

**PHONOLOGICALLY CONDITIONED MORPHOLOGICAL PROCESS IN
MODERN STANDARD ARABIC: AN ANALYSIS OF AL-IBDAAL 'SUBSTITUTION'
IN FTAʕAL PATTERN USING PROSODIC MORPHOLOGY**

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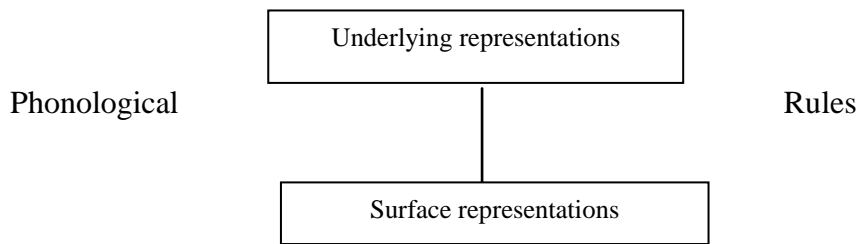
ABSTRACT : *This paper provides an analysis of Al-ibdaal 'substitution' phenomenon found in Modern Standard Arabic (MSA) derivational processes, particularly, in the pattern ftaʕal. Al-ibdaal 'substitution' is defined in many Arabic morphological books (Al-Raagihi, 1984; Al-Galaayini, 1991) as removing a letter and replacing it by another. For example, the /t/ in ztaha: is replaced by /d/ resulting in zdaha: 'flourished'. The paper analyzed examples of words representing the pattern ftaʕal based on prosodic morphology; an approach used to describe non-concatenative morphological processes as those found in Arabic and other Semitic languages (McCarthy, 1981). The analysis of the words revealed that there is actually no substitution of sounds and the change that takes place in that pattern is phonologically motivated. The paper recommends the reconsideration of the concept of Al-ibdaal 'substitution' in the pattern ftaʕal in Arabic morphological books.*

KEYWORDS: Prosodic Morphology, Phonology, Arabic Morphology, Substitution, Morphophonology.

INTRODUCTION AND THEORETICAL FRAMEWORK

In its broadest sense, morphophonology or morphophonemics is concerned with the interaction of word-formation processes and the sound system of languages; more specifically, it deals with the morphological alternations that motivate phonological changes in different morphemes (Spencer, 1996: 57). Put differently, choosing an allomorph to represent a particular morpheme in a certain context depends on the phonological properties of that allomorph; whether it is similar to the other neighboring sounds found in that context, thus, it is also referred to as 'phonologically conditioned allomorphy' (Spencer, 1996: 55). An example of phonologically conditioned morphological allomorphy in English is the plural morpheme that has the underlying representation /z/, it is pronounced as [s], [z], and [əz] in the words *cats*, *doves*, and *fishes* respectively depending on the final segment of the stem to which it is attached, a process referred to as progressive assimilation in phonology (Katamba, 1989).

Phonologically alternating forms, like the productive plural English marker, which are triggered by morphological processes, are usually rule-governed; the derivation of phonetic realizations of a particular morpheme is conducted by using phonological processes. Spencer (1996: 55) proposed the following model of derivation:



Katamba (1993) referred to the changes which a certain form goes through when deriving its surface structure or derived form from its deep or underlying representation as derivation. This paper demonstrates that some of the derivational processes found in Arabic morphology are phonologically motivated .

Arabic is a Semitic language spoken in a large area including North Africa, most of the Arabian Peninsula, and other parts of the Middle East. It is the language of the Quran and the religious language of all Muslims spoken by 440 million people worldwide. Modern Standard Arabic (MSA) or Literary Arabic is currently the only official form of Arabic. It is used in written official documents, news broadcasts, lectures, and on formal spoken occasions. Colloquial Arabic includes several spoken dialects, some of which could be mutually unintelligible. The main dialect groups are those spoken in Arabia, Iraq, Syria, Egypt, and North Africa. This paper analyzes the morphological process found in the pattern *ftaʕal* in Modern Standard Arabic (MSA) not in Colloquial Arabic.

Additionally, Arabic is a language in which non-concatenative morphology prevails, in this type of morphology, words are comprised of combinations of specific consonants and vowels. The consonants usually contribute to the lexical core of the word's meaning, whereas the vowels yield specific morphosyntactic information (McCarthy, 1981: 375). In Arabic, word-formation processes involve patterns of consonants that have a certain meaning; this meaning is interleaved with vowel patterns which, themselves, have meanings or morphosyntactic information (McCarthy, 1981). McCarthy explained that in Arabic "the verb system of the triliteral root is based on fifteen derivational categories and that of the quadriliteral root on four" which he referred to as *binyan* (McCarthy, 1981: 384). He posited that the derived *binyanim* (a single pattern) provides certain modification to the basic meaning of the verb root. McCarthy (1981: 384) identified eight binyanim or canonical patterns that yield the perfective aspect of the triliteral verb root *fʕl* 'do'. The template or binyan *ftaʕal* CCVCVC is the eighth one of these patterns found in Modern standard Arabic (McCarthy, 1981: 384). *ftaʕal* involves different meaning modifications to the root *fʕl* 'do'. Among the meanings of the pattern *ftaʕal* is causation as in causing something to happen such as *ktatab* 'cause to be registered' (Al-Galaayini, 1991: 219). It is worth noting that *ftaʕal* is usually pronounced as *ʔiftaʕal* where the *ʔi* is added to avoid having two consonants word-initially.

AL-IBDAAL 'SUBSTITUTION'

Different Arabic morphological books explained the process of *Al-ibdaal* 'substitution' that occurs in the pattern *ftaʕal*. Al-Galaayini (1991) and Al-Raagihi (1984) are two Arab morphologists who explained this process that occurs in the derivation of *ftaʕal* from different roots. They defined it as "removing a letter and replacing it by another." For instance, the /t/ in *ftaʕal* is replaced by /d/ if it is preceded by /d/, /ð/ or /z/. Therefore, the /t/ in *ztaha:* is replaced by /d/ since the preceding sound is /z/. The resulting word would be *zdaha:* 'florished'. It should be noted that traditional books in Arabic morphology deal with letters not sounds, this paper explains *Al-ibdaal* 'substitution' phenomenon from a phonological point of view. Therefore, it deals with sounds.

It has been argued that when the sounds from which words are composed affect each other due to the differences or the similarities found between them in terms of voicing contrast, place of articulation, and manner of articulation, producing them may be difficult for the speakers (Al-Ilwaani, 2010). Therefore, the phonological change takes place in these words in order to ease some of the pressure placed on the different articulators used in producing these sounds (Al-Ilwaani, 2010). Based on the above, the substitution which takes place in Arabic morphological processes could be explained from a phonological point of view as follows, the situation where the /t/ in *ftaʕal* is replaced by /d/ if the preceding sound is /d/, /ð/ or /z/ occurs as a result of voicing contrast; the /t/ is voiceless while the /d/, /ð/ and /z/ are voiced. The /t/ becomes voiced namely /d/ since it is preceded by a voiced segment. This process is referred to as voice assimilation (Katamba, 1989). McCarthy (1981: 380) explained that this assimilation process happens specifically in the eighth binyan *ftaʕal*. Thus, if one attempts to look at the change which occurs in the derivation of *ftaʕal* from a phonological point of view, it would be clear that, practically, there is no substitution of sounds as explained by the Arabic morphologists Al-Galaayini (1991) and Al-Raagihi (1984). What really takes place in *ztaha:* vs. *zdaha:* is voice assimilation McCarthy (1981: 380).

In light of McCarthy's (1981) explanation, this paper aims at expanding McCarthy's approach via analyzing the derivational process found in the binyan *ftaʕal* as mentioned in Arabic morphological books (e.g. Al-Galaayini, 1991), showing how the change that happens in these words is phonologically motivated. The analysis is based on prosodic morphology; an approach used to account for the non-concatenative morphological process found in Arabic and other Semitic languages where words are derived by inserting affixes inside the root itself not by prefixing or suffixing (Katamba, 1993). This approach draws heavily on autosegmental phonology. The next section gives an overall view of the theory.

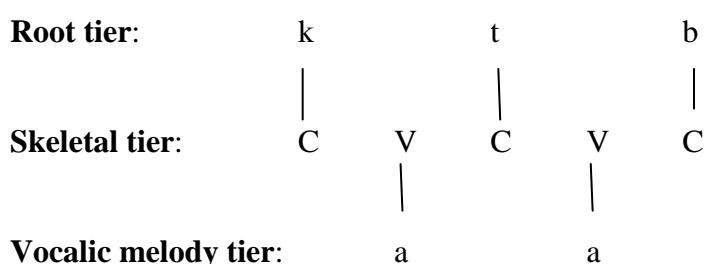
PROSODIC MORPHOLOGY (METHODOLOGY)

Autosegmental phonology or non-linear phonology was originated by Goldsmith (1976) based on classical generative phonology found in Chomsky & Halle (1968) *The Sound Pattern of English* (cited in Goldsmith, 1979). This theory was first developed to describe tonal languages. In this approach, phonological representations consist of several levels or tiers; segments and tones appear on independent tiers that are separate from each other. Between these two tiers, there is a skeletal tier or X-tier which links together the segmental tier and the tonal tier. The autonomous tiers are linked together by means of association lines; these lines are not attached randomly, there are constraints that stipulate the elements that

should be associated on different tiers, these constraints are referred to as the Well-Formedness Condition (WFC) developed by Goldsmith (1979: 207):

1. Each vowel must be associated with (at least) one toneme.
2. All toneme must be associated with (at least) one vowel.
3. No association lines may cross.

Prosodic morphology adopted the main principles of autosegmental phonology. It was initiated by McCarthy (1981: 387) to describe non-concatenative morphological processes as those found in Arabic. He indicated that representing verbs in Arabic is done on three tiers; the root tier, the skeletal or CV tier, and the vocalic melody tier. This is illustrated by the representing the verb *katab* 'write' as follows:



As shown in the analysis above, the consonants are represented on the root tier and the vocalic melody tier represents the vowels. However, in morphological analysis, Universal Linking Conventions are adopted instead of the (WFC), since they are based on the notion of non-automatic spreading; that is spreading only occurs if a given language requires it by a specific rule while the (WFC) assumes automatic spreading of unattached slots to the unattached segments capable of bearing them (Archangeli and Pulleyblank, 1989: 181; Katamba, 1993: 159). These principles are listed below based on Pulleyblank (1986) and Archangeli (1983) (cited in Katamba, 1993: 15)

Universal Linking Convention:

- a) Link a sequence of autosegments with a series of elements on the skeletal tier that are capable of bearing them.
- b) Perform the linking going from the beginning to the end of the word. Unless specific instructions are given in the grammar of the language to do otherwise.
- c) Association lines do not cross.

The following section provides an analysis of the phonological changes that take place when deriving the pattern *ftaʕal* from different roots .

ANALYSIS OF AL-IBDAAL 'SUBSTITUTION' IN WORDS REPRESENTING THE PATTERN FTAʕAL

This paper provides an analysis of the substitution rules found in *ftaʕal* based on their explanation and order by Al- Galaayini (1991: 120-125).

Replacing /y/ and /w/ by /t/

According to Al-Galaayini (1991: 120), the /y/ and /w/ are replaced by /t/ if they occur in the place of /f/ in the pattern *ftaʕal*, they are merged with the following /t/ as in *ttasal* 'called', *ttasar* 'became easy' and *ttaqa* 'feared God'. When the derivation takes place, these words are

derived as *wtasal*, *ytasar*, and *wtaqa* respectively, provided that the origin of the /y/ is not /ʔ/ as in *ytamar* which originally it is *ʔtamar* 'gave orders.' It was argued by McCarthy (1981) that the change that takes place in these words is phonologically motivated. He explained that what really takes place in these words is voice assimilation where the /y/ and /w/ become /t/ if preceded by /t/. Thus, it can be argued that there is actually no substitution. Another way of analyzing the change that takes place in these words is as follows; it could be argued that /y/ and /w/ are deleted to derive the pattern *ftaʕal*. This is accounted for in terms of voicing contrast, place of articulation and manner of articulation. While /t/ is voiceless alveolar stop, the /w/ is voiced labio-velar approximate and the /y/ is voiced palatal approximate. Producing the sounds namely /t/ and /y/ when they are adjacent as in *ytasar* places pressure on the articulators involved in their production due to their different features (Al-Ilwaani, 2010). It may be claimed that it is not only voice assimilation that takes place in these words (*ytasar* and *wtaqa*) since the two segments /y/ and /t/ also differ in the place of articulation and the manner of articulation. As a result, the two glides are deleted, a process described as syncope (Spencer, 1996), and the infix *t* spreads to the unattached slot.

In prosodic morphology, the vowel /a/ in *ttasar* 'became easy' is represented on the vocalic melody tier attached with a V slot, this leaves the other V slot vacant. However, there is a specific rule in Arabic which allows the non-automatic spreading of the vowel /a/ to the vacant V slot in accordance with the Universal Linking Convention (Katamba, 1993). The root *ysr* is represented on the root tier and that only leaves the reflexive morpheme *t*. It has been proposed that the infix *t* is represented on a separate tier called the morpheme tier (McCarthy, 1981). In non-concatenative morphological processes found in Arabic, we can find discontinuous morphemes that have intervening infixes between them. Therefore, McCarthy (1981: 379) argued that morphemes are separated from root consonants and represented on a separate tier in what is known as the morpheme tier hypothesis. He explained that the morpheme root [μ] can be represented on a separate tier supporting his argument by the assimilation that occurs in the eighth binyan *ftaʕal*. McCarthy (1981: 380) posited that the separation of the morpheme root makes it possible to represent the infix *t* which is found in the pattern *ftaʕal*. Thus, in case of *ttasar*, the second *t* is an infix and it is inserted inside the root which is *ysr*.

An examination of figure 1 shows that when *ftaʕal* is derived from this root, the underlying representation is *ytasar*, then the /y/ is de-linked i.e. deleted because of the differences between /y/ and /t/ in terms of voicing, place of articulation and manner of articulation, the fact that places pressure on the articulators when these two segments are adjacent. Figure 1 shows that after delinking the /y/, the C slot becomes unattached. Therefore, the infix *t* spreads from left to right (Archangeli and Pulleyblank, 1989: 181), in accordance with the Universal Linking Convention, to the C-slot leaving it attached to two C-slots in a process referred to as gemination (Spencer, 1996). The outcome of this process is *ttasar*. The analysis is demonstrated below:

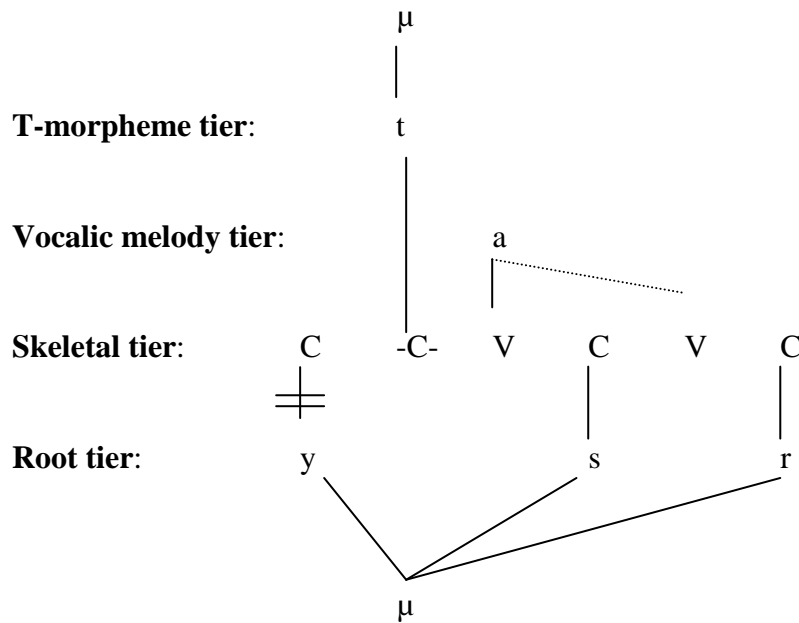


Figure 1. the underlying representation *ytasar*

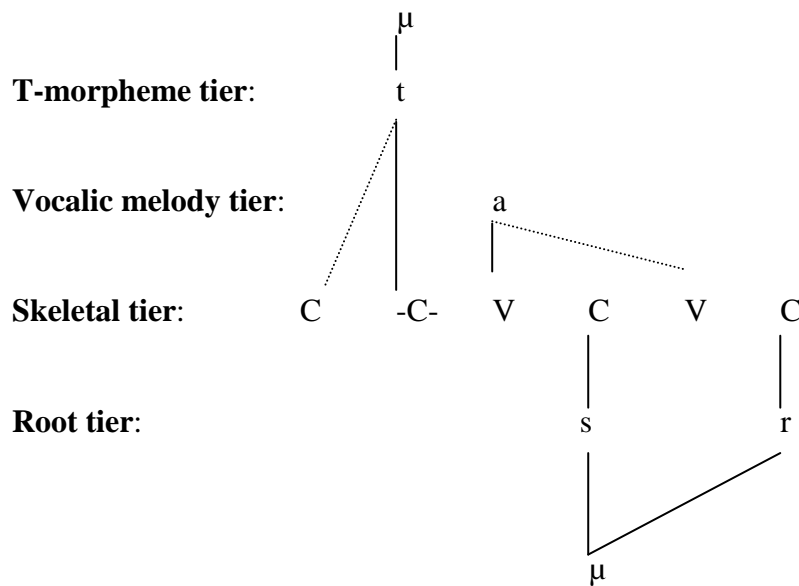


Figure 2. the surface representation *ttasar*

A careful study of figure1 and 2 shows that the *t* is not repeated twice, this is due to the Obligatory Contour Principle (OCP) which prohibits the existence of two identical adjacent sounds (Goldsmith, 1979). Furthermore, it should be noted that in accordance with the Universal Linking Convention, segments are local and may trigger processes if they are adjacent on the same tier. However, it seems that phonological processes of delinking and assimilation that apply in the pattern *ftaʕal* require that the trigger for a rule occurs in a different morphemic tier than the segment that undergoes delinking or assimilation. Hence, if

we need to revise the standard assumption about tier locality, then many other analyses that depend on this assumption also need to be revisited.

Replacing the /t/ in *ʔaʕal* by /θ/ and merging it with the preceding /θ/

In *θʔaʕar* 'avenged', the underlying representation is *θʔaʕar*; the surface structure is derived via replacing /t/ by /θ/ then merging it with the preceding /θ/ (Al- Galaayini, 1991).

However, from a phonological point of view, it could be argued that there is actually no substitution; the change is accounted for in terms of the place of articulation since the /t/ is alveolar while the /θ/ is dental; the place of articulation feature spreads, left to right, from the /θ/ to /t/ in what is called homorganic assimilation (Katamaba, 1993; Spencer, 1996: 152). Then the / θ / is geminated with preceding / θ /. In prosodic morphology, the place of articulation feature [+dental] spreads left to right from /θ/ to /t/ changing it into /θ/. This is illustrated in figure 3 and 4 below:

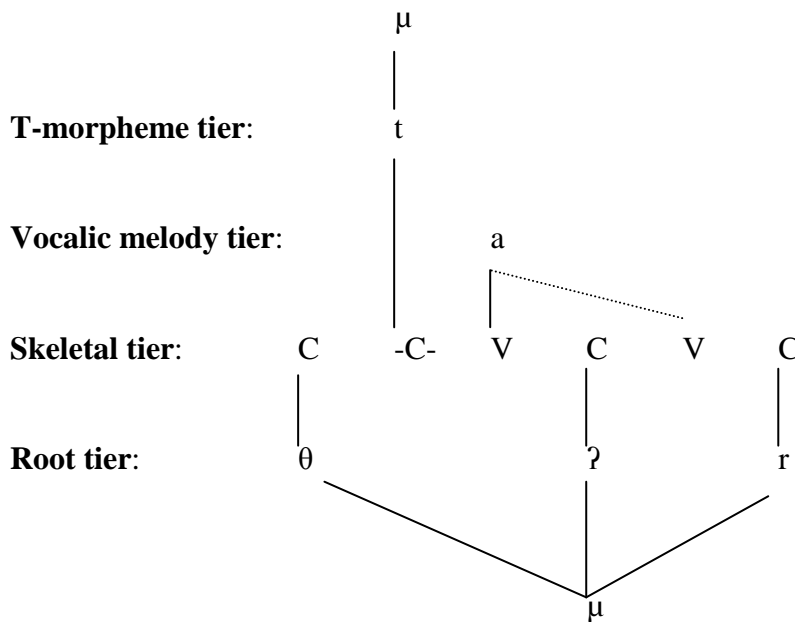


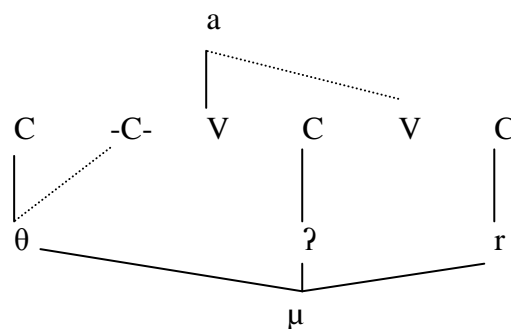
Figure 3. the underlying representation *θʔaʕar*

T-morpheme tier:

Vocalic melody tier:

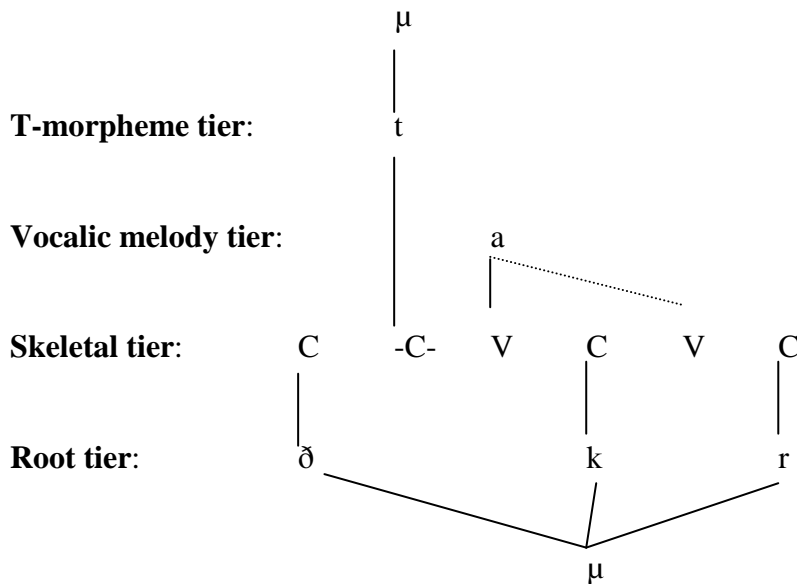
Skeletal tier:

Root tier:



Replacing the /t/ in ftaʕal by /d/ if the preceding sound is /d/, /ð/ or /z/

As it had been mentioned before, voice assimilation is responsible for the change which occurs in these words (McCarthy, 1981). By using prosodic morphology to analyze these words, it is quite clear that there is no substitution; the underlying representation of *ḍdakar* is *ḍtakar*, this is illustrated in figure 5 below:



However, because of voicing contrast between the /ð/ and /t/ the /t/ becomes voiced, in other words; the voicing feature spreads from the /ð/ to /t/ changing it into /d/ and thus, making it easier for speakers to pronounce these words. This is explained by the following rule:

That is, voiceless sounds become voiced when they are preceded by a voiced sound. As a result of applying this rule, the surface representation of *ḍtakar* is *ḍdakar*. Figure 6 below illustrates the above mentioned analysis:

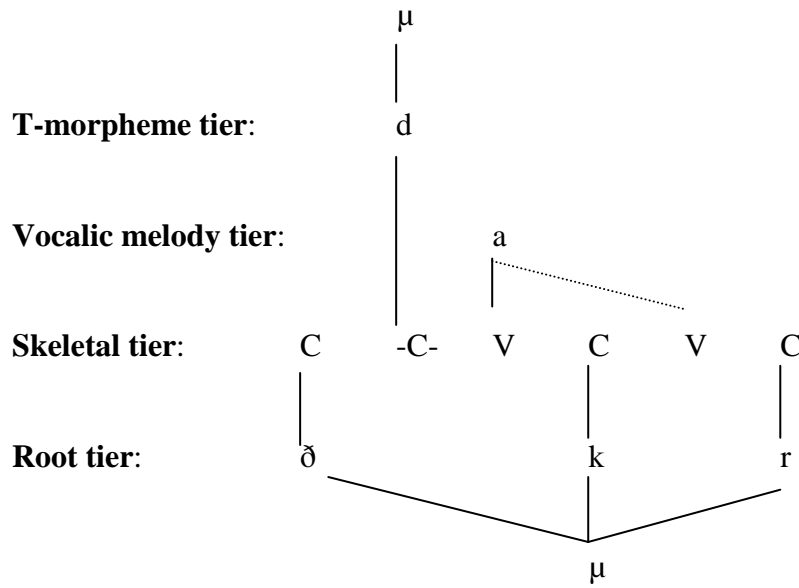


Figure 6. the surface representation *ɔ̌dakar*

Additionally, the derivation of *ɔ̌takar* has two surface forms; the first one was explained above (*ɔ̌takar* <- *ɔ̌dakar*). However, there is also another surface form namely, *ɔ̌ɔ̌dakar*. Similar to *θθaɔ̌ar*, it is also possible to de-link i.e. delete the /d/ and geminate it with the /ɔ̌/ that precedes it to derive *ɔ̌ɔ̌dakar*. In a way, changing the /t/ into /d/ in *ɔ̌dakar* provides the input i.e. feeds the gemination process to derive *ɔ̌ɔ̌dakar*. Thus, the derivation goes in the following way:

(*ɔ̌takar* <- *ɔ̌dakar* <- *ɔ̌ɔ̌dakar*)

Both of the surface forms *ɔ̌dakar* and *ɔ̌ɔ̌dakar* are used in MSA interchangeably. It is possible to look at the derivation of *ɔ̌dakar* as an intermediate step to derive the final surface representation *ɔ̌ɔ̌dakar*. This is illustrated in figure 7 and 8 below:

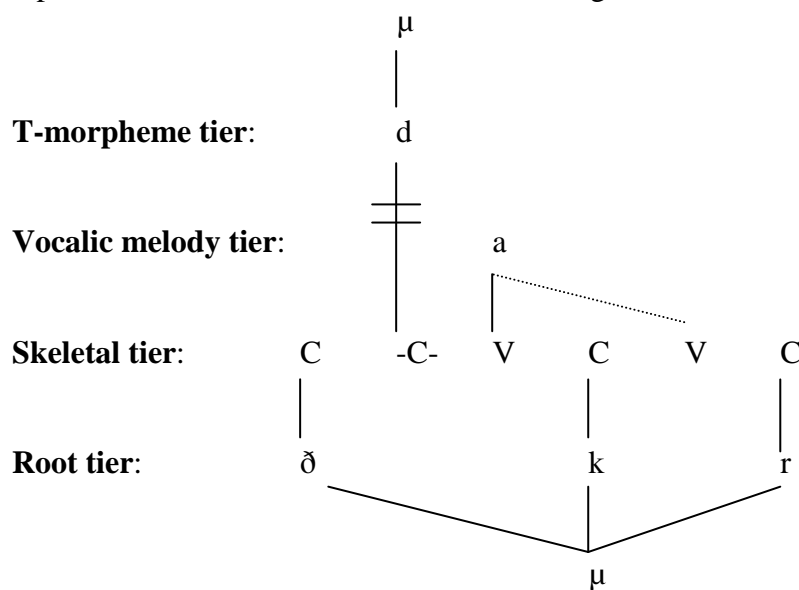
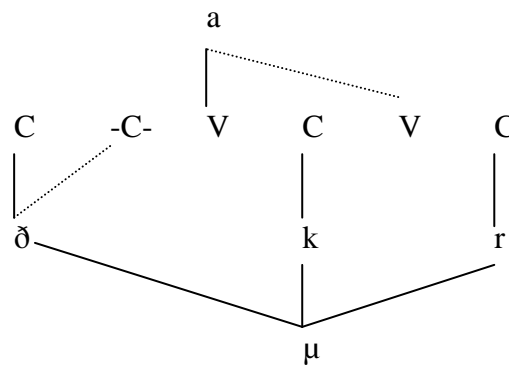


Figure 7. the underlying representation *ɔ̌dakar*

T-morpheme tier:**Vocalic melody tier:****Skeletal tier:****Root tier:**Figure 8. the surface representation *ḏḏakar*

However, it could also be argued that the surface form *ḏḏakar* is derived directly from *ḏtakar* via voice assimilation without deriving *ḏdakar* first. The fact that both *ḏdakar* and *ḏḏakar* are surface forms of the underlying representation *ḏtakar* makes this analysis also feasible.

The derivation of *zdaha:* is different from the other words that is, if we try to represent *zdaha:* 'flourished' using prosodic morphology, the underlying representation of *zdaha:* is *ztahaya* since the root is *zhy*. According to Al-Raagihi (1984), if nothing follows the /y/ as in *zhy* or /w/ as in *dʕw* 'call or invite' at the end of the word, it changes into /a: / in what is known as *iʕlaal bil qalb* 'changing a glide into a vowel' in Arabic. However, if we look at this phenomenon from a phonological perspective, the process is realized differently; the /y/ is deleted and as a result of this deletion there would be compensatory lengthening of the final vowel /a/ (Katamba, 1993). Furthermore, in accordance with the Universal Linking Convention (see section 3), any C or V slots which are unattached to segments are deleted (Katamba, 1993). Therefore, the C slot is deleted after deleting /y/, as it is prohibited to remain unattached with no segment available for it to be attached to; it can only be attached to consonants (see principle a in section 3). Figure 9 and 10 below demonstrate both the underlying representation and the surface representation:

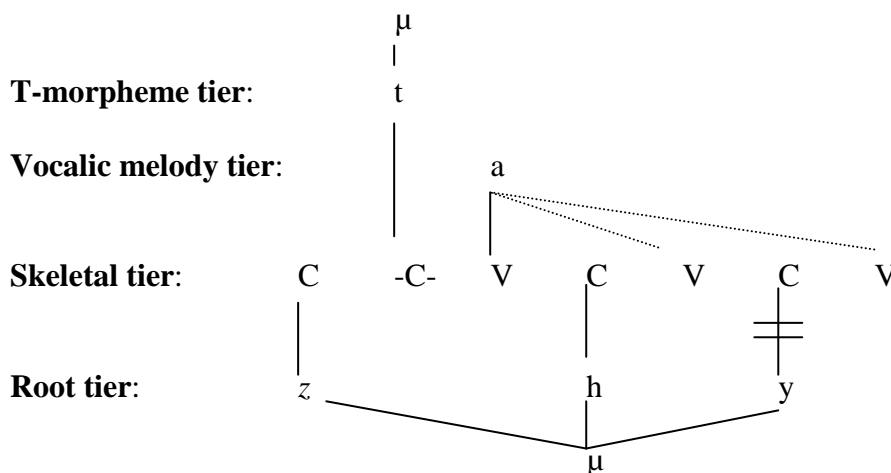


Figure 9. underlying representation *ztahaya*

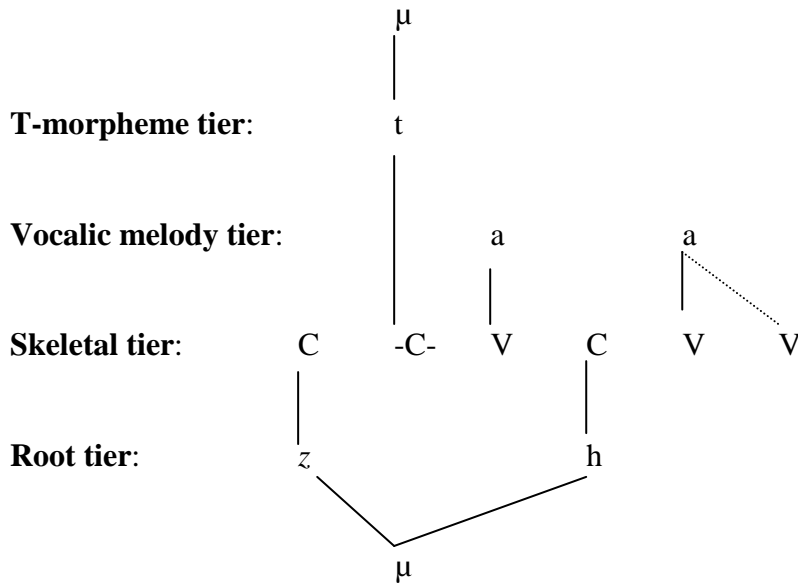


Figure 10. surface representation *ztaha:*

It should be noted *ddaʃa* 'claimed', whose root is *dʃw*, maybe represented in the same way as *ztahaya* vs. *ztaha:* except the */w/* is deleted instead of the */y/*. Similar to *ɔdakar*, the voicing feature of */z/* spreads to the voiceless *t* changing it into voiced */d/* (McCarthy, 1981). This is shown in figure 11 and 12 below:

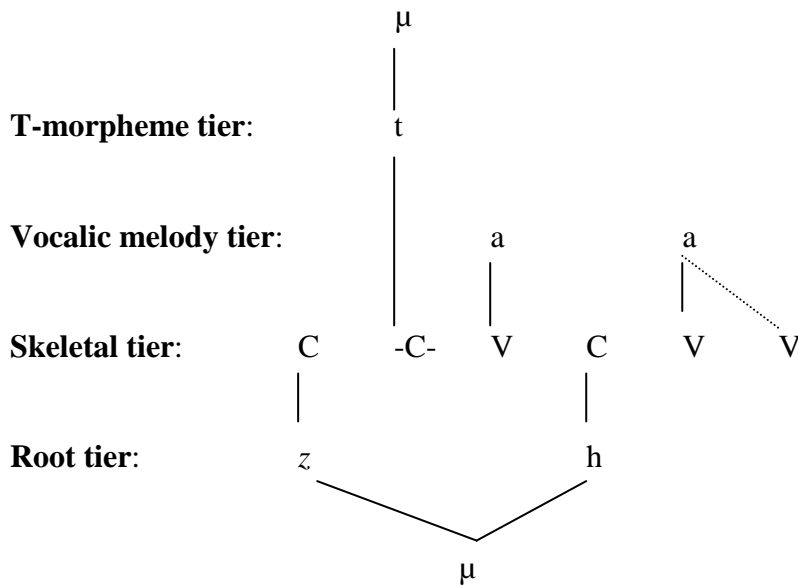


Figure 11. the underlying representation *ztaha:*

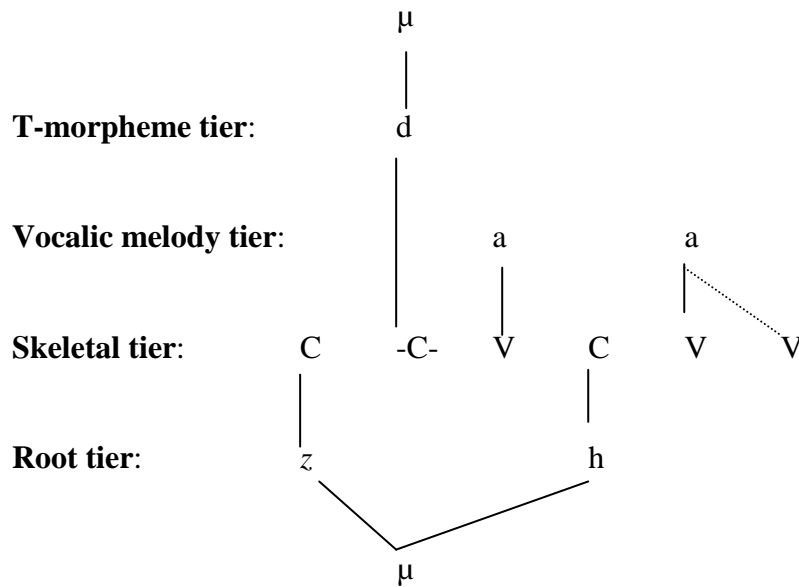


Figure 12. the surface representation *zdaha*:

Again, the derivation of *zdaha*: has two surface forms; the first one was explained above (*ztaha*: <- *zdaha*:). However, there is also another surface form namely, *zzaha*: where the /d/ is de-linked the /d/ and geminated with the /z/ that precedes it to derive *zzaha*:. Hence, the derivation goes as follows where the derivation of *zdaha*: feeds the derivation of *zzaha*: (*ztaha*: <- *zdaha*: <- *zzaha*:)

This process is demonstrated in figure 13 and 14 below:

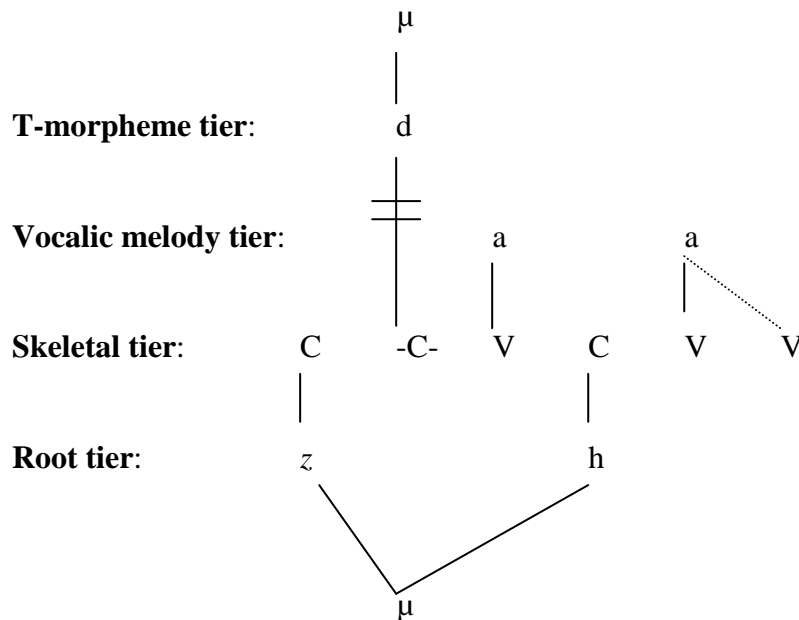


Figure 13. the underlying representation *zdaha*:

T-morpheme tier:

Vocalic melody tier:

Skeletal tier:

Root tier:

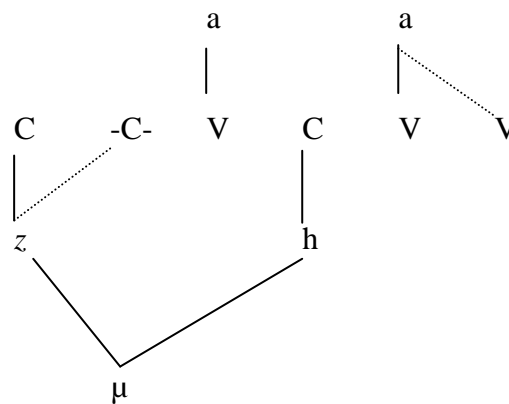


Figure 14. the surface representation *zzaḥa*:

Replacing the /t/ in *ftaṣal* by /t/ if the preceding sound is /s/, /d/, /t/, or /ð/

"The /t/ is substituted in *ftaṣal* with /t/ if the preceding sound is /s/, /d/, /t/, or /ð/ as in *stafa* 'chose', *dtagaṣ* 'lay down', *tṭarad* 'be successive', and *ḏtalam* 'be unjust'. Which were originally *stafa*, *dtagaṣ*, *tṭarad*, and *ḏtalam* (Al- Galaayini, 1991: 124)."

Similar to section 4.3, voice assimilation takes place in these words spreading the voicing feature from /s/, /d/, /t/, or /ð/ to the /t/. By representing *dtagaṣ* using prosodic morphology, again it could be seen that there is no substitution; the voicing feature spreads from /d/ to /t/ in *dtagaṣ* as illustrated below:

[-voice] \longrightarrow [+voice] / [+voice] ____

The surface representation is *dtagaṣ*. This is demonstrated in figure 15 and 16 below:

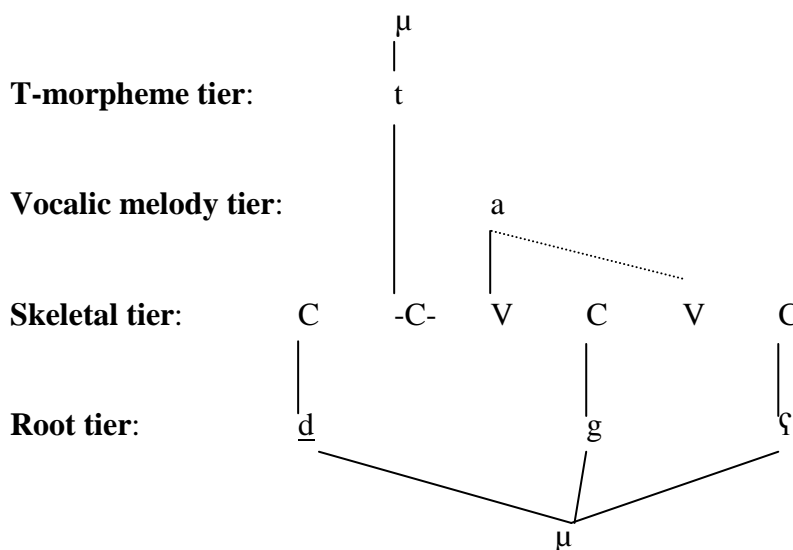


Figure 15. the underlying representation *ɖtagaʃ*

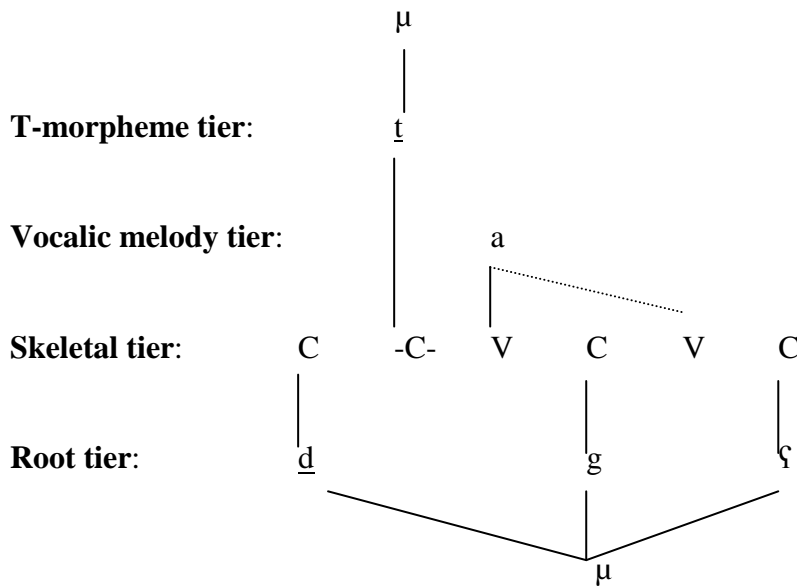


Figure 16. the surface representation *ɖtagaʃ*

Finally, the derivation of *ɖtagaʃ* has two surface representations namely, *ɖtagaʃ* and *ɖɖtagaʃ*. Hence, to derive *ɖɖtagaʃ* from *ɖtagaʃ*, a similar process to what took place in *θθaʔar*, *ððakar*, and *zzaha:* occurs; the /t/ could be de-linked and geminated with the /ɖ/ that precedes it. Thus, the derivation goes as follows:

(*ɖtagaʃ* <- *ɖtagaʃ* <- *ɖɖtagaʃ*)

Figure 17 and 18 below show this process:

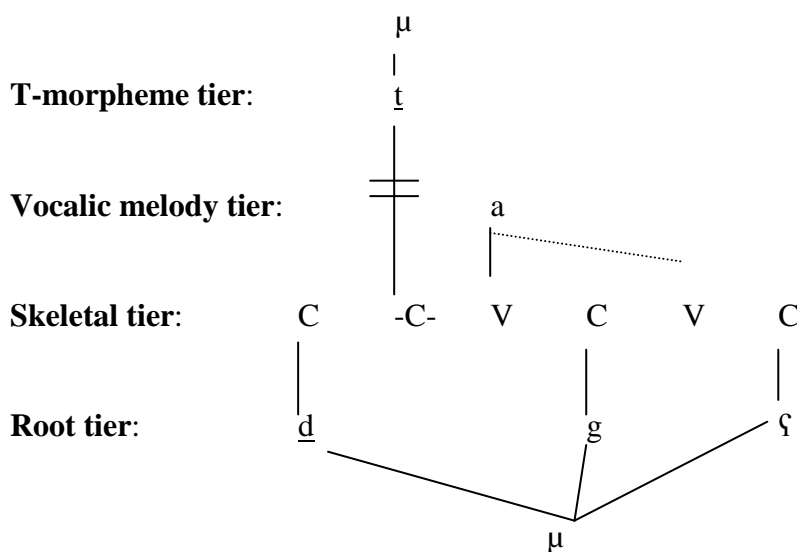
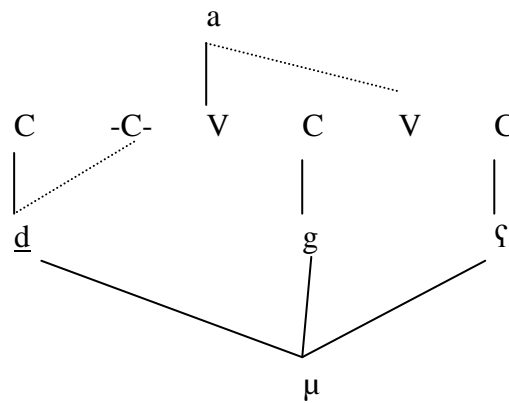


Figure 17. the underlying representation *ɗtagaʕ***T-morpheme tier:****Vocalic melody tier:****Skeletal tier:****Root tier:**Figure 18. the surface representation *ɗɗagaʕ*

The analysis revealed that the Universal Linking Convention needs to be revisited to account for the standard assumption about segments locality that is, segments are local and may trigger processes if they are adjacent on the same tier. However, it seems that phonological processes of delinking and assimilation that apply in the pattern *ʔaʕal* in MSA require that the trigger for a rule occurs in a different tier than the segment that undergoes delinking or assimilation. Thus, if we need to revise the standard assumption about tier locality, then many other analyses that rely on this assumption also need to be re-considered. In addition, the morphological processes explained in classical Arabic morphological books and taught to learners of Arabic need to be revised to account for the change that occurs in the words representing the pattern *ʔaʕal*. This may offer these learners an opportunity to better understand Arabic morphological processes via explaining the trigger for the changes that take place in the words instead of listing rules that do not actually account for the change that occurs naturally and logically. In other words, it would facilitate the learning process of Arabic.

CONCLUSION AND RECOMMENDATION

This paper provided an analysis of *Al-ibdaal* 'substitution' process found in Modern Standard Arabic (MSA) morphological books, particularly, in the pattern *ʔaʕal*. By analyzing the derivation of the words presenting this pattern, namely, *ttasar*, *θθaʔar*, *ððakar*, *zdaha:*, and *ɗtagaʕ* based on the principles of prosodic morphology proposed by McCarthy 1981, it had been argued that there was actually no substitution of sounds as mentioned in Arabic morphological books and the change that takes place in these words is phonologically motivated. In case of *ððakar*, *zdaha:*, and *ɗtagaʕ*, voice assimilation took place in these words spreading the voicing feature left to right from one sound to the other. With regard to *θθaʔar*, homorganic assimilation takes place in *θtaʔar* spreading the place of articulation feature left to right from /θ/ to /t/. As for *ttasar*, the /y/ has been deleted and /t/ had spread to the unattached slot due to differences in voicing, place of articulation and manner of

articulation. On the basis of the analysis, the two authors recommend that the concept of *Al-ibdaal* 'substitution' in the pattern *ftaʕal* should be revisited in Arabic morphological books to explain the phonological motivation that triggers the change in this pattern. Further research is recommended in order to explain other morphological processes like *iʕlaal bil qalb* 'changing a glide into a vowel' in Arabic in other words and patterns from a phonological point of view. These studies would offer another perspective of MSA morphological processes which may require the reconsideration of these processes in Arabic morphological books.

REFERENCES

- Al-Galaayini, M. (1991) *Gaamiʕ adduruus al-ʕarabiyyah alguzu? alʔawwal 'a set of Arabic lessons part one'*. Beirut: Al-Maktaba Al'assriyya.
- Al-Ilwaani, N. (2010) *Al-ibdaal assarfii assawtii fii siigat ftaʕal fii magmaʕ albayyan 'morphological and phonological substitution in ftaʕal pattern in magmaʕ albayyan'*. *Majallat Allugha Al-Arabiyyah wa Aadaabuhaa* 9, 93-120.
- Al-Raagihi, A. (1984) *Atattbiiq assarfii 'morphological application'*. Beirut: Dar Annahda Al-Arabiyyah.
- Archangeli, D. and Pulleyblank, D. (1989) Yoruba vowel harmony. *Linguistics Inquiry*, 20, 173-217.
- Goldsmith, J. (1979) The aims of autosegmental phonology. In D. Dinnsen (ed.) *Current Approaches to Phonological Theory* (pp. 202-222). Bloomington: Indiana University Press.
- Katamba, F. (1989) *An Introduction to Phonology*. London: Longman.
- Katamba, F. (1993) *Morphology*. New York: Palgrave.
- McCarthy, J. (1981) A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry*, 12, 373-418.
- Spencer, A. (1996) *Phonology: Theory and Description*. Cambridge: Blackwell.