An Optimality Theoretic Account of *Vb* Infixed Plurals in Jebbāli

KHALSA AL AGHBARI
University of Florida and Sultan Qaboos University
khalsa@ufl.edu

Abstract: One of the most systematic mechanisms of expressing 'noun plurality' in Jebbāli is *Vb* infixation. The *Vb* infix aligns to the left edge of noun plurals; it specifically occupies the second syllable of these forms. Using Optimality Theory, I assume that an alignment constraint (ALIGN-*Vb*-L) governs the locus of the *Vb* infix. I further illustrate that this constraint is dominated by the language requirement to make the right and left edges of the singulars and plurals stand in correspondence. Moreover, I prove that Jebbāli restricts the size of the infix to be no longer than a single syllable. This restriction is encoded in the constraint AFFIX ≤ SYLLABLE (Crowhurst 2004:129) which stipulates that "the phonological exponent of an affix is not larger than a syllable." This will prove important to the given analysis.

0. Introduction

One of the most prevalent patterns of plural formation in Jebbāli is plurals with *Vb*[1] infixation. This pattern of pluralization is unique to Jebbāli; other Modern South Arabian languages do not mark plurality by *Vb* infixation. Moreover, none of the widely studied Semitic languages is reported to have the *Vb* infix as a plural marker. Although it is not the default mode of pluralization in the language, it occurs quite frequently when pluralizing stationary items, old and new tools and generally loan words which relate to tools. For example, when Jebbāli speakers are asked to pluralize the Arabic loan word [masˤtˤr-ah] 'ruler,' they pluralize it by infixing *Vb*. Thus, [masˤabtˤər] is favored to *[masˤtˤɪrɪti], the suffixed and default plural form. The '*Vb* infix' plural marker also occurs when pluralizing the Arabic words of certain buildings such as offices, restaurants and hotels.

1. *Vb* Infixed Plurals

1.1. Description

Quadri-consonantal singulars bearing the shapes CVCCVC or CVCCVC-*it* or CVCCVC-*ah* (the suffixes represent the feminine gender) take *Vb* infixation to mark plurality. The quality of the vowel in the infix can either be /ɛ/ or /a/ depending on the place features of the preceding conso-

[1] Throughout this paper, morphological pieces (morphemes) are italicized. Phonetically transcribed linguistic forms are enclosed between brackets while phonemes are put between slashes, following convention of phonology. In the analysis of the location of the *Vb* infix, braces enclose individual segments in the singular and plural forms.

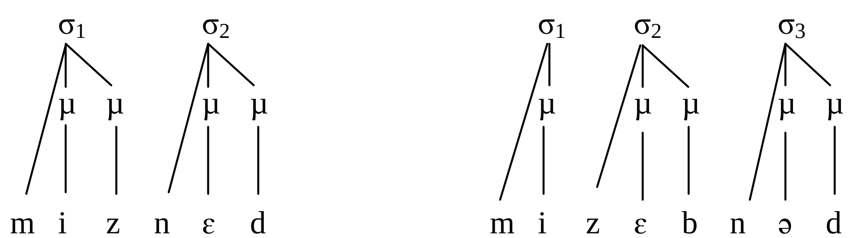
nant. Although there are a few exceptions, /ɛ/ follows a coronal, velar or bilabial consonant while /a/ is preceded by a pharyngeal(ized), glottalized, or a back consonant in general[2]. The *Vb* infix resides towards the left edge of the plural form. The exact locus of this infix is the second syllable from the left edge of the plural after the C_1VC_2 of the base singular form. So, the final plural shape is CVC***Vb***CVC. In (1) below, I list representative examples of plurals which take *Vb* infixation:

(1) **Plurals of *Vb* infixation**

a.	munχul	min**ɛb**χəl	'sieves'
b.	mɛrgɛl	mir**ɛb**gəl	'cauldrons'
c.	maʁdel	maʁ**ab**dəl	'big loads'
d.	maħzɛm	maħ**ab**zəm	'cartridge belts'

The following is a prosodic representation of [miz.nɛd] → [mi.z**ɛb**.nəd] 'rifle-bolts':

(2) *Singular* *Plural*



1.2. Analysis

To govern the locus of the *Vb* infix, I use an alignment constraint. The general formalism of the alignment family of constraints is repeated below:

(3) **Generalized Alignment**

Align (Cat1, Edge1, Cat2, Edge2)=def
∀ Cat1 ∃ Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.
Cat1, Cat2 ∈ Pcat ∪ Gcat
Edge1, Edge2 ∈ {Right, Left} (McCarthy and Prince 1993)

In Jebbāli, *Vb* (**bold-faced** in all the following examples) is aligned to the left edge of the output plural forms. It occupies exactly the second syllable of these forms as can be clearly seen in the following examples (the dot indicates syllable boundaries):

[2] /a/ is also [+low]. However, this feature is irrelevant to the present discussion.

(4) ***Vb* infixed plurals with syllabification indicated**

a.	miz.nɛd	mi.**<u>zɛb.</u>**nəd	'rifle-bolts'
b.	maχ.tˤɛr	ma.**<u>χab.</u>**tˤər	'caravans, turns, times'
c.	məs.'ref	mi.s'**<u>ɛb.</u>**rəf	'rations, supplies'

To address the locus of infixation, I formulate the alignment constraint as:

(5) **ALIGN-*Vb*-L**
Align *Vb* to the left edge of the plural form

The violation of this alignment constraint is gradient. The actual output plural aligns *Vb* after exactly three segments {C_1, V, C_2} from the left edge of the plural form, so three violations of ALIGN-*VB*-L are assessed. The *Vb* resides in the second syllable of the plural form, making C_2 the onset of the *Vb* infix, and this will prove important to the analysis.

This alignment constraint is dominated by the language requirement to keep the right and left edges of the singular forms corresponding to the right and left edges of the plural forms. The infix *Vb* does not disrupt the edges of the singular form when plurality is marked. The set of constraints that keep the edges of the singulars and plurals in a correspondent relation are the anchoring family of constraints whose general formalism stipulates the following:

(6) **{Right, Left} Anchoring**
'Any element at the designated periphery of S_1 has a correspondent at the designated periphery of S_2.'
Let *Edge* (X, {L, R})= the element standing at the Edge=L, R of X (Kager 1999:251)

The actual plural forms have the segments at the leftmost edge and the rightmost edge corresponding with those at the leftmost and rightmost edges in the singular forms. To address this fact, I use the following anchoring constraints:

(7) **L-ANCHOR-PS**[3]
The segment at the leftmost edge of the plural form corresponds with that at the leftmost edge of the singular form.

(8) **R-ANCHOR-PS**
The segment at the rightmost edge of the plural form corresponds with that at the rightmost edge of the singular form.

The violation of the above anchoring constraints is categorical; it occurs when the segments at the edges of both the singular and plural forms do not match. It stipulates that for the segments at

[3] PS stands for Plural - Singular, following other families of Correspondence constraints.

the rightmost and leftmost edges of the plural form, there must be corresponding segments at the leftmost and rightmost edges of the singular form. The following tableau shows the competition between the alignment constraint and the anchoring constraints.

(9) Tableau 1: The locus of the *Vb* infix

miz.nεd + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	ALIGN-*Vb*-L
☞ a. mi.z**εb**.nəd			m i z
b. miz.nə.d**εb**	*!		m i z n ə d
c. **εb**.miz.nəd[4]		*!	

The tableau above illustrates the locus of the infixed *Vb* which is determined by a competition between the alignment and anchoring constraints. The optimal output (a) has the infix right after the first three segments, incurring three violations {m, i, z} of the low ranked constraint ALIGN-*Vb*-L. It obeys the high ranked constraints L-ANCHOR-PS and R-ANCHOR-PS by keeping the left-most and rightmost edges in correspondence. Candidate (c), though it aligns *Vb* all the way to the left-edge and exhibits no violation of ALIGN-*Vb*-L, violates L-ANCHOR-PS, which is crucial for plurals in Jebbāli. The segment {m} at the leftmost edge of the singular has no correspondent in the leftmost edge of the plural form. Thus, it is doomed. Candidate (b) aligns *Vb* to the right edge, skipping far more segments in the plural form than the segments skipped in the actual output. Moreover, it violates the high ranked right anchoring constraint. Therefore, it is out, too.

In the actual output plural, the final C of the first syllable .C_1VC_2. of the singular form $C_1VC_2.C_3VC_4$ makes an onset to the *Vb* infix. Observe the following representation:

(10)

Singular	m	i	z		n	ε	d
	|	|	|		|	|	|
Plural	m	i	z	εb	n	ə	d

In the singular form [miz.nεd], /z/ belongs to the first heavy syllable #C_1VC_2 and closes the first syllable. However, in the output plural, it serves as the onset to the infix *Vb*, the requirement of having an onset is relatively high in the language. So, a potential candidate such as miz.εb.nəd is out as it violates ONSET.

(11) **ONSET**
Every syllable begins with a consonant. (McCarthy and Prince 1990, 1993)

[4] Other potential sub-optimal candidates such as [mebizned] will be dealt with in the next section.

Observe the following tableau which illustrates the fact that the locus of the *Vb* infix must conform with the prosodic requirements of the language. Although the right and the left edges of candidate (d) stand in absolute correspondence with the singular output, it violates ONSET.

(12) Tableau 2: The role of prosody in Jebbāli

miz.nɛd + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	ALIGN-*Vb*-L	ONSET
☞ a. mi.z**ɛb**.nəd			m i z	
b. miz.nə.d**ɛb**	*!		m i z n ə d	
c. **ɛb**.miz.nəd		*!		*
d. miz.**ɛb**.nəd			m i z	*!

The actual output is the most harmonic candidate as it exhibits the fewest violations to the proposed constraints. It exhibits three violations to ALIGN-*Vb*-L by aligning the infix three segments away from the left edge of the plural form. Candidate (d) equally violates ALIGN-*Vb*-L three times. However, it fatally violates the constraint requiring every syllable in the output form to begin with an onset. Thus, candidate (d) is doomed in the ranking above.

[m**ɛ**.**b**iz.nəd] is yet another possible candidate which needs to be considered for the ranking established above. This candidate violates ALIGN-*Vb*-L only once by skipping the segment {m} at the left of the plural form. Thus, it may seem more harmonic than our actual plural form. However, this candidate has the two segments {V} and {b} of the infix separated into two syllables. The optimal output has these two segments contained in one single syllable. Thus, [mɛ.biz.nəd] is doomed. Observe the following tableau:

(13) Tableau 3: Other potential candidates

miz.nɛd + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	ALIGN-*Vb*-L	ONSET
☞ a. mi.z**ɛb**.nəd			m i z	
b. miz.nə.d**ɛb**	*!		m i z n ə d	
c. **ɛb**.miz.nəd		*!		*
d. miz.**ɛb**.nəd			m i z	*!
☹ e. m**ɛ**.**b**iz.nəd			m	

The ranking above requires the stipulation of a constraint that would favor [mi.z**ɛb**.nəd] to [m**ɛ**.**b**iz.nəd]. As is seen, the only difference between these candidates is that the segments contained in the infix {ɛ} and {b} are contained in the same syllable in the winning candidate. Candidate (e) is different from the actual output in that it has {ɛ} and {b} of the infix in separate syllables. The /ɛ/ serves as a nucleus to the preceding syllable while the /b/ makes the onset to the following syllable. So, the infix creates two syllables. The two segments of the infix in the actual output make a syllable and both must belong to that syllable. Observe the following representation showing the locus of the *Vb* infix in the actual output and a potential output:

(14) Actual Output * Potential Output

The representations above show that the infix in the optimal output is contained within a single syllable. Thus, it has the weight and size of a syllable. In the potential output, the segmental content of the infix gets separated; the vowel belongs to a different syllable from that that contains the /b/. Crowhurst (2004) who studies the behavior of the reduplicants in Mangarayi, Mokilese and Tzeltal crucially states "while the Red[uplicant]s in Mangarayi, Mokilese and Tzeltal may not be syllables in segmental terms, each has the weight of a syllable" (Crowhurst 2004:131). She proposes a size-restricting constraint developed from the more conventional generalized alignment constraints, stating that "exemplars of the MCat (Morphological Category) affix are restricted to no more than a syllable size by the constraint Affix ≤ syllable" (Crowhurst 2004:129). She stipulates the following constraint to offer a sufficient analysis for the Morphological Category and Prosodic Category misalignment phenomenon:

(15) **Affix ≤ syllable**
The phonological exponent of an affix is not larger than a syllable.
(Crowhurst 2004:129)

The above constraint rules out candidates whose affixes are larger than a syllable. Moreover, it can be extended to capture the size properties of affixes in general. In her concluding remarks, Crowhurst (2004:172-173) shows that the above size restricting constraint can easily be translated into specific versions of the alignment constraints. In our case, the infix is just one syllable whose content should not be detached. Observe the following formalism:

(16) **AFF-σ-Left$_{\mathrm{SEG}}$**
Align-Left$_{\mathrm{SEG}}$ (Affix$_i$, σ)

The above constraint is more explicit in that it dictates that the size of the affix should be a syllable in length and stipulates a specific alignment for it. In AFF-σ-Left$_{\mathrm{SEG}}$, all the segments of an affix are aligned to the left edge and make a single syllable. Violation to this constraint is incurred by (i) Separating the content of an affix or (ii) having an affix that is bigger than a syllable. Incorporating the Affix ≤ σ constraint into the analysis of the *Vb* infixed plural forms, the tableau below reveals the interaction of the size restricting constraint with the constraints established thus far.

(17) Tableau 4: Restricted affix size

miz.nɛd + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	Affix ≤ σ	ALIGN-*Vb*-L	ONSET
☞ a. mi.z**ɛb**.nəd				m i z	
b. miz.nə.d**ɛb**	*!			m i z n ə d	
c. **ɛb**.miz.nəd		*!			*
d. miz.**ɛb**.nəd				m i z	*!
e. mɛ.**b**iz.nəd			*!	m	

Candidate (e) is now doomed because of the higher ranking constraint Affix ≤ σ which requires the segments of the infix to be contained in a single syllable. In this candidate, {ɛ} of the infix *ɛb becomes* the nucleus to the first syllable at the left edge of the plural form, while {b} is the onset to the following syllable, forcing the infix to span over two syllables and violating Affix ≤ σ.

Jebbāli has a sub-pattern of *Vb* infixed plurals which has peculiar morphophonological properties. This property makes it diverge from the regular *Vb* infixed shapes. For instance, some of the *Vb* infixed plurals begin with a vowel, often a schwa, instead of the systematic initial #mVC. syllable. They take the shape [V.C***Vb*.**CVC] and thus differ from the phonologically conditioned shape [mVC.C***Vb*.**CVC] in starting with an onsetless syllable plural-initially. They are derived from singular forms (3a-c below), which begin with a nasalized vowel, traditionally analyzed as a result of deleting a nasal /m/ (Johnstone 1981, Nakano 1986, and Hofstede 1998). These forms may keep the nasal /m/ or delete it in their plural formation. In other words, Jebbāli admits two plural shapes for these singulars: The regular phonologically conditioned [mVC.C***Vb*.**CVC] shape and the [V.C***Vb*.**CVC] with a deleted /m/ and initial vowel. In the singular forms, when /m/ deletes, the following vowel nasalizes [ĩ]. The singular forms may be pronounced with the initial [m] or [ĩ]. Jebbāli consultants make no difference between the two options and accept the two variations as interchangeable.

(18) **Plurals with *Vb* infix and initial vowel**

a.	ĩftəħ/mɪftəħ	əfɛbtəħ/mɪfɛbtəħ	'keys'
b.	ĩktəb/mɪktəb	əkabtəb/mɪkabtəb	'offices'
c.	ĩglɪs/mɪglɪs	əgɛblɪs/mɪgɛblɪs	'rooms for guests'

The plurals with the nasal /m/ nicely fit into the proposed analysis. If we assume that the plurals that start with a vowel are originally derived from a singular whose /m/ is deleted, then these forms also integrate well in the analysis as the following two tableaux show.

(19) Tableau 6: The interaction of the proposed constraints

ĩglɪs + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	Affix ≤ σ	ALIGN-*Vb*-L	ONSET
a. mɪ.g**ɛb**.lɪs				m ɪ g	
☞ b. ə.g**ɛb**.lɪs				ə g	*
c. **ɛb**.mɪg.lɪs		*!			*
d. mɪg.**ɛb**.lɪs				m ɪ g	*!
e. m**ɛ**.**b**ɪg.lɪs			*!	m	

(20) Tableau 7: The interaction of the proposed constraints

mɪglɪs + *Vb*	R-ANCHOR-PS	L-ANCHOR-PS	Affix ≤ σ	ALIGN-*Vb*-L	ONSET
☞ a. mɪ.g**ɛb**.lɪs				m ɪ g	
b. ə.g**ɛb**.lɪs				ə g	*
c. **ɛb**.mɪg.lɪs		*!			*
d. mɪg.**ɛb**.lɪs				m ɪ g	*!
e. m**ɛ**.**b**ɪg.lɪs			*!	m	

Jebbāli is a language that has intensive deletion. It deletes /m/ word-initially and /w/ and /b/ word-medially and replaces the deleted segments with nasalized or long vowels (Johnstone 1981, Nakano 1986, and Hofstede 1998), although it is unusual to lose an onset and lengthen a vowel[5]. This trend of deletion also applies to the plural formation and reveals a violation to ONSET and MAX-C. Thus, it comes as no surprise that Jebbāli admits two plural shapes for singulars with a deleted initial /m/ and retained one. In tableaux (6) and (7), both candidates (a) and (b) are optimal and admitted in the grammar of the language. However, it is important to note that the /b/of the plural infix never deletes since it is the main element indicating plurality in these forms.

3. Conclusion

To sum up, the analysis of the plurals with *Vb* infixation reveals the interaction of alignment and anchoring constraints to determine the exact locus of the infix in the output plural forms. As the infix resides in the second syllable of the plural form, it exhibits three violation marks to the alignment constraint at the expense of obeying the right and left anchoring constraints. The positioning of the infix has to conform with the language requirement to have onsets; thus, ONSET plays a role in Jebbāli's phonology and rules out a suboptimal candidate with an onsetless syllable. Moreover, the segments of the plural infix must be contained in a single syllable and be of a

[5] The usual scentario in phonology is to lose a coda and lengthen the vowel preceding it. This is called "compensatory lengthening” and has been widely explored in many languages of the world (c.f. Hayes 1989 and Clements 1986 to mention very few).

syllable size. The constraint which addresses this fact is Affix ≤ σ. The following illustrates the overall ranking of the proposed constraints:

(21) R-ANCHOR-PS, L-ANCHOR-PS, Affix ≤ σ » ALIGN-*Vb*-L, ONSET

The anchoring constraints monitoring the segments at the rightmost and leftmost edges of the singular and plural forms along with the constraint restricting the size of the infix outrank the alignment constraint and the prosodic constraint.

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