Phonotactic Patterns and Syllabic Organization in the Consonant Clusters of the Hadhrami Eastern Bedouin Dialect: An Optimality Theoretic Analysis

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Abstract

This paper presents a comprehensive Optimality Theory analysis of the syllable organisation and phonotactics patterns of the Hadhrami Eastern Bedouin Dialect (henceforth HEBD), showing that surface forms arise from the coordinated influence of root-and-pattern morphology and phonological well-formedness constraints, including the Maximal Onset Principle (MOP), closed syllable preference, and biconsonantal cluster limits. Syllabification patterns, onset maximization, coda realization, and consonant cluster distribution in HEBD reflect an integrated constraint system in which morphological faithfulness (MAX-ROOT, ALIGN-MORPH) and phonological markedness jointly determine possible outputs. Evidence from suffixation behavior, resyllabification, and cluster formation demonstrates that the dialect systematically balances the requirements of morphological structure and phonological optimality, with morphological templates shaping available options and phonotactic constraints selecting the preferred surface forms. Analysis of onset maximization, coda retention, cluster tolerance, and gemination reveals a nuanced interaction of constraints unique to HEBD. Cross-dialectal comparison with Arabic dialects and other Yemeni varieties situates HEBD within the wider typological landscape of Arabic phonological systems and highlights its distinctive interplay of morpho-phonological constraints. The findings provide new empirical evidence for understanding the interaction of morphology and phonology in Arabic and demonstrate the value of dialect-specific analysis for refining theoretical models of syllable structure and constraint hierarchy.

Keywords: Hadhrami Eastern Bedouin Dialect; syllable organisation; phonotactics patterns; Optimality Theory; morpho-phonology; Arabic dialects; constraint ranking .

1. Introduction

Syllable structure and phonotactics are central areas of phonological inquiry, capturing how universal principles of linguistic organization interact with language-specific morphological systems. As Selkirk (1981, p. 111) notes, the syllable is a fundamental prosodic unit guiding segmental patterning, but phonotactic constraints are inseparable from morphological structure. Kurisu (2001, p. 27) argues that, especially in languages with rich nonconcatenative morphology, surface forms reflect both morphological and phonological requirements.

Arabic dialects exemplify this morpho-phonological interplay. The root-and-pattern system, as discussed by McCarthy (1981, 1986), shapes both grammatical meaning and phonological realization, while according to Watson (2007, p. 354) dialects may vary in the specific ranking of morphological and phonotactic constraints. Within Optimality Theory (Prince & Smolensky 1993, p. 82), these constraints interact to generate the range of attested syllable structures, consonant clusters, and prosodic alignments in Arabic.

Within this framework, HEBD stands out for its distinctive patterns. Spoken in the eastern coast of Hadramout, HEBD exhibits unique syllabification preferences, onset and coda behaviors, and tolerance for complex consonant margins, all shaped by an interplay of root-and-pattern morphology and key phonological constraints such as the Maximal Onset Principle (MOP), closed syllable preference, and cluster limits. Although differing systematically from other Arabic

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dialects, HEBD remains consistent with the wider Semitic morphological system.

This study fills a gap in Arabic phonological research with the first systematic OT-based analysis of HEBD syllable structure and phonotactics, using field data from the village of Halfoon. Through analysis of onset maximization, coda realization, cluster formation, schwa distribution, and gemination, the findings show that HEBD's surface forms are determined by the interaction of morphological templates and phonological markedness. In doing so, the paper situates HEBD within the broader Arabic typology, providing new evidence for the variety and integration of morpho-phonological constraint hierarchies and underscoring the need for dialect-specific research in theoretical syllable structure.

1.1 Research Objectives

1. To analyze the syllable structure and phonotactic patterns of HEBD within an Optimality Theory framework.
2. To establish the constraint hierarchy that governs syllabification, onset maximization, consonant-cluster formation, schwa distribution, and gemination.

rewrite these objectives.

3. To show how HEBD provides evidence for a morphology-driven phonological grammar in Arabic, highlighting its implications for cross-dialectal generalizations.

2. Literature Review

Research on Arabic dialect phonology reveals considerable variation in how dialects organize syllables and consonant clusters, often departing from the constraints of Modern Standard Arabic (MSA) and challenging classical principles such as the SSP. Abu Guba and Abdallah (2024, p. 380) point out that in Jordanian Ammani Arabic, complex coda clusters are governed by a suite of morphophonological and phonotactic constraints rather than sonority hierarchies, requiring consideration of coda licensing and morphotactic boundaries. In Najdi Arabic, Alghmaiz (2013, p. 45) argues that word-initial consonant clusters are not only permitted but systematically patterned according to sonority distance, revealing dialect-specific adaptation of universal principles.

Contemporary research has increasingly emphasized the interplay of prosodic licensing, morphological faithfulness, and language-specific constraint hierarchies. OT-based approaches provide a framework for understanding how these factors interact to shape surface phonological patterns, with markedness and faithfulness constraints actively ranking and reranking based on dialect-internal pressures.

This complexity is further exemplified in Yemeni Arabic dialects. Al Yaari et al. (2012, p. 448) argue that systematic vowel deletion, especially in verb forms, frequently gives rise to consonant clusters that challenge canonical Arabic syllable structures. Alhamzi and Rahman (2018, p. 219) point out that Mabashi Yemeni Arabic permits a diverse syllable typology, admitting complex onsets and codas that are often restricted in SA. Al-Ariqy (2022, p. 5) demonstrates that in Tihami Arabic, morphophonological alternations such as gemination and epenthesis in definite determiners highlight the dynamic interaction of prosodic and segmental constraints. Watson (2012, p. 33) observes that initial consonant clusters in the two dialects of Mehri, the Mahriyōt and the Mehreyyet, are licensed only when they adhere to the sonority hierarchy. She further notes that these clusters most commonly involve sequences of adjacent fricatives, including configurations in which an initial sibilant precedes or follows another fricative.

Recent studies offer a sharp focus on the phonological particularities of Hadhrami Arabic, especially among urban varieties. Lahmdi and Alfadly (2023, pp. 1324–132)

apply Optimality Theory to wh-movement in Hadhrami Arabic using syntactic constraints such as OP-SPEC, STAY, Q-MARKING, and OB-HD. While their analysis is syntactic, constraints like Q-MARKING and OB-HD have clear phonological or morphological reflexes, suggesting possible syntax–phonology interface effects even though prosodic constraints are not modeled explicitly. Their results show that optional wh-placement is captured through constraint interactions, setting HA apart from MSA and aligning it with dialects that allow wh-in-situ. Busabaa, et al. (2021, p. 52) highlight segmental innovation, most notably ḍ→ǧ in verbal morphology, which directly alters syllable structure and yields phonological forms divergent from both MSA and Gulf dialects. Al Tairi (2010, pp. 24 & 26) provides a comprehensive OT account of consonant clusters in Mukallaene Arabic, demonstrating that complex onsets, even triconsonantal, are permitted, but complex codas are rigorously avoided and handled by regular epenthesis.

Taken together, these works establish a backdrop for the present study, which advances this tradition by delivering the first comprehensive OT-based phonological analysis of HEBD, a variety previously addressed only in terms of verbal inflection by Al-Ghurabi (2021). This positions the analysis not simply as a local descriptive endeavor but as a targeted contribution to the broader theoretical literature on Arabic phonology and syllable structure.

2.1 The Sonority Sequencing Principle (SSP)

With the development of formal models of linguistics in the 20th century, the tendency of speech sounds to be arranged in an alternating pattern of sonority crests and troughs came to be known as the Sonority Sequencing Principle (Parker, 2002. P, 7). The Sonority Sequencing Principle is a foundational concept in syllable structure theory, stipulating that within a syllable, segments should rise in sonority from the onset to the nucleus and fall towards the coda (Clements, 1990, p. 284). According to Ladefoged and Johnson (2015, p. 245), the sonority hierarchy ranks segments from least to most sonorous as follows:

Plosive >> Nasal >> Fricative >> Liquid >> Glide >> Vowel

According to this scale, plosives have the lowest sonority, followed by nasals, fricatives, liquid ds, glides, and vowels, in that order. The SSP predicts that syllable onsets should exhibit rising sonority (e.g., /bl/: plosive >> liquid) while codas should show falling sonority. Clusters that violate this sequencing, such as liquid followed by plosive (/lb/), are typologically marked and often subject to repair strategies.

2.1 Theoretical background

Phonological theory, as stated by Chomsky and Halle (1968, pp. 3-4), is fundamentally concerned with the internalized system of rules that determine the grammatical well-formedness of utterances in a language. However, the grammar must not only define well-formedness but also provide mechanisms to fix ill-formed structures (Prince and Smolensky, 1993, p. 107).

In Arabic, where consonantal roots combine with prosodic templates, such repairs are profitably analyzed as the interaction of ranked, violable constraints that balance onset maximization, margin limits, and root faithfulness (McCarthy, 2005, p. 19 & Watson, 2002. P, 63). This approach accounts for dialectal differences in cluster formation and coda complexity, whether by epenthesis, diphthongization, or resyllabification, through systematic rankings of markedness and faithfulness constraints rather than language-specific rules (Broselow, 2018. P, 39).

This theoretical framework, grounded in Optimality Theory, enables an elegant explanation for the variation and repair phenomena observed in phonological

systems, particularly those involving templatic morphologies such as Arabic. It provides the analytic tools necessary to uncover the hierarchy of constraints governing syllable structure and morphophonological interaction in diverse dialects, including the subject of this study, Hadhrami Eastern Bedouin Arabic.

3. Data Collection

The data analyzed in this study were collected from native speakers of HEBD residing in Halfoon, eastern Hadhramout. Data collection employed a combination of elicited and naturalistic speech materials, including structured verbal paradigms and spontaneous utterances designed to represent the full range of relevant phonotactic patterns.

Participants were carefully selected. Native speakers with lifelong residence in the dialect area and limited contact with urban Arabic varieties are considered the primary source to preserve the integrity of HEBD phonological features. This study also relies on the linguistics description presented in Al-Ghurabi (2021) which provide background material relevant to the current investigation. Recordings were made using high-quality portable audio devices in quiet settings to ensure clarity of acoustic detail.

The speech corpus includes minimal pairs, varied consonant clusters, and phonotactically significant syllable constructions, enabling detailed analysis of segmental inventories, syllable weight, and cluster constraints. All speech data were transcribed using the International Phonetic Alphabet with careful auditory analysis to capture relevant phonetic and phonological distinctions essential for theoretical modeling.

4. Data Analysis

4.1 Root- and- Pattern Framework in Relation to Phonotactics

Following the traditional Semitic model, HEBD forms its words through the interdigitation of consonantal roots, vocalic patterns, and prosodic templates. The root conveys lexical meaning, while the vocalic pattern and syllabic template encode grammatical functions such as aspect and gender (McCarthy, 1981; Watson, 2002).

Although the root- and- pattern system defines underlying structure, its surface realization in HEBD closely interacts with the phonological grammar, particularly with MOP and the organization of consonant clusters. Empirical evidence from actual roots illustrates how phonological constraints and morphological realization interact in HEBD.

A clear example of the priority of morphological alignment comes from /sˤab.bħət/ ‘she came in the early morning’. The pattern /sˤab.baħ/ carries the lexical meaning derived from root √s-ħ-b ‘pull’. The structure favors a two consonants cluster in the second syllable, /sˤab.bħət/, rather than in the first (i.e., /sˤbab.ħət/), preserving the semantic identity of the root. This choice reflects the dominance of ALIGN-MORPH and MAX-ROOT, which prevent resyllabification that would obscure root integrity. Tableau

Tableau 1: Root and pattern alignment /sˤab.bħət/ ‘she came’

Candidate	ALIGN-MORPH	MAX-ROOT	COMPLEX-ONSET	COMPLEX-CODA
a. /sˤbab.ħət/	*	*	✓	*
☞b. /sˤab.bħət/	✓	✓	*	✓

> Constraint Ranking: ALIGN-MORPH, MAX-ROOT ≫ COMPLEX-ONSET

This ranking confirms that in HEBD, morphological faithfulness outranks phonological optimization:

4.2 Onsets and Codas

The organization of onsets and codas in the Hadhrami Eastern Bedouin Dialect (HEBD) is shaped by a hierarchy of constraints that prioritize onse,t maximization and restrict syllable margins to two consonants. The Maximal Onset Principle (MOP) operates as a defining force in syllabification, ensuring that consonants are assigned to onsets wherever the phonotactic grammar allows. Every syllable in HEBD must begin with a consonant (ONSET), and vowel-initial syllables are categorically excluded from the surface grammar.

4.2.1 Onset

Two-consonant clusters are preferred in syllable onsets rather than in codas. To satisfy this preference, roots like /rawwaħ/ undergo diphthongization, producing raw.wħeit with the cluster in the onset of the following syllable, rather than raw.waħt, which would place the cluster in the coda. The tableau below illustrates how the grammar selects the onset-maximizing candidate over the complex-coda candidate

Tableau 2: Onset preference in /raw.wħeit/ 'I went'

Input /rawwaħ/	MAX ROOT	*COMPLEX CODA	COMPLEX ONSET
a. /raw.waħt/	✓	✓	*
☞b. /raw.wħeit/	✓	*	✓

> Constraint Ranking : COMPLEX-ONSET ☞ COMPLEX-CODA

Another example of ONSET preference over CODA comes from [mən.sħəb] 'withdrawn'. The second syllable [sħəb] carries the lexical meaning derived from root √s-ħ-b 'pull'. The structure favors a two consonants cluster in the second syllable rather than in the first (i.e., /məns.ħəb/) to ensure the following constrain:

Tableau: 3 Onset preference in [mən.sħəb] 'withdrawn'

Candidate	ALIGN-MORPH	MAX-ROOT	MOP	SSP
a. /məns.ħəb/	*	*	✓	✓
☞b. /mən.sħəb/	✓	✓	*	*

4.2.2 Onset Requirement and Maximization

Intervocalic consonants are routinely parsed as onsets of the following syllable, yielding syllabifications that fully satisfy ONSET and MOP.

a. /reːɣəb/ → [reː.ɣəb] 'he is willing'

b. /ʕeːbər/ → [ʕeː.bər] 'passing by'

These forms illustrate the categorical onset requirement: every vowel is preceded by an onset consonant. Complex onsets are permitted up to two segments, but never beyond this limit, as enforced by *COMPLEX-ONSET.

Tableau 4: Intervocalic consonants

Input : /reːɣəb/	ONSET	MOP	NO-CODA
a. /reːɣ.əb/	*	*	✓
☞b. /reː.ɣəb/	✓	✓	*

> Constraint Ranking: ONSET, MOP ≫ NO-CODA

4.2.3 Onset Maximization in Derived Forms

Derived forms preserve the same onset-maximizing logic.

/ʕtˤait/ + /-əh/ → /ʕtˤai.tˤəh/ 'I gave him'

Here, /tˤ/ is assigned to the onset of the second syllable, producing a heavy syllable without violating root integrity. This outcome satisfies both ONSET and MOP, while remaining faithful to MAX-ROOT and CONTIGUITY-IO, which prevent deletion or reordering of root consonants. Morphological and phonological constraints thus align harmoniously rather than competing.

> Constraint Ranking: ONSET, MOP, MAX-ROOT ≫ NO-CODA

4.2.4 Two- Consonant Margin Limit and Prosodic Alignment

HEBD enforces a two☞consonant maximum for syllable margins. The high☞ranking constraint COMPLEX☞MARGIN which covers both COMPLEX☞ONSET and COMPLEX☞CODA, restricts any syllable from beginning or ending with more than two consonants. This prosodic constraint interacts with ALIGN☞MORPH and MAX☞ROOT to ensure that both the morphological structure and the lexical root remain intact during affixation.

When affixes attach to the root, segments are redistributed to maintain well☞formed syllables that respect this biconsonantal limit. This process reveals that morphological integrity and phonotactic structure are jointly optimized, even if it requires minor segmental realignment.

- Root: /səl.ləm/ 'he handed'

-Suffix:/ ☞ ət/ (3f.s.):→ /səl.lmət/ 'she handed'

-Prefix:/t☞/ (Measure VIII):

→ /tsəl.ləm/ 'he was handed'

In /səl.lmət/, the suffix /☞ət/ attaches without producing an additional syllable. The root☞final consonant /m/ is resyllabified as the onset of the suffixal syllable rather than closing the preceding one. This complies with COMPLEX☞MARGIN by preventing a complex coda and satisfies ALIGN☞MORPH by keeping the suffix contiguous with the root.

Similarly, in [tsəl.ləm], the prefix /t☞/ merges with the root☞initial /s/ to form the permissible onset cluster [ts], maintaining both prosodic alignment and the two☞consonant limit.

Tableau 5: Two Consonants Margin

Input: /səl.ləm/ + /☞ət/	*COMPLEX☞MARGIN	ONSET
a. /səl.lə.mət/	*	✓
b. /səl.ləm.ət/	*	*
☞ c. /səl.lmət/	✓	✓

Candidate (a) is coda☞less, which is dispreferred when a closed syllable can be formed without breaching any higher☞ranked constraints.
Candidate (b) has an onsetless syllable, a fatal violation of ONSET.
Candidate (c) satisfies the prosodic and morphological requirements and is selected as optimal.
This ranking demonstrates that HEBD favors closed, onset☞satisfying syllables that preserve morphological alignment. The resulting structure reflects the dialect's overall preference for balanced, bimarginal syllables and prosodic integrity under morphological pressure.

4.3 Coda Structure and Syllable Closure

Coda clusters are subject to the same two-consonant maximum. Word-final codas typically consist of one or two consonants, as in /ʕəlb/ 'jujube' and /xsərt/ 'I lost.' Larger clusters are categorically avoided by *COMPLEX-CODA. This consistent limit contributes to predictable syllable-weight patterns and ensures that MOP-driven onset assignment always takes precedence over coda expansion.
In HEBD, coda preference in derived forms illustrates how the dialect negotiates between syllable closure and consonant cluster distribution. When a root like /ʃe:f/ 'he saw' is suffixed with /t/ and then with /na/ ('me'), the form surfaces as /ʃif.tna/; here, the /t/ that originally closed the first syllable (in /ʃift/ 'you saw') is resyllabified as the onset of the following syllable when /na/ is attached. This avoids a final complex coda, resulting in a CC onset (/tn/) in the second syllable, as in /ʃif.tna/ 'you saw me' Instead of /ʃift.na/.
Relevant Constraints:
COMPLEX-ONSET >> COMPLEX-CODA
Conversely, with a root like /ʃfa/ 'he cured', the sequence with /t/ and /na/ surfaces as [ʃfat.na] 'she cured me.' In this case, the /t/ remains as the coda of the first syllable, preventing the creation of an open syllable. Here, the dialect opts for a closed syllable (CVC) rather than allowing resyllabification of the /t/ as onset, which would otherwise result in an open syllable and violate the preference for syllable closure.
This asymmetry indicates that the dialect prefers syllable closure (CVC structure) over the creation of complex onsets when faced with a choice. However, when two coda consonants would arise (as in clusters), the dialect tolerates CC onset (/tn/) in the following syllable to avoid a complex coda. Thus, coda distribution is sensitive to the avoidance of complex codas, but the preference for closed syllables still plays a decisive role in syllable structure.
The preference for maintaining a closed syllable over forming a complex onset is once again illustrated with a different example:
/Kfat/ → 'he hugged'
/Kfat.ha/ → 'he hugged her'
Upon addition of the suffix /ha/, the /t/ remains as the coda of the first syllable, resulting in a closed first syllable rather than creating a complex onset in the second syllable, as in /kfa.tha/.
This pattern reflects the following constraint ranking:
CLOSED-σ >> ComplexOnset
Although complex onsets are generally permissible in the language, the higher-ranked constraint against open syllables forces the /t/ to remain as a coda. This ranking ensures that syllable closure is favored over the creation of a complex onset, thereby producing the well-formed structure /Kfat.ha/.

4.4 Cluster Formation and Sonority Structure

Cluster formation in HEBD reveals a phonological system that prioritizes onset maximization over the Sonority Sequencing Principle (SSP). The dialect consistently tolerates SSP violations when doing so preserves root integrity or

preferred syllable templates. This trend reflects a grammar in which sonority is subordinate to morphological and prosodic well-formedness.

A clear example appears in /sˁba.ri/ 'you (fem.) wait,' derived from the root √sˁ-b-r 'patience.' The initial cluster /sˁb/ violates the expected rising sonority contour of the SSP, yet this sequence is retained to preserve the morphological structure of the root. Altering the syllabification to [sˁab.ri] would yield a distinct lexical item ('Sabri,' a proper name), demonstrating that maintaining the root's semantic identity takes precedence over strict sonority conformity.

A comparable case occurs in /txa.fi/, where the onset cluster /tx/ constitutes an obstruent–obstruent sequence that displays sonority reversal (stop > fricative). Despite violating the canonical SSP hierarchy, this cluster is permitted in HEBD because it fulfills the dialect's strong preference for onset maximization and prosodic completeness. The absence of schwa insertion between /t/ and /x/ indicates that the dialect allows marked onset configurations to avoid coda-heavy syllables, aligning with its general preference for complex onsets over complex codas. This behavior underscores that the phonotactic grammar of HEBD prioritizes morphological transparency and prosodic well-formedness over sonority-driven restrictions.

Tableau 6:Violating SSP in favour of consonant cluster

Candidate	MAX-ROOT	SSP	COMPLEX ONSET
a. ☞ /txa.fi/	✓	*	✓
b. /tə.xa.fi/	✓	✓	*
c. /ta.xfi/	*!	✓	✓

Candidate (a) /txa.fi/ satisfies MAX-ROOT by preserving the consonantal root and forming a maximized onset cluster, though it violates SSP due to the sonority reversal. Candidate (b) inserts a vowel to repair the cluster, violating COMPLEX ONSET.

Candidate (c) alters the root vowels, violating MAX-ROOT.

The optimal candidate (a) therefore demonstrates that HEBD ranks MAX-ROOT and COMPLEX ONSET above SSP, tolerating marked onset clusters when they enhance morphological and prosodic structure.

These forms collectively show that HEBD consonant sequencing is systematically governed by the interaction of MOP, root fidelity and COMPLEX ONSET, with the SSP functioning as a violable, low-ranked constraint. Clusters that would be illicit in other dialects are accepted in HEBD because they satisfy the prosodic requirement for maximal onsets and preserve the lexical meaning encoded by the consonantal root.

4.3.1 Schwa as a Structural Vowel

In many cases, the schwa appears in unstressed syllables to maintain a regular rhythmic pattern while enabling each root consonant to surface in its proper prosodic position as in the following examples:

/rkəb/→[rkəb.ti]'you(fem.)rode'

/məʕduːm/ → [məˈʕduːm] 'nonexistent'

In both examples, [ə] is not inserted to repair a triconsonantal cluster, since no illicit CCC sequence is present. Instead, it is part of the templatic realization of the morphological pattern, ensuring that the consonantal root is fully expressed while conforming to the dialect's rhythmic syllabification. It maintains rhythmic balance and the morphological template, not inserted to break a cluster.

4.4 Morpho-Phonological Interactions

Morphology in the Hadhrami Eastern Bedouin Dialect (HEBD) interacts intricately with phonology through a set of ranked constraints that ensure prosodic well-formedness while preserving morphological identity. These interactions reveal that the grammar of HEBD is not governed by phonotactics alone but by a morphology-driven constraint hierarchy. The phenomena discussed here, gemination, illustrate how morphological templates and prosodic constraints co-determine surface realizations.

4.4.1 Gemination as a Morphological Marker

Gemination in HEBD functions as an inflectional signal rather than a mere phonological effect. It differentiates between inflectional and clitic attachment: gemination occurs in inflectional environments but is blocked when a clitic follows.

Table1: Geminationasa Morphological Marker

Form	Gloss	Observation
/ʕadˤ/	'he counted'	Base stem
/ʕadˤ.ha/	'count it!'	Nogemination (clitic)
/ʕadˤ.dˤu/	'they counted'	Gemination(inflection)

>Constraintranking:ALIGN(Stem-Inflection,σ) ☞*GEMINATE≫ ALIGN(Stem-Clitic,σ)

In OT terms, this alternation reflects a conflict between ALIGN(Stem-Inflection, σ), which demands morphological alignment within the prosodic word, and *GEMINATE, which penalizes long consonants. The ranking ensures that gemination surfaces only when morphologically required.

Thus, gemination is licensed by grammatical structure, not by phonological weight, aligning HEBD with other Bedouin systems where prosodic alignment encodes inflectional categories.

5. Findings and Discussion

HEBD exhibits the following characteristics:

1. Consonant- initial syllables are universal; vowel☞initial syllables are absent.
2. Schwa /ə/ is a phonemic element functioning as part of the dialect's vowel system and not as an epenthetic repair vowel.
3. Onset maximization is categorical: consonants are assigned to onsets wherever permissible (ONSET, MOP ≫ CODA☞COND).
4. Two- consonant clusters are allowed in both onsets and codas but not beyond this limit; COMPLEX☞MARGIN strictly enforces this cap.
5. Sonority violations (SSP) are tolerated when necessary to preserve morphological integrity or root fidelity.
6. Morpho- phonological alternations, as gemination is shaped by high☞ranking alignment and faithfulness constraints rather than repair processes.

The phonotactic system of HEBD offers a rich case study in the interaction between morphology and phonology, challenging long-standing generalizations about syllable structure. While previous research has often emphasized principles such as the SSP as core to syllable organization (e.g., Alghmaiz, 2013, p. 51; Kelly, 2021, p. 8), the HEBD data reveal a distinct constraint ranking. In this dialect, MAX-ROOT, MOP, CLUSTER-TOLERANCE and CLOSED-SYLLABLE-PREFERENCE are central to determining syllable structure and consonant sequencing. This revised ranking demonstrates that HEBD regularly gives

priority to root preservation, cluster tolerance, and onset maximization over canonical phonotactic well-formedness in shaping its syllable structure..

In urban and many Bedouin Arabic dialects, clusters that violate sonority or impose heavy syllable margins are typically avoided or repaired through epenthesis (Al Tairi, 2010, p. 26; Belleswed & Alfadly, 2020, p. 495). This tendency reflects a broader restriction against complex syllable margins, whereby dialects favor simpler edge structures to reduce articulatory and perceptual load. Consequently, marked consonant sequences at syllable edges are commonly modified through vowel insertion or other repair strategies to maintain preferred syllable shapes and ensure phonotactic well-formedness. In contrast, HEBD tolerates such complex margins without systematic repair, indicating a more permissive constraint system that allows heavier syllable-edge configurations than those attested in many other Arabic varieties.

A salient feature of HEBD emerging from the present data is its consistent preference for closed syllables across morphological environments. Syllable closure, achieved through the retention of codas, plays a central role in the phonological organization of the dialect and remains stable in both underived and morphologically complex forms. In HEBD, syllables tend to remain closed even in contexts where alternative syllabification would yield open syllables, underscoring the importance of closure in shaping surface structure. This pattern contrasts with several other Arabic dialects in which open syllables are preferred. In Cairene Arabic, for instance, morphological concatenation frequently gives rise to resyllabification and vowel epenthesis that produce open syllables, reflecting a general tendency toward CV-based syllable structure rather than persistent syllable closure (Watson, 2002, pp. 54-56)

According to Broselow (2018, p. 33) Blevins (1995) claimed that it is generally agreed that the universally preferred syllable consists of a single-consonant onset plus a nucleus. Hamdi et al., (2005, p. 2246) conducted a study on syllable structures in Lebanese, Moroccan, and Tunisian Arabic, claiming that CV represents the most frequent syllable type across all three dialects, consistent with patterns in most languages worldwide.

These contrasts highlight the typological distinctiveness of HEBD in consistently prioritizing closed syllables as a core organizing principle.

Furthermore, the morphological role of gemination in HEBD aligns with observations in other geographically and typologically diverse Arabic varieties such as Maghrebi dialects, where gemination is not solely a phonological weight marker but a crucial morphological indicator (Noamane, 2019, p. 122). This cross-dialectal commonality strengthens the typological significance of the morpho-phonological interface uncovered in HEBD.

Watson (2012, p. 33) points out that Mehri permits consonant clusters at both word margins, allowing complex onsets (CC/CCC) and codas (CVCC), which are phonologically licensed within its syllable structure. By contrast, Arabic dialects generally prohibit word-initial clusters and resolve them through epenthesis, inserting a vowel to maintain simple onsets (Broselow, 2018, p. 39 as cited earlier). Moreover, Alfadly and Bin Mukhashin (2019, p. 498) note that the large number of cognate words shared by Mehri and Hadhrami Arabic (HA) reveals a genetic relationship between the two, reflecting their common Semitic heritage and accounting for shared lexical and phonological features.

Together, these observations provide support for the possibility that HEBD's systematic tolerance for two-consonant

clusters is not merely an internal phonological development but may reflect areal contact with Mehri and related South Arabian languages. Given the geographical adjacency of HEBD region to Mehri-speaking region and the historical patterns of interaction between these communities, contact-induced phonological influence offers a plausible explanation for HEBD's acceptance of marked clusters that are typically restricted in many other Arabic dialects.

Taken together, these findings broaden our understanding of phonological typology by refining the analysis of syllable structure and morpho-phonological interactions in Arabic. The distinct phonotactic profile observed in HEBD highlights the importance of dialect-specific investigation for identifying and articulating the particular constraint hierarchies that shape surface forms. The results demonstrate that morphological constraints, such as root faithfulness, MOP and cluster tolerance, can play a decisive role in the organization of phonological grammar, reconfiguring constraint rankings in ways not always anticipated by general phonotactic principles. This underscores the value of targeted analysis for revealing the fine-grained interactions between morphology and phonology, and for refining broader theoretical models.

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دراسة اللهجة البدوية الشرقية الحضرمية

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الملخص

تُقدّم هذه الدراسة تحليلاً شاملاً في إطار "نظرية الأمثَلية Optimality) (Theory "لبنية المقطع الصوتي والأنماط الفوناتكتيكية)التوزيع الصوتي(في اللهجة البدوية الشرقية الحضرمية) المشار إليها لاحقاً بـ HEBD). وتُبين الدراسة أن الأشكال السطحية للّغة تنشأ نتيجة التأثير المتناسق والمشترك بين المورفولوجيا القائمة على "الجذر والوزن " (root-and-pattern morphology) وقيود السلامة الفونولوجية well−formedness) constraints) (phonological)، بما في ذلك "مبدأ الحد الأقصى للمستهلّ Onset) (Maximal Principle "، وتفضيل المقاطع المغلقة، والقيود المفروضة على العناقيد الساكنة الثنائية cluster limits).(biconsonantal

كما تعكس أنماط قطع المقطع (Syllabification) ، وتكبير المستهلّ onset) (maximization ، وتحقيق المقطع الختامي realization) (coda ، وتوزيع العناقيد الساكنة في هذه اللهجة نظاماً متكاملاً من القيود؛ حيث تتضافر قيود الأمانة المورفولوجية ,MAX−ROOT) (ALIGN-MORPH وقيود الميسمية الفونولوجية (markedness phonological) معاً لتحديد المخرجات الممكنة.

وتُظهر الأدلة المستمدة من سلوك اللاحقات (suffixation) ، وإعادة التقْطيع (resyllabification) ، وتشكيل العناقيد الساكنة، أن اللهجة توازن بشكل منهجي بين متطلبات البنية المورفولوجية والأمثلية الفونولوجية، حيث تشكّل القوالب المورفولوجية) الخلفيات (الخيارات المتاحة، بينما تحكم القيود الفوناتكتيكية باختيار الأشكال السطحية المفضلة.

ويكشف تحليل تكبير المستهل، والاحتفاظ بالمقطع الختامي، وتحمل العناقيد الساكنة، والإدغام)التضعيف (، عن تفاعل دقيق وفريد للقيود في اللهجة البدوية الشرقية الحضرمية. ومن خلال مقارنة هذه اللهجة بلهجات عربية أخرى ومتنوعات يمنية، تضع الدراسة هذه اللهجة في سياق المشهد النمطي الأوسع للأنظمة الفونولوجية العربية، وتسلط الضوء على التداخل المتميز لقيودها المورفو− فونولوجية.

وأخيراً، توفر هذه النتائج أدلة تجريبية) إمبيريقية (جديدة لفهم التفاعل بين المورفولوجيا والفونولوجيا في اللغة العربية، وتؤكد على أهمية التحليل الخاص بكل لهجة لتطوير ونحت النماذج النظرية لبنية المقطع وهرمية القيود.