

## Study Of Chemical Composition Of The *Polygonum alpestre* Flowers

E.N. Jafarova<sup>2</sup>, L.A. Mustafayeva<sup>1\*</sup>

<sup>1</sup> Institute of Botany, Azerbaijan National Academy of Sciences, 40 Badamdar Highway, Baku AZ1004, Azerbaijan;

\*E-mail: latafat\_mustafaeva@yahoo.co.uk

<sup>2</sup> Genetic Resources Institute, Azerbaijan National Academy of Sciences, 155 prospect Azadliq, Baku AZ1106, Azerbaijan

**For the first time quantitative and qualitative composition of biologically active and nutritional substances of the flowers of *Polygonum alpestre* was investigated. It has been established that the flower contains 2.3% total sugar, 0.87% organic acid, 1.2% pectin, 9.4% vaccine, 2.34% flavonoids, 0.58% anthocyanins, 0.8% catechine, 2.3 mg of carotenoids, 358 mg of vitamin C. Glucose, arabinose, galactose was found in the sugar mass, malic and oxalic acid in organic acid mass, quercetine, kaempferol, myricetin derivatives, anthocyanins - sianidin and delfinidin derivatives, carotenoids -  $\beta$ -karotin, zeaksanthin, kriptoksantin, catechins - epigallocatechin, gallocatechin, epigallocatechingallate in the flavonoids mass. It has been established that the flowers of *Polygonum alpestre* can be used as a source of raw material to get medicine means.**

**Keywords:** *Polygonum alpestre*, flower, flavonoid, anthocyan, carotenoid, catechin, sugar, organic acid

### INTRODUCTION

The flora of Azerbaijan is rich in plants with valuable medicine, nutrients, essentials, ash and biological active ingredients. Medicinal herbs are widespread among them. According to the recent information, the flora of Azerbaijan has 1547 species of medicinal herbs used officinalis and in traditional medicine (Мехтиева, 2015). Among the medicinal plants the species of the family *Polygonaceae*, especially genus *Polygonum* L. ranks takes the first place. The family *Polygonum* is represented by 5 genus and 53 species in the flora of Azerbaijan (Рзазаде, 1992). The genus *Polygonum* occupies the first place among other genera of the family. The genus *Polygonum* is represented by 28 species in our flora which means 70 percent of the species in the Caucasus flora. It is related to different natural conditions and geomorphological structure of Azerbaijan compared to other regions of the Caucasus.

The species of *Polygonum* is commonly used as a astringent, general strengthening, and diuretic remedy (Растительные ресурсы, 1987). As a folk remedy it is used as astringent, in hypotensive, tuberculosis, stomach ulcers, diarrhea, malaria, various tumors, diseases of urinary bladder (Махлюк, 1967). It is also widely used in chronic gastritis, bronchitis, kidney diseases, cough, tuberculosis, etc.

Above ground part of species of genus *Polygonum* contain flavonoids (Минаева и др., 1973), phenolcarbonic acids (Hörhammer et al., 1955), organic acid in their leaves, vitamins,

flavonoids, carotene, tanning substance (Макаров, Прямова, 1977) and others. The therapeutic properties of species of genus *Polygonum* include biologically active ingredients - flavonoids, tanning substance, phenolcarbonic acids, catechins, etc. These ingredients have antioxidant, antimutagenic, anticarcinogen and other properties (Новрузов, 2005; Cody V. et al., 1988). Although species *Polygonum* have important medical, nutritional and other useful properties, they are very poorly studied in Azerbaijan. In recent years the discovery of plants that contain antioxidant, antibacterial and other properties is quite urgent task is the science of biology.

We aimed to study the flowers of *Polygonum alpestre* C.A.M of the genus *Polygonum* taking into account its nutritional and medicinal importance.

### MATERIALS AND METHODS

The material of the research is the flowers of the widely spread *Polygonum alpestre* of the Greater Caucasus in Guba. The plant material was collected in 2014 during flourishing phase around the village of Khulif in the Gusar region.

The amount of organic acids, sugar, pectin was determined by methods of A.I.Ermakhov and others (Девятин, 1964), C vitamin – Tilmine (Девятин, 1964), carotenoids - Dorodiyeva (Дородиева, 1967) and E.Novruzov (Новрузов, 2005), anthocyanins - U.G.Skorikova, A.A.Shaftan (Скорикова, Шафтан, 1968), catechins - V.L.Vilogrova (Вигоров, 1972), flavonoids - V.M.Petrenchenko et

al. (Петреченко и др., 2002). The quality composition of sugars was determined by methods of O.A.Pavlinova (Павлинова, 1962), organic acids – S.V.Soldatenkova, T.A.Mazurov (Солдатенков, Мазурова, 1962), anthocyanins - L.A.Shamsizade, E.N.Novruzov (Шамсизаде, Новрузов, 1987), carotenoids (Новрузов, 2005), flavonoids (Новрузов, 2004), catechins- E.N.Novruzov et al. (Новрузов и др., 1983).

## RESULTS AND DISCUSSIONS

The results of the analysis show that the flowers of *Polygonum alpestre* is rich in nutrients and biologically active substances. It has been established that the flower contains 2.3% total sugar, 0.87% organic acids, 1.2% pectin, 9.4% tanning substance, 2.34% flavonoids, 0.58% anthocyan 0.8% free catechine, 2.3 mg carotinoids, 358 mg% vitamin C.

As a result of analysis of organic acid glucose, arabinose, galactose was found in sugar mass, malic and oxalic acid in organic acid mass

After carbohydrates and proteins, organic acids are widely spread in the world of plants, participate in various metabolic processes in the plant organism and the synthesis of a number of substances. There is information about the therapeutic significance of various organic acids in the literature. For example, the malic acid is very important in radiation due to its radioprotective properties.

It is also important for the flowers of *Polygonum alpestre* to store enough pectin in. This substance has antiradic and antitoxic properties and removes the toxic substances in the gastrointestinal tract and radionucleotides which entered the organism in various ways (Беззубов, Хатика, 1961; Беззубов и др., 1960). It has been established that pectin is also involved in stabilization of vitamin C.

One of the ingredients found in the flowers of *Polygonum alpestre* is vitamin C. Vitamin C improves the oxidation and reduction processes in the organism, and in the treatment of scurvy and the activation of vitamin P as antioxidant. Taking into account the fact that the organism needs 50 mg of vitamin C throughout the day, it is possible to compensate for the organism's vitamin C by taking 25 g of flower extract per day. Taking into account the fact that the presence of polyphenols (P vitamins) with hypotensive, vascular enhancer, anti-septic, urine and gallbladder, antioxidant, antiradiant, anticancerogen and other physiologically active agents (P vitamins) with a wide range of treatment and daily human requirement for vitamin P is 100-200 mg, it is advisable to use the flower of the *Polygonum alpestre* for the treatment and

prevention of various diseases. Considering that the flowers store substances of P-active vitamins up to 13%, the therapeutic effect of vitamin C when using the flowers will be high.

Substances with P vitamin activity, besides increasing the activity of vitamin C, reduces the blood vessels' permeability, improves elasticity, plays an important role in the removal of cholesterol from the organism and inflammation of bile duct. Flavonoids, tannins, catechins, anthocyan, antioxidant, antiradiant, anticancerogen with vitamin P activity have antimicrobial action. The various therapeutic effects of polygonum species are related to the quantity and quality of these substances.

Most of the substances with vitamin P activity of the flowers of *Polygonum alpestre* belong to tannins (tanning substance). It has been established that tannins were formed from two groups of substances: pyrogallol and pyrocatechin. The pyrocatechin group forms about 60% of tannin. It also indicates that vitamin P activity and antioxidant properties of tannin in the flower is high.

10 phenol substances were found in the total of flavonoid extracted by ethyl acetate using two-direction paper chromatography method (butanol-acetic acid-water 4:1:1 first direction, water - acetic acid 85:15 second direction). 6 components out of them give a characteristic response to flavonoids. Mass of flavonoids were hydrolyzed for 2 hours with 2% sulfuric acid and diethyl ether with aglycon was extracted from hydrolyzate. After totally removal of ether, the residual was dissolved in the alcohol and aglycon composition of flavonoid mass was studied by means of chromatography. Two (2) aglycons were found in the system of isopropyl alcohol-acetic acid-water (2:5:5) through one-direction chromatogram. When two-direction chromatography was used (in the second direction, butanol-acetic acid-water 4:1:1), three (3) well-separated aglycons were found in the chromatogram. When substances obtained in chromatographs are checked in Rf, in normal condition and under UB light and revealed with ammonia and 2% AlCl<sub>3</sub> solution then it makes possible to determine the aglycons as kaempferol, quercetine, myricetin derivatives.

We also have to point out that in the two-direction chromatograms, mix of quercetine and myricetin is shown as a long spot. From here, we can conclude that the flavonoids found in the mass of flavonoids are derivatives of kaempferol, quercetine and myricetin.

Chromatographic analysis of the mass of anthocyanins (butanol - acetic acid - water 4:1:1 and water - acetic acid - chloride acid 82:15:3) showed three anthocyanins. The initial anthocyanins mass was hydro-

lyzed to determine the anthocyanins. Anthocyanins mass is solved in methyl alcohol and solid hydrochloric acid was added and heated in a water bath for 20 minutes. Anthocyanidins were extracted from the hydrolyzate by amyl alcohol and anthocyanidin aglycons were determined by means of two-direction chromatography. Based on chromatographic and spectral data, aglycons were identified as cyanide and peonidine. Two of the anthocyanins are cyanide and one is delphinidin derivative.

Mass of carotenoid was analyzed by thin-layer chromatography. The analysis was carried out in the Silufol-245 plates (Germany) and in the systems of petroleum ether-acetone (96:4) and petroleum ether-benzol-methanol 60:10:1. Three (3) carotenoids have been found in the chromatogram. The substances in the chromatogram are identified as  $\beta$ -carotene, zeaxanthin, and cryptoxanthin according to the Rf, the color and the absorption zone in the UV spectrum.

Catechin mass after condensing with polyphenol mass extracted with ethyl acetate is settled by means of chloroform. The sediment was dissolved in ethyl alcohol and the composition of catechin was studied by means of paper chromatography. The chromatogram was measured with UV light and 1% vanillin layer was found with solid chloride acid solution.

Three components were detected in the chromatogram. Based on the action of the substances in the chromatogram, the colors with various reagents and the comparison with tea catechin, catechins were found to be identical with (-)epigallocatechin, (+)gallocatechin, and epigallocatechin gallate.

It is possible to conclude from this that the flowers of *Polygonum alpestre* is rich in biologically active and nutritious substances and can be a source of raw materials to obtain medicine means with antioxidant, antiradical, antibacterial, vitamin P and C activity.

## CONCLUSIONS

1. It is for the first time the chemical composition of the flowers of *Polygonum alpestre* species has been analyzed and determined that its flowers are rich in biological active ingredients - flavonoids, catechin, anthocyan, carotenoids and polyphenols.
2. Chromatographic analysis showed that the mass of flavonoids consist of quercetin, kaempferol, myricetin, the mass of anthocyan- cyanidine, peonidin, the mass of catechin – catechin, epigallocatechin, gallocatechin, and epigallocatechin gallate the mass of carotinoid -  $\beta$ -carotene, zeaxanthin and cryptoxanthin.

3. The amount of polyphenols in flowers shows that it can be used as a source of raw material to get medicine with antioxidant, antiradiant and other biological active properties.

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### *Polygonum alpestre* Çiçəklərinin Kimyəvi Tərkibinin Tədqiqi

E.E. Jafarova<sup>1</sup>, L.A. Mustafayeva<sup>2</sup>

1. Institute of Genetic Resources Azerbaijan NAS

2. Institute of Botany Azerbaijan NAS

İlk dəfə olaraq *Polygonum alpestre* növünün çiçəklərinin bioloji fəal və qidalı maddələrinin miqdarı və keyfiyyət tərkibi tədqiq edilmişdir. Müəyyən edilmişdir ki, çiçəyin tərkibində 2,3% ümumi şəkər, 0,87% üzvi turşu, 1,2% pektin, 9,4% aşı maddəsi, 2,34% flavonoid, 0,58% antosian, 0,8% katexin, 2,3 mq% karotinoid, 358 mq% C vitaminin saxlayır. Şəkər cəmində qlükoza, arabinoza, qalaktoza, üzvi turşu cəmində alma və quzuqulağı turşusu, flavonoid cəmində kversetin, kempferol, mirisetin törəmələri, antosianlar sianidin və delfinidin törəmələri, karotinoidlər - β-karotin, zeaksantin, kriptoksantin, katexinlər – epiqallokatexin, qallokatexin, epiqallokatexinqallat aşkar edilmişdir. Müəyyən edilmişdir ki, Dağ qırxbuğumu çiçəklərindən dərman vasitəsi almaq üçün xammal mənbəyi kimi istifadə edilə bilər.

**Açar sözlər:** *Polygonum alpestre*, çiçək, flavonoid, antosian, karotinoid, katexin, şəkər, üzvi turşu

### Исследование Химического Составы Цветков *Polygonum alpestre*

Э.Э. Джафарова<sup>1</sup>, Л.А. Мустафаева<sup>2</sup>

<sup>1</sup> Институт ботаники НАН Азербайджана

<sup>2</sup> Институт генетических ресурсов НАН Азербайджана

Впервые исследован качественный состав и количественное содержание биологически активных и питательных веществ цветков *Polygonum alpestre*. Установлено что, цветки содержат 2.3% общего сахара, 0.87% органических кислот, 1.2% пектин, 9.4% дубильные вещества, 2.34% флавоноид, 0.58% антоциан, 0.8% катехин, 2.3 мг % каротиноид, 358 мг % витамина С. В составе сахаров обнаружено наличие глюкозы, арабинозы, галактозы, из органических кислот яблочная и щавелевая кислоты, флавоноидов – производные кверцетина, кемпферола, мирицетина, антоцианы – производные цианидина и пеонидина, каротиноидов - β-каротин, зеаксантин, криптоксантин, катехинов – эпигаллокатехин, галлокатехин, эпигаллокатехингаллат. Выявлено, что цветки горца горного можно использовать как сырье для получения лекарственного средства.

**Ключевые слова:** *Polygonum alpestre*, цветки, флавоноид, антоциан, каротиноид, катехин, сахар, органическая кислота