

Ethnopharmacological use of wild vegetable plants belonging to the Polygonaceae Juss. family spread in the Azerbaijan flora

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ABSTRACT

The ethnopharmacological and nutritional significance of some wild vegetable plants belonging to the *Polygonaceae* Juss family widespread in the Azerbaijan flora and used in folk medicine has been described in the article. Although ethnic knowledge is passed down from generation to generation, some information is forgotten if it is not documented. Therefore, we set a goal to study the ethnopharmacological use of wild vegetables belonging to the *Polygonaceae* family widespread in the flora of Azerbaijan. The organs and developmental phases of plants used as medicine have been clarified, their importance as vegetables and therapeutic properties have been determined. Bioecological features of plants and their distribution areas have been found, reserves have been evaluated. Resource assessment has shown that the supply of the *Rumex* genus as a raw material will meet the full needs of local communities in vegetables and medicines. Ethnobotanical research was carried out by the methods of field ethnography, observation, survey, questionnaire, interview, etc. Interviews were conducted among human populations of all ages, with most people aged 65-85 providing the necessary information. It has been established that the representatives of the family are used as a food both in raw and cooked form. Their medicinal importance is different. *Rumex* species are mainly used as astringent, hemostatic, anti-tumor, wound healing substances, and in infectious diseases. Underground organs of *Rheum* species are used as astringent and hemostatic substances. Above-ground organs are used in kidney disease, gynecological diseases, lymphangitis, and furunculosis. *Persicaria hydropiper* is used in the treatment of hemorrhoids, gout, rheumatism, diseases of the endocrine system, *Acogonon alpinum* in diseases of the gastrointestinal tract and nervous system, and *Polygonum* species are mainly used as analgesics and anti-inflammatory drugs.

KEY WORDS

Folk medicine; ethnopharmacology; resource assessment; *Polygonaceae*.

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INTRODUCTION

The healing properties of herbs have been known

since ancient times. Our ancestors, who said, “Make medicine your food, and make food your medicine”, used thousands of herbs, flowers, plant

roots, vegetables, fruits and treated their ailments with herbal remedies. Research in this field has been conducted in Azerbaijan for many years and is being conducted now (Damirov et al., 1988; Karimov et al., 1996, Ibadullayeva et al., 2013-2021).

As a result of thousands of observations by the peoples of the world, the healing and other beneficial properties of hundreds of plants have been studied. In each province, healers and doctors treated people with phytotherapy. While 387 plant species were used in medieval Azerbaijani medicine (Aleksperli, 2001) unfortunately, 252 species (69%) of them are not included in the pharmacopeia in modern Azerbaijan medicine, and only 135 species are used as official medicinal plants. About 200 family, 1,100 genera, and 5,000 plant species of the Azerbaijan flora are currently used in folk medicine. However, there is no information in scientific sources about some of these plants. Recognition and use of such natural remedies by humans have stood the test of time and have continued to grow in importance in today's age of scientific and technological progress. The methods of modern folk medicine have been documented and published by us, information about the importance of some medicinal plants spread in our flora has been given (Ibadullayeva et al., 2010; 2012; 2015; 2017; Ibadullayeva, 2020; Munir et al., 2018; Saytar et al., 2021).

There are more than 800 species of 30 genera of the *Polygonaceae* Juss. family in the world, especially in the northern belt, of which 82 species of 11 genera are found in the flora of Azerbaijan (Flora of Azerb., 1952). Representatives of the family adapt to different environmental conditions. One of the characteristic features of the family is the more intensive flowering and fruiting processes.

Species of the *Polygonaceae* Juss family, especially their underground organs, are rich in tannins. Most of the species contain vitamins, some are food, dye, and ornamental plants. Some species are weeds. However, 14 species of the family belonging to different genera are widely used by local communities as both food and medicine. The purpose of this paper is to discuss the ethnopharmacological use of vegetable and food species. Thereby, the medicinal value of wild vegetables used by humans has also been revealed.

MATERIAL AND METHODS

In 2010-2021, the ethnobotanical study of plants was carried out using classical and modern methods. During the expeditions, 60 natural populations of *Polygonaceae* Juss. were selected, the phytocoenoses of plant areals, the principles of collection and use for medicinal purposes were studied, and resource assessments were conducted (Zayko et al., 2007). Plant life-forms were studied (Serebryakov, 1964) and developmental phases were clarified during collection for medicinal and food purposes. The research was carried out based on previously obtained ethnobotanical materials. This material was collected by the authors during surveys performed in different regions of Azerbaijan, especially with the older generation (Fig. 1).

Field research and expeditions were conducted in the Lesser Caucasus (Agstafa, Dashkasan, Goranboy, Goygol, Gadabay, Gazakh, Samukh, Tovuz, Ujar, Yevlakh), Talish (Hirkan, Lankaran), the Greater Caucasus (Zagatala, Shamakhi, Sheki) regions and the Nakhchivan Autonomous Republic (Sharur, Ordubad, and Shahbuz) of Azerbaijan. Ethnobiological views of both rural and urban populations were recorded (Fig. 2). The data collection was performed mainly in the form of personal conversations with representatives of the older generation who are well versed in folk medicine. Ethnobotanical research methods: field ethnography, observation, survey, questionnaire, interview, residual method, comparative-historical method, component analysis, etc. (Martin, 1995; Guber, 2001). Technical recording equipment was often used in the observation process: a dictaphone, a film camera, and a video recorder.

To obtain information about local medicinal plants, first of all, local doctors engaged in phytotherapy were registered in the district administration. The rural community is constantly dependent on the traditional use of local plants for many diseases due to their low income and remoteness from health facilities. Considering these facts, the data collected in different regions were analyzed using the SPSS 9.00 version of the statistical program. The characteristics of plants, the number of responses given by families on the application of medicines prepared from them were

estimated. The data collected were refined using percentages and ratios. The frequency of cases (FC) was calculated on the basis of reports presented by local communities for each plant species used.

Use value: the relative importance of plant species was evaluated by calculating its use value as de-

scribed by Phillips and Gentry [1993]. Use value for species i $UV_i = \sum U_i / N_i$, where the number of use report (s) cited by each informer for specific plant species i is represented by U_i and total number of informers interviewed for specific plants pieces i is represented by N_i (Table 1).

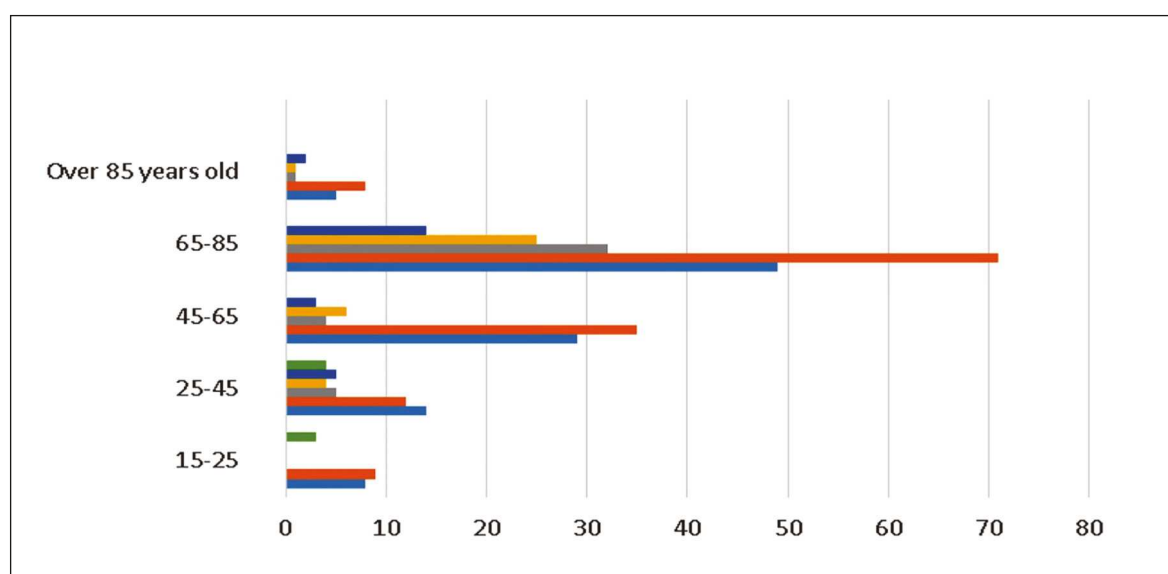


Figure 1. The number of human populations participating in the survey.

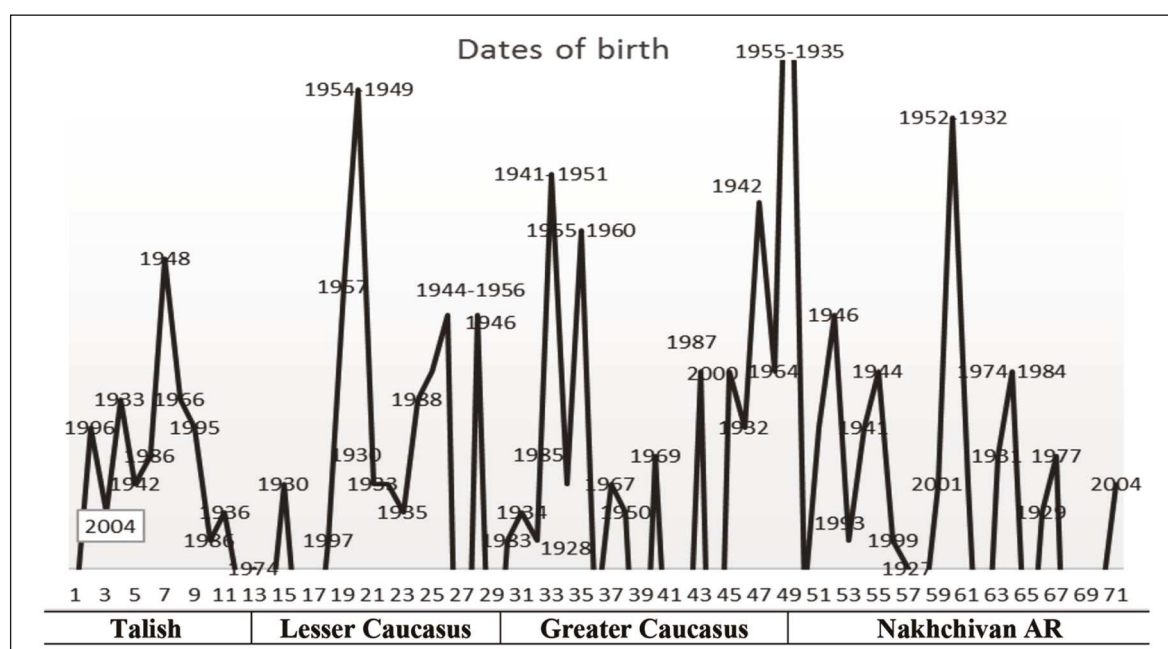


Figure 2. Age indicators of 75 rural communities participating in the interviews.

RESULTS

At present, due to advanced and based on in-depth scientific data use of medicinal plants, the basis is created for elimination diseases. Today, the ways to use herbs are versatile: herbal juices, raw salads, infusions, cooking, ointments, etc. The effect of their biologically active substances directly on the areas where the pathological process takes place, along with the treatment of the patient, also creates conditions for improving the defense system of the organism. It should be noted that herbal medicines never cause complications. During the expeditions and field excursions carried out by our group, conversations were held with the local population and the directions of use of species belonging to the Polygonaceae family in the regions were studied.

In the interviews, 20 people aged 15-25, 44 people aged 25-45, 77 people aged 45-65, 191 people aged 65-85, and 17 people over 85 were interviewed (Fig. 1). As it can be seen, the data on the use of plants as medicine and food were mostly obtained from the older generation. The use of medicinal plants and the population trust in this treatment method are no less important from an environmental point of view. Thus, a person who has experienced the importance of plants and their therapeutic effect will never be indifferent to such richness of nature and will protect them with all their heart. Thus, the areas of distribution of 14 species of the Polygonaceae family were carefully studied and the characteristics of vegetables, harvesting times, and ethnopharmacological features in folk medicine were determined (Table 1).

During the expedition and field excursions, the role of the above 14 species in the flora of Azerbaijan was determined and it was found that the family was represented in alpine and subalpine meadows by 6 (*Oxyria digyna*, *Aconogonon alpinum*, *Polygonum alpestre*, *Rumex alpinus*, *Rheum turkestanicum* and *R. ribes*) species, in forests by 1 (*Rumex acetocella*) species, and in swamp vegetation by 2 (*Persicaria hydropiper* and *Polygonum monspeliense*) species. The rest of the species were distributed in mountain-xerophyte vegetation. Of these species, *Rheum turkestanicum* and *R. ribes* were found

only in the Nakhchivan Autonomous Republic, mainly in the highlands of the Shahbuz (Gishlag village Boz Gaya) and Sharur (Akhura, Havush heights) regions.

It should be noted that while the specificity of the natural conditions of the area is reflected in the systematic composition of its flora, the inhomogeneity of its ecological conditions allows determining the composition of life forms of phytocenoses, dominants in vegetation. During the research, taking into account the biomorphological features and their evolution, the ecological classification of the life forms of plants was studied, and the time of collection of the organ used for therapeutic purposes was also considered.

All species of the family used in ethnopharmacology are perennial herbs. We have noted that the *Rumex* species are widely used as a food plant and are distributed in Azerbaijan only in the biodiversity of LC, GC, and Nakhchivan Autonomous Republic, which is due to their mechanical growth. Representatives of the genera *Rheum* and *Polygonum* are mainly adapted to exochorous pollination by insects and propagate in this way. Therefore, their distribution area is limited.

Other species of the family are also distinguished by their beneficial properties and medicinal importance, but they are not used as vegetables. As a result of the research, it was found that some of the plants studied are widespread in the flora and can be used as a biological raw material base. However, some plants are in danger of extinction due to their unlimited gathering (*Rheum ribes*). The following table shows resource assessments of wild vegetables in the *Polygonaceae* family of the Azerbaijan flora used in ethnopharmacology (Table 2).

As seen in Table 2, there are still sufficient stocks of vegetable plants of medicinal importance in the two districts. They are widespread in the flora and can provide local communities. It should be noted that these plants are collected massively and sold in markets. Therefore, some species are endangered. Thus, the cultivation of the species used both as medicine and vegetables, in the regions, will prevent them from extinction.

The Latin name of the plant and the number of FC	Used organ and months. Spread regions	In ethnopharmacology	Use as a vegetable
<i>Rheum ribes</i> L. FC-15	Above-ground parts, roots and rhizomes; V-VI; Nakh.AR	The underground organs of the plant have astringent and hemostatic properties. Above-ground organs are used in kidney diseases, gynecological diseases, lymphangitis, and furunculosis. Rheum has an astringent effect when applied in small doses, and a laxative effect at high doses. It has also a strong sedative, anti-inflammatory, antiseptic, choleric, and strengthening effect.	Thick flower stalks are peeled and eaten raw. Soup, porridge, omelet, compote, pie, jam, marmalade, juice, etc. are prepared from shoots. The shoots are also dried and used in winter.
<i>Rheum turkestanicum</i> Janisch. (= <i>R. rupestre</i> Litv. ex Losinsk.) FC-9	Above-ground parts, roots; IV-V; Nakh.AR	The underground organs of the plant have astringent and hemostatic properties. Above-ground organs are used in kidney diseases, gynecological diseases, lymphangitis, and furunculosis.	Thick flower stalks are peeled and eaten raw. Young shoots are collected by the population in the spring for sale. Soup, porridge, omelet, compote, pie, jam, marmalade, juice, etc. are prepared from shoots. The shoots are also dried and used in winter.
<i>Oxyria digyna</i> (L.) Hill (= <i>O. elatior</i> R.Br. ex Meissen.) FC-6	Leaves and shoots; IV-VI; GC, LC, Nakh.AR	It is used against inflammation of the teeth and scurvy.	The leaves and shoots are sour and eaten fresh. The leaves have long been used in the preparation of various dishes. It improves the taste of dishes such as dovgha, soup, bughlama, etc. This plant is dried and stored for winter by the local population.
<i>Rumex acetocella</i> L. FC-19	Above-ground parts, VI-VIII; GC, LC, Nakh.AR	The above-ground parts of the plant are used in tumors, non-specific polyarthritis, and as a wound-healing agent. Infusions made from the leaves and shoots are used in dental bleeding, urinary retention, in the treatment of malignant tumors, dysentery, hemorrhoids, tuberculosis, etc.	Salads are made from the leaves and stems of the plant, pilaw and flat pie with greens containing vitamins are cooked. Young shoots and leaves are eaten raw. It has a sour taste. It is dried and added to dishes in winter. Different salads are prepared from fresh leaves. Young shoots are salted and stored for winter use.
<i>Rumex acetosa</i> L. FC-20	Above-ground parts, V-VI; GC, LC, Nakh.AR	It is used in non-specific polyarthritis, infectious diseases, wound healing. The choleric juice of the plant is used also against fever, scurvy, itching, rheumatism. Infusions are used in internal bleeding, skin diseases as a bandage, in the treatment of tumors, and urinary retention. The fruit infusion is used as a remedy.	The locals gather these plants in May-June before flowering and braid them like hair, dry and prepare them for the winter. The leaves are used as a vegetable. Various dishes are prepared from the dried plant in winter.
<i>Rumex crispus</i> L. FC-26	Roots and above-ground parts; V-VI;	An ointment made from the roots and leaves is used in tuberculosis, cancer, strengthening the gums, and as an antialcoholic agent. It is used as a laxative, astringent, wound healing, diaphoretic, and antipyretic agent.	Dried parts of the plant are cooked and used. In winter, it is used for cooking pilaw or fried with oil and onions. The dried parts are chopped and added to various dishes. Freshly picked leaves and stems of the plant are used in salads and pies.

<i>Rumex patientia</i> L. FC-17	Roots and above-ground parts; V-VI; GC, LC, T, Nakh.AR	Infusion of roots and leaves is used as a laxative, astringent, wound healing, diaphoretic, and antipyretic agent.	The dried plant is cooked and used. The dried parts are chopped to give the food a sour taste as a food additive. Freshly picked leaves and stems of the plant are used in salads and pies.
<i>Rumex alpinus</i> L. FC-9	Roots and above-ground parts; V-VI; GC, LC, Nakh.AR	The extract from the root treats diarrhea, benign and malignant tumors. In folk medicine, its infusion and extract are used as astringent, it strengthens the gums, and is used in colds.	The leaves are used as food, for preparing salad and cakes. The above-ground parts of the plant are dried and used in winter.
<i>Rumex euxinus</i> Klok. FC-11	Leaves; V-VII; GC, LC, Nakh.AR	It is used in the treatment of gastrointestinal diseases.	The leaves are used as food. Dried and braided leaves are cooked and fried with oil and onion, added to various dishes, including pilaw.
<i>Rumex scutatus</i> L. FC-19	Leaves; V-VI; GC, LC, T, Nakh.AR	Dishes made from this plant are not only tasty food but also have medicinal value. It helps normalize the gastrointestinal tract. When cooked in water and rice broth it is a powerful remedy for diarrhea.	The locals collect this plant before the flowering and weave it like hair, dry and store it for winter. Various dishes are prepared from the dried plant in winter: pilaw, umaj, gindi, which is prepared with milk, dovgha, gutab, soup, etc. The leaves are edible.
<i>Polygonum monspeliense</i> Thieb.ex Pers (= <i>Polygonum aviculare</i> L.) FC-26	Above-ground parts; IV-V; GC, LC, T, Nakh.AR	Herbal infusions and extracts are used in the treatment of gastrointestinal diseases, as a painkiller, and an anti-inflammatory agent. Its leaves are used to treat dislocations, fractures, and furuncles. Preparations made from it are used against fever, tumors, and tuberculosis. In scientific medicine, dried grass is used as hemostatic in internal bleeding, and the extract is used as a diuretic.	The above-ground parts are collected until flowering. The plant is used raw and cooked. Dovgha, bughlama, pilaw, pie, etc. are prepared. Salads are prepared from the fresh plant. Puree is cooked with urtica. Its rice-cooked pilaw is very tasty with garlic yogurt. It is supplied for the winter and used to make umac and sabzi (fried with meat). Its flour obtained by drying and grinding is used to make porridge.
<i>Polygonum alpestre</i> C.A. Mey. FC-11	Above-ground parts; IV-V; GC, LC, T, Nakh.AR	Infusions and extracts prepared from above-ground parts are used for medicinal purposes in the treatment of gastrointestinal diseases, as a painkiller and anti-inflammatory agent.	The aboveground parts are collected until flowering. The plant is used raw and cooked. Dovgha, bughlama, pilaw, pie, etc. are prepared. Salads are prepared from the fresh plant. Its rice-cooked pilaw is very tasty with garlic yogurt. It is dried and supplied for winter. It is used to make umac and sabzi (fried with meat). Its flour obtained by drying and grinding is used to make porridge. The leaves are used as food when raw.
<i>Aconogonon alpinum</i> (All.) Schur FC-7	Roots, rhizomes, young shoots; V-VI; BP, GC, LC, Nakh.AR	Infusion and extract made from roots and rhizomes are used in the treatment of the diseases of the gastrointestinal tract and the nervous system. It is used as tonic and astringent agent. When chopped, it is placed on the tumors. The extract from above-ground parts is used against tuberculosis, cough, diarrhea and scurvy.	Young shoots have a sour taste. They are peeled and eaten fresh. Shoots are used raw and cooked for preparing salads, pies, gutab, etc. It is also added to meat dishes. Young stems are used after peeling and salting.

<i>Persicaria hydropiper</i> (L.) Spach FC-12	Leaves; V-VII; GC, T., Nakh.AR	In folk medicine, it is prescribed in the form of infusions and decoctions for hemorrhoids, gout, rheumatism, diseases of the endocrine system.	The dried leaves of the plant are a culinary spice. A pie is baked from young shoots.
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Table 1. Ethnopharmacological use of wild vegetables of the Polygonaceae Juss. family in the Azerbaijan flora. GC: Botanical-geographical regions of the Greater Caucasus (Sheki, Ismayilli, Shamakhi); LC: Botanical-geographical regions of the Lesser Caucasus (center, south, and north-east of LC); Nakh.AR: Nakhchivan Autonomous Republic (Nakhchivan mountain, Nakhchivan plain, Nakhchivan High mountain villages); BP: Bozgir plateau; T: Talish.

Species	Spread area (ha)	10 kv2 number	Biological reserve (ton)	Annual supply (ton)
<i>Rumex euxinus</i>	675	19+0.09	1051.2+ 51.86	525.1+ 0.88
<i>Rumex acetosella</i>	714	15+0.05	4940.0 + 220.6	2494.0 + 2.26
<i>Rumex acetosa</i>	1100	25+0.09	9245+ 473.32	1824.5+ 4.72
<i>Rumex scutatus</i>	1171	28+0.14	3301+139.67	1530.1+1.37
<i>Rumex patientia</i>	4803	15.6±1.25	2940.8±238.0	1470.4±119.0
<i>Rumex alpinus</i>	875	9.61±0.79	1736.25±149.4	868.12+74.7.0
<i>Rumex crispus</i>	4981	19.45±1.60	3170.64±248.4	1585.32±124.2
<i>Oxyria digyna</i>	428	8.67±0.62	1823.28±156.8	911.64±78.4
<i>Aconogonon alpinum</i>	105	9+0.05	71.35+ 0.30	37.15+ 0.03
<i>Polygonum monspeliense</i>	235	16+0.09	3015+ 204.6	1501.5+ 2.61
<i>Polygonum alpestre</i>	570	14+0.07	3814+214.68	1812. 4+1.87
<i>Persicaria hydropiper</i>	765	21.77±1.80	3169.64±240.28	1584.8+120.14
<i>Rheum ribes</i>	178	7+0.03	1367 +79.26	786.7 +0.96
<i>Rheum turkestanicum</i>	80	15+0.08	360 + 21.42	170 + 0.14

Table 2. Resource assessments of wild vegetables in the Polygonaceae family of the Azerbaijan flora (Shahbuz and Sharur districts of the Nakhchivan AR, Goygol, and lowland Garabagh regions of the Lesser Caucasus) used in ethnopharmacology.

CONCLUSIONS

Ethnobotanical analysis revealed that information on the use of plants was obtained mainly from women aged 65-85 years.

The underground organs of the *Rheum* species are astringent and hemostatic, the above-ground organs are used in kidney diseases, gynecological

diseases, lymphangitis and furunculosis; *Persicaria hydropiper* in hemorrhoids, gout, rheumatism, endocrine system diseases; *Aconogonon alpinum* in diseases of the gastrointestinal tract and the nervous system; Root extracts of *Rumex* species are used for the treatment of diarrhea, benign and malignant tumors. *Polygonum* species are mainly used as painkillers and anti-inflammatory agents.

The analysis of the Resource assessments showed that species of the *Rumex* genus have the following annual supply reserves: *R. crispus* 1585.32, *R. patientia* 1470.4, *R. acetosa* 1824.5, *R. alpinus* 868.12, *R. acetosella* 2494, *R. euxinus* 1530.1 tons. Besides, the species of the *Polygonum* genus can supply the following annual raw material: *Polygonum monspeliense* 1501.5, *P. alpestre* 1812.8; *Persicaria hydropiper* 1584.8; *Oxyria digyna* 911.64; *Rheum ribes* 786.7, *Rh. turkestanicum* 36; *Aconogonon alpinum* 170 tons.

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