



DOI:10.29013/EJLL-26-3-7-14



EXPERIMENTAL-PHONETIC STUDY OF INTONATION IN AZERBAIJANI MUSICAL TEXTS

Ali-Zade (Alekberova) ¹, Fidan Faig ¹

¹ Faculty of Philology, Baku Eurasian University, Azerbaijan

Cite: Ali-Zade (Alekberova), Fidan Faig. (2026). *Experimental-Phonetic study of intonation in Azerbaijani musical texts. European Journal of Literature and Linguistics 2026, No 3.* <https://doi.org/10.29013/EJLL-26-3-7-14>

Abstract

The article investigates the intonation characteristics of Azerbaijani musical texts using experimental phonetics methods, in particular, the oscillographic analysis method. The main acoustic (intonation) parameters – tempo (duration), intensity and frequency of the main tone – were determined on the basis of the musical texts selected by the author for the purpose of conducting oscillographic research. Within the framework of the study, the syntagma is considered to be as a phonetic-semantic-syntactic whole, which allows us to more accurately trace the movement of the intonation contour within the musical text. The results of the study show that musical intonation is a multicomponent phenomenon that combines several interrelated aspects. In addition, unlike speech, musical melody works with sounds of certain pitch, organized on the basis of interval relations inherent in music, and each melodic sound has its own pitch, rhythmic and intonation properties.

Keywords: *music, intonation, melody, syntagma, phrase unit, intonation organization, rhythmic-melodic parameter*

Introduction

The relationship between language and music has long attracted considerable attention from scholars representing various scientific disciplines. A review of theoretical studies devoted to this issue indicates its multifaceted nature. The scholarly literature addresses such topics as the perception of speech and musical sounds and their impact on the human psyche (Habibova, 2024); the differentiation of emotional nuances in speech and musical expression (Morozov, 2017); the identification of common and specific patterns of speech and musical intonation (Yavorsky, 2022;

Medushevsky, 1994); the determination of the features of music's emotional expressiveness shaped by human speech (Kholopova, 2012); the establishment of the musical basis of speech intonation (Heydarov, et al., 2019); and others. In the present article, the intonational characteristics of music are examined within the framework of intonology, with particular emphasis on the functional role of melody (pitch) as the primary carrier of intonational information. This approach involves the application of structural methods for analyzing the intonational parameters of the vocal realization of musical texts.

It should be noted that the intonational aspect of vocal-artistic genres was initially considered mainly from an aesthetic and philosophical perspective, as well as within studies of the musical organization of artistic speech. At the same time, the principal objective of the experimental-phonetic investigation of musical intonation is to develop a systematic approach to the analysis of the rhythmic and melodic parameters of vocal compositions.

The use of oscillographic analysis methods makes it possible to identify units of the suprasegmental level of language, determine their differential and integral features, and describe vocal forms within a system of musical-phonological categories, taking into account the specific interaction of two intonational systems – the linguistic and the musical.

Methods and Materials

The following methods were employed in the course of the study: auditory analysis, acoustic analysis, oscillographic analysis, as well as methods of generalization and linguistic description. Azerbaijani musical texts representing various genres served as the linguistic material for the investigation. The experimental corpus was represented by the romance “*Without You*” (“*Sənsiz*”). The computer software **Praat** was used to analyze the acoustic parameters of the musical composition, including melodic characteristics (fundamental frequency, F0), intensity, and temporal parameters (duration and sound realization time).

Results and Discussion

As a specific sign system, music serves as a carrier of information conveyed through the intonational, rhythmic, and melodic means of expression. The perception of music is a complex cognitive process involving several interrelated stages, ranging from the physiological perception of an acoustic signal to its semantic interpretation (Amrahova, 2014). For listeners without formal musical training, the perception of a musical composition is largely determined by individual experience, emotional state, and cognitive characteristics. The informational and artistic-expressive potential of music is rooted in its ability to reflect the subtlest manifes-

tations of human intellectual and emotional activity, which are often difficult to express through the means of natural language (Der-gaeva, 2005).

The complexity of any scientific analysis of music stems from its dual nature. On the one hand, music is a cultural phenomenon shaped by historical traditions, national characteristics, social interactions, and collective artistic experience, which necessitates its objective study (Yarovsky, 2022). On the other hand, a musical work exists and is perceived through the listener’s individual experience, determined by personal, cognitive, and emotional factors. It is precisely the interaction between these objective and subjective dimensions that defines the specific nature of the creation, performance, and perception of a musical composition (Gabibova, 2025).

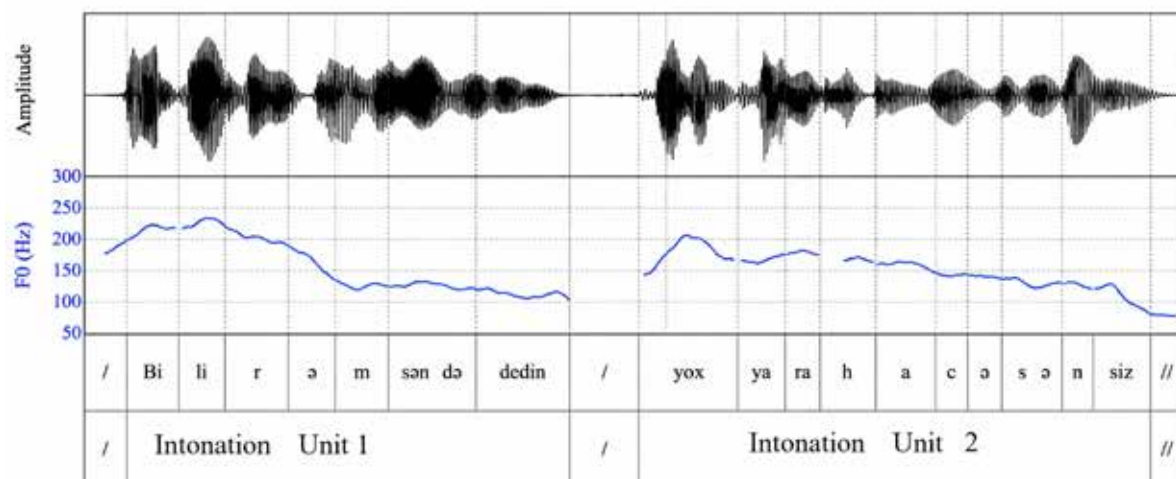
In a musical work, intonation functions as the primary means of expressing artistic content and ensures the transition from conceptual meaning to its acoustic realization. Intonation is a complex multidimensional phenomenon comprising a set of prosodic features, including melody, intensity, duration, accentual structure, rhythm, tempo, timbre, and pause (Veysalli, 1993). The analysis of musical intonation employs the same basic prosodic parameters as the study of speech intonation; however, their realization is governed by the principles of the musical system and the specific features of musical language. According to V.V. Medushevsky, “intonation, in combination with the energies of meaning, constitutes an indivisible whole in all aspects of sound” (Medushevsky, 1994: 33).

The boundaries of a musical phrase are determined primarily by its intonational and rhythmic-musical organization rather than solely by the syntactic structure of the verbal text. The phonetic analysis of the musical text was carried out in several stages: (1) identifying the principal structural unit – the syntagm – as an intonational and melodic whole; (2) determining the syntagmatic parameters of the musical text, including the metrical and rhythmic organization of the phrase; and (3) analyzing the intonational structure of the musical text in terms of fundamental frequency, melodic contour, and their acoustic realization.

In the analysis of the acoustic parameters of the musical text, syntagmatic segmentation was adopted as the primary framework, since dividing an utterance into syntagms allows for the most accurate representation of its phonetic and semantic characteristics. A syntagm is thus viewed as the shortest segment of sounding speech whose isolation does not disrupt its semantic and intonational integrity and which, within a given context, functions as a unified semantic whole. The results of the acoustic analysis revealed that the maximum fundamental frequency (F0) reached 454 Hz, the minimum was 162 Hz, and the mean value was 292 Hz. The maximum intensity level was 76 dB, the minimum was 54 dB, with an average intensity of 65 dB.

The acoustic analysis of the first line of the romance, “Hər gecəm oldu kədər, qüssə, fəlakət” (“Every night of mine was filled with sorrow, grief, and suffering”), showed that the melodic contour begins in the mid-frequency range at approximately 260 Hz, then gradually rises to 283–284 Hz in the middle of the phrase, and finally falls to 230 Hz in its concluding part, thus forming a descending melodic contour. In this segment, the highest fundamental frequency (284 Hz), together with the maximum intensity and duration of sound realization (330 ms), is observed in the final syllable of the word “gecəm,” which is characteristic of the dominant lexical item in the phrase [see Oscillogram 1].

Oscillogram 1.



In this phrase, the maximum intensity is recorded on the first syllable and reaches 72 dB. Combinatory effects are most clearly manifested in the dynamic characteristics of the musical text. For example, in the word “qüssə,” the intensity of the vowel /ü/ in the position preceding the voiceless consonant /s/ is 62 dB, while in the word “fəlakət,” the intensity of the vowel /ə/ in the environment of the consonants /k/ and /t/ reaches 63 dB, which is 7 dB lower than the average intensity value. Toward the end of the line, a decrease in both acoustic parameters is observed. The fundamental frequency (F0) of the vowel in the final syllable is 230 Hz, while the intensity level is 60 dB. In the phrase “*Hər nəfəs çəkdim, hədər getdi o saat səniz*” (“Every breath I took was in vain; that hour passed

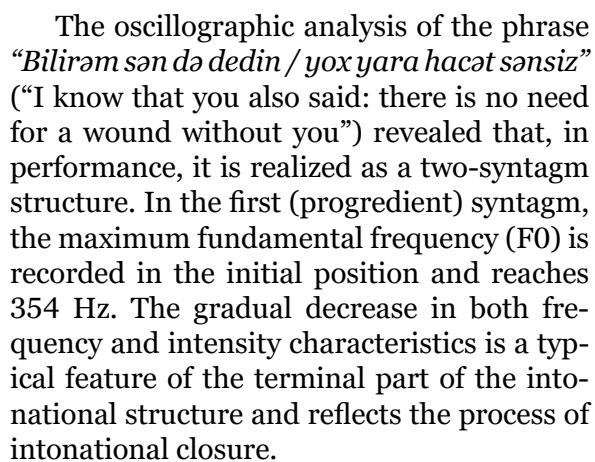
without you”), the melodic parameter is characterized by values above the mid-frequency range, averaging approximately 290 Hz. The relatively high fundamental frequency in the cadential position is conditioned by the presence of the vowel /i/ in the final syllable, situated between a voiceless and a voiced consonant; its frequency value is 229 Hz. The maximum intensity is recorded at the beginning of the syntagm and reaches 71 dB.

The most significant differences were observed in the temporal parameter. At the initial stage of performance, the rate of articulation is relatively fast (151 ms and 126 ms), whereas toward the end of the phrase the duration of the vowels /e/ and /i/ increases considerably. The duration of the vowel /e/ is 469 ms, while the vowel /i/ in the closed

corded on the first vowel of the word “*yam*” and amounts to 73 dB, whereas the minimum value is found on the vowel /i/ in the final syllable, where the intensity decreases to 58 dB. Overall, this syntagm is characterized by a relatively smooth and gradual melodic contour: no abrupt intervals, sharp rises, or steep falls are observed between the maximum and minimum fundamental-frequency values.

The longest duration is registered for the vowel /a/ in the first open syllable of the word “*yari*,” reaching 385 ms. It should be noted that the intensity of vowel sounds within a word is determined by their articulatory and phonetic characteristics. This regularity is also preserved in vocal performance, since the acoustic properties of sounds in a musical composition are likewise influenced by their phonetic nature (Habibova, 2014: 78) [see Oscillogram 2].

Oscillogram 2.

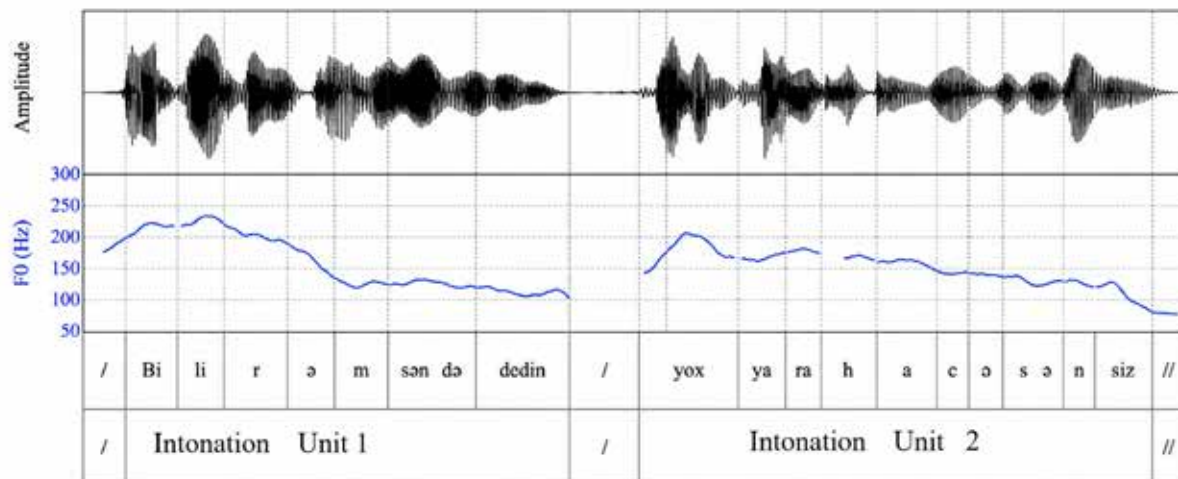


of the vowel /i/ in the word “*dedin*” is 101 ms, whereas in the terminal syntagm the duration of the vowel /i/ in the final syllable of the word “*sənsiz*” increases to 150 ms. The total duration of the first syntagm is 2,448 ms, with an average syllable duration of 349 ms. In the second syntagm, the total duration reaches 3,244 ms, and the average syllable duration is 463 ms. A comparison of the temporal characteristics shows that the second syntagm is more extended: its overall duration exceeds that of the first syntagm by 796 ms, while the average syllable duration is greater by 114 ms. These findings indicate that the differences between the two syntagms are manifested not only in their

melodic and dynamic realization but also in their temporal organization. The increased duration of the second syntagm, accompanied by a decrease in fundamental frequency

and intensity, serves as an acoustic marker of its terminal function and contributes to the perception of intonational completeness in the musical phrase [see Oscillogram 3].

Oscillogram 3.



The acoustic analysis of the utterance “*Sən mənim qəlbimə hakim / sənə qul oldu könül*” (“You are the ruler of my heart / my soul has become your servant”) demonstrates a clear division into two syntagms. The first syntagm, “*Sən mənim qəlbimə hakim*,” is characterized by a rising–falling melodic contour. The maximum fundamental frequency (F0) is recorded on the word “*sən*” and reaches 384 Hz. The minimum value is observed on the final syllable of the word “*hakim*” at the end of the syntagm, where F0 decreases to 213 Hz, indicating a gradual reduction of melodic tension and the formation of a syntagmatic boundary. In the second syntagm, “*sənə qul oldu könül*,” higher fundamental-frequency values are observed at various points along the melodic line. The maximum F0 values occur at key phases of the syntagm, highlighting its emotional and semantic prominence as well as its active melodic organization. Analysis of the dynamic parameter shows that the maximum intensity values in both syntagms coincide with their initial positions. In the first syntagm, intensity reaches 72 dB, while in the second it attains 70 dB. As can be seen, the minimum F0 values are recorded on the final syllables of the syntagms – 293 Hz and 197 Hz, respectively – reflecting the descending movement of the melodic contour toward the boundary of syntagmatic completion. In

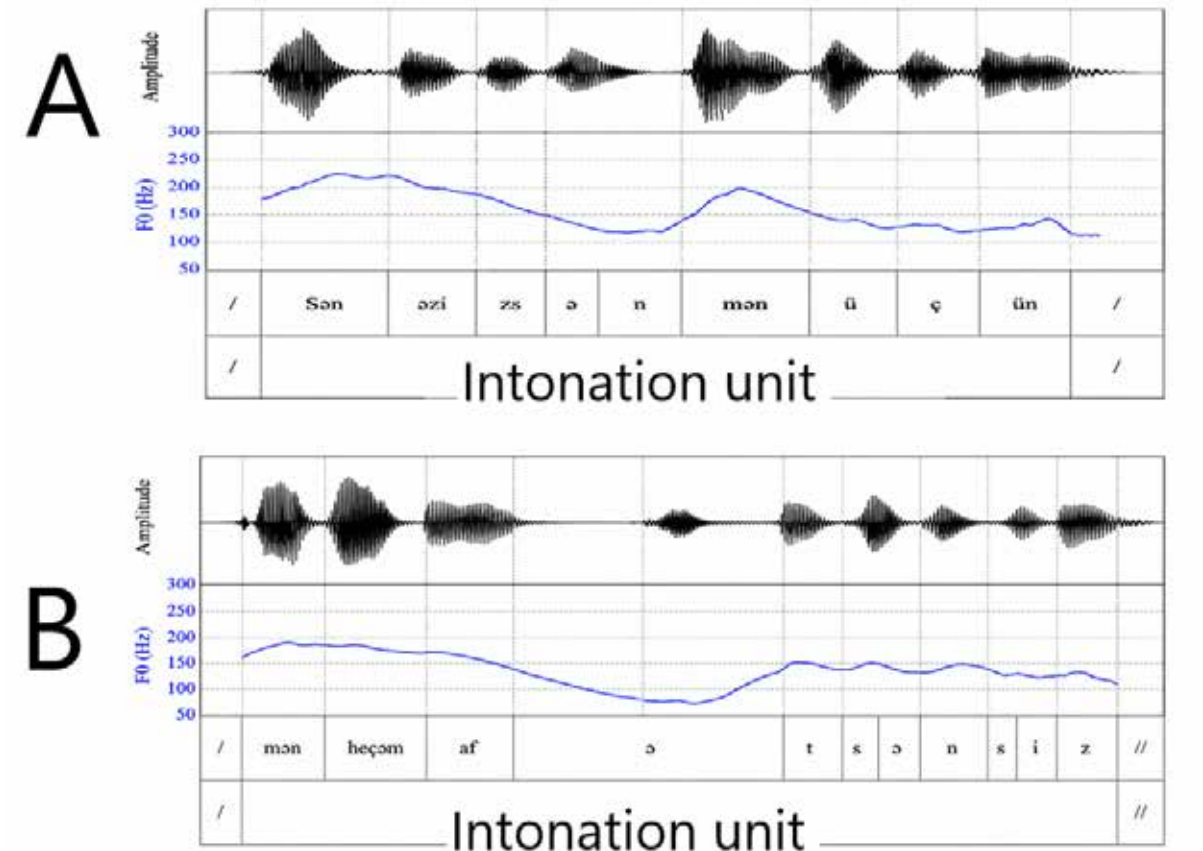
the terminal syntagm, “*mən heçəm əfət sən-siz*” (“I am nothing, a calamity without you”), the maximum fundamental frequency is registered on the first syllable of the word “*əfət*” and reaches 370 Hz. The high F0 value in this position indicates melodic accentuation and underscores the significance of this lexical item within the structure of the vocal phrase. The temporal analysis revealed differences in the durational organization of the two syntagms. The total duration of the first syntagm is 2,469 ms, with an average syllable duration of 352 ms. In the second syntagm, the total duration reaches 1,325 ms, while the average syllable duration amounts to 189 ms. A substantial contribution to the duration of the second syntagm is made by the vowel /ə/ in the word “*əfət*,” which exhibits an extended duration and significantly influences the overall temporal and prosodic organization of the phrase.

In both syntagms, a descending melodic contour is realized, characterized by a gradual decrease in the fundamental frequency toward the end of the phrase. Such a pattern is a typical acoustic marker of the terminal configuration of a vocal construction. The results of the acoustic analysis demonstrate that the organization of the vocal text is determined by the interaction of three principal parameters – fundamen-

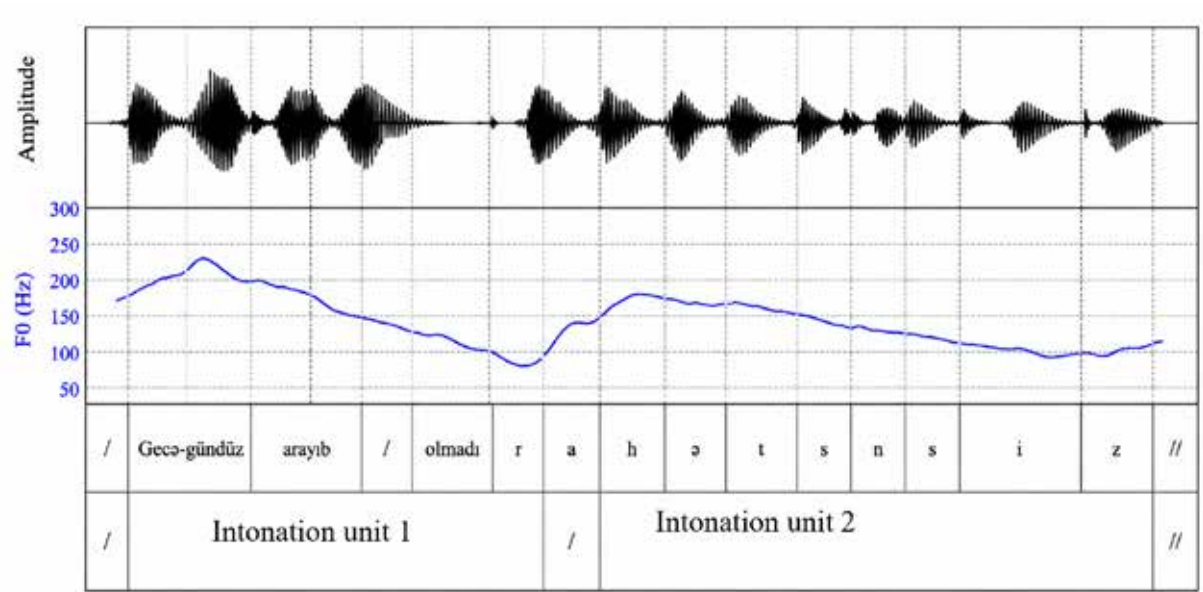
tal frequency (F0), intensity, and duration. The distribution of these parameters shapes the melodic contour, highlights semantic

centers, and contributes to the structuring of the syntagmatic organization of the musical utterance.

Oscillogram 4.



Oscillogram 5.



The diversity of the melodic structure of Azerbaijani folk songs is determined by the

specific features of modal organization, the system of pitch relationships, and the variety

of means of musical expression (Mammadov, 2017; Mammadova, 2018). It is precisely the interaction of these factors that ensures the artistic and emotional richness of the vocal text and shapes its distinctive national character. The specificity of folk-song melody is manifested in the nature of melodic movement, the peculiarities of intonational development, the relationship between pitch levels, and subtle variations in timbral and dynamic characteristics. Changes in the functional role of individual tones, the use of unexpected melodic transitions, and modulatory shifts create opportunities for conveying a wide range of emotional and semantic nuances in both performance practice and compositional creativity.

Conclusion

The melodic organization of Azerbaijani folk songs represents a system of pitch-functional relationships in which each tone fulfills a specific structural function. The sequence of tones within the melodic line directly reflects the principles of pitch organization and is characterized by a stable di-

rectional pattern: low register → rising pitch → return to the low register.

The results of the acoustic analysis demonstrate that this pattern is also manifested at the level of the principal intonational parameters. At the beginning of musical utterances, the fundamental frequency (F0) is generally realized within the mid-frequency range; in the central part of the phrase, frequency values tend to increase, after which a descending melodic contour is formed toward the end of the utterance. Initial tones are usually characterized by higher F0 values than final tones, reflecting the process of intonational development and the subsequent completion of the musical phrase.

Intensity parameters likewise contribute to the structuring of the musical utterance. During the initial and medial phases of a syntagm, intensity may reach its maximum values, serving to highlight the most significant melodic elements dynamically. In terminal position, by contrast, a gradual decrease in intensity is observed, which constitutes one of the acoustic markers of intonational completion.

References

- Dergaeva, I.A. (2005). A Comprehensive Study of the Perception and Psychological Impact of Music. – Yaroslavl.
- Amrahova, A.A. (2014). Verb Forms as a Functional Form of Vowels. *Music Journal*, – 1(58). – P. 7037–7055.
- Gabibova, K. (2025). Functionality in Stemming: Processing Complex Verb Forms Taking into Account Vowel Harmony (Based on the Azerbaijani Language). *Proceedings of the round table “The National Corpus of the Kazakh Language – a Linguistic Base for Teaching the Large Language Model (LLM)” within the framework of the regular scientific-linguistic platform “Askar Zhubanovsky Readings-4”*, – P. 274–279.
- Habibova, K. (2014). Composition of a Complex Syntactic Unit [Composition of a Complex Syntactic Unit]. *Dilchilik institutunun asarlari*, – 1. – P. 77–81.
- Habibova, K. (2024). Speech effect function of presupposition. *Linguistic Researches*, – 1. – P. 91–97.
- Heydarov, R.A., Jafarov, A.G., & Habibova, K.A. (2019, May). Software for experimental methods in phonetic research. In 1st International Scientific Conference “Modern Management Trends and the Digital Economy: from Regional Development to Global Economic Growth” (MTDE 2019) (P. 795–800). Atlantis Press.
- Mammadov, R. (2017). Hybrid genre of Azerbaijani music – “symphonic mugham”. *Conservatory*, – 37. – P. 84–94.
- Mammadova, D.M. (2018). Features of the cadence-harmonic style of Azerbaijani composers. – Baku: Translator.
- Medushevskiy, V.V. (1994). *Intonation form of music*. – Moscow: Muzyka.
- Morozov, V.P. (2017). *Language of emotions and emotional hearing*. – Moscow: Kogito-Center.
- Kholopova, V.N. (2012). *Musical emotions*. – Moscow: Al'teks.

Veysalli, F. (1993). Issues of phonetics and phonology. – Baku: Maarif.
Yavorskiy, B.L. (2022). Structure of musical speech. – Moscow: Kompozitor.

submitted 09.07.2026;
accepted for publication 23.07.2026;
published 31.08.2026
© Ali-Zade (Alekberova), Fidan Faig
Contact: fidanalakbar@gmail.com