



## DISTRIBUTION AND BIOECOLOGICAL CHARACTERISTICS OF WORMWOOD SPECIES IN THE FLORA OF AZERBAIJAN

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### Summary:

*Artemisia* L. genus of the Asteraceae Barcht.et J. Presil family occupies a special place among the naturally distributed folk and agriculturally important plants in the flora of Azerbaijan.

The modern geographic distribution and kinship of Azerbaijan's wormwood species belong to East Asian genetic elements. According to the composition of the flora of Azerbaijan's desert and semi-desert wormwoods, it was determined that there are 565 types of higher flowering plants, which, taking into account that there are about 4500 flowering plants in the flora, is about 1/8 of all flowering plants of Azerbaijan, i.e. 14.1. There are 119 genera of flowering plants in our flora, where wormwood is represented by 58 genera, which makes up 48.7% of the flowering plant genera in Azerbaijan.

The total number of Azerbaijani endemics in wormwoods has reached 10, which is 3.1% of Azerbaijan's endemic species (260 species) and 1.2% of the entire flora of wormwoods. Azerbaijan's endemic species are concentrated in 7 out of 57 intervals represented in this flora.

Thus, it was confirmed that 38 species and 4 variations (42 taxa) of the genus *Artemisia* L. are distributed in the natural flora of Azerbaijan, their new areas were specified, 4 new wormwood species, 7 variations were shown for the first time, and the endemism of 10 species was found.

**Key words:** wormwood, flora, taxon, polymorphic, endemic, species diversity

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In modern times, the comprehensive study of the gene pool of the plant world, identification and protection of its resources is one of the priority directions. Currently, as a result of active and intensive use of natural resources, significant reductions in vegetation are observed. These processes occur as a result of global environmental changes, active anthropogenic influences and inefficient use of plant resources. In this regard, one of the most effective ways of protecting plant diversity is comprehensive study of genetic resources of modern flora, research of existing resources.

It is known that the beneficial properties of plants are mainly related to their chemical composition. Like other genera of the Asteraceae Barcht.et J. Presil interval, which are common in the flora of Azerbaijan, representatives of the genus

wormwood (*Artemisia* L.) are rich in sesquiterpene lactones and are of great practical and theoretical importance. That is why many laboratories around the world have focused their research on the study of sesquiterpene lactones. The interest in this group of compounds lies in the fact that, in addition to having a wide spectrum of pharmacological effects, they are less toxic and do not cause additional effects, unlike compounds obtained by synthesis.

Wormwood representatives are very diverse in terms of species diversity, they spread in different ecological conditions and at the same time belong to the mesophyte, xerophyte, mesoxerophyte plant group.

The genus *Artemisia* L. of the family Asteraceae Barcht.et J. Presil occupies a special place among the naturally distributed folk and agricultural plants in the flora of Azerbaijan.

Although wormwood is polymorphic, it has continued to be controversial among researchers for many years. In modern botanical science, more attention is paid to the karyological, anatomical, and chemotaxonomic clarification of species from a systematic point of view.

Wormwood was first identified by Carl Linnaeus, and at the beginning of the 19th century, the author reported on 19 types of wormwood, 7 of which (*A. annua* L., *A. vulgaris* L., *A. absinthium* L., *A. dracunculoides* L., etc.) described from the Caucasus [16].

After Linnaeus, the systematization of the genus *Artemisia* in the Caucasian flora was first given by A.A. Grossheim and he indicated the shape of the basket and the number of flowers in the basket as the main features [2; 3]. A.A. Grossheim, based on geographical races in the determination of wormwood species, exaggerated many of the variations given by Besser and elevated them to the species level by calling them *Artemisia maritima szowitziana* Bess., *A. hanseniana* (Bess.) Grossh. *A. szowitziana* and gave them comparative names [1; 2].

Until recently, R.K. Malikov characterized wormwoods botanically, geographically, and geobotanically, gave their floristic analysis, fodder importance and geobotanical classification of aromatic wormwood formations in Azerbaijan. According to the author, the difference between this classification and the previous classifications is that wormwood associations are divided into geographical types (desert, semi-desert and steppe). He investigated the participation of 279 tubular plant species belonging to 183 genera and 45 intervals in wormwood [3].

T.M. Tahbov reported for the first time about the presence of the species *A. abrotanum* L. found in the flora of Azerbaijan in Nakhchivan AR. Having thoroughly studied the biodiversity in this region, he pointed out that there are 2791 species in 153 families and 799 genera in the flora of Nakhchivan AR. The scientist announced the widespread distribution of wormwood species, which have abundant natural resources, as medicinal plants used in scientific medicine and folk medicine in Nakhchivan AR [7].

In order to clarify the position of *Artemisia* L. - Wormwood species in the vegetation of Azerbaijan, expedition trips were made in most regions of our republic for about 35 years, and

during the conducted field observations, the regularity of the location of the genus in the flora was determined, the general distribution areas, biological and ecological characteristics of all species were studied, and marked areal maps were drawn up. R. Y. Rzazadeh showed for the first time that the genus from the flora of Azerbaijan is an endemic species (*A. prilipkoana*) in the harsh soil and climate conditions of Gobustan. He attributed them to different ranks. Of these, *A. kobstanica* grows in the salt marshes of Gobustan, both of them are endemic in the Caucasus. Their areas are very wide and spread all the way to Dagestan.

The modern geographic distribution and kinship of Azerbaijani wormwood species belong to East Asian genetic elements. According to the latest literature information, the flora of Azerbaijan's desert and semi-desert wormwoods includes 565 species of flowering plants, which is about 1/8 i.e. 14.1 of all flowering plants in Azerbaijan. There are 119 genera of flowering plants in our flora, where wormwood is represented by 58 genera, which makes up 48.7% of the flowering plant genera in Azerbaijan. According to R.K. Malikov, the division of species and genders on intervals is uneven. Among the hiatuses that differ in their share in the flora: Poaceae (15.5%), Asteraceae (14.2%), Fabaceae (9.6%), Brassicaceae (7.6%), Chenopodiaceae (6.2%) can be noted. Other breaks are Caryophyllaceae (4.8%), Lamiaceae (3.9%), Apiaceae (3%), Boraginaceae (3.2%), Scrophulariaceae (2.7%), etc. breaks together make up 70.9% of the species composition of earthworms [12]. Many researchers have noted that the entire species diversity of wormwood flora is represented by 297 genera.

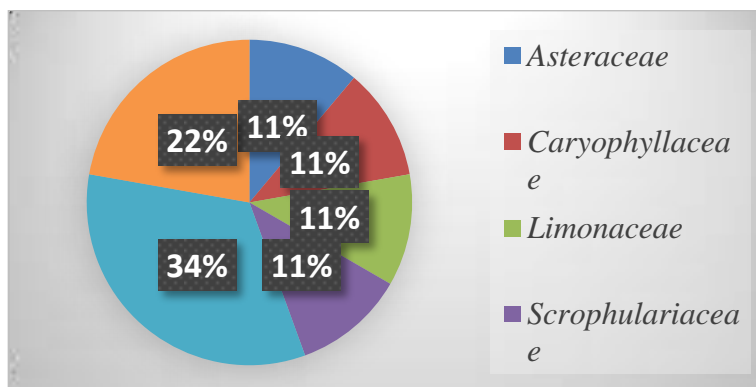
Referring to the results of comprehensive research, R. Y. Rzazade discovered 11 new types of wormwood spreading in the flora of Azerbaijan and investigated whether some of them are endemic species. One of them is *A. kobstanica* Rzazade, and the second is *A. prilipkoana* Rzazade. The range of the first one is very wide, but the range of both of them is as far as Dagestan. F.Q. Akhundov called *Artemisia fedorovii*, *A. eldarica*, *A. scoporioides* species of *Artemisia* L. endemic to Azerbaijan [9].

The total number of Azerbaijani endemics in wormwoods has reached 10, which is 3.1% of Azerbaijan's endemic species (260 species) and 1.2% of the entire flora of wormwoods. Azerbaijan's endemic species are concentrated in 7 out of 57 intervals represented in this flora. Distribution of endemic species by families: Asteraceae - 1, Caryophyllaceae - 1, Limonaceae -

1, Scrophulariaceae - 1, Fabaceae - 3, Iridaceae - 2 species (Chart 1).

Chart 1.

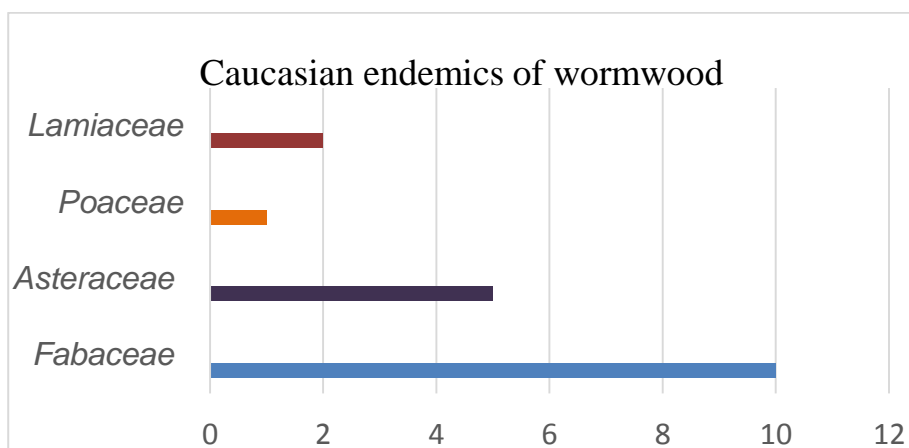
**Distribution of endemic species in Azerbaijan by seasons**



In addition to Azerbaijani endemics, 25 types of general Caucasian endemics are distributed in the flora of wormwoods, which are distributed by families as follows: Fabaceae - 10, Asteraceae - 5,

Poaceae - 1, Lamiaceae - 2 species (Chart 1). In addition to the conducted studies, the latest works of R.K. Malikov were also used as literature data [12; 13].

**Chart 2.**



Based on the materials collected as a result of geobotanical, morphosystematic, chemotaxonomic, cameral and experimental research conducted during long-term research, as well as the data obtained from herbarium funds, the distribution, biomorphological composition, and classification of life forms of the genus *Artemisia* L. in 20 botanical geographical regions of Azerbaijan flora have been perfectly specified. *A. fragrans*-Avt is the dominant species of the wormwood genus in the vegetation of Azerbaijan, so this species is found as an edifier in plant groups in 18 botanical-geographic regions. Fragrant wormwoods (except for the Lankaran region) are found in the coastal lowlands, Absheron, Kur-Araz, Samur-Shabran lowlands, Nakhchivan plain, Bozghir plateau, Ganja-Gazakh, etc. in all regions. They form jungles in their sloping plains. This species forms level I, II, III level in Jeyranchol plateau, creates senoses

with 17-20 species of higher plants in weakly saline soils, often plays the role of an edifier. As we mentioned, the most widespread species in the Ganja-Gazakh region is the aromatic wormwood species, which is also the basis of the winter pastures of Jeyranchol, and this issue has already been passported by several researchers. In literary sources, T.M. Taghiyev's information about the area of Jeyranchol pasture in Samukh district is 226 thousand hectares [2; 4; 8; 9]. According to many authors, wormwood is the founder of phytocenosis in the flora of Azerbaijan.

*A. scoparia* Waldst. do Kit. forming associations with several ephemerals on clayey gray soils in this region, as if *A. fragrans* Willd. It plays the role of dual edifier by accompanying its type. *A.sowitziana* (Bess.) Grossh. creates a large jungle in the river swamps of the salted, dried Chala formation class. Another interesting area

where wormwood is spread is the foothills of Karabakh, Harami plains. Here *A. fragrans* Willd. type plays the role of an edifier. The largest massif of this species can be found north of the village of Araz Yaglivend in Fuzuli region, the species forms large forests, and plays a key role as an edifier in the composition of phytocenosis in semi-deserts. *A. szowitziana* (Bess.) Grossh near the Araz River in Fuzuli region. type, they form large jungles along with shoranges and ganges on the roadside around the villages of Big and Small Bahmanli.

Field searches conducted in 2009 covered Ganja-Gazakh, especially Tovuz, Gazakh, Shamkir, Goygol, Samukh regions. The main goal of the expedition was to determine the role of wormwood species in the vegetation type in this region. Annual wormwood (*A. annua*) can be found in parks, gardens, outside houses in Ganja city. Monogyna wormwood - *A. monogyna* Walds et Kit. = new distribution areas of (*A. santonica* L.) species were first discovered in A.N. Recorded by Alasgarova. *A. absinthium* L, *A. fragrans* Willd, *A. scoparia* Wald et Kit., *A. vulgaris* L. of *Artemisia* L. genus in different ecological conditions in plains, meadow, subalpine, desert, semi-desert, forest, thicket vegetation in Ganja-Gazakh region. , *A. annua* L., *A. monogyna* = *A. santonica* L. In Samukh, *A. scoparioides* Grossh. *A. eldarica* Rzazade, *A. sosnowskyi* Krsch. distribution areas of species were studied. During the results of the phytocenological studies conducted in the biological diversity of the region, two species - *A. annua*, *A. monogyna* were discovered in the herbarium, and it was observed that they spread from the plains to the middle mountain belt with the edification of *A. fragrans*

species. The main elements of this association are *A. fragrans*, *A. santonica*, *Salsola nodulosa*, *Hordeum leporinoma* species.

One of the species of the wormwood genus with a wide range is the wormwood - *A. scoparia*. This species is widespread in the Jeyranchol plain of Samukh region and plays a dominant role in the phytocenosis by accompanying the edifying aromatic wormwood. There are fragrant wormwood, wormwood, *seguriana* milkweed {*Euphorbia seguieriana* Neck.}, large plantain {*Plantago major* L.}, common ivy (*Czchorium intybus* L.), etc. forms associations with species.

Thus, in order to clarify the position in the vegetation of Azerbaijan, in 8 vegetation types in 20 botanical-geographical regions, among them, the desert-vegetation-type sycamore - *A. fragrans*; semi-desert - *A. scoparia*, *A. scoparioides*, *A. spicigera*, *A. A. issaevii*; forest-meadow - *iskenderiana* Rzazade, *A. absinthium*, *A. vulgaris*, *A. campestris*, *A. sosnowskyi*; grass-grass - *A. szowitziana*; primitive cast - *A. annua*; mountain xerophyte- *A. latschinica*, *A. fedorovii*, *A. austriaca*; steppe - *A. monogyna*, subshrub - *A. arenaria*, *A. fascicu-lata* - 42 species and variations have been specified.

From all this, it is clear that the formation of new species belonging to the wormwood genus in the flora of Azerbaijan is inevitable.

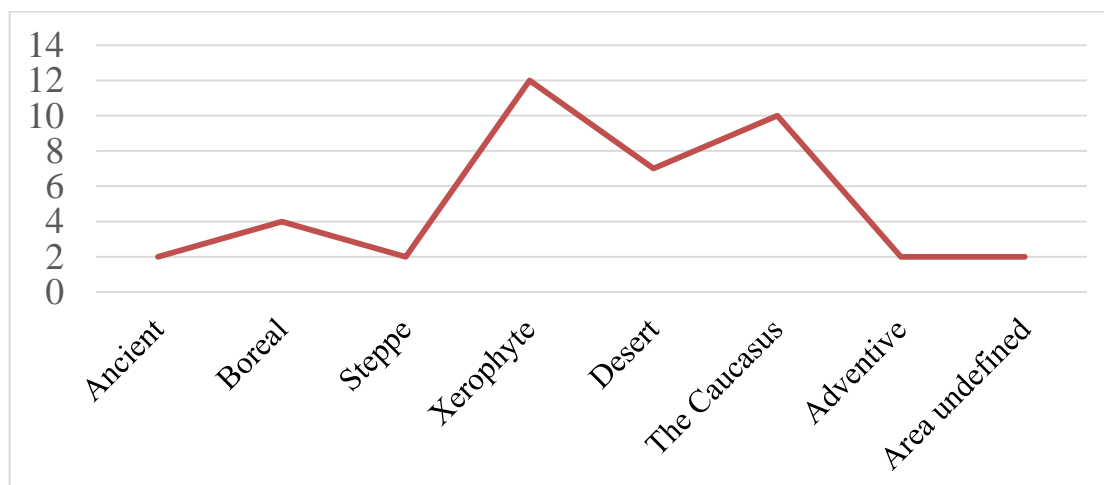
The composition of wormwood flora in Azerbaijan was formed due to species of the xerophytic areal type Mediterranean Sea and ancient, boreal and Caucasian geographical types of their origin (table 1).

**Table 1 Geographical distribution of species growing in the flora of Azerbaijan**

| Number | Type of areal  | Number of species |                      |
|--------|----------------|-------------------|----------------------|
|        |                | in number         | in % of total number |
| 1      | Ancient        | 3                 | 7,14                 |
| 2      | Boreal         | 4                 | 9,52                 |
| 3      | Steppe         | 2                 | 4,76                 |
| 4      | Xerophyte      | 12                | 28,57                |
| 5      | Desert         | 7                 | 16,66                |
| 6      | The Caucasus   | 10                | 23,80                |
| 7      | adventive      | 2                 | 4,76                 |
| 8      | Area undefined | 2                 | 4,76                 |

## Geographical distribution of species growing in the flora of Azerbaijan

### Chart 2



In the flora biodiversity of Azerbaijan, representatives of the genus *Artemisia* L. attract attention with their useful properties. One of the important issues is to learn how to use such plants. It should be noted that the indicated notes are based on literature sources [2; 10; 11; 12; 13; 14; 15].

38 species and 4 variations (42 taxa) of the genus *Artemisia* L. have been confirmed in the natural

effectively in our flora. Polymorphic *Artemisia* L. has a large number of species, as well as various fields of use. Their benefits are classified by us and shown in 2 tables.

flora of Azerbaijan, their new areas have been specified, 4 new species of wormwood, 7 variations have been shown for the first time, endemism of 10 species has been revealed [2].

**Table 2. Classification of useful species of wormwood distributed in the flora of Azerbaijan**

| S/s | Latin name of taxa                           | Useful aspects of plants |               |          |      |           |         |      |           |       |
|-----|--|--------------------------|---------------|----------|------|-----------|---------|------|-----------|-------|
|     |  | Technical                |               |          |      | Commodity |         |      |           |       |
|     |  | Resinous                 | Essential oil | Colorant | Food | Medicine  | Vitamin | Feed | Poisonous | Spicy |
| 1   | <i>Artemisia dracunculhus</i>                | ++                       | ++            | +        | ++   | ++        | ++      | +    | +         | +     |
| 2   | <i>A.abrotanum</i>                           | +                        | +             | +        | +    | +         | +       |      |           | +     |
| 3   | <i>A.fragrans</i>                            | +                        | +             | +        |      | +         | +       | +    |           | +     |
| 4   | <i>A.annua</i>                               | +                        | +             | +        | +    | +         | +       | +    |           |       |
| 5   | <i>A.hanseniana</i>                          | +                        | +             | +        |      | +         |         | +    |           |       |
| 6   | <i>A.marschalliana</i>                       | +                        | +             | +        |      | +         | +       | +    |           |       |
| 7   | <i>A.sosnovsiyi</i>                          | +                        | +             |          |      |           |         | +    |           |       |
| 8   | <i>A.issayevii</i>                           | +                        | +             | +        | +    |           | +       | +    |           |       |
| 9   | <i>A.scoparioides</i>                        | +                        | +             |          |      | +         | +       | +    |           |       |
| 10  | <i>A.splendens</i>                           | +                        | +             |          |      | +         | +       | +    |           |       |
| 11  | <i>A.caucasica</i>                           | +                        | +             |          |      | +         | +       | +    |           |       |
| 12  | <i>A.meyeriana</i>                           | +                        | +             |          |      | +         | +       | +    |           |       |
| 13  | <i>A.absinthium</i>                          | +                        | +             | +        | +    | +         | +       | +    |           |       |
| 14  | <i>A.hanseviana</i> var. <i>abscheronica</i> | +                        | +             | +        |      |           | +       | +    |           |       |
| 15  | <i>A.hanseviana</i> var. <i>yamalica</i>     | +                        | +             | +        |      |           | +       |      |           |       |
| 16  | <i>A.nachitschevanica</i>                    | +                        | +             | +        |      | +         | +       | +    |           |       |
| 17  | <i>A.kobstanica</i>                          | +                        | +             | +        |      | +         | +       |      |           |       |
| 18  | <i>A.prilipkoana</i>                         | +                        | +             | +        |      | +         | +       | +    |           |       |
| 19  | <i>A.iskenderiana</i>                        | +                        | +             | +        |      | +         | +       |      |           |       |

|    |                      |   |   |   |  |   |   |   |  |  |
|----|----------------------|---|---|---|--|---|---|---|--|--|
| 20 | <i>A.meyeriana</i>   | + | + | + |  | + |   | + |  |  |
| 21 | <i>A.fasciculata</i> | + |   | + |  | + | + | + |  |  |
| 22 | <i>A.chazarica</i>   | + | + | + |  | + | + | + |  |  |
| 23 | <i>A.campestris</i>  | + |   |   |  |   | + | + |  |  |

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