, /i/ < [ʊ] vowel realisations come in complementary distribution in these environments in one form of complete consonant-vowel harmony (ibid). Further details on this with examples in section 4.8.

5- In Qəltu, the /i/ is realised as [e] or [ẹ] in the post-velar context or as [ə] (cf. Jastrow, 2006) where stem and epenthetic vowel agree in complete harmony with each other.

More details on this provided in section 4.5. The /i/ is realised as [ɪ] or [e] in all other contexts.

6- In Gilit, the short /u/ is realised as [ʊ] in post-velar contexts (Bellem, 2007). In Qəltu, the /u/ is realised as [ʊ] or [ɔ]. It is also fronted to [e] or [ɛ] in the process of *ʔimaːla* represented as vowel harmony (see details with examples in section 4.5). However, the long /uː/ vowel is realised as [ʊː] or [ɔː] in the context of post-velars and as [uː] in all other contexts in Qəltu. Whereas in Gilit, the /uː/ is realised as [ʊː] in closed syllables or [ɔː] in open syllables in the context of post-velars (cf. Bellem, 2007). However, it is realised as [uː] in all other contexts in closed syllables, and as [oː] in open syllables (Erwin, 1963; Al, Ani, 1970).

7- The diphthong /aw/ found in OA is preserved in some words in Qəltu in [ʕawdʒi] and [ʕɑwdʒə]n. ‘turning’ whereas it is shortened to [ɔː] in other words like [ʕɔːdʒə] in Gilit and [ʕɔːdʒaː] ‘wrong’ in Qəltu.

8- The diphthong /aj/ from OA is realised as [eː] or [ɛː] in / ʁajba/<[ʁeːbi] in Qəltu and < [ɣɛːba] ‘absence’ in Gilit and /bajt/ > /beːt/ in Qəltu, and >/beːt/‘house’ in Gilit. However, the /aj/ of OA / χaːʔif/ is found in Qəltu < / χajjif/ m. ‘afraid’ (the long vowel /aː/ is compensated with the diphthong /aj/ in compensatory lengthening process (doubling the glide /j/ to avoid hiatus (the occurrence of two adjacent vowels) resulting from the absence of the glottal stop). Whereas, in Gilit, the long vowel is preserved in / χaːʔif/</χɑːjef/.

2.9 The linguistic features of Muslawi Qəltu vs. Baghdadi Gilit

It is obvious for any two linguistic dialects or dialects that the linguistic relationship that unifies or differentiates them is much related to the linguistic features that are common or are distinct among them (Ingham, 1969). In this sense, it is the phonology of a language that says much about the similarities or differences among two or more dialects of the same language. Hence, the coming sections focus on the phonological variations found among each of Muslawi Qəltu and Baghdadu Gilit linguistic features of their speech sounds. This is more or less attributed to their linguistic background. As presented earlier, Muslawi Qəltu and Baghdadi Gilit dialects are spoken by people from two different backgrounds across different regions in Iraq. In other words, Muslawi Qəltu and Baghdadi Gilit are from two distinct linguistic backgrounds which make them significantly different in terms of the linguistic features of their speech sounds (Blanc, 1964; Versteegh, 2001, Owens, 2006). Muslawi Qəltu has preserved several linguistic features from MSA, and has some shared linguistic features with other Arabic dialects of the same linguistic background like the feature of *ʔimaːla* ‘inclination’ in urban Syrian Arabic, and Lebanese Arabic. On the other hand, Baghdadi Gilit linguistic features (characteristics) are part of the features of the Bedouin dialects’ sound system.

2.9.1 Muslawi Qəltu linguistic features

Muslawi Qəltu is classified as a sedentary Mesopotamian Arabic variety that occured as a continuation of the medieval vernaculars spoken in the sedentary centres of Abbasid Iraq (Versteegh, 2001). Jastrow (1978) divided the Qəltu dialects spoken in Iraq, Syria and Turkey geographically into three groups: the Tigris group, the Euphrates group, and the Anatolian group. Muslawi Qəltu spoken by Muslims in Iraq belongs to the Northern Tigris group (North Mesopotamian Arabic). Qəltu spoken by Christians and Jews in the Northern and Middle part of the country belongs to the same group and is identified by previous scholars as Christian Arabic and Jewish Arabic (Versteegh, 2001).

However, the Christian and Jewish Qəltu in the Middle part are distinctively different compared to the Christian and Jewish Qəltu spoken in the Northern part. Muslawi Qəltu represents the old sedentary dialect type that preserved many of the Old Arabic (OA)[10] phonological and morphological features like the retention of the OA 1st pers. sg. Morpheme -*tu* (Qəltu ‘I said’) in the perfect; the reflex of q ‘ق’ (/qaːf/ vs. /g/ ‘گ’) in /qaːm/<[qaːm], and [quttulu] ‘I told him’, [qaʕadtu] ‘I sat’ (Jastrow,1994:119) in Muslawi Qəltu vs. [gaːm] ‘he stood’ in Gilit; the final stressed feminine forms of colour adjectives like /sˤafˤɣaː/ ‘yellowish’, /bˤɛːðˤaː/ ‘whitish’, /soːdaː/ ‘blackish’; the invariable suffixed pronoun – *ki* ː in the 2nd pers. sg. fem. in /ʔaqellelki/ ‘I tell you’ (Jastrow, 1978; Palva, 2006: 607); the endings *–in, -un* in the imperfect verbs in words like /jemluːn/ ‘they fill’; the emphatic realisation of /ð/ as [ðˤ], and /s/ as [sˤ] in a leftward harmony process (known as emphasis harmony) in the environment of other post-velar sounds in /jaðuːquːn/< [jðˤoːquːn] ‘they taste’, /jsaffiq/<[jsˤafˤfˤoq] ‘he claps’; and in a rightward harmony process in /naːquːs/<[naːqoːsˤ] ‘bell’.

Moreover, the OA /r/ has shifted to the velar fricative [ɣ] in Qəltu. The [ɣ] is identified as the allophonic variant of the alveolar trill or tap /r ɾ/ in Mosuli Qəltu. The /ɣ/ is realised as being phonetically similar to the original velar fricative /ɣ/ in place of articulation in words like /kaθiːr/<[kθːɣ]'much', and /baɾid/<[baɣid] 'cold' (Tawfiq, 2010; Jastrow, 2006:416). On the other hand, in some phonological descriptions, the velar fricative /ɣ/ is identified as being closely similar to the French uvular trill /R/ (Versteegh, 2001). However, in Muslawi Qəltu, the /r/ is not realised as [ɣ] in words that cause change in meaning when substituted with the phonemic /ɣ/ in /rabbi/ 'Lord' */ɣabbi/ 'raise a child or breed', /yisbir/ 'he is patient' * [yisbiɣ] 'to paint', /tˤamir/ 'digging' * [tˤamiɣ] 'stamp', /raːja/' flag' * [ɣaːja] 'aim' as the /r/ and /ɣ/. This affirms the fact that the /r/ and /ɣ/ are two distinct phonemes in the Qəltu variety which has nothing to do with the /r/ realisation as [ɣ] in particular phonological environments. In support of this argument, Tawfiq (2010) identified the phonological environments in which /r/ surfaces as [ɣ] in MQ; in the long vowel environments as in /χeːr/ ~[χɛːɣ] 'the good', /deːr/~[dɛːɣ] 'monastery', /θoːr/~[θoːɣ] 'bull'. Tawfiq (2010) also identified the phonological environments in which /r/ is prohibited from co-occurring as [ɣ] and elided; in the environment of post-velar sounds in which the /r/ elision is compensated with the long rounded vowels in /ɣerbaːl/<[ɣuːbeːl]'sieve',/xirqa/<[xoːqa] 'tatter', /qursˤa/<[qoːsˤa] 'a loaf of bread'; or degemination in /ʔaqraʕ/ < [ʔaqqaʕ] 'bold', [ʔaqrabi] <[ʔaqqabi] 'scorpion'.

Additionally, MQ has also preserved the velar stop /k/ from the Old Arabic in /kaːn/ <[kaːn] 'was', /samak/<[samak] 'fish' which is fricated or affricated to [ʃ] [t͡ʃ] in Gilit in phonetically conditioned environments (that is in the vicinity of the front vowels) in /kaːn/<[ʃaːn]; /samak/<[simat͡ʃ] 'fish'.

Muslawi Qəltu, unlike other Arabic dialects has the phoneme /p/ as part of its consonantal inventory. The /p/ was brought to the variety via loan words from Turkish and Iranian in words like /parda/ 'curtain' and /panʃar/ 'puncture' (Jastrow, 2006:415). Another feature of MQ is the existence of *ʔimaːla* 'inclination' (the fronting and the raising of /aː/ towards /eː/ or /iː/). *ʔimaːla* is presented in vocalic system of Mediterranean dialects of Arabic (like Syrian Arabic, and Lebanese Arabic) including Mesopotamian Arabic, specifically the Qəltu variety (Blanc,1964; Levin,1994; Jastrow,2006) and in some instances in Gilit (Bellem, 2007). In *ʔimaːla*, literally "inclination" (Kaye and Rosenhouse, 1997), the low front /a/, and its long counterpart /aː/ are raised and fronted to [e], [eː], [i], [iː], [ɛ], [ɛː] (Barkat, 2011).

Muslawi Qəltu displays the medium and strong *ʔima:la*. *ʔima:la* from /a(:)/ > [e (:)ɛ(:)] is a medium *ʔima:la* and it occurs word medially and finally. The strong *ʔima:la* is the word final *ʔima:la* from /a(:)/ <[i(:)] (see Barkat, 2011).

ʔima:la is dependent on the vocalic context of the word (i.e. if a preceding vowel is a raised /i/ or /e/, /ə/, *ʔima:la* in the following vowel exists). Further details in section 4.4.1. *ʔima:la* is also governed by historical dialectal variations (Levin, 1998). *ʔima:la* is close to what is known today as the vocalic harmony (vowel- harmony) (ibid) where *ʔima:la* in Qəltu occur in two word positions: a) medial *ʔima:la* that is conditioned by historical vocalic environments (ibid). It is realised in the productions of (Christians and Jews) Qəltu speakers. The medial *ʔima:la* of /a:/ occurs in the sequence of /i/ in the production of Christian Baghdadi in words like /kila:b/ in OA < [kli:b] 'dogs' in Judaeo (Jewish) Baghdadi and *ʔima:la* towards long /e:/ realised in the production of CB and Mosuli speakers of Qəltu dialect in [kle:b] (ibid). Moreover, *ʔima:la* is not restricted to one context and to one group of consonants. It also occurs in the environment of velar, uvular, and emphatic consonants in words like /ara:dˤi/ in OA < [aʁe:ðˤi] 'lands' in Qəltu, /maqa:sˤi:sˤ/ in OA < [maqe:sˤi:sˤ] 'scissors' in CB and /wa:qef / in OA < [we:qef]/ 'standing' in CB and JB (Blanc, 1964; cited in Levin 1998); and b) final *ʔima:la* is not conditioned by the existence of /i/ in the vocalic environment (the preceding or following syllable) (Levin, 1994). It occurs in words like /ħebla/ in OA < [ħeble:] 'pregnant' in JB and CB and in Mosuli as well and /kasla:ni:n/< [ksa:li:], [kasa:li:] 'lazy' in JB and CB respectively (Levin, 1998:180).

2.9.2 Baghdadi Gilit linguistic features

Baghdadi Gilit, in contrast, is the product of a later process of Bedouinisation, and is of a Bedouin origin (Jastrow, 2006:414). Bedouinisation, derived from the word Bedouin or Bedouins, refers to a group of people who identify themselves as nomads, semi-nomads, and sedentarised nomads. These groups are classified according to their way of living, and their accommodation with the urban life in different regions across the country (Blanc, 1964; Riaz, 2011).

Bedouinisation, is a process by which the urban dialect of a society loses much of its phonological, morphological and syntactic characteristics and accommodates to the Bedouin dialect features and characteristics (Abu-Haidar, 1987; Levin, 1998; Watson, 2002; Jastrow, 2007). Among the Bedouin sound features is the /q/< [g] shifting in /qalb/ <[galˤʊb] 'heart', qemet/ < [gimit] ‘stood up’; /qaːl/ < [gaːl] ‘he said’ (Jastrow, 2006:416) whereas the /q/ is still preserved in some words in Baghdadi Gilit in /quful/ ‘lock’, /daqiːqa/ ‘minute’, /buqa/ ‘he stayed’, /qira/ ‘he read’, /qarja/ ‘village’ (see Palva,2006:18f); the /k/ < [ʃ]~ [t͡ʃ] frication or affrication (Rahim, 1980; Mahdi, 1985; Abu-Haidar, 1987) in /kinna/ < [tʃinna] ‘we were’, /ka:nu:/ < [t͡ʃa:naw], ‘they were’, /takðib/ <[tʃaððib] ‘you lie’, /kalib/ <[tʃaliðb] ‘dog’, /ʃubbaːk/ </ʃubbaːtʃ/ ‘window’, /sikkiːna/ <[sitʃtʃiːna] ‘knife’, and /kabiːr/< [tʃibiːr] ’big’, and the [tʃ] >/k/ frication also exist in the prenominal suffix of the second person singular feminine to distinguish between masculine /be:ta:k/ and feminine /be:titʃi/ ‘your house’; the insertion of an epenthetic vowel after the first consonant in a CC or a CCC cluster as in /kalb/ < [tʃalib] ‘dog’, /jðˤrubu:n/<[jðˤurbu:n] ‘they hit’; and the change of the vowel /a/ to [i] in open syllables and non-post-velar environments as in /samak/< [simaʃ] ‘fish’, and to [ʊ] in post-velar environments as in /basˤal/< [bʊsˤal] ‘onion’; the emphatic quality of /l/ in words like [galˤub] ‘heart’ (Jastrow, 2006), and the emphatic /rˤ/ in words like [ðarˤrˤa] ‘he scattered’ and [rˤabiːʕ) ‘spring’ (Younis, 1994;Youssef, 2009). There is u-coloring and vowel harmony in the environment of bilabials and velars in words like [χʊbʊz] ‘bread’ and [sˤʊdʊg] ‘honestly’ (cf. Erwin 1963; Blanc, 1964; Bellem, 2007; Youssef, 2015).

2.10 Summary

This chapter provided an introduction on the historical and linguistic background of the dialects which existed in the region of Mesopotamia Iraq. The Muslawi Qəltu which belongs to the Northern Tigris group, and the Baghdadi Gilit which belongs to the Southern Tigris group. The two dialects were thoroughly investigated in terms of their consonantal inventory, vocalic inventory and the linguistic features which shaped their linguistic identity as sedentary Muslawi Qəltu and Bedouin Baghdadi Gilit.

Chapter Three: *Features*

3.1 Features

Human speech consists of a combination of segments that are known as the components of speech. However, segments are not the smallest units of speech. They are decomposable into smaller units known as features which constitute the primes of melodic representations (Harris, 1994: 90). The features express the segments' mental representations and its places and manners of articulation. The features which address the segments' place and manner of articulation are consonantal in nature. Consonantal features can have any configurations of manner features (Gussenhoven and Jacobs, 2011). Features can also be vocalic and specify a vowel-like gesture of either the lips or the tongue body (ibid). The consonantal and vocalic features are addressed as the cognitive elements in the phonological theory.In other words, the underlying representations of segments are a combination of features that are present in the speech signal and are presented from the hearer's point of view in production; from the listener's point of view in perception, or in both production and perception (Backley, 2011).

In general terms, the features that define segments characterise their phonetic articulatory or acoustic properties (Chomsky and Halle, 1968). In other words, a feature or features assigned to segments that comprise a natural class is based on their acoustic and articulatory configurations identified in the speech signal (McCarthy, 1988; 1991). It is also argued that a group of sounds comprise a natural class with a phonetic feature(s) which is representative of their phonological behaviour (Watson, 2002; Zsiga, 2013: 293). A natural class of sounds like gutturals in Arabic share the feature [guttural] (Watson,2002) based on their phonological behaviour which include one of the following: 1- there are root-co-occurrence restrictions on the occurrence of homorganic sounds in the same root; 2- vowel lowering;; and 3- degemination (McCarthy,1994, Shahin 2003; Hellmuth,2013).

Earlier phonetic and phonological representations of the underlying features of a segment are addressed within the framework of Distinctive Feature Theory (henceforth DFT) that has its grounds in articulatory phonetics (Chomsky and Halle, 1968). The DFT dates in its origin to the 1930[s] in the Prague School, pioneered by Trubetskoy, 1939; Jakobson, 1942 and Jakobson and Halle, 1957. Jakobson and Halle (1957) in the "Fundamentals of Language" defined features in articulatory, auditory and acoustic terms. They assigned univalent features like [compact] and [grave] for low vowels and back consonants, and features like [diffuse] and [acute] for front vowels and palatal consonants. Jakobson and Halle (1957) related both sets of features to their acoustic speech signals represented in the concentration of energy shown in the spectrograms for these classes of segments. The [compact] feature correlates with the high concentration of energy in the centre of the spectrum and the [diffuse] feature correlates with the widely distributed concentration of energy in the spectrogram (Backley, 2011). However, segments like the emphatics /tˤ dˤ sˤ ðˤ/ with secondary pharyngeal articulations (strictures) are represented with the [+flat] feature (Jakobson, 1957), and with the [+low +back] features by Chomsky and Halle (1968). The secondary articulations can include labialisation (lip narrowing constriction), velarisation (dorsal or tongue body constriction), or pharyngealisation (radical or pharynx constriction) or a combination of one or more of these secondary articulations like labialisation and dorsalisation (tongue body constriction) (Herzallah, 1990). The [+flat] feature proposed by Jakobson (1957) is based on acoustic evidence; that is the F1-F2 compactness presented in the speech signal (Backley, 2011). Moreover, Herzallah (1990) adopted the [+back] feature to represent segments that are articulated further posterior in the oral cavity like the emphatics /tˤ dˤ sˤ ðˤ/, and the uvulars /q χ ʁ / in Palestinian Arabic (Davis,1995).

In the *Sound Patterns of English* (SPE), features were presented as binary (bivalent) (plus/ minus) values (Chomsky and Halle, 1968). Features like [+-round] or [+-low/ +-back] in SPE have their characterisation in phonetics and basically in speech production. As previously stated, features in SPE are assigned to the place and manner of articulation of the speech sounds (Beckley, 2011).

3.2 Feature Theory (Feature Geometry)

The Feature Theory (FT) plays a significant role in the phonological theories of speech production. FT accounts for the phonology of a particular language in the formation of phonological abstract features that target the speech segments' physical properties in the language. It also accounts for the representation of phonological processes like assimilation (Youssef, 2006) emphasis spread (Davis, 1995) or post-velar harmony (Shahin, 2003) on autosegmental tiers that allow features to spread, link or delink (McCarthy, 1988).

Features combine a group of segments based on the articulator(s) that executes them. The articulators that execute the segments comprise one of the six moveable parts in the vocal tract: Lips, Tongue Blade, Tongue Body, Tongue Root, Soft Palate and Larynx (Halle et al. 2000: 388). Each one of these articulators is capable of a restricted set of actions of its own, and one of these actions is associated with a particular feature (ibid). Accordingly, features are assigned to a group of segments based on the constriction (stricture) formed by the articulators during their production (Clements, 1991). The segments whose production superimpose one constriction inside the oral cavity are associated with the classes of bilabials, labiodentals, dentals, alveolars, post-alveolars, uvulars and pharyngeals (Ladefoged 2011). Arabic emphatics are among the class of sounds with a primary (alveolar) and secondary (uvular or pharyngeal) constriction (Ladefoged & Maddieson 1996).

FT contributed to the early stages of the representation of speech segments in both its early approaches in the “Fundamentals of Language” (Jakobson and Halle, 1957); in the Sound Patterns of English (SPE) (Chomsky and Halle, 1968), and in its latter approaches represented in the Feature Geometry (Clements, 1985; Clements and Hume, 1995). In the recent approaches to FT introduced in Feature Geometry, three main Place features or Articulatory nodes in the oral cavity were introduced: the [labial] node which defines segments articulated with lip movement, the [coronal] node which defines segments articulated with the tongue front (tip and blade) movement, and the [dorsal] node which defines segments articulated with raising the dorsum (body) of the tongue (Sagey, 1986).

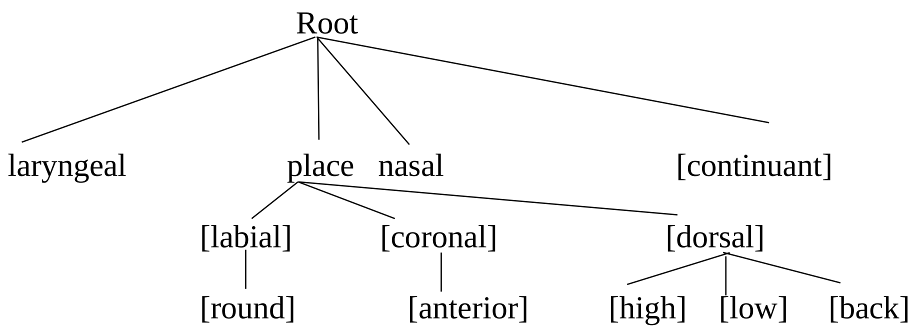

Figure 1 Feature Geometry as suggested by Sagey (1986) cited in Padgett (2011).

However, further features like [radical] or [constricted pharynx] are assigned to segments articulated with pharynx constriction as a primary or secondary articulations in the pharyngeal cavity and are executed under a fourth node called the pharyngeal node (McCarthy,1991, Clements,1991).

Sagey’s (1986) definition of the features [labial], [coronal], [dorsal] and [radical] is based on the articulator movement, and not the articulatory constriction. Thus, Clements (1991) claims that when we talk about vowels in terms of their articulatory movements, we see that features like [high], [back] and [low] can be classified under [dorsal] in terms that in the production of vowels, the tongue body is the active articulator. However, the tongue body as an active articulator is not present in consonants, but rather the tongue body is involved in the formation of a dorsal constriction in the oral cavity. In this sense, Clements introduced the four features above as articulator-defined constrictions rather than articulator movements. In other words, Clements shows that features can be assigned to both consonants and vowels in terms of the place of constriction formed in the oral cavity. So, he claims that a feature like [dorsal] which involves a constriction formed by the centre or the back as opposed to the front of the tongue can distinguish back vowels like [u] and [ɑ] from central vowels like [ʉ] and [a] (80). Thus, Clements' representation allows to account for a natural class of consonants and vowels by assigning features to consonants and vowels in terms of the articulatory constriction they share among them.

The features that are assigned to consonants are called consonantal features, and are referred to as C-place features in Feature Geometry whereas features that are assigned to vowels are called the vocalic features, and are referred to as V-place features (Clements, 1991, Clements and Hume, 1995). In other words, the [labial], [coronal] and [dorsal] can be executed under what is called a consonantal node in a feature Geometry to represent primary articulation in consonants. The same features can be executed under a vocalic node to represent vowels or secondary articulations in complex consonants. However, a separate node is used to specify the degree of opening of vowels (Clements and Hume, 1995).

In Clements' (1991:77) account of Feature geometry as distinct from other representations of Feature geometry, the V-place features are segregated from the C-place features in the sense that they are assigned to different regions or planes to represent phonological processes like vowel harmony and assimilation. This segregation explains that V-place features spread more freely than C-place features and are not blocked by the presence of intervening consonants or vowels. However, Clements' account is no different than other accounts in the respect that a consonant place feature like [coronal] and a vocalic place feature like [back] are to be represented on different planes according to whether the feature represents a consonant or it represents a vowel. This is illustrated in figure 2 below.

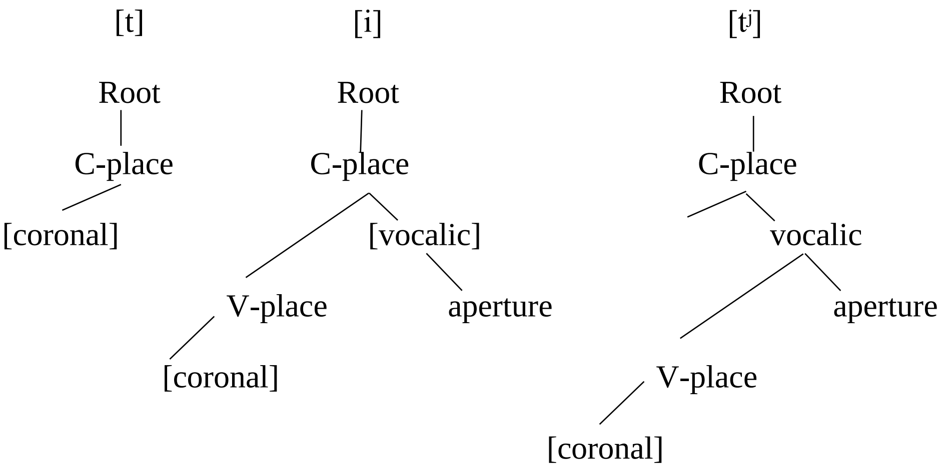

Figure 2 Unified Feature approach as suggested by McCarthy (1991).

The articulatory nodes are dominated by the Place node which is a constituent under the supra-laryngeal node and are derived from the main Root node in the Feature Geometry (Sagey, 1986). Each of these Articulatory nodes or Place nodes dominates constituents corresponding to their relevant features. The [labial] node dominates the [+/-round] and [+/-distr], the [coronal] node dominates [+/-ant] and [+/-distr], and the [dorsal] node dominates [+/-back], [+/-high] and [+/-low]. However, the [radical] node dominates the [+/-ATR] (Gussenhoven and Jacobs, 2005:160). In Clements' (1991:79), and McCarthy's (1991) accounts of Feature Geometry; the [labial], [coronal] and [dorsal] link to an oral node. However, the [radical] links to a pharyngeal node to represent pharyngeal segments articulated with the root of the tongue, and whose articulation extends from the larynx to the uvula. It also includes some laryngeal segments in some languages (McCarthy, 1991). Two bivalent features are argued to link under the pharyngeal node in feature theory to represent segments articulated with the tongue root, these are [+/-advanced tongue root]: [+/-ATR]. [+ATR] is also sometimes referred to as 'tense', this feature characterises segments articulated with the tongue root further advanced in the oral cavity. The tongue root is relatively driven forward, thereby causing an enlargement of the lower pharynx and raising of the tongue body in the oral cavity (Perkell, 1971:123). The [+ATR] is typically used to represent vowels and can account for harmony in vowels in West African languages like Akan (Stewart;1967;Clements, 1985) where tense/lax characterisation of vowels like /i, ɪ/, /u, ʊ/ /o, ɔ/ and /e, ɛ/ are specified (Halle and Stevens,1969); also related is [+/- retracted tongue root]: [+RTR] which refers to constriction of the pharynx, involving retraction of the tongue root and activation of the pharyngeal constrictor muscles (Vaux, 2001). The feature [+RTR] can account for processes like emphasis harmony in languages like Aramaic and Arabic (Hoberman, 1988; Rose and walker, 2011). However, [-ATR] (also called lax), characterises segments articulated with the tongue root further posterior in the oral cavity, mostly it represents vowels in Akan and other African languages, but can also represent consonants (Vaux,1996). On the other hand, [-RTR] (refers to the neutral position of the tongue), and is argued to represent the epiglottals as a primary articulation and the uvulars as a secondary articulation along with the feature [-RTR] (Vaux, 2001). However, the [-ATR] along with the [+RTR] represents pharyngeals (ibid).

Not only place nodes are present in the Feature Geometry, another component of the Feature Geometry that can be derived from the Root node is the Laryngeal node. Features that dominate the Laryngeal node can be one of the following: the [spread glottis], [constricted glottis], the [stiff vocal folds], the [slack vocal folds] and [glottis] (Halle et al., 2011). These features represent the states of the glottis and the vocal folds. However, manner features of speech sound like [consonantal] and [continuant] are also another component in the Feature Geometry that are executed directly from the Root node; that is why these features never spread or delink (Uffmann, 2011).

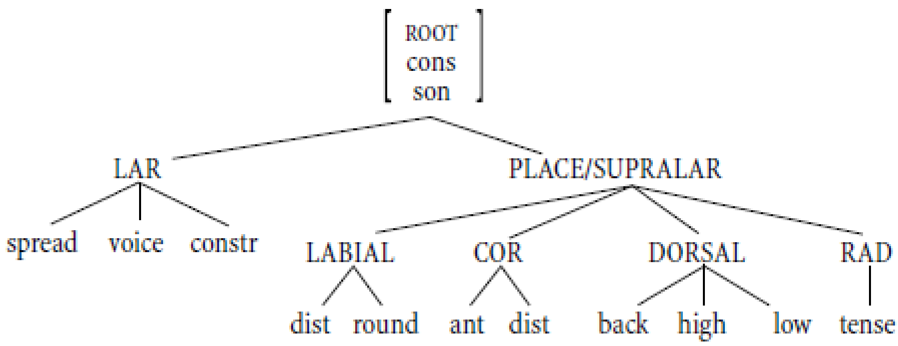

Figure 3 Feature Tree (Carlos & Gussenhoven 2011: 190).

Halle (1995) proposed two types of features in his Feature Geometry: 1- the articulator- free features; 2- the articulator- bound features (AB). The articulator-free features can be executed by a number of different articulators. Manner features like [continuant] and [strident] are articulatory-free features. They can be executed by different articulators like the lips, the tongue blade, the tongue body, the tongue root, the soft palate, the larynx, the pharynx and the epiglottis (Halle, 1995:6). These features are linked with the Root node in feature geometry (Uffmann, 2011).

The articulator-bound features are associated with one feature. Articulator-bound features are features that can be articulated by one specific articulator only, such as [voice], which is bound to the larynx, or [round], which can only be executed by the lips (Uffmann, 2011: 649). The Place features like [high], [low] and [back] which represent vowels are articulator-bound features and are grouped together under the articulator(s) that executes them (Halle 1995:4). The [high] [low] and [back] are grouped under the [dorsal] place node in the feature tree. However, [anterior] (representing segments articulated at the front part of the oral cavity), and [distributed] (representing segments articulated with the tongue further extended in the mouth) are grouped under the [coronal] place node (ibid). Whereas, the articulator-free features like the manner features [consonantal] and [sonorant] are assigned to each consonant. Accordingly, each segment has what is called its designated articulator (the articulator executing the articulator free features of a phoneme) that distinguishes it (Halle et al., 2000).

In the case of consonants and vowels whose production have one stricture in the oral cavity, the consonantal or vocalic features specified for their articulation can be one the following features: [coronal], [labial] or [dorsal] (see Clements and Hume, 1995). McCarthy (1994) proposed that an additional [pharyngeal] feature should be added to the feature tree in order to segregate the oral articulation under which [coronal], [labial] and [dorsal] features are linked from the [pharyngeal] articulation.

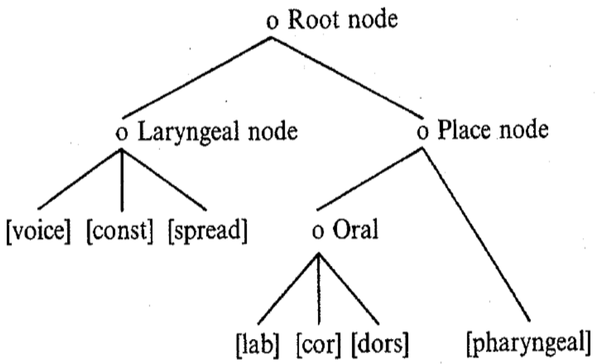

Figure 4 McCarthy’s unified feature geometry

A [labial] feature is associated with the labial /p, b, m/ and labiodental consonants /f/ as a primary articulation. It is also associated with the labials /u, w/ as a non-primary feature along with the primary [dorsal] feature (Watson, 2002).

A [coronal] feature is assigned to both front articulated palatal vowels like /i/. The [coronal] feature is also specified for the true coronal and palatal consonants (Watson, 2002). A [dorsal] feature represents the primary articulation of the uvulars /q, χ, ʁ/ (Watson, 2002) and labio-velar / g/ (Bellem, 2007). The feature [dorsal] also represents the primary articulation of back vowels like /u/ along with the non-primary [labial] articulation for this vowel (ibid). However, a [radical] feature is specified for [+/-retracted tongue root vowels] and the back articulated consonants like the pharyngeals and epiglottals (McCarthy, 1991; 1994). Whereas, the feature [pharyngeal], also addressed as [guttural] (Hayward and Hayward, 1989) is specified for the natural class of post-velars which include the gutturals; that is the pharyngeals /ħ, ʕ/, the uvulars /q, χ, ʁ/, the laryngeals /ʔ, h/ (McCarthy, 1991; 1994), the [back] vowel /ɑ/, and the [low] vowels (Hayward and Hayward, 1989; Hess, 1990; Herzallah, 1990; McCarthy, 1991; 1994). According to Hayward and Hayward (1989), the gutturals also include the front vowels for they argue that front vowels have guttural constricton but with very open constriction (p. 187-188). In other accounts, laryngeals are excluded from being among the natural class of gutturals based on articulatory, acoustic and phonological evidence. The laryngeals does not display a [guttural] classification. In other words, the production of laryngeals does not involve a [pharyngeal] constriction. (Clements, 1985; Bessell, 1992; among others). Therefore, the way they affect vowels is different compared to other gutturals (Zeroual and Clements, 2015). More details below.

Esling (2006) defines the possible articulatory and acoustic correlates of the feature [pharyngeal]. He presented the [pharyngeal] articulation in pharyngeals as aryepiglottal. In other words, Esling argues that all articulations produced in the pharyngeal cavity have an aryepiglottic constriction. He claims that the constriction is partial during the pharyngeals / ħ, ʕ/, the epiglottal fricatives /ʔ, ʜ/, and it is total during the epiglottal stop /ʡ/. In Iraqi Arabic, Hassan el al. (2011) state that in the pharyngeals / ħ, ʕ/constriction, there is an aryepiglottic trilling.

On the other hand, Moisik (2013) defines the [pharyngeal] articulation as an epilarynx constriction (Moisik, 2013). The tongue retraction facilitates the epilaryngeal constriction and enhances pharyngeal articulations by helping to push the epiglottis back towards the pharyngeal wall (Esling, 2005:26). In uvulars, the [pharyngeal] articulation is activated by the tongue dorsum as part of the synergistic relation between the tongue retraction and upper epilayngeal constriction (Moisik, 2013:74-75). In other words, the tongue retraction enhances tongue dorsum where [dorsal] is the active articulator in uvulars (Sylak-Glassman, 2013). Moisik (2013) presents the tongue as the hydrostat in which a change in one part of it can affect the other part (Moisik, 2013:372-373). Elgendy (1999) claims that jaw lowering is involved in the [pharyngeal] constriction to help the tongue root and epiglottis to be retracted more easily in the class of gutturals. In laryngeals, such constriction is not formed for the epiglottis and the aryepiglottic spinchter are not involed in the articulation of these sounds (Shahin, 2011).

Therefore, Zeroual and Clements (2015) favour the symbols / ʜ, ʢ / instead of / ħ, ʕ/ in Arabic for they claim that the [pharyngeal] constriction is epiglottal and that epiglottal represents a secondary articulation in pharyngeal consonants (cf. Traill, 1985).

Based on the articulatory evidence mentioned above, both phayngeals and uvulars are argued to pattern phonetically together in terms of their place of constriction (Sylak-Glassman, 2014).

Another evidence for the patterning of the post-velar pharyngeals and uvulars is based upon phonological and acoustic evidence. The post-velars affect vowels (Sylak-Glassman,2013). In other words, the [pharyngeal] constriction in both pharyngeals and uvulars causes vowels to become [low] or [retracted] as the output of an open vocal tract configuration and tongue retraction in pharyngeals and tongue retraction in uvulars (Sylak-Glassman,2013).Further details in section 5.3.

In this sense, Esling (2005) proposed additional vowel articulatory features to the traditional vowel features [+/-high], [+/-low], and [+/-back] to account for the different derivations of vowels as driven by the the post-velar natural class of gutturals. The traditional vowel place features can be described acoustically according to the diagonal relation of F1-F2. F1 correlates with vowel height and F2 with vowel backness (with high F1 representing [+low] vowels and low F2 reprsenting [+back] vowels. More details in section 5.4.

Esling adds the features [front], [central], [raised], [retracted] to the vowel space. The [front] and [central] vowels are the same [front] and [central] vowels in the traditional vowel space; however, [raised] stand for [back], [high] vowels and [retracted] stands for [low], [back] vowels (cf. Sylak-Glassman, 2013). See figures below. Esling also adds another feature that refer to vowel height. It is the feature [open] which stands for the vocal tract openness. The open vowels are the [+low] vowels. The representation of the modified vowel space features in binary features are [+/-front], [+/-raised] and [+/-retracted] as represented below.

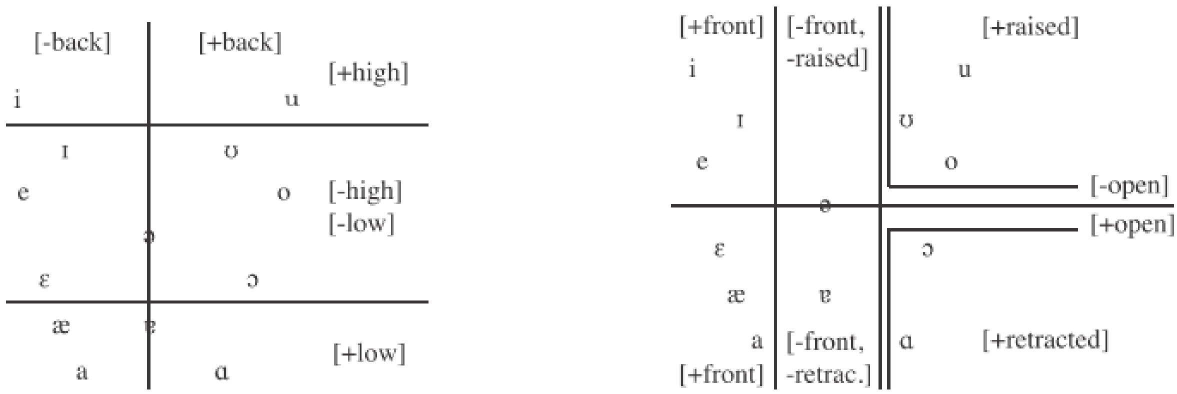

Figure 5 The traditional vowel place features in the acoustic vowel space (on the left) and the modified vowel place features (on the right) (Sylak-Glassman, 2013; adapted from Esling, 2005).

In terms of consonant-vowel interaction (articulation), the presence of the feature [pharyngeal] is best explained in the vowel output both articulatory and acoustically. We see that the [pharyngeal] articulation in pharyngeals correlates with a rise in F1 in the /a/ vowel which is defined as [retracted] [ɑ] (Esling, 2005; Sylak-Glassman, 2013).The feature [pharyngeal] is also identified with a drop in F2 with an output of [low] /i/ and /u/variants after pharyngealized consonants and in some cases uvulars (Ghazeli, 1977; Hess, 1998). More details on this is provided in section 5.4.

In other words, it is determined that the [pharyngeal] constriction is defined with a rise in F1 in the adjacent vowels. However, in laryngeals, this is not the case (Zeroual, 2000). In laryngeals, endoscopic data has shown that tongue root retraction is not involved in the pharyngeal articulation; thus the rise in F1 is not indicated compared to other post-velars whose production involves a tongue root retraction (Zeroual and Clements, 1995).

The pharynx is also used to produce distinct phonemes both as primary as well as secondary place of articulation. Pharyngealized consonants like in (MSA) are identified as exerting a strong coarticulatory influence on nearby vowels (i.e. they are produced with a primary articulation at the dental /alveolar region and a secondary articulation consistiong of a dorsal baking toward the pharyngeal wall. Pharyngealized consonants influence the articulation of not only the closed vowels (/i/,/i:/,and /u/,/u:/),but also the closed vowels(/a/and/a:) by means of modification of their first formants (Embarki et al, 2007:142)

On the other hand, secondary articulations of speech sounds are associated with two place specifications; one indicates the location of the manner of articulation, and one to indicate simultaneous vocalic articulation (Gussenhoven and Jacobs, 2014). The location of the manner of articulation is the manner of stricture in the oral cavity (ibid, Watson, 2002). The manner of articulation is consonantal and can refer to any of the manner features. However, the vocalic articulation is an additional feature that accompanies the consonantal articulation and refers to vocalic gestures represented by the lips or the tongue dorsum (body) (Gussenhoven and Jacobs, 2011), or by the tongue root [TR] (Solami, 2017). For example, the manner of articulation in the emphatics /tˤ dˤ sˤ ðˤ / which are one example of secondarily articulated consonants is defined as a [pharyngeal] articulation which refer to a pharyngeal or aryepiglottic constriction caused by the retraction of the tongue as addressed earlier (McCarthy, 1991; 1994; Davis, 1995; Watson, 2002; Esling, 2005). Zeroual and Clements (2015) presented the [pharyngeal] articulation in the horizontal backward movement of the tongue back in the posterior oro-pharyngeal. In broader terms, the [pharyngeal] constriction in the emphatics is defined as an upper pharyngeal constriction (p. 214). The acoustic correlate of the [pharyngeal] articulation in the emphatics is a decrease (drop) in F2 (Zeroual and Clements, 2015).

The production of secondary articulated consonants like the emphatics /tˤ, dˤ, sˤ, ðˤ / involve a vocalic constriction which is defined as the "superimposition of a close-vowel like articulation on a consonant" (IPA 1999:17). The vocalic articulation can be a [dorsal] constriction which involves the pharyngeal expansion caused by the movement of the tongue body (Watson, 2002:31.The vocalic articulation can also be constriction of the vocal tract at the lips represented by the feature [labial] (Watson, 2002).

We see that the contrast between primary and secondary place articulations is straightforwardly accounted for using the Unified feature model. Consonants with only a primary place have only a C-place node with a terminal feature. Vowels have both a C-place and a V- place node, but only a terminal feature on the V-place node.Therefore, the V-place node can spread freely. Consonants with secondary articulations have both a C-place and V-place terminal feature.

To sum up, the essence of FT in phonology lies in the fact that it can provide a better fit than the Distinctive Feature Theory for it can account for a single set of both consonantal and vocalic features to be shared among consonants and vowels in one of its forms; that is the Unified Feature Theory (henceforth UFT) (Clements, 1991). Thus, UFT can adequately describe segments with secondary articulations like the guttural and emphatic segments; the so-called *mufaxxama* sounds in Arabic. It also couches phonological processes which involve the spreading of one or more features from one segment to another in the local consonant-vowel (C-V) interactions (Watson, 2002; Padgett, 2011), and the long distance vowel-consonant harmony or vowel harmony V-V interaction where the consonant is one of the gutturals or emphatics (Youssef, 2013).

3.3 The Unified feature Theory (UFT)

The UFT is one of the influential contributions to feature geometry, which utilises a single set of place features to represent both consonants and vowels (Clements, 1991; Clements and Hume,1995). In other words, the UFT proposes a unified set of place features for both consonants and vowels which are linked to two distinct nodes but are hierarchically related nodes (Youssef,2013). The features [labial], [coronal] and [dorsal] which define the traditional features [+round], [-back], and [+back] respectively can be associated with C-Place and a V-Place node and the V-Place is dependent on the C-Place node (via a “vocalic” node) (ibid) as represented in the figure below.

According to Morén (2003), the articulatory compatibility between consonant and vowel place is captured and there is a reduction in the number of features in the inventory as illustrated in the figure below.

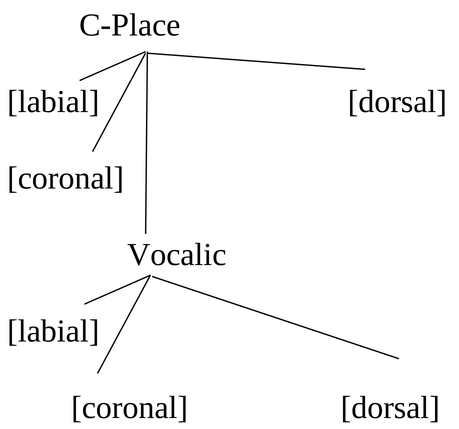

Figure 6 A unified place geometry (Youssef,2013).

Following McCarthy (1991;1994), a feature [pharyngeal] which defines the traditional feature [+low] is now part of the UFT. McCarthy argues that uvulars, pharyngeals, emphatics and in some languages, laryngeal consonants have in common a [pharyngeal] specification (Padgett, 2011; Zeroual and Clements, 2015) as discussed earlier in section 3.2 above.

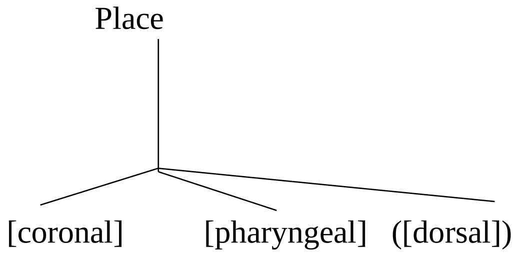

Figure 7 A unified place feature [pharyngeal] illustrating the place of articulation in the emphatics /tˤ, dˤ, sˤ, ðˤ / sounds in Arabic (McCarthy, 1991).

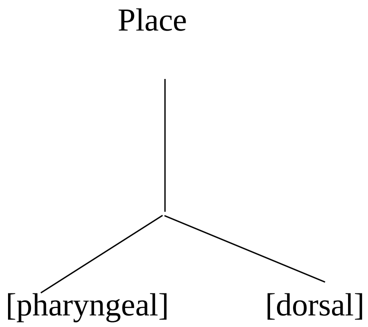

Figure 8 A unified place feature [pharyngeal] illustrating the place of articulation in the uvulars /q, χ, ʁ/ (Mcarthy, 1991).

As presented earlier, both labial consonants and round vowels involve a constriction at the lips; both coronal consonants and front vowels involve constriction at the tip/blade/front of the tongue; both dorsal consonants and back vowels involve constriction at the tongue dorsum; and both pharyngeal consonants and low vowels involve a constriction between the tongue root and the pharynx wall. In the UFT, the features were rendered as consonantal or vocalic under separate C-Place and V-place node depending on whether the constriction is consonantal or vocalic (Padgett, 2011). In other words, the phonetic realisation of the feature distinguish it as consonantal or vocalic alongside any additional consonantal or vocalic features which define a place or manner of articulation of the constriction.

The unification of the consonantal and vocalic place features also solves the problem of the representation of consonants with secondary articulations in which the primary articulation is consonantal and the secondary is vocalic both are represented as terminal features (Padgett, 2011; Uffman, 2011; Youssef, 2013). Secondary articulations like labialisation, palatalisation, velarisation/ pharyngealization correspond directly to the three proposed place features [labial], [coronal], [dorsal] (Clements, 1991: 98-99; Youssef, 2013).

The primary motivation for the UFT is in the observation that the Halle-Sagey model (1986) fails to account for interactions between consonants and vowels (Halle at al., 2011) where vowel harmony and vowel-consonant harmony are involved. In other words, it deals with vowel assimilation to adjacent consonants or vice versa in one form of consonant-vowel interaction (Youssef, 2013; Padgett, 2011). It also proves successful in dealing with long domain harmony, where the spreading of V-place feature under the V-place node is common in languages with vowel harmony in the presence of non-intervening consonants (cf. Morén, 2003; Youssef,2013). It further solves the problem of dealing with vowel-consonant harmony when secondary articulated consonants are involved. By doing so, it solves the spreading of a V-place feature under the V-place node in secondary articulated consonants to both vowels and consonants.

3.4 Tafxi:m in the UFT

Previous approaches to feature theory represented *tafxi:m* using an autosegmental framework whereby the underlying feature(s) of *tafxi:m* in the *mufaxxama* sound were assigned on sepearte tiers (Hoberman,1989; Youssef,2015; cf. Card, 1983; Hoberman,1988,1989). Later approaches utilised a unified set of features where a set of C-place feature and V-place features are derived from the root node in the feature tree. The feature(s) assigned to sounds are represented as C-place and V-place features. The C-place feature represents the place of constriction and is specified under a C-place node derived from the root node. Feature(s) are also representative of the articulator which is activated and are specified under the V-place node in the UFT (cf. Clements,1991). As an example, Herzallah (1990) specified a C-place feature [pharyngeal] and a V-place feature [dorsal] in her representation of *tafxi:m* in the uvulars /q, χ, ʁ/ and the emphatics /tˤ, dˤ, sˤ, zˤ / (Zeroual and Clements, 2015). Added, Herzallah (1990)specified a V-place feature [radical] with the C-place feature [pharyngeal] in her underlying representation of the pharyngeals / ʕ, ħ/.

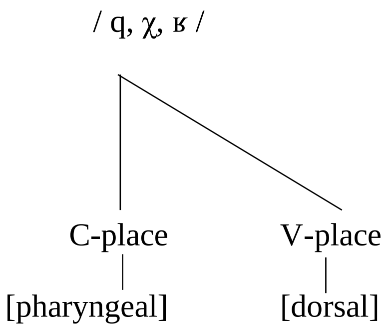

Figure 9 A unified approach to representing *tafxi:m* in the uvulars / q, χ,ʁ/ in Palestinian Arabic (Herzallah,1990).

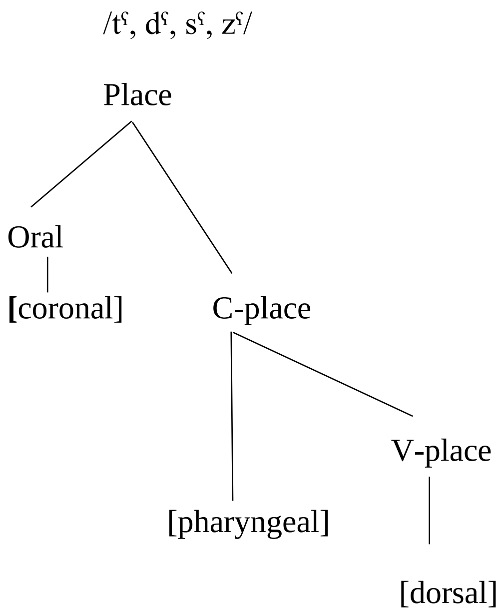

Figure 10 A unified approach to representing *tafxi:m* in the emphatics /tˤ,dˤ,sˤ,zˤ/ in Palestinian Arabic (Herzallah,1990:125).

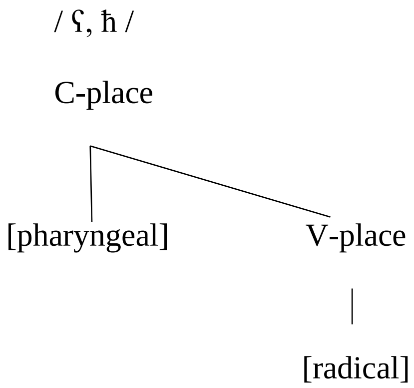

Figure 11 A unified approach to representing *tafxi:m* in the phayngeals / ʕ, ħ / in Palestinian Arabic **(**Herzallah,1990:125).

While Rose (1996) specified [RTR] as a unified underlying primary feature for *tafxi:m* in the pharyngeals / ʕ, ħ / and the uvulars /χ, ʁ/, and as a secondary feature in each of the uvular /q/ and the emphatics /tˤ,dˤ,sˤ, ðˤ/ whereas Youssef (2009) specified [dorsal] as a unified C-Place feature representing *tafxi:m* where it defines both consonantal and vocalic constrictions in the uvulars /q, χ, ʁ/ and emphatics /tˤ,dˤ,sˤ, ðˤ/ (cf. Zeroual and Clements, 2015).

3.5 CV interaction (harmony) in the UFT

The motivation for the UFT is that it captures local place assimilations in the consonant-vowel interaction (C-V), also called cross-category assimilation (Clements,1991). As an example, the feature [dorsal] in consonants like the uvular gutturals /q, χ, ʁ/ , the pharyngeal gutturals / ʕ, ħ/ and the emphatics / tˤ, dˤ, sˤ/ (further details provided in the following sections) is captured in vowels as C-V interaction where a vowel takes on a V-place feature of the adjacent consonant. For example, [dorsal] spreads from the adjacent gutturals or emphatics to the vowel (cf. Youssef, 2009). This leads to either vowel lowering and backing or it shows as backing and rounding in [+high, front] vowels (Herzallah, 1990; Youssef, 2009; 2013).

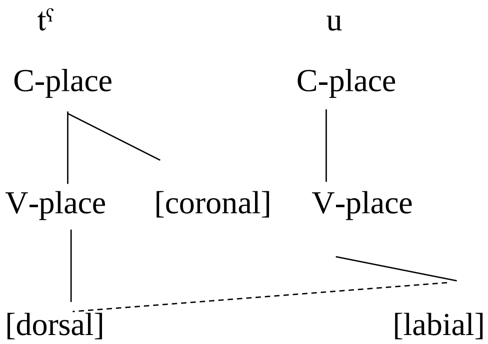

Figure 12C-V interaction in the UFT (Youssef, 2006).

Herzallah (1990) noticed that where the consonant is one of the gutturals /q, χ, ʁ, ʕ, ħ/ or emphatics / tˤ,dˤ,sˤ,zˤ/ in the Palestinian Arabic CaCaC verb, the vowel is /u/ instead of the /i/ in the imperfective form (Zeroual and Clements, 2015). She claims that the underlying /i/ vowel takes on the V-place feature [dorsal] in the gutturals and emphatics; thus it surfaces as [u] (ibid); e.g.

/jisˤlib/ < /jusˤlub/ 'he crucifies'

Similarly, Rose (1996) draws on the CV interaction where the consonant is a guttural or emphatic in Salish languages. She showed that /i/, and /u/ become [e], [o] in one form of vowel lowering through the spreading of the [RTR] feature underlyingly specified in the gutturals and emphatics. She also states that vowel lowering in Semitic languages where /i/ and /u/ becomes /a/ (cf. Herzallah,1990) is another form of CV interaction through the spread of [RTR].

On the other hand, Herzallah, (1990) argues that the /i/, and /u/ surface as [a] through the spreading of [pharyngeal] which leads to a [low] vowel (Herzallah, 1990 ; McCarthy, 1994). Similarly, in McCarthy's (1989;1991;1994) account on Semitic languages, he noticed that the underlying /i/, and /u/ vowels in the imperfective forms **ya**$_{\mathbf{C1a1C2a2C3}}$ as represented below surface as [a] where the consonant is a guttural, e.g. / jaħdiθu/ < [jaħduθu] 'happen'

a2 $\longrightarrow$ a

C2 or C3= Guttural

Figure 13 Vowel lowering as one form of CV interaction (McCarthy,1991).

In short, the UFT solves the problem of cross-category interactions by eliminating the disjointedness of consonantal- and vowel place features (Padgett, 2011) where the vowel takes on the V-place feature in consonants whose production involve both consonantal and vocalic place features like the gutturals and emphatics.

3.6 Long distance assimilation (harmony) in the UFT

The UFT captures long distance assimilation represented in the vowel assimilation; also called vowel harmony (vowel copy), and the vowel-consonant assimilation or harmony (cf. Rose and Walker, 2011). In vowel harmony, the spreading of features are said to be adjacent on the vocalic node (van der Hulst and van de Weijer,1995; Youssef, 2013). In other words, Odden (1991) argues that features like [back] and [round] act as single constituents and can always spread together in Eastern Cheremis (Uffman, 2011). He posits that vowel place feature are dependants on the V-place node to allow for vowel copy as a single operation (ibid). In this sense. The vowel features into Height node and Colour node. The constituents of the Height node are the [high], [low], and the [ATR] whereas the constituents of the Colour node are the [back] and [round] as illustrated in figure 13 below.

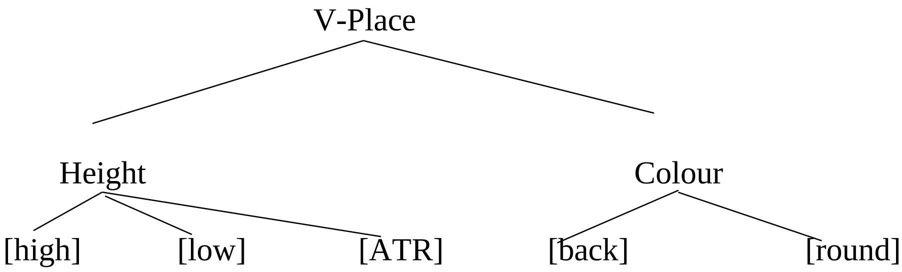

Figure 14Vowel place features (Odden, 1991; cited and adapted in Uffman, 2011).

McCarthy (1989;1991;1994) noted that vowel harmony exists where the consonant is a guttural in several Semitic languages. In other words, the gutturals were transparent to schwa- like vowel harmony despite gutturals being specified with a [pharyngeal] place node which is claimed to trigger [low] vowel variants (cf. Herzallah, 1990; McCarthy, 1991;1994; Rose, 1996). Therefore, McCarthy argues for vowel harmony in these Semitic language by assigning both an oral and pharyngeal node to the gutturals (see chapter three for details) whereby the guttural transparency is explained through the spread of the oral node in the gutturals (Zeroual and Clements, 2015). The epenthetic vowel harmony exists in Baghdadi Arabic where epenthetic /i/ vowel breaks the coda CC cluster in /CiCC/, i.e. [CuCuC], and surfaces as [u] in harmony with the stem [u] vowel where the consonant is one of the gutturals or emphatics preceding or following one of the secondary labial emphatics /bˤ, mˤ, f ˤ/, lateral emphatics /l ˤ, r ˤ/ or velars /k g/. See section 2.9.2.

The UFT also captures the long distance vowel-consonant harmony. Watson (1999) provides examples from Yemini Arabic where both word initial lexical /a/ and the epenthetic vowel surfaces as [back] and [round] [u] in /jatˤfi/ /jutˤufi/ ‘he puts out’ in long distance vowel-consonant harmony. She also provides examples from SanʕaniArabic, eg. /wasˤal/<[wusˤul] ‘he arrived’; and Baghdadi Gilit Arabic where epenthetic /i/ surfaces as [u], e.g. /naðˤim/< [naðˤum] ‘male personal name’. Further details in section 4.8.

3.7 Summary

In this chapter, I have addressed the role of features and feature theory in the representation of speech sounds. Clement’s (1991) approach towards a Unified Feature Theory (UFT) (Clements, 1991) is highlighted in which features define constrictions in both consonants and vowels (cf. section 3.4). Consonantal constrictions are assigned under a consonantal Place node (C-Place) and vocalic constrictions whether in vowels or consonants are assigned under a Vocalic place node (V-Place). A unified feature approach has proven efficient in addressing phonological processes like consonant-vowel (CV) interaction where a vowel takes on the V-place or C-place feature of the consonant in Arabic as represented in section 3.5. This extends to sufficiently target long domain assimilation (harmony) as represented earlier in section 3.6 and followed in section 4.8.

Chapter Four: *Tafxi:m* and *harmony*

4.1 Tafxi:m

Emphasis or *'tafxi:m'* (heaviness or darkness) is defined as a feature that is inherent in the primary or the secondary articulation of sounds called '*mufaxxama*'[11] (Jakobson, 1957). The term *mufaxxama* coincides with 'heavy or dark sounds' in literary terms, also called by Sibawayhi as *'ʔalħuru:f ʔal mutˤbaqa'* (lit. covering with a lid) or *'ʔalħuru:f ʔal mustaʕlija'* sounds (sounds produced with elevation of the tongue (Bellem, 2007).

'ʔitba:q' is "the tongue closing from its primary place up to that part of the tongue opposite the velum towards which the tongue is raised, thus "enclosing" (covering with lid) the sound between the tongue and the velum (secondarily) and the (primary) place of constriction" (Bellem, 2007:24). '*ʔistiʕla:ʔ*', on the other hand, is the elevation of the tongue towards the upper palate (ibid).

The articulatory correlates of *tafxi:m* as *ʔitba:q* and *ʔistiʕla:ʔ* vary among the Arabic dialects (Delattre, 1971; Ghazeli, 1977; Laradi, 1983; Heath, 1987; Esling, 1996; Zawaydeh, 1999; Elgendy, 2001; Yeou, 2001; Hassan, 2005; Watson, 2002; Khattab et al., 2006; Maiteq, 2013). *Tafxi:m* is described as velarisation/ dorsalisation in Lebanese Arabic (Obrecht,1968). *Tafxi:m* is pharyngealization in Mesopotamian Arabic, namely Baghdadi Gilit (Al Ani, 1970; Ali and Daniloff, 1972; Butcher and Ahmed, 1987; Hassan and Esling, 2011), in Moroccan Arabic (Heath,1987, Al-Tamimi, 2017), in Jordanian Arabic (Al-Tamimi, 2007; 2017, in Rural Palestinian Arabic, (Davis, 1995) and in Libyan Arabic (Maiteq, 2013). *Tafxi:m* is pharyngealisation and labialisation in Yemeni Aabic, Sanʕani Arabic (Watson, 2002). Later studies showed that *tafxi:m* is labio-velarisation in Baghdadi Gilit (cf. Bellem, 2007).

[11] The *mufaxxama* sounds are not only part of the phonemic inventory of the Central Semitic languages like Arabic, but are also present in Northwest Semitic languages like Hebrew (Laufer and Baer, 1988), Tiberian Hebrew (Trigo,1991; McCarthy, 1994; Rose,1996) and Aramaic (Hoberman, 1988). They are also part of the phonemic inventory of the Afroasiatic languages (Ladefoged and Maddieson, 1996) of the Semitic branch of Northern Ethiopia like Tigre (Rose, 1996) and Tigrinya (Hayward and Hayward, 1989), and they exist in Indo-European languages like Kurdish, and Azerbaijani (Azeri Turkish) (Hoberman, 1989), in Interior Salish languages (Bessell, 1992, Shahin, 2003), and in Northeast and Northwest Caucasian languages (Bellem, 2007).

4.2 Mufaxxama

*Mufaxxama (*heavy or thick) are the sounds produced with *tafxiːm (heaviness or thickness)* (Ghazeli,1977). The *mufaxxama* sounds include *ʔalħuruːf ʔal mutˤbaqa* (lit. covering with a lid) and *ʔalħuruːf ʔal mustaʕlija* (i.e. sounds produced with elevation of the tongue) (Ghazeli, 1977; Sibawayh, 1982; Al-Nasssir, 1993; Bellem, 2007).

The *mufaxxama* sounds called '*ʔalħuruːf ʔal mutˤbaqa'* include the alveo-pharyngeal[12] obstruents / tˤ, dˤ, sˤ, ðˤ(zˤ) /, also called the primary emphatics (Watson, 2002). They are the counterparts of the oral alveolar obstruents /t, d, s, ð(z)/ (Jakobson, 1957). Not only the above consonants are among the *mufaxxama* sounds. The low back /ɑ(:)/ vowels are also referred to as *mufaxxama* (Cf. Versteegh, 2001; Bellem, 2007).

The *mufaxxama* sounds which are called '*ʔalħuruːf ʔal mustaʕlija'* (Jakobson, 1957) include the uvulars /q, χ, ʁ/. They are also called the gutturals (McCarthy, 1991; 1994). Further details are provided in sections 4.2.1 and 4.2.2. It also includes the secondary PVs referred to as secondary emphatics or gutturals in the literature (cf. section 2.7& section 4.2.2).

(1)

Secondary emphatics	**Plain**
/wɑlˤlˤah/ 'by God'	/wallah/ 'or'
/bˤɑːbɑ/ 'dad'	/baːba/ 'her door'

In Bedouin Gilit, the /l/ and /lˤ/ are determined in the presence of back /ɑː/ (cf. Al-Siraih, 2013).

(2)

	Gilit	
(a)	[χaːl] 'mole'	[χɑːlˤ] 'maternal uncle'
(b)	[χaːli] 'deserted'	[χɑːlˤi] 'my maternal uncle'

[12] I refer to the emphatic sounds here as are alveo-pharyngeals as their production involves two simultaneous articulations: a primary articulation that involves the tip and the blade of the tongue coming in contact with the alveolar ridge. However, the secondary articulation involves a constriction somewhere in the pharynx ~ with the involvement of the tongue root and the epiglottis (see McCarthy, 1991;1994).

As stated earlier, the position of the secondary emphatics in Gilit is argued for in terms of their presence with back /ɑ(:)/ in /ʕɑmˤmˤ/ ‘paternal uncle’, / ʕɑ:mˤ/ ‘year’, /bˤɑ:bˤə/ ‘my father’, /fˤɑ:t/ ‘he entered’, / ʔɑbˤbˤ/ ‘father’, /mˤɑkˤɑ:n/ ‘place’/nˤɑ:s/ ‘people’, /bˤɑ:sˤ/ ‘bus’, /mˤɑrˤrˤ/ ‘he passed by’ as opposed to the plain /l, r, m, b, f, n, k / which are identified with a low front /a(:)/ as in / la:fi/ ‘you (m.) seeking attention’, ma:lti ‘mine sing.’, ma:la:ti ‘mine pl.’, /mastaqbalit/ ‘ I didn’t host a guest’, /na:wi/ ‘aiming for’, /ra:mi/ ‘shooter’ (cf. Erwin, 1963; Blanc,1964; Bellem, 2007; Youssef, 2009; 2014)[13].

Additionaly the position of the secondary emphatic among the class of the *mufaxxama* sounds in Gilit is that they trigger rounding in the stem /a/ vowel progressively in one form of vowel-consonant harmony in /rˤugba/ ‘neck’, /burˤad/ ‘he felt cold’, /mˤuwqif/ ‘attitude’, and /lˤugaf/ ‘he picked smth.’, /fˤugad/ ‘he lost smth.’ It also triggers rounding in the epenthetic /i/ vowel progressively in one form of long domain vowel harmony as in /χubˤuz/ ‘bread’, and /gumˤut/ (cf.Youssef, 2009; 2014).

4.2.1 Emphatic

The so-called *‘ʔalħuru:f ʔal mutˤbaqa’* in the Arabic literature are also addressed as the ‘emphatics’ (heavy or thick), or pharyngeals (McCarthy,1991; 1994). The emphatic sound inventory in Arabic include what is known as the underlying emphatics also called lower pharyngeals (Elgendy, 2001) or secondary pharyngeals (Shahin, 2003; 2011) and surface emphatics (cf. Davis,1995; Watson, 2002; Bellem, 2007).

The presence of a group of sounds which count as underlying emphatics is driven by their place of articulation (constriction). In broader terms, it is the upper pharynx and the lower pharynx which define the emphatic sound inventory (Elgendy, 2001). The group of the underlying emphatics represented in the pharyngealized coronal stops /tˤ, dˤ/ and the pharyngealized coronal fricatives /sˤ, ðˤ/ with reflexes for /dˤ/ and /ðˤ/ across the dialects occupy the lower pharynx (ibid). For example, the reflex [zˤ] for /ðˤ/ is present in Lebanese Arabic (see Khattab et al., 2006) in /ʕɑðˤiːm/ ~ [ʕɑzˤiːm] ‘great’, and the [ðˤ] reflex for /dˤ/ in Mesopotamian Arabic in /ʔidˤa:fa/ <[ʔiðˤa:fa] ‘addition. They are the contrasts of the alveolar/plain stops /t, d/, and the plain fricatives /s, ð / respectively (Jackobson, 1957; McCarthy, 1991; 1994, Davis, 1995;

[13] I refer to secondary emphatics as secondary post-velars.

Khattab et al., 2006). Nonetheless, it is argued that the variability predicted in the realisation of the pharyngealized coronals is attributed to the vowel environment, and the inter and intra subject variability in any specific dialect (Laufer and Baer,1988:195, Heselwood,1996; Bellem,2007).

Emphatics represented in the pharyngealized coronals have a number of articulatory targets which may vary inter-dialectally. The resonant quality of the pharyngealized coronals is achieved through secondary pharyngeal constriction enhanced by jaw lowering, hence expansion of the volume of the oral cavity, or velic lowering, allowing more voicing in the voiced stops (cf.Watson,2002; Bellem, 2007, fn.149:77), and more laryngeal constriction (Al-Tamimi, 2017). It is also achieved through lip protrusion which is delayed until the release phase of the primary articulation; that is the pharyngeal constriction (Watson, 1999). Therefore, the vowel following a pharyngealized coronal is identified with significantly low F2 (Watson, 2002; Bellem, 2007) and low F3 (Al-Tamimi, 2017).

Not only does the pharyngealized coronals count as underlying emphatics or pharyngeals, but also the uvular stop /q/ (Laufer and Baer, 1988; Herzallah, 1990; Hess, 1990; McCarthy, 1991;1994; Davis,1995).

The upper pharynx, that is the uvula is a defining area for constriction of the uvulars /χ, ʁ/ (Ghazeli, 1970; Laufer and Baer, 1988; McCarthy, 1991;1994). Hence, the uvular fricatives /χ, ʁ/ count as underlying emphatics (McCarthy, 1991; 1994; Davis,1995; Zeroual and Clements, 2015). However, the constriction for /q/ is higher up in the uvula compared to the uvular fricatives /χ, ʁ/ which is slightly lower (Hess, 1990; Sylak-Glassman, 2013).

However, their constriction is less variable and more extreme compared to the pharyngealized coronal sounds as will be discussed further in 5.1 and 5.2.

4.2.2 Gutturals

Gutturals in the Arabic literature is used as a cover term for the class of post-velar articulated sounds, that is the *muffaxxama sounds* which include the pharyngeals /ʕ, ħ/ and the uvulars /q,[14] χ , ʁ, ʀ/. It may also include the laryngeals /ʔ, h/ (McCarthy,1991;1994) or exclude them because it is argued that the laryngeals are identified as lacking a place feature; that is they lack the place feature [pharyngeal] which is a place feature in the other gutturals and emphatics (Clements,1985; Sagey,1986; Steriade,1987; Keating,1990; Bessell, 1992; Besell and Czaykowska-Higgins, 1992). Compared to gutturals, laryngeals are produced with a glottal constriction that is acoustically identified in the speech spectrum with a complete absence of formant transitions compared to the other post-velars, and it is determined that it has no visible effect on the adjacent vowels (McCarthy,1991; 1994).

In Mesopotamian Gilit, Bellem (2007) states that the velar /g/, and the labio-velar /w/ behave as guttural consonants (see Bellem, 2007 for more details). Therefore, they are included among the class of gutturals for they affect vowels in a way similar to the group of gutturals as will be further detailed in section 4.8.

The presence of gutturals in a particular language is phonologically governed by the typology of the post-velar inventory of the language (Hayward and Hayward, 1989; Trigo, 1991; Rose, 1996; Walter, 2007; Sylak-Glassman, 2014). It is argued that a language which includes the post-velar pharyngeals as part of its post-velar inventory is more likely to have other post-velars like uvulars, glottals and epiglottals to be part of its inventory and can with pharyngeals form the natural class of gutturals (Sylak-Glassman, 2013; 2014).

The classification of gutturals as a natural class has been subject to debate from both phonetic and phonological point of views. The classification of gutturals as a natural class from a phonetic point of view is embedded in articulatory phonetics driven by the place of articulation (constriction) which combines the class of gutturals. The constriction for gutturals is posterior in the oral cavity (McCarthy,1991;1994). McCarthy's approach to classifying gutturals as a natural class is through assigning the feature [pharyngeal] as their place of constriction. Articulatory, the feature [pharyngeal] refers to "a constriction somewhere in the entire region that encompasses the larynx through the oropharynx" (McCarthy, 1994:192). McCarthy relates

[14] /q/ is realised as [g] in Bedouin Arabic varieties including Mesopotamian Arabic Gilit variety (Blanc, 1964, Jastrow, 1994; 2006).

his choice for [pharyngeal] as a distinctive feature in the class of gutturals to Perkell's (1980) proposal that distinctive features are oresonsory targets in which the choice of the pharyngeal articulation is attributed to the varying distribution of sensory feedback mechanisms in the different regions of the vocal tract (p.192). McCarthy argues that the feature [pharyngeal] is then an orosensory pattern of constriction anywhere in the broad region of the pharynx (p.199).

Similarly, Watson (2002) and Hayward and Hayward (1989) argue for a natural class of gutturals addressing it in the feature [guttural]. Both features are Place features referring to a an articulatory zone which extends from the 'end of the oral cavity (i.e. the uvula) to the pharynx (Hayward and Hayward,1989). The [guttural] specification excludes laryngeals for laryngeals are specified with [glottal] constriction. Thus, they are considered as placeless (Clements, 1985; Sagey,1986).

Phonologically, the classification of gutturals as a natural class is based on vowel lowering next to gutturals. In other words, vowels surface as [+low] next to the gutturals (Chomsky & Halle, 1968; Herzallah,1990), e.g. /fursˤa/ 'chance'.

(3) Arabic guttural lowering

C V

Figure 15 [pharyngeal] Condition : mirror-image rule. (McCarthy, 1994).

Vowel lowering is conditioned by the presence of gutturals (Rose,1996) and is represented in different languages under different condition. These rules also apply to epenthetic vowels in these languages. For example, in Tiberian Hebrew, the epenthetic schwa /ə/ vowel is lowered to [a] in the environment of a guttural consonant as in the following words below.

(4) /baʕəl/~ [baʕal] 'master' (McCarthy, 1994:209).

Herzallah (1990) states that the feminine suffixes /i/, /e/ in a plain environment are lowered to [a] following either a primary or a secondary pharyngeal sounds as in (b).

(5)

(a) /kbire/ 'large'

(b) /ʕariːdˤa/ 'wide'

However, vowel lowering next to gutturals does not only involve the vowel changing in quality to [a]. In other words, lowering has different derivations in [high] vowels as compared to [low] vowels driven by the nature of the element of *tafxi:m* in the trigger environment in one form of consonant-vowel harmony (details provided in the sections below).

4.3 Harmony

Harmony refers to phonological assimilation for harmonic features that may operate over a string of multiple segments (Rose and Walker, 2011:240). In other words, two or more segments become similar in some defined way even though they are not immediately adjacent (Zsiga, 2013). This is constructed in one of two ways. Two segments interact at a distance, at least one (apparently) unaffected segment as in vowel harmony $C_xV_YC_2 \longrightarrow C_zV_yC_2$ or a continuous string of segments may be involved in the assimilation as in vowel-consonant harmony (Rose and Walker, 2011). As for vowel harmony, it can operate at a distance depending on how one counts intervening consonants and vowels that are unaffected by assimilation. It may also be counted as continuous if intervening segemnts participate in harmony (ibid).

On the other hand, the vowel-consonant harmony can operate at a distance skipping over some segments (Rose and Walker, 2011). It can also be represented in a minimum domain (Lehn,1963) as cross-category harmony (Padgett, 2011) and/or local assimilation (Zsiga,2013).

4.4 Vowel harmony

Vowel harmony is a long-distance phonological assimilation. It is defined as the phonetic influence of one vowel on another. In other words, vowel harmony is defined as alternations in vowels where a vowel in one syllable determines the quality of the vowel in another syllable regardless of any presence of intervening consonants (Zsiga, 2013 :230). Harris (1993) defined vowel harmony as assimilation neutralisation, i.e. “ the phonetic interpretation of the position with respect to the relevant contrast is determined by the melodic content of an adjacent position”. In other words, the quality of the harmonising vowel is wholly or partially dependent on that of the domainant vowel within the domain. Adjacent vowels in inflected and uninflected words are said to agree with some feature(s) of the trigger element whether in regressive harmony, or progressive harmony. However, the trigger element of harmony and the domain of harmony are language or dialect specific. Thus, in vowel harmony, the affected vowel(s) might be the stem vowel(s), and/or the prefix vowel(s) in regressive harmony. It is the suffix vowel(s) that is in progressive harmony (see Rose and Walker, 2011).

For example, a high /i/ or /u/ vowel may spread to a local non-high vowel. In other words, if vowel height in a particular language is harmonised, then we would expect that a non-high vowel would surface as high in one type of vowel height harmony (Monahan, 2009: 676). However, the phonetic quality of the vowel which spread (i.e trigger of harmony) and the direction of the spread (i.e. the affected vowels) is language specific (ibid).

Vowel harmony is present in some of the world languages, for example Arabic, Akan, Turkish, Finnish and Altaic languages (Stewart, 1967; Clements, 1985; Kirchner, 1993; van der Hulst, 2011) whereby four types of vowel harmony exist and will be discussed further in the forthcoming sections.

4.4.1 Backness Harmony

One of the best examples of backness harmony is found in Turkish. The Turkish vowel system consist of eight vowels which are the front round and back unround vowels [i y u ɯ o ø e ɑ] (Zsiga, 2013). In backness harmony in Turkish, the suffix vowels alternate in progressive harmony to agree in backness with the trigger element of harmony; that is the vowel in the stem as illustrated in the following words below.

(6)	**Nominative**	**Acusative**	**Genetive**	**Nom.plural**	**Gem.plural**	**Gloss**
(a)	[jel]	[jel-i]	[jel-in]	[jel-er]	[jel-ler-in]	‘wind’
(b)	[kɯz]	[kɯz-ɯ]	[kɯz-ɯn]	[kɯz-lɑr]	[kɯz-lɑr- ɯn]	‘girl’ (Zsiga, 2013:237)

Another example, in a Tuvan (Turkic) word, the trigger element is the [+back] /a/ vowel which spreads progressively to the neighbouring suffix vowels. Thus, the suffixes alternate to agree in backness with the stem vowel as in the following example below.

(7)

(a) /**a**t-Te[15]r-I[16]m-dEn/ → at-tar- ɯm-dan ‘name’ pl-1-abl

(Rose and Walker, 2011:257).

[+back] [+back]

The examples below come from the list of literature on *ʔima:la* in Qəltu representing one type of backness vowel harmony(cf. Abu-Haidar, 1991; Levin, 1998).

(8)

Qəltu

(a) [ħulwa] < [ħəlwi:] ‘she is beautiful’

(b) [ʒubba] < [ʒə̹bbi:] ‘dress’

(c) [ħa:fi:] < [ħɛːfiː] ‘bare feet’

(d) [tˤa:lba] < [tˤɛːlbi:][17] ‘she is asking’

(e) [ba:rda]< [bɛ:ʁdi:] ‘it is cold’

(f) [ʔaraːðˤi:] < [ʔaɣɛːðˤi:] ‘lands’

(g) [ʃəta] < [ʃətiː][18] ‘winter’

Added, word medial stem /a:/ vowel also shows as *ʔima:la* [ɛː] in Qəltu in regressive backness harmony with the other stem vowels in the domain.

[15] The capital E refers to a suffix non-high vowel.
[16] The capital I refers to a suffix high vowel.
17 Vowel lengthening in compensation with the reduced syllable structure in Qəltu. The syllable structure in Qəltu has a tendency towards reduced syllables.
[18] The /i: / is the feminine suffix vowel.

(9)

Qəltu

(a) [masɛːkiːn] ‘naive’

(b)[ʃabɛːbiːk] ‘windows’

(c)[ʒawɛːmɛʕ] ‘mosques’

(d) [χɛːlijji] ‘deserted’

(e) [maqɛːsˤiːsˤ] ‘scissors’

4.4.2 Round Harmony

Monahan (2009:676) argues that Palestinian Arabic display round harmony in its vowel system (cf. Kenstowicz,1981; Abu-Salim,1987; Yoshida,1993). In Palestinian Arabic, vowel harmony exist where the trigger represented in the inflected vowel suffixes assimilate in regressive harmony with the stem rounded /u/ vowel as represented in the following examples.

(10) (a)

(1) /yid-rus/ ⟶ [yudrus] ‘he studies’

(2) /tik-tub/ ⟶ [tuktub] ‘she writes’ (Monahan, 2009:676).

Vowel harmony also exist in the epenthetic /i/ vowel in Baghdadi Gilit as [ʊ] in regressive harmony with the non-inflected stem /ʊ/ vowel as represented in the examples below.

10(b)

(1)/ χʊbz/ ⟶ [χʊbʊz] ‘bread’

(2)/ sˤʊdq/ ⟶ [sˤʊdʊg] ‘honestly’ (cf. Youssef, 2009).

Round harmony is also present in the epenthetic /i/ vowel in Muslawi Qətu as [ɔ] in regressive harmony with the non-inflected stem vowel /ɔ/ vowel as represented in the example below.

(10) (c)

[ðˤɔfɔʁ] ‘nail’ (cf. appendix, E).

Svantesson et al. (2005) argue that round harmony is present in Halh, a dialect of Mongolian with a vowel system which contrasts the following non-pharyngeal unrounded and rounded [a ʊ ɔ] vowels and the pharyngeal unrounded and rounded [i e u o] vowels. Round harmony in Halh occurs among the non-high pharyngeal and non-pharyngeal vowels in this language (Rose and Walker, 2011). In other words, progressive round harmony occurs among the suffix vowels in a word in Halh only if the preceding trigger element, that is the vowel in the stem is a non-high vowel resulting in suffixal alternations between e/o and a/ɔ as illustrated in the following words below.

(11)

(a) [**o**g-lʒo] 'to give'

(b) [x**e**ːlʒ-lʒe] 'to decorate'

(c) [**ɔ**rlʒɔ] 'to enter'

(d) [j**a**walʒa] 'to go' (Rose and Walker, 201ː253).

Moreover, the intervening high vowel like /i/ in a stem with more than one vowel in Halh allows harmony to spread through it to the neighbouring suffix vowels. It acts as a transparent environment to vowel harmony as represented in the following words below.

(12)

(a) [poːr-ig-o] 'kidney'

(b) [xɔːlʒ-ig-ɔ] 'food'

Whereas, the only high /i/ vowel in the stem in a word in Halh acts as a blocker to harmony. In other words, it blocks round harmony as illustrated in the example below.

(13)

[piːr-e] 'brush' (ibid).

Unlike the non-high, pharyngeal and non-pharyngeal round vowels /o ɔ/ respectively, it can be observed that the presence of the high round pharyngeal and non-pharyngeal /u ʊ / vowels as a stem vowel in a word in Halh does not trigger round harmony as illustrated in the following words below.

(14)

(a) suːlʒ-e ‘tail’

(b) mʊːr-a ‘cat’ (ibid).

However, round harmony is said to occur with other types of vowel harmony (Rose and Walker, 2011). For example, in Turkish (Turkic), round harmony comes with backness harmony. The high front or back vowels in the accusative suffixes in Turkic agree in roundness with the preceding stem vowels as in the following words below

(15)

(a) [d**i**ʃ-i] ‘tooth’

(b) [g**y**l-y] ‘rose’ (Zsiga,2013:237).

Another type of Round vowel harmony in Arabic is documented in the dialects of NorthernYemen where vowels agree in roundness in addition to backness (Behnstedt, 1985).

(16)

(a) /katabat/ ‘she wrote’

/b) / ʃiribit/ ‘she drank’ (Behnstedt, 1985; cited in Monahan, 2009:677).

Monahan (2009) also refers to vowel harmony which exists in the Bedouin dialects of Northern Sinai (de Jong, 2000). The inflected prefix vowels agree in roundness and backness with the stem vowels as in the following imperfective $jaC_1C_2aC_3$, $juC_1C_2uC_3$, $jiC_1C_2iC_3$ templates. This is illustrated in the examples below.

(17)

(a) /jaʃrab/ ‘he drinks’

(b) /jugʕud/ ‘he sits’

(c) /jimsik/ ‘he catches’ (de Jong, 2000; cited in Monahan,2009:677).

Additionally, the plural suffixes in Turkic which are non-high vowels underlyingly alternate between /ler/ following the front vowels and /lɑr/ following the back vowels as illustrated in the following words below:

(18)

(a) [g**ø**l-ler] ‘sea’

(b) [d**ɑ**l-lɑr] ‘branch’ (ibid).

Round harmony also comes with [ATR] Harmony in Igbo (Krämer, 2003) and with [RTR] Harmony, also called pharyngeal Harmony in Mongolic languages.

4.4.3 Height harmony

Height Harmony is one type of vowel harmony in which vowels in harmony agree in height. Sample (1976), and Hyman (1999) documented vowel height harmony in Kisa (Bantu) language (Rose and Walker, 2011). In Kisa, the high vowel /i/ in the suffix /il/ is lowered to mid [e] in progressive harmony when preceded by a mid-vowel in the stem as in the following words below.

(19)

(a) [-ts**o**m-el-a] ‘pierce’

(b) [-r**e**k-el-a] ‘set trap’ (Rose and Walker, 2011:253).

However, the suffix /i/ vowel in Kisa is not lowered if the preceding vowel in the stem is high or is followed by the low vowel /a/.

(20)

[f**u**:ng-il-a] ‘lock’ (ibid).

4.4.4 ATR harmony

Another type of vowel harmony is the so called Tongue Root harmony, the ATR harmony (see Archangeli and Pulleyblank, 1994). Vowels in Tongue Root harmony agree in the Tongue Root Features. In the vowel system of Pulaar dialect of Fula, as an example where [+ATR] [i e o], and [+-ATR] [ɛ a ɔ] are contrasts in the dialect, it is seen that ATRness of the mid-vowels contrasting between [+ATR] [e] ~ [-ATR] [ɛ], and [+ATR] [o] ~ [-ATR] [ɔ] surface in harmony with the trigger element. Vowels in mid-position in Pulaar surface as either [+ATR] or [-ATR] in regressive harmony with non-final [+ATR] or [-ATR] vowels as the triggers of harmony illustrated in the following words below (Rose and Walker, 2011).

(21)

(a) peːc-**i** pɛ ːc-**ɔ**n ‘slit’ pl./dim.pl.

(b) dog-oː-ru dɔg-ɔ-w-ɔn ‘runner’ sg./dim.pl.

Moreover, Igbo, a tonal language spoken in Nigeria has a vowel system which contrasts [+ATR] [i e o u] vowels and [-ATR] [ɪ a ɔ ʊ] vowels. The vowel harmony in Igbo occurs in mono-syllabic and long-domain inflected words. In mono-syllabic words, vowel(s) agree with each other in being either [+ATR] or [-ATR].

(22)

[+ATR]	**[-ATR]**
[**í**hé] ‘thing’	[ńk**ɪ́**tá] ‘dog’ (Zsiga,2013:231).

The affix vowel(s) agree in the features advanced tongue root [+ATR], or retracted tongue root [-ATR] with the stem vowel in long-domain inflected words (Zsiga,2013). If the stem vowel is an [+ATR] vowel, then affix vowels alternate to agree with the [+ATR] feature in a progressive harmony with the stem as in the trigger element of harmony.

(23)

[+ATR]	**[-ATR]**
[s**i**-e] ‘cook!’	[s**ɪ́**-a] ‘tell!’ (Zsiga,2013 :231).

However, the Tongue Root harmony system have different representations of ATRness. It is argued that two language systems differ in their manifestation of ATRness based on the structure of the vowel inventory and the neutral vowel(s) (Li, 1996) in the language. As an example, the African Tongue Root systems with respect to other systems exploit the [ATR] harmony feature as a bivalent [+/-ATR] Tongue Root feature where [+ATR] spreads in languages like Akan (Clements,1985), and [-ATR] spreads in Yoruba (Archangeli and Pulleyblank,1989). Other Tongue Root harmony systems as in Tungisic vowel harmony (Li, 1996), and West African languages (Casali, 2003), the [-ATR], and the Tongue Root Backing feature [RTR] are exploited in the language for the vowel inventory of these languages allows both features to be present in the domain of the Tongue Root harmony.

Hence, we conclude that in the three types of vowel harmony; i.e. backness harmony, round harmony, and ATR harmony, the vowels affected by harmony (the harmonised vowels) have contrasts for [back], [round] and [ATR] in the language. In other words, if the vowel system of a language has contrasts for [back], [round] or [ATR], then the vowel contrasts are transparent environment for harmony. The contrastive vowel allows the feature with harmony to spread through it. For example, Akan has the back vowel [-ATR] /ɑ/ which has no [+ATR] /a/ contrast. Therefore, the vowel /ɑ/ is considered opaque and not transparent. Opaque environments are blocking environments, in other words, it does not allow features of harmony to spread through them. Hence, the vowel /ɑ/ in Akan does not allow the spreading of the feature [+ATR] through it, therefore, it is a blocker of harmony. Similarly, the front vowels /i e/ has no [-back] contrasts in the Finnish vowel system. Therefore, they are opaque environments to harmony; i.e. they do not allow the [-back] feature to spread through them (ibid).

4.4.5 Complete harmony

This type of vowel harmony known as complete harmony is present in the vowel systems of languages which show complete assimilation in the vowel quality features (Rose and Walker, 2011). Vowel features are represented in the tongue height features [high], [low], the tongue root features [ATR], [RTR], backness features [front], [back], and roundness feature [round], [unround]. One type of complete -vowel harmony is referred to as transguttural harmony, and is quite similar to translaryngeal harmony (Rose, 1996; Rose and Walker, 2011). Transguttural harmony is documented in several languages like Jibbaali Semitic (Hayward et al. 1988), and Iraqw, a Cushitic language spoken in Tanzania (Mous, 1995). In transguttural harmony, vowels become identical in the environment of guttural consonants (Rose, 1994; 1996). As an example, in Jibbaali Semitic, a Modern Southern Arabian language (Hayward et al. 1988; Rose, 1996), the front vowels like / e, ə/ of a /CeCəC/ pattern exist in a non-guttural environment as illustrated in (a) and (b). However, they surface in a guttural environment as [CaGaC] as represented in (c) and (d) (cf. McCarthy, 1991;1994; Rose 1996) as represented in the examples below.

(24)

(a) [ðekər] 'be mean'/greedy (c) [saʁal] 'busy'

(b) [serəd] 'be lit' (d) [saʕaf] (Hayward et al. 1988; cited in Rose, 1996).

In the examples above, the vowel height feature in a guttural environment is affected. The [high] vowels / e, ə/ are lowered to /a/ in the environment of mid-gutturals in a progressive harmony as in the following patterns / CeCəC/→/CaCəC/→[CaCaC]. Therefore, the nearby vowel(s) surface as [low] /a/ which are identical to the [low] vowel /a/ that followed the guttural (cf. McCarthy, 199; 1994 Rose, 1996).

In Iraqw, a Cushitic language (Mous, 1993; van der Hulst & Mous 1992: 103-104; Rose, 1996), progressive harmony is attested in the vowel(s) following one of the [high] /i(ː), u(ː)/ vowels or the [low] epenthetic /a/ vowel. The [high] /i(ː), u(ː)/ vowels, and the [low] epenthetic /a/ vowel preceding a pharyngeal or a laryngeal spread their feature in transguttural harmony to nearby vowel(s) progressively. Thus, nearby vowel(s) surface as identical in either vowel backness to the vowel preceding the laryngeal or pharyngeal as in (a) or they surface as identical in tongue height as in (b) with epenthetic /a/ surfacing as [i] in the following words below.

(25)

(a) /buːʔ-iːm/→[buːʔ-uːm] 'harvest pay (durative)'

(b) /biʕni/→[biʕini] 'wedge' (Rose, 1996).

Moreover, transguttural harmony is documented as harmony in vowel rounding in some languages with the participation of an intervening guttural consonant like velars and uvulars in Iraqw (Rose, 1996). Vowel(s) following a guttural agree in vowel rounding with the preceding rounded vowel as in the following words below.

(26)

/hluːq-iːm/ ➝ [hluːquːm] ‘kill a big animal or man’ (Rose, 1996).

Nonetheless, complete harmony can be traced not only in vowel harmony, but also in the vowel-consonant harmony in the vowel-place features realised as secondary articulation in consonants (Rose and Walker, 2011). Tongue Root features like [-ATR] (Vaux, 1993), [RTR] (Rose, 1996) which are represented as secondary place features in consonants and the primary place features in vowels can be triggers of vowel-consonant harmony affecting both consonants and vowel(s) (ibid).

4.5 Complete harmony in Muslawi Qəltu

Stem vowels agree in height, backness and rounding in one form of complete *ʔimaːla* harmony in Muslawi Qəltu. The examples below come from the list of literture on *ʔimaːla* in Qəltu (cf. Abu-Haidar, 1991; Levin, 1998; Bellem, 2007; Ahmed, 2018).

(27)

MQ

(a) [ʒaːmiʕ] < [ʒɛːmɛʕ] ‘mosque’

(b) [waːħid] < [wɛːħɛd] ‘someone’

(c) [maːkil] < [mɛːkɛl] ‘he had eaten’

(d) [haːmil] < [hɛːmɛl] ‘he had neglected’

(e) [jaʕtabirak] < [jɛʕtɛbɛrak] ‘he considers you’

(f) [ʁaːfil] < [ʁɛːfɛl] ‘he is ignoring’

(g) [tˤaːlib] < [tˤɛːlɛb] ‘he is asking’

(h) [sˤaːfin] < [sˤɛːfɛn] ‘he is templating’

(i) [ðˤaːbit] < [ðˤɛːbɛt] ‘he is in control’

(j) [qaːfil]< [qɛːfɛl] m. ‘stubborn’

Another form of complete harmony in MQ is represented with /u/ stem vowel fronting agreeing in backness and roundness with final *ʔimaːla* /i/.

(28)

MQ

(a) /ʒubba/ < [ʒə̹bbi] ‘dress’

(b) /kubba/ < [kə̹bbi] ‘kubba’

On the other hand, complete harmony exist in word medial stem vowels in regressive harmony with word final suffixal /a/ vowel triggered by a guttural or emphatic in the domain.

(29)

MQ

(a) [waraqa] ‘paper’

(b) [mazraʕa] ‘farm’

Complete harmony also shows in Muslawi Qəltu with /a/ preserved in a guttural and non-guttural environment.

(30)

MQ

[χalaq] ‘he created’

[ʁasal] ‘he washed’

[qataʕ] ‘he cut’

[sakan] ‘he lived’

[kafal] ‘he guaranteed’

4.6 Vowel-consonant harmony

Vowel-consonant harmony embodies two types of harmony, the cross-categorical (local) consonant-vowel CV harmony (Padgett, 2011), and the long-distance vowel- consonant harmony (Shahin,2003). *Tafxi:m* harmony is one type of harmony which is manifested both locally in the CV interaction, and in long domain vowel-consonant harmony.

4.7 Tafxi:m harmony

Tafxiːm harmony also referred to as emphasis harmony (Hoberman,1988), pharyngealization and uvularisation harmony, and RTR harmony (Shahin, 2003). *Tafxiːm* harmony is bounded to a sound system with a rich post-velar consonantal inventory introduced as the elements of *tafxiːm* (see McCarthy, 1994; Watson, 2002). *Tafxiːm* harmony comprises one of two types of harmony: 1- the vowel harmony where vowels in long domain agree in backness (RTR-ness or dorsality), height or roundness in the presence of the elements of *tafxi:m*; and 2- vowels and consonants agree in backness. Local and long domain *tafxiːm* harmony are determined by the typology of *tafxiːm* harmony in the language or dialect, i.e. the nature of the elements of *tafxiːm* (Shahin, 2003) and the phonological environment represented in vowels and or consonants that are transparent and allow *tafxiːm* harmony to exist in long domain in the language, and the ones that are opaque and restrict *tafxiːm* harmony in long domain. Such environments are opaque for they are specified with a feature that is antagonistic (opaque) to the consonantal or vocalic element with *tafxiːm* harmony.

For example, *tafxiːm* harmony triggered by pharyngeals is present locally in the adjacent vowel (Bessell, 1998; Watson, 2002) in a CV syllable (Lehn, 1963) in one form of vowel-consonant harmony and it is represented in long domain; that is the whole phonological word (Watson,2002) triggered by emphatics in transparent environments where either vowels, consonants or both are identified as trigger domains for harmony (Davis, 1995).

Tafxiːm harmony with the trigger element pharyngeal is is derived in the /i/ vowel in the form of [+low, retracted] [ɛ] in Cairene Arabic (Watson, 2002) as in the examples below.

(31)

(a) /iħna/ ➝[ɛħna] ‘we’

(b) /tiʕmel/➝[tɛʕmil] she does’ (Watson, 2002:271).

It is also derived in the /u/ vowel in form of [+low, retracted] [o] as in the example below.

(32)

/ħubb/➝ [ħobb]’love’ (Watson, 2002:271).

In favour of this, Rose provides evidence from several languages and argues for [RTR] (cf. Davis,1995) as the correlate of *tafxi:m* harmony. Her argument is based on the fact that the spread of the [RTR] feature can account for the derivation of the different vowels across languages.

In other words, she states that with [RTR], there is no strict uniform result for the derived vowel, and that there are no expectations for the (+/-) value of a feature as it is for the [+/-ATR] as such feature represents only vowels. Therefore, she argues that [RTR] here replaces [-ATR] where only one form of a lowered [-ATR] counterpart of a [+ATR] vowel is expected (p.89-90).

For example, in languages like Akan with [+/-ATR] vowel system, one form of vowel derivation is expected in vowel harmony. The [+ATR] /i/, for example is realised as [-ATR] lowered [ɪ]. However, in other languages where [+/-ATR] is not part of the vowel system. Thus, the expected derived vowel can have different forms which can be best presented with the feature [RTR]. The examples below are from four Salish languages (Rose, 1996).

(33)

(a) Chilcotin /i/→ [e]

(b) Lillooet /i/→ [ɛ]

(c) Shuswap /i/→ [ɛ]

(d) Thompson /i/ → [ẹ] (p:90).

Also, the drived vowels in Baghdadi Gilit have different forms in the guttural and emphatic contexts presented as follows:-

(34)

(a) /i/→[ɪ, i, ɨ]

(b)/u/→[ʊ u]

(c)/a/→[ə,ɑ,ʌ,a]

(d)/iː/→[iː, ɪ, ɨ ː]

(e)/aː/→[aː, ɑ ː, ʌ ː]

(f)/uː/→[uː, ʊː] (Al-Ani,1970)

Nonetheless, there are expected variations among the class of gutturals in terms of how they condition *tafxi:m* harmony in vowels. In Moroccan Arabic, the uvular and pharyngeal gutturals condition changes in vowels in a way that is described as strictly local to some degree, and is less pronounced compared to the emphatics present in the language (Rose, 1996: 85-86).

In other words, vowel lowering is less drastic and more sporadic in the uvular and guttural environment compared to the emphatics in Moroccan Arabic and in Ayt Seghrouchen Tamazight Berber. The vowels /i, u/ are lowered to [ɪ] and [ʊ]. However, the /a/ vowel is backed to [ɑ] in Ayt Seghrouchen Tamazight Berber (Rose, 1996:86). This is illustrated in the following words below.

(35)

(a) /bʁa/→ [bʁɑ] ‘to wish’

(b) /iχf/→[ɪχf] ‘head’ (Rose, 1996:86).

Whereas, the /i, a, u/ vowels are retracted to [e, ɑ, o] respectively as represented in the emphatic environment in the following words below.

(36)

(a) /dˤaːr/ →[dˤɑːr] ‘he turned’

(b) /sˤiːf/ → [sˤeːf] ‘summer’

(c)/zˤuːr/→[zˤoːr] ‘visit’ (Rose, 1996:85).

Tafxi:m harmony is represented in long domain in minimal syllables in both vowels and consonants in Cairene Arabic with the trigger element /rˤ/ as in /rˤɑbˤbˤ/ 'God' and in maximal syllables in /tˤulˤlˤɑ:bˤ/ 'students' with the emphatic /tˤ/ as the trigger element whereby nearby consonants and vowels are transparent envirinments for *tafxi:m* harmony in Cairene Arabic (Lehn, 1963). *Tafxi:m* harmony is also represented in long domain in Rural Palestinian Arabic in words like /bˤɑlˤɑ:tˤɑ/ 'tile' (Younes, 1993:125), /ʔɑtˤfˤɑ:lˤ/ 'children' and /χɑbˤbˤɑsˤ/ 'a messar' where /ɑ/ provides the domain for maximal *tafxi:m* harmony (Davis, 1985).

Tafxi:m harmony with emphatics as the trigger elements is blocked or weakened in Arabic when the following sound is a vocalic non-tautosyllabic [+high], [dorsal] /i/ Ghazeli,1977:128), the [+high], [dorsal] /u/ or the [+high], [palatal] /j/. The examples below are from Cairene Arabic as in the following examples:-

(37)

(a)/mɑ**s**ˤɑ:jib/→ [mˤɑ**s**ˤɑ:jib] 'misfortunes'

(b) /ʕɑ**s**ˤɑ:fi:r/→ [ʕɑ**s**ˤɑ:fi:r] 'birds'

(c)/**s**ˤɑħbu/ → [**s**ˤɑħbu] 'his friend' m. (Watson, 2002 : 274).

Tafxi:m harmony is also blocked in Southern Palestinian Arabic (Davis, 1995) when one of the consonantal [+high] palatals / j ʃ ʒ/ are in the domain as illustrated in the example below.

(38)

/ ʕa**t**ˤʃa:n/→[ʕɑ**t**ˤʃa:n] 'thirsty'

On the other hand, the [+high] tautosyllabic dorsal /i/ vowel does not block *tafxi:m* harmony in the domain /tˤ/, /sˤ/ in Cairene Arabic. This is illustrated in the examples below.

(39)

(a)/tˤi:nˤ/ 'mud'

(b)tˤifˤlˤ/ 'child'

(c)/wˤi**s**ˤilˤ/ 'he arrived'. (Watson, 2002:274).

Davis specified two grounded path conditions on the target of the rule that determines the domain of *tafxi:m* harmony. The description of these rules is as follows: *tafxiːm* harmony is identified in the retracted tongue root [RTR] as the articulatory correlate of *tafxi:m* harmony. The [RTR] feature is antagonistic with the [+high] tongue body articulation of the /i j ʃ ʒ/. Hence, grounded path conditions on local *tafxiːm* harmony are represented as follows:

RTR/HI Condition

If [RTR] then not [+high]

RTR/FR Condition

If [RTR] then not [-back]

The condition for the local *tafxiːm* harmony is called Feature- Filling. The feature [RTR] is not specified for the target phonemes /i j ʃ ʒ/. In other words, the adjacent vowel is the only element affected by *tafxiːm* harmony in the Feature-Filling condition. This is illustrated in the following words:

(40)

(a)/tˤiːnak/ ‘your mud’

(b)/ ʕatˤʃaːn/ ‘he is thirsty’ (Davis, 1995).

Tafxiːm harmony in Northern Palestinian Arabic is local in the presence of the segments /ʃ j w i u/ identified as blockers to long domain *tafxiːm* harmony in words like the following.

(41)

(a) /ʕatˤʃaːn/→[ʕɑtˤʃaːn] ‘he is thirsty’

(b) /sˤjɑːm/→ [sˤjaːm] ‘they are fasting’

(c) /tˤwɑːl/→[tˤwaːl] ‘tall’ (Davis, 1995).

Similarly, *tafxiːm* harmony in Cairene Arabic is local. It is blocked by non-tautosyllabic /i j/ and non-tauto-syllabic /u/ in suffixes as identified earlier. In the examples above, grounded path conditions are specified on the target segments /ʃ j w i u/. Davis (1995) specified articulatory governed conditions for the representation of *tafxiːm* harmony illustrated in the feature [-ATR], [RTR] which correlate with [+low], [-high]. Therefore, the affected elements undergoing *tafxiːm* harmony surface as [+low], also represented as [-high].

The articulatory conditions identified below are specified as grounded path conditions (Archangeli and Pulleyblank, 1994) which Davis (1995) adopted to address *tafxiːm* harmony in Northern and Southern Palestinian Arabic are as follows:-

ATR/LO Condition

If [+ATR] then [-low].

If [+ ATR] then not [+ low].

In (a), there are grounded path conditions on the features advanced tongue root [+ATR] and [+low]. Both features are in an antagonistic relation; i.e. it is difficult to articulate an [+ATR] sound when the tongue body is in a [low] position. Both positions are antagonistic to each other.

b. RTR/HI Condition

If [-ATR] then [-high].

If [- ATR] then not [+ high]

In (b), there are grounded path conditions on the features [-ATR] (also represented as [RTR]) and [high]. Both positions are antagonistic. In these rules, the opaque environments are not specified with opposite values to the spreading feature, but rather specified with the articulatory antagonistic features that describe the tongue root and tongue body articulations.

Davis specified other path conditions that are considered as weaker than the previous ones since they are not grounded neither in phonetics nor they are phonologically common cross-linguistically. The path conditions in the rule below are specified for the [+front] or [-back] articulation being in a sympathetic relation with the advanced tongue root [ATR]; i.e. it is easier to articulate a [ATR] sound when the tongue position is [-back] in the oral cavity.

FR/ATR Condition

If [- back] then [+ ATR]

If [- back] then not [- ATR]

That is the **RTR/HI condition.** The **RTR/HI** condition expresses the antagonistic relation between the feature [RTR] of the trigger element and the [+high] feature of /ʃ j w i u/. Opacity is explained under these conditions.

In Northern Palestinian Arabic, the /w u/ are identified potential blockers to long domain *tafxiːm* harmony, but not in Southern Palestinian Arabic. Hence, path conditions on the target of the rules are specified as follows **RTR/HI** and **RTR/FR** to exclude the back high /u w/ segments from being potential blockers of progressive *tafxiːm* harmony in Southern Palestinian Arabic.

On the other hand, regressive *tafxiːm* harmony in Southern Palestinian Arabic exist in long domain, as it is in Northern Palestinian Arabic. In other words, there are no grounded path conditions on the target phonemes /i j ʃ ʒ/ as illustrated in the following example:

(42)

(a) / ʔatˤfaːl/→[ʔɑtˤfˤɑːlˤ] 'children'

(b) / ʕatˤʃa ːn/→[ʕɑtˤ**ʃ**a:**n**] 'he is thirsty' (Davis, 1995).

Progressive *tafxiːm* harmony in example (b) is blocked in the /ʃ/ environment because of the specified ground path condition.

Similarly, regressive *tafxiːm* harmony in Northern Palestinian Arabic exist in a maximum domain beyond the syllable boundary (Herzallah, 1990; Davis, 1995), in Qatari Arabic Bukshaisha (1985) and in Cairene Arabic (Watson, 2002).

Davis (1995) generated parameters for regressive *tafxiːm* harmony in Northern Palestinian Arabic that is similar to that of the Southern Palestinian Arabic. It is as follows in table 3 below.

Table 3 Grounded path conditions for regressive *tafxi:m* harmony in Northern Palestinian Arabic.

Argument [RTR]
Parameters :
Function : **INSERT**
Type : **PATH**
Direction : **REGRESSIVE**
Iteration : **ITERATIVE**
Structure Requirements
Argument Structure : **NONE**
Target Structure : **FREE**
Other requirements
Argument condition : **SECONDARY PLACE**
Target conditions : **STEM-BOUND (Optional)**

Davis presented several examples of regressive *tafxiːm* harmony in Palestinian Arabic. Some of which are highlighted in the examples below.

(43)

(a)/ maxʃuːtˤ/→ [mˤaχˤʃˤuːtˤ] 'scratched'

(b) /χajjaːtˤ/ → [χˤajˤjˤɑːtˤ] 'tailor

4.8 Tafxi:m harmony in the vowels of Baghdadi Gilit vs. Muslawi Qəltu

It is argued that *tafxi:m* harmony is present in the lexical /a/ as [ʊ], or [ɒ][19] in the presence of secondary emphatics in BG in one form of vowel-consonant harmony harmony. It is proposed that the stem /a/ undergo *tafxi:m* harmony as the result of the default feature specification combined with place assimilation. According to Youssef (2009), the vowel receives the C-place feature [dorsal] and the V-place [labial] specified in the secondary emphatics in one form

[19] The [ɒ] is identified as [ɔ], [o] in the lilterature (Bellem, 2007; Al-Siraih, 2013; Ahmed, 2018). Most likely, it varies according to intra- dialectal variations or intra-speaker variations.

of progressive vowel-consonant harmony as in (a) and regressive vowel-consonant harmony as in (b) represented in the figure below (cf. Youssef, 2009).

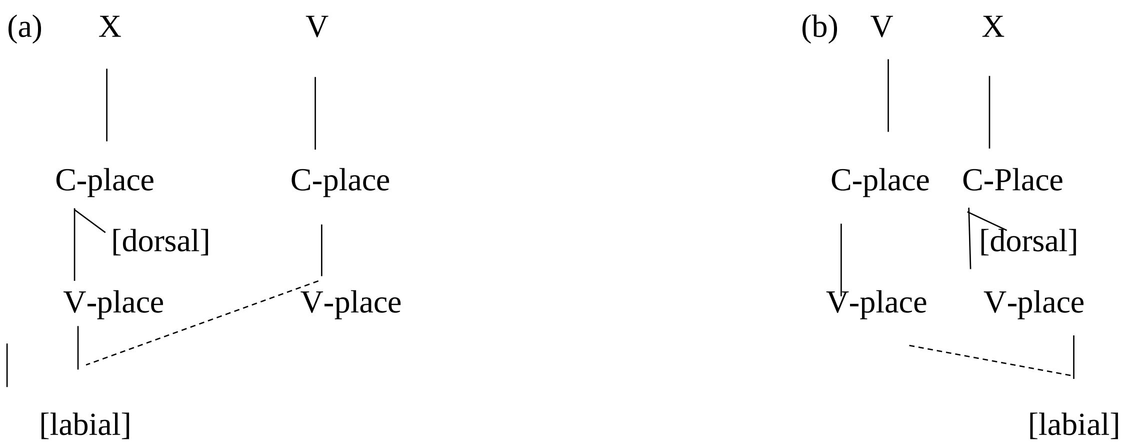

Figure 16 progressive (on the right) and regressive (on the left) *tafxi:m* harmony in the stem /a/ vowel in Baghdadi Gilit (cf. Youssef, 2009).

Below are some of the examples from BG representing regressive *tafxi:m* harmony in the lexical stem /a/ as [ʊ], [ɒ] triggered by secondary emphatics regressively in the presence of the gutturals and emphatic triggers progressively See figure below for clarification.

The examples below come from earlier studies conducted on *tafxi:m* harmony in the vowels of BG some which are based on observing the data auditorily (cf. Erwin, 1963; Youssef, 2009) while others implemented acoustic analysis through measuring F1-F2 formants (Bellem, 2007; Al-Siraih, 2013; Ahmed, 2018).

(44a)

BG	**MQ**	
(1) [sˤʊbˤɑrˤ]	[sˤʌbʌr]	‘he stood patient’
(2) [tˤʊmˤɑrˤ]	[tˤʌmʌr]	‘he buried’
(3) [ðˤʊfˤɑrˤ]	[ðˤʌfʌr]	‘he succeeded’
(4) [sˤʊfˤɑnˤ]	[sˤʌfʌn]	‘he contemplates’
(5) [qʊfˤɑlˤ]	[qʌfʌl]	‘he locked’

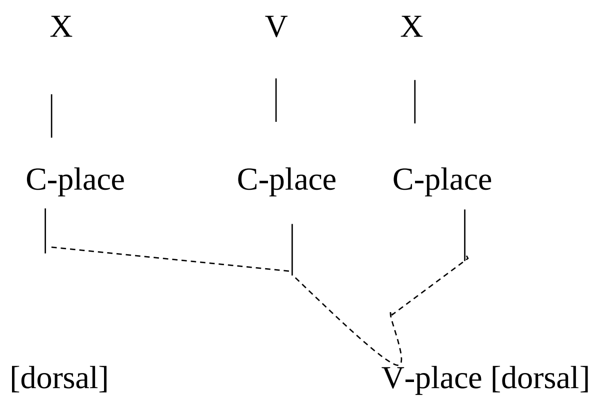

Figure 17 *Tafxi:m* harmony in the stem /a/ vowel in Baghdadi Gilit (Youssef, 2009)

In MQ as represented in the exmaples above, the /a/ vowel is realised as [ʌ] pr [ə] where *tafxi:m* harmony in a non-guttural and non- emphatic environment is not sporadic compared to BG. In other words, secondary emphatics are not identified in MQ for they lack the feature specification [dorsal] which is present in BG.

Progressive *tafxi:m* harmony is also identified in the stem /a/ as [ʊ] or [ɔ:] in the trigger environment of the secondary emphatics /rˤ/, /mˤ/, /bˤ/, /w/ and /j/ as represented in the examples below which come from a group of data from previous researches on *tafxi:m* harmony in the vowels of BG (cf. Erwin, 1963; Bellem, 2007).

(44b)

	BG	**MQ**	
(1)	[rˤʊgbɑ]	[ʁɑqɑbi][20]	‘neck’
(2)	[mˤʊkˤɑːnˤ]	[maka:n]	‘place’
(3)	[bˤʊsˤɑlˤ]	[bʌsˤʌl]	‘onion’
(4)	[bˤʊqɑ]	[bʌqa]	‘he stayed’
(5)	[wʊgɑf]	[wʌqʌf]	‘he stood’
(6)	[wʊsˤɑlˤ]	[wʌsˤʌl]	‘he arrived’
(7)	[jɔ:gɑʕ]	[jəqaʕ]	‘he is falling’
(8)	[jˤɔ:sˤɔfˤ]	[jəsˤəf]	‘he is describing’

[20] *ʔima:la* word finally is strong *ʔima:la*.

In ex. (1) in 44 (b) above, the [ʁ] realization of /r/ identified as a secondary emphatic in MQ show *tafxi:m* harmony in the /a/ vowel as [ɑ] along with the guttural /q/ present in the domain in one form of vowel-consonant harmony.

Progressive *tafxi:m* harmony (see figure 18 below) also shows in the epenthetic /i/ vowel as [ʊ] in long domain vowel-consonant harmony (cf. Youssef, 2006; 2009) where secondary emphatics are identified as the triggers along with the gutturals and emphatics present in the domain as represented in the examples below (a) to (g). The epenthetic vowel is also represented as [ʊ] in long domain regressive vowel harmony with the stem [ʊ] in the trigger environment of secondary emphatics and gutturals discussed earlier in sections 2.9.2 and 4.4.2. See example (h). More details in section 6.1.

(45)

BG

(a) [ʁɑːfˤʊlˤ] 'mislead'

(b) [tˤɑːlˤʊbˤ] 'asking'

(c) [sˤɑːfˤʊnˤ] 'contemplating'

(d) [ðˤɑːbˤʊtˤ] 'officer' (cf. Bellem, 2007)

(e) [qɑːfˤʊlˤ] 'stuborn'

(f) [gɑlˤʊbˤ] 'heart'

(g)[tˤamˤʊrˤ] 'burying'

(h) [sˤʊfˤʊrˤ] 'zero'

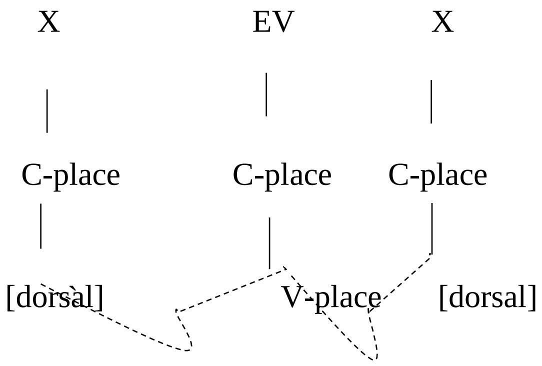

Figure 18 Tafxi:m *harmony in the epenthetic /i/ vowel in Baghdadi Gilit (cf. Youssef, 2009).*

4.9 Summary and conclusion

This chapter has shed the light on *tafxi:m* and the *mufaxxama* sounds in Arabic. It also addressed the types of harmony which existed in the different languages among which *tafxi:m* harmony is present in Baghdadi Gilit as vowel rounding in long domain vowel harmony and vowel-consonant harmony and *ʔima:la* existing as vowel raising or centralisation in complete vowel harmony in Muslawi Qəltu.

Chapter Five: Phonetic and experimental approach

5.1 Introduction

This chapter provides the experimental data procedures (auditory and acoustic) adopted with relevance to *tafxi:m* in the vowels of Qəltu and Gilit.

5.2 Tafxi:m in the mufaxxama sounds

Tafxi:m in the group of the *mufaxxama* sounds; that is the emphatics /tˁ, sˁ, ðˁ, dˁ /, the uvulars /q, χ, ʁ/ and the pharyngeals /ʕ, ħ/ including or excluding the laryngeals / ʔ, h/ (Clements, 1991;1994; Zeroual and Clements, 2015) is represented in their secondary constriction which is [pharyngeal] (McCarthy,1991;1994; Herzallah, 1990; Zeroual and Clements,2015).

The feature [pharyngeal] is defined as a consonantal pharynx constriction in the group of emphatics /tˁ, dˁ,sˁ, ðˁ/ and is represented under a C-Place feature dominating a C-place node (see details in sections 3.2 and 3.4). According to Watson (2002), the pharynx constriction is a consonantal configuration which involves the retraction of the palatine dorsum initiated by the vocalic retracted tongue dorsum constriction. The pharynx constriction defined in [pharyngeal] is accompanied with V-place dominating features; that is [dorsal] and [labial]. The former feature [dorsal] correlates with pharynx constriction, palatine dorsum backing and palatine dorsum depression along with the raising of the tongue blade (Watson,2002). More specifically, a rearward movement of the back of the tongue towards the wall of the pharynx at the level of the second cervical vertebra with a depression of the palatine dorsum (Ghazeli,1977). Maiteq's (2013) defined [dorsal] as a retracted tongue dorsum resulting in narrowing in the upper portion of the pharynx. This retraction is accompanied by small retraction by the lower part of the anterior wall of the pharynx and the epiglottis which is similar to the retracted tongue root [RTR] (Maiteq, 2013). The latter feature [labial] correlates with lip protrusion or rounding (see Lehn, 1963; McCarthy, 1991; 1994; Watson, 2002; Al-Masri and Jongman, 2004; Zeroual and Clements, 2015; among others) (see details in section 3.2, 3.6 and 3.7).

On the other hand, Zeroual and Clements (2015) defined the elements of *tafxi:m* in the epiglottal region. The epiglottal articulation is achieved by a pronounced backward epiglottis movement toward the posterior laryngopharyngeal wall (p. 261). Similarly, Al-Tamimi and

Heselwood (2011:187) instrumental investigation reveal that the elements of *tafxi:m* are defined in the epiglotto –pharyngeal region which involves an approximation behind and below a retracted and bunched-up tongue root which together narrow up the oropharynx in the cervical vertebra (CV2-CV3) region.

Tafxi:m in the uvulars /q, χ, ʁ/ also encompasses the larynx through the laryngopharynx region (McCarthy,1994:192). In the above uvulars, *tafxi:m* is initiated by a retacted tongue dorsum and tongue root (Solami, 2017). In other words, the tongue body [dorsal] and tongue root [TR] are argued to be the active articulators involved in forming the constriction in uvulars. The active articulators constrict the air flow in their direct contact with other articulators that comprise a part of the pharynx region (see McCarthy, 1991;1994).

Tafxi:m in the uvular stop /q/ involves a superior-posterior movement of the back of the tongue which ends with the tongue dorsum being pressed against the uvula (i.e. uvular constriction). The backward movement results in narrowing of the oropharynx with the narrowest constriction taking place between the epiglottis and the back wall of the pharynx (McCarthy,1991;1994).

On the other hand, the uvular fricatives /χ, ʁ/ are produced with much higher and slightly narrower constriction than pharyngeals. Similar to /q/, the constriction for /χ, ʁ/ is obtained by raising and retracting the tongue dorsum towards the posterior wall of the oropharynx (ibid). The constriction is narrower for /χ / (McCarthy 1991), and more back for /ʁ/ (Ghazeli, 1977:55). The larynx involved in forming the constriction for the uvulars /χ ʁ/, and the uvula in /ʁ/ is curved downward and anteriorly to produce the uvular trill /ʀ/ (McCarthy, 1994:195). The uvular trill /ʀ/ is produced with both a uvular and pharyngeal constriction (Ghazeli, 1977).

In pharyngeals, *tafxi:m* involves the tongue root, the epiglottis and the posterior pharyngeal wall (McCarthy,1991). The pharyngeal articulation is described as an approximation of the posterior wall of the laryngopharynx and the tongue root from the epiglottis down to the larynx. The posterior wall and the tongue root are raised from their rest position during the articulatory process of these sounds (p. 193-194). Similarly, Ghazeli’s (1977) description of *tafxi:m* in pharyngeals /ʕ, ħ/ is that it involves a backward movement of the root of the tongue and a forward displacement of the lower end of the back of the pharynx (p.37). It is also argued that an additional articulatory gesture is involved in *tafxi:m* in pharyngeals, that is a narrowing or constriction of the lips (lip protrusion) (ibid) in addition to jaw lowering which help the tongue root and epiglottis retract easily (Elgendy, 1999; Zeroual and Clements, 2015). The constricted pharynx configuration that characterises the *tafxi:m* in the uvulars, the pharyngeals and the primary emphatics is identified as a "narrowing of the lower pharynx past the neutral position in the region of the tongue root" (Perkell, 1971). In pharyngeals and uvulars, it is"the retraction of the epiglottis into the pharynx and over the glottis" (Heselwood & Al-Tamimi 2011:101).

In secondary emphatics, *tafxi:m* is defined as labio-velar constriction; therefore their area of constriction is in the upper pharynx with a narrowing or constriction of the lips (cf. Bellem, 2007).

5.3 The articulatory correlates of tafxi:m in vowels

Previous works on the different Arabic dialects including the Qəltu and Gilit have shown that vowels undergo [dorsality], i.e. tongue dorsum lowering and centralisation in a uvular and emphatic context (Ghazeli,1977; Butcher and Ahmed, 1987), [RTR-ness] (tongue root retraction) in a pharyngeal context (Al-Ani,1970; Herzallah,1990; among others) or lip protrusion [labiality] or [labio-dorsality] in uvulars, secondary PVs (also called labio-velars) (Bellem, 2007), and emphatic contexts (Watson, 1999; 2002; Bellem, 2007; Youssef, 2009). *Tafxiːm as* [RTR-ness] is present in the/a(ː)/ vowel with further degrees of backing [RTR-ness] in /a(ː)/ in a pharyngeal context whereas *tafxi:m* as [dorsal] is present in the /i(:), /u(:)/ vowels with further degress of lowering and centralisation [dorsality] in the /i(ː)/, and /u(ː)/ vowels in a uvular and emphatic context (Watson, 2002).

In uvulars and secondary PVs, [dorsality] represents a state of the tongue: tongue dorsum raised towards the uvula in /a(ː)/, /u(ː)/) or towards the front part of the velum in /iː/ (Ghazeli,1977; Al-Tamimi, 2018). It also represents the following state of the tongue: a depression of the tongue dorsum, rearward movement of the back of the tongue towards the upper pharynx in /uː/ or mid/lower pharynx in /iː/ and /aː/ (ibid).

[RTR-ness] in pharyngeals is translated in the /a/ vowel as [open, retracted, + low] [ɑ] (Davis,1995; Sylak-Glassman, 2013; 2014). Similarly, [dorsality] in the uvulars is derived in the /u/ vowel in the form of [open, raised, +back] as illustarted in **Table 4** below (cf. Elgendy, 2007; Sylak-Glassman, 2013, 2014).

Sylak-Glassman (2013, 2014) argues that the effect of post-velar consonants on vowels is assimilatory. In other words, he states that vowels' articulations need to be described in terms of their assimilatory to post- velar consonants which can interpreted both from an articulatory and acoustic points of views. The similarity scales presented in Table 3 below are based on phonetic information (both articulatory and acoustic) from a cross-linguistic data survey (Sylak-Glassman, 2014). It is found that the vowel that shares the most articulatory and acoustic properties with a given post-velar consonant is ranked at the top as Step 1 (Sylak-Glassman, 2013). For example, the uvular consonants are articulated with raised tongue dorsum and an overall more open vocal tract configuration (Sylak-Glassman, 2013;2014).Thus, the [+raised, -high], / ʊ, o/, are most similar to the uvulars. However, in uvular stops, the vowel is similar to /ʊ/ while in uvular fricatives, it is similar to /o/ since the tongue dorsum is higher with uvular stops compared to uvular fricatives (ibid). The next most similar is the [+raised, +high] vowel /u/. Then followed by the [+back] vowels which in articulatory and acoustic terms involve the [+raised] and [+retracted] vowels in the vowel space (cf. Esling, 2005). Based on typological evidence, the vowel that is least similar to the uvulars is /i/ (Sylak-Glassman,2013). In pharyngeals, Sylak-Glassman (2013) argues that the pharyngeal consonants are articulated with constriction in the epilarynx, and an open vocal tract configuration and tongue retraction. Therefore, the most similar vowel to pharyngeal consonants from a broad typological perspective is the [+open, +retracted, +low] [ɑ] as stated previously. See table 4 below for reference.

Table 4 The representation of the uvulars and pharyngeals' compatibility with the vowels in articulation in steps.

Similarity to Uvulars			*Similarity to Pharyngeals*		
Step	*Features*	*Vowels*	*Step*	*Features*	*Vowels*
1	raised, +back, +high	u	1	open, retracted, +low	ɑ
2	raised, +back	u, ʊ, ɔ	2	open, retracted	ɑ, ɔ
3	+back	u, ʊ, o, ɔ, ɑ	3	open, +back	ɐ, ɑ, ɔ
4	open	ɛ, æ, a, ɐ ,ɑ, ɔ	4	open	ɛ, æ, a, ɐ ,ɑ,
5	front	i, ɪ, e, ɛ, æ, a	5	open, front	ɛ, æ, a
6	close	i, ɪ, e ,o, ʊ, u	6	front	i, ɪ, e, ɛ, æ, a
7	front, close	i, ɪ, e	7	close	i , ɪ, e ,o, ʊ
8	+front, close, +high	i	8	front, close	i, ɪ , e
			9	close, +high	i,u
			10	+front, close, +high	i

5.4The acoustic correlates of tafxi:m in vowels

The correlates of *tafxiːm* in vowels are lowering, retraction (backing, centralisation) and/or rounding. F1 rise typically correlates with lowering and F2 decrease correlates with backing and/or rounding with F1 rise being prominent in a pharyngeal context, and F2 decrease being prominent in a uvular and pharyngealised context (Al-Ani,1970; Ghazeli,1977).

The acoustic correlates of *tafxi:m* in vowels are detected at both the consonant-vowel transition (i.e. start) and the vowel steady state (i.e. mid-point) (Al-Tamimi,2007). It is reported that *tafxiːm* is salient at the consonant-vowel transition in [+high], [+front] /i(ː)/ (Ghazeli,1977; Card, 1983) vowel and at the vowel steady state in [+high], +[back] /(u(ː)/ vowel; both signalled with decrease in the second formant frequency (F2) (Ghazeli, 1977; Kriba, 2010). Thus, signalling vowel lowering and backing in [+high,front] vowels and vowel lowering and centralisation in [+high, back] vowels.

The presence of F2 transition in /i(ː)/ and /u(ː)/ reflect the amount of required displacement of the tongue from the element of *tafxiːm* to the vowel and the speed of the movement (Ghazeli,1977ː85). In the long /iː/ vowel, the back of the tongue gradually moves forward to achieve the target position of the /iː/ vowel, thus decreasing the volume of the oral cavity and increasing the value of F2 (Ghazeli, 1977ː79). In the /u/ vowel, the distance the tongue must travel to and away is very small since both sounds are [back] (ibidː79). Therefore, increasing the volume of the oral cavity and decreasing the value of F2.

In the [low] /a(ː)/ vowel, *tafxiːm* harmony is detected at both the consonant-vowel transition and the steady state of the vowel represented in a complete change in vowel quality from [+low] and [+front] /a(ː)/ to [+low] and [+back] [ɑ(ː)] or [+low], [+back] and [+rounded] [ɒ(ː)] (Yeou, 1997). This indicates that long /i(ː)/ and the /u(ː)/ vowels are resistant to *tafxiːm* harmony compared to /a(:)/ (Hassan, 2005; Hassan and Esling, 2007; Kriba, 2010; Jongman et al., 2011).

5.6 Material (Stimuli)

The material prepared for this research included embedding the /i/, iː/, /a/, /aː/, /u/, and /uː/ in three groups of consonantal contexts. The three groups were categorised as follows: the /q/, /χ/, / ʁ / were categorised under the group of uvulars. The / ʕ/, /ħ / under the group of pharyngeals, and the / tˤ/, /sˤ/, /ðˤ / under the group of emphatics. The plain (non-PVs) were represented with another group of emphatics in minimal pairs. Each consonantal context in each group of PVs was produced syllable initially followed by one of the target vowels /i/, iː/, /a/, /aː/, /u/, and /uː/ as represented in the stimuli (see appendix A). The fact that this study focuses on addressing the correlates of *tafxiːm* in the target vowels, and that it involves running auditory, acoustic and statistical tests means that the items were carefully chosen (i.e. restricting the choice of items and syllabic context) driven by the fact that the items should be familiar to speakers of both dialects to guarantee accurate productions.

The number of tokens each of the informants produced is 120 tokens (6 vowel targets x 8 types of consonants x 3 repetitions) which involves the pharyngeal, uvular and pharyngealized coronals consonantal contexts, and 108 tokens (6 vowel targets x 6 types of consonants x 3 repetitions) which involves the emphatic (pharyngealized coronal) vs. plain consonantal contexts. So, it is 228 tokens per speaker. Overall, 228 *20 speakers= 4,560 tokens.

5.7 Informants

Background information was collected from the informants before enrolling them in the experiment (see appendix B). The informants were male speakers of either Muslawi Qəltu or Baghdadi Gilit dialects of Mesopotamian Arabic who were enrolled in postgraduate studies at Newcastle University, Manchester University or Essex University. None of the speakers reported a history of either speech or hearing impairment. The number of informants was chosen evenly per each dialect; 10 speakers per dialect. The age range of the informants was 22-47 years old. The Muslawi Qəltu speakers originated from Mosul city in Northern Iraq. The Baghdadi Gilit speakers came from Baghdad city in Central Iraq. The informants were asked to fill a consent form (see appendix B) in which the steps involved in the experiment are stated; that is, the aim of the study, the time allocated for the experiment, the place and room the experiment will take place, and the equipment(s) that will be used in the experiment. In the form, it was also stated that they had the right to withdraw from the experiment at any time, and that all their data would be deleted if they chose to do so.

The recruitments of the informants was based on the fact that they were born and bred in the respective cities. The material was first piloted with three informants per dialect. The informants were asked to examine the word list to check their familiarity with all words and their ability to produce them before they were presented in front of them on Power Point slides for the recording. They were asked to determine if some of the words sounded unfamiliar to them in their dialect. Some of the words were identified as no longer in use in the dialect, and some were identified as ambiguous or did not exist in the dialect. Therefore, some of the tokens were removed, and others were replaced (see Appendix B).

5.8 Recording techniques

The recordings were made using recorder Type Edirol R09 with an external microphone (Sony Electret Condenser, Model: ECM-MS907). All the recordings were digitised at 44.1 Hz with 16-bit quantization and imported into PRAAT software (Boersma and Weenink, 2007) to perform several acoustic measurements on them.The recorded data was first saved on the Edirol recorder and later transferred onto a personal computer on which the software used for the acoustic analysis was installed. All recording sessions took place at the university premises in Newcastle, Manchester and Essex. Informants from Newcastle were recorded in the Phonetics lab at the Speech and Language Sciences Section, School of Education, Communication and Language Sciences. The informants were introduced to the facilities provided in the room before the recording session took place. The data was introduced to them on a wide digital screen in a sound proof room and they were instructed to adopt a moderate speaking rate with the microphone being placed about 20-25 centimetres away from their mouths.

5.9 Data technique

The target data was introduced to the informants in a carrier sentence “quːl ______ θala:θ marrat” (*say _____three times*) which was applied with all the target words. The target words were presented in the Arabic script with no-vocalisation with word fillers to drag the speakers’ attention from the real purpose of the study and to encourage the informants to produce the word in the dialectal form (see Appendix C).

This approach was adopted to limit and control for the inconsistent productions driven by individual differences among the speakers of both varieties.

Furthermore, dialectal variants were included in the orthography to encourage the informants to use a non-standard style (e.g. guːl with Baghdadi Gilit speakers, and quːl with Muslawi Qəltu speakers). For the plain/emphatic word stimuli, the examples of minimal pairs containing the plain consonants were randomly presented (cf. Kriba, 2010) to ensure informants weren't overtly aware of the contrast the researcher is trying to elicit.

The instructions were given in Arabic to read the target utterances without pausing between words. The informants had the chance to rehearse the list before the start of the recording and ask for any words that sounded unfamiliar or ambiguous to them.

The words were presented on a screen on PowerPoint slides and the informants read them one by one. The informants were asked to repeat each token three times in its sentence before the researcher moved to the next slide. The number of slides introduced to each participant were 82 slides in total. However, short breaks were included between 10 to 20 slides.

5.10 Data analysis

The study adopts a two way data identification method: 1- the auditory analysis; and 2- the acoustic analysis. The data was segmented and labelled beforehand to carry with the auditory and acoustic analysis followed by the statistical analysis.

5.11 Segmentation and labelling

The data was segmented and analysed using PRAAT. The sound files were extracted into Text Grids for segmentation in PRAAT. The IPA (International Phonetic Association) was adopted to transcribe the sounds. Two Texts Grids were aligned. The first Text Grid was for the consonant-vowel labelling. "C" is for the consonant, and "V" is for the vowel (see appendix D). The second Text Grid was for the segments with the PV consonants assigned under the C (consonantal) label, and the related vowel under the V (vocalic) label (see appendix D). The segmental boundaries were determined based on visual inspection of the spectrographic and waveform records. The vowel boundaries were marked at the onset of periodicity which is determined in the waveform as the start of the first cycle of the regular, repeating pattern showing all the components of the complex sine-wave. The onset of periodicity was identified in the spectrogram as the point where there is a complete set of dark bands representing the first three vowel formants (see Di Paolo et al., 2011: 91).

The consonantal boundaries were identified based on visual signs in the spectrogram, following the acoustic description of consonantal characteristics in Kent and Read (1992; 2002) and applying this on the consonants dealt with in this study. The voiced fricatives like / ð/, / ðˤ/ have the aperiodic energy with the quasi-periodic energy of vocal cords vibrations as sources of energy whereas for voiceless fricatives like /s/ and /sˤ/, and / ħ/, the only source of energy is the turbulence noise. The voiced fricatives were identified with higher frequency energy in the spectrogram specified in the intensity level. Therefore, the voiced fricatives have a similar pattern to their voiceless counterparts, but with the addition of the vertical striations in the spectrogram that indicates voicing. The frication was quite clear in the spectrogram of fricatives and the white noise in the spectrogram indicated the turbulent airflow for fricatives. The energy peaks in the spectrogram for fricatives helped in determining their place of articulation taking into consideration the formants (F1-F2) for the surrounding vowels. For stops, the closure, and the initial release of the closure are the points of the acoustic energy identified in the spectrogram. The transient waveform for the stops is the acoustic energy formed by the release of the closure and the moment of the vocal cords vibration for the following sound. However, in the case of /ʕ/, there was a variability in its realisation as whether it is represented in the spectrogram as / ʕ/ with a stop like quality (Al-Ani,1970), an approximant like (Butcher and Ahmed,1987) or a fricative like quality (cf. Al-Siraih,2013). The quality of /ʕ/ is determined by adopting the above criteria for identifying it as a stop, fricative, or approximant.

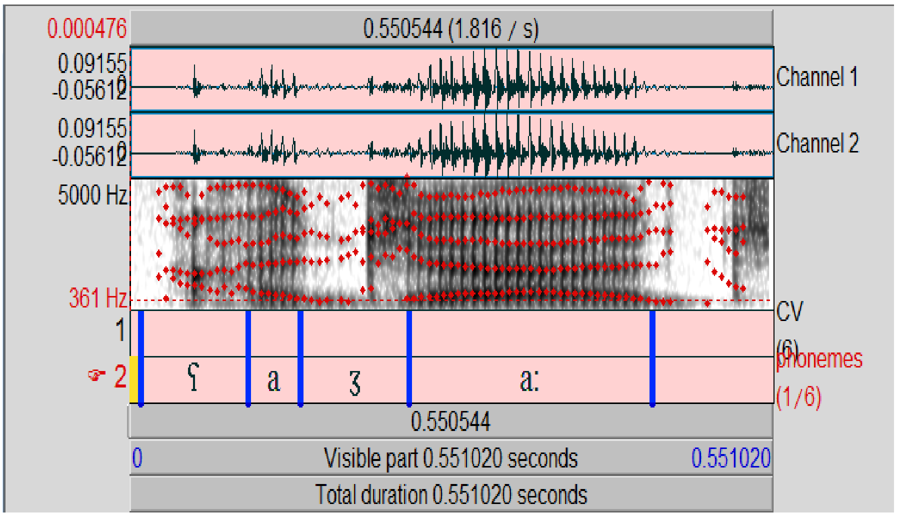

Figure 19 The sound waves and spectrogram for the token [ʕadʒaːdʒ] ‘sandstorm’ as realised by Qəltu speaker.

5.12 Data coding

The data coding included assigning a number for each speaker, followed by specifying the consonantal context (“PH” was given to pharyngeals, the “UV” to uvulars, and the “E” for the emphatic and lastly the “P” for the plain consonants), the vowel target /i, iː, a, aː, u, uː/, the dialect name (i.e abbreviations “MQ “for Muslawi Qəltu, and “BG” for Baghdadi Gilit, the three repetitions of the target vowels (i.e. the vowel realisations) per speaker in each dialect.

5.13 Auditory analysis

The auditory analysis involved listening to all three repetitions of each of the tokens per consonantal context. An auditory profiling involved transcribing the whole token (i.e. the target vowel and the consonantal context per token (see appendix E). First transcription was attempted by the researcher of all the data then followed by inter and intra reliability check for 10 token per vowel context (10 *6 = 60 tokens in total) carried out by a researcher working at Newcastle university who is well acquainted with both Muslawi Qəltu and Baghdadi Gilit dialects. The two transcriptions were compared and agreed on.

5.11 Acoustic analysis

For the acoustic analysis, the data was coded, segmented then analysed. The acoustic analysis involved measuring the first and second formants (F1-F2) in the target vowels /i, i:, a, a:, u, u:/ at the vowel start (F1-F2) and at the vowel mid-point (F1-F2 mid).

Data procedure involved extracting the formants (F1start, F2start, F1mid, F2mid). The justification for the adoption of the two vowels points, that is the onset and mid-point is that they encode the transition from a consonantal vocal tract configuration to a vowel tract configuration (Yeou, 2011:5). In other words, the vowel start reveals the greatest effect of the consonantal context on the vowel. Whereas, the vowel mid-point is expected to show the least degree of the consonantal effect (Kriba,2010). The F1-F2 formants at the onset of the vowel were extracted from LPC spectra using Burg algorithm to extract three measurments and not just a single point, formant values were averaged across three points chosen from the first vocalic pulse with 10-ms distance (Di Paolo et al., 2010). Similarly, the F1, F2 formants at the mid-point of the vowel were extracted from LPC spectra at 50-ms distance into the vowel using Burg algorithm. The window settings for the formants was adjusted to suit a male speaker voice. The window for the vowels was set at 5000Hz for 5 formants. Three repeated occurrences were obtained for each measurement of the target vowels for one speaker, per consonantal context using a PRAAT script adopted and modified for the purpose of the research (Al-Tamimi, 2014). The measurements were extracted automatically to an Excel sheet.

5.12 Piloting the data acoustically and statistically

The first step in acoustic analysis involved: 1- piloting the vowel data of three speakers per dialect through extracting four vowel measurements per each vowel target in each consonantal context with three repetitions per vowel; 2- extracting and plotting the average mean values of each vowel realisations in the consonantal contexts in Excel; and 3- performing preliminary statistical tests implemented in the statistical software SPSS, version 22. For instance, the mean values of each of the formants (F1start-F2start-F1mid-F2mid) of each vowel target in each consonantal context were compared in the two dialects. Furthermore, Independent Samples T-tests were performed on each vowel measurement to determine whether there were any significant differences in the mean values of the vowel realisations for each vowel category in the different consonantal contexts in both Qəltu and Gilit. The analyses were followed by several one-way ANOVA (analysis of variance) with Bonferroni PostHoc, and p-value of <0.001 analysis were applied on each of the acoustic measurements (F1start, F2start, F1mid, F2, mid) with type of vowel, the consonantal contexts and the dialect code as independent variables (cf. Al-Siraih, 2013). Moreover, several one-way MANOVA (multi-variance of analysis) tests were carried out on the 4 vowel measurements (F1-F2) onset and (F1-F2) mid of /a/, /a:/ and /u/ in each of the post-velar contexts with speaker as a Random Factor.

After several trials, the researcher substituted the use of SPSS as a statistical software with R statistical package (R Core Team) version 3.3.2 because it proved more efficient in analyzing linguistic data after several attempts of trials and errors. Further details in section 5.16.

5.12.1 F1

F1 corresponds with open/close in terms of vowel openness. F1 rise represents open and low /i(:), a(:), u(:)/ vowel variants (cf. Al-Tamimi, 2017) where higher degrees of openness and lowering are translated in the /a(:)/ vowel in a pharyngeal context compared to all other contexts in Qəltu and Gilit.

Below are the initial results of the pilot study identifying the different consonantal contexts as represented in the the group of PVs (i.e. the uvulars, the pharyngeals, and the emphatics) vs.

the plain consonants in terms of their effect on each of the target vowels. The consonantal effect is manifested in the first formant transition (F1) at the vowel onset. As argued earlier, the vowel onset reveals the greatest effect of the consonant on the vowel. Therefore, the modification in the whole quality of the vowel is determined at the vowel onset in which F1 rise translates a change in vowel quality as an open vocal tract configuration and vowel lowering (cf. Al-Tamimi, 2007). In other words, the articulatory correlates associated with F1 rise are open and low.

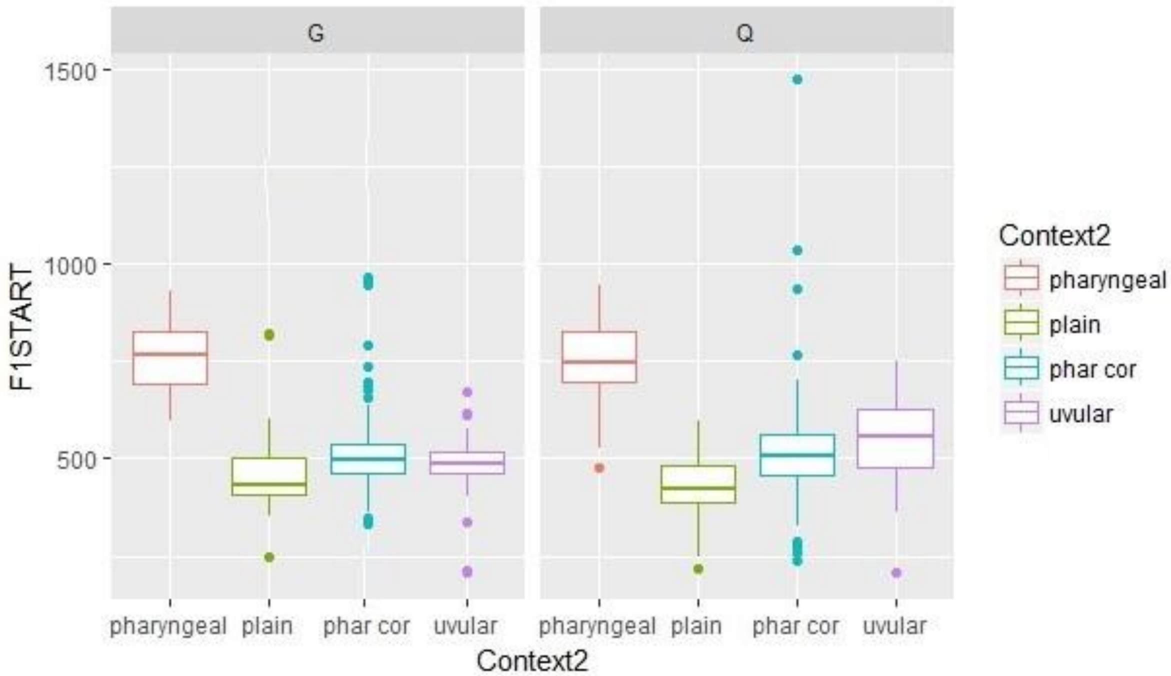

Figure 20 The F1 start of the /a/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation. [21]

[21] ggplot(data_QG_a, aes(Context2, F1start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

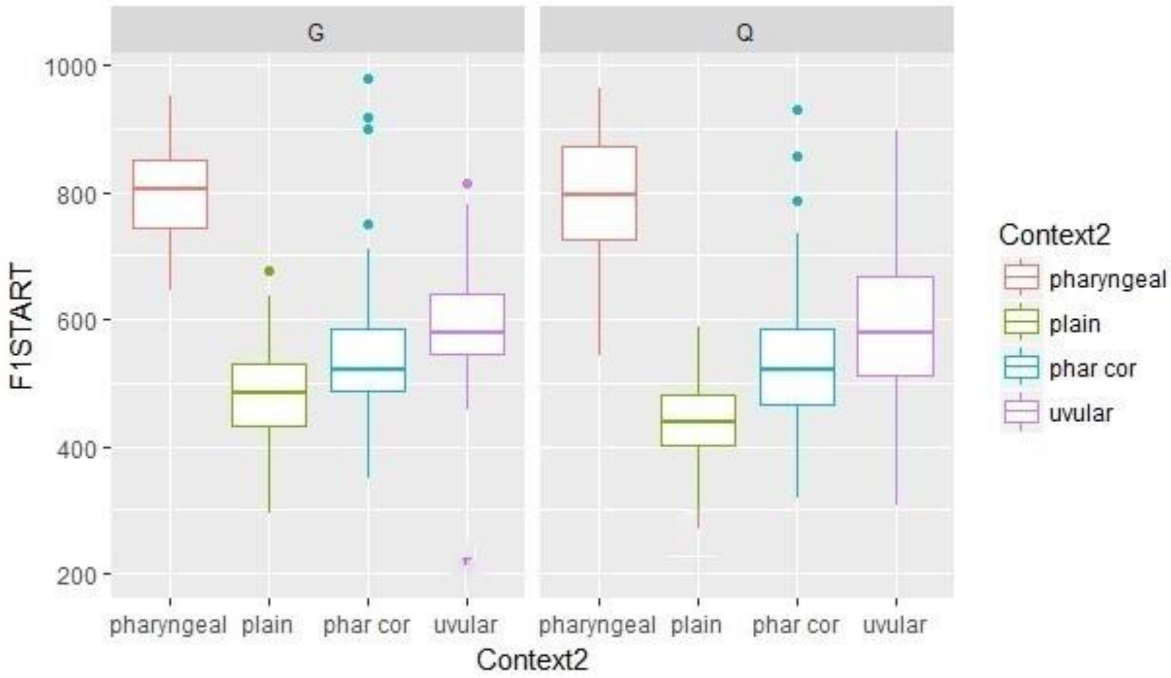

Figure 21 The F1start of the /aː/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation. [22]

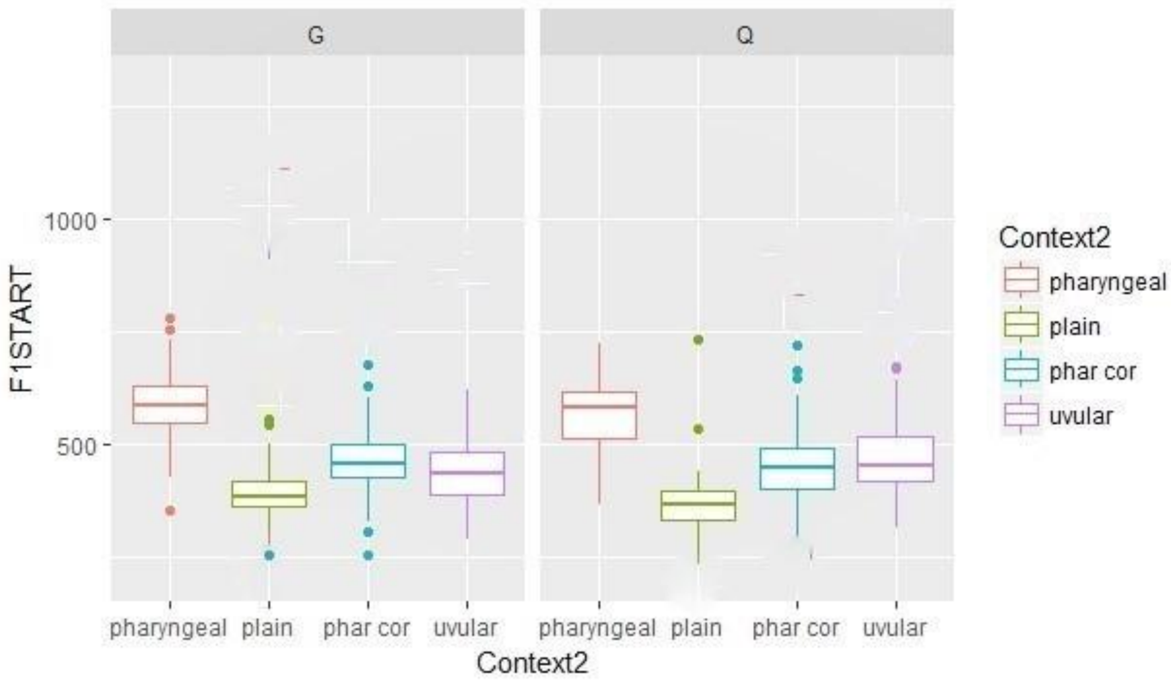

Figure 22 The F1start of the /i/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation. [23]

[22] ggplot(data_QG_aa, aes(Context2, F1start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[23] ggplot(data_QG_i, aes(Context2, F1start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

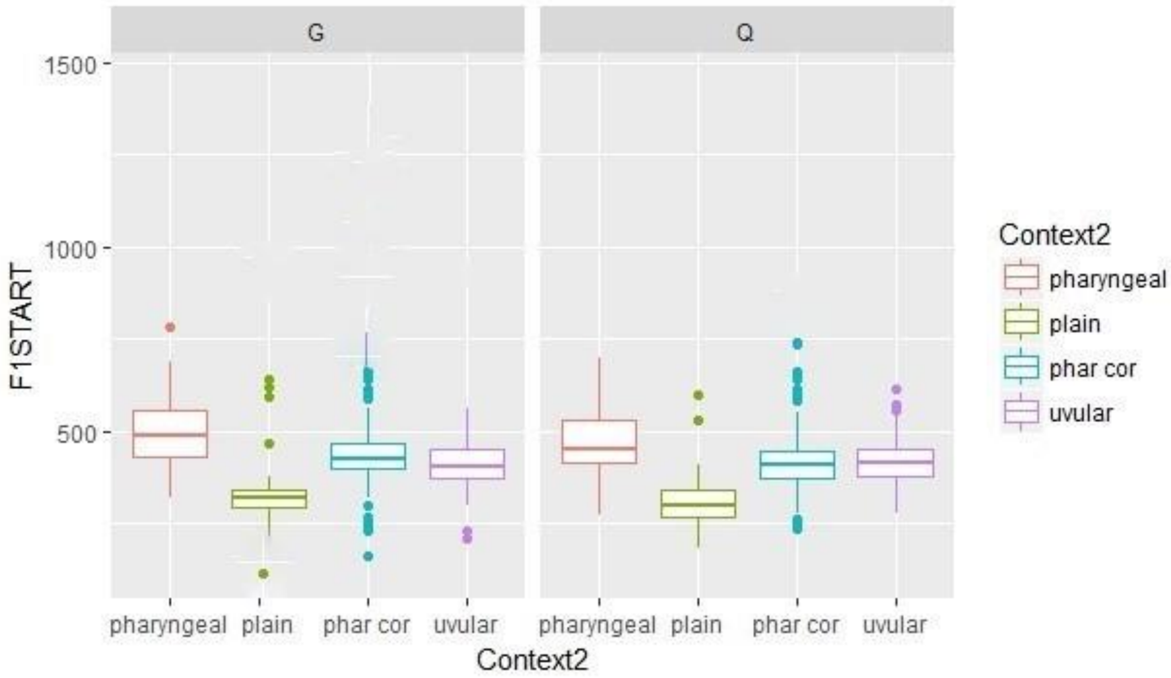

Figure 23 The F1start of the /iː/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts classified according to their place of articulation.[24]

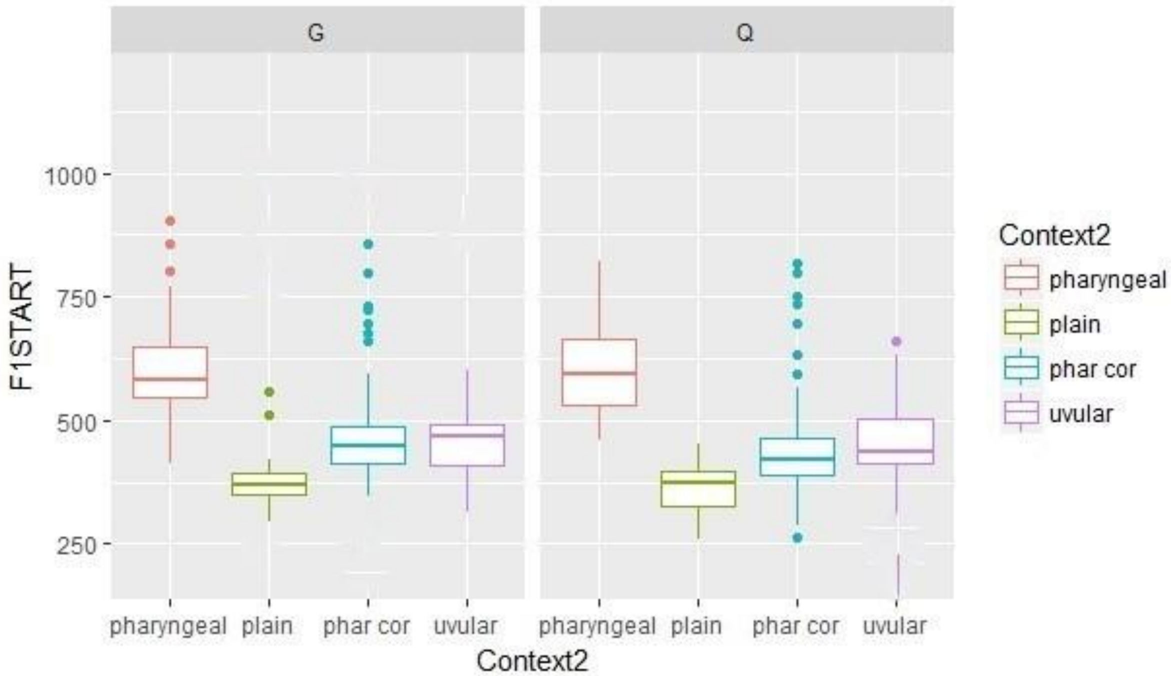

Figure 24 The F1start of the /u/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[25]

[24] ggplot(data_QG_ii, aes(Context2, F1start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[25] ggplot(data_QG_u, aes(Context2, F1START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

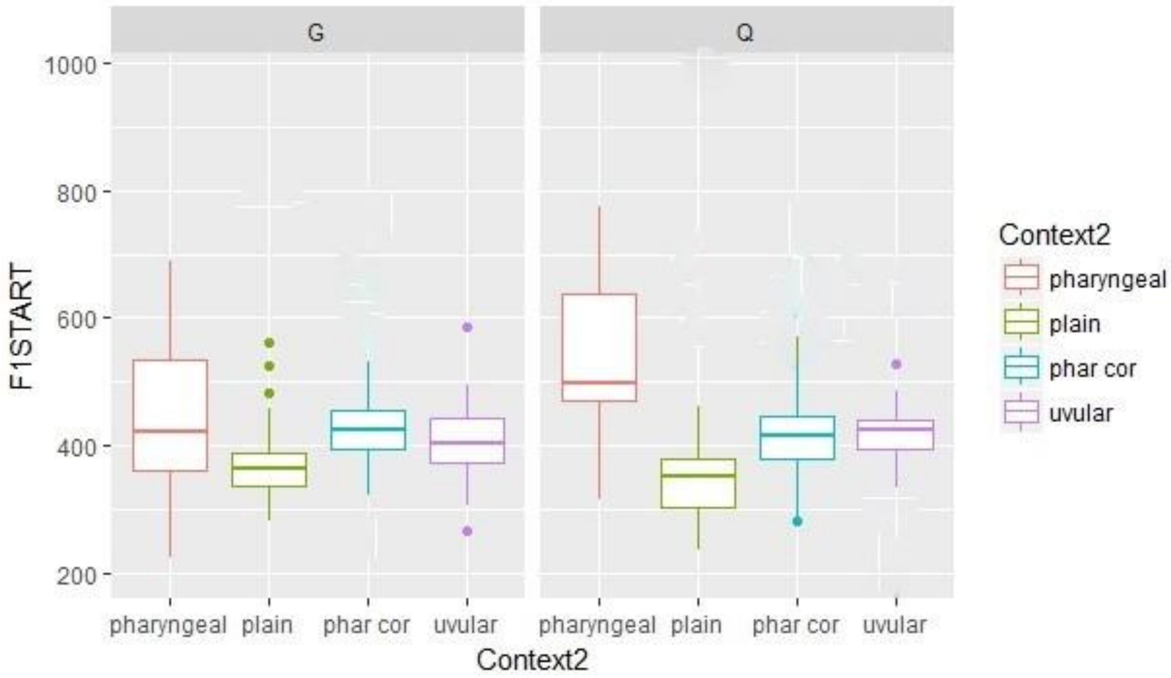

Figure 25 The F1start of the /uː/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[26]

The results above state that the F1 start values significantly rise in correlation with openness in vowel. A significant rise is shown in the F1 start values of /a/, /a:/, /i/, /i:/, /u/, /u:/ in the pharyngeal context in correlation with the open vocal tract configuration in pharyngeals compared to the pharyngealized, uvular and plain contexts in both Qəltu and Gilit .

5.12.2 F2

F2 corresponds with front/back in terms of vowel backness in which F2 decrease translates vowel retraction (cf. Al-Tamimi, 2017). The results above state that the F2 start values significantly decrease in correlation with backness in vowel. A significant decrease is shown in the F2 start values of /a/, /a:/, /i/, /i:/, /u/, /u:/ in the pharyngealised (emphatic) contexts in both Qəltu and Gilit. Go to section 6.5 for the main study results.

Below are the initial results of the pilot study identifying the different consonantal contexts as represented in the experimental group (i.e. the uvulars, the pharyngeals, and the emphatics) vs. the plain consonants) in terms of their effect on each of the target vowels in the two dialects. The consonantal effect is manifested in the second formant transition (F2) at the vowel onset. As argued earlier, the vowel onset reveals the greatest effect of the consonant on the vowel.

[26] ggplot(data_QG_uu, aes(Context2, F1START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Threfore, the modification in the whole shape of the vowel (the change in vowel quality) is determined at the vowel onset in which a drop in F2 in the above contexts translates a change in vowel quality as open vocal tract configuration and vowel backing. In other words, the articulatory correlates associated with F2 drop are open and back (cf. Al-Tamimi, 2017).

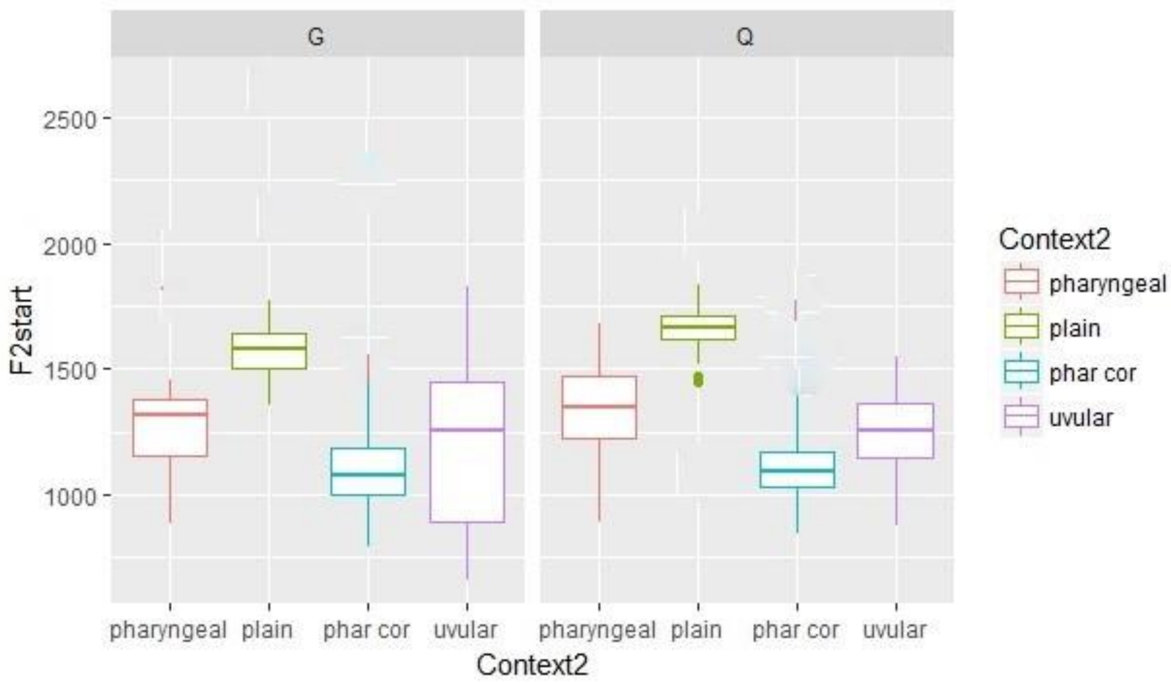

Figure 26 The F2start of the /a/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation. [27]

[27] ggplot(data_QG_a, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

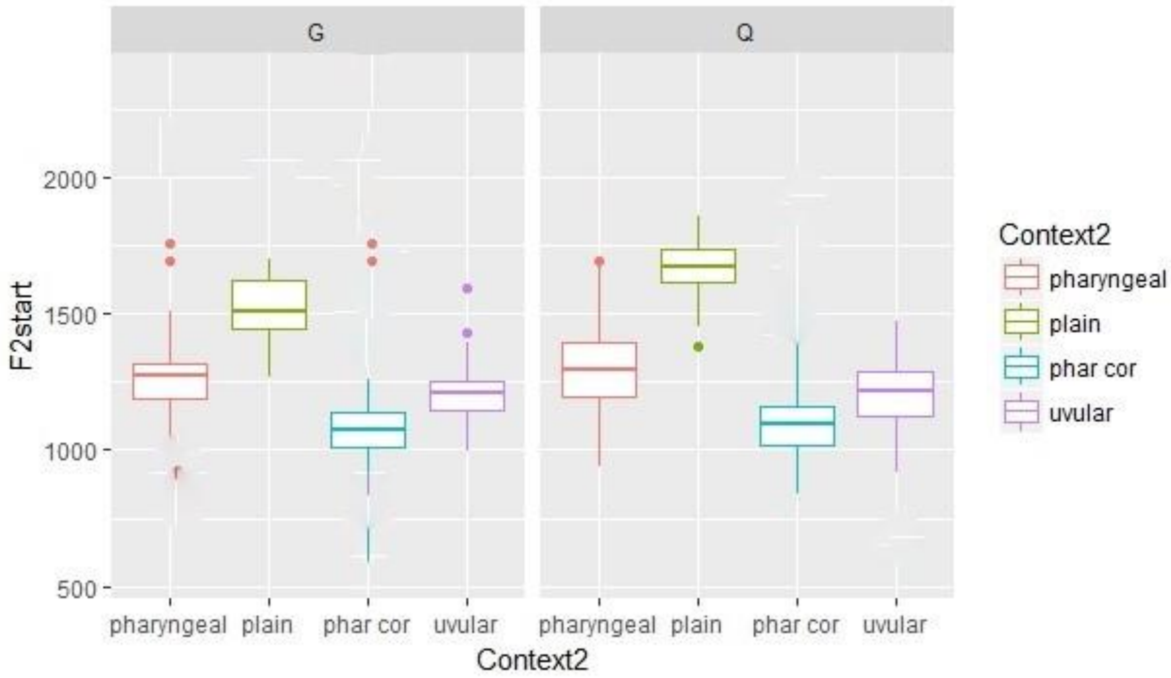

Figure 27 The F2start of the /aː/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation. [28]

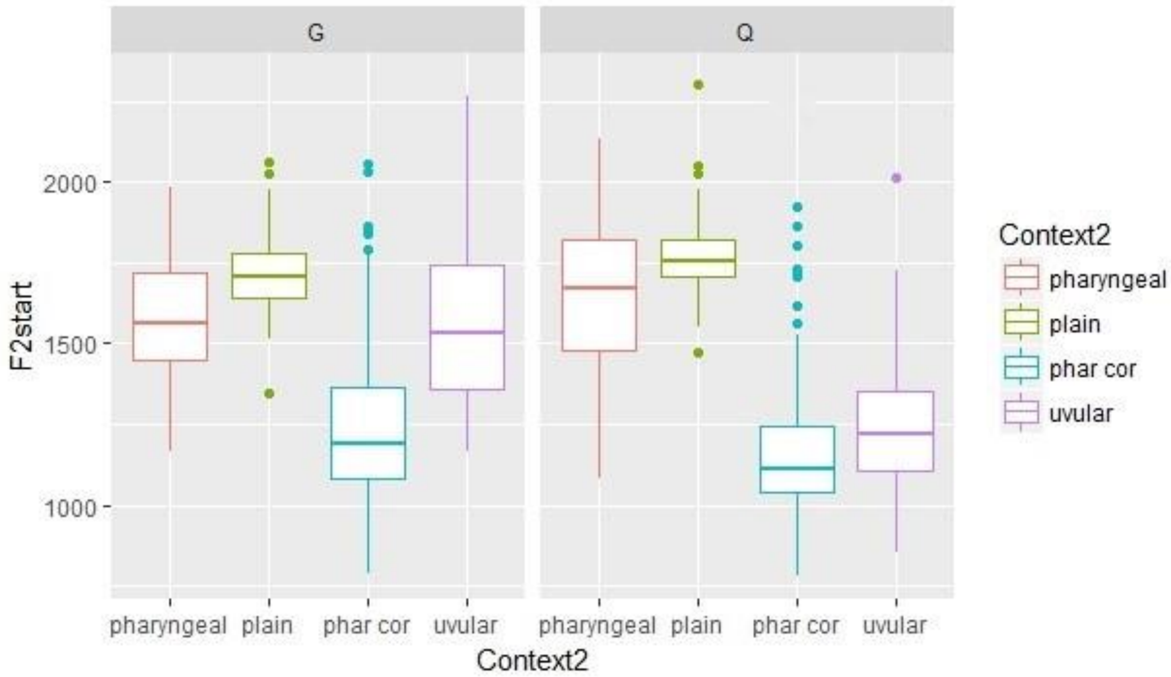

Figure 28 The F2start of the /i/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[29]

[28] ggplot(data_QG_aa, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[29] ggplot(data_QG_i, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

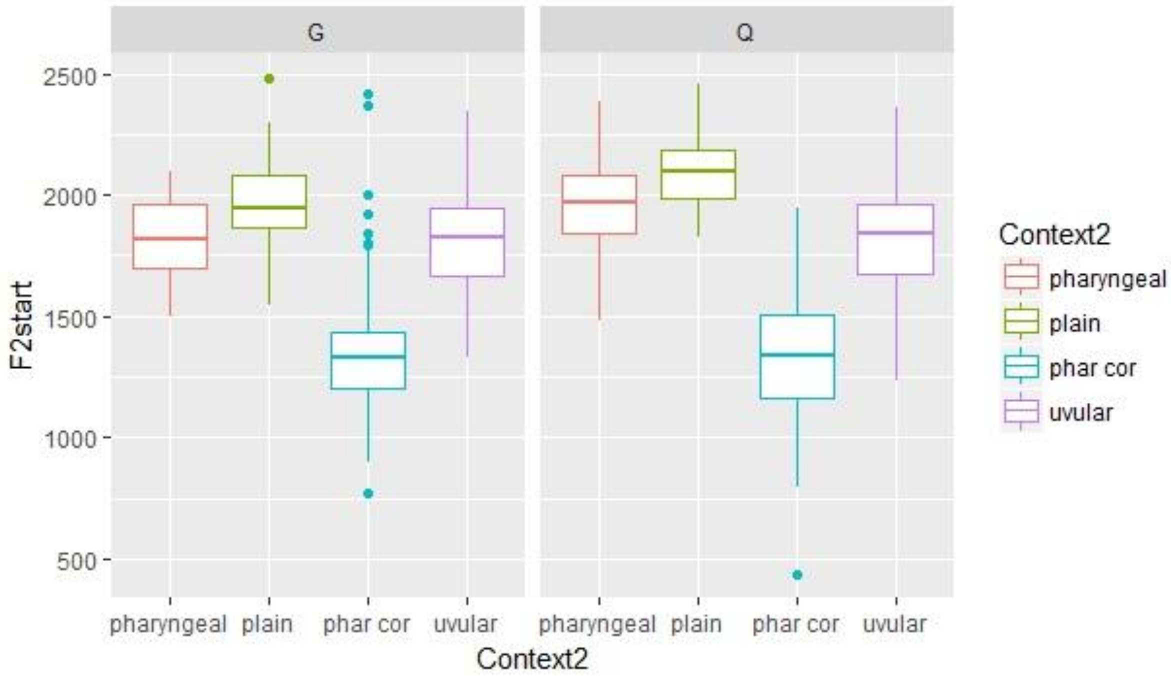

Figure 29 The F2start of the /i:/ vowel variants Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[30]

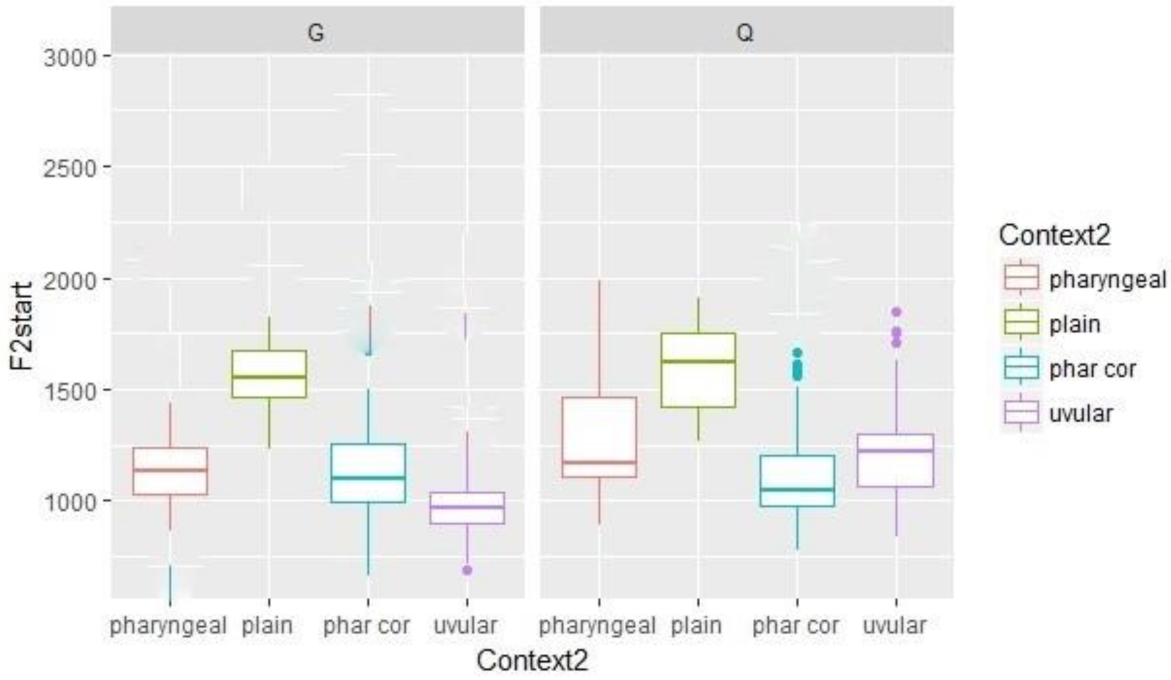

Figure 30 The F2start of the /u/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[31]

[30] ggplot(data_QG_ii, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[31] ggplot(data_QG_u, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

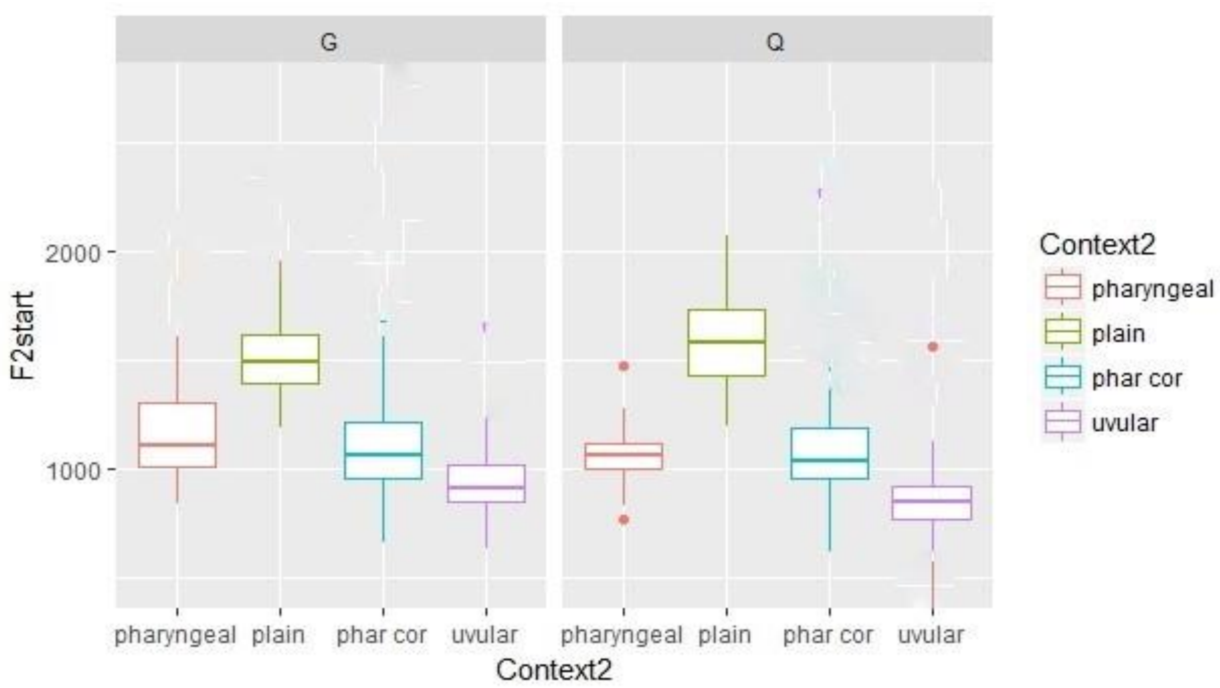

Figure 31 The F2start of the /u:/ vowel variants in Qəltu and Gilit as displayed in the different consonantal contexts; classified according to their place of articulation.[32]

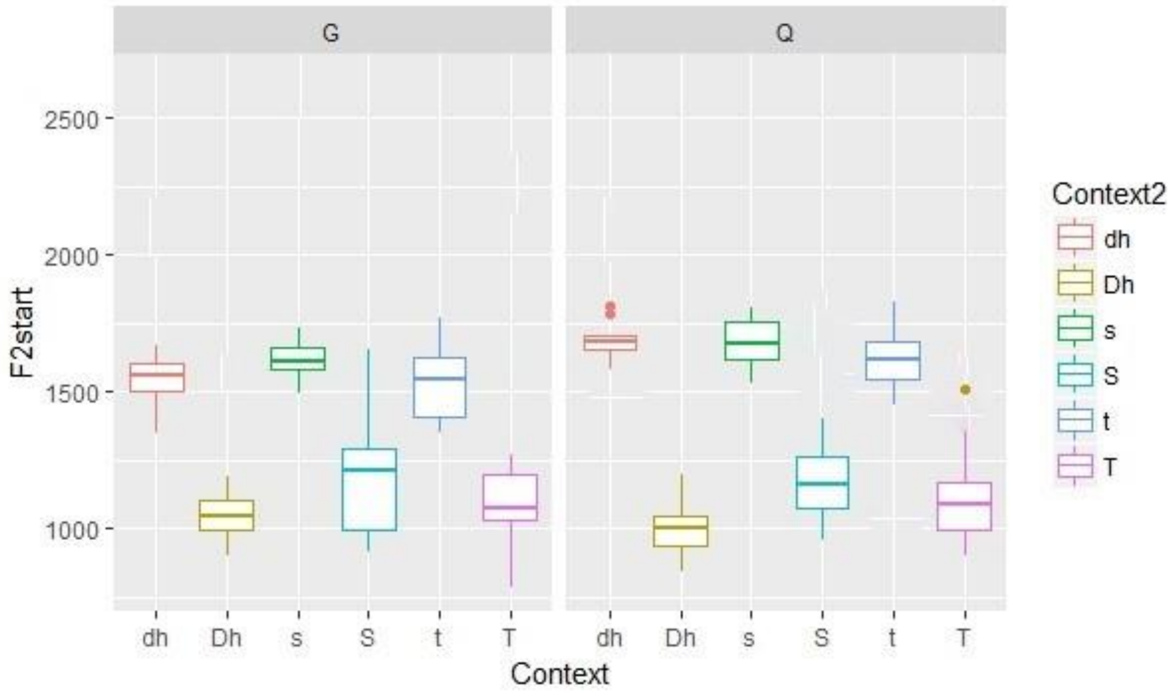

Figure 32The F2 start of the /a/ vowel in Qəltu and Gilit as displayed in each plain vs. emphatic context.[33]

[32] ggplot(data_QG_uu, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[33] ggplot(data_CCa_i, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

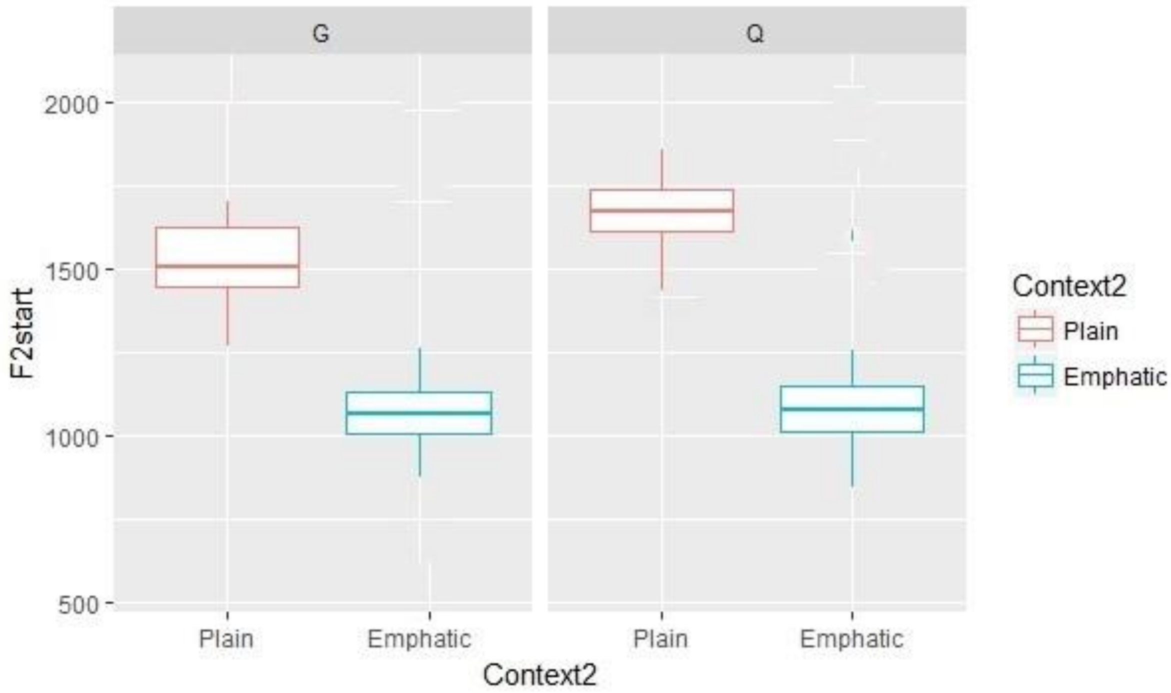

Figure 33The F2 start of the /a/ vowel variants in Qəltu and Gilit as displayed in plain vs. emphatic contexts. [34]

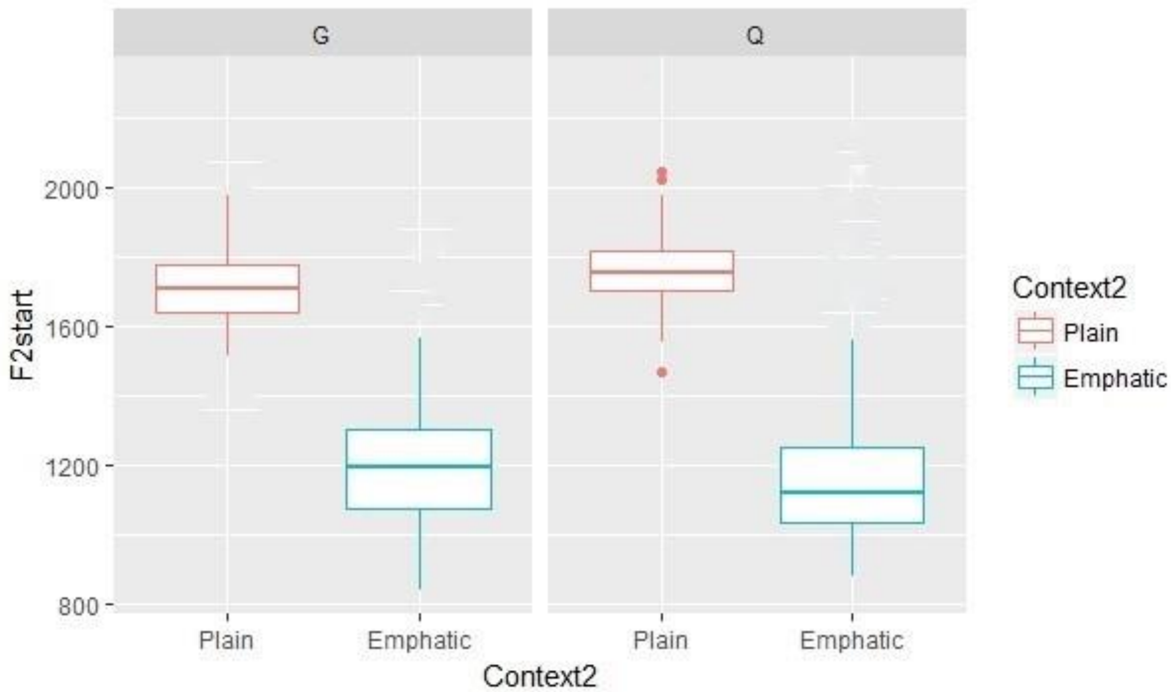

Figure 34 The F2 start of the /i/ vowel variants in Qəltu and Gilit as displayed in plain vs. emphatic contexts. [35]

[34] ggplot(data_CCa_aa, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

[35] ggplot(data_CCa_i, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

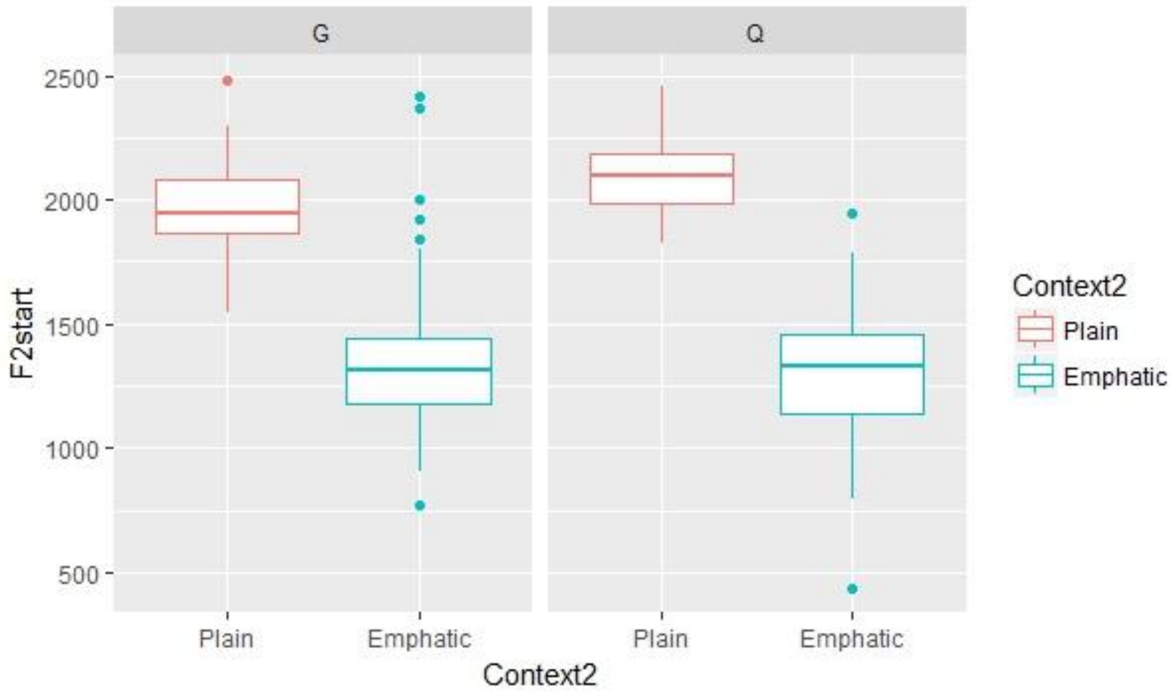

Figure 35The F2 start of the /i:/ vowel variants in Qəltu and Gilit as displayed in plain vs. emphatic contexts.[36]

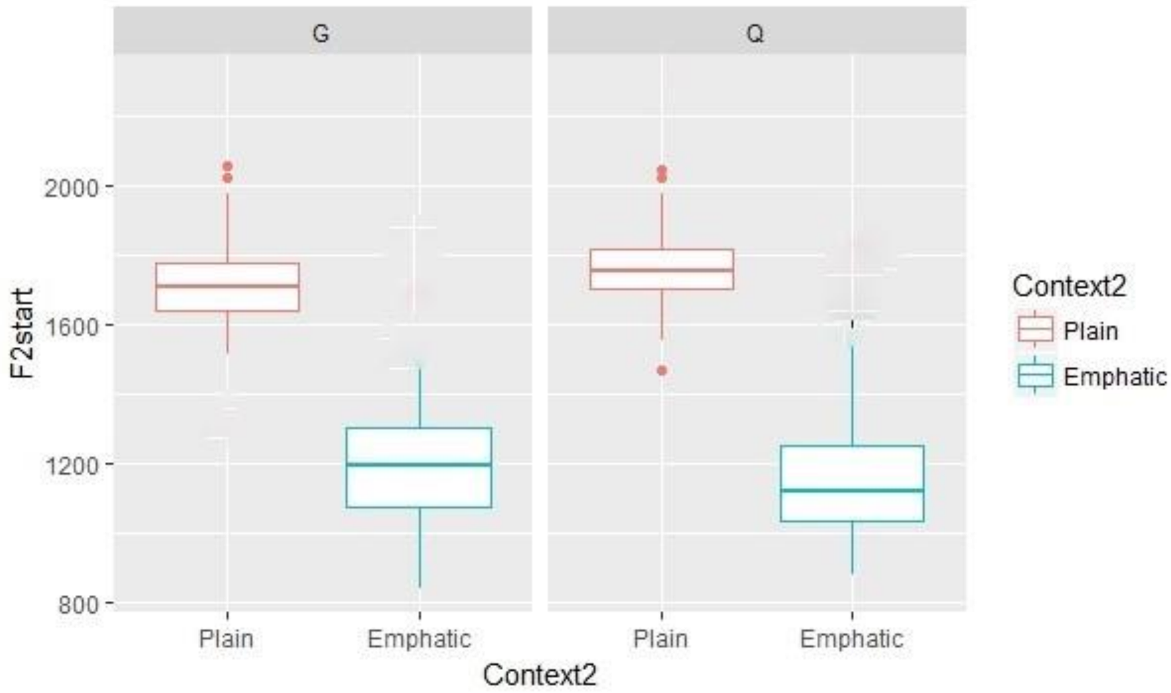

Figure 36The F2 start of the /u/ vowel variants in Qəltu and Gilit as displayed in plain vs. emphatic contexts.[37]

[36] ggplot(data_CCa_ii, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).
[37] ggplot(data_CCa_u, aes(Context2, F2start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

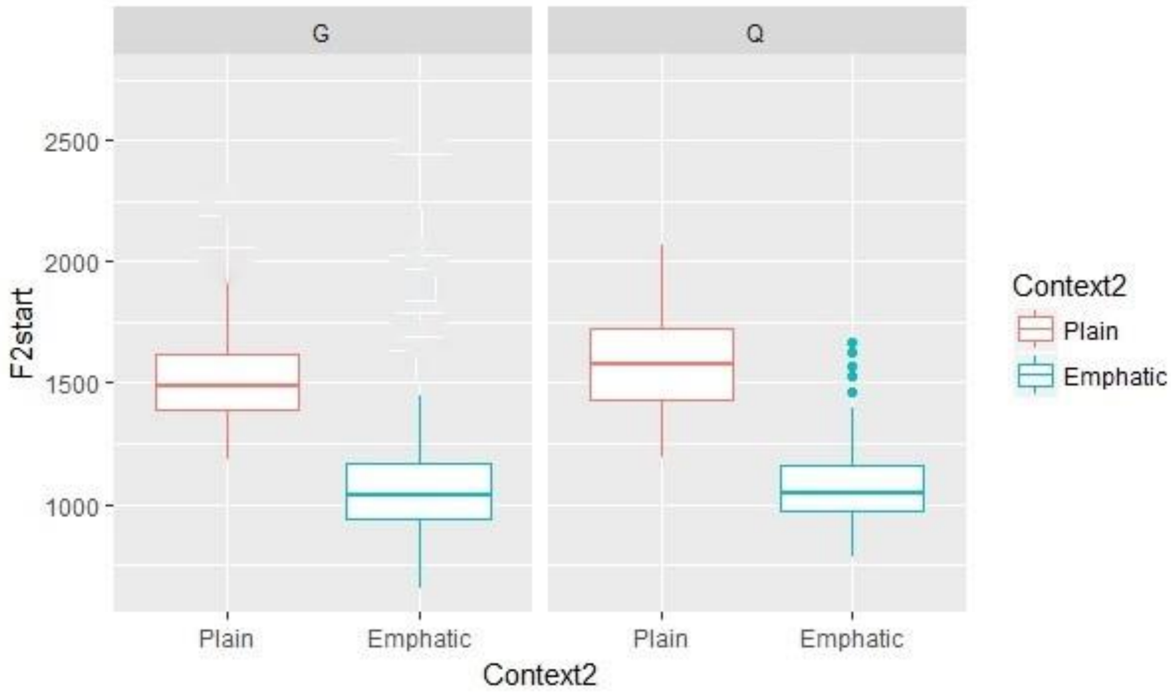

Figure 37The F2 start of the /uː/ vowel variants in Qəltu and Gilit as displayed in plain vs. emphatic contexts.

5.13 Statistical analysis

Several steps of data sorting and coding preceded performing the statistical analysis in R (R Core Team) version 3.3.2: 1- data sorting involved opening the Excel data file in 'Open Microsoft Office program' because Open Microsoft Office reads all IPA symbols that were adopted for labelling the sounds (i.e. the post- velar consonants, the target vowels, and the vowel variants (the different vowel realisations) in the TextGrids in PRAAT, 2- the data was saved again as an Excel (csv) file to guarantee that all the IPA codes are defined appropriately, 3- sorting out all the variables by giving them codes or numbers (the speaker, the consonantal contexts, the target vowels, and their realisations, the dialect group, the four vowel measurements, and the repetitions) in the extracted columns in Excel, and 4- specifying the fixed effects (the independent and dependent variables) in the data as categorical or continuous, and specifying the random factor(s).

The steps in performing the statistical analysis in R Studio (R Core Team) were the following:

1- Installing R (R Core Team) software package.

2- Installing the (dplyr) package in R and loading the package in the library in R Studio.

3- importing and cleaning the data:

(a) Importing the data set from the Excel (csv_file) to the R Studio through import in R Studio.

(b) Specifying a domain (path) for the data set to be recalled in R every time the researcher needs to run the analysis.

(c) Opening the data set file through the specified domain or embedding the actual file name in the read.csv code in R studio.

(d) Assigning a new name for the data file when creating a new function in R like asking R to read all the columns in the data file, sub-setting the data, avoiding blank spaces in the data file; etc.

(e) Re-arranging the variables as factors by recalling the new name of the data frame in the domain.

(f) Sub-setting the variables. Each vowel target was identified in separate sub-sets. The consonants were sub-setted into groups (classes) for neat illustrations and visualisation of the data.

(g) Installing (Phon R) package version 1.0.7 (McCloy, 2015) for vowel plotting, and loading it in the library in R Studio to plot the F1-F2 formants for each vowel target in each group of consonantal contexts in both dialect groups.

(h) Installing the (ggplot 2) package version 2.2.1 (Wickham et al. 2016) and loading to the library in R studio to plot the effect of consonantal contexts on each target vowel in both dialects.

(i) The Fixed Effect factors were specified. These are the consonantal contexts (defined as context in the domain), and the dialect group; both defined as categorical (independent) variables (factors). However, the dependent continuous variables were represented in the four vowel measurements (F1-F2START), (F1-F2MID) for each target vowel per speaker in each dialect.

(j) The speaker variable was the Random Effect factor.

(k) The mean values of F1-F2 at the vowel transition and steady state in the different consonantal contexts were calculated, and assigned to tables as a start point for the main analysis through the function “aggregate” implemented in R.

All these steps were performed before running the analysis. We used analysis of vaiance to calculate the p. value and we used the linear mixed model LMM fitted by REML (lmer) package (Bates et al., 2014) in R to compare two hypotheses where the likelihood ratio is calculated and it turns out that the hypotheses with the effect in question; that is the dialect background are affecting the values in terms of significance; therefore, the test was done both with consonantal effect and dialect background with speaker as a random factor, Afterwards, analysis of variances was calculated for each vowel to compare F1onset and mid and F2 onset and mid values for each vowel in the different consonantal contexts for both dialects. The LMM model is chosen as it allows to combine both fixed and random effects with an output of coefficients for both. It picks an intercept that is always the first in the alphabet for the fixed effects as a reference level. The intercept works as a point of comparison with a range of p values to determine the strength of significance. Moreover, it defines a “Multiple R-Squared” which refers to the statistics R squared. It is a measure of variance accounted for (Winter, 2014). It explains how much variance is in the data on a scale from 0-1. In other words, the closest the value is to 1, the more the data is explained in the range of differences among the fixed effects. However, in the Adjusted R- squared also defined when running the model, the lower the value, indicates the higher the number of fixed effects applied in the model. The lower the values are, the higher the number of fixed effects. Additionally, the p-values at the bottom of the output report the significance of the whole model. However, the model also defines p-values specified for each coefficient which show the degree of significance of each when compared to the intercept. Furthermore, the model extracts F-values and degrees of freedom as an output to be reported (ibid). Further details on this are in the next chapter. In the LMM model, it is more likely to report on p-values, and state if there was any significance in the fixed effects according to the likelihood Ratio test (Pinheiro and Bates, 2000; Bolker at al., 2009) as a means to attain the p-values (Winter, 2013; 2014). In this type of test, the p-values are reported by comparing two models; one model with the null hypotheses; that is, without the effect in question (i.e. the dialect); and the actual model with the effect in question (i.e. the dialect and the consonantal context). The likelihood ratio test is performed using

ANOVA (analysis of variance) test for each vowel measurement with the null model compared to the actual model (ibid).

5.14 Data visualisation

The analysed vowel data of all participants was visualised using the NORM program (NORM's Vowel Normalization Methods (v. 1.1) by Erik and Kendall (2007) using the formant-means unnormalized method. The different consonantal effects in each target vowel in both Qəltu and Gilit are visualised using the ggplots package version 2.2.1 (Wickham et al., 2016) implemented in R where codes are specified as will be represented in the results section.

5.19 Summary

This chapter dealt with the data procedures adopted in this research including the auditory, phonological, acoustic and statistical analsysis perfomed to determine the typology of *tafxi:m* in the vowels of Qəltu and Gilit in the trigger environments with *tafxi:m.*

Chapter Six: Auditory, acoustic and statistical vowel profiling

6.1 Introduction

As discussed earlier in chapter two, the vowel system of the Qəltu (Abu-Haidar,1991; Blanc,1964), and Gilit (Erwin,1963; Blanc,1964) dialects of Mesopotamian Arabic (see section 2.8) is featured in the dialect background (see section 2.8), the phonological environment and the trigger environment (details in sections 4.4 & 4.5 and 4.8). Therefore, this research further investigates the vowels of Qəltu and Gilit both auditorily and acoustically as driven by the facts above to determine the typology of *tafxi:m* in the vowels of Muslawi Qəltu and Baghdadi Gilit.

The experimental investigation includes auditory analysis in section 6.2 and acoustic analysis presented in section 6.3 followedby statistical analysis in section 6.4 on a data sample chosen carefully with six vowels, that is the [+high, front] /i, iː/, the [+low, front] /a, aː/, and the [+high, back] / u, uː/ embedded in the different *muffaxxama* environments (i.e. the pharyngeals / ʕ, ħ/, the uvulars /q, χ, ʁ/, and the pharyngealized coronals / $t^{ʕ}$, $s^{ʕ}$, $ð^{ʕ}$/ preceding the vowels with particular word contexts are followed by a set consonants specified for *tafxi:m* like the labials /b, m, f/ (Youssef, 2009).

6.2 Auditory vowel profiling

The auditory profiling is presented in tables for each class of PVs (cf. appendix E). Below are the diacritics adopted in the narrow transcription of the vowels as presented in the production of the speakers of both Qəltu and Gilit.

Table 5 The vowel diacritics

◌̹	**Rounded**
◌̜	**Less rounded**
◌̟	**Advanced**
◌̠	**Retracted**
◌̈	**Centralized**
◌̙	**Retracted Tongue Root**
◌̞	**Lowered**

6*.2.1 The Gilit vowel profiling in the pharyngeal /ʕ/ and /ħ/ contexts.*

The vowel targets /a, aː, i, iː, u, uː/ have different realisations across the different tokens in the pharyngeal /ʕ/ and ħ/ contexts.

Table 6: The /a/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/a/ vowel	**Token**	**Gloss**
Realisation	[a̙]	/ʕaʒaːʒ/	sandstorm
	[a̞]	/ħakam/	he ruled

The stem /a/ vowel is realised as [open, retracted, + low] [a̙] in one form of vowel-consonant harmony with pharyngeals in terms of articulation. The /a/ is identified as a transparent environment for long domain vowel-consonant harmony in BG as shown in the examples below.

(47)

(a)[ʔa̠dʒa̠ːdʒ] ‘sandstorm’

(b) [ʜa̠kˤa̠mˤ] ‘he ruled’

Table 7: The /aː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/aː/ vowel	Token	Gloss
Realisation	[a̠ː]	/ʕa̠ːdaːt/	traditions
	[a̠ː]	/ħa̠ːkim/	ruler

The word initial stem /aː/ vowel is realised as the [open, retracted,+ low] [a̠ː] in harmony with the pharyngeal articulation as seen in the production of BG speakers in the examples below.

(48)

(a)[ʔa̠ːda̠ːt] ‘traditions’

(b) [ʜa̠ːkˤʊmˤ] ‘ruler’

Table 8: The /i/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/i/ vowel	Token	Gloss
Realisation	[ɪ]	/ʕift/	I abandoned
	[ɪ]	/ħikma/	wisdom

The stem /i/ vowel is realised as [+low, retracted] [ɪ], [e̞] in one form of vowel-consonant harmony with the pharyngeals in articulation. However, compared to /a/, the /i/ vowel is resistant to lowering in the pharyngeal context as both /i/ and the pharyngeals are not highly compatible in terms of articulation with /i/ being [dorsal] in terms of articulation.
In other words, the /i/ blocks long domain vowel-consonant harmony.
(49)

(a) [ʔɪfɪt] ‘I abandonned’
(b) [ʜɪkmə] ‘wisdom’

Table 9: The /iː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/iː/ vowel	Token	Gloss
Realisation	[i̞ː̈]	/ʕiːdaːn/	sticks
	[i̞ː̈]	/ħiːra/	confusion

The long /iː/ vowel is realised as [+low, central] [i̞ː̈] in the production of BG speakers. The degree of articulatory compatibility between pharyngeals and /i(:)/ is lower on the scale of vowel-consonant harmony. Long vowels are also identified as blockers to long domain vowel-consonant harmony (cf. Davis, 1995; Kriba, 2010).

(50)

(a) [ʔi̞ː̈daːn] ‘sticks’

(b) [ʜi̞ː̈r̈ə] ‘confusion

Table 10: The /u/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/u/ vowel	Token	Gloss
Realisation	[ʊ], [ɔ]	/ʕurf/	norm
	[ʊ]	/ħukkaːm/	rulers

The initial lexical stem /u/ is realised as [ʊ], [ɔ] in the /ʕ/ context in example (a) below as realised in the production of BG speakers in one form of long domain vowel- consonant harmony with pharyngeals progressively and regressively with [dorsality] and [labilaity] in the secondary emphatic /rˤ/ (cf. Youssef, 2009). The epenthetic /i/ vowel surfaces as [ʊ] progressively in vowel harmony with the stem [ʊ] vowel.
In (b), the /u/ surfaces as [ʊ] in vowel-consonant harmony progressively with the pharyngeal /ħ/ in articulation.

(51)
(a) [ʔʊrˤʊfˤ] ‘norm’
(b) [ʜʊkˤkˤɑːmˤ] ‘rulers’

Table 11: The /uː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/uː/ vowel	Token	Gloss
Realisation	[uː̈]	/ʕuː̈dʒaːn/	twisted
	[uː̈]	/ jifraħuː̈n /	they feel happy

The long /uː/ vowel is realised as [central] [uː̈] . The /uː/ is resistant to vowel-consonant harmony in the pharyngeal context. Long /uː/ blocks long domain vowel-consonant harmony.

(52)

(a) [ʔuː̈dʒaːn] ‘twisted’

(b) [jifraħuː̈n] ‘they feel happy’

6.2.2 The Gilit vowel profiling of all tokens in the uvular /q/ context.

The vowel variants of the target vowels /a, aː, i, iː, u, uː/ are represented for each token in the uvular guttural context /q/ as produced by speakers of Gilit.

Table 12:The /a/ vowel realisations in *the* uvular /q/ context.

	/a/ vowel	Token	Gloss
Realisation	[ʊ]	/qafal/	he locked

The initial stem /a/ vowel is realised as [round, raised] [ʊ] in regressive vowel-consonant harmony with the elements [dorsal, labial] in the secondary emphatic /fˤ/ which trigger rounding in vowels in long domain vowel-consonant harmony as represented in the example below.

The second stem /a/ is realised as [ɑ] in progressive and regressive vowel-consonant harmony.

(53)

[qʊfˤɑlˤ] ‘he locked’

Table 13: The /aː/ vowel realisations in *the* uvular /q/ context.

	/aː/ vowel	**Token**	**Gloss**
Realisation	[a̠ː]	/qaːmaːt/	heights

The initial stem long /aː/ vowel is realised as [open , retacted, +low] [a̠ː] in harmony with the trigger element /q/ in articulation. The second /a/ is realised as [a̠ː] in long domain vowel harmony with the initial stem /a:/ where the secondary emphatic /mˤ/ provides a domain for harmony in BG as represented in the example below.

(54)

[qa̠ːmˤa̠ːt] ‘heights’

Table 14: The /i/ vowel realisations in the uvular /q/ context.

	/i/ vowel	**Token**	**Gloss**
Realisation	[e̠], [ɪ]	/waqt/	time

The epenthetic /i/ vowel is realised as [low, retracted] [ɪ] or [e̠] as represented in the production of BG speakers in (a) or as in (b) where the element of *tafxi:m* is [dorsal[which trihher lowering in vowels,

(55)

(a)[wakıt][38] ‘time’

(b) [waqe̠t] ‘time’

Table 15 The /iː/ vowel realisations in the uvular /q/ context.

	/i/ vowel	**Token**	**Gloss**
Realisation	[iː̈]	/daqiːqa/	minute

Similarly, the long /iː/ vowel is realised as [central] [iː̈] as represented in the example below. Long /i:/ is further centralised in a uvular /q/ context compared to a pharyngeal context since both /i:/ and uvulars are represented as [dorsals] in place of articulation.

(56)

[daqiː̈qə] ‘minute’

[38] The [k] is historically /q/. It is a synchronic phonological process. It is the result of historical shift.

Table 16 :The /u/ vowel realisations in the uvular /q/ context.

	/u/ vowel	Token	Gloss
Realisation	[ʊ]	/qufl/	lock

The stem /u/ vowel is realised as [central] [ʊ] in the production of BG speakers in harmony with /q/ progressively. The underlying epenthetic /i/ vowel, on the other hand is realised as [ʊ] in vowel-consonant harmony progressively with /q/ and in long domain vowel harmony with the initial stem [ʊ].

(57)

[qʊfˤʊlˤ]~ [gʊfˤʊlˤ] 'lock'

Table 17: The /uː/ vowel realisations in the uvular /q/ context.

	/uː/ vowel	Token	Gloss
Realisation	[üː]	/jquːmuːn/	they stood

The long /uː/ vowel is realised as [central] [üː] with /q/ realised as [g] as in the example below. It represents an example of vowel-consonant harmony with [dorsal] in the trigger [g] representing the element of *tafxi:m*.

(58)

[jgüːmüːn] 'they stood'

6.2.3 The Gilit vowel profiling of all tokens in the uvulars /χ/ and /ʁ/ contexts.

The different vowel variants of the six target vowels /a, aː, i, iː, u, uː/ are introduced in the context of the uvular fricatives /χ/ and /ʁ/. One token per consonantal context for each of the target vowels.

Table 18: The /a/ vowel realisations in *the* uvular /χ/, and /ʁ/ contexts.

	/a/ vowel	Token	Gloss
Realisation	[ʌ], [ɪ]	/χasaf/	he pulled down
	[ä]	/ʁazaːl/	deer

The /a/ vowel is realised as [central] [ʌ] or [ɪ] based on whether Gilit speakers produced the target word /χasaf/ as in (a) or in (b) in one form of vowel- consonant harmony. However, the

/a/ vowel is realised as [central] [ä] in (c). As addressed earlier in chapter four, there are different derivations for a vowel in a particulat context driven by the nature of the articulatory element; in uvulars, it is the element [dorsal].

(59)

(a) [χʌsʌf] ‘he pulled down’

(b)[χɪsaf] ‘he pulled down’

(c) [ʁäzäːl] ‘deer’

Table 19: The /aː/ vowel realisations in the uvular /χ/, and /ʁ/ contexts.

	/a/ vowel	Token	Gloss
Realisation	[aː̢]	/χaːlaːt/	aunts
	[aː̢]	/ʁaːbaːt/	forests

The long /aː/ vowels are realised as [+low] [ạː] with both /lˤ/, and /bˤ/ in BG providing domains for vowel harmony as in the examples below.

(60)

(a)[χạːlˤạːt] ‘aunts’

(b) [ʁạːbˤạːt] ‘forests’

Table 20: The /i/ vowel realisations in the uvular /χ/ and /ʁ/ contexts.

	/i/ vowel	Token	Gloss
Realisation	[ɛ̢] [ʊ]	/χift/	I got scared
	[ɛ̢], [ʊ]	/ʁibt/	1was absent

The initial stem and epenthetic /i/ vowel are realised as the [low, retracted, slightly rounding] [ɛ̢], or [central] [ʊ] in the productions of BG speakers in long domain vowel-consonant harmony with the /χ/ and /ʁ/ in terms of articulation. The non-stem epenthetic /i/ is realised as [ʊ] in long domain vowel harmony with the stem [ʊ] in some realisations of BG speakers.

(61)

(a) [χɛ̜fɛ̜t] ~ [χʊfʊt] ‘I got scared’

(b) [ʁɛ̜bɛ̜t] ~ [ʁʊbʊt] ‘I was absent’

Table 21: The /iː/ vowel realisations in the /χ/, and /ʁ/ contexts.

	/iː/ vowel	Token	Gloss
Realisation	[iː̈]	/χiːra/	goodness
	[iː̈]	/ʁiːba/	gossip

The long /iː/ vowel is realised as [central] [iː̈] in one form of vowel- consonant harmony. More centralised productions of [iː̈] are identified in [ʁiː̈bə] compared to [χiː̈rə]. The [iː̈] is also identified as resistant to long domain vowel-consonant harmony harmony as represented in the examples below.

(62)

(a)[χiː̈rə] ‘goodness’

(b) [ʁiː̈bə] ‘gossip’

Table 22: The /u/ vowel realisations in *the* /χ/, and /ʁ/ contexts.

	/u/ vowel	Token	Gloss
Realisation	[ʊ], [ɛ̜]	/χulq/	patience
	[ʊ], [ɛ̜]	/ʁubn/	deception

The stem /u/ vowel is realised as [ʊ],[ɛ̜] respectively; both realisations occur in complimentary distribution in the above contexts as highlighted in the examples below. They are examples of vowel- consonant harmony with the elements of *tafxi:m* in uvulars.

(63)

(a) [χʊlˤʊg]~ [χɛ̜lˤɛ̜g] ‘patience’

(b) [ʁʊbʊn]~ [ʁʊbin]~ [ʁɛ̜bin] ‘deception’

Table 23: The /uː/ vowel realisations in *the* /χ/, and /ʁ/ contexts.

	/u/ vowel	**Token**	**Gloss**
Realisation	[uː]	/jχuːnuːn/	they betray
	[uː]	/jaʁuːr/	Jaguar

On the other hand, the long /uː/ vowel preserves its quality as [uː] the examples below. Long /uː/ show resistance to long domain consonant-vowel harmony.

(64)

(a) [jχuːnuːn] 'they betray'

(b) [jaʁuːr] 'Jaguar'

6.2.4 The Gilit vowel profiling of all tokens in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ/.

The vowel targets /a, aː, i, iː, u, uː/ are introduced in the three pharyngealized consonantal contexts /tˤ/, /ðˤ/ and /sˤ/. Each target vowel is introduced in one token per consonantal context.

Table 24: The /a/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/a/ vowel	**Token**	**Gloss**
Realisation	[a̙]	/ tˤalab /	he requested
	[a̙], [u̙]	/ðˤafar/	he succeeded
	[a̙], [u̙]	/sˤabar/	he stood patient

The stem /a/ vowel is realised as the [open, retracted, +low] [a̙] in the /tˤ/ context in one form of vowel-consonanat harmony with the articulation of /tˤ/, /sˤ/, and /ðˤ/.

However, most /a/ productions are realised as [u̙] in complete vowel-consonant harmony in the trigger environment of emphatics and secondary emphatics underlyingly specified with [dorsal, labial] as the elements of harmony. Details provided earlier in section 4.8.

(65)

(a) [tˤa̙lab] 'he requested'

(b) [sˤa̙bar] ~ [sˤu̙bˤa̙rˤ] 'he stood patient'

(c) [ðˤa̙fˤa̙r] ~[ðˤu̙fˤa̙rˤ] 'he succeeded'

Table 25: The /aː/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/aː/ vowel	Token	Gloss
Realisation	[a̤ː]	/ tˤaːlib /	student
	[a̤ː]	/ðˤaːfir/	successor
	[a̤ː]	/sˤaːffaːt/	classes

On the other hand, the long /aː/ vowel in all three contexts; that is the /tˤ/, /ðˤ/ and /sˤ/ are realised as the [a̤ː] with the short /i/ blocking long domain harmony in (a) and (b). It is also realised as [a̤ː] with long [a̤ː] allowing long domain vowel harmony as in (c).

(66)

(a) [tˤa̤ːliːb] 'student'

(b) [ðˤa̤ːfir] 'successor'

(c) [sˤa̤ːffa̤ːt] 'standing in classes'

Table 26: The /i/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/i/ vowel	Token	Gloss
Realisation	[ɛ̧], [ʊ]	/ tˤift/	you (m.s) floated'
	[ɛ̧], [ʊ]	/ðˤift/	'you (m.s) added'
	[ɛ̧], [ʊ]	/sˤifr/	zero

The stem /i/ vowel is realised as the [ɛ̧] or [ʊ] in the production of Gilit speakers in one form of vowel-consonant harmony with the empahtic articulation. However, short /i/ blocks long domain vowel-consonant harmony. It also exist as [ʊ] in the epenthetic /i/ in vowel harmony with the stem [ʊ] vowel..

(67)

(a)[tˤɛ̧fit] ~[tˤʊfʊt] 'you (m.s) floated'

(b)[ðˤɛ̧fit]~ [ðˤʊfʊt] 'you (m.s) added'

(c) [sˤɛ̧fir]~ [sˤʊfˤʊrˤ] 'zero'

Table 27: The /iː/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/iː/ vowel	Token	Gloss
Realisation	[iː̞]	/ tˤiː̞ba/	purity
	[iː̞]	/ðˤiːfa/	you (m.s.) add.
	[iː̞], [iː̈]	/sˤiːnijjaːt/	trays

The long /iː/ vowel is realised as [iː̞] by Gilit speakers in their production of the examples in (a) and (b) below. Few centralised [iː̈] realisations of the target long /iː/ vowel are identified in the production of Gilit speakers in (c). The long /iː/ vowel is identified as a blocker to long domain vowel-consonant harmony in the following examples.

(68)

(a) [tˤiː̞bə]

(b) [ðˤiː̞fə]

(c) [sˤiː̞nijjaːt] 'trays'.

Table 28: The /u/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/u/ vowel	Token	Gloss
Realisation	[ʊ]	/ tˤurˤuq /	purity
	[ʊ]	/ðˤufr/	'finger nail'
	[ʊ]	/sˤufr/	yellowish

The stem /u/ vowel is realised as [ʊ] with the underlying epenthetic /i/ in the last two examples surfacing as [ʊ] in one form of round harmony known as /u/ vowel coloring (cf. section 2.9.2 &4.4.2).

(69)

(a) [tˤʊrˤʊq] 'roads'

(b) [sˤʊfˤʊrˤ] 'yellowish'

(c) [ðˤʊfˤʊrˤ] 'nail'

Table 29: The /uː/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/uː/ vowel	Token	Gloss
Realisation	[uː]	/ tˤuːlak /	your height
	[uː]	/jðˤuːquːn/	they taste.
	[uː̈]	/jsˤuːmuːn/ /	they are fasting

The /uː/ vowel in is realised as [uː] showing backness vowel harmony in the last two examples.

(70)

(a) [tˤuːlak] 'your height'

(b) [j. ðˤuːguːn̈] 'they taste'

(c) [j.sˤuː̈muːn̈] 'they are fasting'

6.2.5 The Gilit vowel profiling of all tokens in the emphatic /tˤ/, /ðˤ/, and / sˤ/ and non-emphatic /t/, /ð/, and /s/ contexts.

The target vowels /a, aː, i, iː, u, uː/ are introduced in the emphatic contexts vs. their plain counterparts in minimal pair words. Each vowel target is presented in one token for each consonantal emphatic vs. plain context. The target vowels are realised as follows in the emphatic vs. the plain contexts.

Table 30: The /a/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/a/ vowel	Token	Gloss		/a/ vowel	Token	Gloss
Realisation	[a̤]	/ tˤamir /	burying		[ʌ]	/tʌmir/	date
	[a̤]	/ðˤalˤlˤ/	he stayed		[ʌ]	/ ðʌll/	he humiliated
	[a̤]	/sˤa̤dd /	he prevented		[ʌ]	/sʌdd/	he closed

The /a/ vowel in the emphatic /tˤ/, /ðˤ/, and sˤ/ consonantal contexts has different realisations among the different tokens. The /a/ is realised [a̤] in the examples below. Whereas, in the plain consonantal contexts; that is the / t/, /ð/, and /s/ by Gilit speakers, it is realised as [cemtral] [ʌ] as represented in the examples below.

(71)

(a) [tˤa̤mir] 'burying'

(b) [ðˤa̤lˤlˤ] 'he stayed'

(c) [sˤa̤dd] 'he prevented'

(d) [tʌmir] 'date'

(e) [sʌdd] 'he closed'

(f) [ðʌll] 'he humiliated'

Table 31: The /aː/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/aː/ vowel	**Token**	**Gloss**		**/aː/ vowel**	**Token**	**Gloss**
Realisation	[a̤ː]	/ tˤaːb /	he recovered		[aː]	/taːb/	he repented
	[a̤ː]	/ðˤaːll/	lost		[aː]	/ ðaːl/	humiliator
	[a̤ː]	/sˤaːdd /	he hunted		[aː]	/saːdd/	he prevailed

Similarly, the long /aː/ vowel is realised as [a̤ː] and in the production of Gilit speakers. In the plain / t/, /ð/, and /s/ consonantal contexts, the long /aː/ is realised as in the examples below.

(72)

(a) [tˤa̤ːb] 'he recovered'

(b) [ðˤa̤ːll] 'lost'

(c) [sˤa̤ːd] 'he hunted'

(e) [taːb] 'he repented'

(f) [ðaːll] 'humiliator'

(g) [saːd] 'he prevailed'

Table 32: The /i/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/i/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ɪ̞]	/ tˤibt /	you (m.s.)recovered		[i]	/tibt/	you (m.s.) repented
	[ɪ]	/ðˤilˤlˤ/	shadow		[i]	/ ðill/	humiliation
	[ɪ]	/sˤidd /	you (m.s.)defend		[i]	/sidd/	you (m.s)close

The stem /i/ vowel is realised as [ɪ] in the production of Gilit speakers in vowel-consonant harmony with the emphatics# articulation. The underlyingly epenthetic /i/ vowel is realised as [+low] [i̞] where long domain vowel-consonant harmony is blocked in the /i/ vowel environment in (a). In plain consonantal contexts, the /i/ is realised as [i] in (d), (e) and (f).

(73)

(a) [tˤɪbi̞t] ‘you recovered’

(b) [ðˤɪlˤlˤ] ‘shadow’

(c) [sˤɪdd] ‘you (m.s.) defend’

(d) [tibit] you (m.s.) repented

(e) [ðill] ‘humiliation’

(f) [sidd] ‘you (m.s) close’

Table 33: The /iː/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/iː/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ï̞ː]	/ tˤiːn /	mud		[iː]	/tiːn/	fig
	[ï̞ː]	/ðˤiːb/	Non-sense word		[iː]	/ ðiːb/	wolf
	[ï̞ː]	/sˤiːdd /	you (m.s)hunt		[iː]	/siːdd/	you (m.s.)prevail

The long /iː/ vowel is realised as the [central] [i̞ː] by Gilit speakers. Whereas, in the plain consonantal contexts, the /iː/ is realised as by Gilit speakers as presented in the examples below.

(74)

(a) [tˤi̞ːn] 'fig'

(b) [ðˤi̞ːb] 'non-sense word'

(c) [sˤi̞ːdd] you (m.s.) hunt'

(d) [tiːn] 'fig',

(e) [ðiːb] 'wolf'

(f) [siːdd] 'you (m.s.) prevail'

Table 34: The /u/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/u/ vowel	Token	Gloss		/u/ vowel	Token	Gloss
Realisation	[ʊ]	/ tˤubt /	I recovered		[u]	/tubt/	I repented
	[ʊ]	/ðˤuruːf/	circumstances		[u]	/ðuruːf/	shedding tears
	[ʊ]	/sˤubˤbˤ/	you(m.s.) pour		[u]	/subb/	you(m.s.) swear

The /u/ vowel is realised as [ʊ] in the production of Gilit speakers in progressive vowel-consonanat harmony with the trigger. In the plain contexts, the /u/ is realised as [u] as presented in the examples below.

(75)

(a) [tˤʊbʊt] ~[tˤʊbit] 'I recovered'

(b) [ðˤʊrˤʊːfˤ] 'circumstances'

(c) [sˤʊbˤbˤ] 'you (m.s) pour'

(d) [tubɪt] 'I repented'

(e) [ðuruf] 'shedding tears'

(f) [subb] 'you (m.s) swear'

Table 35: The /uː/ vowel realisations in the emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/uː/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ʊː]	/ ftˤuːr/	breakfast		[uː]	/ftuːr/	coldness
	[ɔː]	/ðˤuːb/	non-sense word		[uː]	/ðuːb/	melt
	[ʊː]	/sˤuːra/	picture		[uː]	/suːra/	verse

The long /uː/ vowel is realised as [ʊː] or [open, low, retracted] [ɔː] in the production of Gilit speakers as presented in the examples below.

(81)

(a) [ftˤʊːř] 'breakfast'

(b) [sˤʊ̈ːrə] 'picture'

(c) [ðˤɔːb] 'non-sense word'

(d) [f.tuːr] 'coldness'

(e) [ðuːb] 'melt'

(f) [suːrə] 'verse'

6.2.6 The Qəltu vowel profiling of all tokens in the pharyngeal / ʕ/ and ħ/ contexts.

The vowel targets /a, aː, i, iː, u, uː/ have different realisations in the production of Qəltu speakers across the different tokens per consonantal context in the class of the PV pharyngeals.

Table 36: The /a/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/a/ vowel	**Token**	**Gloss**
Realisation	[a̹]	/ʕaʒaːʒ/	sandstorm
	[a̹]	/ħakam/	he ruled

The stem /a/ vowel is realised as [+low] [a̹] as represented in the examples below where /a/ is not identified as transparent to long domain harmony in Qəltu as represented in the examples below.

(76)

(a) [ʕḁdʒaːdʒ] ‘sandstorm

(b) [ħḁkam] ‘he ruled’

Table 37: The /aː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/aː/ vowel	Token	Gloss
Realisation	[aː̙]	/ʕaːdaːt/	traditions
	[ḁː]	/ħaːkim/	ruler

On the other hand, we see that the long /aː/ vowel is realised as the [+low, retracted] [aː̙]. Both examples show that long /aː/ does not provide an environment for long domain harmony in Qəltu compared to Gilit.

(77)

(a) [ʕaː̙daːt] ‘traditions’

(b) [ħḁːkim] ‘ruler’

Table 38: The /i/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/i/ vowel	Token	Gloss
Realisation	[ə]	/ʕift/	I abandoned
	[ə]	/ħikma/	wisdom

The stem and epenthetic /i/ vowel are realised as [central] [ə] in as represented in the examples below.

(78)

(a) [ʕəfət] ~ [ʕəftu] ‘I abandoned’

(b) [ħəkmi] ‘wisdom’

Table 39: The /iː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/iː/ vowel	Token	Gloss
Realisation	[i̞ː̈]	/ʕiːdaːn/	sticks
	[i̞ː̈]	/ħiːra/	confusion

On the other hand, the long /iː/ vowel is realised as centralised [i̞ː̈] in the examples below.

(79)

(a) [ʕi̞ː̈daːn] ‘sticks

(b) [ħiːra]‘confusion’.

Table 40: The /u/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/u/ vowel	Token	Gloss
Realisation	[ə]	/ʕurf/	norm
	[ə]	/ħəkkaːm/	rulers

ʔima:la in one form of complete vowel harmony exist in Qəltu speakers’ realisation if /u/. *ʔima:la* [ə] exist in one form of vowel harmony in [ʕərəf] in Qəltu compared to [ʡʊrˤʊfˤ] in Gilit.

(80)

(a) [ʕərəf] ‘norm’

(b) [ħəkkaːm]‘rulers’

Table 41: The /uː/ vowel realisations in the / ʕ/ and ħ/ contexts.

	/uː/ vowel	Token	Gloss
Realisation	[ɔː], [uː]	[ʕuːdʒaːn]	twisted
	[uː̈]	[jifraħuːn]	they feel happy

The long /uː/ vowel is realised as the [uː] or [ɔː]. Long /uː/ vowel blocks long domain vowel-consonant harmony as represented in the examples below.

(81)

(a) [ʕuːdʒiːn] ~ [ʕɔːdʒiːn] ‘twisted’

(b) [jifraħuːn] ‘they feel happy’

6.2.7 The Qəltu vowel profiling of all tokens in the uvular /q/ context.

The variants for each of the target vowels /a, aː, i, iː, u, uː/ are represented per token in the context of the uvular stop /q/.

Table 42: The /a/ vowel realisations in the uvular /q/ context.

	/a/ vowel	**Token**	**Gloss**
Realisation	[a̹]	/qafal/	he locked

The stem /a/ vowels are realised as [+low] [a̹] by Qəltu speakers in vowel-consonant harmony with the trigger element; the uvular /q/.

(82)

[qa̹fa̹l] 'he locked'

Table 43: The /aː/ vowel realisations in the uvular /q/ context.

	/aː/ vowel	**Token**	**Gloss**
Realisation	[a̹ː]	/qaːmaːt/	heights

The stem long /aː/ is realised as [a̹ː] in the example below in harmony with the trigger element /q/.

(83)

[qa̹ːma̹ːt]

Table 44: The /i/ vowel realisations in the uvular /q/ context.

	/i/ vowel	**Token**	**Gloss**
Realisation	[e̹]	/waqt/	time

The epenthetic /i/ vowel is realised as [+low, retracted] [e̹] in vowel-consonant harmony with the trigger /q/ as represented in the example below.

(84)

[waqe̹t] 'time'

Table 45: The /iː/ vowel realisations in *the* uvular /q/ context.

	/i/ vowel	**Token**	**Gloss**
Realisation	[iː̈]	/daqiːqa/	minute

The long /iː/ vowel is realised as [central] [iː̈] in the example below.

(85)

[daqiː̈qə] 'minute'.

Table 46: The /u/ vowel realisations in *the* uvular /q/ context.

	/u/ vowel	**Token**	**Gloss**
Realisation	[ə]	/qufl/	lock

The stem /u/ and the underlying epenthetic /i/ in Qəltu are realised as *ʔima:la* [ə̧] in one form of complete vowel harmony in the trigger environment.

(86)

[qə̧fə̧l] 'lock'

Table 47: The /uː/ vowel realisations in *the* uvular /q/ context.

	/uː/ vowel	**Token**	**Gloss**
Realisation	[uː̈], [ɔː]	/jquːmuːn/	they are standing

The target local long /uː/ vowel is realised as [uː̈] or as [ɔː] in the examples below. The long /u:/ vowel blocks long domain vowel hamony and vowel-consonant harmony.

(87)

[jquː̈muː̈n] ~[j.qɔːmuːn] 'they are standing'

6.2.8 The Qəltu vowel profiling of all tokens in the uvular /χ/ and /ʁ/ contexts.

The different vowel variants of the fourtarget vowels /a, aː, i, iː, u, uː/ are introduced in the context of the uvular fricatives /χ/ and /ʁ/. The variants are introduced per token per consonantal context for each of the target vowels.

Table 48: The /a/ vowel realisations in *the* uvular /χ/, and /ʁ/ contexts.

	/a/ vowel	Token	Gloss
Realisation	[a̹]	/χasaf/	he pulled down
	[ä]	/ʁaza:l/	deer

The stem and epenthetic /a/ vowels are realised as [+low] [a̹] in (a) in one form of vowel-consonant harmony with the trigger uvulars.

(88)

(a) [χa̹sa̹f] ‘he pulled down’

(b) [ʁäzä:l] ‘deer’

Table 49: The /a:/ vowel realisations in *the* uvular /χ/, and /ʁ/ contexts.

	/a/ vowel	Token	Gloss
Realisation	[ä:]	/χa:la:t/	aunts
	[ä:]	/ʁa:ba:t/	forests

The long /a:/ vowel is realised as [ä:] one form of vowel-consonant agreement in articulation with the trigger uvulars.

(89)

(a) [χä:lä:t] ‘aunts’

(b)[ʁä:bä:t] ‘forests’

Table 50: The /i/ vowel realisations in *the* uvular /χ/, and /ʁ/ contexts.

	/i/ vowel	Token	Gloss
Realisation	[ə̹]	/χift/	I got scared
	[ə̹]	/ʁibt/	Iwas absent

The stem and epenthetic /i/ vowel are realised as [central] [ə̧] in some productions of Qəltu speakers in complete vowel harmony as represented in (a) and (b).

(90)

(a) [χə̧fət] ~[χə̧ftu] 'I got scared'

(b) [ʁə̧bət] 'I was absent'

Table 51: The /iː/ vowel realisations in *the* /χ/, and /ʁ/ contexts.

	/iː/ vowel	**Token**	**Gloss**
Realisation	[iː̈]	/χiːra/	goodness
	[iː̈]	/ʁiːba/	gossip

The long /iː/ vowel is realised as [central] [iː̈] in the production of Qəltu speaker. Long /iː/ blocls long domain vowel-consonant harmony.

(91)

(a) [χiː̈ra]

(b) [ʁiː̈ba]

Table 52: The /u/ vowel realisations in *the* /χ/, and /ʁ/ contexts.

	/u/ vowel	**Token**	**Gloss**
Realisation	[ə]	/χulq/	patience
	[ə]	/ʁubn/	deception

The stem /u/ vowel in the Qəltu speakers' productions is realised as [+central] [ə], [ə̧] and the epenthetic /i/ is realised as [+central] [ə] in the examples below in one form *ʔimaːla* complete vowel harmony with the trigger uvulars. Wheras in Gilit, both stem and epenthetic vowels are realised as [ʊ] in [χʊlʊg] and [ʁʊbʊn] or [ʁʊbin] where vowels in harmony agree in backness and rounding in one form of vowel harmony as discussed earlier in chapter four.

(92)

(a) [χəlәq] ‘patience’

(b) [ʁə̹bən] ‘deception’

Table 53: The /uː/ vowel realisations in *the* /χ/, and /ʁ/ contexts.

	/u/ vowel	Token	Gloss
Realisation	[uː]	/jχuːnuːn/	they betray
	[uː]	/jaʁuːr/	Jaguar

The long /uː/ vowel preserves its quality as [uː] in in the production of Qəltu speakers.

(93)

(a) [jχuːnuːn] ‘betray’

(b) [jaʁuːr] ‘Jaguar’

6.2.9 The Qəltu vowel profiling of all tokens in the pharyngealized coronals' /tˁ /, /ðˁ/, and / sˁ/ contexts.

The different vowel targets /a, aː, i, iː, u, uː/ are introduced in the three pharyngealized consonantal contexts / tˁ /, /ðˁ/ and /sˁ/. Each target vowel is introduced in one token per consonantal context for each vowel target.

Table 54: The /a/ vowel realisations in the pharyngealized coronals' /tˁ/, /ðˁ/, and /sˁ / contexts.

	/a/ vowel	Token	Gloss
Realisation	[a̠]	/ tˁa̠lab /	he requested
	[a̠]	/ðˁafar/	he succeeded
	[a̠]	/sˁabar/	he stood patient

The stem /a/ vowels are realised as [+low, retracted] [a̠] in the contexts below. They agree in articulation with the emphatics.

(94)

(a) [tˤḁlḁb] ‘he requested’

(b) [ðḁfˤḁɣ] ‘he succeeded’

(c) [sˤḁbḁr] ‘he stood patient’

Table 55: The /aː/ vowel realisations in the pharyngealized coronals’ /tˤ/, /ðˤ/, and /sˤ / contexts.

	/aː/ vowel	**Token**	**Gloss**
Realisation	[ḁː]	/tˤaːlib /	student
	[ḁː]	/ðˤaːfir/	successor
	[ḁː]	/sˤaːffaːt/	classes

On the other hand, the long /aː/ vowel in all three contexts; that is the /tˤ/, /ðˤ/ and /sˤ/ is realised as [+low, retracted] [ḁː] in the production of Qəltu speakers.

(95)

(a) [tˤḁːliːb] ‘student’

(b) [ðˤḁːfir] ‘successor’

(c) [sḁːfˤfˤaːt] ‘classes’

Table 56: The /i/ vowel realisations in the pharyngealized coronals’ /tˤ/, /ðˤ/, and /sˤ / contexts.

	/i/ vowel	**Token**	**Gloss**
Realisation	[ə̥]	/ tˤift/	you (m.s) floated
	[ə̥]	/ðˤift/	you (m.s) added
	[ə̥]	/sˤifr/	zero

The stem /i/ vowel isrealised as [central] [ə̥] in harmony with the trigger emphatic articulation. However in examples (a) and (b), the short /i/ blocks long domain vowel-consonant harmony.

(96)

(a) [tˤə̹fit] ‘you (m.s) floated ‘

(b) [ðˤə̹fət] ‘you (m.s) added

(c) [sˤə̹f ər] ‘zero’

Table 57: The /iː/ vowel realisations in the pharyngealized coronals’ /tˤ/, /ðˤ/, and /sˤ / contexts.

	/iː/ vowel	**Token**	**Gloss**
Realisation	[i̞ː]	/ tˤiː̞ba/	purity
	[ï̞ː]	/ðˤiːfa/	add it 2nd. p. sing. m.
	[ï̞ː]	/sˤiːnijjaːt/	trays

The long /iː/ vowel is realised as [i̞ː] in the production of Qəltu speakers as represented in the examples below. Long /iː/ blocks long domain vowel-consonant harmony.

(97)

(a) [tˤi̞ːbi] ‘purity’

(b) [ðˤï̞ːfa] ‘add it’

(c) [sˤiː̈nijjaːt] ‘trays’.

Table 58: The /u/ vowel realisations in the pharyngealized coronals’ /tˤ/, /ðˤ/, and /sˤ / contexts.

	/u/ vowel	**Token**	**Gloss**
Realisation	[ʊ̹]	/ tˤurˤuq /	purity
	[ʊ̹]	/ ðˤufr /	you add it
	[ʊ̹]	/sˤufˤr /	yellowish

The target local /u/ vowel is realised as [+raised, retracted] [ʊ̹] in the examples below in harmony with the trigger emphatics.

(98)

(a) [tˤʊ̹rˤʊ̹q] ‘roads’

(b) [ðˤʊ̹fˤʊ̹ɣ] ‘nail’

(c) [sˤʊ̹fʊ̹ɣ] ‘yellowish’

Table 59: The /uː/ vowel realisations in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ / contexts.

	/uː/ vowel	Token	Gloss
Realisation	[uː]	/ tˤuːlak /	your height
	[ɔː]	/jðˤuːquːn/	they are tasting
	[uː]	/jsˤuːmuːn/	they are fasting

The /uː/ vowel is realised as [uː] in the It is also realised as [+low, retracted] in harmony with the trigger emphatics.

(99)

(a) [tˤuːlak] 'your height'

(b) [jsˤuːmuːn] 'they are fasting'

(c) [jðˤɔːquːn] 'they are tasting'

6.2.10 The Qəltu vowel profiling of all tokens in the emphatic /tˤ /, /ðˤ/, and / sˤ/ and non-emphatic /t/, /ð/, and /s/ contexts.

The target vowels /a, aː, i, iː, u, uː/ are introduced in the emphatic contexts vs. their plain counterparts in minimal pair words. Each vowel target is presented per token following each emphatic and non-emphatic (plain) consonantal context.

Table 60: The /a/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/a/ vowel	Token	Gloss		/a/ vowel	Token	Gloss
Realisation	[ʌ]	/ tˤamir /	burying		[a]	/tamir/	date
	[ʌ]	/ðˤall/	he stayed		[a]	/ ðall/	he humiliated
	[ʌ]	/sˤadd /	he prevented		[a]	/sadd/	he closed

The /a/ in /tˤamir/ 'burying' is realised as [central] [ʌ] in (a), (b), (c). Whereas, in the plain consonantal contexts; that is the / t/, /ð/, and /s/, the /a/ vowel is realised as [a] by Qəltu speakers (cf. the vowel realisations in chapter four).

(100)

(a) [tˤʌmiɣ] ‘burying’

(b) [ðˤʌll] ‘remained’

(c) [sˤ ʌdd] ‘prevented’

(d) [tamˤʊɣ] ‘date’

(e) [ðall] ‘he humiliated’

(f) [sadd] ‘he closed’

Table 61: The /aː/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/aː/ vowel	**Token**	**Gloss**		**/aː/ vowel**	**Token**	**Gloss**
Realisation	[a̱ː]	/ tˤaːb /	he recovered		[aː̇]	/taːḃ/	hse repented
	[a̱ː]	/ðˤaːlˤlˤ/	lost		[aː̇]	/ ðaːl̇/	humiliator
	[a̱ː]	/sˤaːdd /	he hunted		[aː̇]	/saːḋd/	he prevailed

Similarly, the long /aː/ vowel is realised as [a̱ː] in the emphatic contexts. In the plain / t/, /ð/, and /s/ contexts, the long /aː/ is [aː̇] in the examples below.

(101)

(a) [tˤa̱ːb] ‘recovered’

(b) [ðˤa̱ːlˤlˤ] ‘lost’

(c) [sˤa̱ːdd] ‘he hunted’

(d) [taːḃ] ‘repented’

(e) [ðaːl̇l] ‘humiliator’

(f) [saːḋ] ‘he prevail’

Table 62: The /i/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/i/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ə̧]	/ tˤibt /	you (m.s.) recovered		[ɪ]	/tibt/	you (m.s.) repented
	[ɪ̧]	/ðˤilˤlˤ/	shadow		[ɪ]	/ ðill/	humiliation
	[ɪ̧]	/sˤidd /			[ɪ]	/sidd/	you (m.s.) close

The /i/ vowel is realised as [ə̧] in (a) in the emphatic contexts. In plain consonantal contexts, the /i/ is [ɪ] as represented in the examples below.

(102)

(a) [tˤə̧bə̧t] 'recovered'

(b) [ðˤɪ̧lˤlˤ] 'shadow'

(c) [sˤɪ̧dd] 'prevent'

(d) [tɪbɪt] 'you (m.s.) repented'

(e) [ðɪll] 'humiliation'

(f) [sɪdd] 'you (m.s.) close'

Table 63: The /iː/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/iː/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ï̞ː]	/ tˤiːn /	mud		[iː]	/tiːn/	fig
	[ï̞ː]	/ðˤiːb/	non-sense word		[iː]	/ ðiːb/	wolf
	[ï̞ː]	/sˤiːdd /	you(m.s.)hunt		[iː]	/siːdd/	you (m.s)prevail

The long /iː/ vowel is realised as [i̞ː]. However, it is realised as [ï̞ː]. Whereas, in the plain consonantal contexts, the /iː/ is realised as [iː].

(103)

(a) [tˤï̞ːn] ‘mud’

(b) [ðˤï̞ːb] ‘non- sense word’

(c) [sˤï̞ːdd] ‘you (m.s.) hunt’

(d) [tiːn] ‘fig’

(e) [ðiːb] ‘wolf’

(f) [siːdd] ‘you (m.s.) prevail’

Table 64: The /u/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/u/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ʊ̞]	/ tˤubt /	I (m.s.)recovered.		[ə]	/tubt/	I repented
	[ʊ̞]	/ðˤuruːf/	circumstances		[u]	/ðuruːf/	shedding tears
	[ʊ̞]	/sˤubb/	you (m.s.)pour		[ə]	/subb/	you(m.s.)swear

The /u/ is realised as [ə̞] in [tˤə̞bˤtu] in one form of medial*ʔimaːla* (cf. Levin,1998). However, the /u/ vowel is realised as the [ʊ̞] in [ðˤʊ̞rˤʊːf] and [sˤʊ̞bˤbˤ]. Whereas, in the plain contexts, the /u/ is realised as [ə] in the production of Qəltu speakers of /tubt/ and /subb/ and it is realised as [u] in [ðuruf].

(104)

(a) [tˤə̣bˤtu] ‘I recovered’

(a) [ðˤʊ̣rˤʊːf] ‘circumstances’

(b) [sˤʊ̣bˤbˤ] ‘you (m.s.) pour’

(c) [təbət] ‘ I repented’

(d) [səbb] ‘you (m.s.) swear’

(e) [ðuruf] ‘shedding tears’

Table 65: The /uː/ vowel realisations in emphatic /tˤ/, /ðˤ/, and /sˤ / vs. the plain /t/, /ð/, and /s/ contexts.

	/uː/ vowel	**Token**	**Gloss**		**/i/ vowel**	**Token**	**Gloss**
Realisation	[ʊː̈]	/ ftˤuːr/	breakfast		[uː]	/ftuːr/	coldness
	[ʊː]	/ðˤuːb/	non-sense word		[uː]	/ðuːb/	melt
	[ʊː̈]	/sˤuːra/	picture		[uː]	/suːra/	verse

The long /uː/ vowel is realised as centralised [ʊː̈] in the emphatic contexts (see exmaples below) compared to [u:] in the plain contexts (see realisations in the table above).

(105)

(a) [f.tˤʊː̈r̈] ‘breakfast’

(b) [ðˤʊːb] ‘non-sense word’

(b) [sˤʊ̈ːrə] ‘picture’

6.3 Acoustic vowel profiling

In the sections below, the F1-F2 vowel plots are presented for each of the target vowels /a/, /aː/, /i/, /iː/, /u/, /uː/ as extracted at two vowel positions: the onset (i.e at the consonant-vowel transition), and the mid-point (i.e. steady state of the vowel) for all tokens per consonantal context, i.e. in the context of the pharyngeals, the uvulars, the pharyngealized coronals (the emphatics) plus another group of emphatics vs. non-emphatics. The Q in the vowel plot stands for Qəltu and the G for Gilit. The auditory results are suggestive that there are variations among the realisations of each of the target vowels in the different consonantal contexts in each of Qəltu and Gilit. Therefore, the researcher is carrying out the acoustic analysis to determine the location of the target vowels and their realisations in the acoustic vowel space in the different consonantal contexts in both dialects.

6.3.1 The F1-F2 vowel plots of the target vowels in the pharyngeal /ʕ/, and / ħ/ contexts in Qəltu and Gilit.

The F1-F2 vowel plots below represent the different vowel variants of each of the target /a/, /aː/, /i/, / iː/. /u/. /u ː/ vowels as produced by Qəltu and Gilit speakers in the pharyngeals /ʕ, ħ/ context.

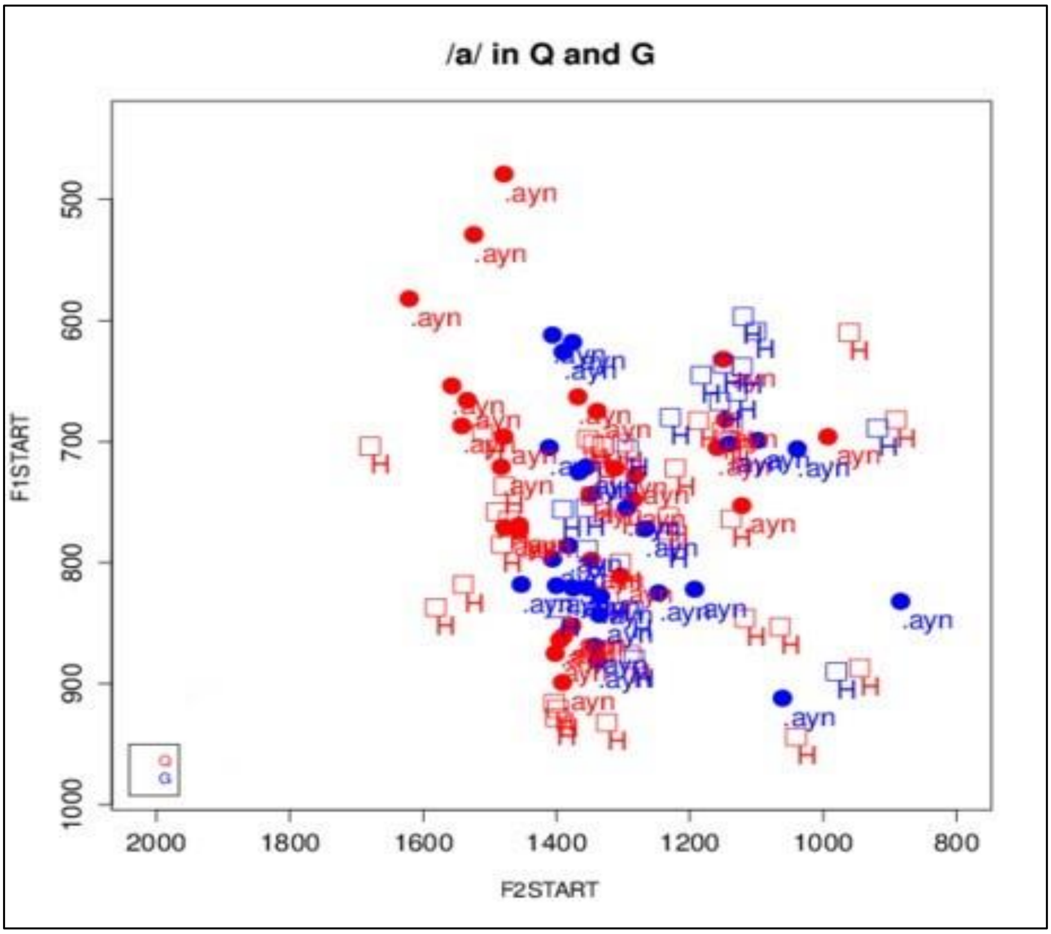

Figure 38: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

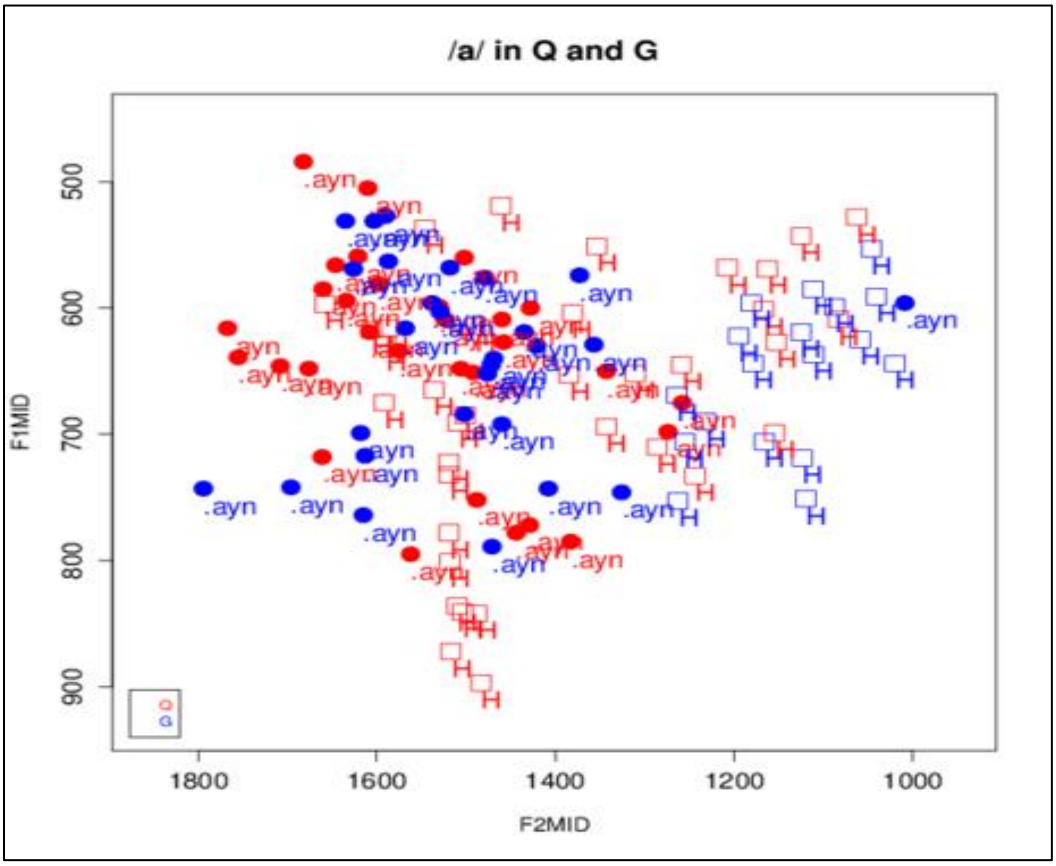

Figure 39: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 38 above illustrates the variants of **/a/** vowel in the pharyngeal /ʕ, ħ/ contexts in the tokens /ʕaʒaːʒ/ 'sandstorm' and /ħakam/ 'ruled' plotted in terms of their F1-F2 at the vowel onset in the Qəltu and Gilit speaker' productions. The rise in the F1 at the vowel onset compared to the F1 at the vowel mid-point in **Figure 39** indicate /a/ fronting in a pharyngeal /ʕ/ context . However, /a/ backing is represented in the pharyngeal /ħ/ context in Qəltu, with higher F1 showing that /ħ/ have further back constriction in the pharyngeal cavity in Qəltu compared to Gilit (cf. Moisik, 2013; Sylak-Glassman, 2013;2014).

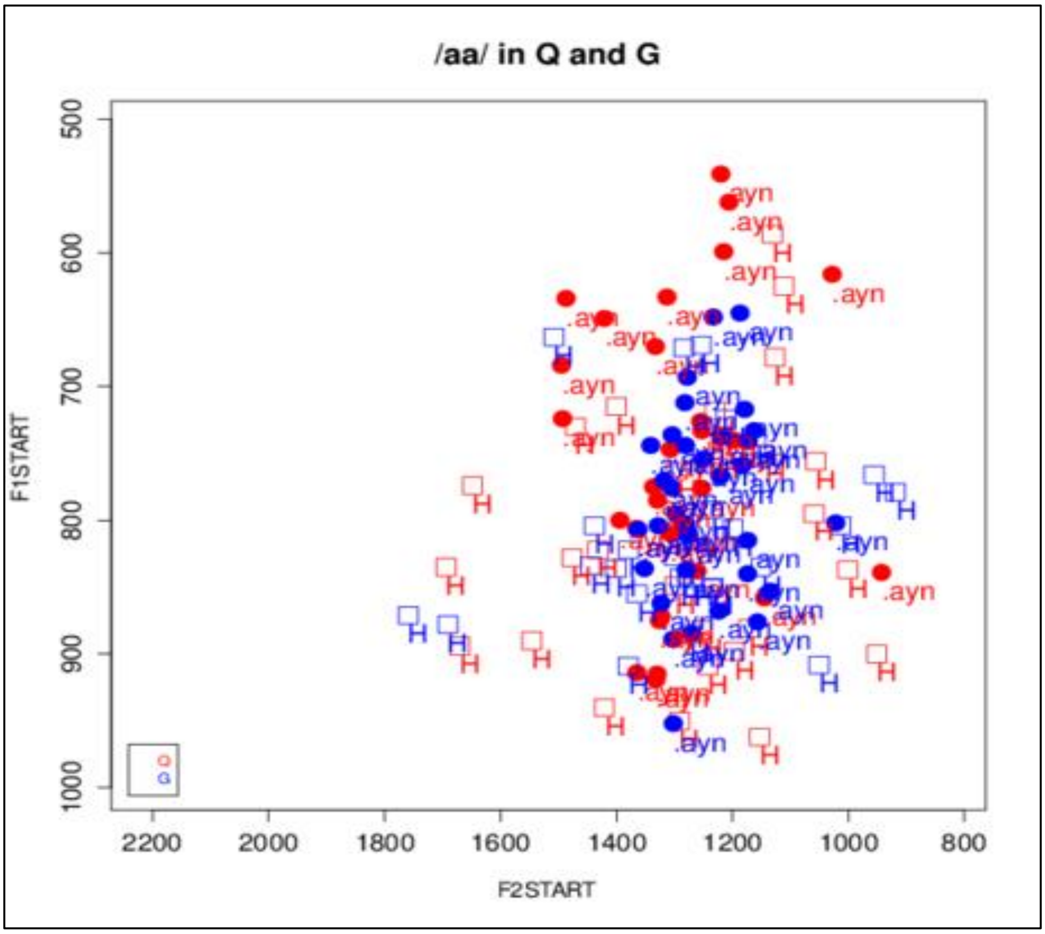

Figure 40: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

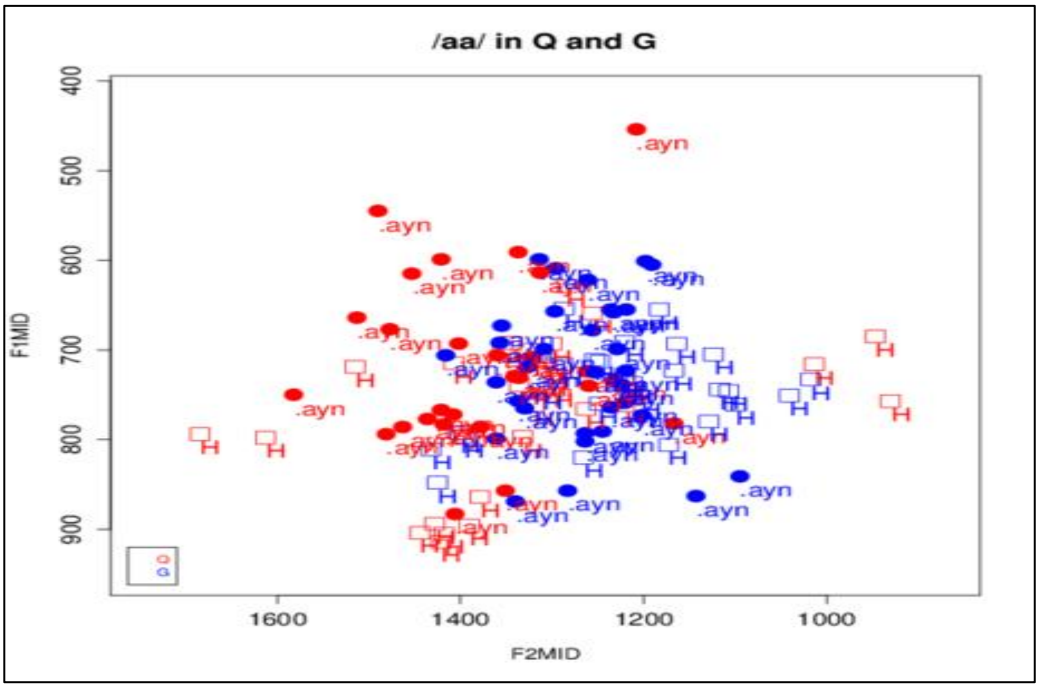

Figure 41: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 40 and Figure 41 above illustrate the **/a**:/ vowel variants as represented in the production of both the Qəltu and Gilit speakers in the /ʕ, ħ/ contexts in the tokens /ʕa:da:t/ 'norms' and /ħa:kim/ 'ruler'. The rise in F1 of /a:/ at the vowel onset compared to F1 at the vowel mid-point indicate [low], [open] and [back] /a:/ vowel variants respectively in Qəltu and Gilit. However, further [back] /a:/ variants in Gilit are represented in the /ʕ/ context in /ʕa:da:t/ with lower F2 at the vowel onset and mid-point compared to F2 onset and mid-point in Qəltu.

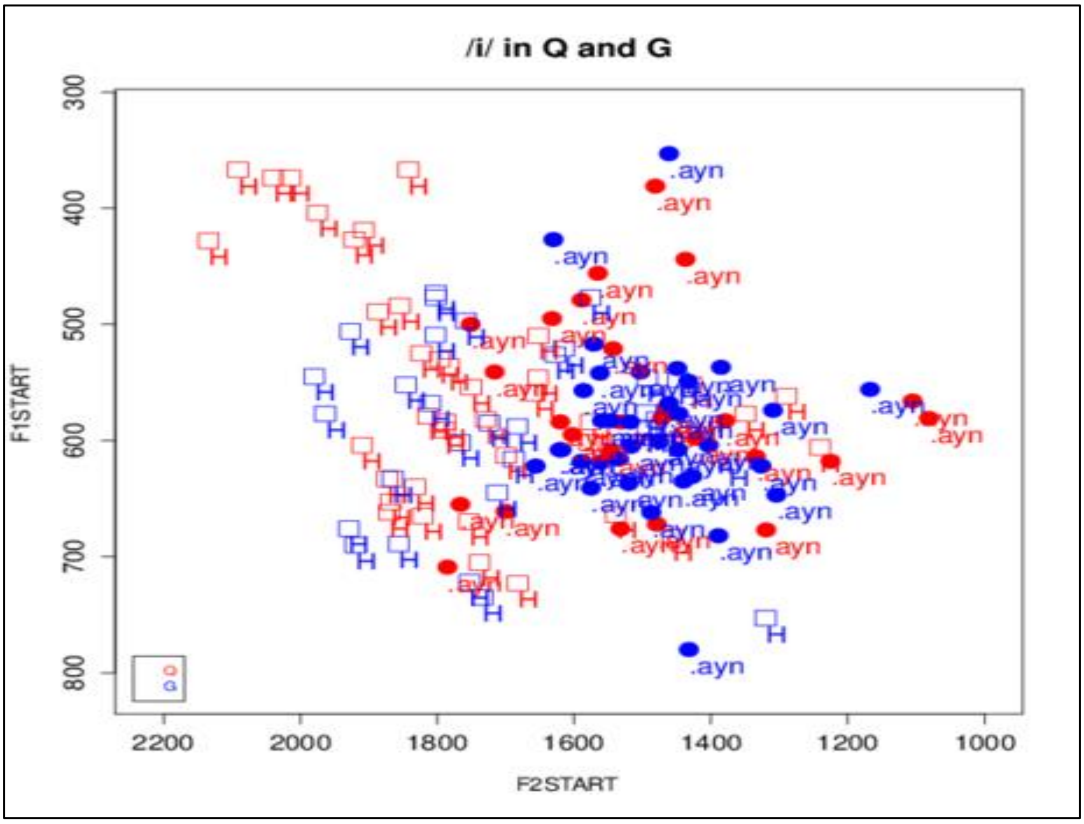

Figure 42: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

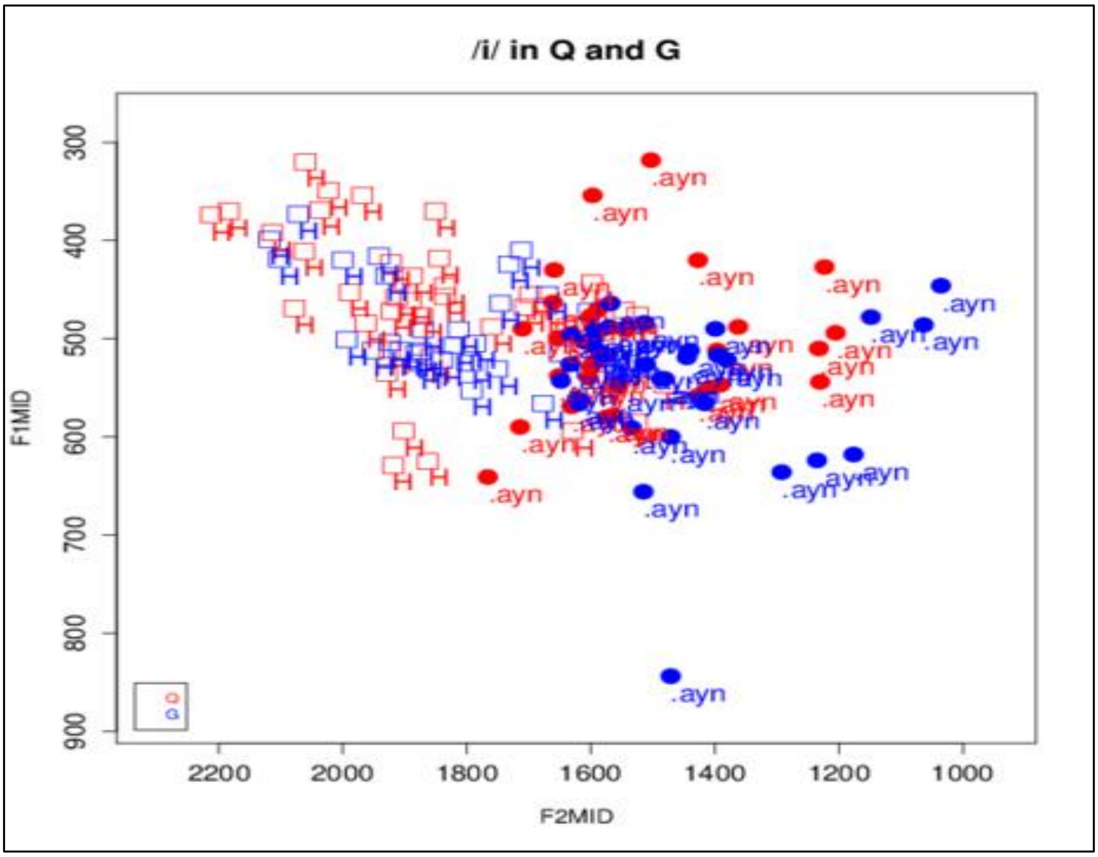

Figure 43: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 42 and **Figure 43** illustrate the syllable initial **/i/** vowel variants as extracted at the vowel onset and mid-point in the production of the Qəltu and Gilit speakers of the tokens /ʕift/ ‘I abandonned’ and /ħikma/ ’wisdom’. [centralised] /i/ variants are reported in the / ʕ/ and /ħ/ in Qəltu as reported earlier in chapter four compared to Gilit where /u/ ~ /i/ variants occur in complimentary distribution in the trigger *mufaxxama* environment.

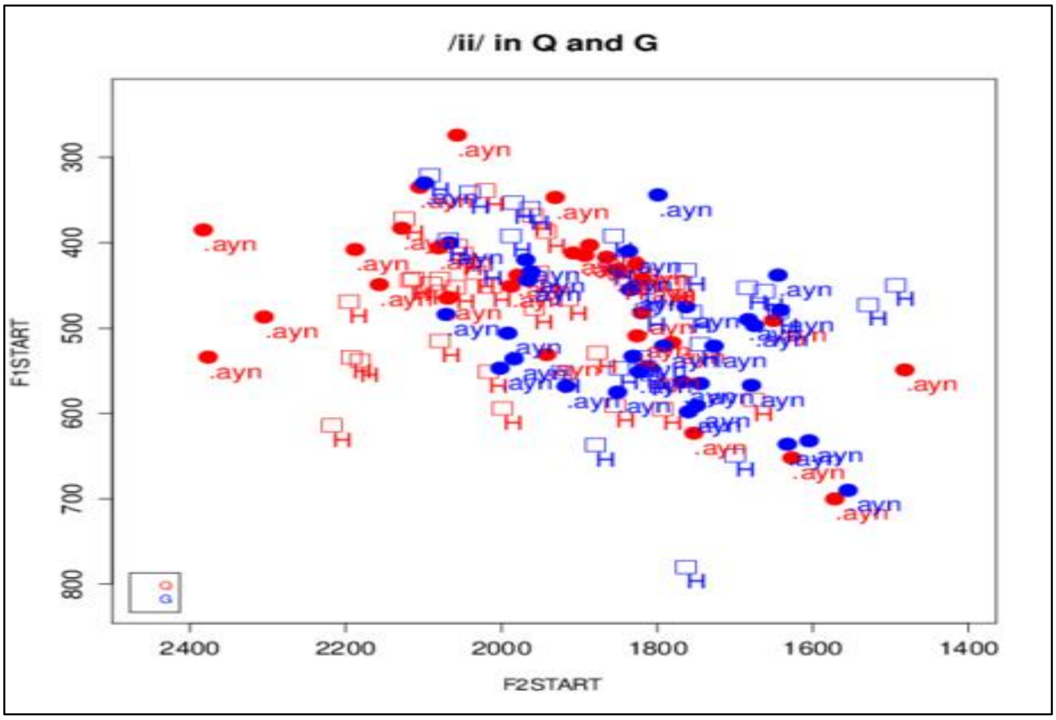

Figure 44: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

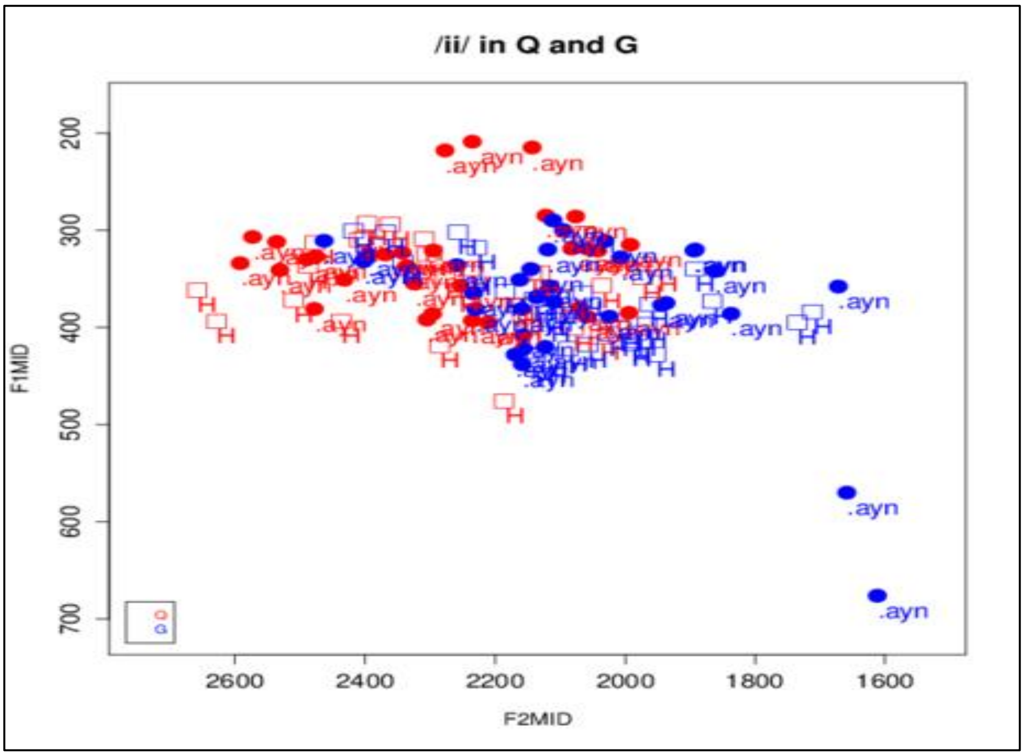

Figure 45: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 44 and Figure 45 above illustrate the **/i**ː**/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /ʕiːdaːn/ 'sticks', and /ħiːra/ 'confusion'. High F1 and low F2 at the vowel onset compared to F1 and F2 at the vowel mid-point are significant of

[low], and [back] /iː/ variants in both /ʕ/, and /ħ/ in Gilit and Qəltu with further [low], and [back] /iː/ variants in Gilit compared to Qəltu.

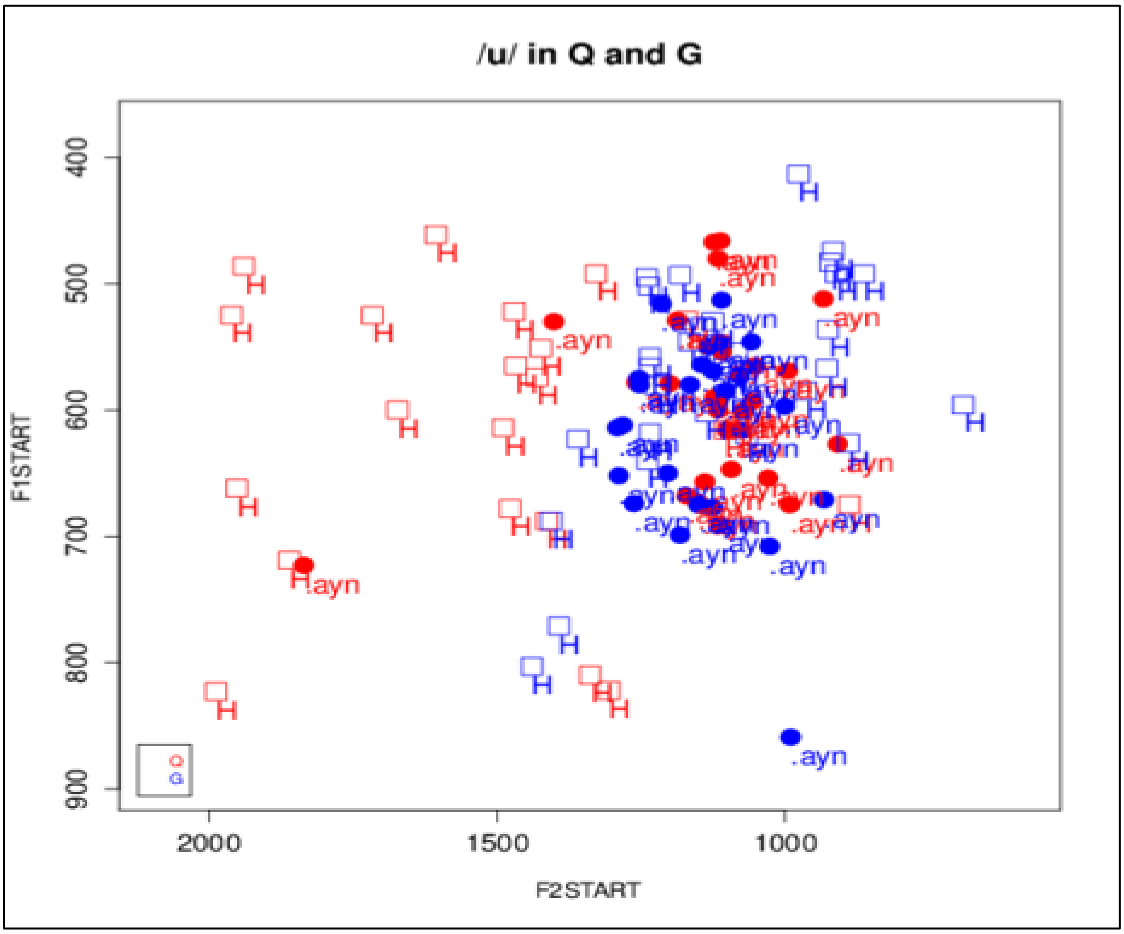

Figure 46: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

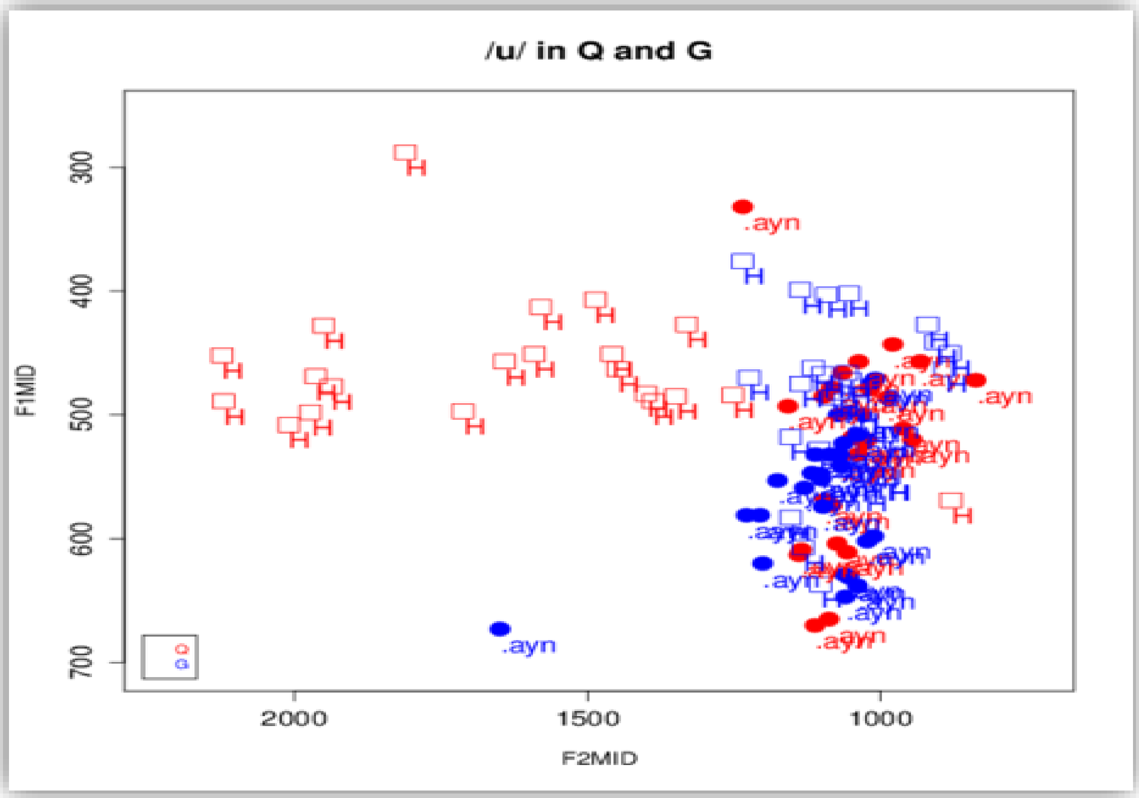

Figure 47: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 46 and Figure 47 illustrate the **/u/** variants as represented in the production of Qəltu and Gilit speakers of the tokens / ʕurf/ 'norm' and / ħukkaːm/ 'rulers'. High F1 and low F2 at the vowel onset compared to the vowel mid-point in both Qəltu and Gilit indicate [open, low] /i/, /u/ variants are reported where /u/ ~ /i/ productions are in complimentary distribution in Gilit in the *mufaxxama* contexts. However, high F2 at the vowel onset and mid-point signify [centralised] /u/ variant introduced as *ʔimaːla* in the production of Qəltu speakers of / ħukkaːm/ (cf. chapter four).

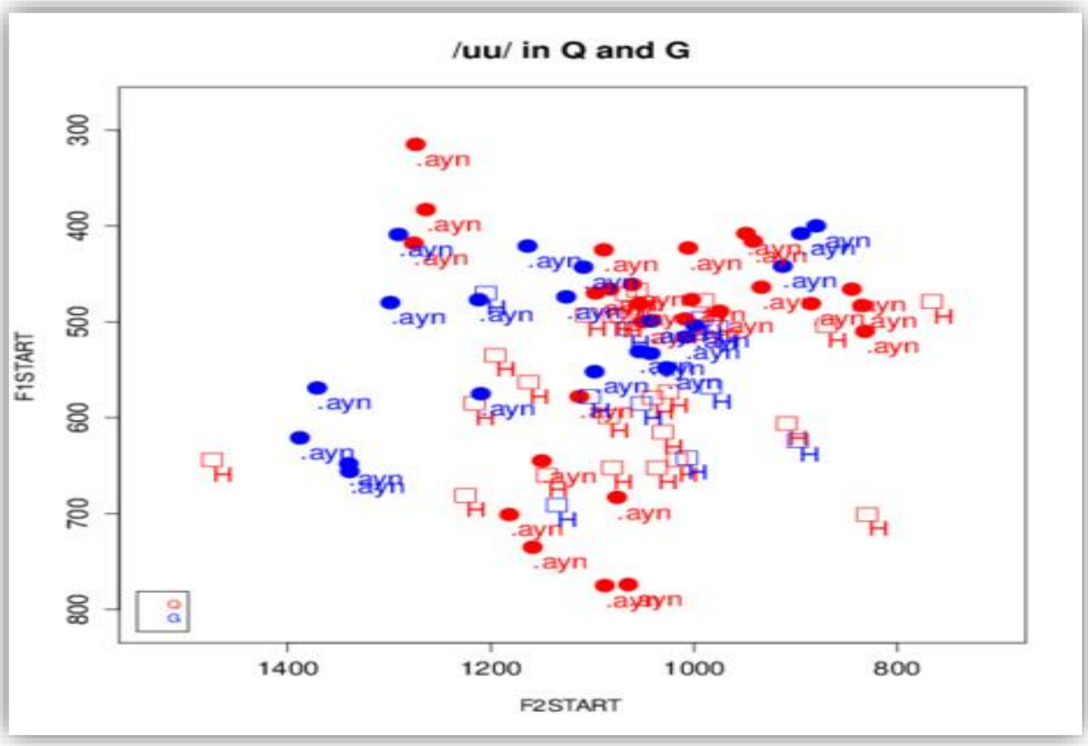

Figure 48: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngeal / ʕ, ħ/ contexts.

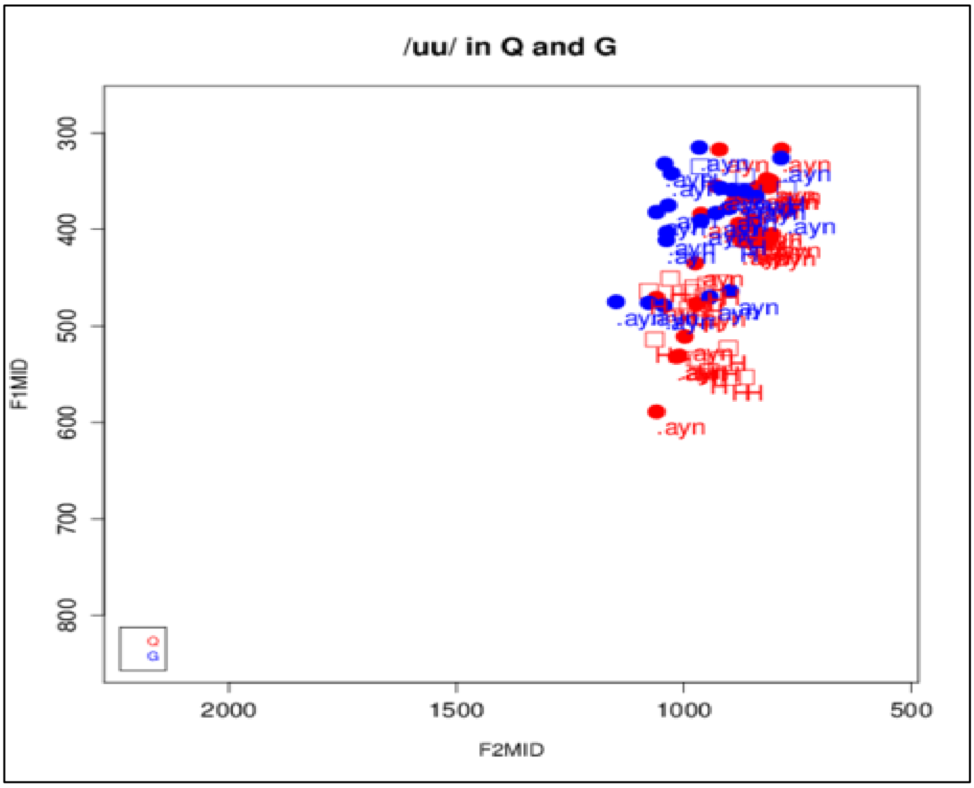

Figure 49: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngeal / ʕ, ħ/ contexts.

Figure 48 and **Figure 49** above illustrate the **/u:/** vowel variants as represented in the production of Qəltu and Gilit speakers of the tokens / ʕuːʒaːn/ 'twisted and /jfraħuːn/ 'they became happy'. High F1, and Low F2 at the vowel onset indicate [low] /uː/ variants with further [low] /uː/ variants in Qəltu represented in lower F2 compared to F2 in Gilit.

6.3.2 The F1-F2 vowel plots of the target vowels in the uvular /q/ context in Qəltu and Gilit.

The F1-F2 vowel plots below represent the different vowel variants of each of the target vowels /a/, /a :/, /i/, / iː/. /u/. /u :/ vowels as produced by Qəltu and Gilit speakers in the uvular /q/ context.

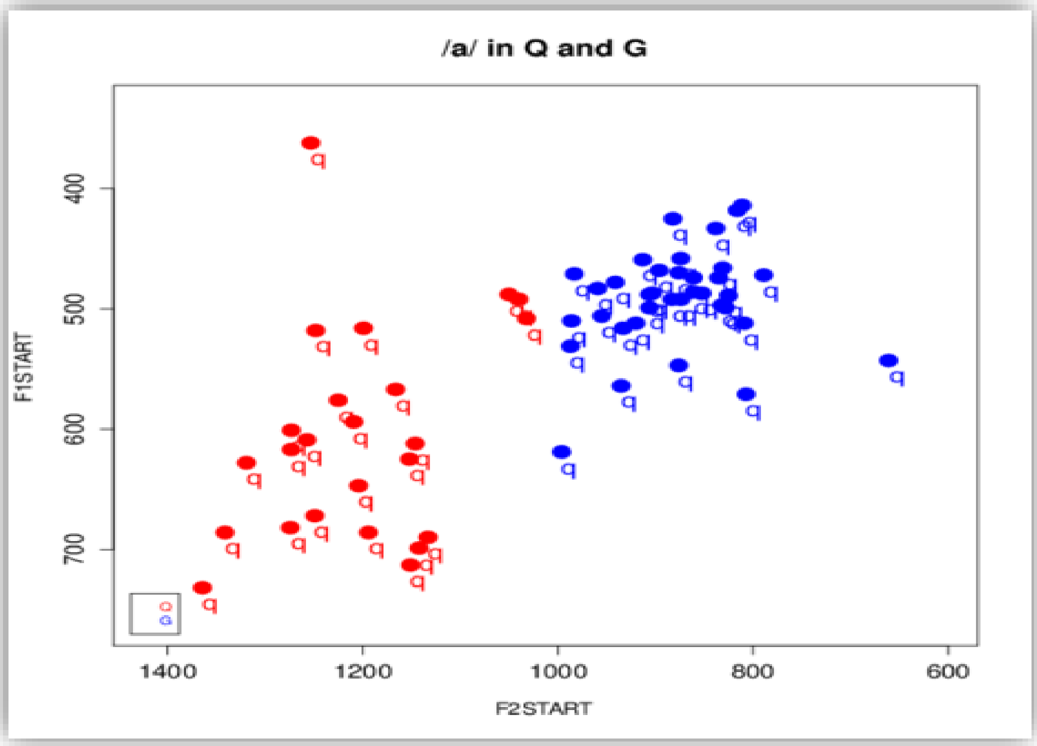

Figure 50: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

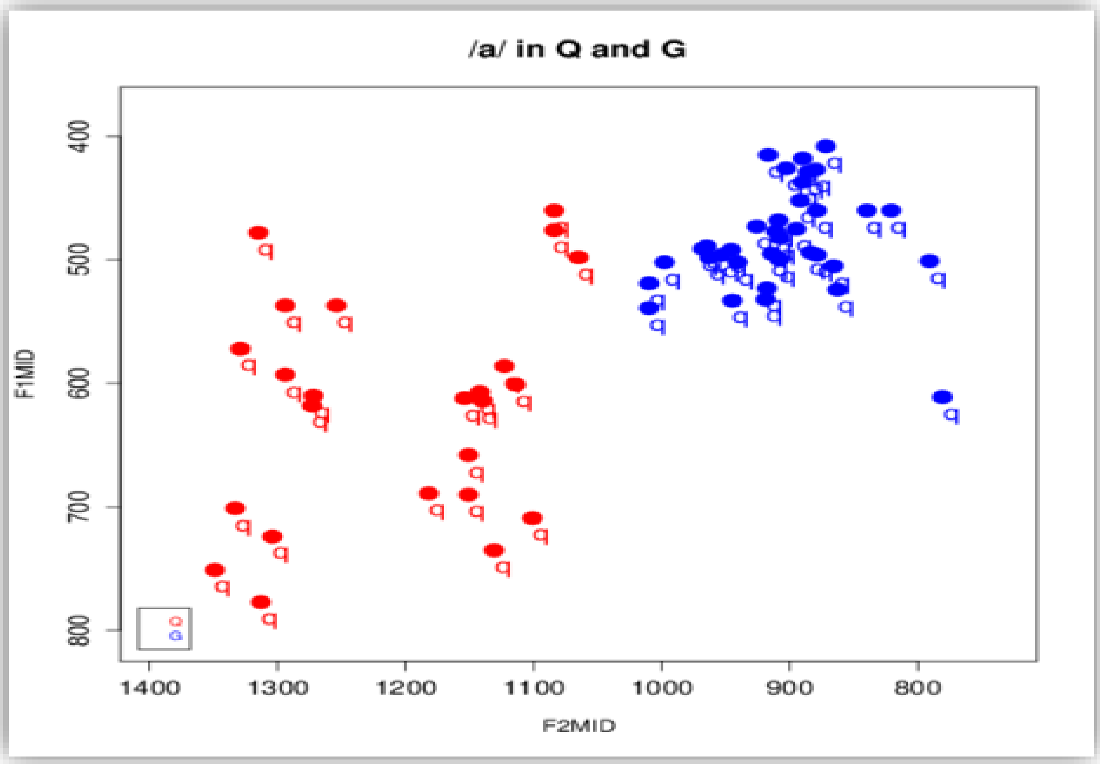

Figure 51: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 50 and Figure 51 above illustrate the **/a/** variants as represented in the production of Qəltu and Gilit speakers of the token/ qafal/ 'locked'. [back] and [round] /a/ variants are represented in the production of Gilit speakers of the /qafal/ < [gɒfˤalˤ] 'he locked' in one form of backness, roundness and RTR-ness harmony in the trigger context as discussed earlier in chapter four in section 4.9 compared to [low] [ä] variants in the same context in /qafal/ ~ [qạfạl] in Qəltu.

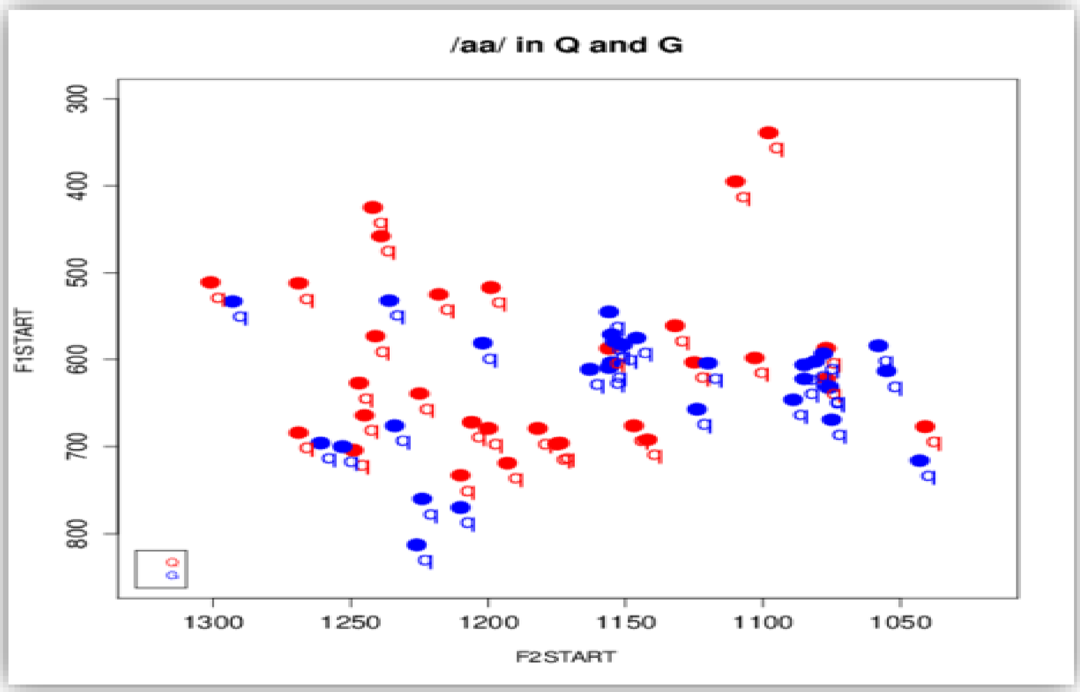

Figure 52: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

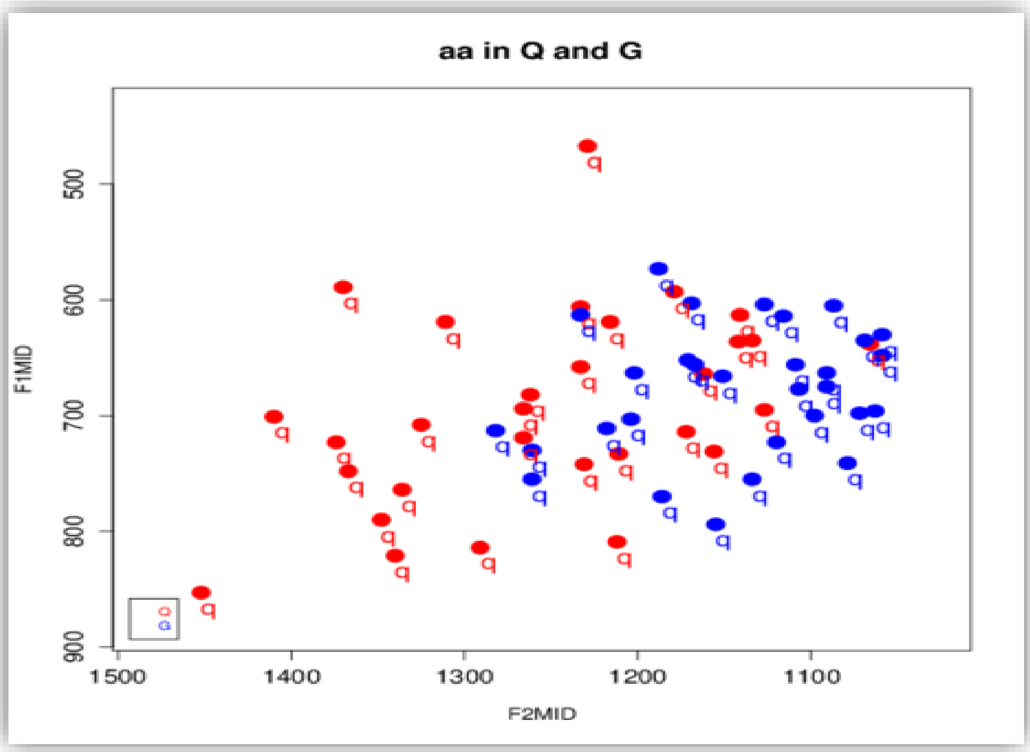

Figure 53: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 52 and Figure 53 above illustrate the **/aː/** variants as represented in the production of the Qəltu and Gilit speakers. Higher F1 and lower F2 at the vowel mid-point compared to the vowel onset indicate /aː/ resistance to lowering and backing at the vowel onset with further [low] /aː/ variants represented in higher F1 in Qəltu compared to Gilit, and further [back] /aː/ variants represented in lower F2 in Gilit compared to Qəltu.

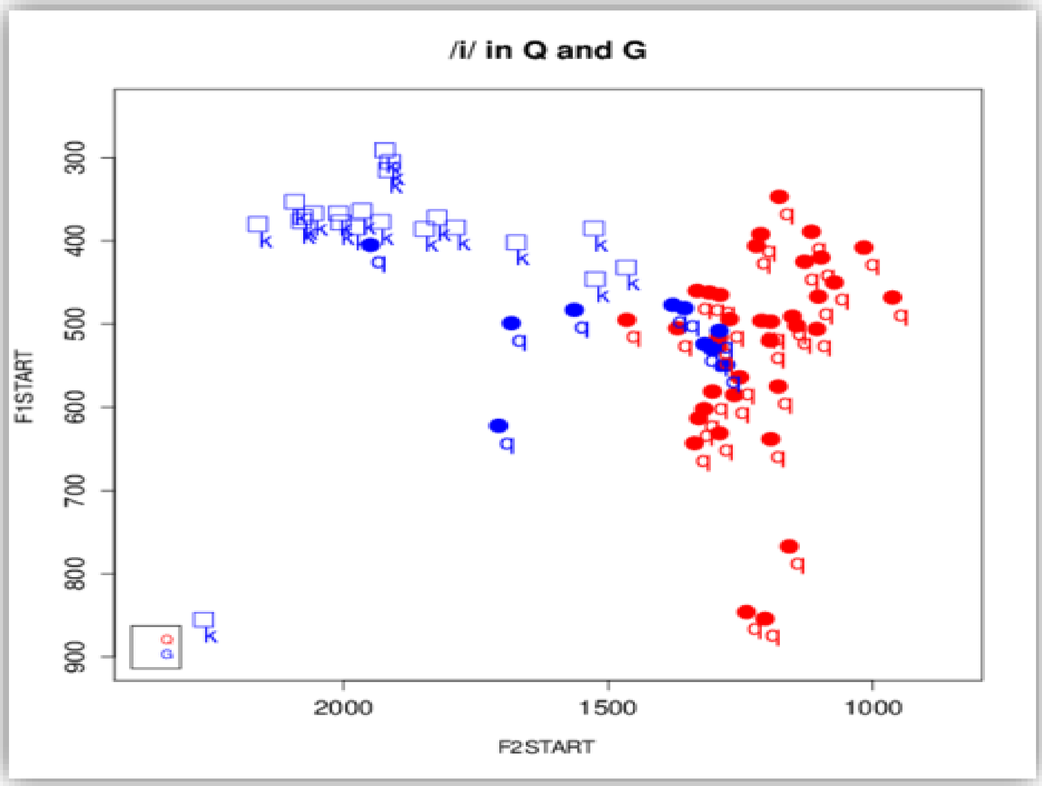

Figure 54: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

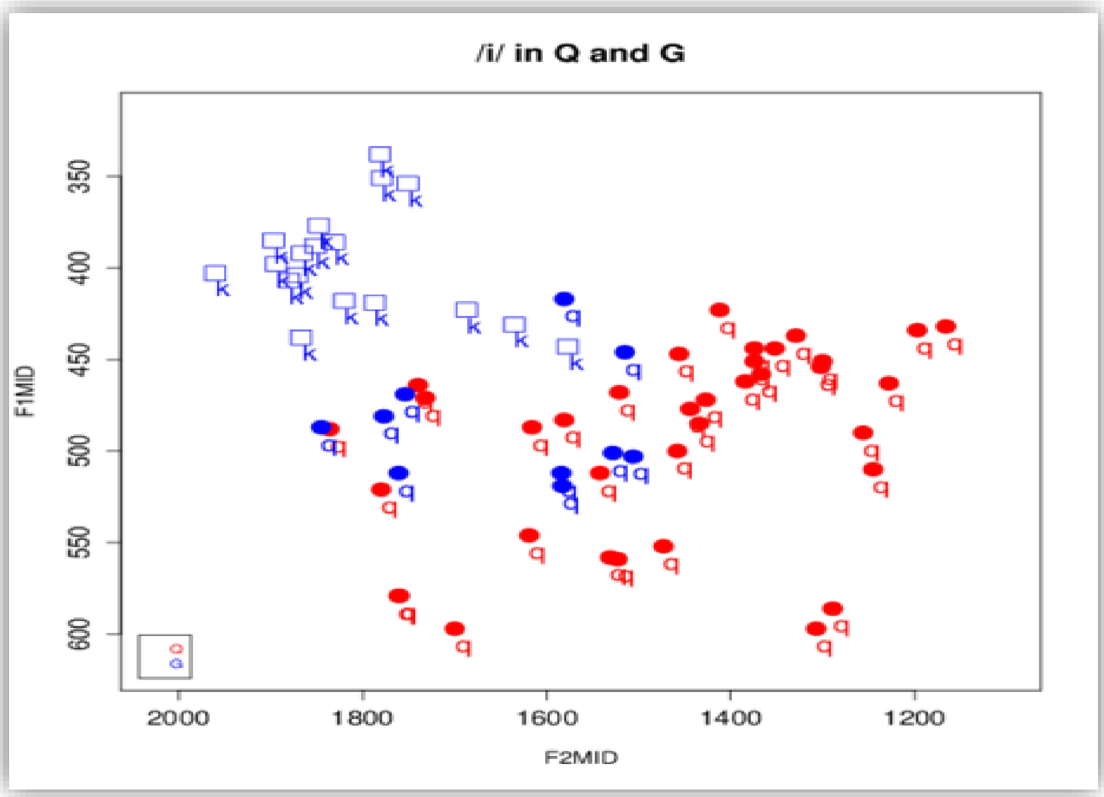

Figure 55: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 54 and Figure 55 illustrate the **/i/** variants as represented in the production of Qəltu and Gilit speakers of the token /waqt/ 'time' as [waqe̦t] in Qəltu and Gilit and as [wakit] in Gilit. High F1 and low F2 at the vowel onset compared to the vowel mid-point indicate [low,slightly rounded] variants in the production of Qəltu and Gilit speakers of /waqt/. On the other hand, high F2 at the vowel onset and mid-point in Gilit are indicative of raised, and fronted /i/ variants in the production of Gilit speakers of [wakit].

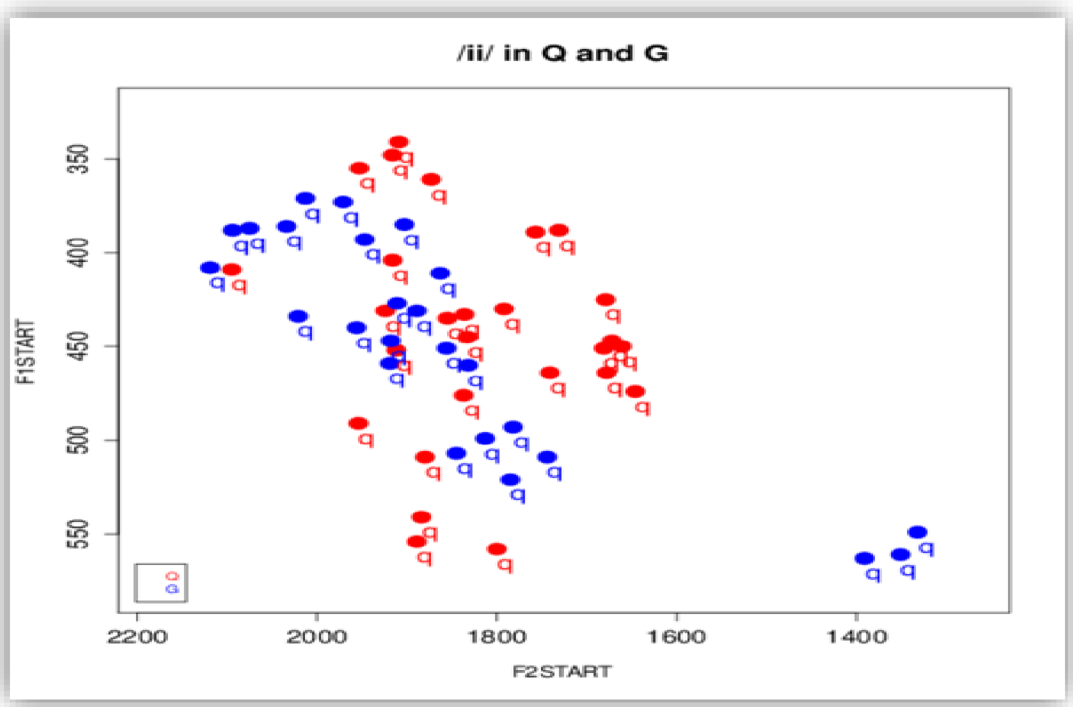

Figure 56: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

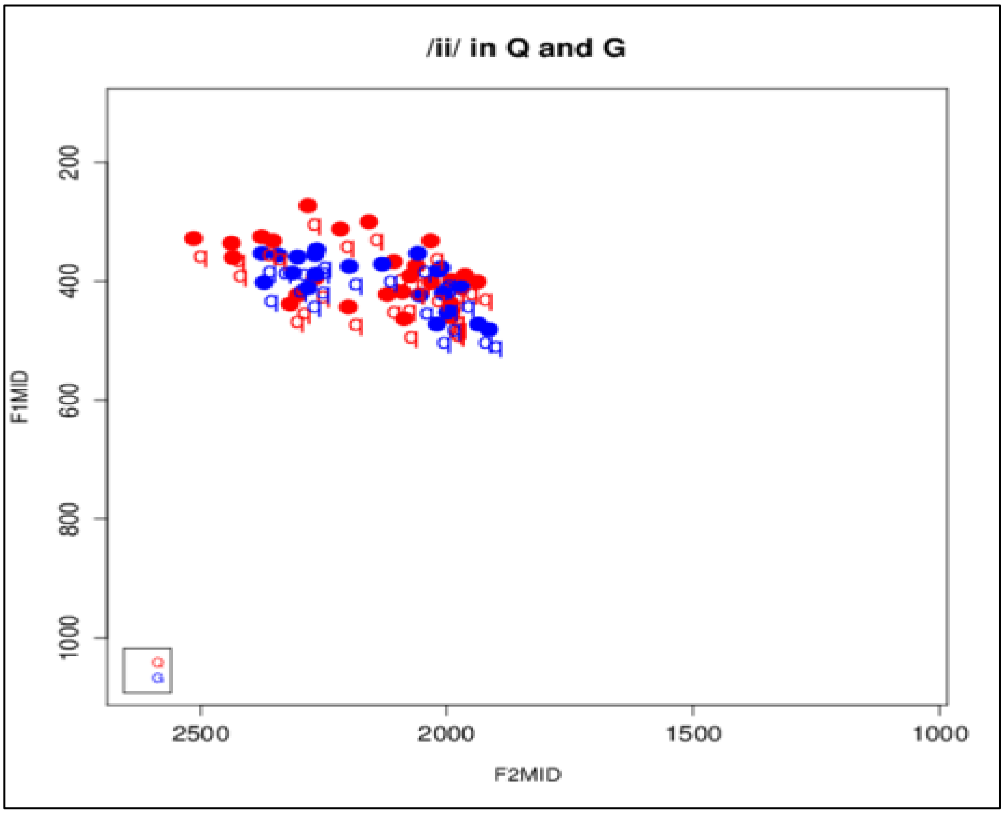

Figure 57: The /i:/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 56 and Figure 57 above illustrate the **/i**:**/** variants as represented in the production of the Qəltu and Gilit speakers of the token /daqi:qa/ 'minute'. High F1 and low F2 at the vowel onset compared to the mid-point indicate [centralised] /i/ variants in the given context.

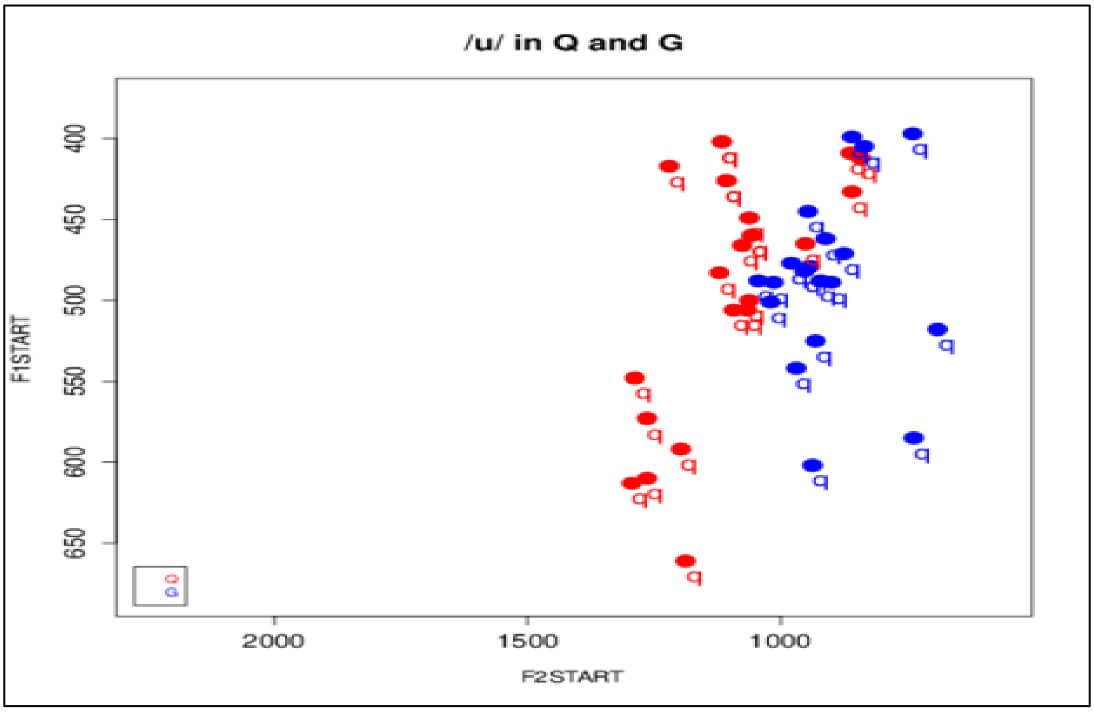

Figure 58: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

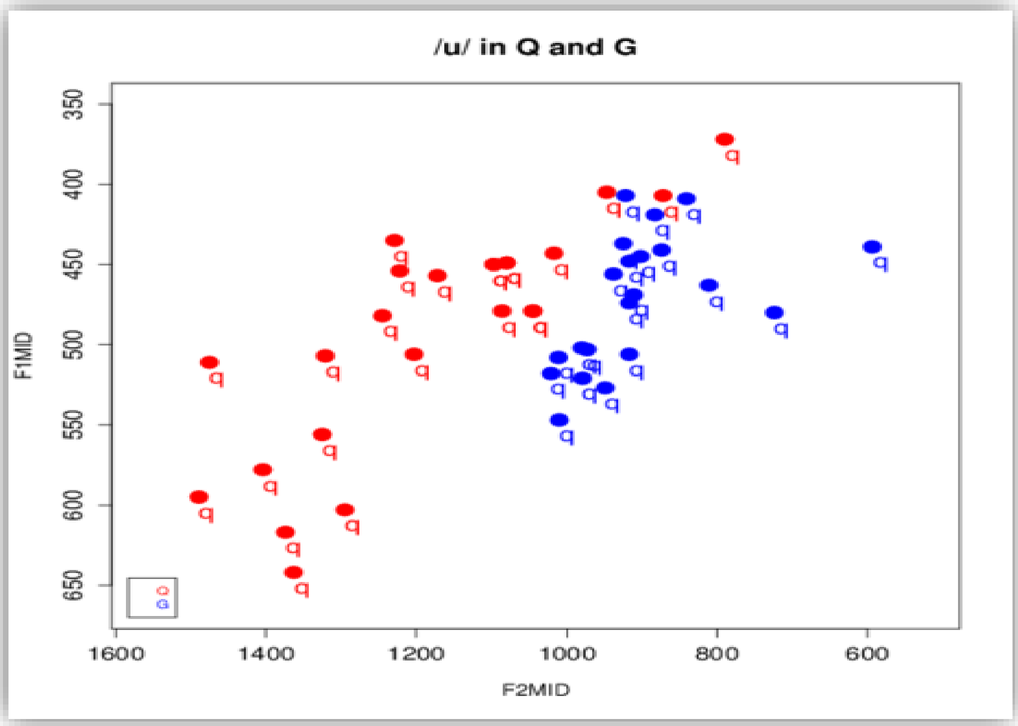

Figure 59: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 58 and Figure 59 above illustrate the **/u/** variants as represented in the production of the Qəltu and Gilit speakers of the token /qufl/ 'lock'. [retracted][ʊ] variants are reported in /qufl/ realised as [gʊfˤʊlˤ] in one form of vowel-consonant harmony compared to fronted /u/ variants in Qəltu with higher F1 compared to F1 in Gilit. Further details provided in section 4.9. High F1 and low F2 at the vowel mid-point compared to the vowel onset indicate the /u/ vowel resistance to lowering and backing.

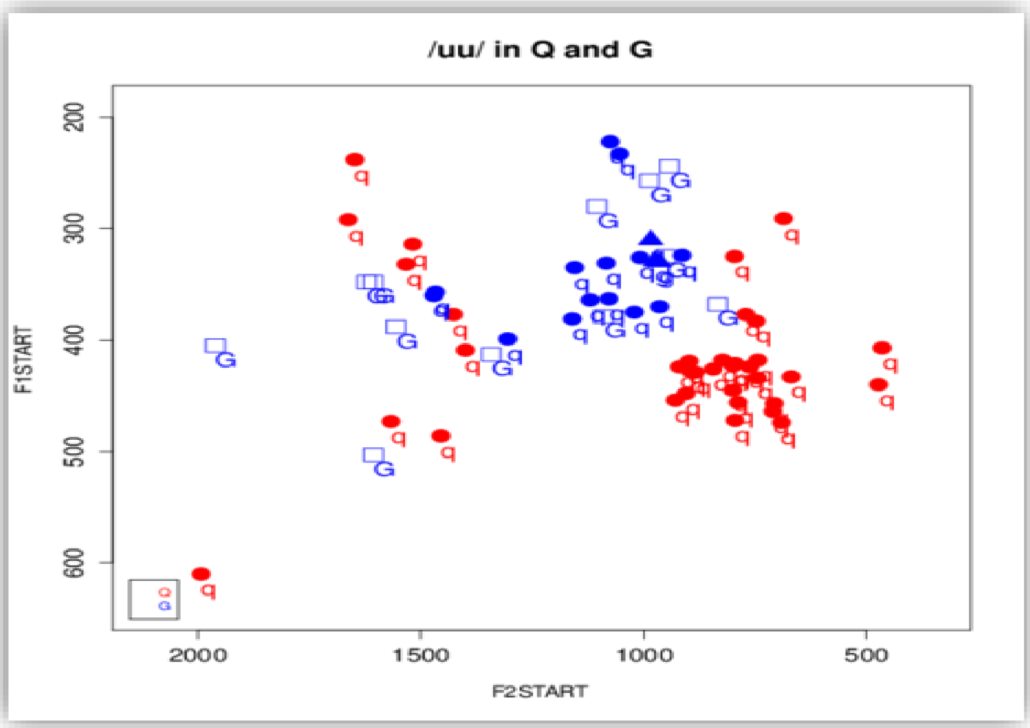

Figure 60: The /u:/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular /q/ context.

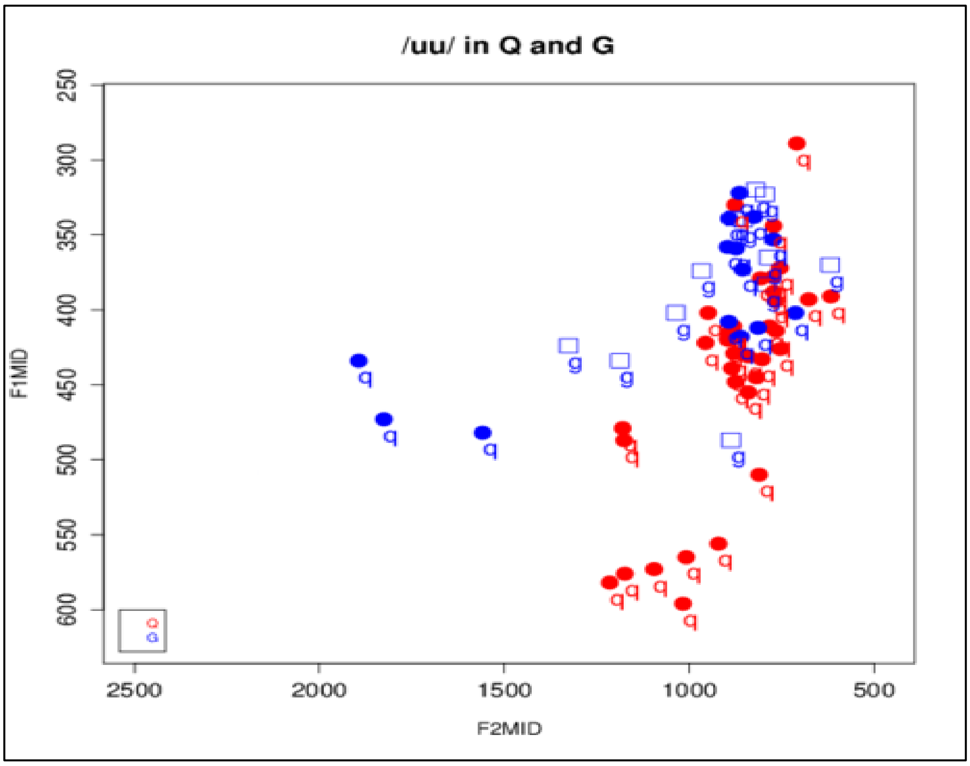

Figure 61: The /u:/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular /q/ context.

Figure 60 and Figure 61 illustrate the **/u:/** variants as represented in the production of the Qəltu and Gilit speakers of the token /jqu:mu:n/ 'they stood' produced as [jqu:mu:n] in Qəltu and Gilit and as [jgu:mu:n] with /q/ realised as [g] in Gilit. The rise in F1 and lowering in F2 at the vowel mid-point compared to the vowel onset indicate resistance to lowering at the vowel onset in the /u:/ vowel. However, further lowering and of /u:/ are represented in higher F1, and lower F2 in Qəltu compared to Gilit.

6.3.3 The F1-F2 of the target vowels in the uvulars /χ/, and /ʁ/ contexts in Qəltu and Gilit

The F1-F2 vowel plots below represent the different vowel variants of each of the target vowels / a/, /a :/, /i/, / i:/. /u/. /u :/ vowels as represented in all tokens for all speakers in the uvular fricatives' /χ, ʁ/ context in Qəltu and Gilit.

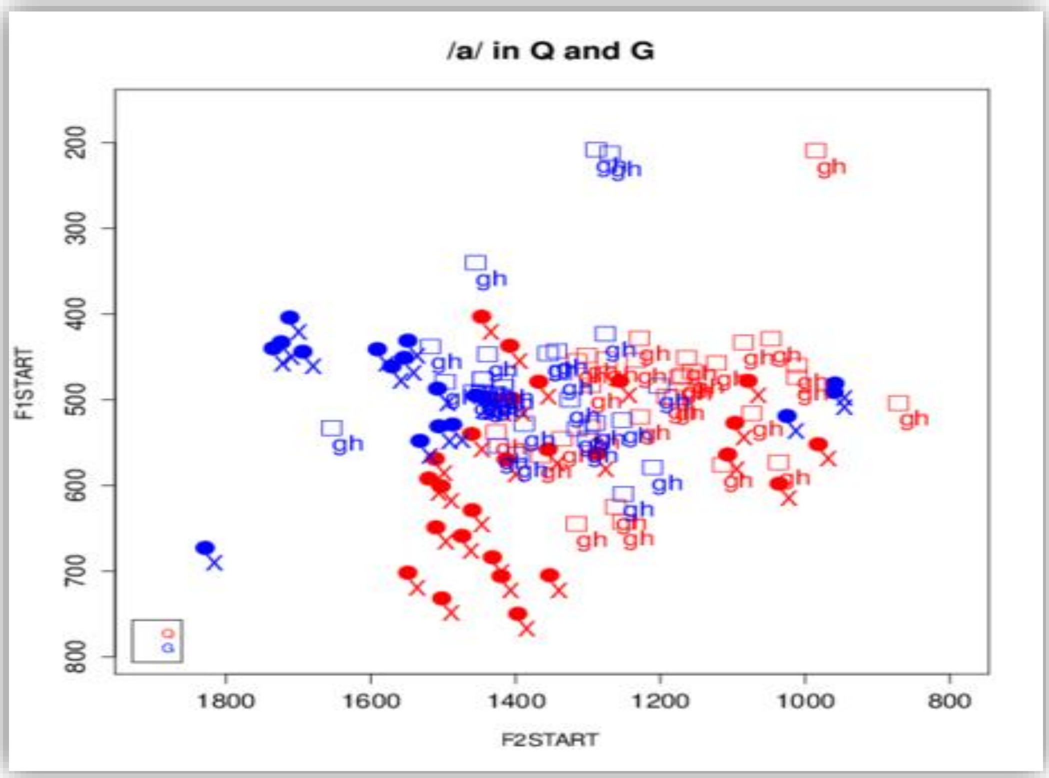

Figure 62: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ/ and / ʁ/ contexts.

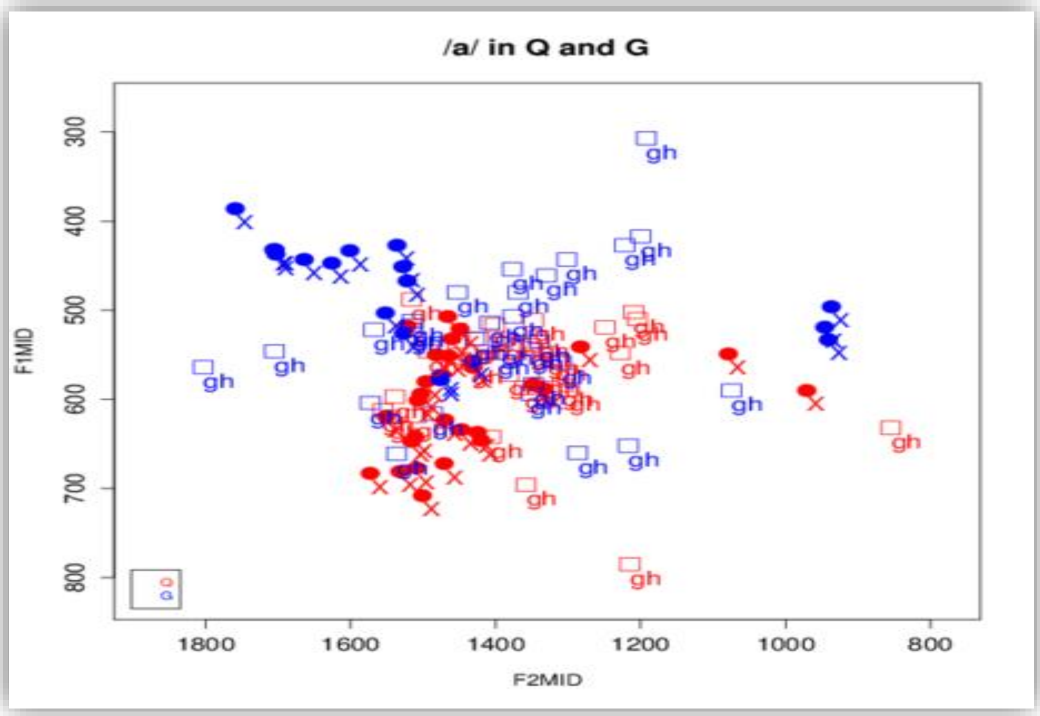

Figure 63: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ/ and / ʁ/ contexts.

Figure 62 and Figure 63 above represent the **/a/** variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset and mid-point in the uvular fricatives' / χ/ and / ʁ/ in the tokens / χasaf/ 'pulled down' and / ʁazaːl/ 'deer'. Higher F1 and lower F2 at the vowel onset and mid-point in Qəltu compared to Gilit indicate [lower] and [back] /a/ variants in the above contexts in Qəltu compared to Gilit.

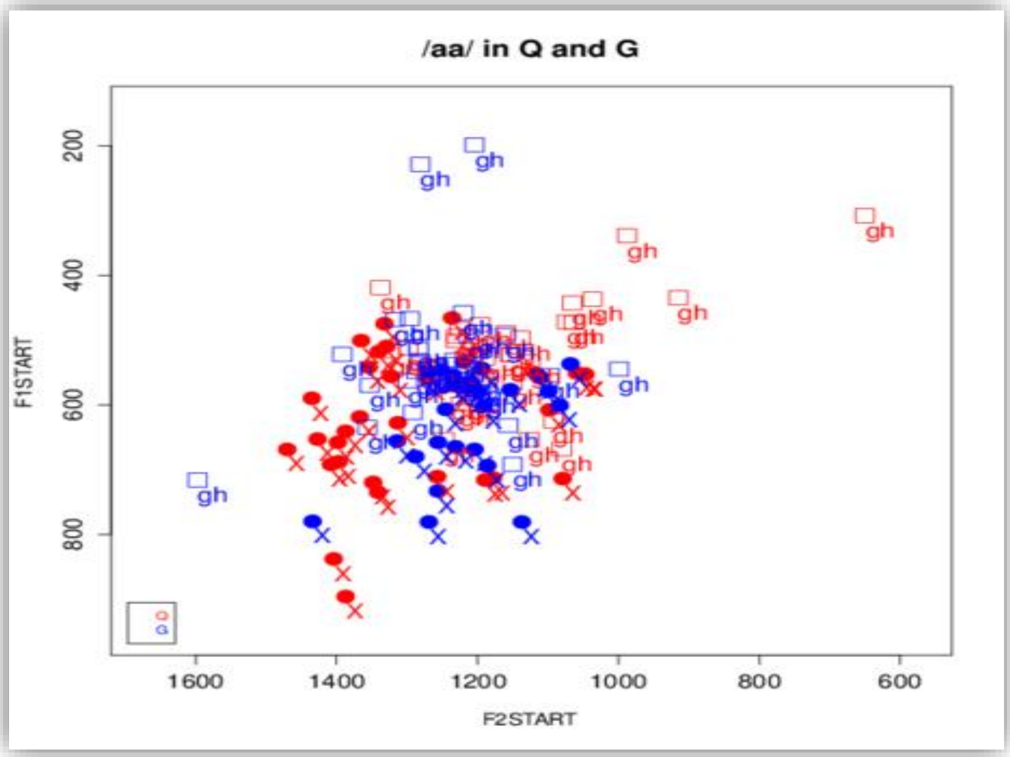

Figure 64: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ/ and / ʁ/ contexts.

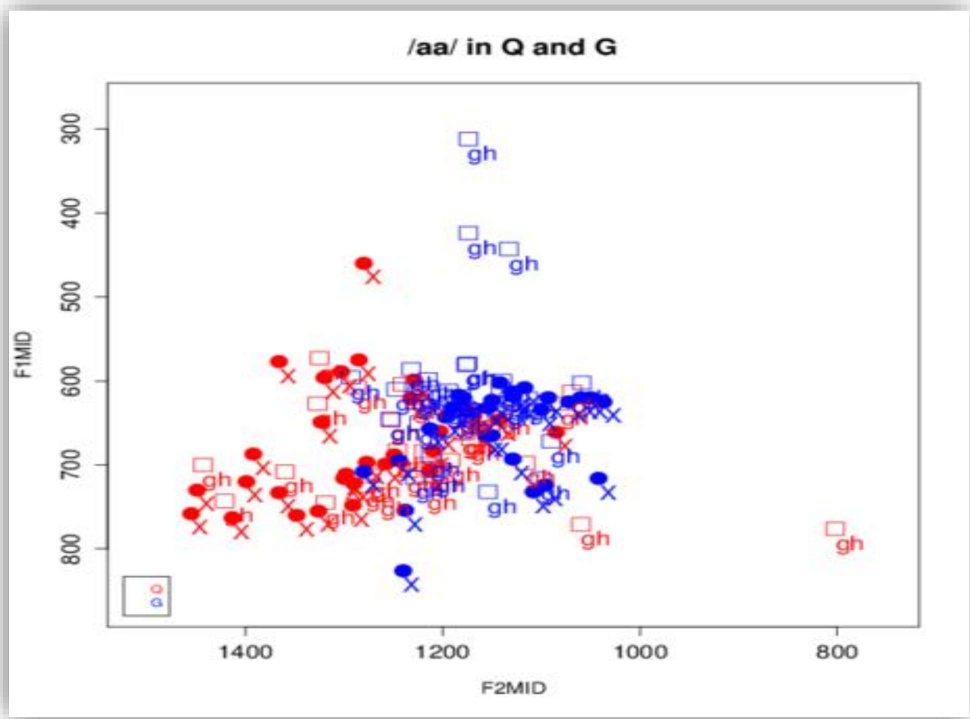

Figure 65: The /aː/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ/ and / ʁ/ contexts.

Figure 64 and Figure 65 above illustrate the syllable intitial **/a:/** variants as represented in the production of the the Qəltu and Gilit speakers of the tokens / χa:la:t/ 'aunts' and / ʁa:ba:t/ 'forests'. [low] /a:/ variants are represented in Qəltu with higher F1, and [back] /a:/ variants are represented in Gilit with lower F2.

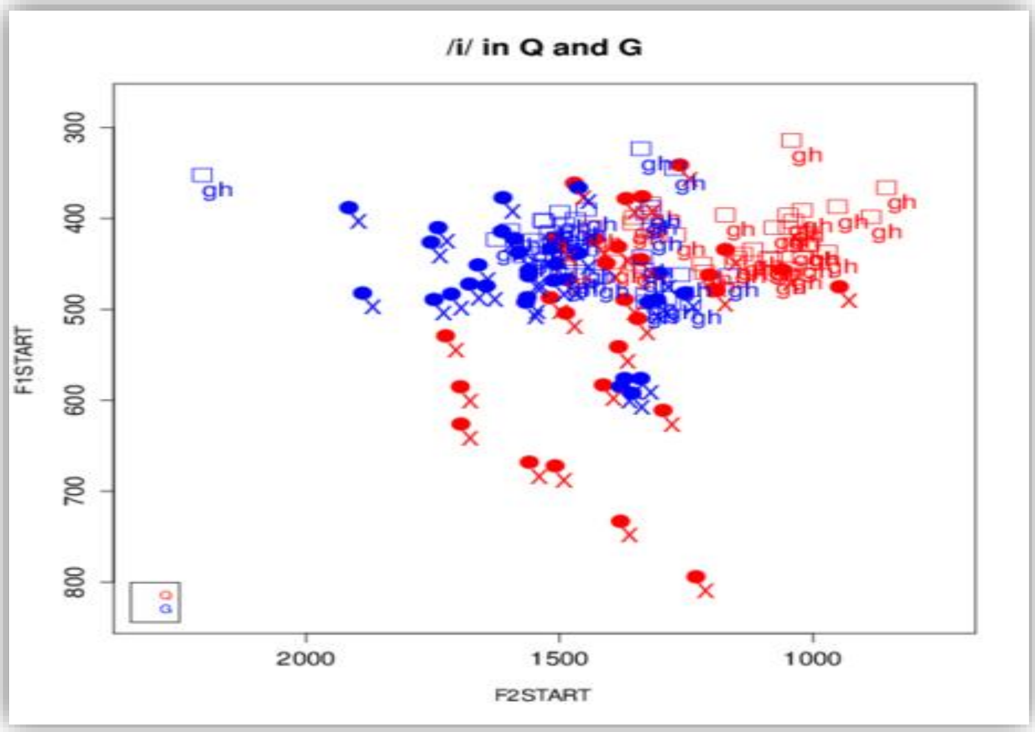

Figure 66: The /i/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ/ and / ʁ/ contexts.

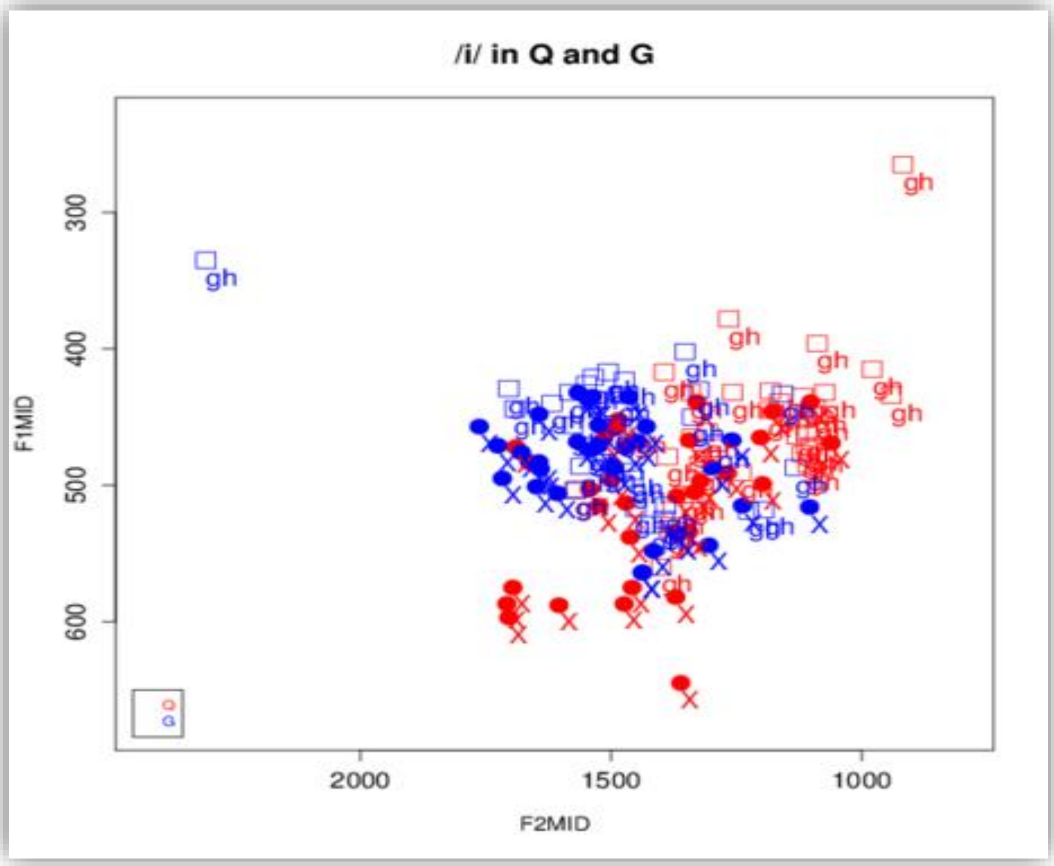

Figure 67: The /i/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ/ and / ʁ/ contexts.

Figure 66 and Figure 67 above illustrate the **/i/** variants as represented in the in the production of the the Qəltu and Gilit speakers of the tokens / χift/ 'I got scared', and / ʁibt/ 'I was absent'. Further details provided in section 4.9.

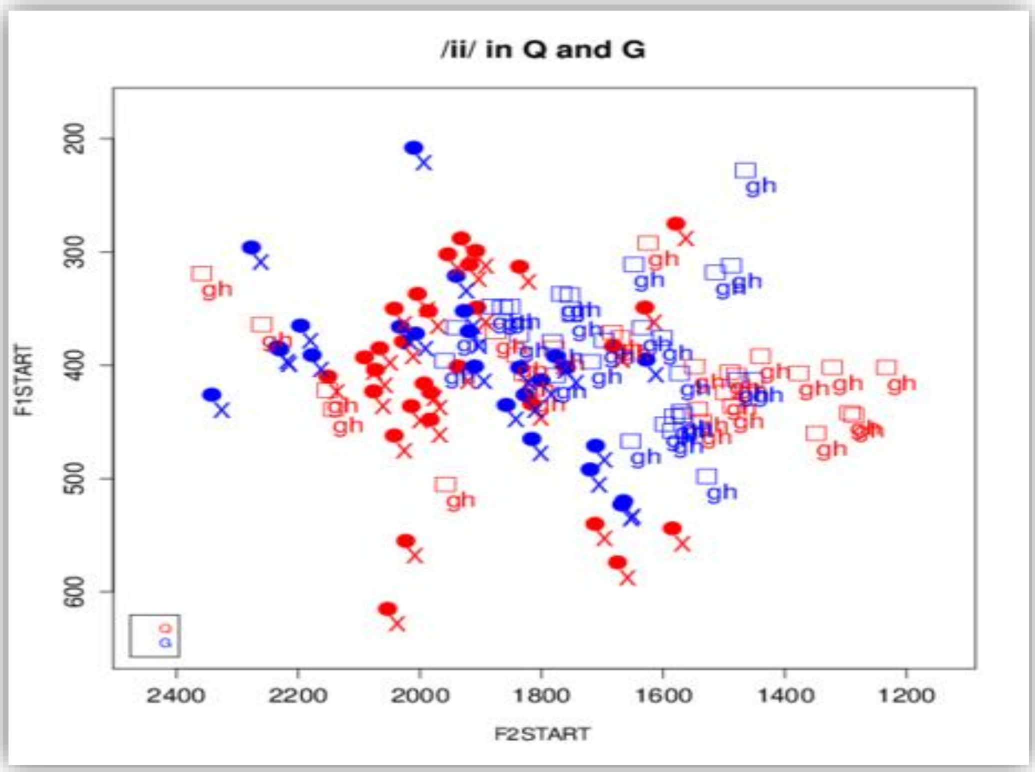

Figure 68: The /iː/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ/ and / ʁ/ contexts.

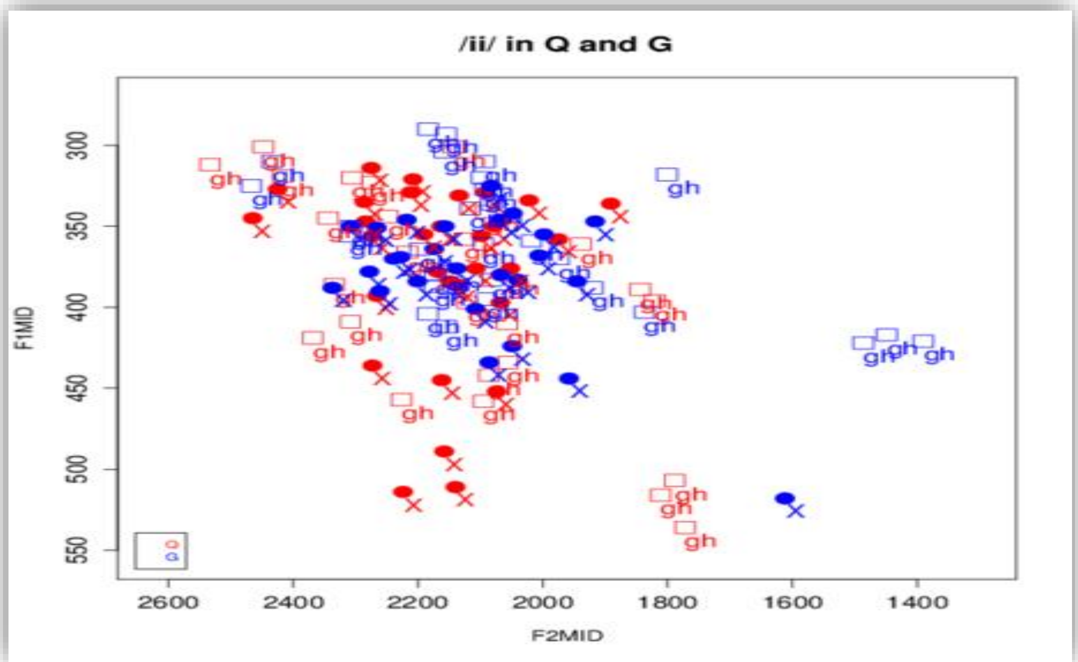

Figure 69: The /iː/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ / and / ʁ/ contexts.

Figure 68 and Figure 69 illustrate the **/i**:**/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /χiːra/ 'goodness', and /ʁiːba/ 'gossip'. There is a rise in F1 and lowering in F2 at the vowel onset compared to the vowel mid-point indication of [low, [back] /iː/ variants. However, the rise in F1 and lowering in F2 is not salient in Qəltu and Gilit compared to the rise in F1 and lowering in F2 of the short /i/ vowel.

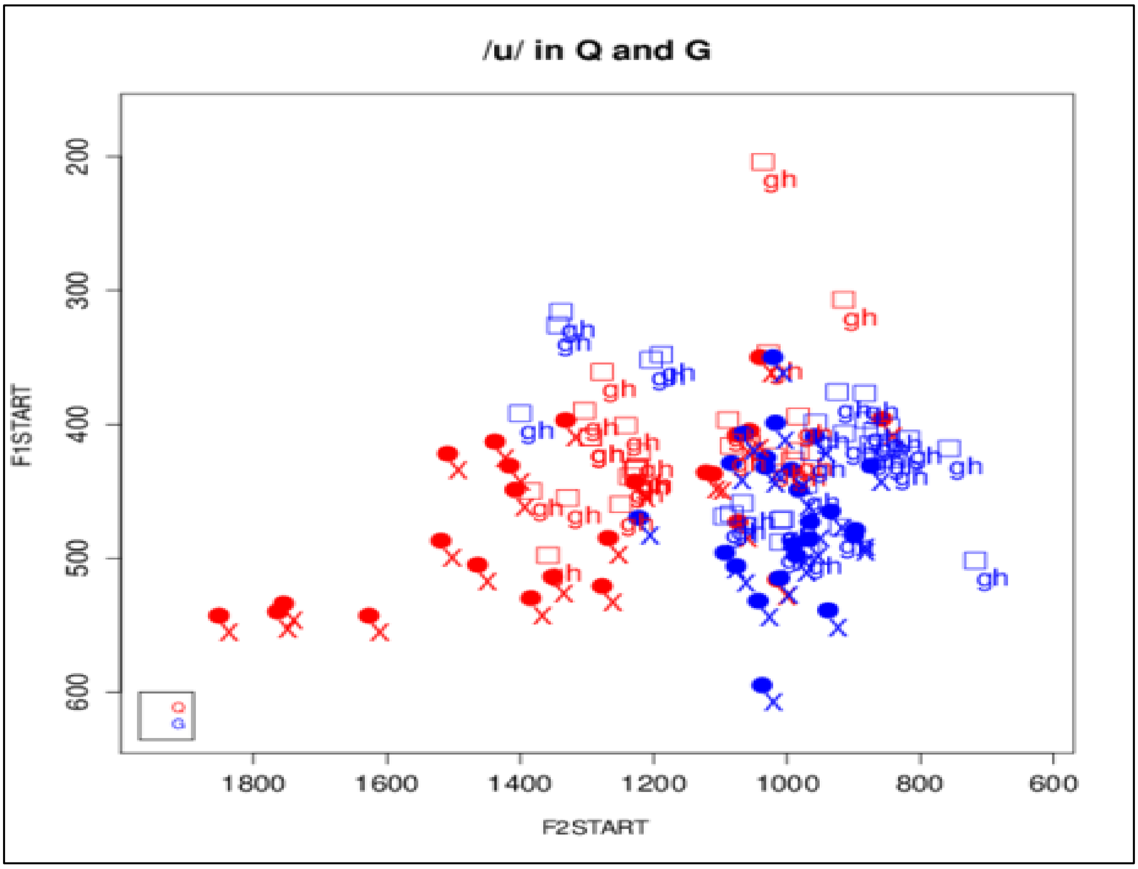

Figure 70: The /u/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ / and / ʁ/ contexts.

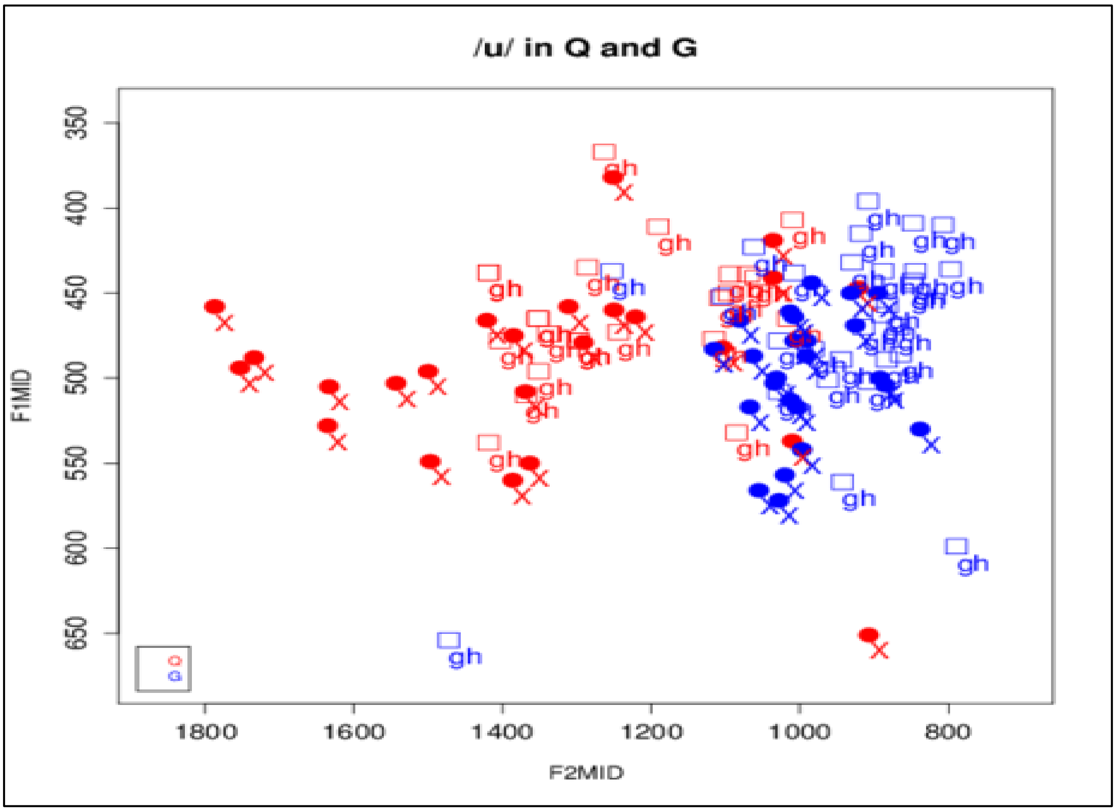

Figure 71: The /u/variants as represented in the production of the the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ / and / ʁ/ contexts.

Figure 70 and Figure 71 illustrate the /u/ variants as represented in the production of the Qəltu and Gilit speakers of the tokens /χulq/ 'patience', and / ʁubn/ 'deception'. The /i/ and /u/ variants occur in complimentary distribution in Gilit in these contexts as discussed earlier in chapter four compared to Qəltu.

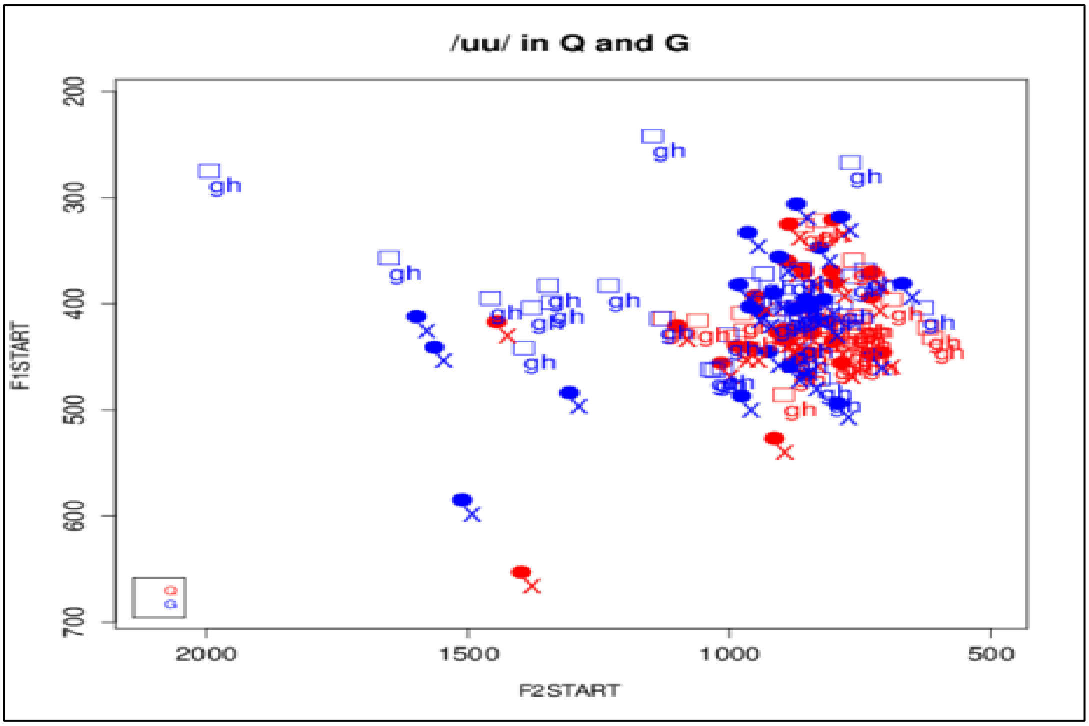

Figure 72: The /u:/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel onset in the uvular fricatives' / χ / and / ʁ/ contexts.

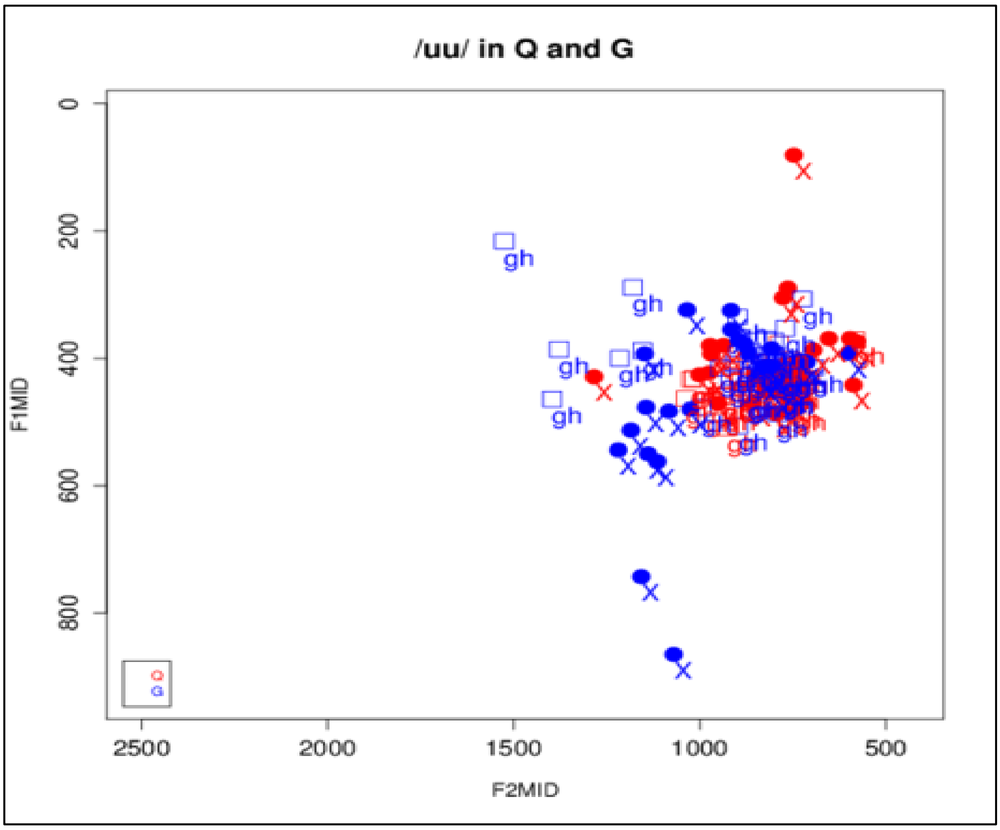

Figure 73: The /u:/ variants as represented in the production of the the Qəltu and Gilit speakers at the vowel mid-point in the uvular fricatives' / χ / and / ʁ/ contexts.

Figure 72 and Figure 73 above illustrate the /uː/ variants as represented in the production of the the Qəltu and Gilit speakers of the tokens /jχuːnuːn/ 'betray' and /jʁuːruːn/ 'initiate a fight'. The rise in F1 and lowering in F2 at the vowel onset and mid-point indicative of [low] /uː/ variants. Further [back] /uː/ variants are suggested in the / χ/, and /ʁ/ contexts in Qəltu, and [low] /uː/ variants are suggested in the /χ/ context in Gilit.

6.3.4 The F1-F2 of the target vowels in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts in Qəltu and Gilit.

The F1-F2 vowel plots below represent the different vowel variants of each of the target vowels /a/, /a :/, /i/, / i:/. /u/. /u :/ vowels as represented in all tokens for all speakers in the pharyngealized coronals' contexts in Qəltu and Gilit.

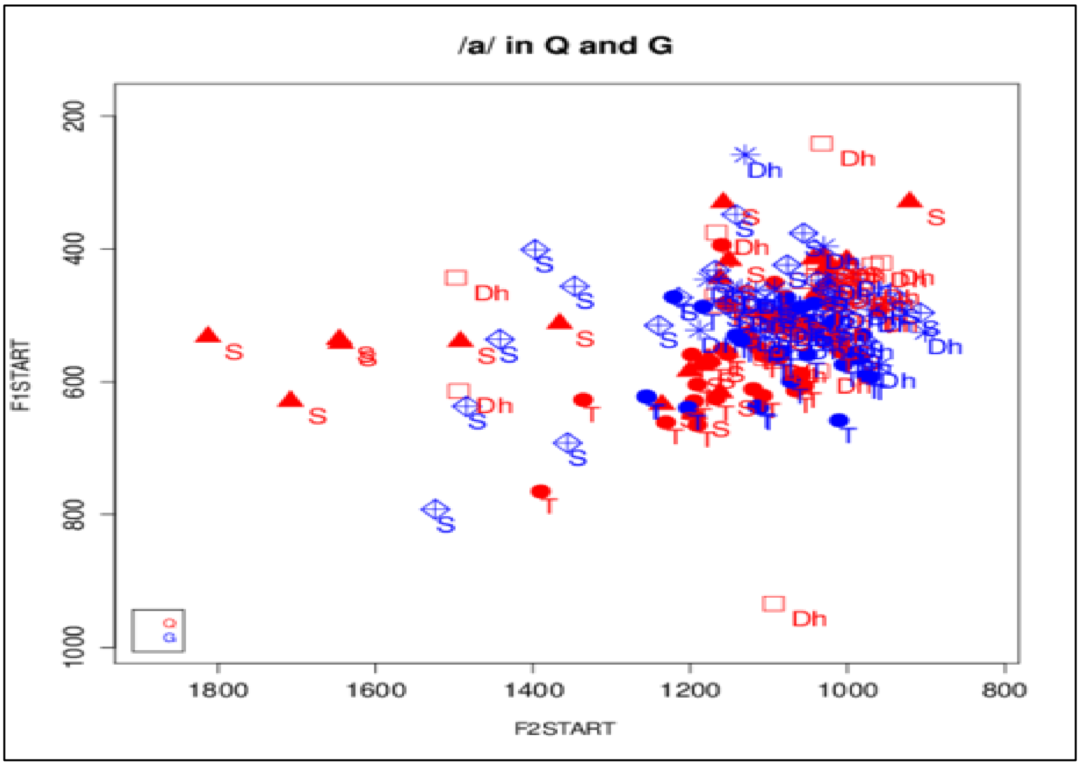

Figure 74: The /a/variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

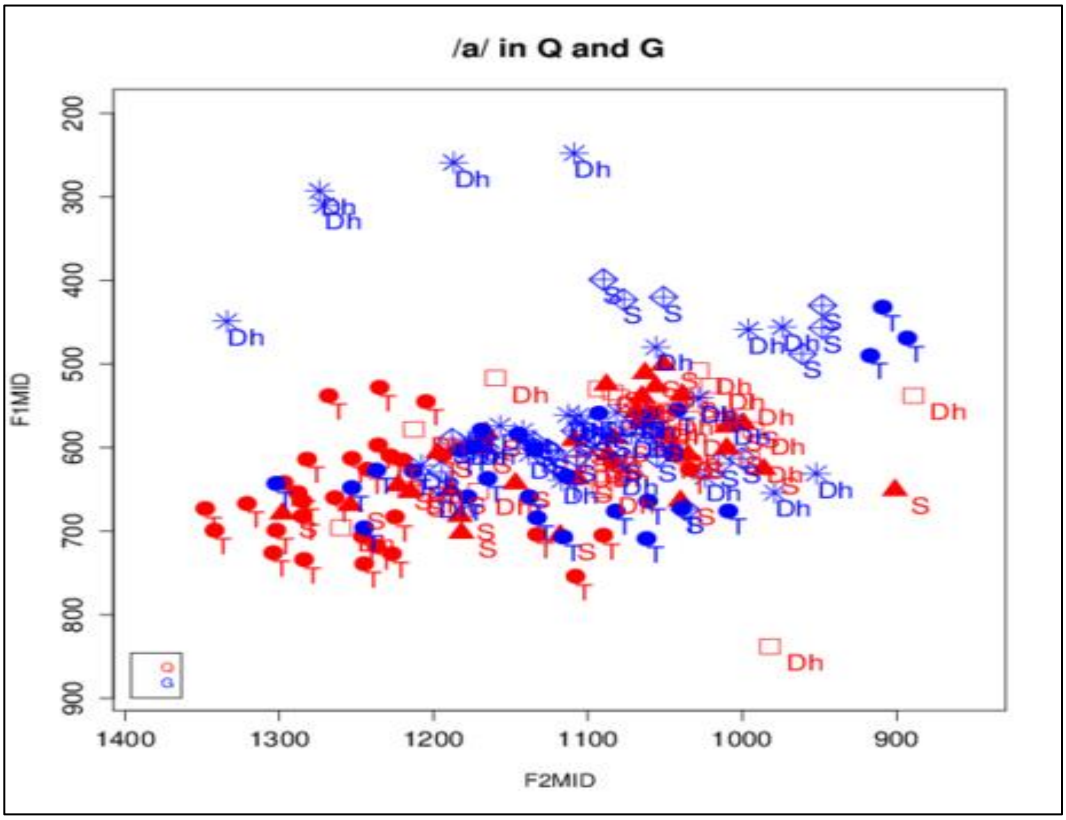

Figure 75: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

Figure 74 and Figure 75 illustrate the **/a/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /tˤalab/ 'he requested', / ðˤafar/ 'he succeeded', and /sˤabar/ 'he stood patient. Details provided in section 4.9.

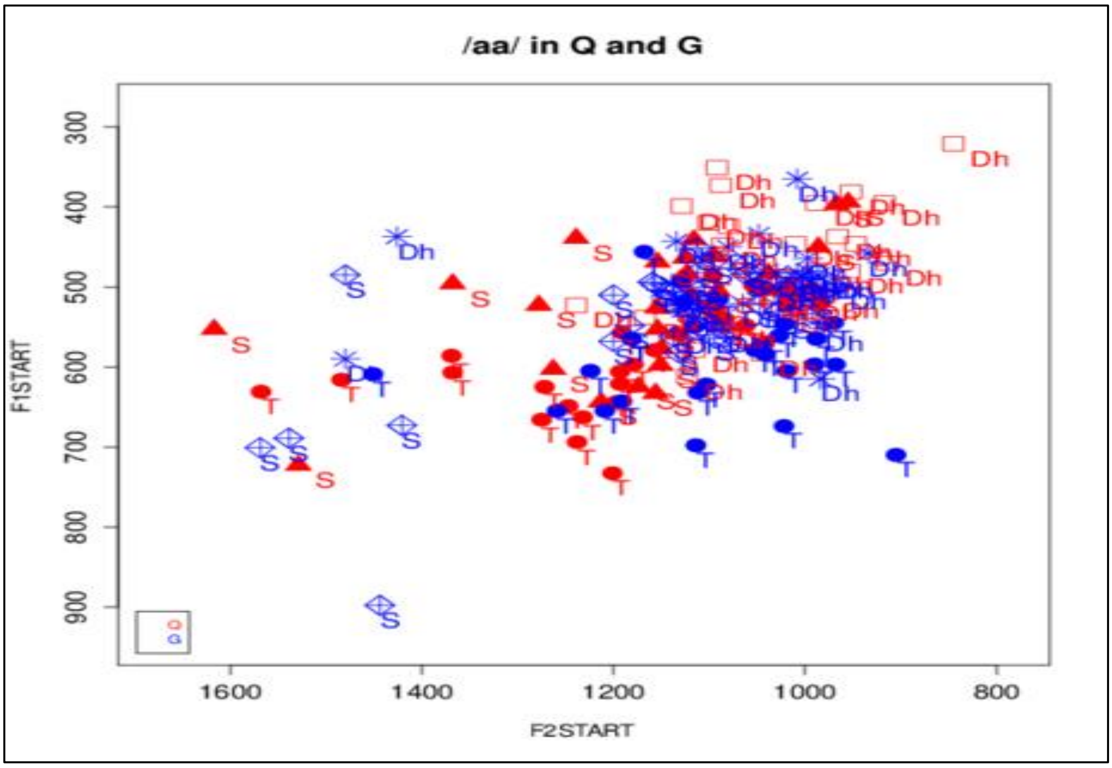

Figure 76: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

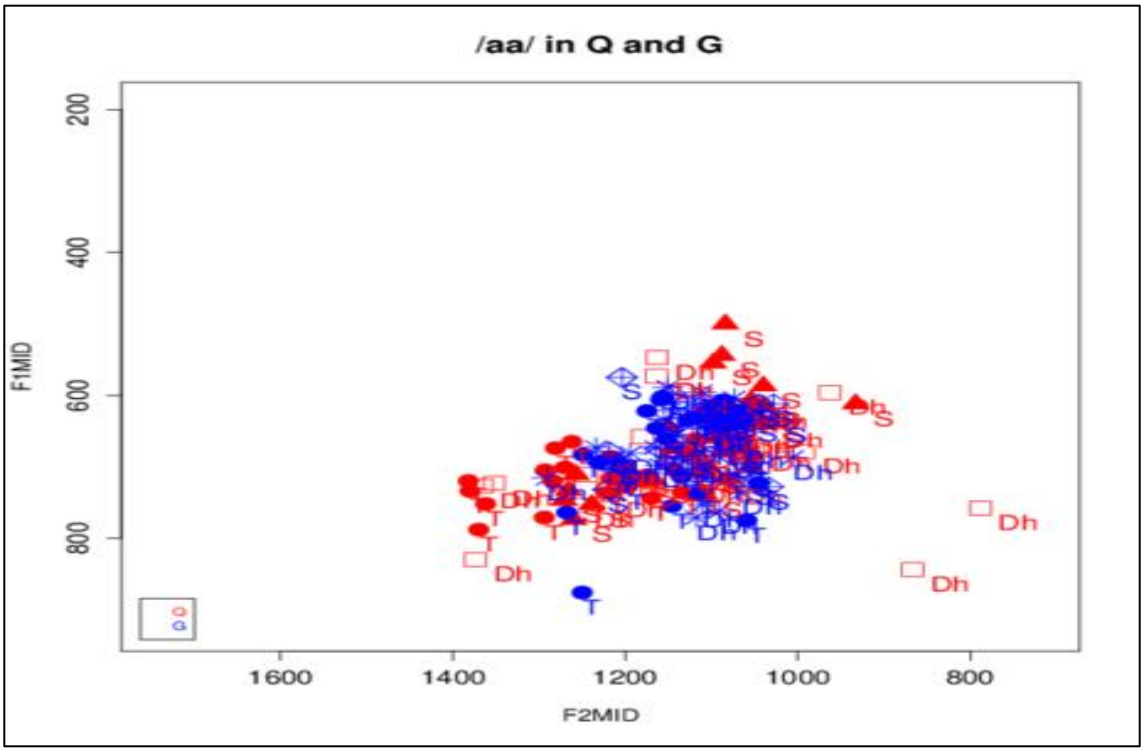

Figure 77: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

Figure 76 and Figure 77 illustrate the **/a:/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /tˤa:lib/ 'student', /ðˤa:fir/ 'successor', and /sˤa:ffa:t/ 'classes'. Higher F1 at the vowel mid-point compared to the vowel onset indicate /a:/ resistance to lowering at the vowel onset. However, further [low] /a:/ variants are represented in the /tˤ/, and /ðˤ/ contexts in Qəltu with higher F1 compared to F1 in the same contexts in Gilit, and further [low] /a:/ variants with higher F1 in the /sˤ/ context in Gilit compared to F1 in the same context in Qəltu. Additionally, further [back] /a:/ variants are represented in the /sˤ/, and /ðˤ/ contexts in Qəltu with lower F2 compared to F2 in the same context in Gilit, and further [back] /a:/ variants with lower F2 are represented in the /tˤ/ context in Gilit compared to F2 in the same context in Qəltu. This suggest that the pharyngealized coronal /tˤ/ in Gilit is represented with further posterior constriction in the oral cavity while the constriction for the pharyngealized coronals /ðˤ/ and /sˤ/ is further back in Qəltu.

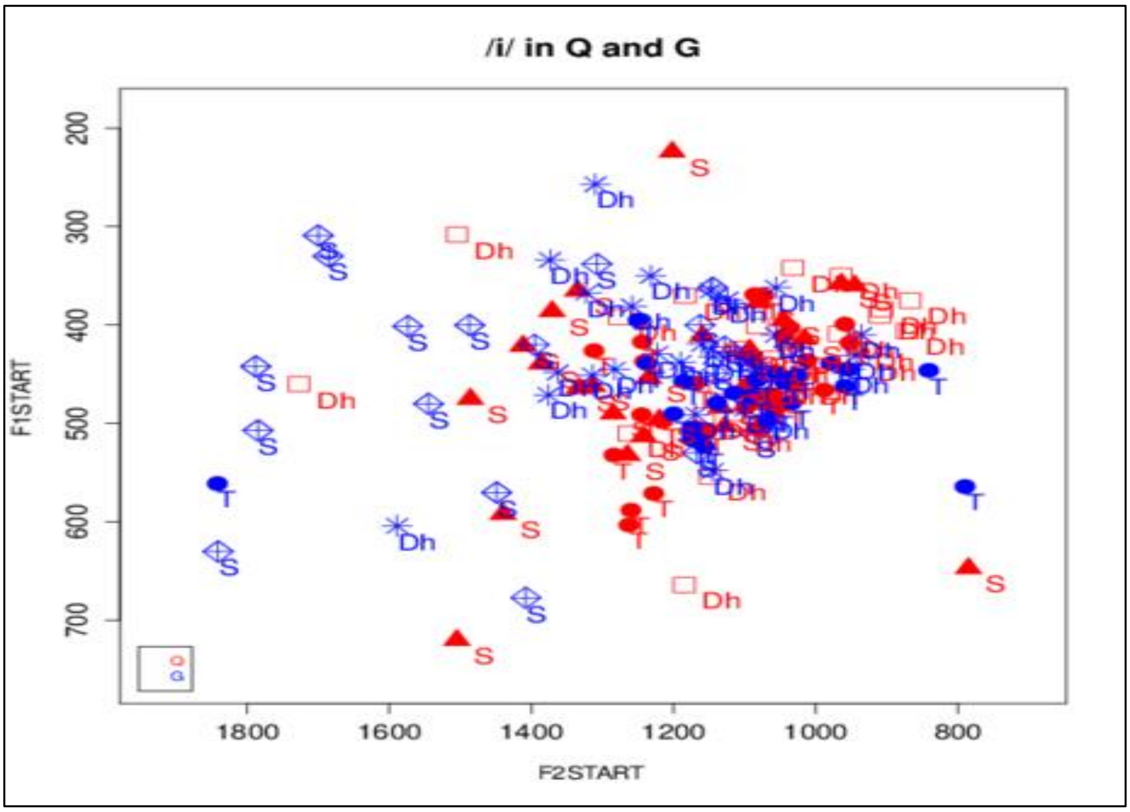

Figure 78: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

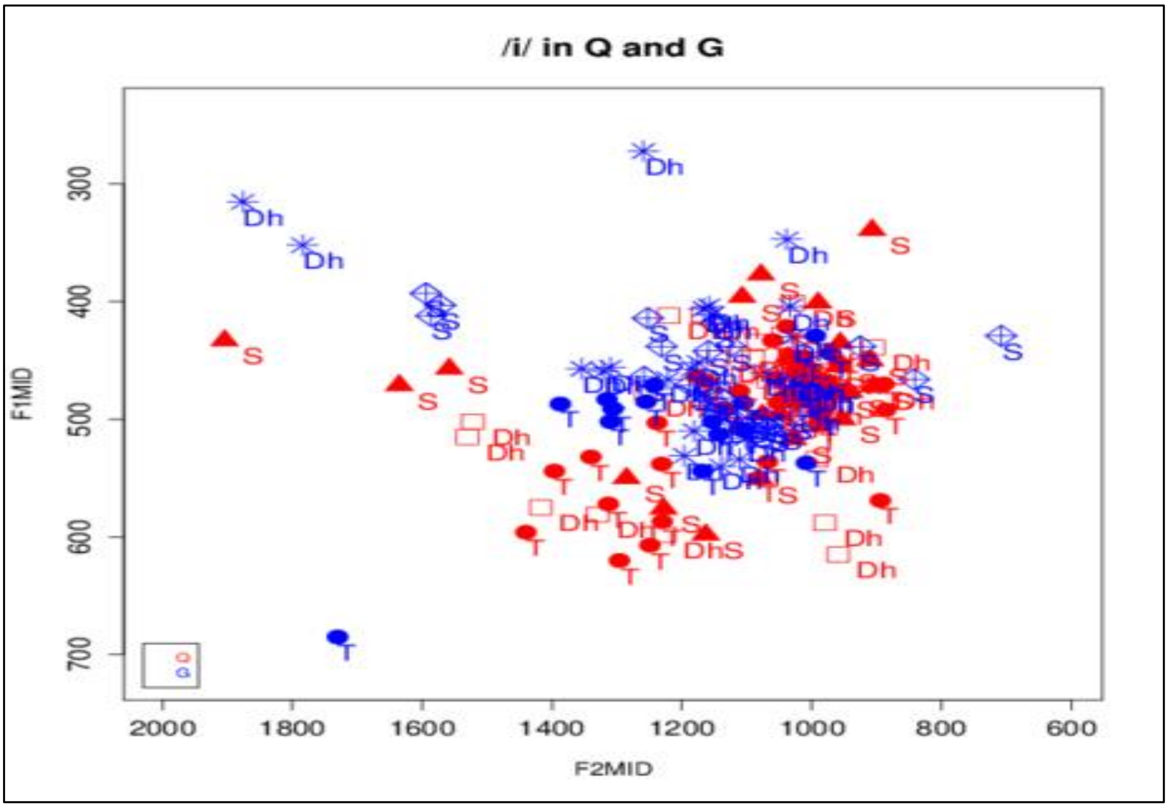

Figure 79: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ / contexts.

Figure 78 and Figure 79 illustrate the **/i/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /tˤift/ 'I floated', / ðˤift/ 'I added', and / sˤifr/ 'zero'. The /i/ variants are represented with higher F1 in the **/**tˤ/, and / sˤ / contexts in Gilit compared to Qəltu indicative of backing and rounding when secondary emphatics are present in the phonological word. The /u/ variants occur in complimentary distribution in the same contexts in Gilit.

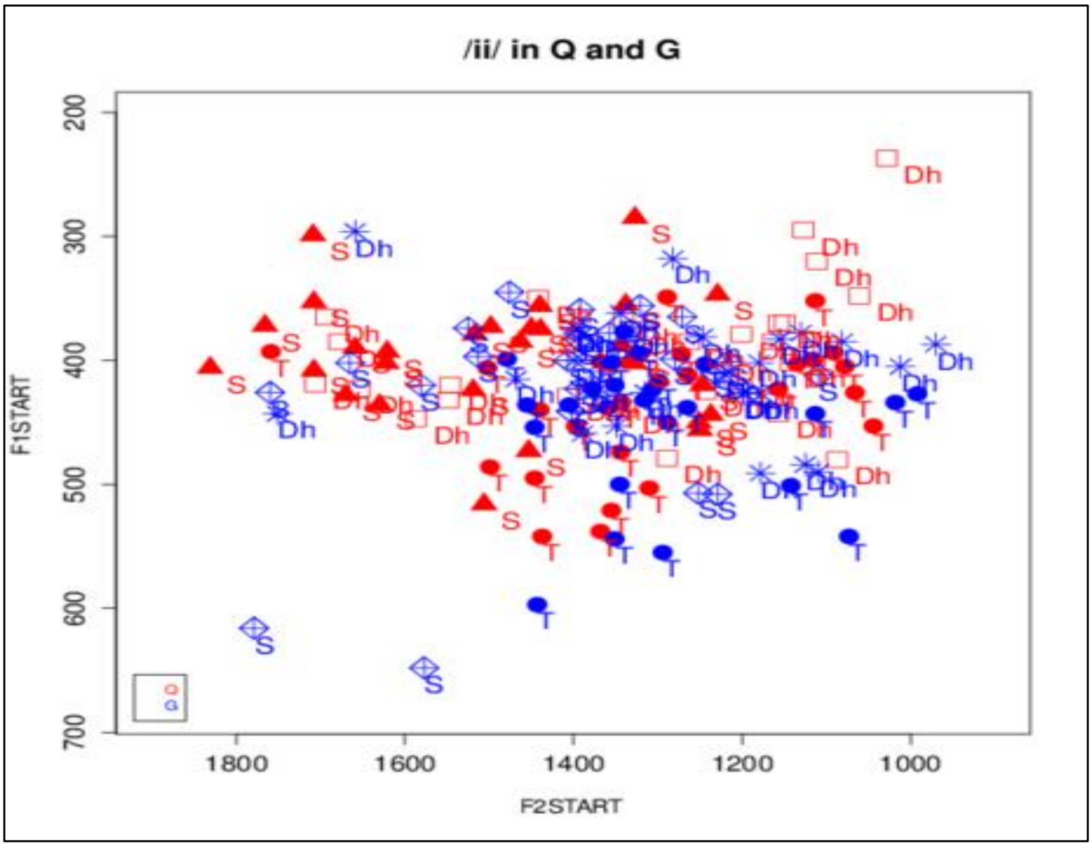

Figure 80: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

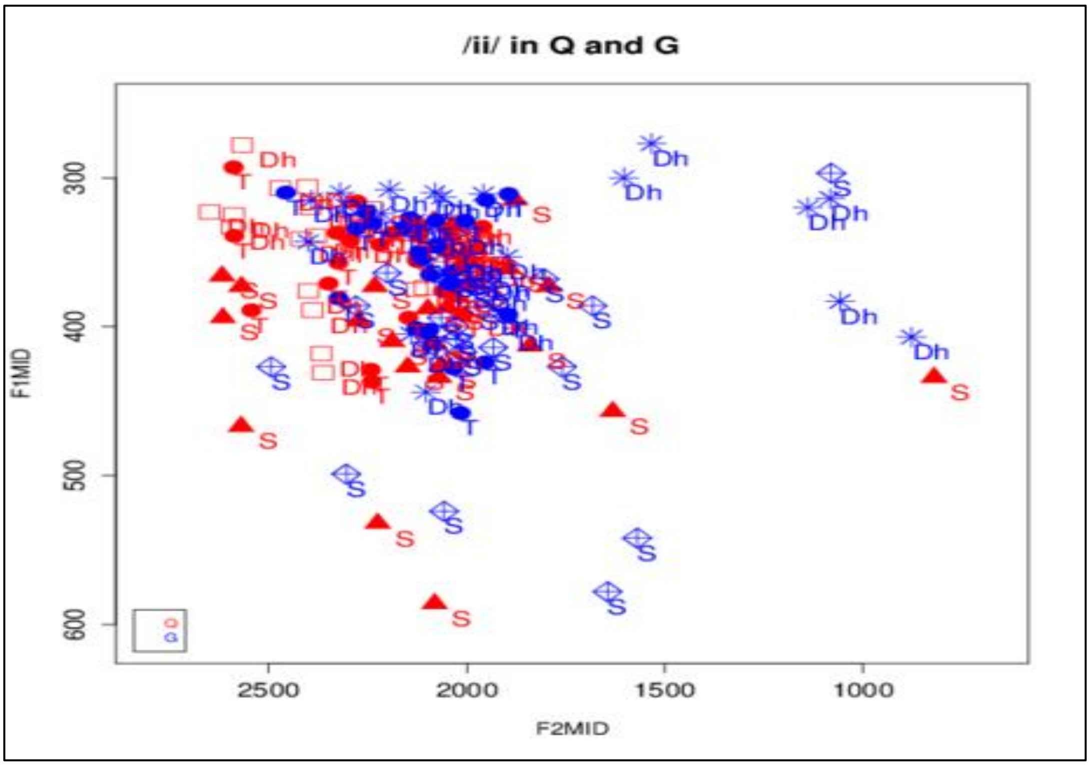

Figure 81: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

Figure 80 and Figure 81 illustrate the **/i:/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens /tˤi:ba/ 'purity', / ðˤi:fa/ you (m.s.) add it', and / sˤi:nijja:t/ 'trays'. Higher F1 and lower F2 at the vowel onset compared to the mid-point indicate [low], and [back] /i:/ variants. However, further [low], and [back] /i:/ variants are represented in Gilit with lower F2 compared to F2 in Qəltu.

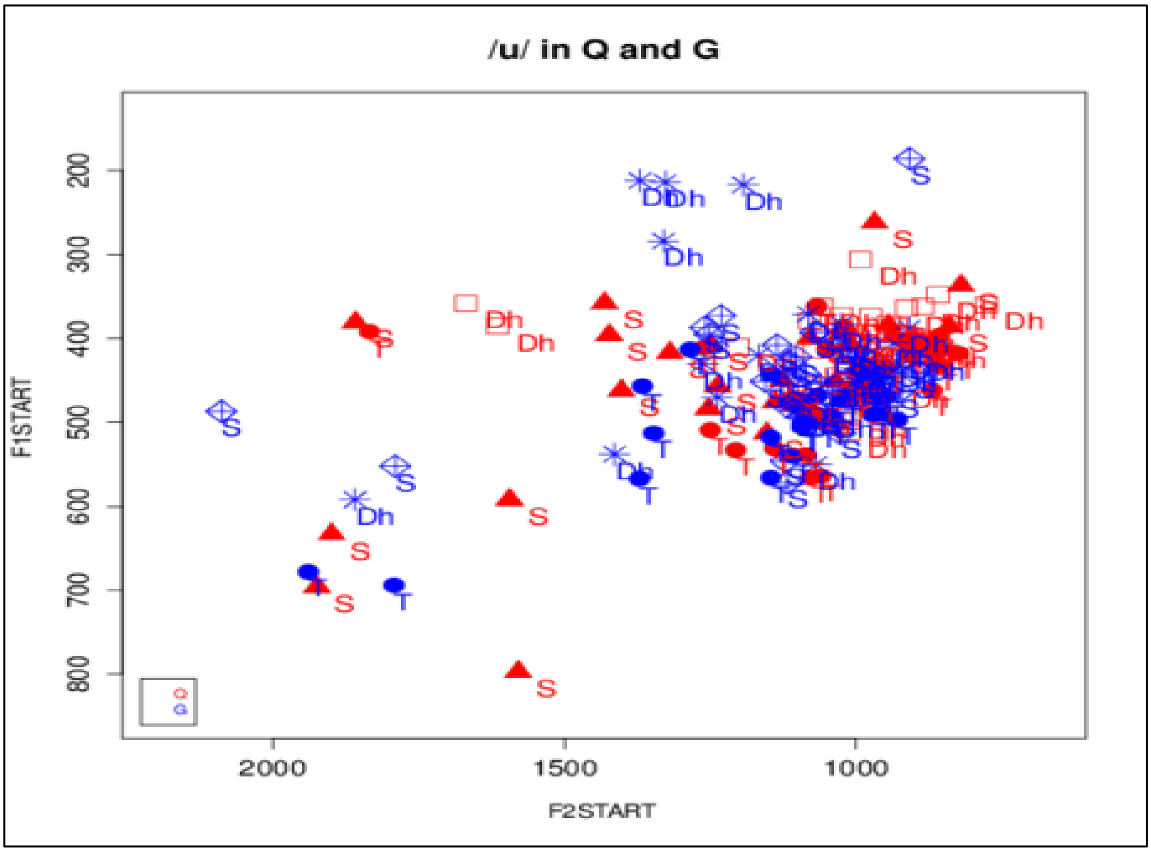

Figure 82: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

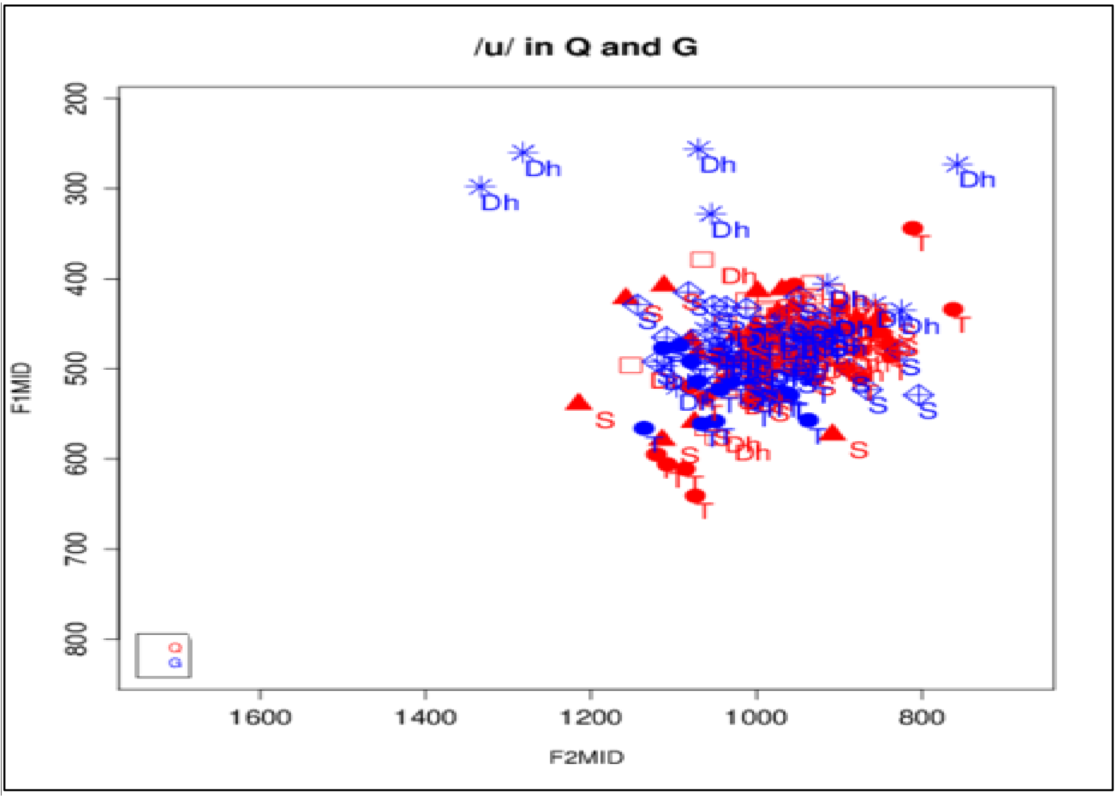

Figure 83: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

Figure 82 and Figure 83 illustrate the **/u/** variants as represented in the production of the Qəltu and Gilit speakers of the tokens / tˤuruq/ 'roads', / ðˤufr/ 'finger nail', and / sˤufr/ 'yellowish'. Higher F1, and lower F2 at the vowel mid-point compared to the vowel onset indicate /u/ resistance to lowering at the vowel onset. The /u/ variants are represented with higher F1 in the /tˤ/, and / sˤ/ contexts in Gilit compared to F1 in the same contexts in Qəltu, and [low] /u/ variants are represented in the /ðˤ/ context in Qəltu with higher F1 compared to F1 in the same context Gilit.

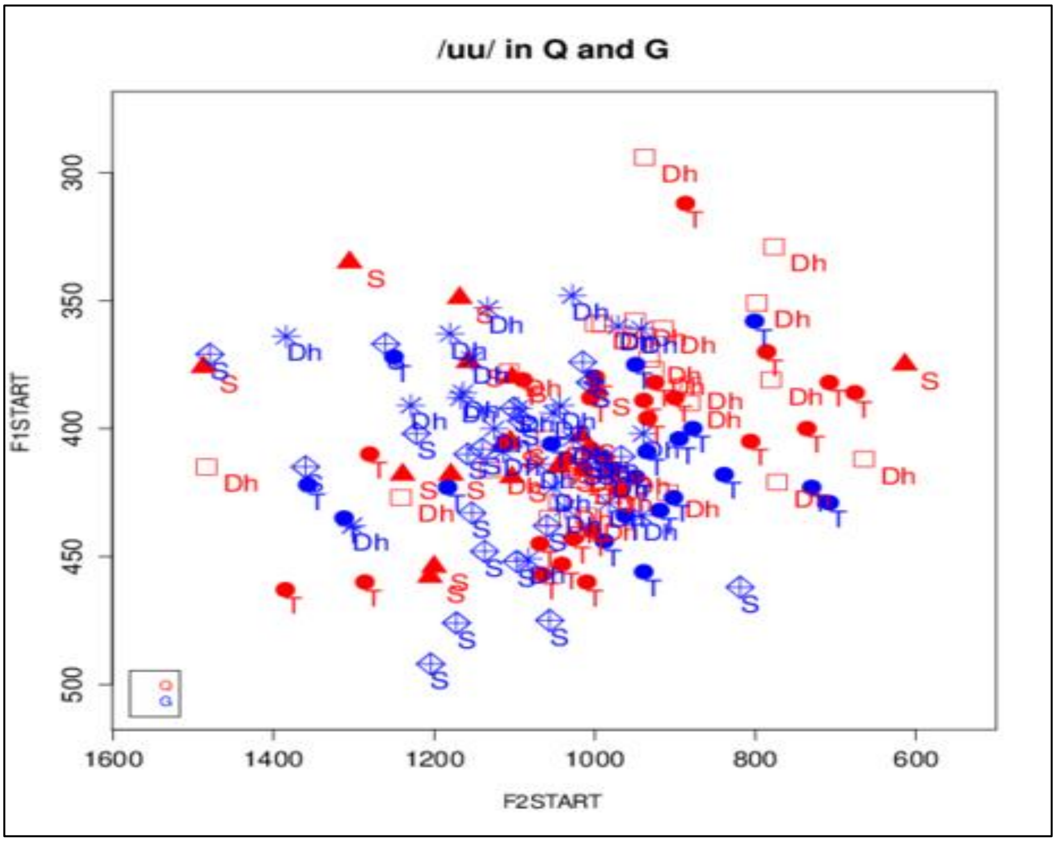

Figure 84: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

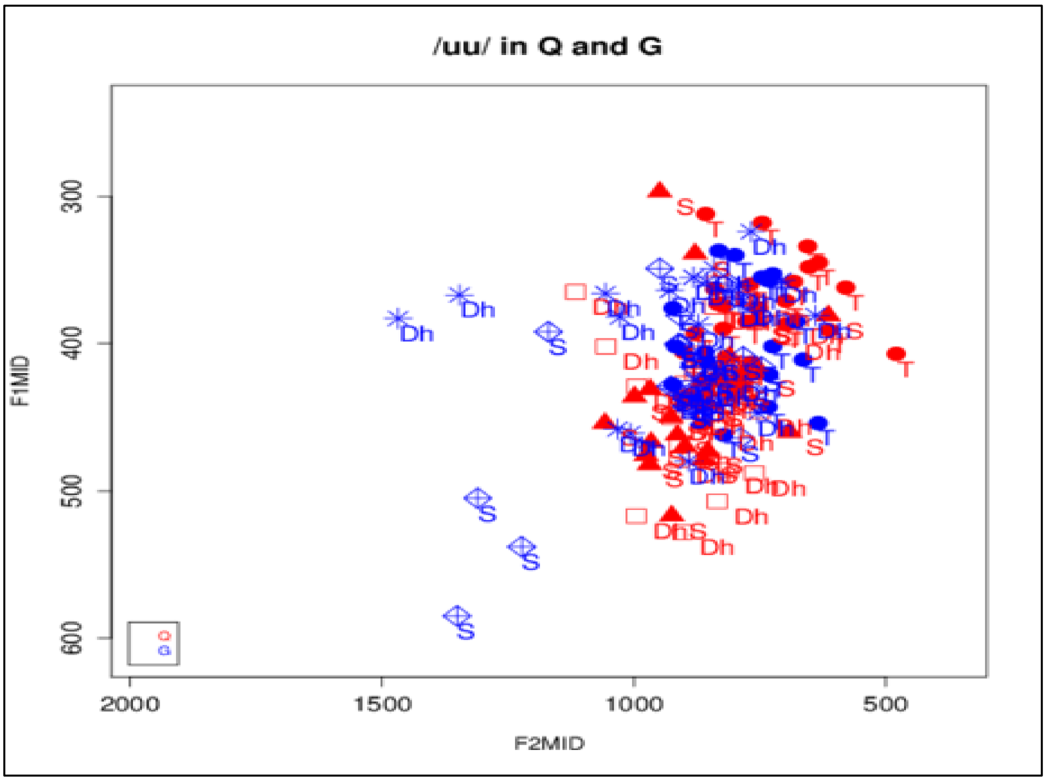

Figure 85: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts.

Figure 84 and Figure 85 above illustrate the /u:/ variants as represented in the production of the Qəltu and Gilit speakers of the tokens /tˤu:lak/ 'your height', /jðˤu:qu:n/ 'they taste', and /j sˤu:mu:n/ 'they are fasting'. Higher F1 and lower F2 at the vowel mid-point compared to the vowel onset indicate /u:/ resistance to lowering and backing at the vowel onset. Further [low], and [back] /u:/ variants are represented in the /tˤ/, and / sˤ/ contexts in Gilit with higher F1 and lower F2 compared to F1 and F2 in the same contexts in Qəltu, and further [low], and [back] /u:/ variants are represented in the /ðˤ/ context in Qəltu with higher F1 and lower F2 compared to F1 and F2 in Gilit.

6.3.5 The F1-F2 of the target vowels in the emphatics' (pharyngealized coronals) context vs. the plain contexts in Qəltu and Gilit.

The F1-F2 vowel plots below represent the different vowel variants of each of the target vowels /a/, /a :/, /i/, / i:/. /u/. /u :/ vowels as represented in all tokens for all speakers in the emphatics pharyngealized coronals) context vs. their plain counterparts in Qəltu and Gilit.

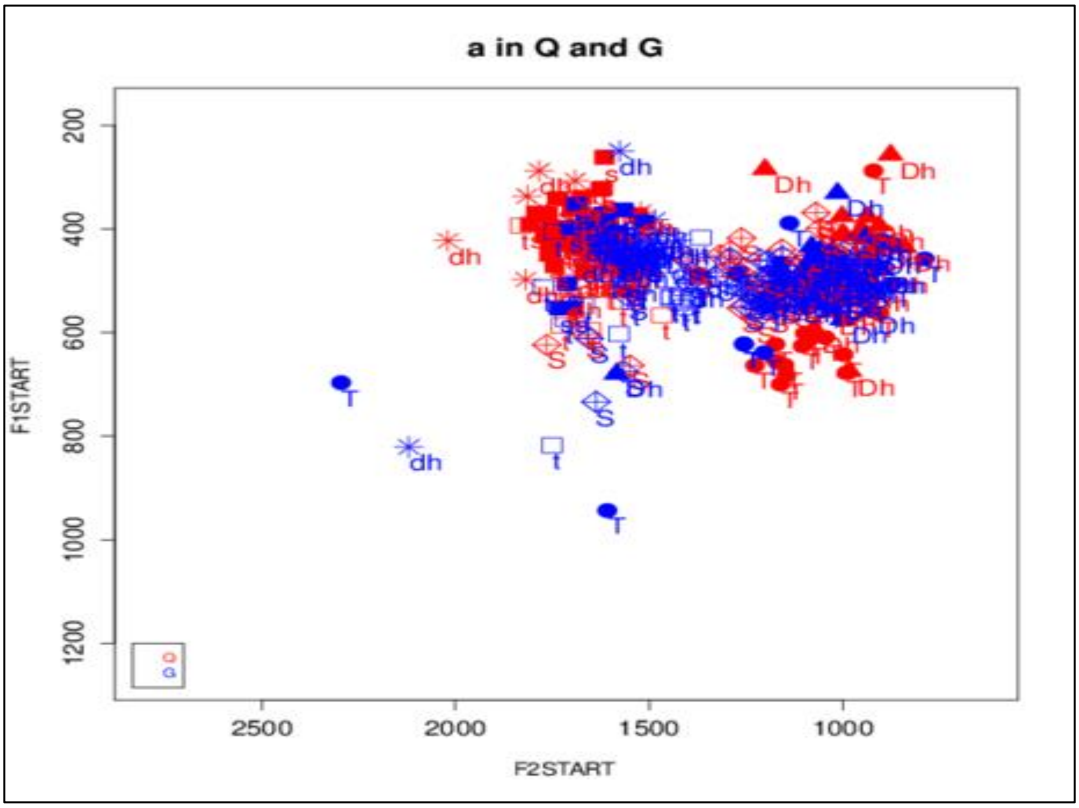

Figure 86: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

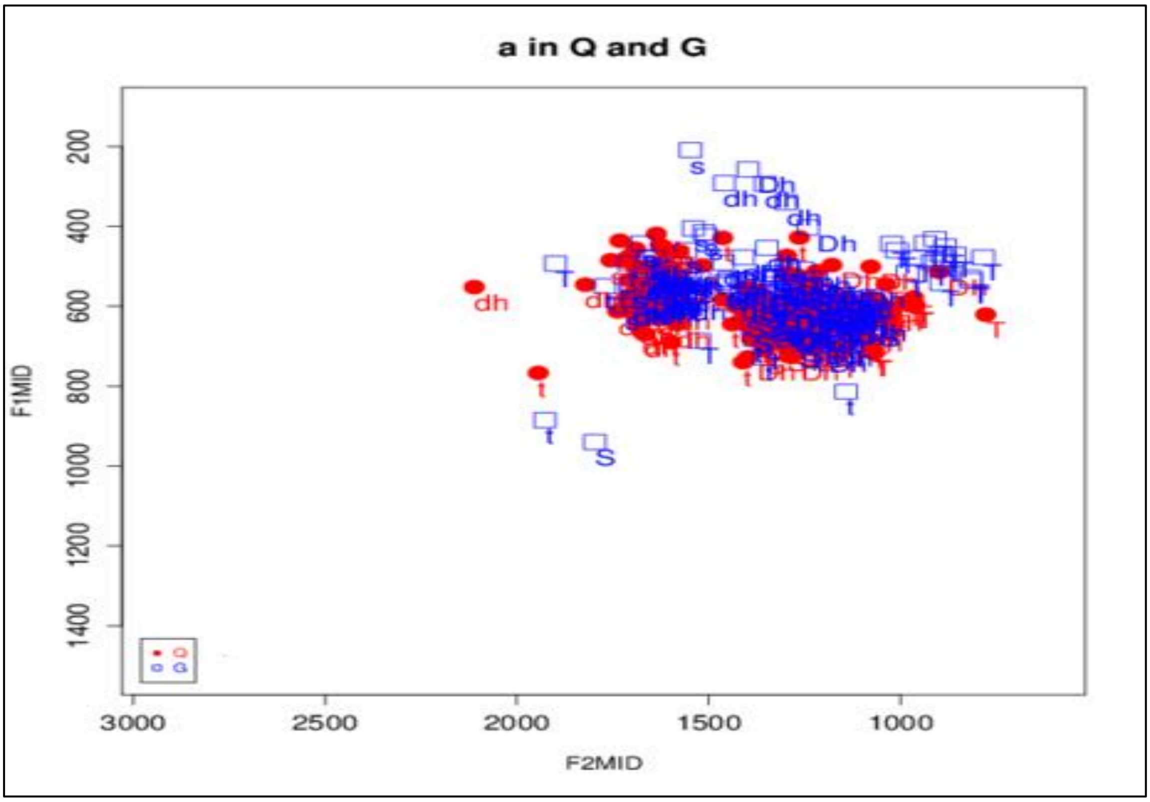

Figure 87: The /a/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 86 and Figure 87 illustrate the **/a/** variants as represented in the production of the Qəltu and Gilit speakers in the pharyngealized coronals' /tˤ/, /ðˤ/, and /sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts respectively in the tokens /tˤamir/ 'burying', /ðˤall/ 'he stayed', and /sˤadd/ 'he prevented' and in the plain contexts in the tokens /tamir/ 'date', /ðall/ 'he humiliated', and /sadd/ 'he closed'. There is a range of variability in the /a/ productions in the plain vs. the emphatic contexts in both Qəltu and Gilit with some /a/ vowel productions in the emphatic contexts being further [low] and [back] as represented in higher F1 and lower F2 at the vowel mid-point compared to the vowel onset.

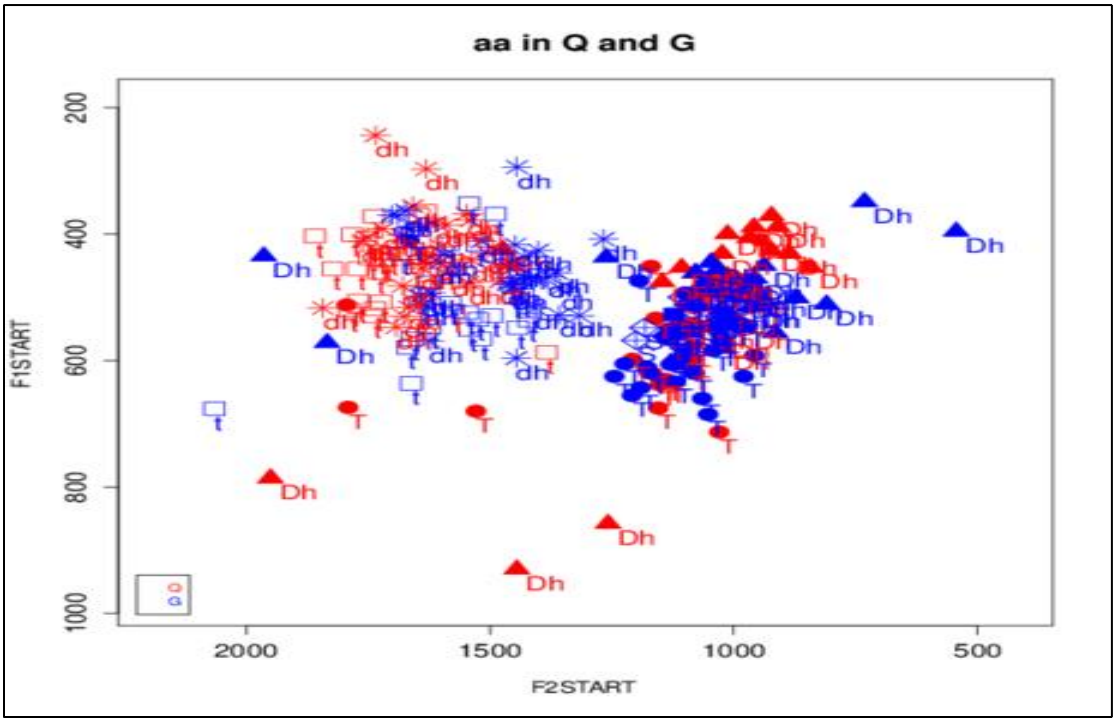

Figure 88: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

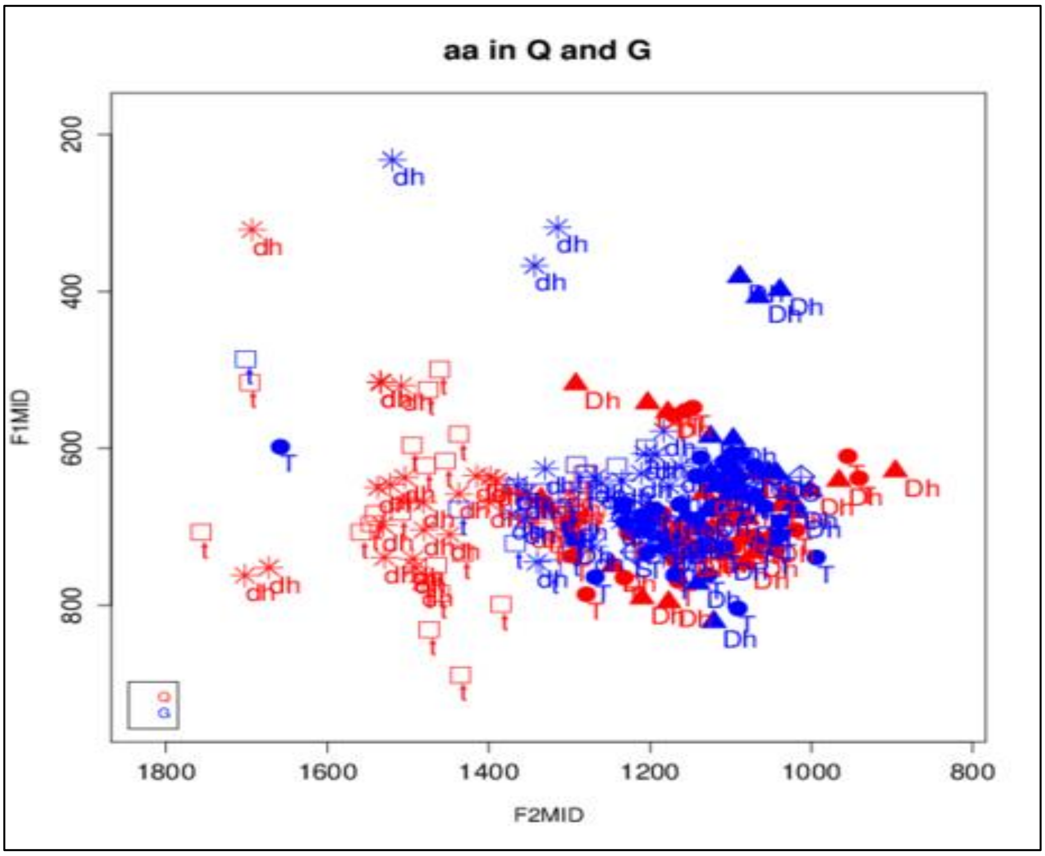

Figure 89: The /aː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 88 and Figure 89 illustrate the **/aː/** variants as represented in the production of the Qəltu and Gilit speakers in the 171haryngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts respectively in the tokens /tˤaːb/ 'he recovered', /ðˤaːll/ 'lost', and /sˤaːdd/ 'he hunted', and in the plain contexts in the tokens /taːb/ 'repented', /ðaːll/ 'humiliator', and /saːdd/ 'he prevailed'. The figures are pharyngeal of further [low] /aː/ productions represented in higher F1 at the vowel mid-point compared to the vowel onset in Qəltu compared to Gilit in the emphatic vs. plain contexts. Additionally, further [back] /aː/ productions with lower F2 at the vowel onset compared to the vowel mid-point in Gilit compared to Qəltu in the emphatic vs. plain contexts are indicative of /aː/ resistance to lowering and backing at the vowel onset in the emphatic context.

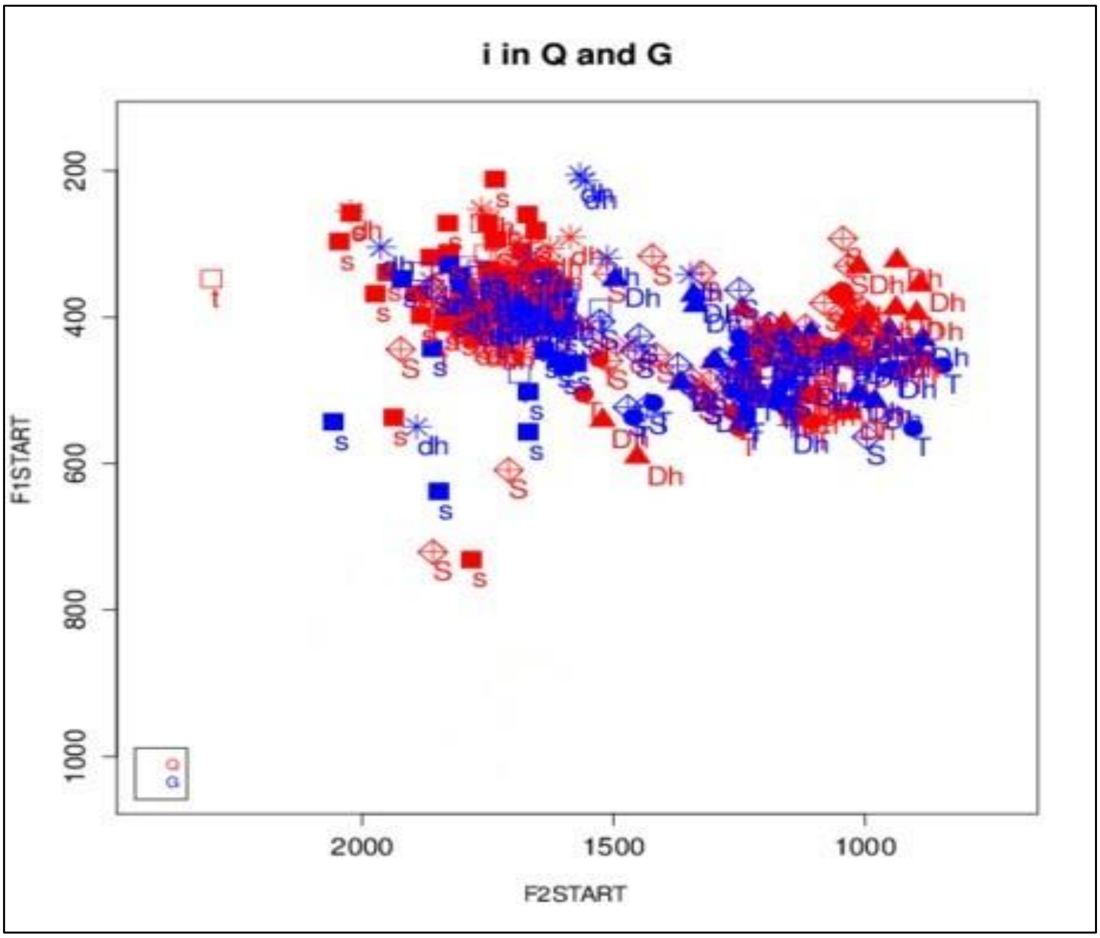

Figure 90: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

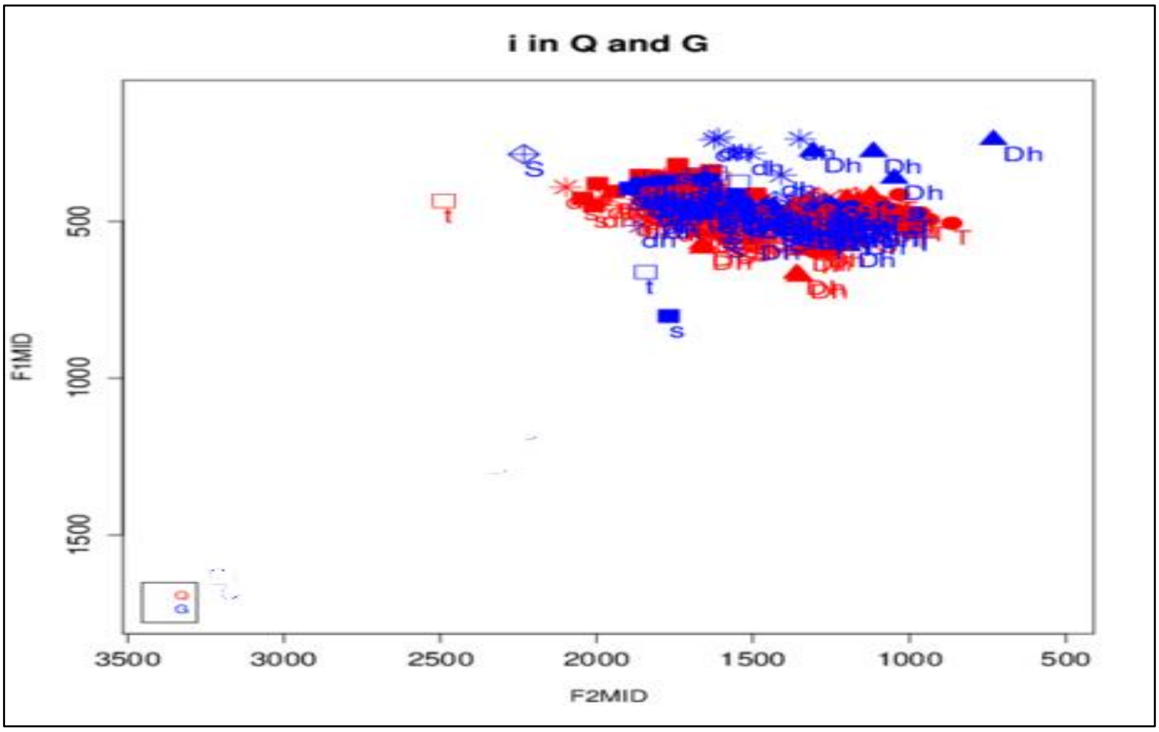

Figure 91: The /i/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 90 and Figure 91 illuustrate the /i/ variants in the emphatic vs. plain contexts at the vowel onset compared to the vowel mid-point in the tokens / tˤibt/ 'you (m.s.) recovered', / ðˤill/ 'shadow', and / sˤidd/ 'you (m.s.) defend' vs. the /i/ variants in the plain contexts in /tibt/ 'repented', / ðill/ 'humiliation', and /sidd/ 'you (m.s.) close' respectively.

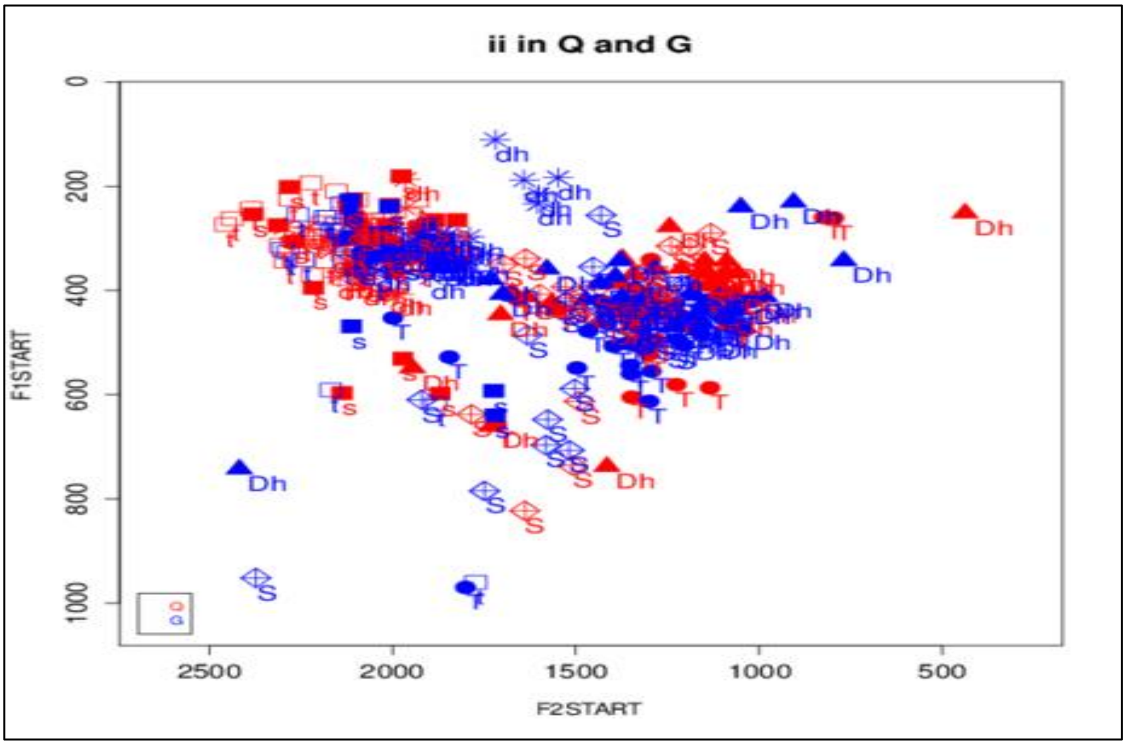

Figure 92: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

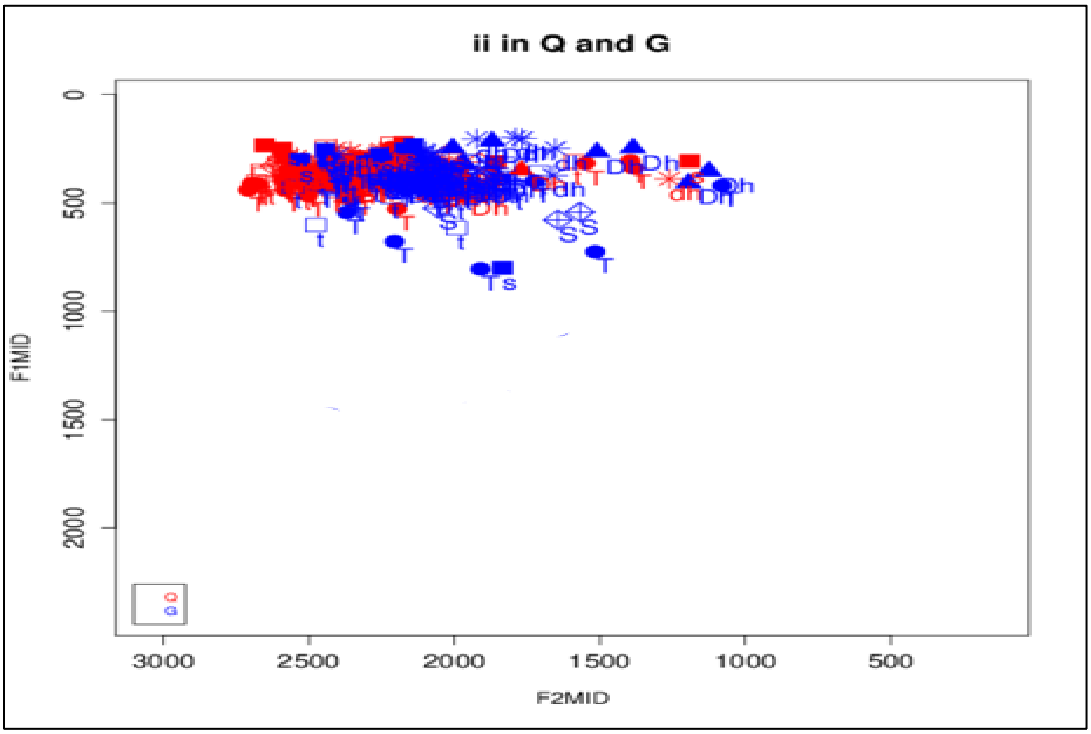

Figure 93: The /iː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 92 and Figure 93 above are illustrative of the **/i:/** productions of the Qəltu and Gilit speakers of the tokens in the emphatic contexts / tˤi:n/ 'mud', / ðˤi:b/ 'non-sense word', and / sˤi:dd/ 'you (m.s.) hunt', and in the plain contexts /ti:n/ 'mud', / ði:b/ 'wolf', and /si:dd/ 'you (m.s.) prevail'. The figures are suggestive of further [back] /i:/ productions in the emphatic contexts vs. the plain ones in both Qəltu and Gilit at the vowel onset compared to the mid-point. However, very [low] /i:/ productions are traced in the emphatic contexts and in plain contexts resembling the emphatic contexts in both Qəltu and Gilit.

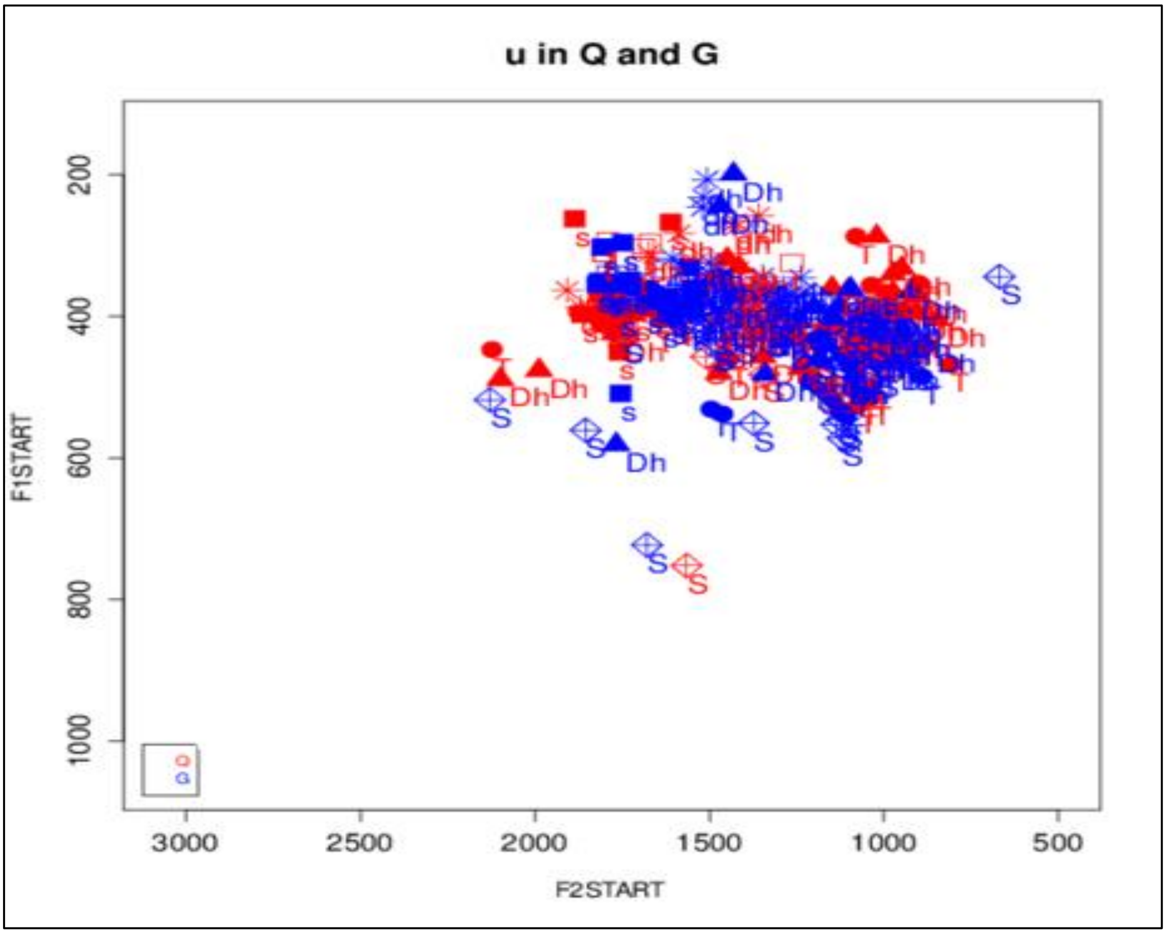

Figure 94: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

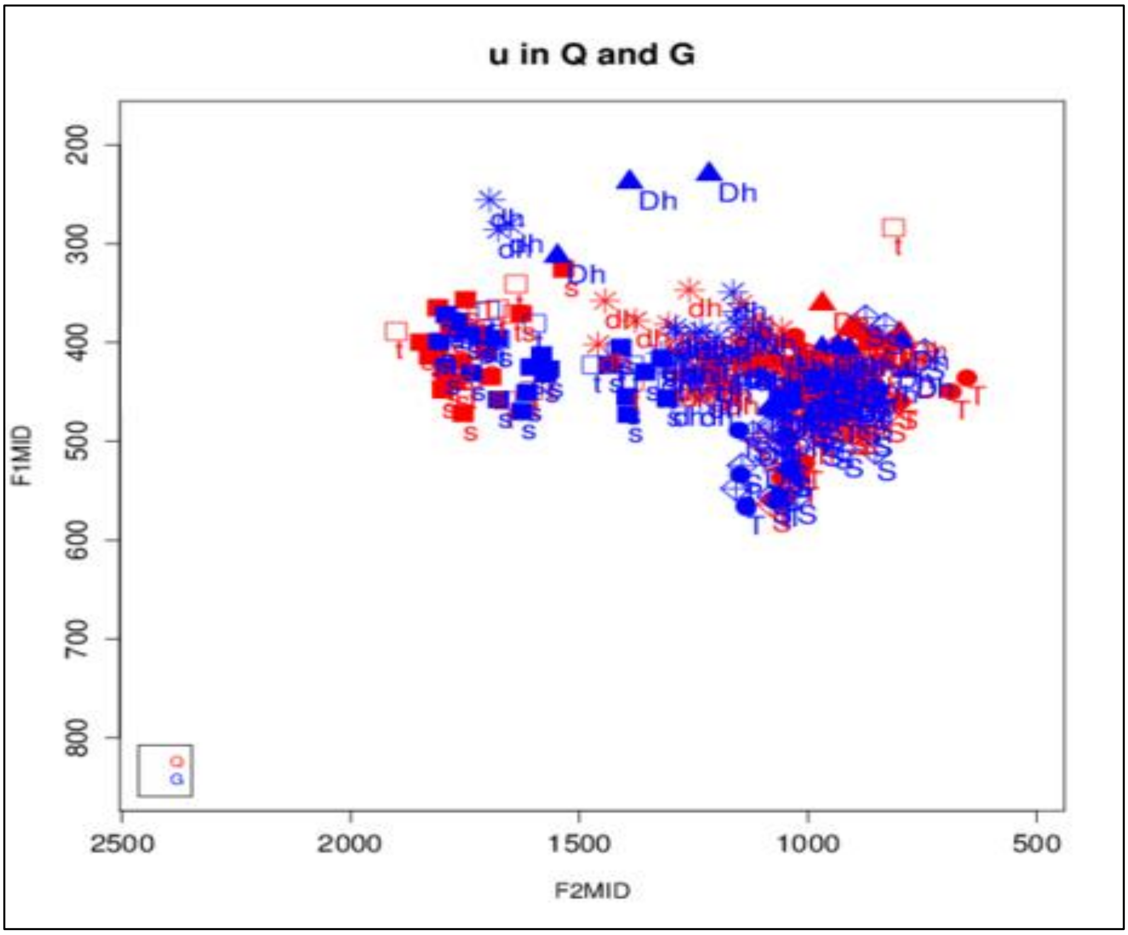

Figure 95: The /u/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 94 and Figure 95 illustrate the /u/ variants as represented in the productions of the Qəltu and Gilit speakers in the emphatic contexts in the tokens / tˤubt/ 'I recoverd', / ðˤuruːf/ 'circumstances', and /sˤubb/ 'you (m.s.) pour' vs. /i:/ variants in the plain contexts in /tubt/ 'repented', / ðuruːf/ 'shedding tears', and / subb/ 'you (m.s.)swear' respectively. The vowel onset compared to the vowel mid-point is indicative of further [back] /u/ productions in the emphatic contexts compared to the plain contexts.

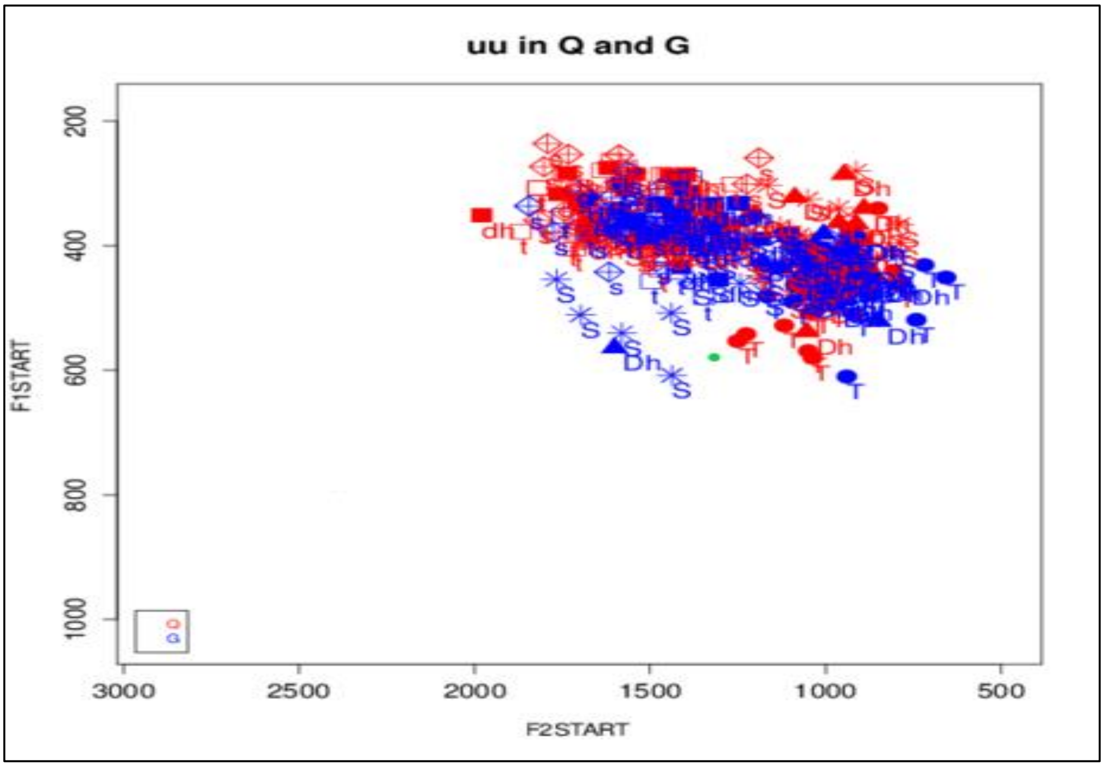

Figure 96: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel onset in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

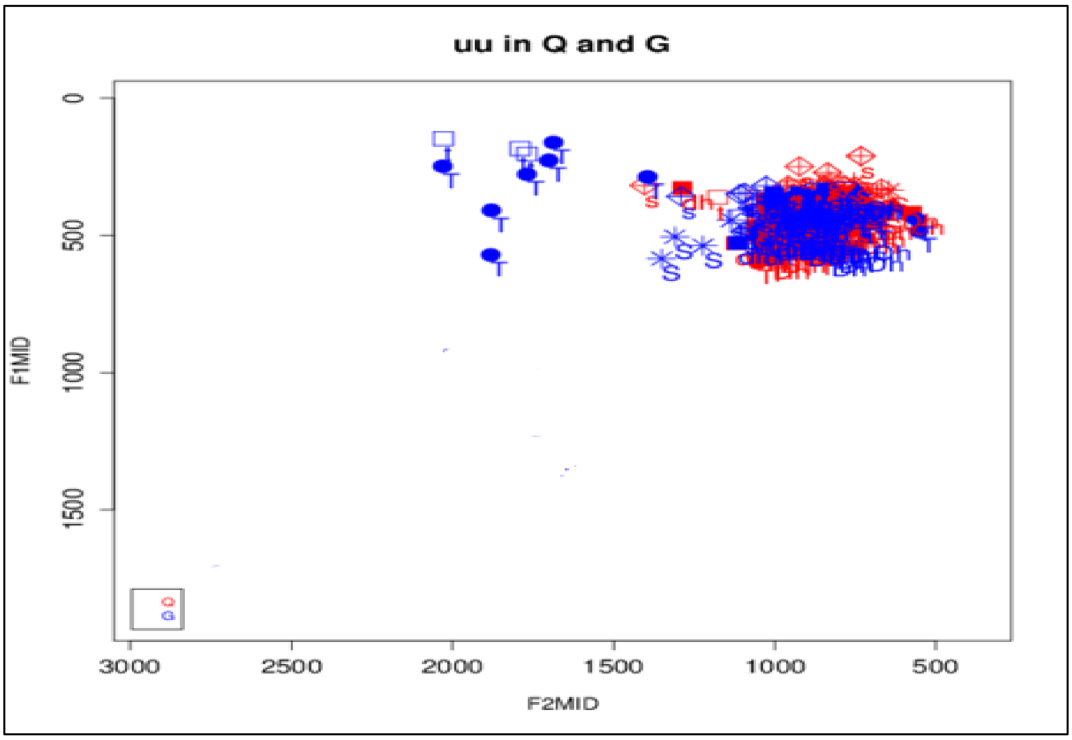

Figure 97: The /uː/ variants as represented in the production of the Qəltu and Gilit speakers at the vowel mid-point in the pharyngealized coronals' /tˤ/, /ðˤ/, and / sˤ/ contexts vs. their plain /t/, /ð/, and /s/ counterparts.

Figure 96 and Figure 97 are suggestive of **/uː/** resistance to backing at the vowel onset with further [back] /u/ productions represented at the vowel mid-point in the emphatic context compared to the plain contexts. Similarly, /uː/ productions in the plain contexts are [back] at the vowel mid-point.

6.4 Statistical vowel profiling

This section introduces the statistical profiling of the target vowels **/a, aː, i, iː,u, uː/** as represented in their formants (F1-F2Start), and (F1-F2Mid) between MQ and BG in the three groups of consonantal contexts i.e. the pharyngeals, the uvulars, and the pharyngealized coronals. For the statistical analysis, We used R (R Core Team, 2012), and lme4 (Bates et al., 2012) to perform linear mixed effects analysis of the relationship between context (i.e. the pharyngeals, uvulars, and pharyngealized coronals), and variety (MQ and BG) in their effect on each target /i, iː, u, u ː, a, aː/ vowel in the four vowel measurments (F1start-F1mid) and (F2start-F2mid). Additionally, separate linear mixed effects analysis were performed of the relationship between context (i.e the pharyngealized vs. the plain consonants), and variety (MQ and BG) in their effect on each of the target /i, iː, u, u ː, a, aː/ vowels in the four vowel measurements (F1start-F1mid) and (F2start-F2mid). As fixed effects, we entered context and variety (with interaction term) into the model. As random effects, we had intercepts for subjects. Visual inspection of residual plots did not reveal any obvious deviations from homoscedasticity or normality "(see Winter, 2014). The analysis were followed by ANOVA to obtain P-values of the effect in question specifying speaker as a Random factor.

6.4.1 F1start of the /a/ variants

The F1start value of the /a/ variants are significantly different in all three groups of consonantal contexts suggesting variations in the /a/ vowel realisation in each of the groups $F(2,449) = 7.76; p < .000.$[39] *(see Table 66).*

[39] anova=aov(F1START~Context2*Variety+(1|Speaker_id),data=data_QGa_a).

Table 66: The mean F1 Start values of the /a/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[40]

Context	Variety	F1Start/Hz	Context	Variety	F1Start/Hz
ʕaʒaːʒ	G	783	ʕaʒaːʒ	Q	729
ðˤafar	G	478	ðˤafar	Q	479
ʁazaːl	G	475	ʁazaːl	Q	494
ħakam	G	725	ħakam	Q	775
qafal	G	491	qafal	Q	605
sˤabar	G	512	sˤabar	Q	504
tˤalab	G	556	tˤalab	Q	558
χasaf	G	486	χasaf	Q	582

The highest F1start values of /a/ are reported in the group of pharyngeals in both Qəltu and the Gilit with higher F1 start values of /a/ in one pharyngeal context in Qəltu compared to another pharyngeal context in Gilit.

Additionally, reported differences in F1start values of /a/ are in the uvular contexts in Qəltu compared to Gilit, with the uvular stop /q/ having higher F1 values of /a/ among the other uvulars, that is the / χ/, and the /ʁ/ compared to Gilit suggestive of [backing] of /a/ in the /q/ and /ħ/ contexts in Qəltu compared to Gilit while [back] /a/ variants are suggested in the pharyngeal /ʕ/ context in Gilit represented in higher F1 values compared to Qəltu.

[40] aggregate(F1START~Context+Variety,data=data_QGa_a,mean.

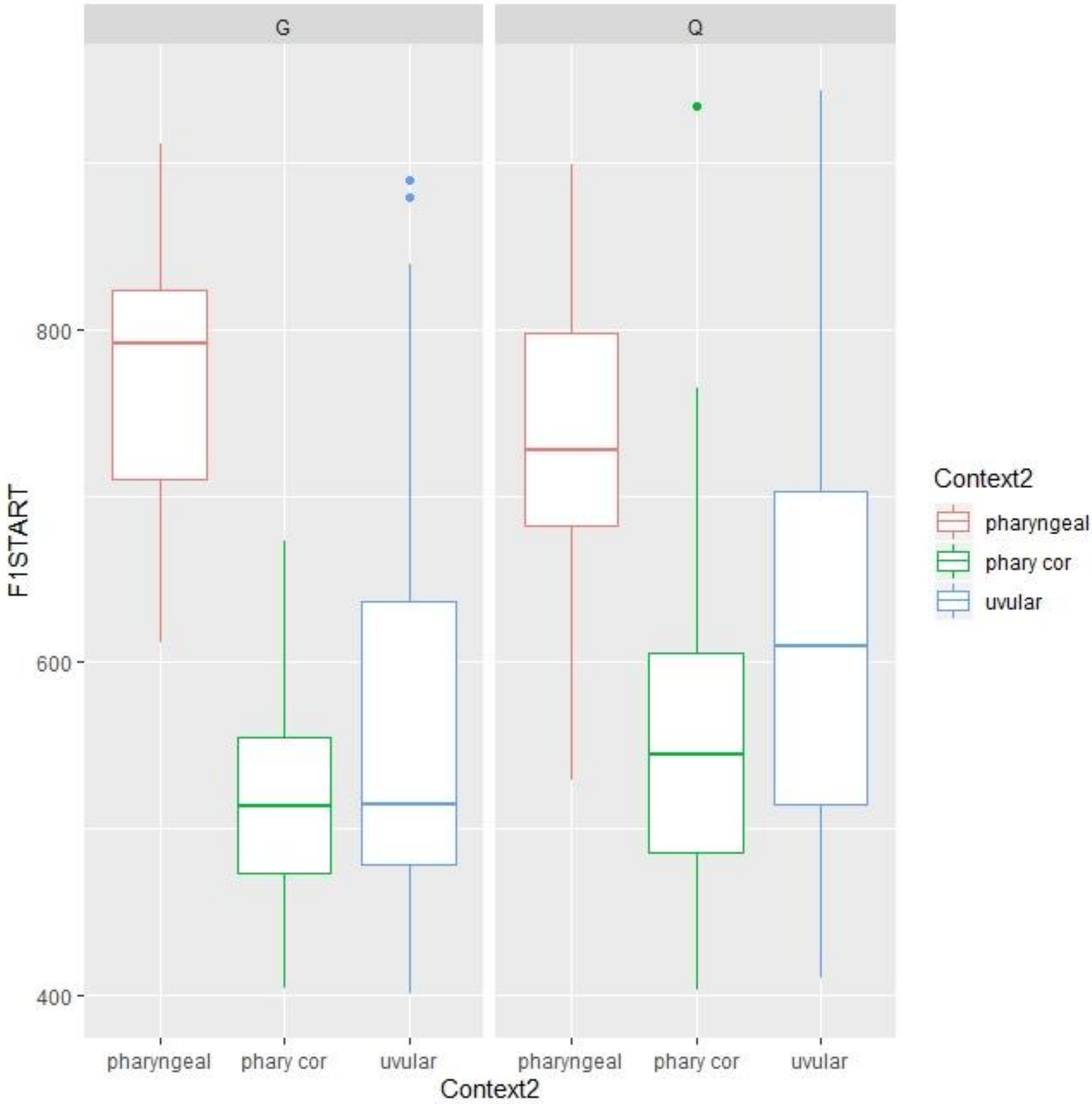

Figure 98: The F1start of the local /a/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit.[41]

[41] ggplot(data_QGa_a, aes(Context2, F1start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.2 F1 mid of the /a/ variants

The results confirm that variations in the F1 mid values of the /a/ variants among all three groups of consonanats in the two dialects. The variations in F1 mid values of /a/ variants in Qəltu and the Gilit are reported significant $F(2,449) = 8.408; p < .000$.[42]

Higher F1 mid values of the /a/ variants are introduced in the uvular contexts in Qəltu compared to F1 mid of /a/ in the same context in Gilit suggestive of the robust /a/ lowering in the uvular context /q/, and /χ/, and /tˤ/ contexts in Qəltu compared to Gilit. Similarly, in the /sˤ/ context in Gilit compared to Qəltu as represented in 67 below.

Table 67: The mean F1 Mid values of the local /a/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[43]

Context	**Variety**	**F1Mid/Hz**	**Context**	**Variety**	**F1Mid/Hz**
ʕaʒaːʒ	G	642	ʕaʒaːʒ	Q	640
ðˤafar	G	532	ðˤafar	Q	590
ʁazaːl	G	529	ʁazaːl	Q	570
ħakam	G	650	ħakam	Q	670
qafal	G	483	qafal	Q	618
sˤabar	G	669	sˤabar	Q	605
tˤalab	G	616	tˤalab	Q	653
χasaf	G	480	χasaf	Q	601

42 anova=aov(F1MID~Context2*Variety+(1|Speaker_id),data=data_QGa_a).

43 aggregate(F1MID~Context+Variety,data=data_QGa_a,mean)

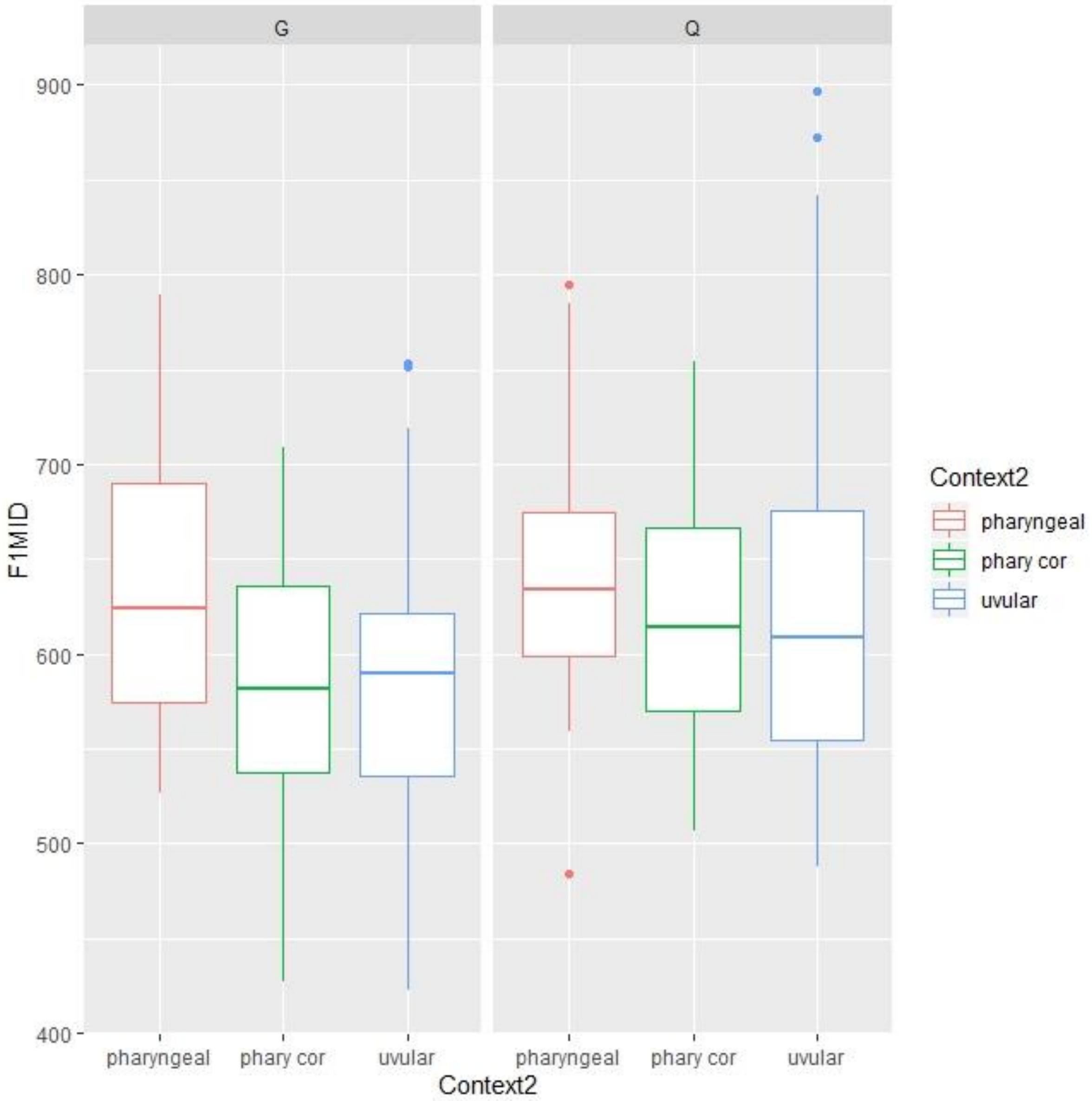

Figure 99: The F1mid of the local /a/ vowel as represented in the group of pharyngeals, uvulars, and pharyngealized coronals in the Qəltu and the Gilit.[44]

6.4.3 F2 start of the /ɑ/ variants

Consonantal variations in the mean F2start values of the /a/ variants are reported significant *F (2,449) = 25.4; p < '.000'* with the two dialects showing significant variations in the mean values of /a/ *in the* uvular /q/, uvular /χ/, and the pharyngealized coronal /tˤ/ contexts. The results are suggestive of further [back, round] /a/ variants in the /q/ and /tˤ/ contexts in Gilit

44 aggregate(F1MID~Context+Variety,data=data_QGa_a,mean)

compared to Qəltu, and further [back] /aː/ varaints in the /χ/ context in Qəltu compared to Gilit. (refer to Table 68) below.

Table 68: The mean F2 Start values of the local /a/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[45]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ʕaʒaːʒ	G	1350	ʕaʒaːʒ	Q	1370
ðˤafar	G	1096	ðˤafar	Q	1095
ʁazaːl	G	1379	ʁazaːl	Q	1184
ħakam	G	1204	ħakam	Q	1290
qafal	G	878	qafal	Q	1203
sˤabar	G	1192	sˤabar	Q	1186
tˤalab	G	1079	tˤalab	Q	1124
χasaf	G	1490	χasaf	Q	1361

45 aggregate(F2START~Context+Variety,data=data_QGa_a,mean)

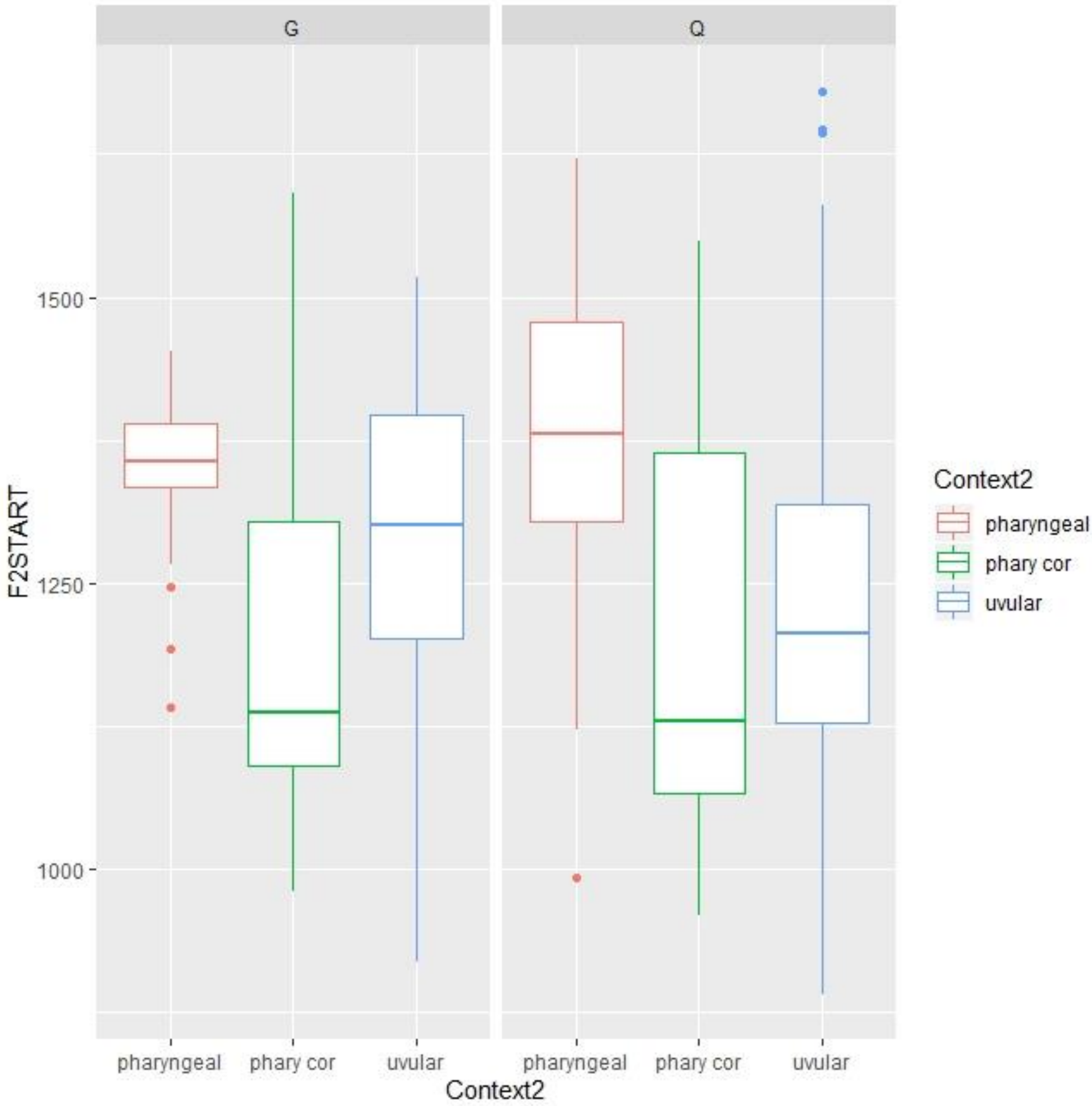

Figure 100 The F2start of the local /a/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [46]

[46] ggplot(data_QGa_a, aes(Context2, F2Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.4 F2 mid of the /a/ variants

Differences in the F2 start values of the /a/ variants in all three contexts are reported significant in the uvulars, pharyngeals and the pharyngealized coronals in the two dialects $F\ (2,449) = 5.58;\ p <$ '.000'[47].

Table 69: The mean F2 Mid values of the local /a/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[48]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ʕaʒaːʒ	G	1506	ʕaʒaːʒ	Q	1542
ðˤafar	G	1109	ðˤafar	Q	1079
ʁazaːl	G	1398	ʁazaːl	Q	1356
ħakam	G	1143	ħakam	Q	1398
qafal	G	906	qafal	Q	1206
sˤabar	G	1260	sˤabar	Q	1100
tˤalab	G	1113	tˤalab	Q	1228
χasaf	G	1479	χasaf	Q	1434

Significant variations in F2mid values of /a/ are reported in Gilit compared to Qəltu with lower F2 mid values of /a/ in the /q/, /ħ/, and /tˤ/ contexts in Gilit compared to Qəltu suggestive of [back, round] /a/ variants in the /q/ context in Gilit driven by the elements of *tafxi:m*; that is the uvular /q/ and the secondary emphatic /f/ (further details in section 4.9). Added, [back] /a/ variants are represented in the /ħ/ and /tˤ/ contexts in Gilit compared to the /sˤ/ and /ðˤ/ contexts in Qəltu (*see Table 69*) above.

47 anova=aov(F2MID~Context2*Variety+(1|Speaker_id),data=data_QGa_a).

48 aggregate(F2MID~Context+Variety,data=data_QGa_a,mean)

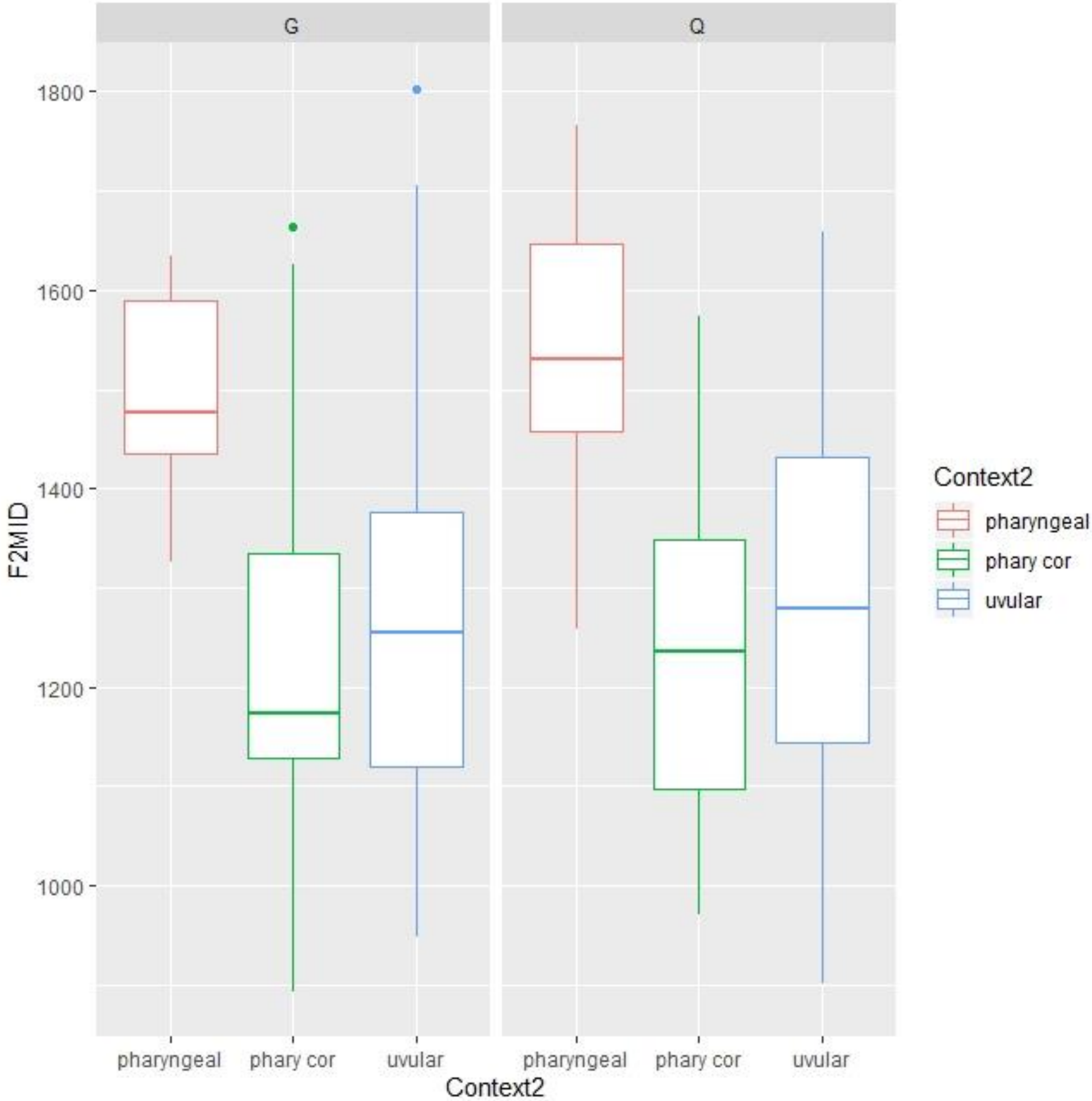

Figure 101: The F2mid of the local /a/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [49]

[49] ggplot(data_QGa_a, aes(Context2, F2Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.5 F1 start of the /a:/ variants

Results confirm that significant variations are reported in the pharyngeal context among Qəltu and Gilit in their effect on the /aː/ vowel variants compared to the uvulars' and pharyngealized coronals' contexts *F(2,449) = 7.765; p < .000. (See table 70) below.*

Table 70: The mean F1 Start values of the local /aː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[50]

Context	Variety	F1Start/Hz	Context	Variety	F2Start/Hz
ʕaːdaːt	G	788	ʕaːdaːt	Q	753
ðˤaːfir	G	519	ðˤaːfir	Q	471
ʁaːbaːt	G	528	ʁaːbaːt	Q	513
ħaːkim	G	814	ħaːkim	Q	812
qaːmaːt	G	630	qaːmaːt	Q	601
sˤaːffaːt	G	546	sˤaːffaːt	Q	521
tˤaːlib	G	603	tˤaːlib	Q	577
χaːlaːt	G	619	χaːlaːt	Q	628

[50] aggregate(F2MID~Context+Variety,data=data_QGa_aa,mean).

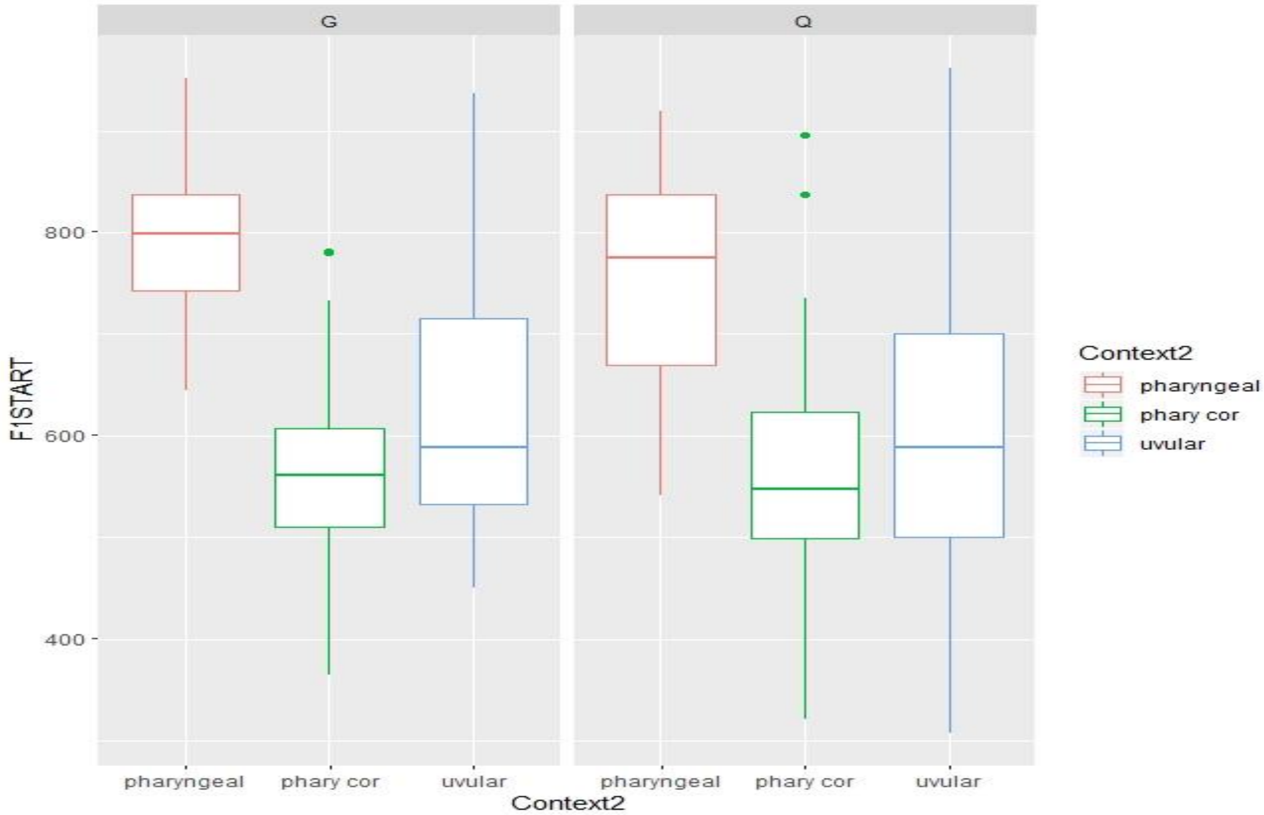

Figure 102: The F1start of the local /aː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [51]

6.4.6 F1 mid of the /aː/ variants

The results reveal that the variations in the F1mid values of the /aː/ vowel variants among the three groups of consonantal contexts are reported as non-significant $F(2,460) = 0.754; p < .1$. confirming that /aː/ vowel lowering is robust at the vowel onset compared to the vowel mid-point (*See table 71*) below.

[51] ggplot(data_QGa_aa, aes(Context2, F1Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 71: The mean F1 Mid values of the local /aː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[52]

Context	Variety	F1Mid/Hz	Context	Variety	F1Mid/Hz
ʕaːdaːt	G	723	ʕaːdaːt	Q	746
ðˤaːfir	G	606	ðˤaːfir	Q	681
ʁaːbaːt	G	609	ʁaːbaːt	Q	677
ħaːkim	G	744	ħaːkim	Q	763
qaːmaːt	G	677	qaːmaːt	Q	692
sˤaːffaːt	G	734	sˤaːffaːt	Q	661
tˤaːlib	G	684	tˤaːlib	Q	699
χaːlaːt	G	658	χaːlaːt	Q	672

[52] aggregate(F1MID~Context+Variety,data=data_QGa_aa,mean)

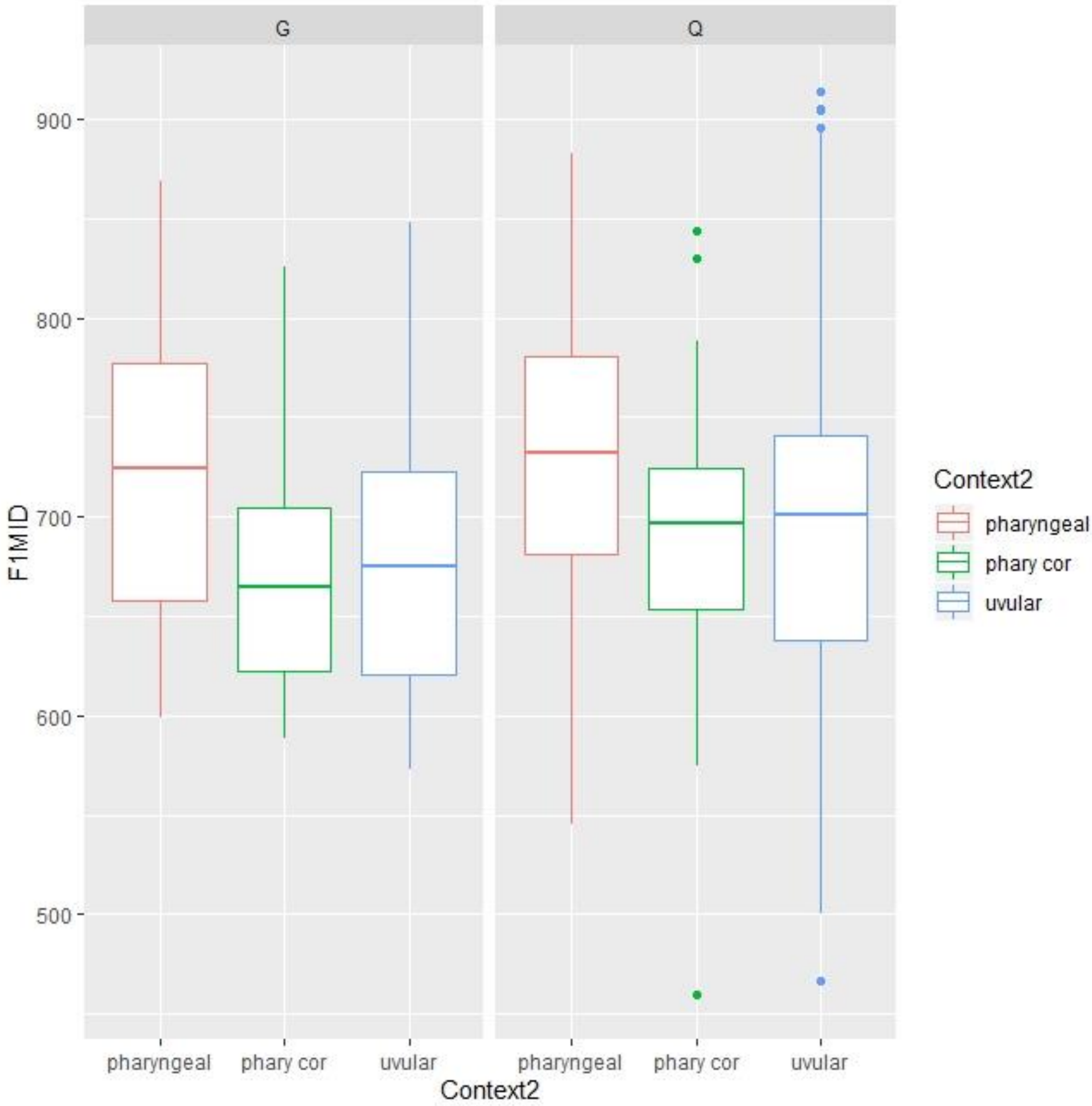

Figure 103: The F1mid of the local /aː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [53]

6.4.7 F2 start of the /aː/ variants

Results show that variations among the F2start values of the /aː/ vowel variants in Qəltu and Gilit are confirmed to be statistically non- significant *F(2,460) = 0.793; p < .1.* indicative of /aː/ resistance to backing at the vowel onset with Qəltu showing lower F2 values of /aː/ suggesting backing of /aː/ in the pharyngealized coronal / ðˤ / context, and Gilit showing lower

53 ggplot(data_QGa_aa, aes(Context2, F2Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

F2 values in the uvular /ʁ/ suggesting /aː/ backing being robust in /ʁ/ compared to the other PV contexts.

Table 72: The mean F2 Start values of the local /aː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[54]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ʕaːdaːt	G	1247	ʕaːdaːt	Q	1293
ðˤaːfir	G	1136	ðˤaːfir	Q	1039
ʁaːbaːt	G	1250	ʁaːbaːt	Q	1146
ħaːkim	G	1315	ħaːkim	Q	1310
qaːmaːt	G	1147	qaːmaːt	Q	1183
sˤaːffaːt	G	1164	sˤaːffaːt	Q	1161
tˤaːlib	G	1145	tˤaːlib	Q	1175
χaːlaːt	G	1209	χaːlaːt	Q	1293

[54] aggregate(F2START~Context+Variety,data=data_QGa_aa,mean)

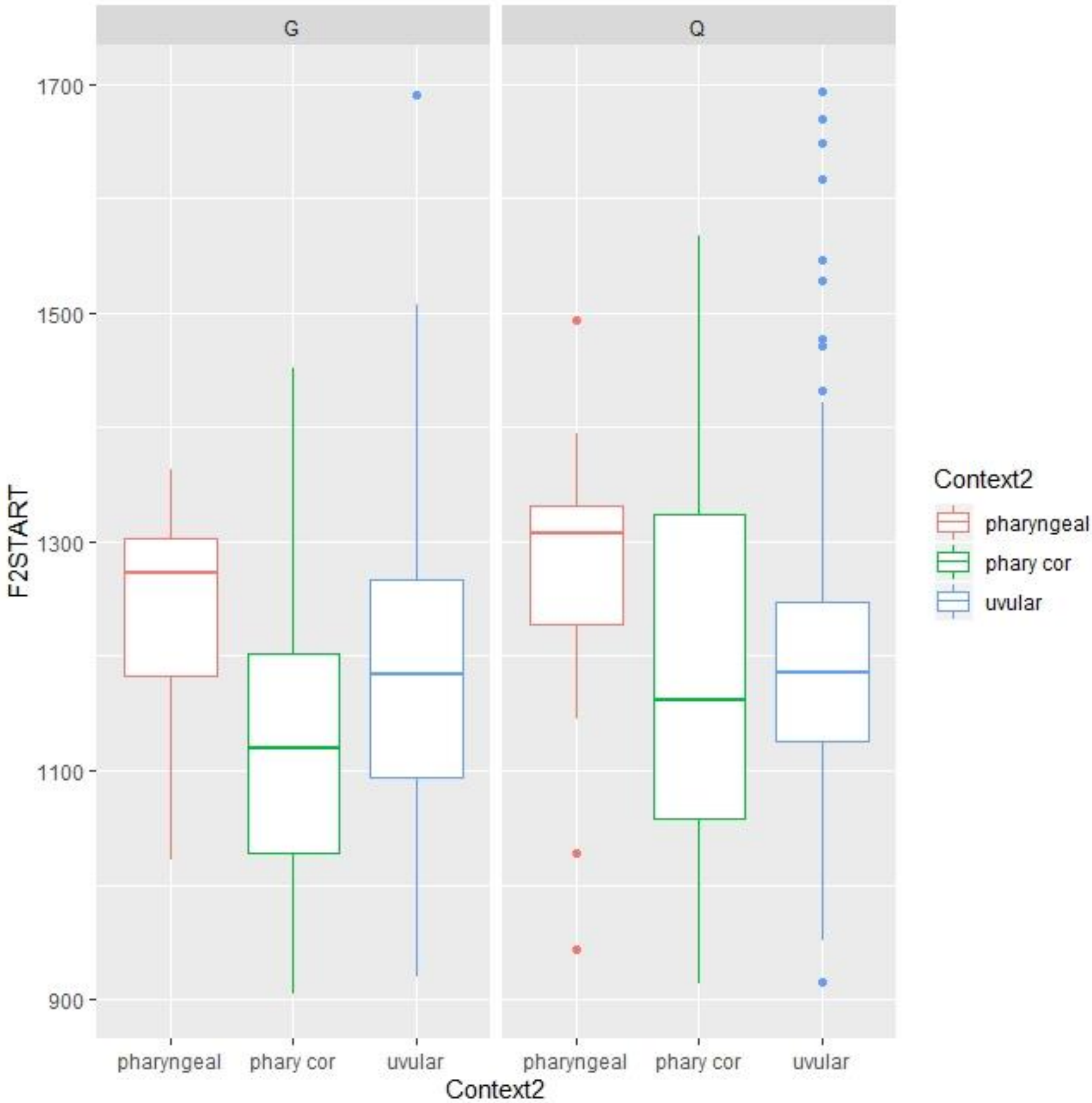

Figure 104 The F2 start of the local /aː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit.

6.4.8 F2mid of the /aː/ variants

The results confirm that /aː/ backing in all three groups of consonantal contexts extends to the vowel mid-point with highly significant variations reported among the F2mid values of /aː/ per context in Qəltu and the Gilit *$F(2,460) = 10.66; p < .000$. (see Table 73) below.*

Table 73: The mean F2 Mid values of the local /aː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[55]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ʕaːdaːt	G	1268	ʕaːdaːt	Q	1412
ðˤaːfir	G	1137	ðˤaːfir	Q	1119
ʁaːbaːt	G	1180	ʁaːbaːt	Q	1216
ħaːkim	G	1220	ħaːkim	Q	1323
qaːmaːt	G	1144	qaːmaːt	Q	1252
sˤaːffaːt	G	1279	sˤaːffaːt	Q	1126
tˤaːlib	G	1133	tˤaːlib	Q	1197
χaːlaːt	G	1143	χaːlaːt	Q	1288

[55] aggregate(F2Mid~Context+Variety,data=data_QGa_aa,mean)

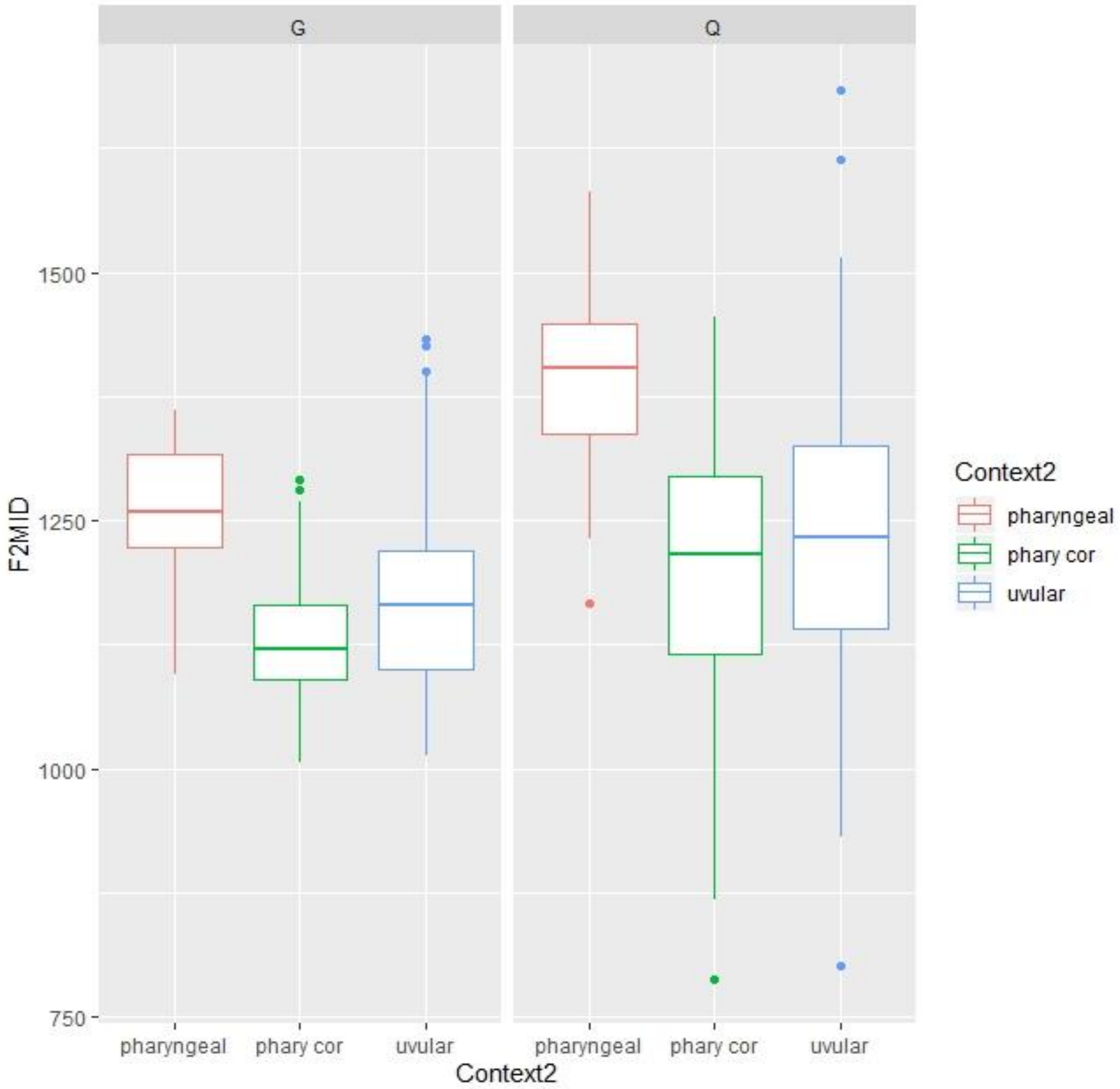

Figure 105 The F2 mid of the local /aː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit.

6.4.9 F1start of the /i/ variants

Results show variations among the F1start values of /i/ vowel variants in all three groups of consonantal contexts *F(2,484) = 8.072; p < .000.*in Qəltu and the Gilit with the highest F1start values of /i/ reported in the pharyngeal contexts in both dialects (*see Table 74*) below.

Table 74: The mean F1Start values of the /i/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[56]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ʕifit	G	609	ʕifit	Q	575
ðˤifit	G	445	ðˤifit	Q	451
ʁibit	G	425	ʁibit	Q	420
ħikma	G	587	ħikma	Q	554
waqit wakit	G G	507 394	waqit	Q	527
sˤifir	G	530	sˤifir	Q	469
tˤifit	G	489	tˤifit	Q	464
χifit	G	467	χifit	Q	521

56 aggregate(F1Start~Context+Variety,data=data_QGa_i,mean)

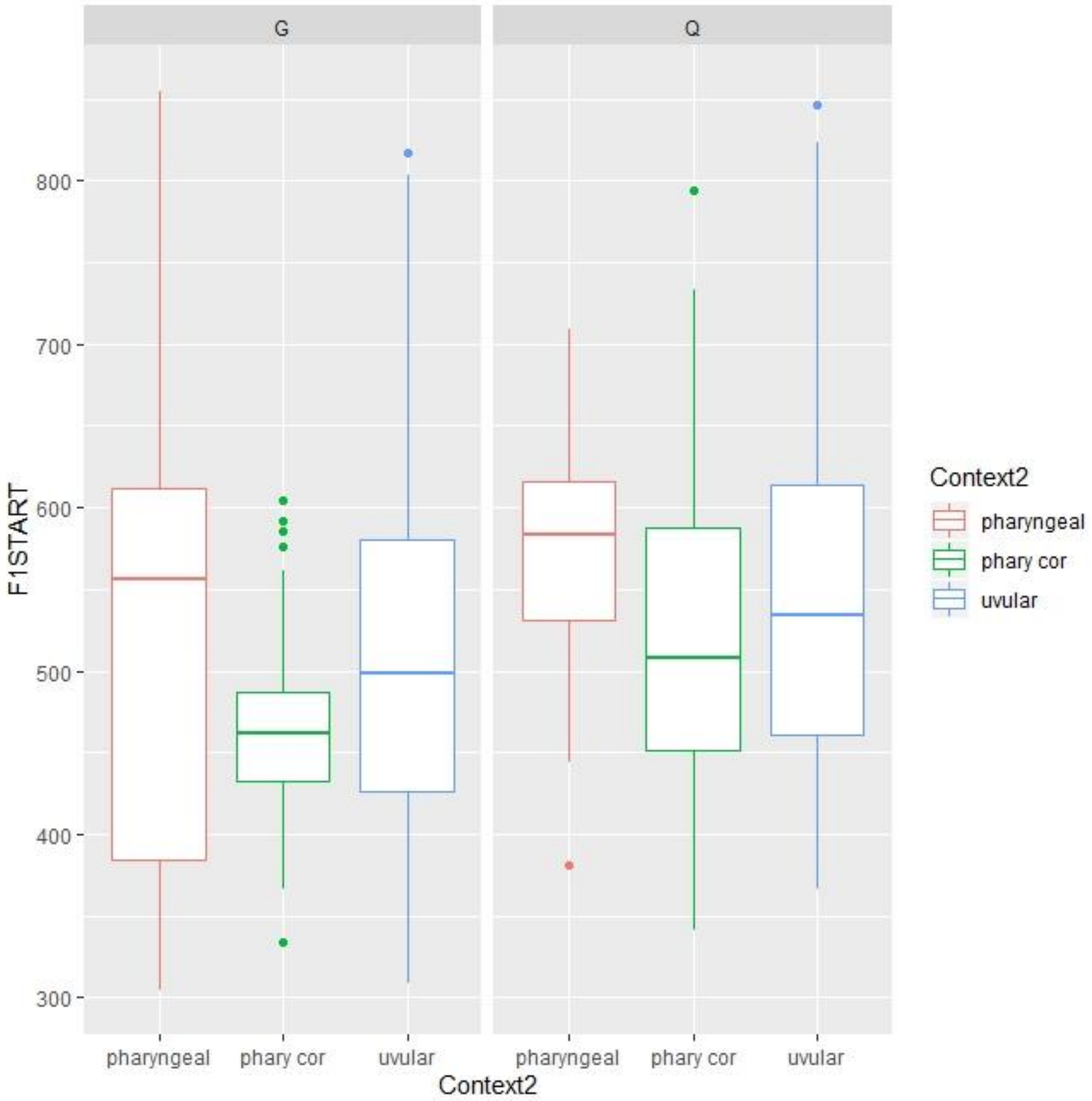

Figure 106: The F1start of the local /i/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [57]

6.4.10 F1mid of /i/ variants

Reported results $F(2,449) = 4.409; p < 0.05$ confirm less variability in the /i/ vowel productions in the Qəltu and the Gilit in all three contexts; that is the uvulars, the pharyngeals and the pharyngealized coronals showing that lowering of /i/ is salient at the vowel onset and it is not salient at the steady state as soon as the consonantat effect is not present.

[57] ggplot(data_QGa_i, aes(Context2, F1Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 75: The mean F1Mid values of the /i/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[58]

Context	**Variety**	**F1Mid/Hz**	**Context**	**Variety**	**F1Mid/Hz**
ʕifit	G	538	ʕifit	Q	505
ðˤifit	G	449	ðˤifit	Q	483
ʁibit	G	461	ʁibit	Q	455
ħikma	G	483	ħikma	Q	466
waqit	G	484	waqit	Q	493
wakit	G	403			
sˤifir	G	563	sˤifir	Q	469
tˤifit	G	493	tˤifit	Q	505
χifit	G	485	χifit	Q	514

[58] aggregate(F1Mid~Context+Variety,data=data_QGa_i,mean).

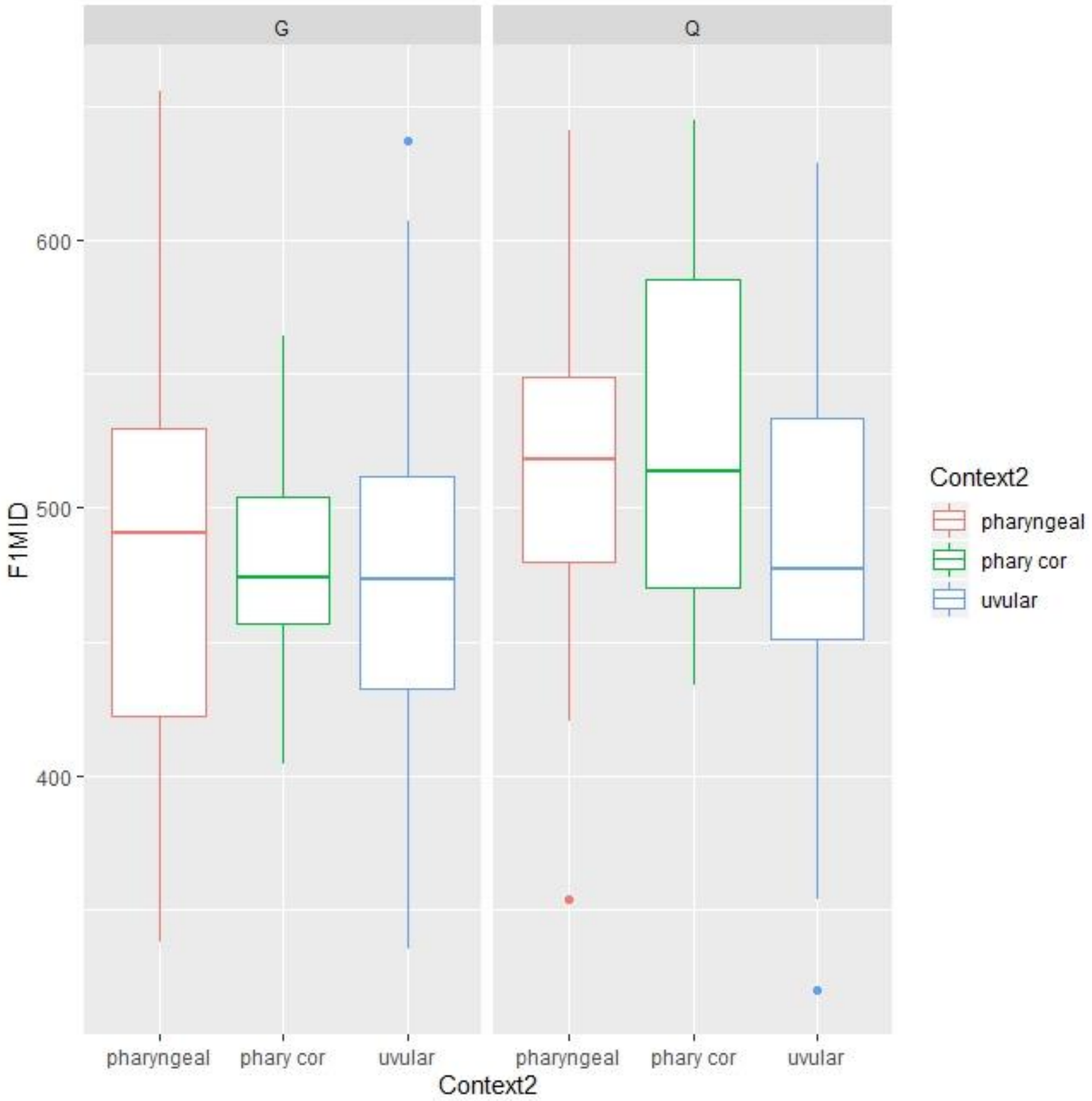

Figure 107 The F1mid of the local /i/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [59]

6.4.11 F2start of /i/ variants

Statistically significant results *F(2,484) = 30.42; p < .000.* indicate variations in the F2start values of /i/ vowel variants in the two dialects with lower F2 start values of /i/ variants in Qəltu in the uvular context compared to Gilit (*see Table 76*) below.

[59] ggplot(data_QGa_i, aes(Context2, F1Mid, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 76: The mean F2Start values of the /i/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[60]

Context	Variety	F2Start/Hz	Context	Variety	F2Start/Hz
ʕifit	G	1481	ʕifit	Q	1501
ðˤifit	G	1222	ðˤifit	Q	1141
ʁibit	G	1444	ʁibit	Q	1134
ħikma	G	1707	ħikma	Q	1753
waqit	G	1482	waqit	Q	1216
wakit	G	1905			
sˤifir	G	1469	sˤifir	Q	1247
tˤifit	G	1135	tˤifit	Q	1115
χifit	G	1547	χifit	Q	1407

[60] aggregate(F2Start~Context+Variety,data=data_QGa_i,mean)

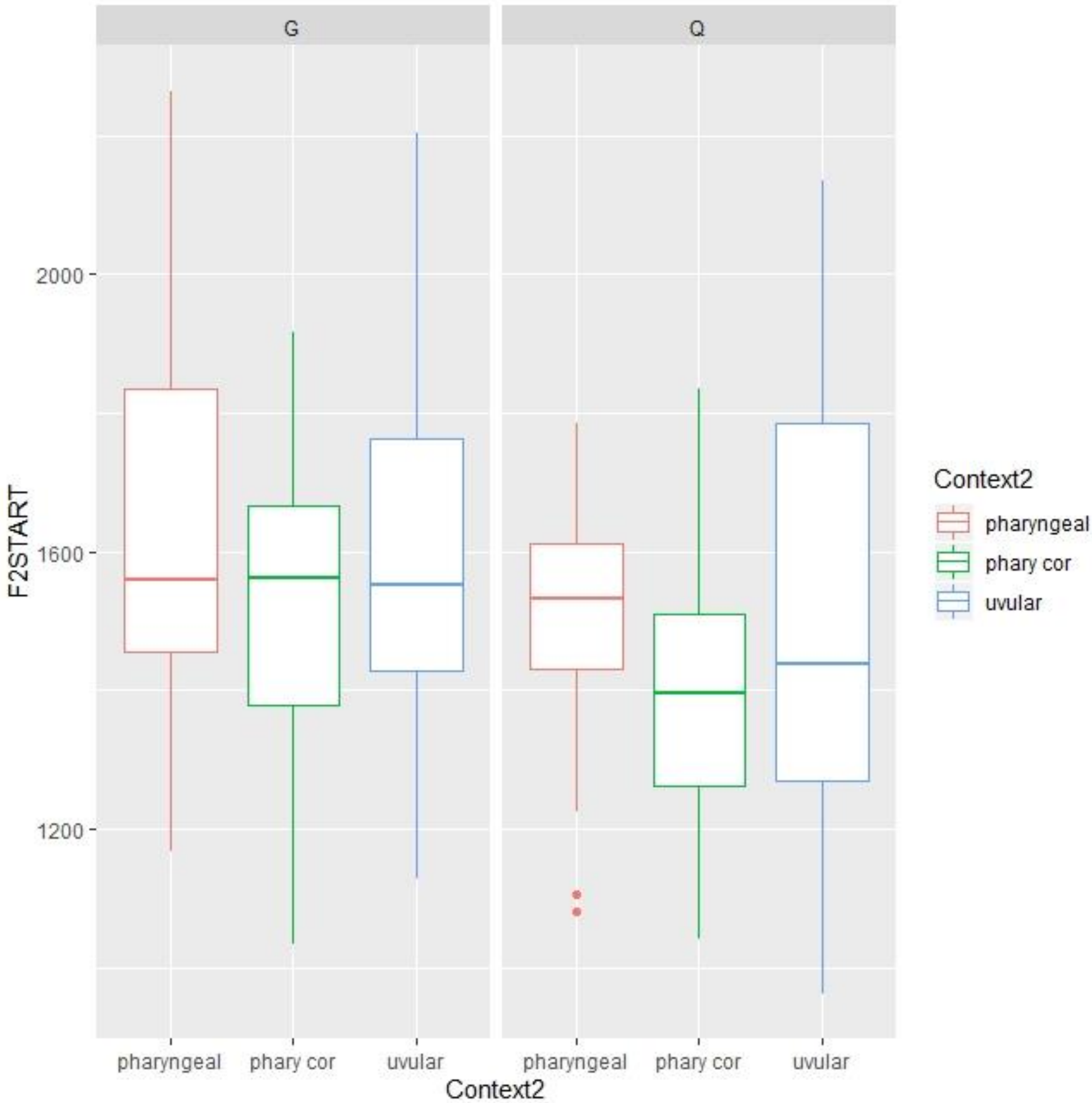

Figure 108The F2start of the local /i/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [61]

6.4.12 F2 mid of /i/ variants

Results confirm a statistically significant variability *F(2,484) = 16.82; p < .000* among the F2 mid values of the /i/ vowel variants in both Qəltu and the Gilit in all three contexts (*see Table 77*below).

[61] ggplot(data_QGa_i, aes(Context2, F2Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 77: The mean F2Mid values of the local /i/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[62]

Context	Variety	F2Mid/Hz	Context	Variety	F2Mid/Hz
ʕift	G	1469	ʕift	Q	1517
ðˤift	G	1188	ðˤift	Q	1116
ʁibit	G	1476	ʁibit	Q	1219
ħikma	G	1832	ħikma	Q	1851
waqt wakit	G G	1643 1835	waqt wakit	Q	1467
sˤifr	G	1268	sˤifr	Q	1104
tˤift	G	1133	tˤift	Q	1096
χift	G	1506	χift	Q	1416

62 aggregate(F2Mid~Context+Variety,data=data_QGa_i,mean)

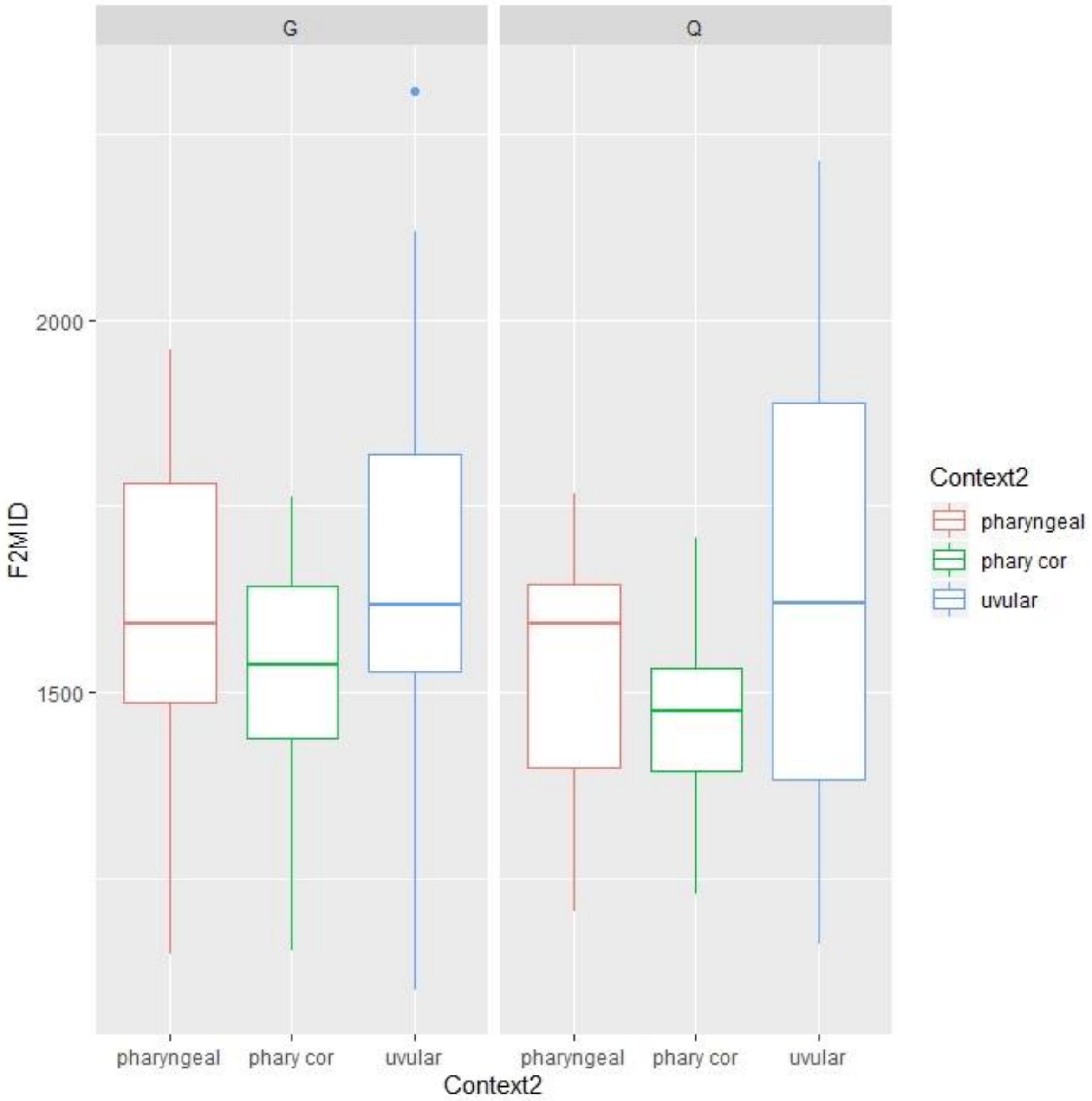

Figure *109:* The F2mid of the local /i/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [63]

6.4.13 F1start of /iː/ variants

Results indicate that the variations in the F1start values of the /iː/ vowel variants among the different consonantal groups between Qəltu and the Gilit are statistically non- significant *F(2,440) = 0.1616; p < .'1'*.

[63] ggplot(data_QGa_i, aes(Context2, F2Mid, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 78: The mean F1Start values of the local /iː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[64]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ʕiːdaːn	G	535	ʕiːda ːn	Q	463
ðˤiːfa	G	417	ðˤiːfa	Q	408
ʁiːba	G	383	ʁiːba	Q	406
ħiːra	G	477	ħiːra	Q	474
daqiːqa	G G	450	daqiːqa	Q	441
sˤiːnijja ːt	G	425	sˤiːnijja ːt	Q	396
tˤiːba	G	440	tˤiːba	Q	437
χiːra	G	417	χiːra	Q	405

[64] aggregate(F1Start~Context+Variety,data=data_QGa_i,mean)

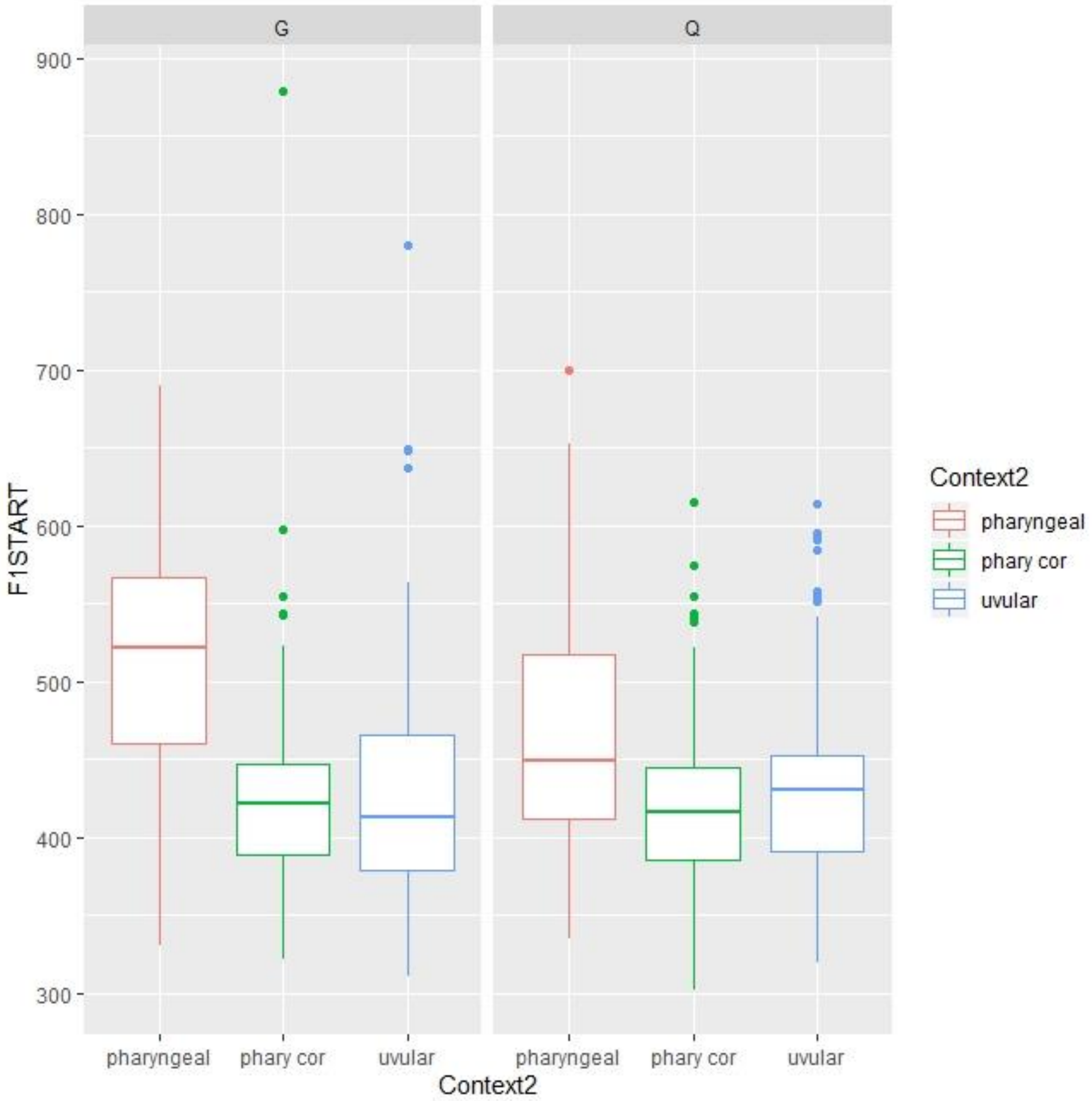

Figure 110 The F1start of the local /iː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [65]

6.4.14 F1mid of /iː/ variants

Results confirm that variations between the Qəltu and the Gilit consonantal groups in the F1mid values of the /iː/ vowel variants are not significant $F(2,440) = 1.818; p < \text{'}1\text{'}$.

[65] ggplot(data_QGa_i, aes(Context2, F1Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 79: The mean F1 Mid values of the local /iː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[66]

Context	Variety	F1Mid/Hz	Context	Variety	F1Mid/Hz
ʕiːdaːn	G	407	ʕiːdaːn	Q	330
ðˤiːfa	G	343	ðˤiːfa	Q	349
ʁiːba	G	359	ʁiːba	Q	389
ħiːra	G	378	ħiːra	Q	354
daqiːqa	G	431	daqiːqa	Q	386
sˤiːnijjaːt	G	453	sˤiːnijja ːt	Q	399
tˤiːba	G	423	tˤiːba	Q	355
χiːra	G	379	χiːra	Q	377

66 aggregate(F1Mid~Context+Variety,data=data_QGa_ii,mean)

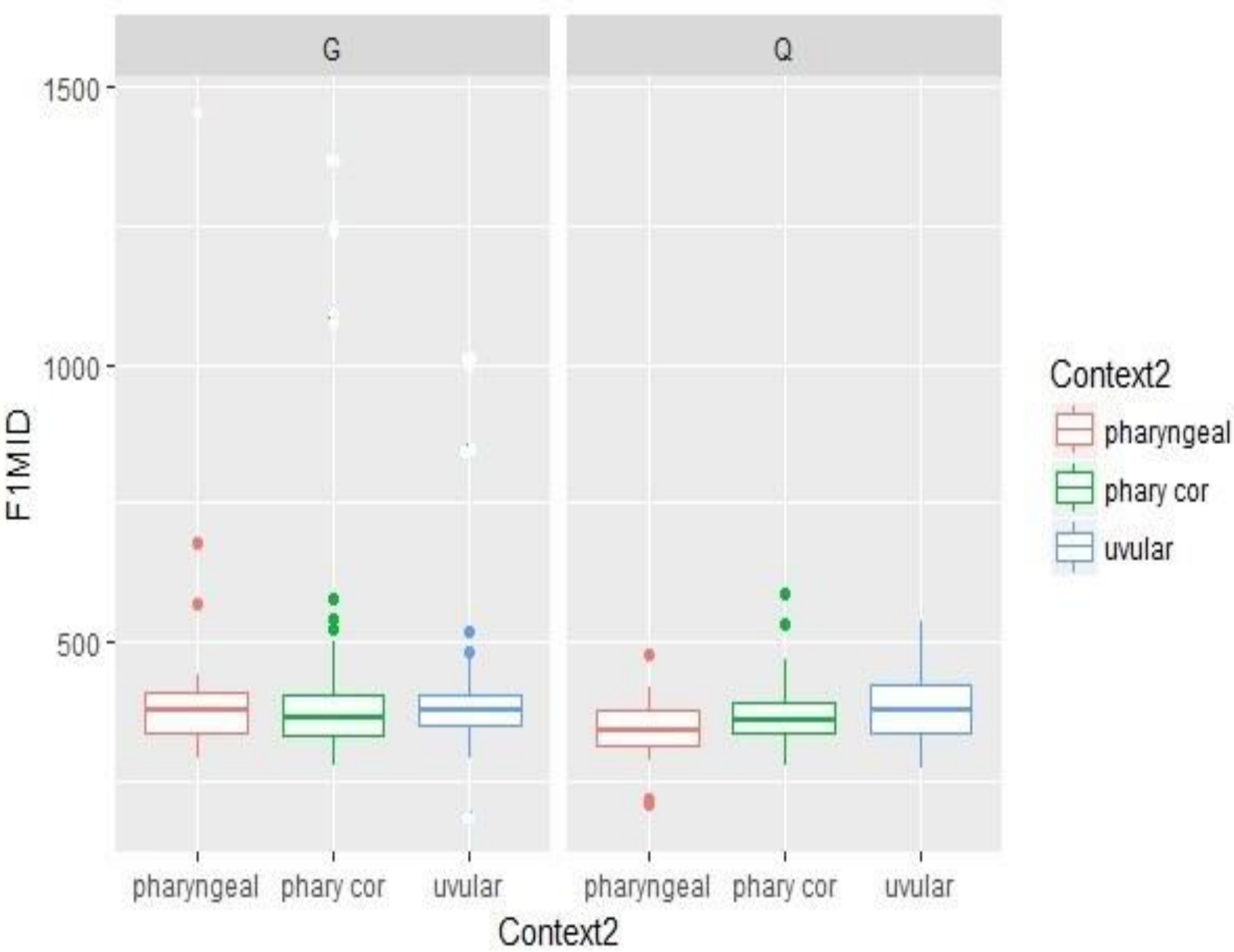

Figure 111The F1mid of the /iː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [67]

[67] ggplot(data_QGa_ii, aes(Context2, F1Mid, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.15 F2start of /iː/ variants

The variations in the F2start values of /iː/ vowel variants in the pharyngeal and pharyngealized coronals' consonantal contexts in the Qəltu and the Gilit are reported as statistically significant F*(2,440) = 4.990; p < '0.001'*. (*see Table 80*) below.

Table 80: mean F2 Start values of the local /iː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[68]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ʕiːdaːn	G	1816	ʕiːdaːn	Q	1935
ðˤiːfa	G	1284	ðˤiːfa	Q	1340
ʁiːba	G	1672	ʁiːba	Q	1661
ħiːra	G	1827	ħiːra	Q	1999
daqiːqa	G	1854	daqiːqa	Q	1826
sˤiːnijjaːt	G	1412	sˤiːnijja ːt	Q	1485
tˤiːba	G	1309	tˤiːba	Q	1299
χiːra	G	1936	χiːra	Q	1922

[68] aggregate(F2Start~Context+Variety,data=data_QGa_ii,mean)

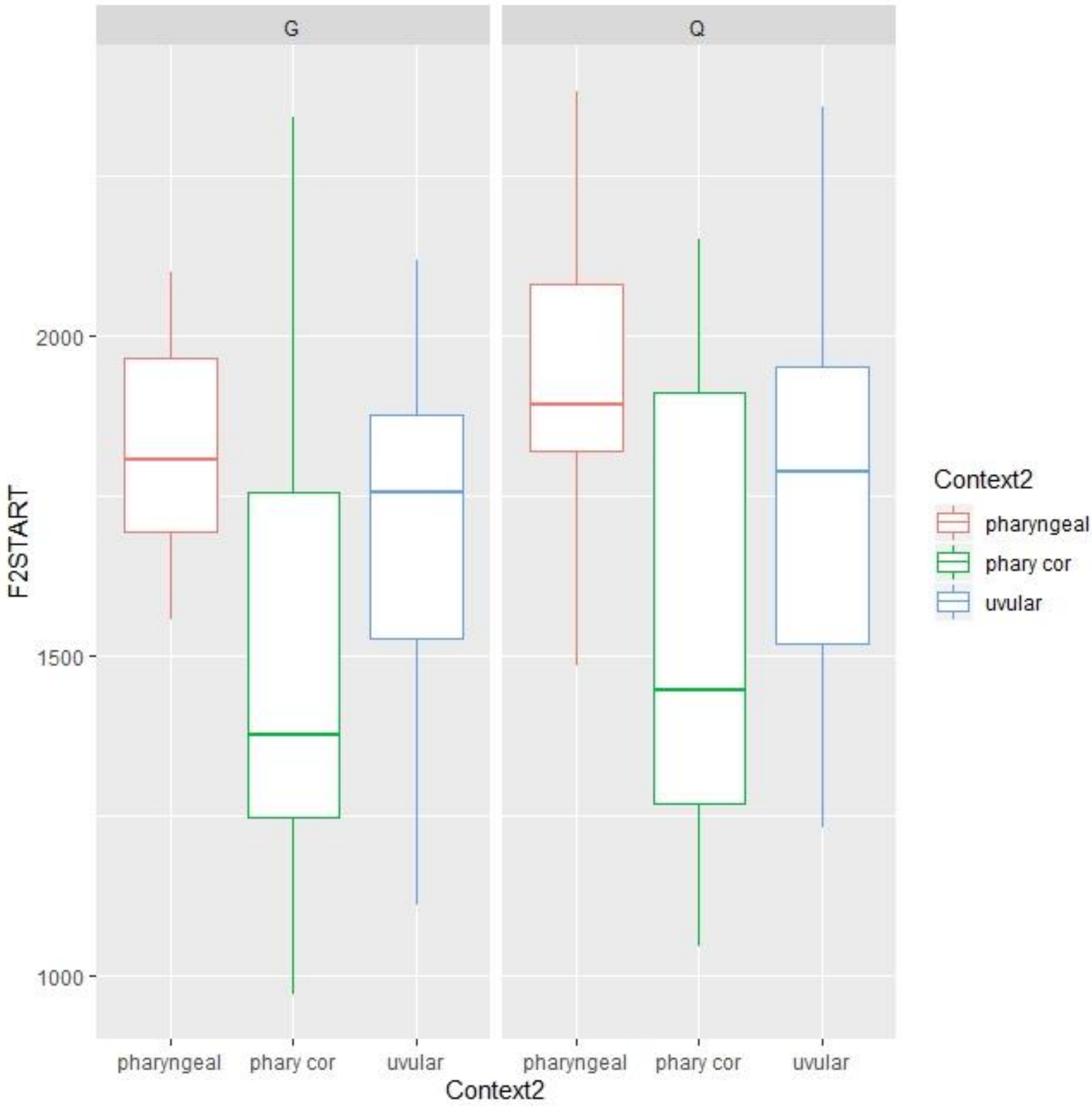

Figure 112The F2start of the /iː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [69]

6.4.16 F2mid of /iː/ variants

The results confirm that the F2 mid values of /iː/ remain steady in all three groups of consonantal contexts in the Qəltu and the Gilit are reported as statistically non-signficant *F (2,440) = 2.76; p < '1'* compared to F2start as represented in Table 81 below.

[69] ggplot(data_QGa_ii, aes(Context2, F2Start, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 81: The mean F2 Mid values of the local /iː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[70]

Context	Variety	F2Mid/Hz	Context	Variety	F2Mid/Hz
ʕiːdaːn	G	2076	ʕiːdaːn	Q	2274
ðˤiːfa	G	1913	ðˤiːfa	Q	2259
ʁiːba	G	2057	ʁiːba	Q	2141
ħiːra	G	2072	ħiːra	Q	2219
daqiːqa	G	2079	daqiːqa	Q	2160
sˤiːnijjaːt	G	1947	sˤiːnijjaːt	Q	2068
tˤiːba	G	2094	tˤiːba	Q	2211
χiːra	G	2017	χiːra	Q	2168

[70] aggregate(F2Mid~Context+Variety,data=data_QGa_ii,mean)

6.4.17 F1start of /u/ variants

Results confirm significant variations in the F1start values of the /u/ vowel variants per consonantal group among Qəltu and Gilit *F (2,413) = 2.76; p < '1'.*

Table 82: The mean F1 Start values of the local /u/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[71]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ʕurf	G	618	ʕurf	Q	593
ðˤufr	G	417	ðˤufr	Q	402
ʁubn	G	436	ʁubn	Q	406
ħukkam	G	581	ħukkam	Q	616
qufl	G	491	qufl	Q	493
sˤufr	G	470	sˤufr	Q	471
tˤuruq	G	502	tˤuruq	Q	449
χulq	G	466	χulq	Q	465

[71] aggregate(F1Start~Context+Variety,data=data_QGa_u,mean)

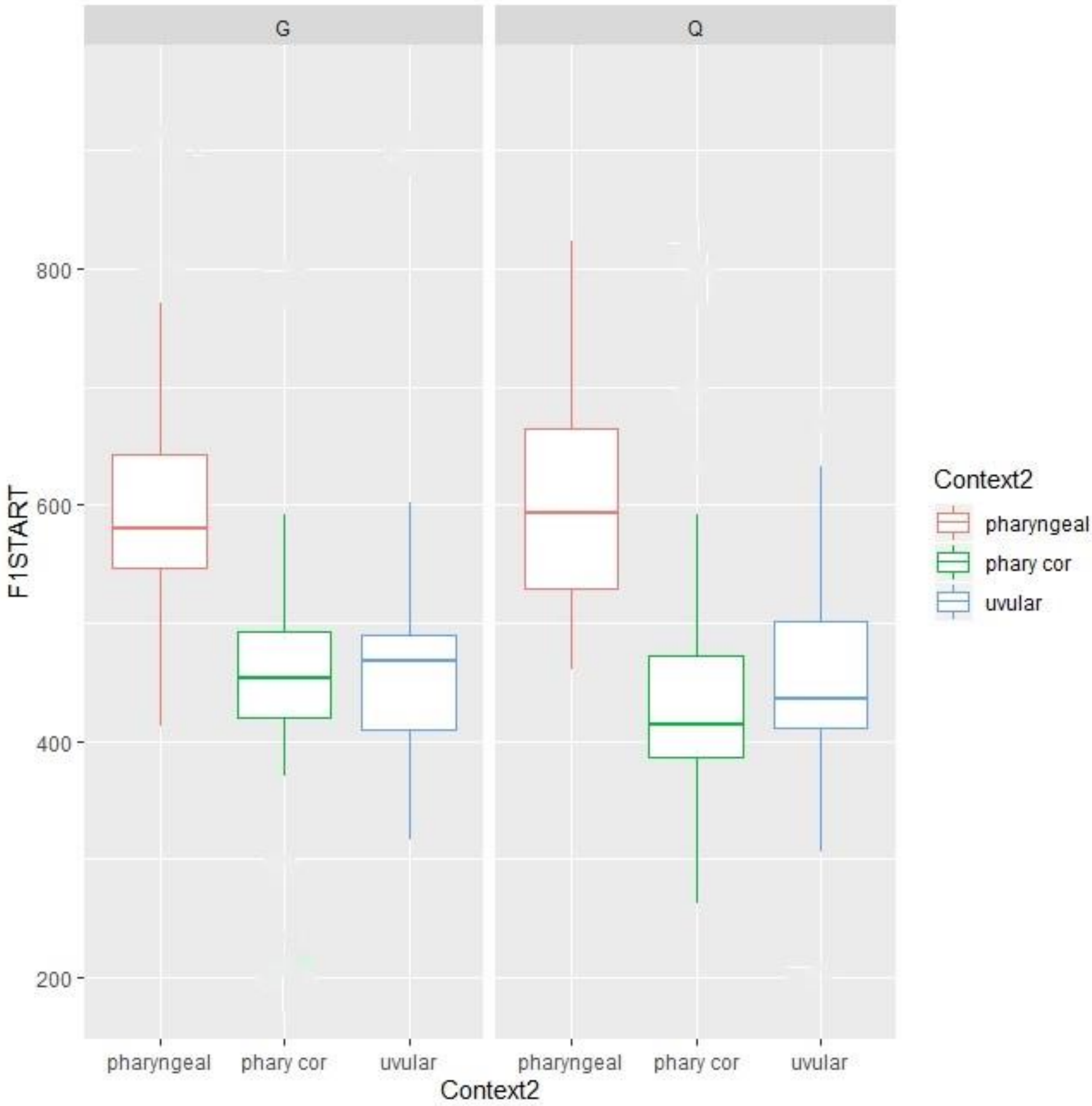

Figure 113The F1 start of the /u/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [72]

[72] ggplot(data_QGa_u, aes(Context2, F1START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.18 F1mid of /u/ variants

Results indicate that the F1 mid values of the /u/ variants remain steady across all three consonantal groups in the Qəltu and the Gilit with non-significant effect of all three groups of consonantal contexts on the F1 mid F $(2,440) = 2.76; p < \text{‘}1\text{’}$ compared to the F1start of /u/.

Table 83: The mean F1 Mid values of the local /u/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[73]

Context	**Variety**	**F1Mid/Hz**	Context	**Context**	**Variety**	**F1Mid/Hz**
ʕurf	G	577	ʕurf	ʕuruf	Q	523
ðˤufr	G	427	ðˤufr	ðˤufir	Q	466
ʁubn	G	469	ʁubn	ʁubin	Q	460
ħukkam	G	491	ħukkam	ħukkam	Q	461
qufl	G	472	qufl	qufil	Q	491
sˤufr	G	537	sˤufr	sˤufir	Q	477
tˤuruq	G	523	tˤuruq	tˤuruq	Q	496
χulq	G	497	χulq	χulq	Q	491

[73] aggregate(F1Mid~Context+Variety,data=data_QGa_u,mean)

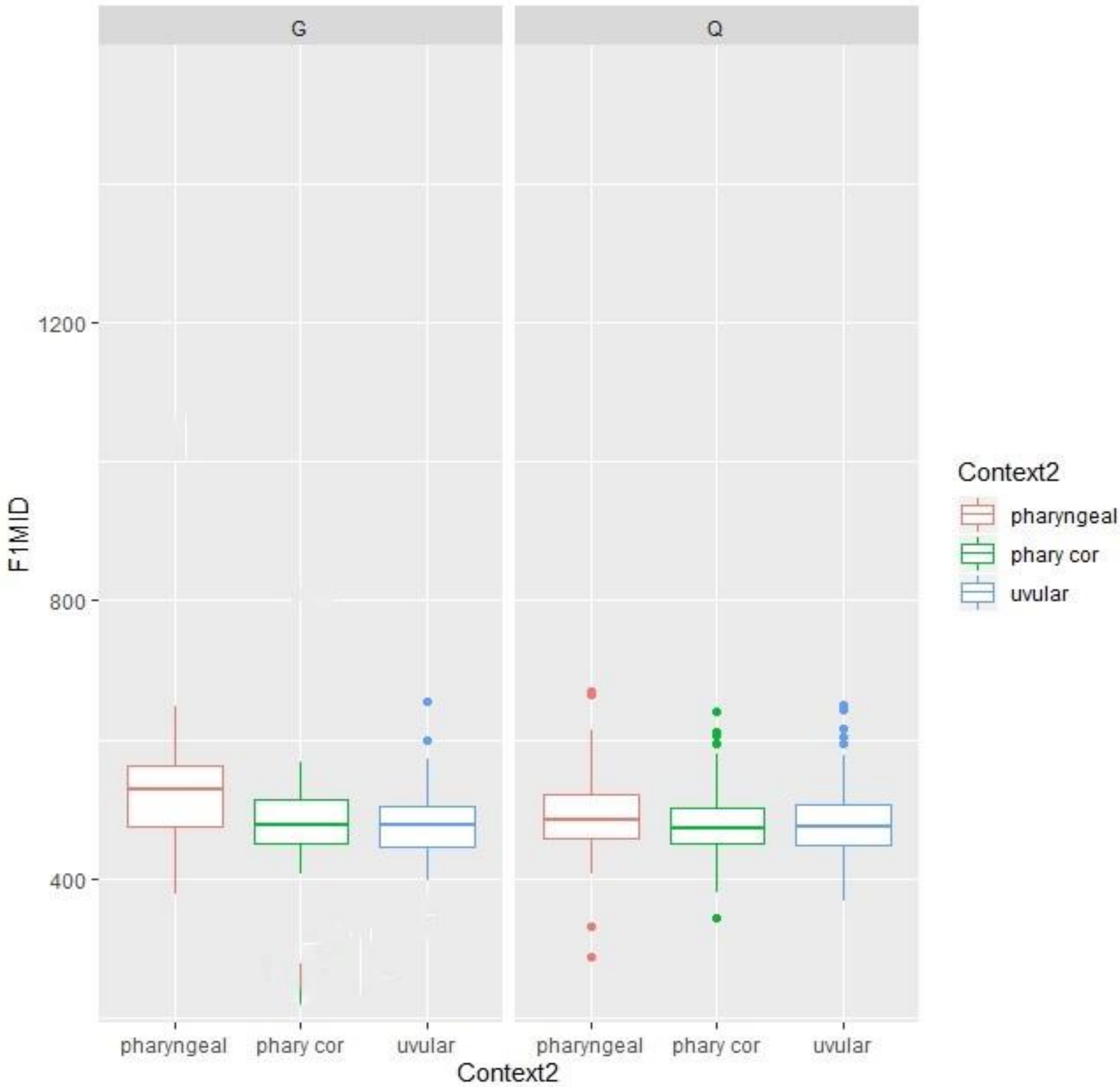

Figure 114The F1 mid of the /u/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [74]

[74] ggplot(data_QGa_u, aes(Context2, F1Mid, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.19 F2start of the /u/variants

Results confirm significant variations in the F2start values of the /u/ vowel variants per consonantal group in Qəltu and Gilit as represented in Table 84 below with F2 lowering being significant in the uvular context in Gilit compared to Qəltu suggesting that the /u/ and uvulars are showing high compatibility in articulation in Gilit which is present both locally and in long domain vowel harmony and vowel-consonant harmony. Details provided in section 4.9.

Table 84: The mean F2 Start values of the local /u/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[75]

Context	Variety	F2Start/Hz	Context	Variety	F2Start/Hz
ʕurf	G	1141	ʕurf	Q	1135
ðˤufr	G	1108	ðˤufr	Q	1028
ʁubn	G	1017	ʁubn	Q	1176
ħukka:m	G	1128	ħukka:m	Q	1523
qufl	G	1014	qufl	Q	1124
sˤufr	G	1149	sˤufr	Q	1254
tˤuruq	G	1150	tˤuruq	Q	1038
χulq	G	1004	χulq	Q	1330

[75] aggregate(F2Start~Context+Variety,data=data_QGa_u,mean)

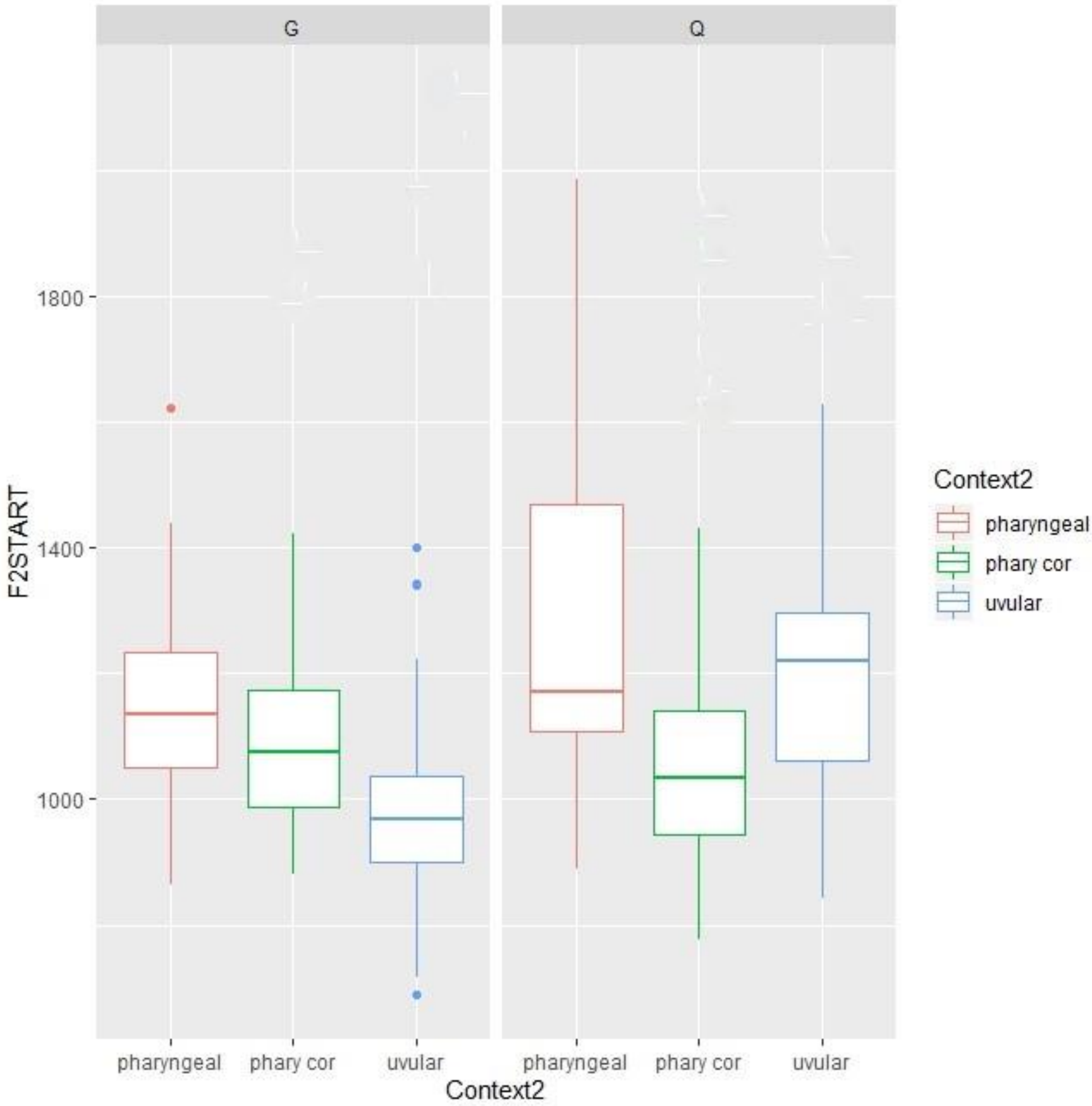

Figure 115The F2 start of the /u/ vowel as represented in the group of pharyngeals, uvulars, and pharyngealized coronals in the Qəltu and the Gilit. [76]

[76] ggplot(data_QGa_u, aes(Context2, F2START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.20 F2 mid of the /u/ variants

Significant variations are reported among the F2 mid values of the /u/ vowel variants in the different consonantal contexts with significant /u/ lowering and retraction in the pharyngeal the uvular context in Gilit compared to Qəltu driven by the nature of the articulatory element and the phonological environment (i.e. the presence of underlying secondary *mufaxxama* in the domain). However, /u/ lowering and retraction is salient in the pharyngealised context in both dialects with /u/ lowering being robust in the pharyngelaised contexts in Qəltu compared to Gilit.

Table 85: The mean F2 Mid values of the local /u/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[77]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ʕurf	G	1115	ʕurf	Q	1050
ðˤufr	G	1020	ðˤufr	Q	979
ʁubn	G	945	ʁubn	Q	1235
ħukkam	G	1059	Ħukka:m	Q	1637
qufl	G	904	qufl	Q	1178
sˤufr	G	1100	sˤufr	Q	1008
tˤuruq	G	1038	tˤuruq	Q	973
χulq	G	994	χulq	Q	1345

[77] aggregate(F2Mid~Context+Variety,data=data_QGa_u,mean)

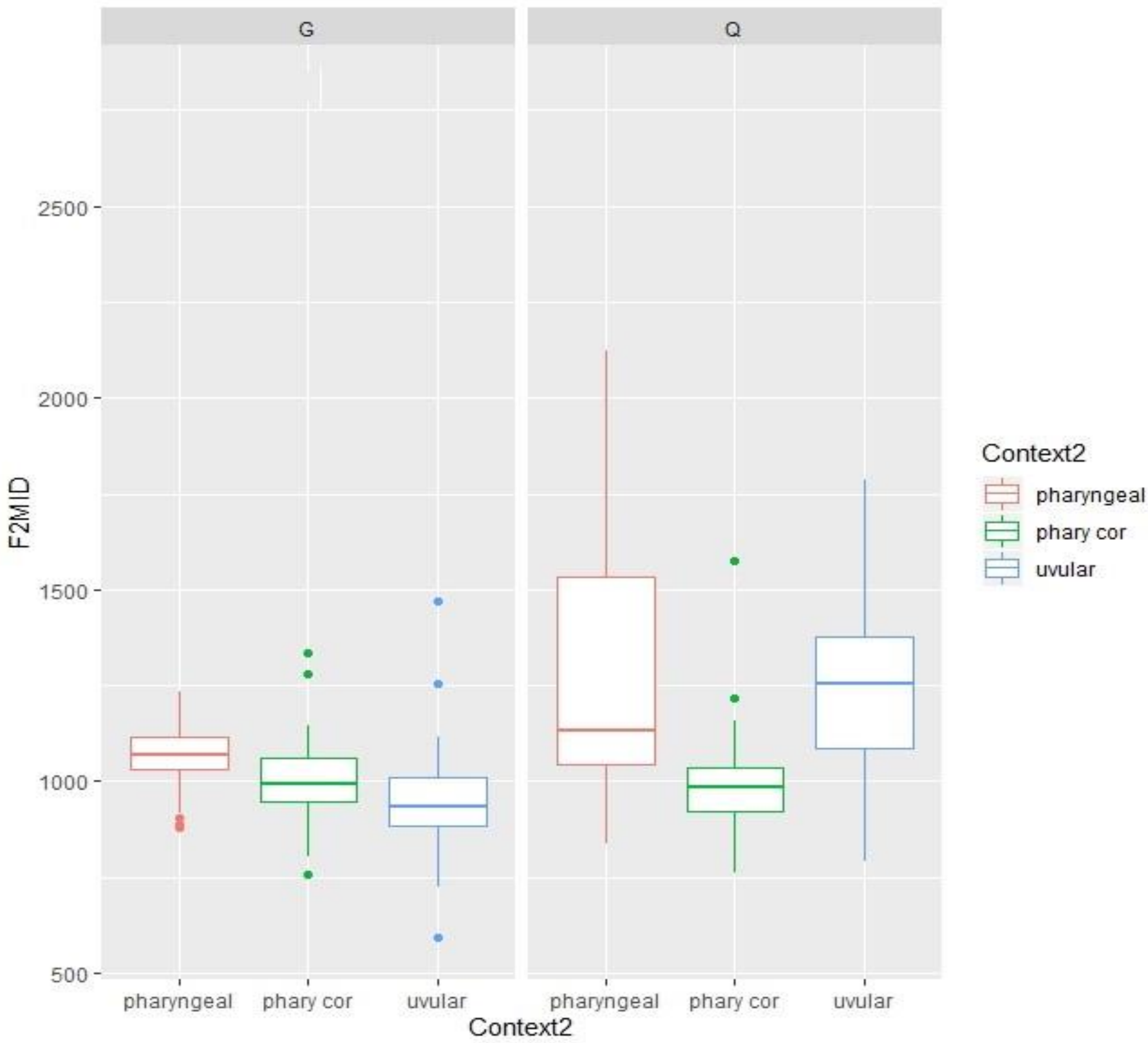

Figure 116The F2 mid of the /u/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [78]

[78] ggplot(data_QGa_u, aes(Context2, F2Mid, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.21 F1start of the /uː/

The reported variations among the F1start values of the /uː/ vowel variants in the pharyngeal and uvular contexts in Qəltu compared to Gilit are non-significant with /uː/ showing resitance to lowering at the vowel onset in both Qəltu and Gilit However, per consonantal group, there is a range of variation in the F1start values of /uː/ reported in the pharyngeal context in Qəltu compared to Gilit**.**

Table 86: The mean F1 Start values of the local /uː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[79]

Context	Variety	F1Start/Hz	Context	Variety	F1Start/Hz
ʕuːʒaːn	G	509	ʕuːʒaːn	Q	515
j.ðˤuːquːn	G	391	j.ðˤuːquːn	Q	389
jaʁuːruːn	G	404	jʁuːruːn	Q	417
j.fraħuːn	G	573	j.fraħuːn	Q	572
j.guːmuːn j.quːmuːn	G G	354 338	j. quːmuːn	Q	414
jsˤuːmuːn	G	416	jsˤuːmuːn	Q	456
tˤuːlak	G	414	tˤuːlak	Q	414
j.χuːnuːn	G	415	j.χuːnuːn	Q	423

[79] aggregate(F1Start~Context+Variety,data=data_QGa_uu,mean)

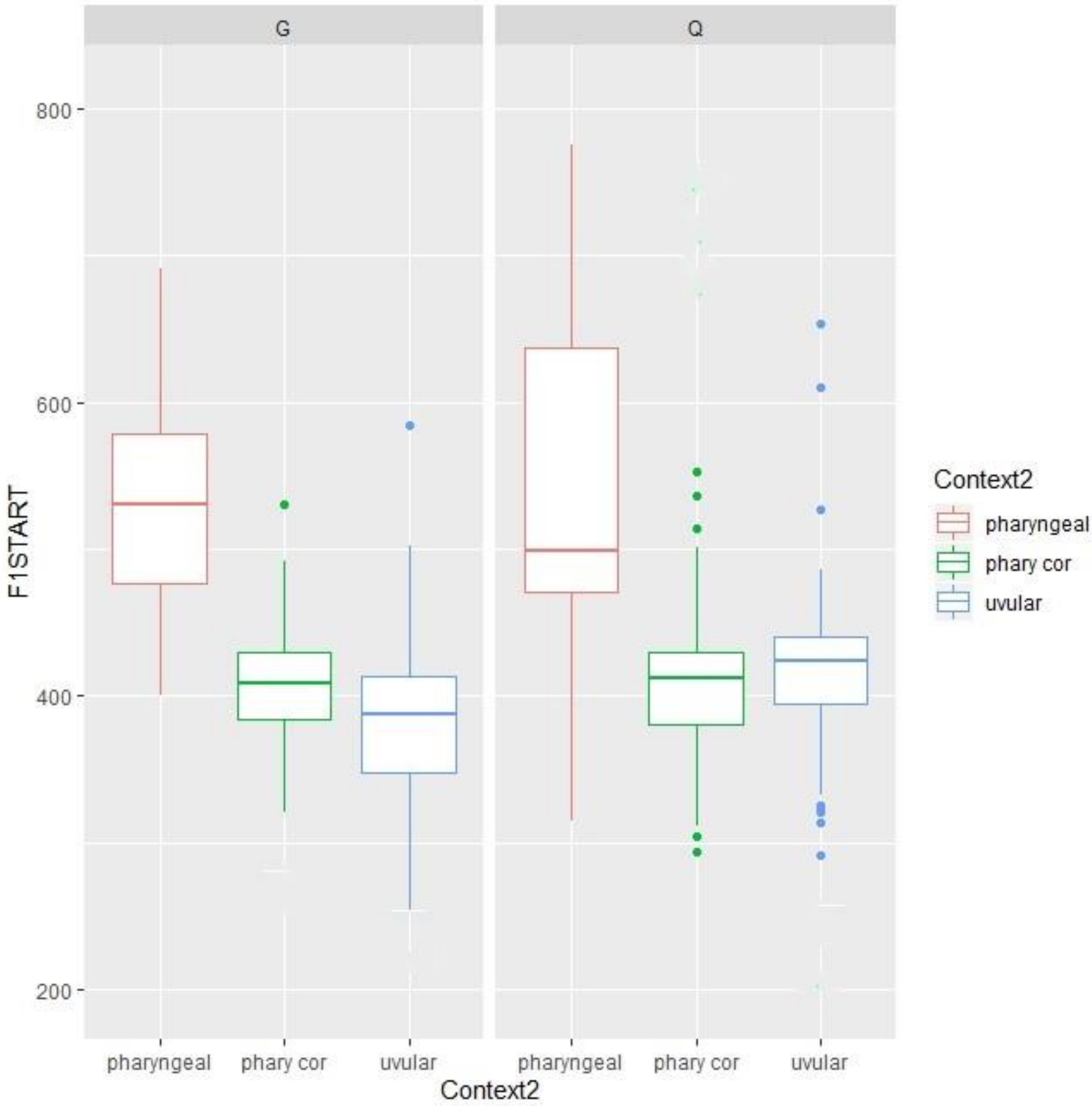

Figure 117The F1 start of the /uː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [80]

[80] ggplot(data_QGa_uu, aes(Context2, F1START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.22 F1mid of the /uː/ vowel variants

The effect of the three group of consonantal contexts on the the /uː/ vowel in the Qəltu and the Gilit is reported significant in the pharyngeal context with higher F1 mid values of /uː/ in the named context in Qəltu compared to Gilit.

Table 87: The mean F1 Mid values of the local /uː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[81]

Context	**Variety**	**F1Mid/Hz**	**Context**	**Variety**	**F1Mid/Hz**
ʕuːʒaːn	G	391	ʕuːʒaːn	Q	409
j.ðˤuːquːn	G	385	jðˤuːquːn	Q	433
jʁuːruːn	G	411	jʁuːruːn	Q	437
jfraħuːn	G	493	jfraħuːn	Q	503
jguːmuːn jquːmuːn	G G	395 390	jquːmuːn	Q	439
jsˤuːmuːn	G	617	jsˤuːmuːn	Q	433
tˤuːlak	G	402	tˤuːlak	Q	388
j.χuːnuːn	G	460	j.χuːnuːn	Q	405

[81] aggregate(F1Mid~Context+Variety,data=data_QGa_uu,mean)

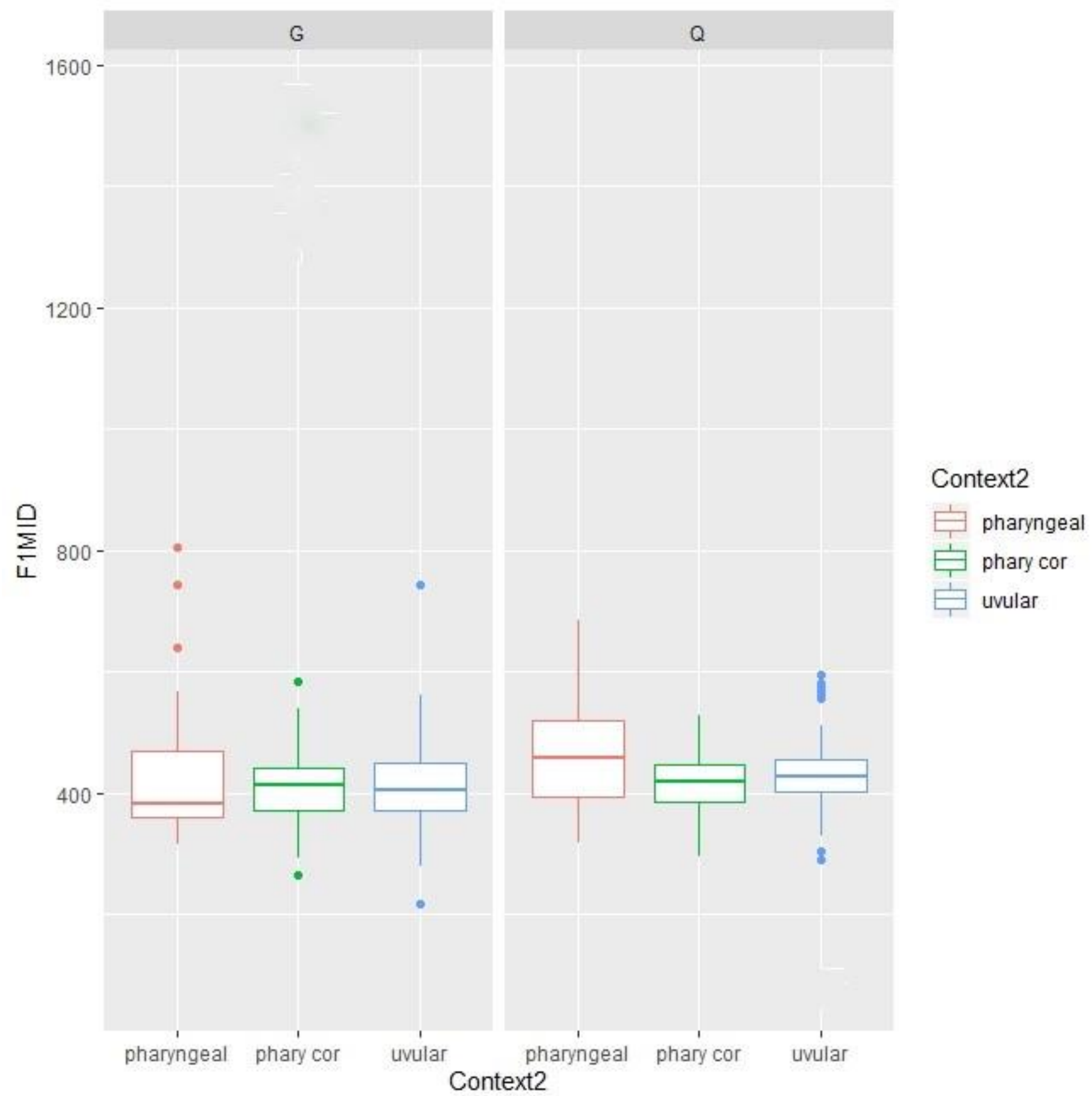

Figure 118The F1 mid of the /uː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [82]

6.4.23 F2start of the /uː/ vowel variants

The variations in the F2 start values of /uː/ vowel variants in both dialects in the different consonanatal groups is reported as non-significant as represented in Table 88 below suggesting /uː/ resistance to lowering at the vowel onset compared to the mid-point.

[82] ggplot(data_QGa_uu, aes(Context2, F1MID, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

Table 88: The mean F2 Start values of the local /uː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[83]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ʕuːʒaːn	G	1133	ʕuːʒaːn	Q	1048
j.ðˤuːquːn	G	1195	jðˤuːquːn	Q	1001
jʁuːruːn	G	1003	jʁuːruːn	Q	826
jfraħuːn	G	1169	jfraħuːn	Q	1064
jguːmuːn jquːmuːn	G G	974 1134	jquːmuːn	Q	978
jsˤuːmuːn	G	1306	jsˤuːmuːn	Q	1392
tˤuːlak	G	977	tˤuːlak	Q	1087

[83] aggregate(F2Start~Context+Variety,data=data_QGa_uu,mean)

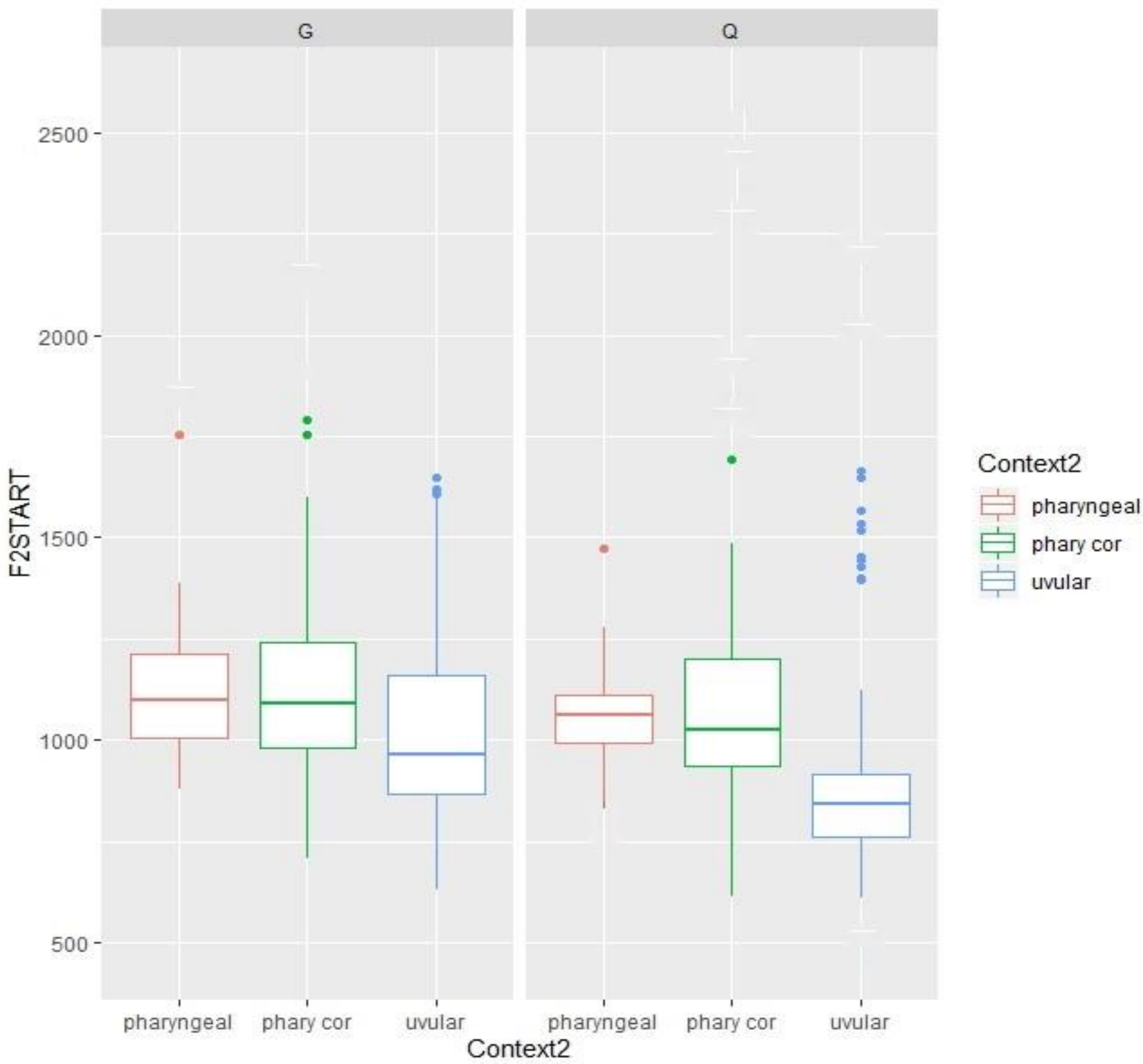

Figure 119The F2 start of the /uː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [84]

[84] ggplot(data_QGa_uu, aes(Context2, F2START, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.4.24 F2mid of /uː/

The results are suggestive of /uː/ lowering being salient in all three groups of consonantal contexts with robust retraction of /uː/ in all three groups in Qəltu compared to Gilit as represented in Table 89 below.

Table 89: The mean F2 Mid values of the local /uː/ vowel in the PV consonantal contexts in the MQ and BG dialects of Mesopotamian Arabic.[85]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ʕuːʒaːn	G	961	ʕuːʒaːn	Q	894
j.ðˤuːquːn	G	991	jðˤuːquːn	Q	871
jʁuːruːn	G	944	jʁuːruːn	Q	851
jfraħuːn	G	1321	jfraħuːn	Q	1060
jguːmuːn jquːmuːn	G G	1227 1038	jquːmuːn	Q	880

[85] aggregate(F2Mid~Context+Variety,data=data_QGa_uu,mean)

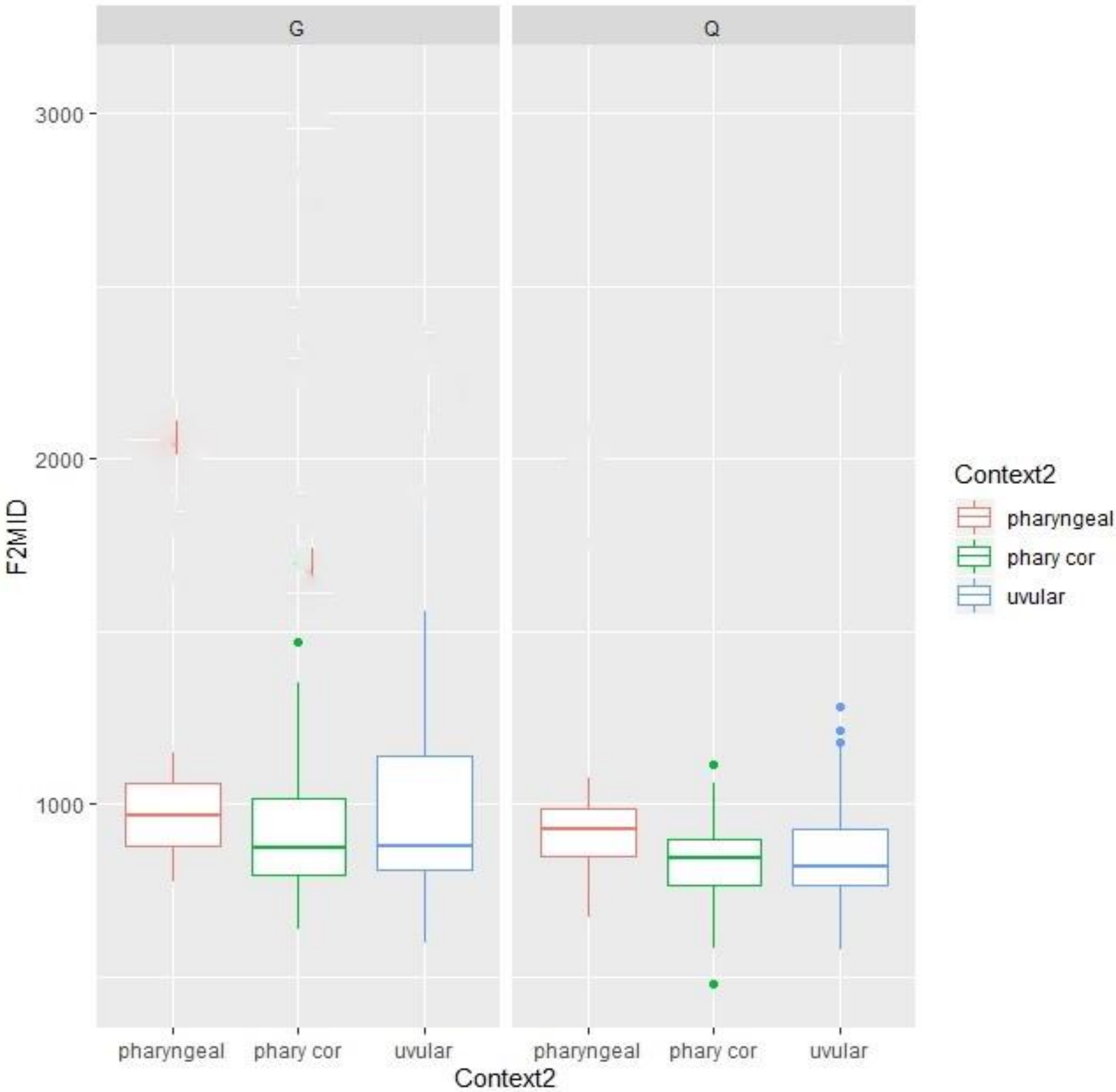

Figure 120The F2 mid of the /uː/ vowel as represented in the group of pharyngeals, uvulars and pharyngealized coronals in the Qəltu and the Gilit. [86]

[86] ggplot(data_QGa_uu, aes(Context2, FMID, colour=Context2)) + geom_boxplot() + facet_wrap(~Variety).

6.5 Acoustic and statistical vowel profiling of the emphatics vs. plain contexts

Below are the F1-F2 formants of the target vowels at the vowel onset and mid point in the pharyngealized vs. the plain contexts in Qəltu and Gilit.

Table 90: The mean F1 Start values of the local /a/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [87]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ðˤall	G	491	ðˤall	Q	458
ðall	G	437	ðall	Q	409
sˤadd	G	511	sˤadd	Q	493
sadd	G	451	sadd	Q	402
tˤamir	G	519	tˤamir	Q	558
tamir	G	513	tamir	Q	480

The results suggest variations among that the group of emphatics vs. their plain counterparts i n terms of F1 start values of /a/, with significant variations among both groups in both Qəltu and Gilit *F (2,327) =1.68; p* < ‘1’.

Table 91: The mean F2 Start values of the local /a/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [88]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ðˤall	G	1061	ðˤall	Q	1004
ðall	G	1563	ðall	Q	1698
sˤadd	G	1214	sˤadd	Q	1198
sadd	G	1652	sadd	Q	1679
tˤamir	G	1148	tˤamir	Q	1127
tamir	G	1553	tamir	Q	1570

Similarly, the reported variations in the F2start values of /a/ among the groups of emphatics in both Qəltu and Gilit and the variations in the F2start values of /a/ among their plain counterparts in both dialects are reported non-significant between the two dialects F(2,327)=2.191;p< ‘1’.

[87] aggregate(F2MID~Context2+Variety,data=data_EPa_a,mean)

[88] aggregate(F2START~Context2+Variety,data=data_EPa_a,mean)

Table 92: The mean F1 Mid values of the local /a/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [89]

Context	**Variety**	**F1Mid/Hz**	**Context**	**Variety**	**F1Start/Hz**
ðˤall	G	586	ðˤall	Q	613
ðall	G	514	ðall	Q	559
sˤadd	G	628	sˤadd	Q	612
sadd	G	532	sadd	Q	533
tˤamir	G	544	tˤamir	Q	638
tamir	G	625	tamir	Q	597

Dialectal variations are reported as statistically non-significant among the consonantal groups (the emphatics vs. their plain contexts) in the F1mid values of /a/ $F(2,327)=0.682;p<$ '1'with plain /t/ having higher F1 mid values of /a/ compared to /tˤ/ in Gilit.

Table 93: The mean F2 Mid values of the local /a/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [90]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F1Mid/Hz**
ðˤall	G	1230	ðˤall	Q	1244
ðall	G	1552	ðall	Q	1678
sˤadd	G	1339	sˤadd	Q	1258
sadd	G	1622	sadd	Q	1639
tˤamir	G	1070	tˤamir	Q	1109
tamir	G	1393	tamir	Q	1339

Dialectal variations in F2 mid values of /a/ are reported as non-significant in the emphatic contexts as well as in the plain contexts $F(2,327)=0.155;p<$ '1'. However, the variations among the emphatic consonantal groups vs. their plain counterparts in their effect on the F2 mid values of /a/ is reported as statistically significant $F(2,327)=125.6;p<$ '.000'.

[89] aggregate(F1MID~Context2+Variety,data=data_EPa_a,mean)

[90] aggregate(F2MID~Context2+Variety,data=data_EPa_a,mean)

Table 94: The mean F1 Start values of the local /a:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [91]

Context	Variety	F1Start/Hz	Context	Variety	F1Start/Hz
ðˤa:ll	G	487	ðˤa:ll	Q	507
ða:ll	G	457	ða:ll	Q	425
sˤa:dd	G	538	sˤa:dd	Q	520
tˤa:b	G	581	tˤa:b	Q	568
ta:b	G	508	ta:b	Q	455

Table 95: The mean F2 Start values of the local /a:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. 92

Context	Variety	F2Start/Hz	Context	Variety	F2Start/Hz
ðˤa:ll	G	1052	ðˤa:ll	Q	1078
ða:ll	G	1488	ða:ll	Q	1632
sˤa:dd	G	1116	sˤa:dd	Q	1125
tˤa:b	G	1113	tˤa:b	Q	1695
ta:b	G	1562	ta:b	Q	1163

Table 96: The mean F1 Mid values of the local /a:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. 93

Context	Variety	F1MID/Hz	Context	Variety	F1MID/Hz
ðˤa:ll	G	646	ðˤa:ll	Q	683
ða:ll	G	624	ða:ll	Q	652
sˤa:dd	G	666	sˤa:dd	Q	676
tˤa:b	G	684	tˤa:b	Q	683
ta:b	G	667	ta:b	Q	681

[91] aggregate(F1START~Context2+Variety,data=data_EPa_aa,mean)

[92] aggregate(F2START~Context2+Variety,data=data_EPa_aa,mean)

[93] aggregate(F1MID~Context2+Variety,data=data_EPa_aa,mean)

Table 97: The mean F2 Mid values of the local /a:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [94]

Context	Variety	F2MID/Hz	Context	Variety	F2MID/Hz
ðˤa:ll	G	1119	ðˤa:ll	Q	1136
ða:ll	G	1265	ða:ll	Q	1473
sˤa:dd	G	1137	sˤa:dd	Q	1142
tˤa:b	G	1140	tˤa:b	Q	1129
ta:b	G	1288	ta:b	Q	1447

Dialectal variations are reported as highly statistically significant in the F2start values of /a:/ $F(1,221)=13.26; p<$ '.000', and F2 mid values of /a:/ $F(1,221)=43.28; p<$ '.000'. Variations among the consonantal groups (ie. the emphatics and their plain counterparts) in the two dialects is also reported as statistically significant in F1start $F(1,221)=3.893; p<$ '0.05', F2start $F(1,221)=5.139; p<$ '0.05', and F2 mid $F(1,221)=45.81; p<$ '.000'

Table 98: The mean F1 Start values of the local /i/ vowel in the emphatic vs. plain contexts in the MQ and BGdialects of Mesopotamian Arabic. [95]

Context	Variety	F1Start/Hz	Context	Variety	F2Start/Hz
ðˤill	G	451	ðˤill	Q	444
ðill	G	380	ðill	Q	364
sˤidd	G	475	sˤidd	Q	432
sidd	G	469	sidd	Q	360
tˤibit	G	486	tˤibit	Q	467
tibit	G	421	tibit	Q	370

94 aggregate(F2MID~Context2+Variety,data=data_EPa_aa,mean)

95 aggregate(F1Start~Context2+Variety,data=data_EPa_i,mean)

Table 99: The mean F2 Start values of the local /i/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [96]

Context	Variety	F2Start/Hz	Context	Variety	F2Start/Hz
ðˤill	G	1131	ðˤill	Q	1123
ðill	G	1684	ðill	Q	1713
sˤidd	G	1367	sˤidd	Q	1305
sidd	G	1746	sidd	Q	1782
tˤibt	G	1165	tˤibt	Q	1128
tibt	G	1715	tibt	Q	1798

Table 100: The mean F1 Mid values of the local /i/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [97]

Context	Variety	F1Mid/Hz	Context	Variety	F1Mid/Hz
ðˤill	G	460	ðˤill	Q	508
ðill	G	393	ðill	Q	441
sˤidd	G	458	sˤidd	Q	466
sidd	G	505	sidd	Q	409
tˤibt	G	500	tˤibt	Q	495
tibt	G	469	tibt	Q	408

Dialectal variations are reported as highly statistically significant in the F1start values of /i/ $F(1,320)=19.8; p<$ '.000' (see Table 98). However, variations among the consonantal groups (ie. the emphatics and their plain counterparts) in the two dialects is also reported as statistically significant in F1mid $F(1,221)=5.311; p<$ '0.01' (see Table 99) for the reported mean F1mid values.

[96] aggregate(F2Start~Context2+Variety,data=data_EPa_i,mean)

[97] aggregate(F1Mid~Context2+Variety,data=data_EPa_i,mean)

Table 101: The mean F2 Mid values of the local /i/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [98]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ðˤill	G	1315	ðˤill	Q	1390
ðill	G	1719	ðill	Q	1778
sˤidd	G	1454	sˤidd	Q	1414
sidd	G	1757	sidd	Q	1753
tˤibt	G	1167	tˤibt	Q	1119
tibt	G	1709	tibt	Q	1751

Table 102: The mean F1 Start values of the local /iː/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [99]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ðˤiːb	G	420	ðˤiːb	Q	412
ðiːb	G	300	ðiːb	Q	312
sˤiːdd	G	506	sˤiːdd	Q	449
siːdd	G	332	siːdd	Q	322
tˤiːn	G	492	tˤiːn	Q	449
tiːn	G	356	tiːn	Q	287

[98] aggregate(F2Mid~Context2+Variety,data=data_EPa_i,mean)

[99] aggregate(F1Start~Context2+Variety,data=data_EPa_ii,mean)

Table 103: The mean F2 Start values of the local /i:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [100]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ðˤi:b	G	1844	ðˤi:b	Q	1303
ði:b	G	1272	ði:b	Q	2036
sˤi:dd	G	1458	sˤi:dd	Q	1448
si:dd	G	1994	si:dd	Q	2075
tˤi:n	G	1339	tˤi:n	Q	1242
ti:n	G	2071	ti:n	Q	2177

Table 104: The mean F1 Mid values of the local /i:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [101]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ðˤi:b	G	344	ðˤi:b	Q	427
ði:b	G	307	ði:b	Q	312
sˤi:dd	G	457	sˤi:dd	Q	325
si:dd	G	382	si:dd	Q	309
tˤi:n	G	504	tˤi:n	Q	397
ti:n	G	409	ti:n	Q	349

[100] aggregate(F2Start~Context2+Variety,data=data_EPa_ii,mean)

[101] aggregate(F1Mid~Context2+Variety,data=data_EPa_ii,mean)

Table 105: The mean F2 Mid values of the local /i:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [102]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ðˤi:b	G	1983	ðˤi:b	Q	2148
ði:b	G	2082	ði:b	Q	2263
sˤi:dd	G	2096	sˤi:dd	Q	2250
si:dd	G	2211	si:dd	Q	2258
tˤi:n	G	2142	tˤi:n	Q	2280
ti:n	G	2208	ti:n	Q	2423

Dialectal variations among the consonantal conetxts are reported highly significant in the F2 mid values of /i:/ $F(1,306)=22.221; p<$ '.000'. However, variations among the consonantal groups (ie. the emphatics and their plain counterparts) in the two dialects is also reported as statistically significant in the F2start $F(2, 306)=6.114; p<$ '0.01'.

Table 106: The mean F1 Start values of the local /u/ vowel in the emphatic vs. plain contexts in the MQ and BGdialects of Mesopotamian Arabic. [103]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ðˤuru:f	G	434	ðˤuru:f	Q	400
ðuru:f	G	352	ðuru:f	Q	361
sˤubb	G	478	sˤubb	Q	460
Sub	G	376	subb	Q	375
tˤubt	G	497	tˤubt	Q	438
tubt	G	463	Tubt	Q	355

[102] aggregate(F2Mid~Context2+Variety,data=data_EPa_ii,mean)

[103] aggregate(F1Start~Context2+Variety,data=data_EPa_u,mean)

Table 107: The mean F2 Start values of the local /u/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [104]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ðˤuru:f	G	1189	ðˤuru:f	Q	1209
ðuru:f	G	1428	ðuru:f	Q	1468
sˤubb	G	1332	sˤubb	Q	1226
Sub	G	1696	Sub	Q	1757
tˤubt	G	1197	tˤubt	Q	1143
tubt	G	1616	tubt	Q	1649

Table 108: The mean F1 Mid values of the local /u/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [105]

Context	**Variety**	**F1Mid/Hz**	**Context**	**Variety**	**F1Mid/Hz**
ðˤuru:f	G	422	ðˤuru:f	Q	420
ðuru:f	G	392	ðuru:f	Q	404
sˤubb	G	477	sˤubb	Q	458
subb	G	420	subb	Q	405
tˤubt	G	500	tˤubt	Q	455
tubt	G	447	tubt	Q	400

Table 109: The mean F2 Mid values of the local /u/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [106]

Context	**Variety**	**F2Mid/Hz**	**Context**	**Variety**	**F2Mid/Hz**
ðˤuru:f	G	1018	ðˤuru:f	Q	936
ðuru:f	G	1255	ðuru:f	Q	1215
sˤubb	G	972	sˤubb	Q	1155
sub	G	1599	subb	Q	1750
tˤubt	G	1054	tˤubt	Q	965
tubt	G	1430	tubt	Q	1472

[104] aggregate(F2Start~Context2+Variety,data=data_EPa_u,mean)

[105] aggregate(F1Mid~Context2+Variety,data=data_EPa_u,mean)

[106] aggregate(F1Mid~Context2+Variety,data=data_EPa_u,mean)

Results confirm that the dialectal variations are reported highly significant in the F1start $F(1, 283)=8.644; p<$ '0.01', and the F1 mid values of /u/ $F(1,306)=7.455; p<$ '0.01'. However, variations among the consonantal groups (ie. the emphatics and their plain counterparts) in the two dialects are reported as statistically non-significant in the F2start $F(1, 283)=0.808; p<$ '1', and the F2mid $F(1, 283)=2.1 p<$ '1'.

Table 110: The mean F1 Start values of the local /u:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [107]

Context	**Variety**	**F1Start/Hz**	**Context**	**Variety**	**F1Start/Hz**
ðˤu:b	G	468	ðˤu:b	Q	412
ðu:b	G	381	ðu:b	Q	344
sˤu:ra	G	462	sˤu:ra	Q	379
su:ra	G	395	su:ra	Q	379
f.tˤu:r	G	456	f.tˤu:r	Q	468
ftu:r	G	411	ftu:r	Q	346

Table 111: The mean F2 Start values of the local /u:/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. [108]

Context	**Variety**	**F2Start/Hz**	**Context**	**Variety**	**F2Start/Hz**
ðˤu:b	G	1080	ðˤu:b	Q	1112
ðu:b	G	1428	ðu:b	Q	1547
sˤu:ra	G	1246	sˤu:ra	Q	1166
su:ra	G	1598	su:ra	Q	1575
f.tˤu:r	G	1101	f.tˤu:r	Q	1088
f.tu:r	G	1525	f.tu:r	Q	1621

[107] aggregate(F1Start~Context2+Variety,data=data_EPa_uu,mean)

[108] aggregate(F2Start~Context2+Variety,data=data_EPa_uu,mean)

Table 112: The mean F1 Mid values of the local /uː/ vowel in the emphatic vs. plain contexts in the MQ and BGdialects of Mesopotamian Arabic. [109]

Context	Variety	F1Mid/Hz	Context	Variety	F1Mid/Hz
ðˤuːb	G	475	ðˤuːb	Q	478
ðuːb	G	403	ðuːb	Q	405
sˤuːra	G	504	sˤuːra	Q	391
suːra	G	465	suːra	Q	355
f.tˤuːr	G	402	f.tˤuːr	Q	530
f.tuːr	G	484	f.tuːr	Q	389

Table 113: The mean F2 Mid values of the local /uː/ vowel in the emphatic vs. plain contexts in the MQ and BG dialects of Mesopotamian Arabic. 110

Context	Variety	F2Mid/Hz	Context	Variety	F2Mid/Hz
ðˤuːb	G	868	ðˤuːb	Q	886
ðuːb	G	954	ðuːb	Q	905
sˤuːra	G	1023	sˤuːra	Q	807
suːra	G	1077	suːra	Q	887
f.tˤuːr	G	1104	f.tˤuːr	Q	951
f.tuːr	G	1216	f.tuːr	Q	878

Results confirm that the dialectal variations are reported highly significant in the F1start F(1, 313)=13.97; p< '.000', and the F2mid values of /uː/ F(1, 313)=22.21;p< '.000'. However, variations among the different consonantal groups (ie. the emphatics vs. their plain counterparts) in the two dialects are reported as statistically non-significant in the F2mid F(2, 313)=0.911p< '1'.

[109] aggregate(F1Mid~Context2+Variety,data=data_EPa_uu,mean)

[110] aggregate(F2Mid~Context2+Variety,data=data_EPa_uu,mean)

6.6 Summary of the auditory and acoustic results

The results show a great deal of variability in the manifestations of *tafxiːm* as represented in the different PVs in the target vowels in the Muslawi Qəltu and Baghdadi Gilit. The results confirm that the degree of articulatory compatibility of PVs on a scale of highly compatible to less compatible with the affected vowel, the underlying feature of the affected vowel, the phonological environment, and the typology of *tafxiːm* in the dialect are reflected in the outcome (Watson, 2002; Sylak-Glassman, 2013). In a dialect like Baghdadi Gilit of Bedouin origin, it is found that the pharyngeals override the uvulars in their effect on vowels. With close examination of the data set, it is found that the prominent featural manifestation of *tafxi:m* in the vowels in Baghdadi Gilit is retraction which shows similarity with tongue retraction; the articulation of pharyngeals.

In other words, the articulation of pharyngeals involve tongue retraction, open vocal tract configuration and epilarynx constriction (Sylak-Glassman, 2013; 2014) so when compared to vowels; it is seen that the [retracted] /a/ variants as [a̱], [ɑ] which are present in the realisations of Baghdadi Gilit speakers are the most similar to pharyngeals in articulation. With the /i/, and /u/ vowels, the case is also similar to /a/ retraction where the /i/, /u/ vowels undergo retraction in the same PV contexts in BG, but to a less degree with instances of [ɪ], [e̱] variants of /i/, and [ʊ] variant of /u/ realised in the production of BG speakers in [ʔɪfit] 'I abandonned' and [ʜʊkˤkˤɑːm] 'leaders' respectively (see section 6.2& appendix E).

Additionaly, in the presence of secondary emphatic contexts in BG, vowel rounding and retraction is identified as another featural manifestation of *tafxi:m* in the dialect. The retracted and rounded [ʊ] variants of epenthetic /i/ in the uvular contexts in [ʁʊbʊn] > /ʁʊbn/ 'deception' , [qʊfˤʊlˤ] < / qʊfˤl/ 'lock' and the [ʊ] variants of /a/ in [qʊfˤɑl] > /qafal/ 'he locked' are realized in the production of BG speakers.

Both uvulars and secondary emphatics assimilate with [ʊ] in place of articulation; therefore instances of [ʊ] variants of /i/ and /a/ respectively are identified in the production of BG speakers where uvulars and secondary PVs are present in the same phonological context as stated above (cf. Sylak-Glassman, 2013; 2014).

In other words, the uvular consonants are articulated with raised tongue dorsum and an overall more open vocal tract configuration (Sylak-Glassman, 2013; 2014). Thus, the [ʊ] variants which are realised in the production of BG speakers are the most similar to the uvulars (cf. appendix E).

On the other hand, in Muslawi Qəltu, the featural manifestations of *tafxi:m* are lowering of /i:/ and /u:/. The /i:/ and /u:/ lowering is seen prominent in the /i:/ and /u:/ vowels in the emphatic and uvular contexts with further lowering of /i:/ in a uvular / χ/ context in [χi:ra] 'goodness' compared to /u:/ lowering in an emphatic /ðˤ/ context in [j. ðˤɔːqu:n] 'they taste'. However, further lowering of /u:/ compared to /i:/ lowering is identified in the dialect for emphatics are compatible with /u:/ vowels in place of articulation. In other words, they are assimilatory in place of articulation (cf. Sylak-Glassman, 2014).

While another correlate of *tafxi:m* in MQ represented as /u/ > [ə] fonting and /i/ > [ə] centralisation is identified in the the pharyngeal, uvular and emphatic contexts in one form of long domain *ʔima:la* vowel harmony. Some examples from the data are [ʕərəf] 'norm', [χə̹fət] context, and [ðˤə̹fət] 'I added'.

In other words, the presence of PVs does not exclude the presence of *ʔimaːla* in Muslawi Qəltu which determine that the presence of PVs in the dialect consonantal inventory is driven too by the dialect background when it comes to *tafxi:m* in vowels. It is expected to see *tafxi:m* more prominent in a dialect of Bedouin origin like Baghdadi Gilit compared to a dialect of sedentary origin like Muslawi Qəltu.

As discussed earlier, *tafxiːm* tends to be more pronounced in vowels that are compatible in articulation with the trigger PV element (Kriba, 2010). Acoustically, this is represented with a rise in F1 and a decrease in F2 at the consonant-vowel transition compared to the mid-point with F2 decrease being prominent in the uvular and emphatic contexts (Ghazeli, 1977; Watson, 2002), and F1 rise being prominent in the pharyngeal contexts (Al-Ani,1970).

Both the auditory and acoustic results confirm that *tafxiːm* driven by pharyngeals is more pronounced in the /a/ vowel for pharyngeals and /a/ are articulatorily compatible in terms of their constriction. The pharyngeals and the /a/ vowel are articulated with open vocal tract configuration and tongue root retraction (Alwan, 1989; Esling, 2011). Therefore, the effect of pharyngeals in /a/ is reported as vowel retraction at the consonant-vowel transition with an output of high first formant frequency (F1) which correlates with the pharyngeal articulation (Ghazeli,1977). Higher degrees of /a/ retraction represented in higher F1 at the consonant-vowel transition are reported in the pharyngeal /ħ/ context in Muslawi Qəltu compared to the pharyngeal /ʕ/ context, which has higher F1 at the consonant-vowel transition in BG. *Tafxiːm* in the pharyngeal / ħ/ context in Muslawi Qəltu is manifested as lowering in /a/.

On the other hand, the degree of compatibility the pharyngeals have with the dorsal /i, u/ vowels is lower on the scale of vowel-consonant compatibility. Pharyngeals are articulated with tongue retraction and open vocal tract configuration whereas dorsal articulation involves tongue dorsum lowering (Sylak-Glassman,2 013). Therefore, *tafxiːm* driven by pharyngeals is less salient in the dorsals /i/ and /u/ compared to /a/ (ibid).

Low F2 at the vowel mid-point is attested in the /ħ/ context in / ʜukkam/ 'rulers' in BG, suggesting *tafxiːm* in /u/ is retraction compared to the fronted /u/ variants in / ħəkkaːm/ 'rulers' in Qəltu, as represented with high F1 and high F2 at the consonant-vowel transition and mid-point.

Additionally, *tafxiːm* in pharyngeals proves salient in long /aː/ vowel too in the pharyngeal context, where long /aː/ vowel surfaces as low and retracted with high F1 and low F2 at the consonant-vowel transition.

The effect of *tafxiːm* in the pharyngeals is less prominent in the long /iː/ vowel indicating resistance in both MQ and BG, with low F1 and high F2 values at the consonant-vowel transition and mid-point compared to the F1 and F2 of the short /i/ vowel (cf. Card, 1983). *Tafxiːm* in the pharyngeals surfaces in the /uː/ vowel with further low /uː/ variants in MQ, as represented in the high F1 at the consonant-vowel transition and the very low F2 .

Tafxiːm in the uvulars, on the other hand show different effect in the vowels. The uvulars are less compatible with the /a/ vowel in articulation compared to their compatibility with the dorsal vowels /i, u/ (Sylak-Glassman, 2013). Therefore, compared to pharyngeals, *tafxiːm* driven by uvulars in the /a/ vowel is not salient as it is in the /i, u/ vowels. Both uvulars and the dorsals /i, u/ involves tongue body lowering (Watson, 2002). Therefore, *tafxiːm* in the target /i, u/ vowels is translated as vowel lowering with an output of low F2 in the /i, u/ compared to its effect on the F2 of the /a/ vowel at the consonant-vowel transition compared to the vowel mid-point (ibid).

The uvulars also show variability among them in their manifestations of *tafxiːm* in the different vowels in both the MQ and BG. The uvular stop /q/ constriction involves both tongue dorsum lowering and tongue root retraction. Therefore, the effect of the uvular stop /q/ in the /a/ vowel is represented as retraction and rounding. The decrease in F2 in environments with intervening secondary emphatics in BG compared to F2 in MQ suggest that [RTR] is primary in /q/ compared to the uvular ficatives and the constriction is lower. Both [dorsality, RTR-ness] trigger retraction. However, [RTR] overrides the [dorsal] in the /q/ similar to the emphatics. Therefore, it triggers backing in /a/ in Baghdadi Gilit. Further details on this provided in section 4.9.

On the other hand, *tafxiːm* in /q/ is manifested in the /a/ vowel as lowering with higher F1 in MQ compared to F1 at the consonant-vowel transition and mid-point in BG. On the other hand, *tafxiːm* in /q/ is represented with open and retracted /i/ variants manifested in the low F2 in MQ compared to the F2 in BG suggesting *tafxi:m* in /i/ as backing in the /q/ context in MQ where uvulars in MQ are represented as having a considerable effect on vowels compared to pharyngeals in BG.

Additionally, *tafxiːm* in /q/ is present in the long /aː, iː, uː/ with long vowels showing resistance to lowering and retraction at the consonant-vowel transition compared to their short counterparts. *Tafxiːm* in long /aː/ vowel is represented in the (low F1) at the consonant-vowel transition compared to the vowel mid-point (high F1) in MQ, and low F2 at the consonant-vowel transition compared to a higher F1 at the consonant-vowel transition in BG. However, in the long /iː/ vowel, *tafxiːm* is not as prominent compared to its short counterpart in the two dialects with long /iː/ showing resistance to the *tafxiːm* represented in the least high F1, and least low F2 at the consonant-vowel transition in MQ and BG. Low /iː/ variants are represented in BG, and further retracted /iː/ variants in MQ.

The uvular fricatives / χ/ and /ʁ/ compared to /q/ are articulated with tongue dorsum lowering. Thus, they are compatible in articulation with the dorsals /i, u/. In other words, *tafxiːm* as lowering and retraction of /i/ and /u/ is expected to be more pronounced in the two vowels compared to /a/. The presence of *tafxiːm* in /i/ is salient in the uvulars /χ/ and /ʁ/ contexts with high F1 and low F2 at the consonant-vowel transition in MQ compared to BG. *Tafxiːm* in the uvulars is seen as more pronounced in the /u/ vowel in BG with prominent lowering and retraction at the vowel mid-point represented in the high F1 and low F2 compared to the consonant-vowel transition suggestive of *tafxiːm* in /u/ is salient in the uvular context with uvulars showing higher degrees of compatibility with the /u/ vowel.

Moreover, *tafxiːm* in the /a/ vowel, in the uvulars /χ/, and /ʁ/ contexts is more prominent in MQ compared to BG, with further lowering and retraction represented in higher F1 and lower F2 at the consonant-vowel transition and mid-point.

Long vowels are also affected by the *tafxiːm* in the uvular contexts with long vowels showing resistance to *tafxiːm* at the vowel onset. Lowering and retraction of /aː/ is manifested in the high F1 in Qəltu compared to low F2 in Gilit at the vowel mid-point.

However, the long /iː/ vowel in the context of the uvulars /χ/ and /ʁ/ shows resistance to *tafxiːm*, as represented in its very low F1 and high F2 compared to its F1 and F2 in the context of pharyngeals and uvular /q/ in both MQ and BG. Lastly, *tafxiːm* in the uvulars /χ/, and /ʁ/ is implemented in the /uː/ vowel with further low and retracted variants, as displayed in higher F1 and lower F2 at the consonant-vowel transition in MQ compared to BG.

6.7 The phonetic and phonological implications of tafxi:m in the Muslawi Qəltu and Baghdadi Gilit

This section brings together the results of the experimental investigation along with the phonological analysis into a clear discussion on the typology of *tafxi:m* in the MQ and BG dialects of Mesopotamian Arabic, which originate from two different linguistic backgrounds; sedentary and Bedouin respectively. It sums up some of the relevant linguistic features of each of the dialects highlighted earlier in sections 2.9.1 and 2.9.2 and following in 4.4.1 & 4.5 on MQ and in 4.8 in BG.

6.7.1 The phonetic implications of tafxi:m in the Muslawi Qəltu and Baghdadi Gilit

In this study, the typology of *tafxi:m* as an underlying articulatory element in the different PVs in both MQ and BG is determined in vowels. The *mufaxxama* sounds are defined as the elements of *tafxi:m* which trigger vowel lowering, backing, centralisation or rounding. However, the type of *tafxi:m* a vowel undergeoes is driven by the articulatory nature of the element of *tafxi:m*, the phonological environment, and the dialect linguistic background.

Tafxi:m is centralisation in the /i/ and /u/ vowels in MQ in a pharyngeal to a uvular to a pharyngealised coronal context and it is lowering in the /a/ vowel. Centralisation of /i/ and /u/ in a uvular and pharyngealised context is driven by the articulatory configuration; that is tongue dorsum lowering which leads to a [central] /i/, /u/ variants. In BG, *tafxi:m* is backing in the /i/, /a/ vowels in a pharyngeal, pharyngealised and uvular context. *Tafxi:m* as backing is enhanced with rounding in the /i/, and /a/ vowels both locally and in long domains when secondary *mufaxxama* sounds are part of the phonological context of the word suggestive of a Bedouin sound quality feature present in dialects of Bedouin origins including BG (Watson, 2002; Bellem, 2007; Youssef, 2006; 2009).

In long vowels, *tafxi:m* as lowering in MQ is prominent in the /u:/ < [o:] vowel in the pharyngeal / ʕ/, the uvular /q/, and the pharyngealised coronal /ðˤ/ and /sˤ/ contexts while /u:/ vowel showing resistance to *tafxi:m* in BG in these contexts compared to MQ (cf. section 2.8). In BG, *tafxi:m* is represented as backing of /a:/<[ɑː] in the pharyngeal and in the pharyngealised coronal /tˤ/ context in driven by the nature of the articulatory constriction in the pharyngealized stop /tˤ/ (see sections 4.2&5.3). In long /i:/, *tafxi:m* is represented as less robust. In other words, long /i:/ vowel shows resistance to *tafxi:m* (cf. Card, 1983; Kriba, 2010).

Lastly, the position of certain emphatic vs. plain counterparts is questioned with plain /t/, the counterpart of emphatic /tˤ/ showing *tafxi:m* suggestive of a Bedouin sound feature found in Gilit.

Tafxi:m in /i/ is realised as retraction with rounding in BG locally in the lexical vowel. It is also realised as so in long domain in the epenthetic vowel in the conditioned phonological contexts as suggested in the data, e.g. /ʁibn/ ~ /ʁubn/ < [ʁɛ̜bɛ̜n]~ [ʁʊbˤ[111]ʊn] ‘disgracefulness’ where *tafxi:m* in /i/ and /u/ exist in complimentary distribution in the target PV contexts (see section 4.8).

In the long /iː/ vowel, *tafxi:m* in the MQ and BG is realised as the lowered and retracted [iː̞̠], confirming results from previous studies where *tafxi:m* in the long /i:/ vowel is represented as lowering and retraction in the pharyngeal and the pharyngealised contexts as suggested in the data, e.g. [ʔi̞̠ːdaːn] ‘sticks. Backing in /i:/ in the in /ʕ/ context in BG compared to MQ is suggestive that *tafxi:m* is prominent in /ʕ/ in Gilit (ibid) while in MQ lowering and retraction are robust in the pharyngeal /ħ/ and the pharyngealised coronal /ðˤ/, e.g [ħi̞̠ːra] ‘wonder’ questioning the position of the pharyngeal /ħ/ and the pharyngealised coronal /ðˤ/ in MQ where /ħ/ is determined to be articulated with a further lower pharynx constriction in MQ compared to BG.

Tafxi:m is also represented as centralised [iː̈] in uvular contexts, e, g. [ʁïːba] ‘gossip’. In the long /uː/ vowel, *tafxi:m* is represented as centralised [uː̈] in BG. However, it is represented as the lowered and retracted [ɔː] in MQ. The /uː/ vowel lowering is present in Qəltu speakers’ productions compared to centralised /uː/ in BG speakers’ productions where /q/ is realised as velar [g]. Thus, *tafxi:m* in [g] is not robust compared to *tafxi:m* in /q/ for [g] is labio- velar in place of articulation in BG. These results suggest that /u:/ vowel in BG resists *tafxi:m* as driven by PVs compared to MQ where long /u:/ undergoes *tafxi:m.*

[111] In /u/ context, the /b/ surfaces as [bˤ], in the /i/ context, it is [b]. The /i/ vowel blocks tafxi:m harmony.

6.7.2 The phonetic and phonological implications of tafxi:m in the vowels of Muslawi Qəltu and Baghdadi Gilit

This section draws on the phonological analysis from chapter four with relevance to *tafxi:m* in the vowels of MQ and BG. *Tafxi:m* in vowels is phonologically oriented in BG in the presence of segments identified as secondary *mufaxxama* (emphatics) in the sound system of Bedouin dialects like Gilit (see section 4.2). The secondary *mufaxxama* are argued to be underlyingly specified with the elements of *tafxi:m* discussed earlier in section 4.8.

In MQ, *tafxi:m* is gradient in the presence of the elements of *tafxi:m* where vowel lowering, backing or cemtralisation is present in vowels locally driven by the articulatory nature of the trigger element of *tafxi:m*. In other cases, the sedentary background of MQ dialect imposes the presence of *ʔima:la* instead of *tafxi:m* in phonologically conditioned environments (see section 4.5 & 4.8).

Tafxi:m in the /i/ and /a/ vowels in BG is the result of default feature specification combined with place assimilaton. The place assimilation is represented with vocalic V-elements underlyingly specified as the elements of harmony. The vowels in the domain of *tafxi:m* take on the V-element from the neighbouring PV *mufaxxama*; thus *tafxi:m* in vowels exist (details in section 4.8).

As an example, *tafxiːm* is represented in long domain vowel-consonant harmony as backing and rounding of short /a/ <[ʊ] in the domain of secondary PVs (cf. Bellem, 2007), e.g. /qafal/ < [qʊfˤɑlˤ] 'he locked' with the /q/ underlyingly specified with the [dorsal, RTR] features which trigger backing in /a/ progressively. The secondary emphatic /fˤ/ is underlyingly specified with the [dorsal, labial] features which trigger rounding regressively in the /a/ vowel. Further details are provided in section 4.8.

Tafxiːm in /i/ and /u/ is retraction enchanced with rounding [ɛ̹], [ʊ] in Gilit locally and in long domain in lexical and epenthetic vowels the PV context with [dorsal, labial] identified as the elements of *tafxi:m* , e.g / tˤibt/ < [tˤɛ̹bɛt]~ [tˤʊbʊt] 'I recovered', /χifit/ < [χɛ̹fɛ̹t] ~ [χʊfʊt] 'I got scared'(cf. Bellem,2007) where [ɛ̹], [ʊ] occur in complimentary distribution in these contexts in long domain vowel-consonant harmony.

Additionaly, *tafxiːm* is represented in the long domain in the form of rounded and retracted [ʊ] in BG, e.g. /ðˤɑːbˤitˤ/ <[ðˤɑːbˤʊtˤ] in vowel-consonant harmony with the trigger PV /tˤ/

underlyingly specified with the elements [dorsal, RTR] regressively and the secondary PV /bˤ/ specified with [dorsal, labial] progressively, inducing vowel rounding. Details are provided in section 4.8.

On the other hand, *tafxiːm* in /u/ in BG is realised as [ʊ] locally in the context of PVs and in long domain vowel harmony and vowel-consonant harmony in the epenthetic /i/, e.g. /χʊlq/ < [χʊlʊg] ‘ patience’.

However, in MQ, centralised [ə] variants of /u/ in long domain vowel harmony are represented in the pharyngeal and uvular contexts; e.g. [χələq] ‘patience’ (details on this provided earlier in 6.2 &section 2.8).

Chapter Seven: Conclusion

7.1 Introduction

This chapter draws on the results obtained from both the phonetic and phonological accounts of *tafxi:m* driven by the PV *mufaxxama* sounds in both MQ and BG and their implications in Arabic dialectology.

7.2 The present study

The present work has addressed the typology of *tafxi:m* in the Arabic dialects through investigating *tafxi:m* in vowels in two Mesopotamian Arabic dialects of two different linguistic backgrounds; that is the Muslawi Qəltu of sedentary background and Baghdadi Gilit of Bedouin background.

7.3 The purpose of the present study

This study is driven by the hypothesis that the typology of *tafxi:m* is phonetically, phonologically and sociolinguitically grounded. Phonetically, *tafxi:m* is goverened by the articulatory nature of the trigger element and the vowel quality. Phonologically, *tafxi:m in* vowels is represented in two types of harmony; vowel harmony and vowel-consonant harmony both locally and in long domain. Sociolinguistically, *tafxi:m* is goverened in the dialect background.

7.4 The results of the present study

The results of both the phonetic and phonological accounts on *tafxi:m* in the present work suggest that *tafxi:m* is determined phonetically (coarticulatory) in vowels as CV interaction in one form of lowering and centralisation in [+high] /i(:)/, (u(:)/ vowels, backing (retraction) or backing and rounding in [+front] /i(:)/, /a(:)/ vowels driven by the articulatory elements of *tafxi:m* in the trigger *mufaxxama,* the position of vowel in the acoustic vowel space, the phonological environment and the dialect background.

Tafxi:m as backing and backing and rounding in the /i/, /a/ vowels in Baghdadi Gilit is driven by the presence of secondary emphatics identified as secondary *mufaxxama* in dialects of Bedouin origin like Gilit (cf. Youssef, 2009). However, in Muslawi Qəltu of sedentary origin, *tafxi:m* is featured locally as lowering and retraction in the same phonological environment while *ʔima:la* (vowel fronting) is present in long domain in two types of vowel harmony. On the other hand, *tafxi:m* in /u/ in Baghdadi Gilit is present as retraction both locally and in long domain where *tafxi:m* in /i/ and /u/ in Gilit occur in complimentary distribution while *tafxi:m* in /u/ exist as long domain *ʔima:la* in Muslawi Qəltu.

The elements of *tafxi:m* are [dorsality] in the uvulars and [dorsality, RTR-ness] in the emphatics which are derived in the [dorsals] /i/ and /u/ vowels as lowering and retraction locally in MQ and and as lowering and retraction both locally and in long domain vowel harmony and vowel-consonant harmony in BG. *Tafxi:m* is also derived in the lexical and epenthetic /i/ as rounded and retracted [ʊ] in BG in long domain *tafxi:m* harmony driven by the elements of *tafxi:m* in the uvulars and emphatics in vowel harmony and vowel-consonant harmony where secondary emphatics identified with [dorsal, labial] are part of the phonological domain. In MQ, long domain *ʔimaːla* vowel harmony, a sedentary voice quality feature exist partially as backness harmony and fully as complete vowel harmony in domains where *tafxi:m* harmony in BG is present.

7.5 The position of tafxi:m in the Muslawi Qəltu and Baghdadi Gilit in the broader contexts of the Arabic dialectology

This study has added to the body of the literature on *tafxi:m* in vowels addressed in the Arabic dialects where *tafxi:m* more is backing and backing and rounding in dialects of Bedouin origin (Watson,1999;2002) including BG (cf. Bellem, 2007) compared to dialects of sedentary origin where *tafxi:m* is seen as less salient in vowels cross-linguistically among the Arabic dialects of sedentary origin while *ʔimaːla* is featured as prominent in their sound system (ibid;Ahmed,2018) and vowel lowering as a cross category interaction is featured locally.

7.6 Limitations of the present study

The present study attempted to cover the typology of *tafxi:m* in the vowels of both Muslawi Qəltu and Baghdadi Gilit; however, it had its limitations due to the nature of the work which included both phonetic and phonological investigations on *tafxi:m* in the Muslawi Qəltu and Baghdadi Gilit dialects of Mesopotamian Arabic. A large corpus of the data was based on controlled speech, and not spontaneous speech due to the nature of the phonetic investigations which involved carrying out auditory, acoustic and statistical analysis on a data set in controlled phonological environments. Added, further extended phonological analysis on the data set on *tafxi:m* in the vowels of Muslawi Qəltu and Baghdadi Gilit has not been included and is suggested for future research.

7.7 Suggestions for future research

Due to the limitations of this research and the lack of experimental studies on *tafxi:m* in both Muslawi Qəltu and Baghdadi Gilit; this study in its current position paves the path for further research on *tafxi:m* in vowels as driven by the *mufaxxama* sounds in both Muslawi Qəltu and Baghdadi Gilit where *tafxi:m* can be investigated not only in vowels but also in consonants. Further acoustic cues like measuring F1, F2, F3 and the duration in the PV consonants can be implemented in addition to measuring F3 in vowels as an additional cue to determine the type of *tafxi:m* in both PV consonants and vowels. Moreover, to my knowledge no articulatory or any experimental work has been done on *tafxi:m* in secondary PVs in Baghdadi Gilit or Muslawi Qəltu to determine the nature of the articulatory constriction in the secondary PVs. Therefore, future work can implement articulatory and acoustic investigations to identify the articulatory and acoustic correaltes of *tafxi:m* in the secondary PVs and question the position of the secondary emphatics in Gilit in the presence of back /ɑ(:)/.

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Appendix A

Stimuli 1

	/ ʕ/	**/ħ/**	**/q /**	**/χ/**	**/ʁ /**	**/tˤ/**	**/ ðˤ/**	**/sˤ/**
/a /	/ʕaʒaːʒ/ ‘tornado’	/ħakam/ ‘he ruled’	/qafal/ ‘locked’ 2nd p. sing. m.	/χasaf/ ‘he pulled down’	/ʁazaːl/ ‘deer’	/tˤalab/ ‘he requeste d’	/ðˤafar/ ‘he succeded’	/sˤabar/ ‘he stood patient’
/aː/	/ʕaːdaːt/ ‘traditions’	/ħaːkim/ ‘ruler’	/qaːmaːt/ ‘heights’	/χaːlaːt/ ‘maternal aunts’	/ʁaːbaːt/ ‘forests’	/tˤaːlib/ ‘student’	/ðˤaːfir/ ‘successor ’	/sˤaːffaːt/ ‘classes’
/ i /	/ʕift/ ‘I abandonned’	/ħikma/ ‘wisdom’	/wa.qit/ ‘time’	/χift/‘I got scared’	/ʁibt/ ‘I was absent’	/tˤift/ ‘I floated’	/ðˤift/ ‘you (m.s.) added’	/sˤifr/ ‘zero’
/i ː/	/ʕiːdaːn/ ‘sticks’	/ħiːra/ ‘confusion’	/da.qi ːqa/ ‘minute’	/χiːra/ ‘goodness’	/ʁiːba/ ‘gossip’	/tˤiːbə/ ‘purity’	/ðˤiːfa/ ‘you (m.s) add’	/sˤiːnijjaːt/ ‘trays’
/u /	/ʕurf/ ‘tradition’	/ħukkaːm/ ‘rulers’	/qufl/ ‘lock’	/χulq/ ‘patience’	/ʁubn/ ‘deception’	/tˤuruq/ ‘roads’	/ðˤufr/ ‘nail’	/sˤufr/ ‘yellow coloured trays’
/uː/	/ʕuːja ːn/ ‘lame’	/jifrħuːn/‘the y feel happy’	/j.quːmuːn/ ‘theyare standing’	/j.χuːnuːn/ ‘they betray’	/j ʁuːr/ ‘he attacked’	/tˤuːlak/ ‘height’	/j.ðˤuːquːn/ ‘they taste’	/j.sˤuːmuːn/ ‘they are fasting’

Stimuli 2

	/tˤ/	**/t/**	**/ ðˤ/**	**/ ð/**	**/sˤ/**	**/s/**
/a/	/tˤamr/ ‘burying’	/tamr/ ‘date’	/ðˤall/‘he stayed’	/ðall/‘he humiliated’	/sˤadd/ ‘he prevente d’	/sadd/ ‘he closed’
/a ː/	/tˤaːb/‘he was recovered’	/taːb/ ‘he repented’	/ðˤaːll/ ‘lost’	/ðaːll/ ‘humiliator’	/sˤaːd/ ‘he hunted’	/saːd/ ‘he took over’
/i/	/tˤibt/ ‘you(m.s) recovered’	/tibt/‘you (m.s) repented’	/ðˤill/ ‘shadow’	/ðill/ ‘humiliation’	/sˤidd/ ‘you (m.s) defend’	/sidd/ ‘ you (m.s.) close’
/i ː/	/tˤi ːn/ ‘mud’	/tiːn/ ‘fig’	/ðˤiːb/‘non-sense word’	/ðiːb/ ‘wolf’	/sˤiːdd/ ‘you (m.s) hunt’	/siːd/ ‘you (m.s) prevail’
/u/	/tˤubt/‘I recovered’	/tubt/ ‘I repented’	/ðˤuruːf/ ‘circumstanc-es’	/ðuruːf/ ‘shedding tears’	/sˤubb/ ‘you (m.s.) pour’	/subb/ ‘you (m.s)swear’
/u ː/	/futˤuːr/ ‘breakfast’	/futuːr/ ‘coldness’	/ðˤuːb/‘non-sense word’	/ðuːb/ ‘melt’	/sˤuːra/ ‘picture’	/suːra/ ‘verse’

Appendix B

Participant Information Sheet

Title of project: *Tafxiːm* in the Qəltu and Gilit dialects of Iraqi Arabic

Name of supervisor(s): Dr S.J. Hannahs, Dr. Ghada Khattab

Email: s.j.hannahs@ncl.ac.uk work phone number: +44 (0) 191 208 3400

E-mail: ghada.khattab@ncl.ac.uk work phone number: +44 (0) 191 208 6583

Name of researcher: MAHA IBRAHIM JASIM

Email: m.i.jasim@ncl.ac.uk Mobile: +44 (0)7455016281

Contact address: School of Education, Communication and Language Sciences, King George VI Building, Newcastle University, Newcastle upon Tyne, Tyne and Wear, NE1 7RU, United Kingdom.

Dear Participant

You are invited to take part in a research project by an IPhD student enrolled in the Speech and Language Sciences Section at Newcastle University as stated above. Before you decide to participate, you will need to understand some basic information about the nature of this research and why it is conducted. Please, take your time to read it.

Your contribution to the research is entirely voluntarily. All the information you give will be kept confidential. You can withdraw the consent at any time by contacting the researcher via e-mail or phone without giving any reasons. The researcher will delete your records once you withdraw the consent and are no longer happy to participate.

Please feel free to ask for any clarification or additional information.

Purpose and objectives of the research

The purpose of this research is to address the differences and/or similarities found among Qəltu and Gelet dialects of Iraqi Arabic. Such a research is important in the field of concern as it will help classify Qəltu and Gilit dialects of Iraqi Arabic among the categorical urban/ Bedouin classifications of the Arabic dialects.

Participation selection

You have been selected to participate in this project because you are a native speaker of Qəltu or Gilit.

Voluntary participation

Your participation in this project is entirely voluntary. Once you agree to participate in this project, you will be asked to sign a consent form to indicate your willingness to participate. You have the right to withdraw your consent at any time without providing any reasons. The data you provide will be kept confidential. The researcher will only keep your data based on your approval. If not, any data or information collected from you will be deleted.

What is involved in participation

If you agree to participate in this project, you will be asked to read aloud a list of words written on Power point slides and displayed on a computer screen in front of you while you are going to be recorded doing so. The entire session should not last more than an hour. If you are a resident at Newcastle upon Tyne, the recording session will take place at Newcastle University in the Phonetics lab in King George VI Building using the recording equipment there. If you are living outside Newcastle, the recording sessions will be carried out in a quiet place at your location using a portable digital recorder.

Risks and Benefits

There are no potential risks of any type that are expected to occur to participants. The potential benefits from participating in this project are much related to how it will advance the wider field on Arabic Linguistics and knowledge of the Arabic dialects. You will also receive a thank you gift as a souvenir for participation.

Anonymity and confidentiality

The information that you will provide during the course of participation (before, during and after the recording session) will be kept confidential. The recordings will be anonymised and identified by numbers. Your real name will be identified by number or initials when presented in this research and will never be used in any written or verbal forms of the research.

Confidentiality and data storage

The recorded sound files will be held by the researcher. The information collected from the the questionnaire will be identified by numbers. The data collected from you will be anonymised and stored on a separate hard drive locked with a password and a user name so that it cannot be accessed or retrieved by someone else if missed or lost. The hard drive will be kept in a personal locked cabinet at the university.

Dissemination of result

The results of the analysed data in this research will be used in future research and shared in published work or used in public performance in full or in part. No further or additional information will be shared in this respect.

Thank you

Consent form

Appendix B

I, the undersigned, confirm that (please tick box as appropriate):

1.	I have read and understood the information about the project, as provided in the information sheet.	☐
2.	I have been given the opportunity to ask questions about the project and my participation.	☐
3.	I voluntarily agree to participate in the project.	☐
4.	I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.	☐
5.	The procedures regarding confidentiality have been clearly explained (e.g. use of names, pseudonyms, anonymization of data, etc.) to me.	☐
6.	Select only **one** of the following: • I would like my name used and understand what I have said or written as part of this study will be used in reports, publications and other research outputs so that anything I have contributed to this project can be recognised.	☐
	• I do not want my name used in this project.	☐
7.	I, along with the Researcher, agree to sign and date this informed consent form.	☐
8.	I understand that participation in this project will involve me reading out loud a list of words and that I will be recorded while doing so.	☐
9.	I understand that the researcher may use the data in further research other than the current project.	☐
10.	The use of the data in research, publications, sharing has been explained to me.	☐

Participant:

Name of Participant	Signature	Date

Researcher:

Name of Researcher	Signature	Date

Thank you for your participation!

Appendix B

Questionnaire

Dear Participant,

The researcher would like you to fill some background information. Your personal information is highly confidential and you may choose to withdraw at any time.

Note: **You can write down only <u>the initials</u> of your first and last name in the table below**:

Name	Age	Gender	Nationality	Hometown	Native language	Native dialect	Other languages	Other dialects

1- How long have you lived in your home town? ___________________

2- Have you lived in cities other than your home town? If yes, how long?
____

3- How long have you been living in the UK? __________________________

Date of Interview: ________________________________

Occupation: ________________________________
(if presently unemployed or full-time care-giver, please state previous employment)

Highest educational qualification: _______________________________

Thank you for your participation

Appendix C

Samples from the stimuli for Gilit speakers presented on Powerpoint slides

تِگـدَرْ تْكُولْ....(عرف).

(عجاج)..(جامع)..

ثلاث مرات

. تِكْدَرْ تْكُولْ...(عِيدَانْ).

(عودان).

(عيديه)...

ثلاث مرات

.. تِكْدَرْ

تْكُولْ..(خَالاتْ)..(خاليه)..
(خاف).(خال)...(خل)...

ثلاث مرات

.. تِكْدَرْ

تْكُولْ..(حوبَة)..(يفرحون)...

ثلاث مرات

.. تِكْدَرْ
تْكُولْ..(غبنْ)..(غرفة).
(غسول)..
ثلاث مرات

.. تِكْدَرْ تْكُولْ..(خفتْ).....
ثلاث مرات

.. تِكْدَرْ تْكُولْ..(ظيفه).....

ثلاث مرات

Samples from the stimuli for Qəltu speakers presented on Powerpoint slides.

تقدر

تْقولْ....(عغفْ)..(عييف)

...(عاف)...(عجاج)....

(عِمل).....

ثلاث مرات

.. تِقدَرْ تْقولْ..(حُوبِي)
(يفرحون)...
ثلاث مرات

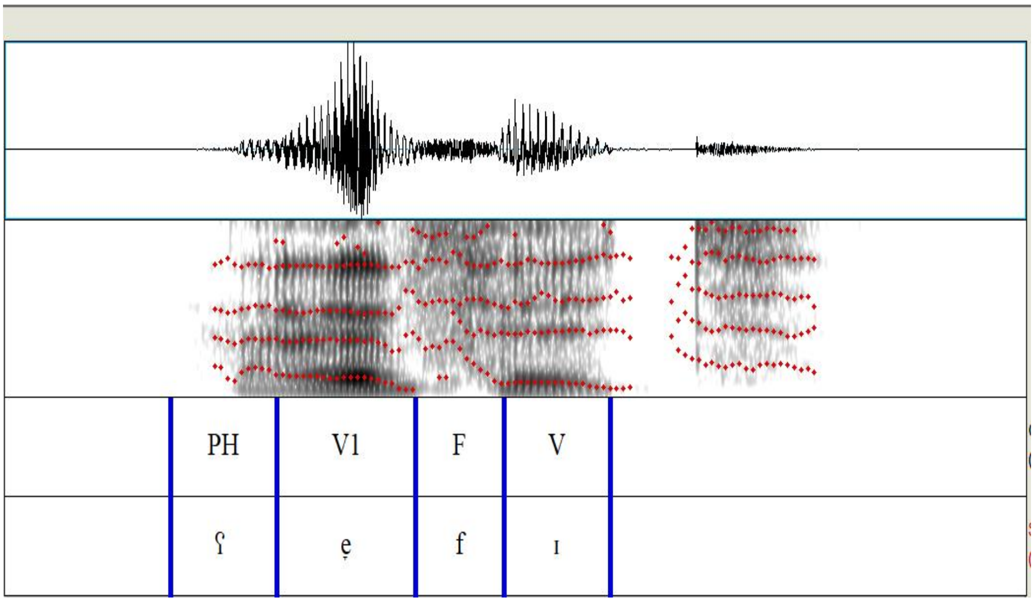
.. تِقدَرْ تْقولْ..(حَارّه)..(حاكم)
.(احنا).
ثلاث مرات

.. تِقدَرْ تْقولْ..(يظوقون).....
ثلاث مرات

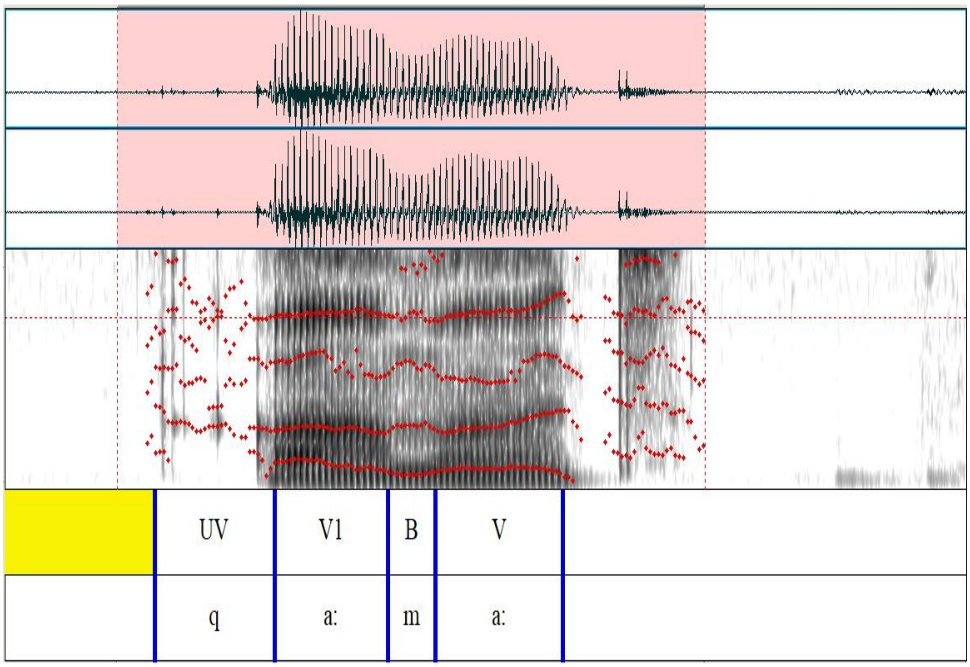
.. تِقدَرْ تْقولْ..(خفتْ).(خفتو).
(خاف)....(خال).....(خلّ)
ثلاث مرات

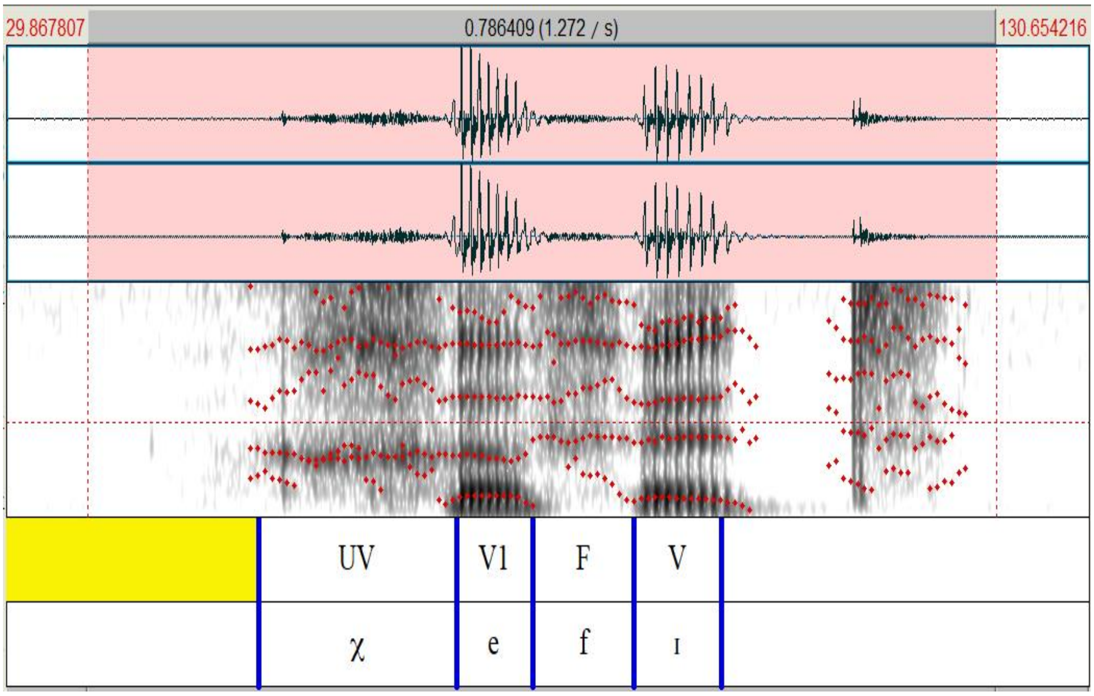
Appendix D

Samples of transcribed data from a Gilit speaker



Samples of transcribed samples from a Qəltu speakers




29.867807
0.786409 (1.272 / s)
130.654216
UV
V1
F
V
χ
e
f
ɪ

Appendix E

The auditory profiling of the Gilit speakers' productions.

Token	Variable	Variant	Realisation	Gloss	
ʕ**a**ʒa:ʒ	/a/	[ɑ]	ʔɑdʒa:dʒ	sandstorm	
ʕ**a**:da:t	/a:/	[ɑ:]	ʔɑ:dɑ:t	traditions	
ʕ**i**ft	/i/	[ȩ]	ʔ ȩfɪt	I abandonned	
ʕ**i**:da:n	/i:/	[i:̚]	ʔ i:̚da:n	sticks	
ʕ**u**rf	/u/	[ɔ̧] or [ʊ]	ʔɔ̧rˤofˤ	norm	
ʕ**u**:ʒa:n	/u:/	[ʊ:̚]	ʔʊ:̚dʒˤa:n	twisted	
ħ**a**kam	/a/	[ɑ]	ħɑkˤəm	He ruled	
ħ**a**:kim	/a:/	[ɑ:]	ħɑ:kˤəm	ruler	
ħ**i**kma	/i/	[ɪ]	ħɪkmə	wisdom	
ħ**i**:ra	/i:/	[i:̚]	ħi:̚rə	confusion	
ħ**u**kka:m	/u/	[ʊ]	ħʊkˤkˤɑ:m	rulers	
jfrħ**u**:n	/u:/	[u:]	jfrħu:n	they feel happy	
q**a**fal	/a/	[ʊ]	qʊfˤalˤ	he locked	
q**a**:ma:t	/a:/	[ɑ:]	qɑ:mɑ:t	heights	
waq**i**t	/i/	[e][ɪ]	waqet/wakɪt	time	
daq**i**:qa	/i:/	[i:]	daqi:qə	minute	
q**u**fl	/u/	[ʊ]	qʊfˤʊlˤ	lock	
jq**u**:mu:n	/u:/	[u:]	jgu:mu:n	they are standing	
χ**a**saf	/a/	[a]	χasaf	he pulled down	
χ**a**:la:t	/a:/	[ɑ:]	χɑ:lˤɑ:t	maternal aunts	
χ**i**ft	/i/	[e]	χefɪt	I got scared	
χ**i**:ra	/i:/	[i:]	χi:rə	goodness	
χ**u**lq	/u/	[ʊ]	χʊlˤʊg	patinece	
jχ**u**:nu:n	/u:/	[u:]	jχu:nu:n	they betray	
ʁ**a**zal	/a/	[ä]	ʁäzal	deer	
ʁ**a**:ba:t	/a:/	[a:]	ʁa:ba:t	forests	
ʁ**i**bt	/i/	[e]	ʁebɪt	I was absent	
ʁ**i**:ba	/i:/	[i:̚]	ʁi:̚bə	gossip	
ʁ**u**bn	/u/	[ʊ], [ɔ]	ʁʊbin	deception	
jaʁ**u**:r	/u:/	/u:/	jaʁu:r	Jaguar	
tˤ**a**lab	/a/	[ɑ]	tˤɑlab	request	
tˤ**a**:**l**ib	/a:/	[ɑ:]	tˤɑ:li:b	student	
tˤ**i**ft	/i/	[e] or [ʊ]	tˤefˤɪt	I floated	
tˤ**i**:ba	/i:/	[i:̚]	tˤi:̚bə	purity	
tˤ**u**ruq	/u/	[ɔ]	tˤɔrɔq	paths	
tˤ**u**:lak	/u:/	[u:]	tˤu:lak	your height	
ðˤ**a**far	/a/	[ɑ]	ðˤɑfar	he succeded	
ðˤ**a**:fir	/a:/	[ɑ:]	ðˤɑ:fir	successor m.	

ðˤ**i**ft	/i/	[e]	ðˤefet	I added
ðˤ**iː**fa	/i:/	[iː̈]	ðˤiː̈fə	you (m.s) add
ðˤ**u**fr	/u/	[ʊ]	ðˤʊfˤʊr	nail
j.ðˤ**uː**quːn	/u:/	[uː]	ðˤuːguːn	they taste
sˤ**a**bar	/a/	[ɔ] or [ɑ]	sˤɔbar	he stood patient
sˤ**aː**ffat	/a:/	[ɑː]	sˤɑːffaːt	classes
sˤ**i**fr	/i/	[e]	sˤefer	zero
sˤ**iː**nijjaːt	/i:/	[iː̈]	sˤiː̈nijjaːt	trays
sˤ**u**fr	/u/	[ʊ]	sˤʊfˤʊr	yellowish
j.sˤ**uː**muːn	/u:/	[uː]	j.sˤuːmuːn	they are fasting
tˤ**a**mir	/a/	[ɑ]	tˤɑmˤir	burying
t**a**mir	/a/	[a]	tamir	date
tˤ**aː**b	/a:/	[ɑː]	tˤɑːb	he was recovered
t**aː**b	/a:/	[aː]	taːb	he repented
tˤ**i**bt	/i/	[e] or [ʊ]	tˤebɪtˤ	you (m.s) recovered
t**i**bt	/i/	[ɪ]	tɪbɪt	You (m.s) repented
tˤ**iː**n	/i:/	[iː̈]	tˤiː̈n	purity
t**iː**n	/i:/	[iː̈]	tiːn	fig
tˤ**u**bt	/u/	[ʊ]	tˤʊbɪtˤ	I recovered
t**u**bt	/u/	[ʊ]	tubɪt	I repented
f. tˤ**uː**r	/u:/	[ʊː̈]	f.tˤ ʊː̈r	breakfast
f.t**uː**r	/u:/	[uː]	f.tuːr	coldness
ðˤ**a**ll	/a/	[ɑ]	ðˤɑll	he stayed
ð**a**ll	/a/	[a]	ðall	he humiliated
ðˤ**aː**l	/a:/	[ɑː]	ðˤɑːl	lost
ð**aː**l	/a:/	[ɑː]	ðaːl	humiliator
ðˤ**i**ll	/i/	[e]	ðˤill	shadow
ð**i**ll	/i/	[ɪ]	ðɪll	humiliation
ðˤ**iː**b	/i:/	[ïː]	ðˤ ïːb	non-sense word
ð**iː**b	/i:/	[iː]	ðiːb	wolf
ðˤ**u**ruːf	/u/	[ʊ]	ðʊrʊːf	circumstances
ð**u**ruːf	/u/	[u]	ðurʊːf	shedding tears
ðˤ**uː**b	/u:/	[ʊː̈]	ðˤʊː̈b	non-sense form
ð**uː**b	/u:/	[uː]	ðuːb	melt
sˤ**a**dd	/a/	[ɑ]	sˤɑdd	he prevented
s**a**dd	/a/	[a]	sadd	he closed
sˤ**i**dd	/i/	[e]	sˤedd	defend
s**i**dd	/i/	[ɪ]	sɪdd	you (m.s.) close
sˤ**iː**dd	/i:/	[iː̈]	sˤiː̈dd	you (m.s) hunt
s**iː**dd	/i:/	[iː]	siːdd	you (m.s.)prevail
sˤ**u**bb	/u/	[ʊ]	sˤʊbb	you (m.s.)pour
s**u**bb	/u/	[ɪ]	sɪbb	you (m.s.) swear
sˤ**uː**ra	/u:/	[ʊː̈]	sˤʊː̈rə	picture
s**uː**ra	/u:/	[uː]	suːrə	verse

The auditory profiling of the Qəltu speakers' productions.

Token	Variable	Variant	Realisation	Gloss
ʕa:da:t	/a:/	[ä:]	ʕäːdaːt	traditions
ʕaʒaːʒ	/a/	[ä]	ʕädʒa:dʒ	sandstorm
ʕifit	/i/	[ə]	ʕeftu	I abandonned
ʕi:da:n	/i:/	[iː̈]	ʕiː̈da:n	sticks
ʕurf	/u/	[o̜] [ɒ]	ʕo̜rˤofˤ	norm
ʕu:ʒa:n	/u:/	[ʊː̈] [ɔː]	ʕʊː̈dʒi:n	twisted
ħakam	/a/	[ä]	ħäkam	he ruled
ħa:kim	/a:/	[ä:]	ħäːkim	ruler
ħi:ra	/i:/	[iː̈]	ħiː̈ɣa	confusion
ħikma	/i/	[ɪ]	ħɪkmi	wisdom
ħukka:m	/u/	[ə]	ħəkkä:m	leaders
jfrħu:n	/u:/	[u:]	jfɣaħu:n	they feel happy
qafal	/a/	[ä]	qäfal	he locked
qa:ma:t	/a:/	[äː]	qäːmaːt	heights
waqit	/i/	[e]	waqet	time
daqi:qa	/i:/	[i:]	daqi:qə	minute
qufl	/u/	[ə̜]	qə̜fəl	lock
χa:la:t	/a:/	[äː]	χä:laːt	maternal aunts
χasaf	/a/	[a]	χasaf	he pulled down
χift	/i/	[ə̜]	χə̜fət	I got scared
χi:ra	/i:/	[i:]	χi:ɾa	goodness
xulq	/u/	[ə]	χələq	patience
jχu:nu:n	/u:/	[u:]	jχu:nu:n	they betray
ʁazal	/a/	[ä]	ʁazal	deer
ʁa:ba:t	/a:/	[äː]	ʁä:ba:t	forests
ʁibit	/i/	[ə̜]	ʁə̜bət	I was absent
ʁi:ba	/i:/	[iː̈]	ʁiː̈bi	gossip
ʁubn	/u/	[ə]	ʁəbən	deception
jaʁu:r	/u:/	[ɔː] [u:]	jaʁɔːr	Jaguar
tˤalab	/a/	[ä]	tˤälab	request
tˤa:lib	/a:/	[ä:]	tˤä:li:b	student
tˤift	/i/	[ə̜]	tˤə̜fet, tˤə̜ftu	I floated
tˤi:ba	/i:/	[iː̈]	tˤiː̈bi	purity
tˤuruq	/u/	[ʊ][ɔ]	tˤʊrɔq	paths
tˤu:lak	/u:/	[u:]	tˤu:lak	your height
ðˤafar	/a/	[ä]	ðˤäfaɣ	he succeded
ðˤa:fir	/a:/	[ä:]	ðˤä:fir	successor m.
ðˤift	/i/	[ə̜]	ðˤə̜fət	he added
ðˤi:fa	/i:/	[iː̈]	ðˤiː̈fa	you (m.s.) add
ðˤufr	/u/	[ʊ] [ɔ]	ðˤɔfɔɣ	nail

j.ðˤu:qu:n	/u:/	[u:][ɔ:]	j.ðˤɔ:qu:n	taste
sˤabar	/a/	[ä]	sˤäbar	he stood patient
sˤa:ffat	/a:/	[ä:]	sˤä:ffa:t	classes
sˤifr	/i/	[ə̧]	sˤə̧fə̧r	zero
sˤi:nijja:t	/i:/	[i:̚]	sˤi:̚nijja:t	trays
sˤufr	/u/	[ɔ]	sˤɔfɔɣ	yellowish
tˤamir	/a/	[ɑ]	tˤɑmiɣ	burying
tamir	/a/	[a]	tamir	date
tˤa:b	/a:/	[ä:]	tˤä:b	he recovered
ta:b	/a:/	[a:]	ta:b	he repented
tˤibt	/i/	[ə̧]	tˤə̧bə̧t	you (m.s) recovered
tibt	/i/	[ɪ]	tɪbɪt	you (m.s) repented
tˤi:n	/i:/	[i:̚]	tˤi:̚n	purity
ti:n	/i:/	[i:̚]	ti:n	fig
tˤubit	/u/	[ʊ]	tˤʊbtu	I recovered
tubit	/u/	[ʊ]	tɪbtu	I repented
f. tˤu:r	/u:/	[ɔ:]	f.tˤ ʊ:̚r	breakfast
f.tu:r	/u:/	[u:]	f.tu:r	coldness
ðˤall	/a/	[ä]	ðˤäll	he stayed
ðall	/a/	[a]	ðall	he humiliated
ðˤa:l	/a:/	[ä:]	ðˤä:l	lost
ða:l	/a:/	[a:]	ða:l	humiliator
ðˤill	/i/	[ɛ]	ðˤɛll	shadow
ðill	/i/	[ɪ]	ðɪll	humiliation
ðˤi:b	/i:/	[ï:]	ðˤ ï:b	non-sense word
ði:b	/i:/	[i:]	ði:b	wolf
ðˤuruf	/u/	[ɔ][ʊ]	ðˤɔru:f	circumstances
ðuruf	/u/	[ʊ]	ðʊru:f	shedding tears
ðˤu:b	/u:/	[ɔ:][ʊ:̚]	ðˤɔ:̚b	non-sense form
ðu:b	/u:/	[u:]	ðu:b	melt
sˤädd	/a/	[ä]	sˤädd	he defended
sadd	/a/	[a]	sadd	he closed
sˤidd	/i/	[ɛ]	sˤɛdd	defend
sidd	/i/	[ɪ]	sɪd	you (m.s) close
sˤi:d	/i:/	[i:̚]	sˤi:̚dd	you (m.s) hunt
si:d	/i:/	[i:]	si:d	you (m.s) prevail
sˤu:ra	/u:/	[ʊ:̚]	sˤʊ:̚ra	picture
su:ra	/u:/	[ʊ:][u:]	sʊ:ra	verse
sˤubb	/u/	[ʊ]	sˤʊbb	you (m.s) pour
subb	/u/	[e]	sebb	you (m.s) swear