Morpho-phonological Structure of Sound Feminine Plural: Revisited

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Abstract
This work investigates an unusual and intriguing concatenative morpho-phonological process, which occurs in a Jordanian variety as spoken by Ahl Al-Jabal Bedouin, the native dwellers of North East Badia of Jordan. The work shows that the voiceless plosive /t/ undergoes deletion if and only if it is part of the sound feminine plural morpheme -aat. In the pre-pausal position, /t/ deletion is further compensated by the reproduction of the voiceless glottal fricative [ʔ]. Phonologically, the final voiceless plosive /t/, in the sound feminine plural -aat, undergoes debuccalization by which it loses its original place of articulation [alveolar] and moves to the glottis to surface as [guttural] [h]. Glottal closure (glottalization) takes place via a glottal fricative [h] rather than a glottal stop [ʔ]. The results of this paper further prove that the phonological status of sound feminine pluralization in Ahl Al-Jabal dialect is significantly motivated by morphology, an interesting piece of evidence that certain morphological patterns operate in the phonological component, or at least require phonological implications. 

Keywords: Sound feminine plural (SFP), Morpho-phonology, Jordanian Arabic, Debuccalization, Glottalization

1. Introduction
Arabic has a systematic productive morphological structure with many interesting and challenging aspects, one of which is pluralization. Although a structured derivational process that associates specific singular and plural patterns is not easy to resolve, plurality, in the nominal system of Arabic, can be expressed by the formation of an inflected form based either on modification according to a morphological template ‘broken plural’ or the affixation of a plural suffix ‘sound plural’ (cf. Ratcliffe, 2008: 440, 445; Mashaqba, 2015: 196). Theoretically, sound plural (SP) is one of the clear aspects in the literature on Arabic morpho-phonology. Broken plural (BP), by contrast, is one of the most challenging topics. The challenge stems from how morphology relates singular stems to the plurals in their surface structure by ‘a series of virtual rather than real time sequence of changes’ (cf. Sakarna, 2013: 48). The body of literature discussing the implications of the phonological and morphological theory on Arabic confirms that Arabic continues to challenge and help advance the study of such modern theory (cf. McCarthy, 2008: 305).

The bare noun is either singular or collective. In terms of the grammatical category of number, the mode of noun inflection is singular (unmarked/default), dual, or plural. Similarly, Jordanian Arabic dialects exhibit three realizations of pluralization: SP (external/ inflectional/ purely suffixal), BP (internal/ derivational/ templatic/ rearrangement of vowel melody of the singular), and suppletion (involving unrelated patterns with different unrelated roots, as in: marah ‘wife’, niswaan ~ niswaanin ‘married women’) (cf. McCarthy, 2008: 303; Weninger, 2011: 164; Mashaqba, 2015: 195).

Traditional accounts (e.g. generative approaches, such as Levy, 1971) rely on different specifications to account for plural formation in Classical Arabic (CA). For example all categories that match with one of the following features [-Derived], [+Foreign], [+Alphabet Letter], [Adj-aan] take one of the SP patterns. However, such proposals that consider sound-broken plural asymmetry have been criticized for not proposing a clear principle for BP-SP assignment. Neither traditional generalizations nor the features proposed in generative model are adequate to predict plural formation in CA (cf. Abd-Rabbo, 1990: 56-59). Subsequently, recent work has shown that the selection of SP or BP of the noun/adjunct depends on its stem (McCarthy, 2008: 303).

1 Being defined as the default does not mean the most frequent plural but rather ‘the plural of last resort’ (Ratcliffe, 2008: 440).
2 For details about the behaviour of dual and pseudo-dual in Jordanian Arabic, see Mashaqba, 2015: 195, fn. 78, 198).
3 Plurals that do not end with either -aat or -unn (cf. Abd-Rabbo, 1990: 56).
4 These modes of pluralization are also manifested in Ahl Al-Jabal dialect.
As the name suggests, SP is characterized by a suffix or more precisely by the lengthening of an existing suffix. The BP patterns are characterized by internal modification of the stem, i.e., syllable structure and vocalism (Ratcliffe, 2008: 439-440). Phonologically, the SFP -aat ‘involves lengthening of the feminine suffix vowel itself’, -at > -aat, as in dyaaμ sábado-un ‘university’ dyaaμ sábado-aat-un (cf. McCarthy, 2008: 303; McCarus, 2008: 243 for Modern Standard Arabic (MSA)).

2. Literary Review

Sound feminine plural is among the most Arabic inflectional rules of a high degree of productivity as it can combine freely with almost all nouns and adjectives in the process of plural formation. The process of forming SPs involves a fairly simple suffixation; the SFP suffix -aat is also the default plural form for most foreign borrowings in all regional varieties (Wilmsen, 2007: 375).

Although the SP morphemes have gained some ground at the expense of BP patterns, SP receives little attention in the modern literature on CA, MSA, and modern Arabic dialects simply because it is rule-governed. In the literature, modern Arabic dialects have lost their declensional system: ‘the sound plural is marked by the oblique ending -in for masculine and -aat for feminine nouns’ (Versteegh, 2004: 1749).

The inflectional morphology is predominantly concatenative in the morphological category of number for SP but non-concatenative for BP (Benmamoun et al., 2014: 94). In CA and MSA (e.g., Haywood & Nahmad, 1965; Abd-Rabbo, 1990; Holes, 2004; Ryder, 2005; Abu-Chakra, 2008, among others), and the great majority of Arabic vernaculars (e.g. Cowell, 1964 for Syrian Arabic, Watson, 2002 for Cairene Arabic, Abu-Haidar, 1991 for Christian Arabic of Baghdad, Mashaqba, 2015 for Wadi Ramm Arabic, Honeetey, 2015 for Wadi Mousa Arabic, among others), SP employs suffixation of the masculine -in (-aum for nominative case in CA and MSA) or feminine -aat to the nominal stem (nouns and adjectives), basically attested in derived nominals, namely: ‘participle, nouns of profession, and relational nouns and adjectives’ (cf. Abd-Rabbo, 1990: 56; Watson, 2002; Mashaqba, 2015). The sound masculine plural suffix -in is demonstrated where the referent is human male. The SFP pattern is ‘less restricted in use than the sound masculine plural’ (Mashaqba, 2015: 195-196); it can be affixed to deverbal derivatives as in (1a. and 1b.), loanwords (as in 1c.), singular nouns ending with a feminine ending -ih, -i (as in 1d.), non-human plural nouns (as in 1c. and 1d.), substantives that have female referents (as in 1e.), or plurals of plurals (as in 1f.). (ibid: 195-198).

Sound feminine plurals are typically assigned to feminine adjectives marked by -at, as in jaalis ‘sitting m.’, jaalis(aat ‘sitting f.p.’. When adjectives serve an attribute or predicate to a dual/plural substantive, the feminine plural form is used, as in (2):

(1) a. mašqul ‘busy’ > mašqul(aat ‘busy f.p.’
   b. saalim ‘being safe’ > saadm(aat ‘being safe f.p.’
   c. talafoon ‘telephone’ > talafoon(aat ‘telephones’
   d. maxaddih ‘pillow’ > maxadd(aat ‘pillows’
   e. dżadżah ‘grandmother’ > dżad(aat ‘grandmothers’
   f. ɑyvaam ‘days’ > ɑyvaam(aat ‘days’

For words which are ‘defective’ – lacking a third consonant in part of their paradigm – or which have become defective as a result of sound change, there is a synchronic tendency to realize as tri-consonantal root throughout the paradigm, e.g. sama > samawaat ‘skies’ from s-m-w.

In Semitic languages, the SFP is represented by two endings that do not constitute any distinguishing feature of the South Semitic languages. The most common and widely distributed ending, in Arabic as well as in South Semitic languages, is -(a)aat and its corresponding variants: in Epigraphic South Semitic languages -(V)i; in Ge’ez, Tigrinya, Tigré -(a)aat(-i)at; in Modern South Arabian languages -(V)i(-V)aat(n); in the southern branch of the Ethio-Semitic languages (Amharic and others) -očč-(a)čč-čč (Belova, 2009: 309). Although rare, the SFP of the noun is attested in Thamudic as in aṣyu > ɑywaat ‘antelopes’ (Knauf, 2009: 480).


Most interestingly, Northern Najdi (the dialect of the Shammar tribe and the city of Ḥayil) marks zimāla of the feminine plural suffix, changing the final plural morpheme -aat into -aye (e.g., banaat jabbauxaat ‘girls cooking’ > banaay jabbauxaay) (Ingham, 2009: 126). This remarkable feature distinguishes Northern Najdi from the other local variety in Najd (Central Najd) as well as from other regional dialects in Saudi Arabia (namely the Hijaz, the Southwest, and the Eastern region). For more details, see Ingham (1971, 1986a, 1986b, 1994). The early Arabic grammarians refer

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5 Ratcliffe (1990, 1998) and Idriisse (1997) conclude that SPs are different from BPs not because one involves suffixation and the other is templatic, but because the former operates outside the stem whereas the latter operates within the stem.

6 It is referred to as ‘-aat Plural’ in Abd-Rabbo (1990: 56).


8 This language refers to epigraphically attested Ancient Arabic scripts and languages (Knauf, 2009: 477).
to this ḫimaala as a feature of the ṯayyiʾ tribe, who inhabited the area of Jabal ṯayy, now known as Jabal Shammar (Anis, 1995: 99; 9 Rabin, 1951: 206 cited in Ingham, 2009: 126).

In Nigerien Arabic, the past tense -t marking the first/second person masculine singular, is deleted word-finally after a consonant; thus, ṭaxallas-t ‘finish-I’ is pronounced taxallas (Owens, 1998: 22–26 cited in Hoberman, 2009: 118). The SFP in Maltese has ‘withstood the test of time’ and is being more preferred to BP (Mifsud, 2008: 154). Other than -iin and -aat, Jewish Baghdadi uses Hebrew suffixes -iim and -ooq with Hebrew words: ḥxamim ‘rabbis’, braxooq ‘blessings’ (Mansour, 2006: 237).

However, the morphological mapping of SFP in the dialect under investigation involves rather interesting phonological realizations which are different from other Jordanian Arabic dialects as well as the majority of regional Arabic dialects; where the predominant SFP ending in most Arabic dialects is -aat, it is aalaa in Ahl Al-Jabal variety (see sections 4 and 5 below).

3. Material and Methodology

To examine SFP in Ahl Al-Jabal Arabic, the researchers recruited 24 ideal participants, 12 males and 12 females, who are natives of Ahl Al-Jabal Arabic, and who have spent all their life in Ahl Al-Jabal areas. The ages of participants range between 35–70 years old. Ahl Al-Jabal tribe consists of the following subtribes: MasaXiid, ḫqumaat, Shuruфаat and Zḥaаid. Six participants are chosen from each tribe to ensure the quality of data; Participants’ level of education ranges from primary education (17 participants) to secondary education (7 participants). The researchers made sure that all these participants are healthy, have no speech impediments and are willing to answer all questions that serve this study.

Two methods are employed to examine SFP in the dialect under investigation. The first method involves recording conversations with 20 participants where researchers raise questions involving plural words. In the second method, a list of 80 singular words was prepared and given to all participants to use them in a sentence. All data were checked with two language consultants.

Section one of this study gives a brief overview of the background of the problem investigated; section two is devoted to review literature on plural system in Arabic. The methodology along with the research outline are presented in section three. Section four accounts for the results of the current study followed by a detailed discussion of the behaviour of SFP in Ahl-Al-Jabal dialect. Hereafter, acoustic analysis is given in section five in support of the morphological studies.

4. Results and Discussion

This section examines cases where SFP takes place in Ahl Al-Jabal dialect. Drawing on Watson (2002), the data are followed by a feature geometric model in an attempt to explain ways of mapping each representation. Then, spectrographic representations are provided to give a visual explanation for the deletion of the voiceless plosive [t] where it is part of the SFP morpheme -aat, and how the [t] deletion is accompanied by a fricative noise pre-pausally.

Contrary to CA, MSA (e.g., Haywood & Nahmad, 1965; Abd-Rabbo, 1990; Holes, 2004; Ryding, 2005; Abu-Chacra, 2008), Jordanian Arabic dialects (e.g., Al-Wer, 2007 for Ammani Arabic, Mashaqba, 2015 for Wadi Ramm Arabic, Huneety, 2015 for Wadi Mousa Arabic), as well as most of the modern local and regional Arabic dialects (e.g., Cowell, 1964 for Syrian Arabic, Holes, 1984 for Colloquial Arabic of the Gulf and Saudi Arabia, Abu-Haidar, 1991 for Christian Arabic of Baghdad, Watson, 2002 for Cairene Arabic, Davey, 2013 for Coastal Dhoafārii Arabic), the SFP suffixation fails to surface as -aat in Ahl Al-Jabal dialect, the target of the present study. Most interestingly, this remarkable feature also distinguishes Ahl Al-Jabal dialect from Northern Najdi dialect which marks ḫimaala of the feminine plural suffix, changing the final plural morpheme -aat into -aay (e.g., banaat ṭabbaaxaat ‘girls cooking’ > banaaay ṭaabbaaxaayy) (cf. Ingham, 2009: 126) (see also section one above).

Interestingly, final voiceless plosive -t deletion is clearly a lexical process as the final /t/ fails to elide if the word-final -aat does not mark SFP. The examples of final /t/ deletion in (3b) compare with those in (3a) where [t] does take place.

(3a)  
įybaat ‘he sleeps’ > iyбаat  
tagtaat ‘she eats’ > tagtaaat  
tanśaat ‘to be kicked’ > tanśаaat  
saat ‘to be known’ > šaat  
maat ‘to die’ > maat  
gaat ‘one’ > gaat  
bigľaat ‘exactly’ > bigľaat  
sibaat ‘sleep’ > sibaat

(3b)  
bint ‘daughter’ > banaa ‘daughters’  
mʃallma ‘teacher f.’ > mʃallmaa ‘teachers f.’  
farša ‘matrix f.’ > faršaa ‘matrixxes’  
sanṭa ‘bag’ > sanṭaa ‘bags’  
sayyaara ‘car’ > sayyaaraa ‘cars’

Deletion of -t occurs within a morphological domain; Tier Conflation (TC) takes place prior to deletion since the plosive alveolar /t/ is linearly adjacent and visible to the long guttural [aa] of SFP in order to surface as -aat. On the

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9 Anis opposes others in this respect; he claims that this is not ḫimaala. Instead, it involves a final consonant elision.
other hand, -t deletion occurs iff the neighbouring guttural [aa] is part of the SFP suffix -aat. This confirms that TC keeps the phonological information for morphemic distinction, whereas, morphological cue is erased. Therefore, association of the feminine suffix -aat to a preceding singular noun applies in two stages: (i), TC folds the morphemes nodes together in a linear configuration, as in (4) (after Watson, 2002: 232):

Stage (ii) involves deletion of the root node of the rightmost matrix (the matrix associated with /-aat/) motivated by specific morphological domain; consider data in (5a.) and (5b.). # marks word-finally in juncture position; [ ] marks pause (pre-pausal/utterance-final position).

At this point, total erasure of part of the morpheme nodes takes place, where the output is not subject to post-lexical phonological representation as the erasure process does not violate extrametricality; thus the vacuum created by the deletion of the root node is left empty (see grid in 5b.). Notice that all elision examples do not involve any new resyllabication patterns.

Pre-pausally, the final voiceless plosive /t/ undergoes debuccalization by which it loses its original place of articulation [alveolar] and moves to the glottis to surface as [h], as in:

This process would not be claimed to be aspiration since aspiration is a puff/ burst of air that accompanies voiceless plosives. At this point, the debuccalized consonant has been lenited to the point of clear elision. In other words, when
the singular noun/adjective ends with a final vowel, the attached SFP is realised by a pre-pausal glottalization, a glottal closure is noticed by the glottal fricative [h]. In such environment, association of the feminine suffix -aat to a preceding singular nominal stem similarly lies in two stages: (i) TC (as represented earlier in the grid in (4) above). Stage (ii) involves delinking of the root feature [-continuant] and the place feature [coronal] from the voiceless plosive /t/ and spreading of the root feature [continuant] and the place feature [guttural] from the guttural [aa]; the vacuum created by deletion of the root node is filled by the glottal fricative [h]; consider the grid in (7) below:

<table>
<thead>
<tr>
<th>X place</th>
<th>Place</th>
<th>Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>[guttural]</td>
<td>[coronal]</td>
<td>{ }</td>
</tr>
</tbody>
</table>

The above grid confirms how the process of [h] production instead of /t/ would not be claimed to be aspiration. To argue how [h] production takes place in this environment, we claim that the effects of such an environment take place by spread of the stricture feature [continuant] and the place feature [guttural] from the [guttural] [continuant] vowel /aa/ and delinking of [-continuant] and [coronal], respectively.

At this point, one would recall that, in the literature, final positions may undergo phonological processes word-finally and utterance-finally (pre-pausal position), e.g., devoicing word-final voiced obstruents and pre-pausal glottalization of sonorants and voiced and emphatic obstruents in Şan’aani Arabic (cf. Watson & Bellem, 2011, Bellem & Watson, 2014:169-170). However, the deletion of -t from the SFP -aat can be claimed to be a synchronic process in Ahl Al-Jabal dialect; this is evident from deletion of -t in recently adapted loan words in Ahl Al-Jabal dialect, as in (8):

<table>
<thead>
<tr>
<th>(8)</th>
<th>talafon</th>
<th>talafoonaa</th>
<th>telephones’</th>
</tr>
</thead>
<tbody>
<tr>
<td>mobayl</td>
<td>mobaylaa</td>
<td>‘mobiles’</td>
<td></td>
</tr>
<tr>
<td>baas</td>
<td>baasa</td>
<td>‘buses’</td>
<td></td>
</tr>
<tr>
<td>baaloon</td>
<td>baaloona</td>
<td>‘balloons’</td>
<td></td>
</tr>
<tr>
<td>kundišin</td>
<td>kundišinaa</td>
<td>‘air conditions’</td>
<td></td>
</tr>
<tr>
<td>dišš</td>
<td>diššaa</td>
<td>‘dishes’</td>
<td></td>
</tr>
<tr>
<td>kaboon</td>
<td>kaboona</td>
<td>‘coupons’</td>
<td></td>
</tr>
</tbody>
</table>

Subsequently, one could predict the deletion of the final consonant /t/ as a mere morpho-phonological process (a helpful one, facilitating pronunciation, or an unfortunate one, obscuring the basic form of the suffix); on the other hand, others would prefer it as means of identifying the sound feminine suffix as opposed to other sequences. (See Hoberman, 2009: 115 for discussion on sandhi).

5. Acoustic Evidence

This section establishes further visual piece of evidence via spectrographic representations in support of the deletion of the voiceless plosive /t/ if and only if it is part of the SFP morpheme -aat. We can also prove how the /t/ deletion is accompanied by a fricative noise pre-pausally. To handle such significant morpho-phonological structures, we analyze examples from Ahl Al-Jabal dialect and another local Bedouin Jordanian dialect.

Figure (1) is a waveform and a spectrogram of the utterance [ammʕallmaat gaaybaat] ‘the teachers f. are absent’ as produced by a female native speaker of Bani Hassan Bedouin (one of the Bedouin Jordanian dialects).
Three acoustic properties characterize the Arabic voiceless plosive /t/ utterance—medially and pre-pausally: (i) closure and hold phases which can be seen as white blank, (ii) no voicing bar at the bottom of the spectrogram (at low frequency around 200 Hz) denoting voicelessness, and (iii) the release (transient burst) which can be observed as a strong vertical spike. Consider Figure (1) where the red rectangular refers to the production of utterance—medial voiceless plosive [t], and the green rectangular which refers to a pre-pausal voiceless plosive [t].

In contrast with Figure (1), Figure (2) is a waveform and a spectrogram of the utterance [ammʕallmaa ġaaybaah] ‘the teachers f. are absent’, as produced by a female native speaker of Ahl Al-Jabal dialect.

The red rectangular denotes the long vowel [aa]. It can be represented as a periodic noise/signals which has two visual properties that mark voicing: clear defined dark formant bars and regular vertical striations along the production of the vowel. The long vowel [aa] is followed by an immediate transitional friction noise representing the consonant [g]. At this point, no any acoustic factors denote or represent any of the phases of the voiceless plosive [t]. The green oval also refers to the voiceless glottal fricative [h], where its production involves a lesser constriction in the glottis allowing friction noise to be produced. This can be seen on the spectrogram as a random noise and faint bands (very weak formants). In other words, the voiceless glottal fricative [h] production does not involve clear voicing bar, instead, it produces a weak voicing bar in contrast with those produced by vowels. The spectrograms give crystal clear evidence that [t] in the ‘default’ SFP suffix is deleted in Ahl Al-Jabal dialect, and is further compensated by the voiceless glottal fricative [h] only in pre-pausal position.

### 6. Conclusion

To test language loss/change in the area of morphology, SFP formation is elaborated as attested in Ahl Al-Jabal dialect. Plural formation in Ahl Al-Jabal Arabic is a rather interesting area of morphology, especially when compared with the morphology of plural in other Jordanian Arabic dialects as well as in many regional Arabic dialects. It shows synchronic innovations in nominal morphology; thus, where the predominant SFP ending in most modern Arabic
dialecits is -aat, it is aaiiaah in Ahl Al-Jabal variety.

This paper presents data showing that the same singular nominal base derives two different SFP forms in different dialectal varieties in Jordan. The work is also of serious importance to the morphophonological theories as it emphasises the weight of how a purely phonological structure/output is significantly visible to morphological constraints.

Finally, further work should be carried out on other morphophonological aspects to be attested in the Ahl Al-Jabal dialect, such as the deletion of the first person singular pronominal suffix word-finally.

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