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## **Ethnopharmacological application the plants from family Geraniaceae in the Pirot County**

### **Етнофармаколошка употреба биљака из фамилије Geraniaceae у Пиротском округу**

***Abstract:** The subject of this study was the study of the ethnopharmacological application of plants from family Geraniaceae in the Pirot County (South-eastern Serbia). The research was conducted in the form of surveys among the rural population in four municipalities: Pirot, Babušnica, Bela Palanka, and Dimitrovgrad. The analysis of the survey showed that the population of the County was used *Erodium cicutarium* (1 report), *Geranium macrorrhizum* (7 reports), *Geranium robertianum* (1 report), and *Pelargonium gra-**

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*veolens* (1 report) in the folk medicine for internal application. *Erodium cicutarium* was used against spasms in the abdomen of children (1 report), *Geranium macrorrhizum* against bronchitis (2 reports), diabetes (1 report), for rejuvenation (1 report), high blood pressure (2 reports), and Parkinson's disease (1 report), and *Pelargonium graveolens* against diabetes (1 report). One respondent has mentioned the use of *Geranium robertianum*, but without the knowledge about its use. The results were compared with the results of previous ethnobotanical studies in neighboring regions. Our results about the applications of species from the family Geraniaceae are completely different from their ethnobotanical surveys in Serbia and the Balkan Peninsula.

**Keywords:** Geraniaceae, ethnopharmacological application, Pirot County

**Сажетак:** Предмет овог истраживања било је проучавање етнофармаколошке употребе биљака из фамилије Geraniaceae у Пиротском округу (југоисточна Србија). Истраживање је спроведено у облику анкете међу сеоским становништвом у четири општине: Пирот, Бабушница, Бела Паланка и Димитровград. Анализа извршене анкете показала је да становништво испитиваног округа користи *Erodium cicutarium* (1 изјава), *Geranium macrorrhizum* (7 изјава), *Geranium robertianum* (1 изјава) и *Pelargonium graveolens* (1 изјава) у народној медицини за унутрашњу употребу. *Erodium cicutarium* се користио против грчева у стомаку деце, *Geranium macrorrhizum* против бронхитиса (2 изјаве), дијабетеса (1 изјава), за подмлађивање (1 изјава), против високог крвног притиска (2 изјаве) и Паркинсонове болести (1 изјава), а *Pelargonium graveolens* против дијабетеса (1 изјава). Један испитаник је поменуо употребу врсте *Geranium robertianum*, али без знања о њеној употреби. Резултати су упоређени са резултатима претходних етноботаничких истраживања у околним подручјима. Наши резултати о употреби биљака из фамилије Geraniaceae се у потпуности разликују од других етноботаничких истраживања у Србији и на Балканском полуострву.

**Кључне речи:** Geraniaceae, етнофармаколошка примена, Пиротски округ

## INTRODUCTION

The species from family Geraniaceae are spread, as wild plants, in Serbia in two genera, *Geranium* (19 species) and *Erodium* (2 species) (Јанковић, 1973). According to the mentioned author, the species from genus *Geranium*, noticed in Serbia, are the following species: *G. phaeum* L., *G. villosum* Ten., *G. molle* L., *G. divaricatum* Ehrh., *G. pyr-*

*enaicum* Burm., *G. bohemicum* Torn., *G. pussilum* Burm., *G. dissectum* Jusl., *G. striatum* Jusl., *G. sanguineum* L., *G. sylvaticum* L., *G. asphodeloides* Burm., *G. palustre* Torn., *G. nodosum* L., *G. columbinum* L., *G. macrorrhizum* L., *G. lucidum* L., *G. purpureum* L., *G. robertianum* L., and the species from genus *Erodium* are the following species: *E. ciconium* (Jusl.) Ait, and *E. cicutarium* (L.) L' Herit.

*Erodium cicutarium* (L.) L' Herit. (folk name „živa trava“), *Geranium macrorrhizum* L. (folk name „zdravac“), and *Geranium robertianum* L. (folk name is the same as *E. cicutarium* - „živa trava“) were used as medicinal plants of Serbia (Сарић, 1989). According to the same author, aerial part of *E. cicutarium* (*Erodii cicutarii herba*) was used in the popular medicine as hemostatic, underground part of *G. macrorrhizum* (*Geranii macrorrhizii rhizoma*) was used as an astrigent, and aerial part of *G. robertianum* (*Geranii robertianii herba*) was used as styptic and antihemorrhagic. Marković et al. (2010) and Марковић, Ракоњац, Николић (2020) were mentioned the same three species as medicinal plants of the Pirot County, with the same user, and the following local names: *Erodium cicutarium* - „živa trava“, *Geranium macrorrhizum* – „baštenski zdravac“, and *Geranium robertianum* - „klinovita trava“, „zdravac“, „živa travka“. Марковић, Матовић, Ракоњац (2019) were noticed *G. macrorrhizum* in the forest associations on the Vidlič Mountain.

*Geranium macrorrhizum* and *Geranium robertianum* are protected with national legislative, with regulation named „Code on declaration and protection of strictly protected and protected wild species of plants, animals and fungi“ („Правилник о проглашењу и заштити строго заштићених и заштићених дивљих врста биљака, животиња и гљива“ – Службени гласник Републике Србије, бр. 5/10, 47/11 и 32/16). They can only be harvested with appropriate picking permits. Special care in determining contingents for collection from nature is necessary for these two species, as well as the others from a list of protected species in Serbia. The protection of their populations should be taken into consideration.

The aim of this study was to collect and analyze the traditional knowledge about species from family Geraniaceae in Pirot County and their use in medicinal purposes and to compare our results with previous ethnobotanical studies in Serbia and the Balkan Peninsula.

## METHODOLOGY

The study about knowledge and use of medicinal plants in Pirot County was carried out in the form of a population survey. The questionnaire about knowledge and use of herbs included inhabitants of 144 villages in four municipalities: Pirot, Babušnica, Bela Palanka, and Dimitrovgrad. A total of 631 were surveyed, of which 337 were male, and 294 female (Marković, 2019; Marković, Pljevljakušić, Kojičić & Cupara, 2020; Marković, Pljevljakušić, Nikolić & Rakonjac 2020; Marković, Pljevljakušić, Nikolić, Rakonjac & Stankov Jovanović 2020; Marković et al., 2021; Stankov Jovanović, Šmelcerović, Smiljić, Ilić, Marković, 2018).

The results were systematized using Microsoft Excel and presented in table 1 according to the municipalities (Pirot, Babušnica, Bela Palanka) and alphabetical order of the villages in the municipalities. In the columns the following information were entered: Latin name, folk name, municipality, village, gender, age of respondent, part of the plant that is used, and application.

## RESULTS AND DISCUSSION

It was noticed that four plant species from the family Geraniaceae were used in the folk medicine of the Pirot County, of which three plants were wild species (*Erodium cicutarium*, *Geranium macrorrhizum*, *Geranium robertianum*), and one plant was cultivated species (*Pelargonium graveolens*). All mentioned plants were for internal application.

A total of 10 interviewed persons mentioned the species from the family Geraniaceae and their medicinal usage (Table 1), of which 8 of them were Serbian nationality, 1 was Bulgarian nationality and 1 was Roma. Among respondents, a total of 4 was male, and 6 were female. In Pirot municipality, the species from family Geraniaceae were known to 5 respondents, in municipality Babušnica 3, and in municipality Bela Palanka 2 interviewed people. In municipality Dimitrovgrad the species from the family Geraniaceae were not mentioned. Gender of respondents which mentioned the species from the family Geraniaceae was 28 to 77 ages.

Table 1 Overview of the survey results in the Pirot County population about the application of species from family *Geraniaceae*Табела 1 Преглед резултата истраживања међу становништвом Пиротског округа о примени биљних врста из фамилије *Geraniaceae*

Latin name	Folk name	Municipality	Village	Gen.	Age	Nat.	Part used	Application
<i>Pelargonium graveolens</i> L' Her.	lezetra	Pirot	Brlog	F	77	Ser	folium	diabetes
<i>Geranium macrorrhizum</i> L.	zdravac	Pirot	Izvor	F	63	Ser	folium	for rejuvenation
<i>Geranium robertianum</i> L.	crveni zdravac	Pirot	Jelovica	F	56	Ser	herba	unknown use
<i>Geranium macrorrhizum</i> L.	zdravac	Pirot	Srečkovac	F	53	Ser	rhizoma	Parkinson disease
<i>Geranium macrorrhizum</i> L.	zdravac	Pirot	Crvenčevo	F	70	Ser	folium	high blood pressure
<i>Geranium macrorrhizum</i> L.	baštenski zdravac	Babušnica	Bratiševac	M	50	Roma	folium	bronchitis
<i>Geranium macrorrhizum</i> L.	zdravac	Babušnica	Vava	M	44	Ser	folium	diabetes
<i>Erodium cicutarium</i> (L) L' Her.	živa trava	Babušnica	Preseka	M	28	Bul	herba	against spasms in the abdomen of children
<i>Geranium macrorrhizum</i> L.	zdravac	Bela Palanka	Babin Kal	F	70	Ser	herba	bronchitis
<i>Geranium macrorrhizum</i> L.	zdravac	Bela Palanka	Novo Selo	M	57	Ser	folium	high blood pressure

The majority of interviewed persons mentioned the use of the leaves of the *Geranium macrorrhizum* in the form of tea in the treatment of bronchitis (2 reports), and against high blood pressure (2 reports). *Geranium macrorrhizum* was also used for rejuvenation (1 report), and against Parkinson disease (1 report). The leaves of *Pelargonium graveolens*, and *Geranium macrorrhizum* were used in the treatment of diabetes (1 report, each one). *Erodium cicutarium* was used against spasms in the abdomen of children (1 report). Likewise, one respondent mentioned *Geranium robertianum* but did not know its use.

*Geranium macrorrhizum* was also known as “zdravac” or “baštenski zdravac” to the local population of Pirot County, and *Geranium robertianum* as “crveni zdravac”. *Pelargonium graveolens* was known as “lezetra”, and *Erodium cicutarium* as “živa trava”.

Our results were compared with other ethnobotanical studies in Serbia and Balkan Peninsula. Menković et al. (2011) found that the population of the Prokletije Mountains in Montenegro was used *Geranium macrorrhizum* externally against inflammation of the skin and mucous membranes. The same authors mentioned the internal use of *Geranium robertianum* against diarrhea, gastritis, inflammatory conditions of the gallbladder and its ducts, kidney, and bladder, and external use against poorly healing wounds and mild rashes. Popović et al. (2012) studied phytotherapeutic plans from the Deliblato sands. They found that the population was used *Geranium robertianum* internally as an antidiarrheal and antihaemorrhagic agent, and externally as an anti-inflammatory agent. Matejić et al. (2020) in the most recent ethnobotanical study for eastern and southeastern Serbia, in the Svrljig and Timok, based on a survey of the local population, noted the use of *Geranium macrorrhizum* for immunity, eye infection, abdominal pains, as well as for kidney colic, swelling, and insomnia, and *Geranium robertianum* against abdominal pains. Živković et al. (2020) studied the taxonomic and pharmacological valorization of medicinal plants of the Pčinja gorge in southeastern Serbia. They mentioned *Geranium macrorrhizum* against digestive disorders. All mentioned applications of species from the family Geraniaceae were different from our results obtained in this study.

## CONCLUSION

Based on the results of interviews of the local population in Pirot County done in this study, it can be concluded that four species from the family Geraniaceae are known to people living in the rural areas: *Pelargonium graveolens*, *Geranium macrorrhizum*, *Geranium robertianum*, and *Erodium cicutarium*. They are used for the treatment of some medical indications. Leaves of *Geranium macrorrhizum* were used in the form of tea for the treatment of bronchitis, high blood pressure, for rejuvenation, and diabetes. Underground parts of *Geranium macrorrhizum* were used against Parkinson disease. The leaves of *Pelargonium graveolens* were used in the treatment of diabetes. Aerial parts of *Erodium cicutarium* were used against spasms in the abdomen of children. *Geranium robertianum* was mentioned by one person but without the knowledge of its use. Ethnopharmacological applications of mentioned

plant species from the family Geraniaceae in the Pirot County are new for Serbia and Balkan Peninsula.

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## РЕЗИМЕ

Биљке из фамилије Geraniaceae заступљене су у Србији као самоникле биљне врсте са два рода *Geranium* (19 врста) и *Erodium* (2 врсте). У Србији и Пиротском округу је забележено да се као лековите врсте из поменутих родова користе *Erodium cicutarium* (L.) L' Herit., чији је народни назив „жива трава“, *Geranium macrorrhizum* L., чији је народни назив „здравац“ или „баштенски здравац“, и *Geranium robertianum* L, чији је народни назив „клиновита трава“, „црвени здравац“, „жива травка“. *Erodium cicutarium* се користи као хемостатик, *Geranium macrorrhizum* као адстрингент, а *Geranium robertianum* као стиптик и антихеморагик.

Сеоско становништво у четири општине Пиротског округа анкетирано је о познавању и примени биљака из фамилије Geraniaceae у етномедицини, а добијени резултати су упоређени са етноботаничким истраживањима у осталим деловима Србије и Балканског полуострва. Забележено је да се четири биљне врсте из фамилије Geraniaceae користе у народ-

ној медицини Пиротског округа, од којих су три самоникле (*Erodium cicutarium*, *Geranium macrorrhizum*, *Geranium robertianum*), а једна култивисана (*Pelargonium graveolens*). *Erodium cicutarium* се користи против грчева у стомаку деце, *Geranium macrorrhizum* против бронхитиса, дијабетеса, за подмлађивање, против високог крвног притиска и Паркинсонове болести, а *Pelargonium graveolens* против дијабетеса. Један испитаник је поменуо употребу врсте *Geranium robertianum*, али без знања о њеној употреби. Резултати добијени анкетањем становништва у Пиротском округу о употреби биљака из фамилије Geraniaceae су различити и нови у поређењу са осталим етноботаничким истраживањима у Србији и на Балканском полуострву.

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