

MEDICINAL AND AROMATIC PLANTS OF AZERBAIJAN

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Summary

Data on the biological active substances and therapeutical properties of more than 131 medicinal and aromatic (spicy-aromatic) plants widely distributed and frequently used in Azerbaijan are given in this chapter. The majority of the described species contain flavonoids (115 sp.), vitamin C (84 sp.), fatty oils (78 sp.), tannins (77 sp.), alkaloids (74 sp.) and essential oils (73 sp.). A prevalence of these biological active substances defines the broad spectrum of therapeutic actions of the described plants. So, significant number of species possess antibacterial (69 sp.), diuretic (60 sp.), wound healing (51 sp.), styptic (46 sp.) and expectorant (45 sp.) peculiarities. The majority of the species are used in curing of gastrointestinal (89 sp.), bronchopulmonary (61 sp.), dermatovenerologic (61 sp.), nephritic (55 sp.) and infectious (52 sp.) diseases, also for treatment of festering wounds, ulcers and scalds (55 sp.). 20 sp. are spicy-aromatic plants and widely used by local population.

1. Introduction

To collect, systematize, summarize and analyse the data on medicinal plants from flora of Azerbaijan on the base of modern informative technologies the inventarization of Azerbaijan flora was carried out, more than 500 scientific literature sources [Medicinal plants of Azerbaijan, 1942; Makhlyuk 1967; Minaeva 1970; Medicinal plants in scientific and folk medicine, 1972; Gammerman et al., 1976; Shreter et al., 1979; Aseeva et al., 1985; Ismailov, 1985; Plant resources of USSR, 1984-1991; Mashkovskiy, 1985-2008; Damirov et al., 1988; Ladinina et al., 1990; Alekperov, 1992; Plant resources of Russia and adjoining states, 1993; Plant resources of Russia and adjoining states, 1994; Plant resources of Russia and adjoining states, 1996; Aliyev, 1998; Kiseleva et al., 2002; Chobanov et al., 2004; Zeynalova, 2004; Serkerov, 2005; Mehtiyeva, 2006; İbadullayeva and Djafarova, 2007; Mehtiyeva, 2007; Medical

peculiarities of food plants, 2007; Plant resources of Russia, 2008; Mehtiyeva, 2008; Mehtiyeva, 2009; Mehtiyeva et al., 2009; Sahmurova et al., 2009; Zeynalova, 2009; Zeynalova et al., 2009; Novruzov, 2010; Serkerov et al., 2010 etc.] were analyzed, special field works were conducted, information on 26 parameters of each species of medicinal plants were gathered and “The electronic information-search base on medicinal plants from flora of Azerbaijan” [Mehtiyeva, 2006-2008] is created. As a result of analysis of the information of this database it was revealed that that from 4500 plant species distributed in Azerbaijan 1545 species belonging to 178 families and 740 genus or 34.3% of flora of Azerbaijan are medicinal plants.

According to the systematic classification majority of plants of the medicinal flora of Azerbaijan belong to *Magnoliophyta* (1461 species – 94.6%) and very less belong to *Polypodiophyta* and *Lychenophyta* (26 sp. - 1.7% for each), *Pinophyta* (18 sp. - 1.2%), *Equisetophyta* (6 sp. - 0.4%), *Gnetophyta* (3 sp. - 0.2%), *Bryophyta* and *Lycopodiophyta* (2 sp. - 0.13% for each), *Ginkophyta* (1 sp. - 0.06%).

Magnoliopsida class is represented mostly by species of *Asteraceae* Dumort. (160 sp.), *Fabaceae* Lindl. (102 sp.), *Lamiaceae* Lindl. (97 sp.), *Rosaceae* Juss. (82 sp.), *Apiaceae* Lindl. (72 sp.) and *Brassicaceae* Burnett (68 sp.) families. *Ranunculaceae* Juss. (46 sp.), *Caryophyllaceae* Juss. (39 sp.), *Chenopodiaceae* Vent. (38 sp.), *Scrophulariaceae* Juss. (31 sp.), *Polygonaceae* Juss. (30 sp.), *Boraginaceae* Juss. (30 sp.), *Euphorbiaceae* Juss. (25 sp.), *Malvaceae* Juss. (24 sp.), *Solanaceae* Juss. (19 sp.) and *Rubiaceae* Juss. (17 sp.) families took also main places. Medicinal plants from these families are more widely distributed in forest and meadow coenosis.

The leading families of *Liliopsida* class are *Poaceae* Barnhart (47 sp.) and *Orchidaceae* Juss. (28 sp.), also *Cyperaceae* Juss. (19 sp.), *Liliaceae* Juss. (15 sp.), *Alliaceae* J. Agardh (12 sp.), *Hyacinthaceae* Batsch and *Juncaceae* Juss. (11 sp. for each), *Iridaceae* Juss. (8 sp.) and *Amaryllidaceae* J. St.-Hil (7 sp.) are represented by numerous species.

On taxonomic view genera *Euphorbia* L. (21 sp.), *Salvia* L. (14 sp.), *Centaurea* L. (13 sp.), *Viola* L., *Galium* L., *Stachys* L., *Erysimum* L., *Allium* L. and *Artemisia* L. (12 sp. for each), *Potentilla* L. and *Rumex* L. (11 sp. for each), *Orchis* L. and *Chenopodium* L. (10 sp. for each) are distinguished by the number medicinal plants.

On life form medicinal plants distributed in Azerbaijan flora are trees (122 sp.), shrubs (115 sp.), subshrubs (13 sp.), dwarf shrub (11 sp.), dwarf subshrub (22 sp.), shrubs-liana (11 sp.), liana (1 sp.), perennial grasses (749 sp.), biennial grasses (86 sp.), annual grasses (354 sp.), also lichens (26 sp.), mosses (2 sp.), club-moss (1 sp.), ferns (26 sp.) and horse-tails (6 sp.).

The geographical relief has significant influence on the areals of medicinal plants. 937 sp. (60.6%) of medicinal plants are distributed in the middle mountain belt, 867 sp. (56.1%) – in lower mountain belt, 792 sp. (51.3%) – in mountain and foothills, 403 sp. (26.1%) – in high mountains, 248 sp. (16%) – in subalp and 76 sp. (4.9%) in alp mountain belts.

They are mostly weed (425 sp.), forest-shrub (250 sp.), mountain-meadow (241 sp.), also mountain-xerophytes (193 sp.), forest (162 sp.), rock-reef (132 sp.), mountain-steppe (123 sp.), high-steppe (107 sp.), desert (105 sp.), aquatic-marsh (82 sp.), psammophyte-actic (79 sp.) and roan-meadow (57 sp.) vegetation types.

Medicinal plants on classification on ecological groups are 399 sp. xeromesophytes, 324 sp. mesophytes, 323 sp. xerophytes, 260 sp. mesoxerophytes, 33 sp. hydrophytes and 13 sp. parasites. The rest species are transitional ecological groups.

On the distribution of medicinal plants in botanical-geographical regions of Azerbaijan Guba massif of Great Caucasus (590 sp.) and the mountain part of Nakhchivan (569 sp.) are more rich by these plants. The northern and central regions of Small Caucasus are represented by 455 and 444 sp. of medicinal plants, respectively, eastern and western regions of Great Caucasus – by 404 and 387 sp., respectively, mountain part of Lenkaran – by 356 sp., southern regions of Small Caucasus – by 332 sp., Kur-Araz and Lenkaran lowlands– by 328 and 310 sp., respectively, Kur and Nakhchivan plains – by 308 and 263 sp., respectively, Bozgir plateau – by 258 sp., Gobustan – 257 sp., Diabar – 233 sp., Absheron – 214 sp., Samur-Devechi lowland – by 206 sp., Alazan-Eyrichay valley – by 127 sp., Mugan of Lenkaran – by 52 sp. 184 sp. (11.9%) of medicinal plants are distributed in all regions of Azerbaijan.

78 sp. of medicinal plants are endemics of Caucasus, 5 sp. are Azerbaijan endemics. 45 sp. are relicts and 110 sp. are rare plants.

Medicinal plants of Azerbaijan are rich with significant biological active substances. 912 sp. (59%) of medicinal plants contains flavonoids, 593 sp. (38.4%) alkaloids, 518 sp. (33.5%) vitamin C, 454 sp. (29.4%) fatty and 466 sp. (30.1 %) essential oils, 452 sp. (29.3%) tannins, 321 sp. (20.8%) saponins, 297 sp. (19.2%) coumarins, 279 sp. (18.1%) steroids, 248 sp. (16.1%) anthocyanins, 230 sp. (14.9%) organic acids, 216 sp. (14%) carotinoids, 213 sp. (13.8%) triterpenoids, 201 sp. (13%) carotin, 138 sp. (8.9%) glycosides, 105 sp. (6.8%) resins, and from 8 to 90 sp. other biological active substances.

In whole, 112 sp. (72%) of medicinal plants are officinal species included in Pharmacopoeia. Besides, 1189 sp. (77%) of these plants are used in folk medicine, 259 sp. (16.8%) in homeopathy, 218 sp. (14.1%) scientific and 140 sp. (9.1%) in practical medicine, 707 sp. (45.8%) in experimental, 90 sp. (5.9%) in clinical trials, 158 sp. (10.2%) in Tibetan, 92 sp. (5.9%) for each in Chinese and Indian, 431 sp. (27.9%) in medieval Azerbaijanian medicine, 214 sp. (13.8%) in pharmacology, 147 sp. (9.5%) in veterinary.

On therapeutic peculiarities among medicinal plants of Azerbaijan 445 sp. (28.8%) have diuretic action, 361 sp. (23.4%) antibacterial, 326 sp. (21.3%) wound healing, 255 sp. (16.6%) softened, 249 sp. (16.1%) anti-inflammatory, 215 sp. (14%) anthelmintic, 199 sp. (12.9%) astringent, 172 sp. (11.1%) haemostatic, 163 sp. (10.9%) expectorant, 141 sp. (9.2%) for each sudorific and hypotensive, 138 sp. (8.9%) cholagogic, 134 sp. (8.7%) analgesic, 123 sp. (8%) anti-tumor, 118 sp. (7.6%) for each sedative and tonic, 114 sp. (7.4%) for each febrifugal and styptic, 113 sp. (7.3%) antiseptic, 93 sp. (6%)

protistosidal and 33 sp. (2.1%) antiviral. There are 168 (10.9%) sp. among medicinal plants. Majority of plants combine certain these properties.

The range of diseases cured by medicinal plants and assortments of plants used for diseases treatments are quite wide.

397 sp. (25.7%) of plants are used in curing of stomach diseases, 384 sp. (24.6%) – dermatological problems, 275 sp. (17.8%) – rheumatism, 231 sp. (15.1%) – festering wound and ulcers, 216 sp. (14.%) – intestinal, 214 sp. (13.9%) – heart, 204 sp. (13.2%) – bronchitis and bronchial asthma, 198 sp. (12.8%) – liver, 183 sp. (11.8%) – women's diseases, 173 sp. (11.2%) – pulmonary tuberculosis, 158 sp. (10.2%) – haemorrhoids, 153 sp. (10%) for each – kidney and podagra, 123 sp. (7.7%) – sharp respiratory infections, 118 sp. (7.6%) – eye diseases, 113 sp. (7.3%) – throat, 84 sp. (5.4%) – gall bladder, 81 sp. (5.3%) for each – neural and diabetes, 26 sp. (1.7%) – allergic diseases and 97 sp. (6.3%) – scalds.

As a result of inventarization of aromatic plants it was established that 640 species belonging to 311 genus and 80 families are distributed in flora of Azerbaijan [Zeynalova, 2009].

2. Historical Perspective of the Traditional Medicine

In Azerbaijan adjoining with eastern and western countries, folk medicine with peculiar features has profound roots. A history of the use of medicinal plants or herbs, i.e. plants with healing properties has an ancient background in Azerbaijan and information on plant medicines handed down over the centuries. Even today, the preference of phytotherapy is not negated by the modern medicine.

Azerbaijan occupies a very favorable geographical location, since 9 from all over the world existing 11 climatic zones are found in this territory. This is a main reason of the unique biodiversity of the flora in Azerbaijan. Besides, Azerbaijan is a country at the crossroads of numerous cultures, religions and civilizations.

So, ancient Azerbaijani medicine was influenced by various healing systems, such as Turkic, Iranian, Semitic and Greek medicine, and ancient inhabitants of Azerbaijan distinguished by their knowledge in the field of medicine [Alakbarli, 2006].

Some ancient Azeri folklore devoted to medicinal plants can be good evidence for it. For example, short folk verses named "bayati" contain information about healing properties of yarpiz (water mint), uzerrick (harmel), zoghal (cornel), yemishan (hawthorn) etc.

Traditionally, no part of a medicinal plant was wasted; all parts (seeds, flowers, leaves, stems and roots) were used. But much investigation remains to be done now as out of 726 medicinal herbs that were mentioned in early manuscripts, only 466 are known to grow in Azerbaijan today. Of these, 252 are not currently being used for any medicinal purpose, at all (Alakbarli, 2006)

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Chobanov R.E., Aleskerova A.N., Dzhanahmedova S.N., Safieva L.A. (2004) Experimental estimation of antiparasitic properties of essential oils of some *Artemisia* (Asteraceae) species of Azerbaijan flora. *Plant Resources* , V. 40, R.4, 94-98. [Antiparasites properties of essential oils from *Artemisia absinthium* L., *A. annua* L. and *A. scoparia* Waldst. Et Kit. are approved on experimental models of intestinal human parasites (*Hymenopelis nana*, *Lambli intestinalis*, *Syphacia obvelata*, *Trichocephalus muris*). By enteral injection of 0.01 ml/g 6% essential oil in ethanol solution (2 times per day during 3 days) to white mice the effectiveness of treatments of intestinal parasites has appeared in 70-90% animals.]

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Ismailov N.M. (1985) Alkaloid-bearing plants of Azerbaijan (description of families, genres and species). Elm, Baku , V. II, 182 p. [This book provides brief characteristics, distribution on regions of Azerbaijan, geographical type, the growing conditions, ecological groups, contents and chemical

composition of alkaloids of 305 alkaloid-bearing species. The use of some species in scientific and folk medicine is indicated.]

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Grossheim A.A. Ed. (1942) *Medicinal plants of Azerbaijan*. Baku , 202 p. [Recommendations on collection, drying and conservation, also brief botanical description, geographical distribution in regions of Azerbaijan, medical features and prescriptions for application of 210 wild-growing and cultivated medicinal plant species are given in this book. Plants are divided into officinal, non-officinal and public medicinal.]

University of Saratov Publ., (1972) *Medicinal plants in scientific and folk medicine* , 382 p. [This book contains description of 160 wild-growing and cultivated medicinal plant species used in medical practice. Botanical description, their distribution, time and methods for procurements, used parts, active substances, influence on organism and diseases are given for each species.]

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Mashkovskiy M.D. (1985) *Medicinal remedies*. M., 10th Ed., V. 1, 624 p.; V. 2, 575 p.; 11th Ed., 1988, P. 1, 624 p., P. 2, 573 p., 12th Ed., 1993; 14th Ed., 2002; 15th Ed., 2008, 1206 p. [New revised and supplemented edition contains information about more than 2000 domestic and foreign medicinal means (about 13.5 thousands names including synonyms) authorized in medical practice. Information on chemical structure, pharmacological properties, action mechanism, indications and contraindications for application, doses, side effects and other data necessary for the rational therapy are presented.]

Mehtiyeva N.P. (2006) Comparative analysis of computer database of medicinal plants from Lenkaran region of Azerbaijan. *News of Azerbaijan National Academy of Sciences. Biol. Sci. series* , 5-6, 23-35. [On the basis of computer databank on biodiversity of medicinal plants of Azerbaijan created by author the results of taxonomical, biomorphological, ecological-geographical analysis, the analysis on the contents of biological active substances, therapeutic groups and forms of application of 798 species from 478 genus and 130 families of medicinal plants from Lenkoran zone are presented in this article. Among these species 15 species are endemics of Caucasus, 8 – endemics of Azerbaijan, 12 - relic and 79 - rare and disappearing species.]

Mehtiyeva N.P. (2007) On creation of database of medicinal plants of Azerbaijan flora. Proceedings of 4th International Scientific Conference on “Biological diversity. Introduction of plants”, St-Petersburg , p. 57-58. [Brief information on creation of computer data base including biodiversity of medicinal herbs of Azerbaijan flora (171 families, 729 genus, 1500 species, from them 77 species – endemics Caucasus, 15 species – endemics Azerbaijan, 22 species – relict, 130 rare and disappearing species) is given in this article. Passport for each species inserted to the computer data base includes 26 parameters, which show complete botanical description, ecology, contents of biologically active substances, medicinal characteristics and color photos in natural coenosis.]

Mehtiyeva N.P. (2008) Biological activity and therapeutical properties of medicinal plants from Azerbaijan flora. Proc. of I Phytotherapeutic Congress of Russia, Moscow, Russia , 276-284. [Taxonomical analysis, analysis on contents of biological active substances, therapeutical peculiarities

and application forms of 1523 species comprised on the base of computer data bank of medicinal plants of Azerbaijan are presented. Prevalence of species containing flavonoids, alkaloids, essential oils, vitamin C and tannins possessing diuretic, antibacterial, wound healing, laxative and anthelmintic properties and applied against gastrointestinal and dermal diseases was established.]

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Mehtiyeva N.P. (2009) Medicinal plants from flora of Azerbaijan used in homeopathy. *Traditional Medicine*, 1(16), 12-20. [The taxonomical, biomorphological, ecological analysis, also analysis on contents of biological active substances and therapeutical properties of 257 species applied in homeopathy are presented in the article. Among them 127 species are from principal families (Asteraceae, Rosaceae, Lamiaceae, Fabaceae, Ranunculaceae, Brassicaceae, Apiaceae, Cucurbitaceae, Scrophulariaceae, Solanaceae, Poaceae, Melanthiaceae, Liliaceae). The majority of (from 102 to 155 sp.) investigated species contain tannins, fatty and essential oils, alkaloids, vitamin C and flavonoids. Most part of (39.30-54.23%) investigated species possess diuretic, wound healing and anthelmintic properties.]

Minaeva V.G. (1970) *Medicinal plants of Siberia*. Nauka, Novosibirsk, 271 p. [Information on 200 main medicinal plants from Siberia: brief botanical characteristics, chemical composition, action, methods of collection and conservation, also field and methods of application are given in this book.]

Novruzov E.N. (2010) *Pigments of reproductive organs of plants and their significance*. Elm, Baku, 308 p. [The modern status, perspectives of investigations and application of plant pigments – antocyanins, flavonoids, carotinoids, betacyanins, possessing antioxidant, antiradiant, antiviral, anticarcinogenic properties, A and P vitamins activities of 400 plant species from flora of Azerbaijan are presented in this book. Issues on biology, chemotaxonomic and phylogenetic significance of pigments, also the reserve characteristics of industrially-valuable pigment-containing species, scientifically grounded ways of their rational use for production of carotinoids, antocyanins, flavonoids, concentrates and food coloring stuffs are elucidated.]

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Plant resources of Russia and adjoining states. Flowering plants, their chemical composition, use. 1993, V. 7, 352 p. [Information on chemical composition and useful properties of 1005 species of wild-growing flowering plants from flora of USSR belonging to 136 genera and 1 family (Asteraceae) is indicated in the book. The description is composed on the base of generalization of voluminous local and foreign literature data.]

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Plant resources of Russia and adjoining states. Flowering plants, their chemical composition, use. Mir i Semya, 1996, V. 9 additions to V. 1-7, 571 p. [In the first part of book information on chemical composition and useful properties of 174 of wild-growing plants belonging to 52 genus and 28 families (Lycopodiaceae – Ephedraceae) is presented. The second part contains new information on species already included to the 1-7 volumes, also on uninvestigated earlier plants. The description is composed on the base of generalization of voluminous local and foreign literature data.]

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belonging to 133 genus and 30 families (Magnoliaceae – Juglandaceae, Ulmaceae, Moraceae, Cannabaceae, Urticaceae). The description is composed on the base of generalization of voluminous local and foreign literature data.]

Sahmurova A.M., Zeynalova S.A., Mehdiyeva N.P., Mustafayeva S.J., Atakishiyeva Y. (2009) On antifungal effects of essential oils from *Pimpinella peregrina* L., *Daucus carota* L., *Achillea filipendulina* Lam. / *Journal of International Scientific Publication: Ecology & Safety*, Bulgaria. Volume 3, Part 1 p. 666-679. [Essential oil percentage of three widely distributed and having heavy stocks in flora of Azerbaijan species *Achillea filipendulina* Lam., *Pimpinella peregrina* L., *Daucus carota* L. have been investigated. Antifungal activity of essential oils is studied; the most active essential oils are in *A.filipendulina*, less - *P.peregrina*, weak - *D.carota*.]

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Shreter A.I., Muravyeva D.A., Pakaln D.A., Yefimova F.B. (1979) Medicinal flora of Caucasus. M., 1365 p. [Authors of book describe 131 species of main and 47 species of supplementary wild-growing and cultivated medicinal plants from Northern Caucasus and Transcaucasia. Brief botanical description, typical habitats, regions of possible procurements, characteristic of raw material and qualifying standards, also information on chemical composition and medicinal application are given for each species.]

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Zeynalova S.A., Mehtiyeva N.P., Mustafayeva S.D., Ismailov E.I., Bakhshaliyeva K.F. (2009) Biological peculiarities of some medicinal and aromatic plant species, their anti-fungal activity. *Traditional Medicine*, 3(18), 40-47. [The summarized information on chemical composition, therapeutical features and application forms of *Phlomis pungens*, *Chenopodium botrys*, *Leucanthemum vulgare*, *Conyza canadensis*, *Anthemis rigescens* and *Eupatorium cannabinum* are presented in the article. Their areal, phytocenological peculiarities and resources in Guba region of Azerbaijan are indicated. As a result of investigations on anti-fungal activity of these plants and their aqueous extracts it was established that the aqueous extracts of *Chenopodium botrys* and *Eupatorium cannabinum* possess the highest fungistatic activity.]

Zeynalova S.A. (2009) Component composition of essential oil of *Teucrium polium* L. from flora of Azerbaijan. *J. Bulletin of Issik-kul University*, 24, 73-76. [Data on qualitative composition of essential oils from *Teucrium polium* L. wide-spread in flora of Azerbaijan is given in this article. Essential oil is isolated by hydrodistillation from air-dry above-ground parts of plants in flowering period (0,12%). Main components of essential oils are α -pinen (50,1%) and linalool (6.77%). Water extract possesses anti-

fungal activity concerning to test-culture *Trichoderma lignorum* and *Fusarium oxysporum*.]

Biographical Sketches

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Work experience: 1980-2011 – Department of Plant resources, Institute of Botany, Azerbaijan National Academy of Sciences (from junior scientist till the leading scientist)

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PhD: 1988 – on topic “Biological peculiarities and essential oils of *Pimpinella* L. species growing in Azerbaijan”.

Specialization: Botanist-resource

Scientific publications: 85

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PhD: 1994 – on topic “Bioecological peculiarities and essential oils of *Chaerophyllum* species L. from flora of Azerbaijan”

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Scientific publications: 65