Traditional use of medicinal plants in rural areas of Osijek-Baranja county, Republic of Croatia

Smiljana Solarov[1,*], Gorana Eljuga[2], Milan Ilić[2], Jelena Živković[1], Nataša Jovanović Lješković[2], and Katarina Šavikin[1]

[1] Institute for Medicinal Plants Research "Dr. Josif Pančić", Belgrade, Serbia
[2] University Business Academy in Novi Sad, Faculty of Pharmacy Novi Sad, Trg mladenaca 5, Novi Sad, Serbia
[*] Corresponding author: ssolarov@mocbilja.rs

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In this study, the ethnobotanical use of medicinal plants in the rural areas of Osijek-Baranja County, eastern Republic of Croatia, was analyzed by conducting an ethnobotanical survey with 200 informants. Our aim was to collect and identify plant species used for therapeutic purposes and to record information on traditional herbal medicine. According to our study, 72 plant taxa belonging to 34 families were identified and their usage has been recorded. The most commonly used plants belong to the Asteraceae family followed by species from Lamiaceae, Rosaceae, Apiaceae, and Alliaceae families. Well-known medicinal plant species such as chamomile, linden, nettle, sage, calendula, houseleek, and mint were the ones most often used for medical treatment purposes. Different pharmaceutical forms were prepared, starting from infusions, juices, medicinal baths, poultices, syrups, ointments, oils, solutions, and mixtures with honey. The most common indications were various inflammations, colds, skin diseases, insomnia, nervous problems, menstrual problems, as well as digestive and urinary system related problems. Folk medicine in Osijek-Baranja County is intended mainly as a mode of primary health care in the healing of minor illnesses.

Key words: Medicinal plants; ethnobotany; Osijek-Baranja county; WHO

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1. INTRODUCTION

For thousands of years, people around the world have used herbal preparations to treat ailments ranging from the common cold to heart disease (Yost, 2010). Although in the past decades in the modern world, traditional medicine was somewhat neglected, nowadays we are witnessing an unprecedented revival of natural healing (Simon and Chopra, 2006). Fortunately, in rural regions, where modernism has not taken root, medicinal plants are still abundantly grown and used by local people (Hawkey, 1998). More than 80 % of people today use some form of herbal medicine to improve their health (Yost, 2010).

Phytotherapy is a method of treating, alleviating, and preventing diseases and ailments using whole plants or their parts (leaves, flowers, herbs, roots, etc.), for preparation of herbal medicinal products with pharmacologically active principles. Today, many scientific disciplines chemically, biodynamically, and pharmacologically justify the use of medicinal herbs and preparations used in traditional medicine. Modern phytotherapy is not only alternative medicine but also a part of scientific medicine and constitutes the basic prevention and help in curing various diseases (Tanović, 2004). Herbal medicines have been supported by the World Health Organization (WHO, 1999), which assists in the efforts of underdeveloped countries to increase the use of herbal medicines and thus spend less money on ready-made synthetic medicines (Inglis and West, 1986).

Ethnobotany is defined as a scientific discipline that deals with interactions between humans and plants (Jones, 1941). encompassing many sciences, from natural to social (Hamilton et al., 2003). The challenges faced by applied ethnobotany include preservation of plant species and other forms of biological diversity, botanical assessment of the conservation status of the species, sustainability of wild plant species, increased safety of food, nutrition, and health care, preservation, recovery, and dissemination of traditional botanical knowledge, strengthening ethnic and national identity (Campbell and Luckert, 2002; Cunningham, 2001; Hamilton et al., 2003; Laird, 2002; Martin, 1995)

Due to the increasing flow of information through modern media, the folk custom is slowly losing its authenticity, mixing with the custom of other cultures and slowly being forgotten. In this way, traditional knowledge of healing with medicinal

plants is also threatened with disappearance (Hazler Pilepić et al., 2015). Ethnobotany today tends to become a more analytical, quantitative, cross-disciplinary, and multi-institutional science including the issue of species conservation, sustainable development, cultural affirmation as well as intellectual property rights of indigenous and local people (Mlot, 1995). The Balkan Peninsula is one of the most important centers of biodiversity in Europe (Menković et al., 2014). This indicates a potentially large and diverse application of medicinal plants for medical purposes. However, a good part of this region is still not sufficiently ethnobotanically studied (Menković et al., 2014). The aim of our study was to collect and preserve ethnopharmacological knowledge from rural areas of Osijek-Baranja County (Republic of Croatia) and to compare traditional knowledge with scientifically proven data, especially those accepted by WHO (WHO, 1999).

2. MATERIALS AND METHODS

2.1. Research area and ethnobotanical survey

A survey questionnaire was used as an instrument to collect data for this research. It was composed of a series of general questions, which collected data on gender, age, the tradition of collecting medicinal plants, use of professional literature, and independent collection. Furthermore, the questionnaire contained questions about the names of medicinal herbs, the parts that are most often used, the purpose for which they are used, the method of preparation of medicinal herbs, and knowledge of contraindications and side effects. The questionnaires were anonymous. Ethnobotanical surveys were conducted in the period from June to July 2019 in rural areas of Osijek-Baranja County, Republic of Croatia, and included the following villages: Batina, Bilje, Branjin Vrh, Cerovac, Čeminac, Donji Miholjac, Darda, Gorjani, Grabovac, Jagodnjak, Josipovac, Karanac, Kneževi Vinogradi, Kneževo, Kozarac, Luč, Lug, Mece, Mirkovac, Okučani, Petlovac, Podolje, Popovac, Samatovci, Suza, Šumarina, Topolje, and Vuka. A total of 200 respondents were surveyed. The study was conducted with people who declared that they use medicinal plants. The questionnaires were conducted orally with all respondents. Regarding gender, there were 65 male respondents and 135 female respondents, i.e., 32.5 % men and 67.5 % women surveyed. The age of the respondents was between 19 and 86 years, with an average age being 50 years old. Out of 200 respondents, 35 are highly educated, while the rest have secondary education.

During the implementation of the questionnaire, the respondents were asked to list all the plants they use in the treatment of various health problems. All recorded plant species are classified according to disease categories, i.e. the international classification of primary health care accepted and approved by the WHO: general and non-specific (A), digestive system (D), blood, hematopoietic organs and immune mechanisms (B), endocrine/metabolic and nutritional (T), psychological (P), neurological problems (N), ophthalmological (F) and hearing problems (H), cardiovascular system (K), respiratory system (R), skin problems (S), musculoskeletal system (L), urinary system (U), pregnancy, family planning, children (W), female reproductive system (X) and male reproductive system (Y) (ICD-10, 2000). In data processing, all mentioned plant species were recorded, even in the case when they were mentioned by only one respondent (Pieroni et al., 2011).

3. RESULTS AND DISCUSSION

In this research, the ethnobotanical use of medicinal plants in the rural areas of Osijek and Baranja, in the east of the Republic of Croatia, was analysed by conducting an ethnobotanical questionnaire on the local population.

The collected ethnobotanical data were analyzed in order to obtain data on the frequency of use of a certain species and the number of the most frequently mentioned families, indications for use of plant species, the most commonly used plant parts, as well as preparation methods. The data collected during the field study were classified and compared with the monographs published by the World Health Organization (WHO, 1999).

In Table 1 all the plant species recorded by the survey questionnaire are presented together with the following information: Latin name of the species, author, English name of the species, and plant family. Then the plant parts that the respondents indicated they use were listed, as well as indications for use, classified according to the WHO classification. It is indicated whether the medicinal plant for the mentioned indication was applied internally (I) or externally (E). Also, the Table 1 column 'Preparation type', more precisely preparations of medicinal herbs (infusions, decoctions, macerates, etc.). In the last column of the Table 1, 'Comparison with WHO monographs' is given according to the monographs of the WHO (WHO, 1999).

According to our research, 72 plant species classified into 34 plant families are traditionally used in the researched area. The most used plants were from Asteraceae, Lamiaceae, Malvaceae, Urticaceae, Apiaceae, and Rosaceae family. These families include many medicinal plant species that can be easily reached in the ecosystem of the studied area. Because of this, we can say that, at least in part, their wide application in traditional medicine can be attributed to their predominance in the flora of the researched area. The largest number of respondents indicated the use of the following plant species: *Matricaria chamomilla* L. (119), *Tilia cordata* Mill. (66), *Urtica dioica* L. (60), *Sempervivum tectorum* L. (32), *Salvia officinalis* L. (32), *Calendula officinalis* L. (32). The three species with the most diverse application were *Ocimum basilicum* L., *Urtica dioica* and *Matricaria chamomilla*.

It is important to emphasize that all these medicinal plant species in folk medicine are primarily used for the treatment of minor illnesses, such as cold, flu, cough, etc. The three most frequently mentioned indications according to the WHO classification are R- respiratory system (mentioned 184 times by respondents), D - digestive system (mentioned 101 times by respondents), and S - dermatological system (mentioned 74 times by respondents). Under those three most common indications, the most common recorded sub-indications were cold, cough, asthma and flu (R); digestive problems, diarrhea, vomiting and increased appetite (D); skin care, warts, rashes, eczema and burns (S).

In relation to our respondents, several different ways of preparation and application of medicinal plants have been recorded. Most medicinal plants were consumed internally, while external use was recorded in a smaller number.

Table 1. Plant species used in the traditional medicine of Osijek-Baranja county

Latin name, English name, family name	Number of reports	Plant part	Indications	Preparation type	Comparison with WHO monographs
Abelmoschus esculentus Moench, Okra, Malvaceae	2	fruit	D: 2 (I: gastritis) T: 1 (I: acceleration of metabolism)	soaking in warm water	
Achillea millefolium L., Yarrow, Asteraceae	4	whole plant flower leaf	K: 1 (E: hemorrhoids) D: 1 (I: gastritis) K: 1 (I: lowers blood pressure) T: 3 (I: regulation of hormones, liver)	infusion ointment tonic	herb: /
Acorus calamus L., Sway, Acoraceae	1	root	R: 1 (I: for respiratory tract)	macerate	
Aesculus hippocastanum L., Horse chestnut, Sapindaceae	3	flower bark fruit	K: 4 (E: hemorrhoids, varicose veins) S: 1 (E: skin care)	ointment	Seeds: I: chronic venous insufficiency, pain and heaviness in the legs, muscle spasm, itching, edema E: symptomatic treatment of chronic venous insufficiency, sebum on the skin
Allium sativum L., Garlic, Amaryllidaceae	5	leaf	R: 3 (I: flu, bronchitis) D: 1 (I: for intestinal complaints) K: 3 (I: lowers blood pressure) T: 1 (I: lowers blood fat level)	fresh plant tincture	Bulbus: I: vascular changes, mild hypertension hyperlipidemia
Allium schoenoprasum L., Chives, Amaryllidaceae	3	leaf	K: 1 (I: lowers blood pressure) T: 1 (I: lowers cholesterol level) D: 1 (I: stimulates digestion)	infusion	
Aloe vera (L.) Burm. f., Aloe, Asphodeliaceae	2	root leaf	D: 1 (I: digestion) A: 1 (I: for all diseases)	infusion juice ointment gel	Dried aloe leaf juice: I: constipation
Anethum graveolens L., Dill, Apiaceae	2	leaf seed	R: 1 (I: cough) D: 1 (I: stomach upset)	infusion	

Arctium lappa L., Greater burdock Asteraceae	1	seed flower root	U: 1 (I: diuretic) T: 3 (I: diabetes, hepatitis)	infusion	
Arctostaphylos uva-ursi (L.) Spreng., Kinninnick, Ericaceae	1	leaf	U: 1 (I: urinary tract infection)	infusion	Leaf: /
Armoracia rusticana G. Gaertn., B. Mey. & Schreb., Horseradish, Brassiacaceae	3	root	Q: 2 (I: anti-fatigue) B: 1 (I: detoxification)	fresh plant	
Aronia arbutifolia (L.) Pers., Red chokeberry, Rosaceae	4	fruit leaf	K: 2 (I: lowers blood pressure, improves the cardiovascular system) B: 3 (I: immunity, antioxidant) T: 1 (I: lowers blood glucose)	juice infusion tincture	
Artemisia absinthium L., Wormwood Asteraceae	7	leaf whole plant flower herb root stem	K: 2 (E: hemorrhoids) D: 6 (I: stimulates digestion, anti-diarrheal, anti-bloating) X: 1 (I: painful menstruation)	infusion tincture	
Asparagus officinalis L., Sparrow grass, Asparagaceae	1	whole plant	T: 1 (I: diabetes) R: 1 (I: bronchitis)	infusion	
Bellis perennis L., Daisy, Asteraceae	3	flower whole plant	R: 2 (I: for the respiratory tract, bronchitis) B: 1 (I: inflammation)	infusion juice	
Beta vulgaris L., Beet, Amaranthaceae	9	root whole plant	B: 9 (I: immunity, anemia) R: 2 (I: cold) T: 2 (I: for liver, bile)	juice decoction	
Brassica oleracea L., Cabbage, Brassicaceae	2	leaf	L: 2 (E: rheumatism)	poultices	
Calendula officinalis L., Common marigold, Asteraceae	32	flower leaf root	S: 29 (E: skin care, wounds, burns, acne) D: 3 (I: problems with intestines, stomach) B: 1 (I: immunity) T: 1 (I: hepatitis) X: 1 (I: painful menstruation)	infusion ointment tincture cream balm juice	Flower: /
Carum carvi L.,	3	seed	D: 4 (I: stimulates digestion, against cramps, and flatulence)	infusion	

Caraway, Apiaceae				macerate fresh herb	
Ceratonia siliqua L., Carob, Fabaceae	1	root	T: 1 (I: lowers blood fat)	fresh plant	
Coriandrum sativum L., Coriander,	1	herb	D: 1 (I: stimulates digestion)	infusion	
Corylus avellana L., European hazelnut, Betulaceae	1	fruit	Y: 1 (I: potency)	mixing with honey	
Crataegus monogyna Jacq., Hawthorn, Rosaceae	2	fruit bark flower	K: 2 (I: for the heart, cardiovascular system) R: 1 (I: for respiratory tract) B: 1 (I: antioxidant)	tincture infusion	Leaf and flower: I: treatment of congestive heart failure II degree
Cucumis sativus L., Cucumber, Cucurbitaceae	1	fruit	S: 1 (E: skin care)	poultices	
Cydonia oblonga Mill., Quince, Rosaceae	9	leaf fruit	D: 9 (I: for digestive problems, antidiarrheal) R: 1 (I: cough)	infusion compote	
Cynara scolymus L., Globe artichoke, Asteraceae	1	leaf fruit	T: 1 (I: lowers cholesterol)	tincture	T: 1 (I: lowers cholesterol)
Daucus carota L., Wild carrot, Apiaceae	1	root	S: 1 (I: acne)	juice	
Echinacea angustifolia DC., Black Samson, Echinacea, Asteraceae	1	root	B: 1 (I: immunity)	tincture	Root: I: colds, infections of the respiratory system, immunity, urinary infections Herb: I: respiratory system infections, skin inflammation, urinary infections, immunity
Equisetum arvense L., Common horsetail, Equisetaceae	1	whole plant herb	R: 3 (I: for respiratory tract, bronchitis) T: 1 (I: gout) B: 2 (I: against bleeding in the body, anemia)	infusion	Herb: I: diuretic
Ficus carica L., Fig, Moraceae	6	fruit leaf	S: 5 (E: nipples) D: 6 (I: stimulates digestion)	dry fruit fresh juice tincture	
Foeniculum vulgare Mill.,	3	seed	D: 2 (I: stimulates digestion)	infusion	Fruit: /

Fennel, Apiaceae			X: 1 (I: menstrual problems) W: 1 (I: spasms in babies)		
Gentiana lutea L., Great yellow gentian, Gentianaceae	1	root	D:1 (I: stimulates digestion)	infusion	Root: I: possible benefit in dyspepsia
Glycyrrhiza glabra L., Liquorice, Fabaceae	1	root flower	R: 1 (E/I: asthma) P: 1 (I: antidepressant) B: 1 (against infections)	infusion ointment	Root: /
Helianthus tuberosus L., Jerusalem artichoke, Asteraceae	1	root	T: 1 (I: diabetes)	fresh plant decoction	
Helichrysum italicum (Roth) G. Don, Immortelle, Asteraceae	4	flower herb	S:1 (E: skincare) R: 1 (I: asthma) T: 1 (I: reduces blood fat level) N: 1 (I: migraine)	infusion macerate cream	
Humulus lupulus L., Hops, Cannabaceae	1	cone	T: 2 (I: liver, stimulates appetite) P: 1 (I: antidepressant)	infusion fresh plant	Cone: /
Hypericum perforatum L., St. John's wort, Hypericaceae	3	flower leaf stem	S: 2 (E: for burns, wounds) K: 1 (E: hemorrhoids) D: 1 (I: stimulates digestion)	infusion macerate	Herb I: for the treatment of depressive episodes
Laurus nobilis L., Bay tree, Lauraceae	3	leaf	R: 3 (I: for the respiratory tract, anti-cough)	infusion syrup	
Lavandula angustifolia Mill., Lavender, Lamiaceae	10	flower leaf bud	R: 3 (I: cold, sore throat, sinuses) L: 1 (E: muscle pain) N: 3 (I: migraine) P: 6 (I: against stress) D: 1 (I: stomach pain) X: 1 (I: menstrual pain)	infusion tincture macerate dried flowers	Essential oil: by inhalation: anxiety for calming down E: circulatory disorders Flower: /
Levisticum officinale W.D.J. Koch, Lovage, Apiaceae	1	whole plant	U: 1 (I: diuretic) T:1 (I: stimulates appetite)	infusion	
Lilium candidum L., Madonna lily, Liliaceae	1	flower	S: 1 (E: for wounds)	tincture poultices	
Malva sylvestris L., Common mallow, Malvaceae	2	whole plant leaf root	D: 1 (I: ulcer) In: 1 (I: urinary complaints)	infusion	

Matricaria chamomilla L., Chamomile, Asteraceae	11 9	flower whole plant leaf	D: 32 (I: stimulates digestion, against cramps) R: 45 (I: cough, cold, sore throat) A: 1 (I: preventive) S: 7 (E: skin care, for wounds) X: 3 (I: painful periods) P: 36 (I: for calmness, insomnia) B. 17 (I: inflammation, immunity)	infusion a bath poultices	Flower: I: flatulence, dyspepsia, mouth and gum infections, fatigue, insomnia, for calming down I: irritations and inflammations of the skin, mucous membranes (wounds, sores, insect bites) infections of the mouth and gums, hemorrhoids
Melissa officinalis L., Lemon balm, Lamiaceae	7	leaf flower	P: 7 (I: anti-stress, relaxing, calming) B: 1 (I: immunity) N: 1(I: migraine) P: 1 (I: insomnia) K: 1 (I: better heart function)	infusion	Leaf E: herpes on the lips
Mentha X piperita L., Peppermint, Lamiaceae	28	leaf, the whole plant, herb	R: 8 (I: asthma, for the respiratory tract, cold, sore throat) D: 12 (I: for digestive problems, stomach problems, gingivitis) T: 2 (I: bile secretion) X: 1 (I: menstrual problems) P: 4 (I: to calm down)	infusion fresh plant	Essential oil I: irritable bowel syndrome, flatulence, gastritis E: migraine Leaf: /
Morus nigra L., Black mulberry, Moraceae	1	leaf	T: 1 (I: diabetes)	soaking in warm water	
Ocimum basilicum L., Great basil, Lamiaceae	12	leaf whole plant flower herb	B: 1 (I: inflammation) R: 4 (I: cough, cold) S: 1 (E: for wounds) K: 2 (I: lowers blood pressure, improves the cardiovascular system) T: 3 (I: diabetes, appetite stimulant, for the liver) N: 2 (I: migraine) L: 1 (E: rheumatism)	infusion poultices fresh plant	

			U: 1 (I: kidney stones) D: 2 (I: stimulates digestion, flatulence) P: 1 (I: to calm down)		
Petroselinum crispum (Mill.) Fuss, Parsley, Apiaceae	32	stem seeds whole plant root leaf	U: 20 (I: urinary tract infection, diuretic, kidney inflammation) S: 3 (E: acne, eczema) D: 6 (I: against flatulence, wind, cramps) K: 1 (I: anemia) T: 3 (I: gout, for the liver, lowers blood glucose) L: 1 (I: rheumatism) B: 1 (I: inflammation)	infusion juice fresh plant mixing with honey	
Pimpinella anisum L., Aniseed, Apiaceae	2	seed leaf	D: 2 (I: stimulates digestion) R: 2 (I: for respiratory tract)	infusion poultices macerate	essential oil: / fruit: /
Plantago lanceolata L., Ribwort plantain, Plantaginaceae	12	seed leaf	B:5 (I: anti-infective; E: hemorrhoids, stops bleeding) S: 4 (E: corns, wounds) R: 4 (I: cough, for respiratory tract)	infusion syrup juice poultices fresh leaf	/
Polygonum aviculare L., Common knotgrass, Polygonaceae	1	leaf	D: 1 (I: for stomach)	infusion	
Portulaca oleracea L., Common purslane, Portulacaceae	1	stem leaf	K: 1 (I: improves blood count)	fresh plant	
Ricinus communis L., Castor bean, Euphorbiaceae	1	seed	S: 1 (E: skincare)	macerate	Oil: /
Rosa canina L., Wild rose, Rosaceae	14	flower fruit	D: 1 (I: antidiarrheal) R: 8 (I: cold, flu, sore throat) B: 5 (I: immunity)	infusion jam syrup	
Rosmarinus officinalis L., Rosemary, Lamiaceae	8	leaf twig herb	D: 2 (I: stimulates digestion) K: 3 (E: circulation) P: 3 (I: antidepressant, insomnia, improves memory) R. 1 (I: for respiratory tract)	infusion macerate poultices	/
Rubus fruticosus Lour., Blackberry, Rosaceae	7	leaf, root, fruit	D: 6 (I: antidiarrheal) B: 1 (anemia)	infusion	

Rubus idaeus L., Raspberry, Rosaceae	2	fruit leaf	B: 2 (I: anemia, for immunity)	infusion juice fresh plant	
Salvia officinalis L., Sage, Lamiaceae	32	the whole plant leaf shoot flower	R: 15 (I: sore throat, respiratory tract, cold) D: 6 (I: canker sores, digestive problems, anti-spasms) P: 5 (I: to calm down) B: 4 (I: immunity, inflammation) S: 3 (E: rash, herpes, for wounds) T: 2 (I: diabetes, blood glucose lowering) N: 1 (I: migraine) A: 1 (analgesic effect)	infusion poultices tonic ointment	leaf: I: in Alzheimer's disease
Sambucus nigra L., Elder, Viburnaceae	21	flower fruit	B: 12 (I: immunity, inflammation, detoxification) R: 12 (I: flu, cold, cough) D: 2 (I: stimulates digestion, for stomach pain)	infusion juice	flower: /
Sempervivum tectorum L., Houseleek, Crassulaceae	32	leaf whole plant	H: 29 (I: ear pain) U: 2 (I: painful urination) S: 4 (E: warts, corns, burns) R: 1 (I: bronchitis)	infusion juice	
Symphytum officinale L., Comfrey, Boraginaceae	5	root whole plant stem	S: 4 (E: wounds, burns) L: 3 (E: arthritis) R: 1 (I: for respiratory tract)	ointment tincture	
Taraxacum officinale F.H.Wigg., Dandelion, Asteraceae	29	flower whole plant leaf root	B: 17 (I: anemia, immunity, inflammation) U: 5 (I: diuretic, kidney stones, inflammation of the urinary system) R: 3 (I: cough, for respiratory tract) T: 5 (I: lowers blood fat, accelerates metabolism, liver pain) P: 1 (I: fatigue) S: 1 (E: skincare)	infusion fresh plant syrup mixing with honey cream tincture decoction	root: / herb: /
Teucrium montanum L., Mountain germander,	2	leaf, top of plant	D: 2 (I: digestive problems)	infusion tincture	

Lamiaceae			P: 1 (I: antidepressant)		
Thymus serpyllum L., Wild thyme, Lamiaceae	6	flower leaf herb whole plant stem	R: 3 (I: cough, sore throat) Q: 2 (I: to calm down) B: 1 (I: immunity) N: 1 (I: migraine) L: 1 (E: joint pain)	infusion tincture poultices	
Thymus vulgaris L., Common thyme, Lamiaceae	1	whole plant	R: 1 (I: asthma)	infusion	Leaf: /
Tilia cordata Mill., Little-leaf linden, Malvaceae	66	flower leaf	D: 3 (I: stimulates digestion) B: 3 (I: inflammation, immunity) U: 3 (I: diuretic) T: 1 (I: diaphoretic) R: 57 (I: cold, sore throat, cough) S: 1 (E: skincare) P: 2 (I: fatigue, insomnia)	infusion, mixing with honey fresh plant flower bath	Flower: /
Tussilago farfara L., Coltsfoot, Asteraceae	3	herb	R: 2 (I: bronchitis, asthma) S: 1 (E: nipples)	infusion	
Urtica dioica L., Nettle, Urticaceae	60	leaf root seeds herb whole plant	B: 33 (I: anemia, detoxification, immunity, allergies) U: 13 (I: diuretic, for kidneys, urinary tract infections) R: 8 (I: sore throat, respiratory tract, cold) S: 6 (I: aphthae; E: skin care, rash) D: 3 (I: for gum inflammation, stimulates digestion) K: 4 (I: circulation, lowers blood pressure, angina pectoris) T: 4 (I: lowers blood glucose, liver, pancreas, gout) Y: 2 (I: prostate) P: 2 (I: for calming, fatigue) L: 1 (E: sciatica)	infusion ointment tincture decoction juice tonic a bath	Root: I: symptomatic treatment of disorders of the lower urinary system (nocturia, polyuria), urine retention
Vaccinium myrtillus L., Bilberry,	1	leaf	T: 1 (I: diabetes)	infusion	Fruit: I: dysmenorrhea, premenstrual syndrome,

Ericaceae			B: 1 (I: immunity)		venous insufficiency in adults, capillary permeability, circulatory disorders
Valerianella locusta (L.) Laterr., Mache, Caprifoliaceae	1	leaf	R: 1 (I: cold) K: 1 (I: improves blood count)	macerate	
Viola tricolor L., Heartsease, Violaceae	1	flower	S: 1 (E: acne)	poultices	
Viscum album L., Mistletoe, Santalaceae	1	leaf	K: 1 (I: for the heart) L: 1 (I: rheumatism) T: 1 (I: gout)	infusion	

As for the internal application of plants, the dominant form was the infusion (49) - an aqueous extract of the drug for internal use, which is prepared by crushing the plant material and moistening it with an equal part of water, then left to stand for a while, poured with boiling water, stirred occasionally, left to stand again, and after that strained (Hadžović and Pilipović, 1999). The infusion use was followed by the use of a fresh plant (16), juice (12), mixture with honey (4), syrup (4), and decoction (4). For external use, recorded herbal preparations were tinctures (14) - prepared by soaking medicinal herbs in a mixture of alcohol and water, poultices (11), macerate (8) – an aqueous extract of herbal drugs, prepared by extracting the drug with water at room temperature, and intended for external and internal use, ointment (8), cream (3), tonic (3) and gel (1) (Hadžović and Pilipović, 1999).

The most used plant part was the leaf, mentioned 39 times. This can partly be explained by the ease of collection. Other plant parts used were: flower (21), whole plant (19), root (19), fruit (14), herb (10), seed (9), stem (6), bark (2), shoot, bud, twig, top and cones which were mentioned only once.

While carrying out this questionnaire, one of the important information we were interested in was the use of professional literature, more specifically, whether our respondents use medicinal plants on their own, or if they still use some professional literature when collecting them. By analyzing the data, we concluded that oral traditions are still predominant today, because the findings on the use of professional literature are disappointing. As many as 78.5 %, or 157 out of 200 respondents, do not use any literature to inform and educate themselves about possible indications and contraindications for the use of herbs. A smaller part of the respondents who use literature, 43 respondents (21.5 %), state that they use various books, atlases, encyclopedias, the press, grandmother's recipes, and the indispensable Internet. Of the 43 respondents who use literature, 25 of them use books, atlases, encyclopedias, 19 of them use the Internet, 5 respondents find information in the press, and 2 respondents use their grandmother's old recipes.

Although medicinal plants are considered relatively safe, there are also numerous possible contraindications or side effects of their use. When it comes to knowledge of potential contraindications and side effects, the results are disappointing. Namely, only a small part of the respondents knows the possible contraindications or side effects of medicinal herbs. The following Table 2 describes the mentioned contraindications and side effects.

The World Health Organization has published a series of monographs on selected plant species, with the aim of providing adequate information on the safety, efficacy, and quality control of the most commonly used medicinal plants (WHO, 1999). These monographs are comprehensive scientific references for physicians, pharmacists, scientists, and governing bodies.

Of the 72 plant species recorded in our study, 30 of them are described in WHO monographs (41.7 %) and for only 16 of them WHO states medical use confirmed by clinical evidence (53.33 %). Among them, 11 plant species that the respondents mentioned agree in indications with WHO monographs, while the remaining 5 plant species differ in application. The five plant species recorded in our research with different reported indications from those indicated by the World Health Organization are sage, lemon balm, St. John's wort, blueberry and horsetail.

Sage (*Salvia officinalis*), which is used by as many as 32 respondents, has a beneficial effect on Alzheimer's disease according to the WHO monograph, while this was not recorded in the survey questionnaire. Namely, the respondents indicated the use of leaves, flowers, shoots, and the whole plant, in the form of infusions and tonics, for the treatment of sore throats, respiratory tracts, colds, aphthae, digestive problems, for lowering the level of glucose in the blood, increasing immunity, for calming and for migraines, and externally in the form of poultices and ointments for the treatment of wounds, herpes, and rashes. The beneficial effect of sage comes from numerous active substances. The leaves contain 2 % of essential oil, resins, flavonoids, tannins, and bitter substances. The essential oil contains thujone, which determines the value of the plant, followed by cineole, borneol, camphor, and bornyl acetate (Mohring, 2000). Furthermore, the sage leaf contains carnosic acid and carnosol - the bitter substances of the sage leaf, rosmarinic acid, and ursolic acid (EMA, 2015; Kuštrak, 2005). Sage oil has a strong effect on the central nervous system (EMA, 2015), so even small amounts are toxic, so the tea should not be used in excessive amounts. Furthermore, due to its estrogenic effect, it is not recommended for breastfeeding and pregnant women (Mohring, 2000).

The traditional use of lemon balm (*Melissa officinalis*) recorded in our study also does not match the WHO monograph, which states that lemon balm leaf applied externally treats cold sores. Our respondents mentioned only the internal application of lemon balm, in the form of an infusion to treat stress, and migraines, as a means of calming, relaxing, and boosting immunity.

St. John's wort, *Hypericum perforatum*, well known for his positive effect on nervous system disorders, is also used for preparation of St. John's wort oil, a wound healing promoting agent (Martić, 2003). In our research, three respondents declared that they use St. John's wort, internally to stimulate digestion in the form of an infusion, and externally for the treatment of hemorrhoids, wounds, and burns but they did not mention the use of St. John's wort as antidepressant, which does not agree at all with the WHO monograph that states the clinically proven use of St. John's wort for the treatment of depressive episodes.

According to the WHO, the fruit of the blueberry, *Vaccinium myrtillus* L., applied internally helps with dysmenorrhea, premenstrual syndrome, venous insufficiency in adults, circulatory disorders, and capillary permeability, while the respondent only reported that the blueberry leaf could be applied in the form of an infusion in diabetes treatment and to increase immunity.

Also, the indication recorded by the respondents for the use of horsetail, *Equisetum arvense* L., does not agree with the WHO monograph. The WHO monograph lists the medical application confirmed by clinical evidence for the use of horsetail as a diuretic, while the survey questionnaire recorded the use of horsetail for the treatment of bronchitis, gout, anemia, and bleeding in the body (WHO, 1999).

With this comparison, we can conclude that the traditional application differs in many ways from the medical application for which there is clinical evidence, pointing out that folklore and folk medicine influence treatment even in the modern age.

CONCLUSION

Osjek and Baranja are areas extremely rich in plant species. Fertile land is suitable for the growth of numerous plant species, both wild and cultivated. Collected data showed that the tradition of medicinal plant usage has been preserved in these regions. It is especially important to point out that the methods of treatment with medicinal plants were not only applied by the elderly population, but also by younger people. According to our research, traditional medicine in rural areas of Osijek-Baranja county is mainly used for milder health

Table 2. Contraindications and side effects familiar to respondents

Plant species	Plant part	Adverse effect/contraindication
Mentha × *piperita* L., Peppermint, Lamiaceae	leaf, herb	Excessive use affects the heart adversely (mentioned twice)
Urtica dioica L., Nettle, Urticaceae	the whole plant	Causes skin burns; Pregnant women, nursing mothers, heart and kidney patients should not use it
Matricaria chamomilla L., Chamomile, Asteraceae	flower	Do not use in case of diarrhea and vomiting
Salvia officinalis L., Sage, Lamiaceae	the whole plant	In excessive amounts it can be poisonous
Tilia cordata Mill., Little-leaf linden, Malvaceae	flower	In excessive amounts, it damages the heart
Morus nigra L., Black mulberry, Moraceae	leaf	Do not use with constipation
Allium sativum L., Garlic, Amaryllidaceae	fruit	Do not use with a damaged stomach
Viscum album L., Mistletoe, Santalaceae	leaf	Poisonous in excessive amounts
Equisetum arvense L., Common horsetail, Equisetaceae	herb	Do not use too often
Portulaca oleracea L., Common purslane, Portulacaceae	stem, leaf	In excessive amounts, it can damage the kidneys
Sambucus nigra L., Elder, Viburnaceae	flower	Not for pregnant women, nursing mothers
Levisticum officinale W.D.J. Koch, Lovage, Apiaceae	the whole plant	Not in pregnant women, not in case of elevated body temperature
Ricinus communis L., Castor bean, Euphorbiaceae	seed	Toxic per os
Artemisia absinthium L., Wormwood Asteraceae	herb	In excessive amounts, it has an adverse effect on the nervous system

problems. The most common indications were various inflammations, colds, skin diseases, insomnia, nervous problems, menstrual problems, as well as digestive and urinary system related problems. The most commonly used plants belong to the Asteraceae family followed by species from Lamiaceae, Rosaceae, Apiaceae, and Alliaceae families. Among them, chamomile, linden, nettle, sage, calendula, houseleek, and mint were the ones most often used for medical treatment purposes.

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