Traditional use of pot marigold (*Calendula officinalis* L.) in the Balkan Peninsula

MARIJA S. MARKOVIĆ[1*], DEJAN S. PLJEVLJAKUŠIĆ[2] AND ŁUKASZ J. ŁUCZAJ[3]

[1]*Institute of Forestry, Belgrade, Kneza Višeslava 3, 11030 Belgrade, Serbia*
[2]*Institute for Medicinal Plants Research "Dr. Josif Pančić", Tadeuša Koščuška 1, 11000 Belgrade, Serbia*
[3]*Institute of Biology, University of Rzeszów, Zelwerowicza 4, 35-601 Rzeszów, Poland*
**Corresponding author: markovicsmarija9@gmail.com*

Received: October 23, 2024
Accepted: November 25, 2024
Published on-line: December 23, 2024
Published: December 25, 2024

The objective of this study was to compile and systematize traditional knowledge regarding the medicinal uses of pot marigold (*Calendula officinalis* L.) among the Balkan population, based on existing literature. The ethnobotanical studies reviewed encompass various regions of the Balkan Peninsula, including Bosnia and Herzegovina, Bulgaria, Croatia, and Serbia. These studies identified several categories of disorders commonly treated with pot marigold flowers in Balkan folk medicine, such as autoimmune disorders, cardiovascular conditions, dermatological issues, digestive ailments, neurological complaints, reproductive system disorders, urinary conditions, and other health issues. Additionally, fresh pot marigold leaves are traditionally used as a nutritional supplement. This synthesis of traditional knowledge on the medicinal uses of pot marigold flowers may serve as a valuable foundation for future studies, potentially leading to the development of new medicinal applications.

Keywords: ethnobotany, pot marigold, Balkans, phytotherapy

https://doi.org/10.61652/leksir2444007M

1. INTRODUCTION

The traditional use of medicinal plants has been practiced worldwide, particularly in developing countries, and is increasingly gaining popularity in developed nations (Džamić and Matejić, 2017; Marković et al., 2022). Conventional medicine does not fully address a variety of human health disorders, which has led to a rising global interest in phytotherapy (Marković et al., 2022). According to these authors, the long history of herbal drug use has demonstrated its relative safety and efficacy. Medicinal herbs are often free from hazardous side effects (Schultz et al., 2001). However, Džamić and Matejić (2017) warn that while pharmacologically active compounds in plants benefit health, they may also pose risks due to potential toxic components. Thus, further scientific research is needed to confirm the safety of plants intended for medicinal use.

In the Balkan Peninsula, the population traditionally relies on medicinal plants as common alternatives or complements to conventional treatments (Džamić and Matejić, 2017). The simultaneous use of medicinal herbs alongside official drug therapies is also prevalent in this region (Živković et al., 2020). Traditional knowledge of natural medicinal plant products has been documented extensively through ethnobotanical studies, especially over the past two decades. This review aims to highlight the significance of the traditional use of *Calendula officinalis* L. within the Balkan region.

Calendula officinalis L. (pot marigold) is an annual plant species belonging to the Asteraceae family (Figure 1), native to the Mediterranean region (Ramos et al., 1998). As a wild species, it grows in warm Mediterranean habitats and is cultivated in other parts of the Balkan Peninsula (Sarić, 1989). Initially cultivated as an ornamental plant, it has also been grown extensively in Europe for its medicinal properties and long-standing use in traditional medicine. According to Ramos et al. (1998) and Ashwlayan et al., (2018), pot marigold flowers have commonly been used externally to treat wounds, ulcers, herpes, scars, skin injuries, burns, frostbite, and skin eruptions. Internally, they serve as bactericidal, diuretic, tonic, analgesic, antidiabetic, antitumor, anti-ulcer, and anti-inflammatory agents, and are also used for gastrointestinal disorders, gynecological issues, and eye diseases. Additionally, pot marigold extract has shown immunostimulant properties, as well as antifungal and antiviral activity, including effectiveness against HIV (Patil et al., 2022).

Fig. 1. Pot marigold (*Calendula officinalis* L.)

In Serbia, pot marigold flower oil macerate is commonly applied topically to treat skin disorders, as noted by Gostuški (1973), Sarić (1989), and Tucakov (1990). Additionally, an infusion of the flowers can be used to soothe bee stings (Tucakov, 1990). Pot marigold flower tea is known to induce perspiration (Gostuški, 1973; Sarić, 1989; Tucakov, 1990). It can also be used for kidney ailments, abdominal organ disorders, spleen swelling, and liver diseases (Gostuški, 1973), as well as for stomach and bile issues (Tucakov, 1990). It is reportedly used to ease menstrual pain, provides a calming effect for anemic women (Gostuški, 1973; Sarić, 1989) and can be applied externally as a vaginal wash (Tucakov, 1990). Tucakov (1990) have highlighted the antiseptic properties of *Calendula officinalis* flowers, while Sarić (1989) has also mentioned its use in treating hysteria, chronic illnesses, and even malignant tumors. Dried pot marigold flowers are the component of different tea products, packed as tea mixtures for the treatment of kidney inflammation, constipation, and candidiasis symptoms by the Institute for Medicinal Plant Research "Dr Josif Pančić" in Belgrade (Filipović and Ugrenović, 2015). Preparations from pot marigold flowers are frequently used topically in moisturizing creams or tinctures to help stimulate blood circulation and hydrate the skin (Pavlović and Marković, 2024).

2. ETHNOBOTANICAL STUDIES IN THE BALKAN PENINSULA INCLUDED IN THIS REVIEW

The rural areas of the Balkan Peninsula are notable for ethnobotanical studies due to their unique mountain ranges, rich biodiversity, and cultural diversity. This part of Europe reflects a history of diverse cultural influences (Živković et al., 2020), and extensive ethnobotanical research has been conducted here over the past twenty years. Each studied region features populations of various ethnic backgrounds who have traditionally utilized local plants for medicinal purposes.

This review includes ethnobotanical studies documenting the traditional uses of pot marigold (*Calendula officinalis* L.) across various Balkan regions: Kopaonik Mt (Jarić et al., 2007), central, southern, and western Bosnia and Herzegovina (Šarić-Kundalić et al., 2010), Pešter Plateau in Sandžak (Pieroni et al., 2011), Deliblato Sands (Popović et al., 2012), Zlatibor District (Šavikin et al., 2013), the Suva Planina Mt (Jarić et al., 2015), Bulgaria (Koleva et al., 2015), southern Kosovo and Metohija (Mustafa et al., 2015), northeastern Bosnia and Herzegovina (Saric-Kundalic et al., 2016), Svrljig and Timok (Matejić et al., 2020), Štrpce area in southern Kosovo and Metohija (Mustafa et al., 2020), Pčinja District (Živković et al., 2020), Kuršumlija (Đelić et al., 2021), the Adriatic Islands in Croatia (Łuczaj et al., 2021), the Stara Planina Mt (Jarić et al., 2024), Pirot District (Marković et al., 2024), and Rujan Mt (Simić et al., 2024) (Table 1).

3. THE USE OF POT MARIGOLD IN ETHNOBOTANICAL STUDIES ON THE BALKAN PENINSULA

In the Kopaonik Mt of Serbia, pot marigold has traditionally been used topically in the form of an oil-based cream (ointment) to treat fungal foot infections, wounds, burns, frostbite, leg swelling, and painful veins (Jarić et al., 2007). It is also taken internally as a vermifuge in tea form. In Bosnia and Herzegovina, pot marigold is used in ointments for skin injuries, burns, varicose veins, and leg pain, while the infusion is taken for increased vaginal secretion (Šarić-Kundalić et al., 2010). On the Sandžak region's Pešter Plateau, pot marigold is traditionally used to treat hepatitis (Pieroni et al., 2011), and in Deliblato Sands, it has been noted as an emmenagogue, mild purgative, and diuretic (Popović et al., 2012).

In Serbia's Zlatibor District, pot marigold is applied externally for skin issues, burns, wounds, hemorrhoids, and varicose veins, and is also used internally for digestive disorders and gastric or duodenal ulcers (Šavikin et al., 2013)). In Suva Planina Mt, pot marigold flowers are used internally to support blood circulation, and as an antidiarrheal, while external applications serve to treat burns, skin complaints, varicose veins, and hemorrhoids (Jarić et al., 2015). In Bulgaria, pot marigold is used as a prophylactic and anti-inflammatory for nerve issues, stomach disorders, ulcers, wounds, and blood detoxification (Koleva et al., 2015). In South Kosovo and Metohija, pot marigold serves as an antibacterial and antifungal

Table 1. A comparative review of the traditional use of pot marigold (*Calendula officinalis* L.) across the Balkan Peninsula,

Group of disorder	Indication	Form of use	E / I	Region	Reference
Au	Bone ache	Ointment	E	Adriatic Islands – Croatia	Łuczaj et al., (2021)
	Bone pain	Ointment	E	Pčinja district	Živković et al., (2020)
	Carcinomas	Infusion	I	Rujan Mt	Simić et al., (2024)
	Hepatitis	Infusion	I	Pešter Plateau	Pieroni et al., (2011)
	Pain in the legs	Ointment	E	Bosnia and Herzegovina	Šarić Kundalić et al., (2010)
	Rheumatic pain	Extract in alcohol / ointment	E	Pirot District	Marković et al., (2024)
	Swelling of the leg	Ointment	E	Kopaonik Mt	Jarić et al., (2007)
		Extract in "rakija"		Adriatic Islands – Croatia	Łuczaj et al., (2021)
Ca	Blood vessels	Infusion	I	Svrljig region	Matejić et al., (2020)
	Detoxification of the blood	Infusion	I	Stara planina Mt	Jarić et al., (2024)
	Circulation	Infusion	I	Suva Planina Mt	Jarić et al., (2007)
				Pirot District	Marković et al., (2024)
	Good for blood	Infusion	I	Adriatic Islands – Croatia	Łuczaj et al., (2021)
				Zlatibor District	Šavikin et al., (2013)
	Hemorrhoids	Ointment / tincture	E	Suva Planina Mt	Jarić et al., (2015)
				Svrljig region	Matejić et al., (2020)
				Pirot District	Marković et al., (2024)
				Rujan Mt	Simić et al., (2024)
	Painful veins	Ointment	E	Kopaonik Mt	Jarić et al., (2007)
				Bosnia and Herzegovina	Šarić Kundalić et al., (2010)
	Varicose veins	Ointment / tincture	E	Zlatibor District	Šavikin et al., (2013)
				Suva Planina Mt	Jarić et al., (2015)
				Stara planina Mt	Jarić et al., (2024)
	Vein inflammation	Ointment	E	Adriatic Islands – Croatia	Łuczaj et al., (2021)
	Vein problems	Ointment	E	Pčinja district	Živković et al., (2020)
Dm	Abscesses	Ointment	E	Konjuh Mt	Saric-Kundalic et al., (2016)
				Kopaonik Mt	Jarić et al., (2007)
				Zlatibor District	Šavikin et al., (2013)
				Suva Planina Mt	Jarić et al., (2015)
				South Kosovo and Metohija	Mustafa et al., (2015)
	Burns	Ointment	E	Svrljig region	Matejić et al., (2020)
				Timok region	Matejić et al., (2020)
				Pčinja district	Živković et al., (2020)
				Kuršumlija	Đelić et al., (2021)
				Rujan Mt	Simić et al., (2024)
	Bruises	Ointment	E	Timok region	Matejić et al., (2020)
	Cuts	Ointment	E	Timok region	Matejić et al., (2020)
	Frostbite	Ointment	E	Kopaonik Mt	Jarić et al., (2007)
	Fungous ailments of the feet	Ointment	E	Kopaonik Mt	Jarić et al., (2007)
	Lacerations	Ointment	E	Štrpce region	Mustafa et al., (2020)
	Rashes	Ointment	E	Konjuh Mt	Saric-Kundalic et al., (2016)
	Skin complaints / diseases	Ointment	E	Zlatibor District	Šavikin et al., (2013)
				Suva Planina Mt	Jarić et al., (2015)
				Svrljig region	Matejić et al., (2020)
				Pčinja District	Živković et al., (2020)
	Skin infections	Ointment	E	Štrpce region	Mustafa et al., (2020)
	Skin injuries (in mixtures)	Balm	E	Bosnia and Herzegovina	Šarić Kundalić et al., (2010)
	Sunburns	Ointment	E	South Kosovo and Metohija	Mustafa et al., (2015)
	Ulcers	Ointment	E	Konjuh Mt	Saric-Kundalic et al., (2016)
				Kopaonik Mt	Jarić et al., (2007)
				Zlatibor District	Šavikin et al., (2013)
				South Kosovo and Metohija	Mustafa et al., (2015)
	Wounds	Ointment	E	Konjuh Mt	Saric-Kundalic et al., (2016)
				Timok region	Matejić et al., (2020)
				Pčinja District	Živković et al., (2020)
				Kuršumlija	Đelić et al., (2021)
				Adriatic Islands – Croatia	Łuczaj et al., (2021)
				Rujan Mt	Simić et al., (2024)
Dg	Antidiarrheal	Infusion	I	Suva Planina Mt	Jarić et al., (2015)

	Abdominal pain	Infusion	I	Timok region	Matejić et al., (2020)
	Light purgative	Infusion	I	Deliblato Sands	Popović et al., (2012)
	Liver diseases / complaints	Infusion	I	Svrljig region Pčinja District	Matejić et al., (2020) Živković et al., (2020)
	Digestive disorders / complaints	Infusion / tincture	I	Zlatibor District Pčinja District	Šavikin et al., (2013) Živković et al., (2020)
	For stomach	Infusion	E	Pirot District	Marković et al., (2024)
	Gastric and duodenal ulcer	Infusion / tincture	I	Zlatibor District	Šavikin et al., (2013)
	Gastrointestinal system disorders	Infusion	I	Konjuh Mt	Saric-Kundalic et al., (2016)
	Stomach diseases / troubles	Infusion / extract in alcohol	I	Pirot Disrict	Marković et al., (2024)
	Stomach pain / stomachache	Infusion	I	Timok region Rujan Mt	Matejić et al., (2020) Simić et al., (2024)
Dp	Liver cleanse	Infusion	I	Pirot Disrict	Marković et al., (2024)
	Blood purification	Infusion	I	Pirot Disrict	Marković et al., (2024)
Nr	Mental illnesses	Infusion	I	Konjuh Mt	Saric-Kundalic et al., (2016)
	Sedation	Infusion	I	Pirot Disrict	Marković et al., (2024)
Pr	Disease prevention (coffee substitute)	Infusion	I	Pirot Disrict	Marković et al., (2024)
	Improvement of the immune system	Infusion	I	Pirot Disrict	Marković et al., (2024)
Rp	Ovarian cysts	Infusion	I	Pirot Disrict Rujan Mt	Marković et al., (2024) Simić et al., (2024)
	Emmenagogue	Infusion	I	Deliblato Sands	Popović et al., (2012)
	Gynecological problems	Infusion	I	Pirot Disrict	Marković et al., (2024)
	Increased vaginal secretions	Infusion	I	Bosnia and Herzegovina Konjuh Mt	Šarić Kundalić et al., (2010) Saric-Kundalic et al., (2016)
	Inflammation of the ovaries	Infusion	I	Rujan Mt	Simić et al., (2024)
	Menstrual cycle disorders	Infusion	I	Rujan Mt	Simić et al., (2024)
	Painful menstruation	Infusion	I	Timok region	Matejić et al., (2020)
Rs	Dry cough	Infusion	I	Rujan Mt	Simić et al., (2024)
Ur	Diuretic	Infusion	I	Deliblato Sands	Popović et al., (2012)
	Urogenital system inflammations	Infusion	I	Konjuh Mt	Saric-Kundalic et al., (2016)
Vr	Against shoulder pain	Ointment	E	Pirot Disrict	Marković et al., (2024)
	Antibacterial	Infusion	I	South Kosovo and Metohija	Mustafa et al., (2015)
	Antifungal	Infusion	I	South Kosovo and Metohija	Mustafa et al., (2015)
	Bone fractures	Ointment	E	Konjuh Mt	Saric-Kundalic et al., (2016)
	Chills	Infusion	I	Rujan Mt	Simić et al., (2024)
	For better eyesight	Infusion	I	Pirot Disrict	Marković et al., (2024)
	In nutrition*	Fresh leaf	I	Pirot Disrict	Marković et al., (2024)
	Vermifuge	Infusion	I	Kopaonik Mt	Jarić et al., (2007)
	Weakness / tiredness	Infusion	I	Stara planina Mt	Jarić et al., (2024)

* The only known use of the leaf (all other uses are of flowers).
E / I – mode of administration: E – external, I – internal.
Group of disorders: Au - Autoimmune diseases, Cd – cardiovascular, Dm – dermatology, Dg – digestive, Dp – depurative, Nr – neurological conditions, Pr – preventive, Rp – reproductive system disorders, Rs – respiratory diseases, Ur – urinary system disorders; Vr – various.

treatment and is used to treat burns and skin wounds (Mustafa et al., 2015). Around Konjuh Mt in Bosnia and Herzegovina, pot marigold is used internally for urogenital and gastrointestinal issues, mental health, and externally for wounds, bone fractures, rashes, ulcers, and abscesses (Saric-Kundalic et al., 2016). In Svrljig, southeastern Serbia, it is applied externally for burns and skin issues, while internal uses include liver and vascular health (Matejić et al., 2020). In the Timok region, in eastern Serbia, pot marigold is used externally for burns, bruises, and wounds, and internally for abdominal and menstrual pain (Matejić et al., 2020). In Štrpce (Kosovo and Metohija), it treats lacerations and skin infections (Mustafa et al., 2020).

In Pčinja District, southeastern Serbia, pot marigold treats burns, wounds, skin issues, vein problems, and bone pain externally, and is used internally for digestive and liver ailments (Živković et al., 2020). In Kuršumlija, pot marigold is applied to heal burns and wounds (Đelić et al., 2021). On Croatia's Adriatic Islands, pot marigold flowers are used in infusions for blood health and as a cream for vein inflammation, wounds, and aching bones. It is also used in a homemade alcohol-based drink (rakija) for leg massages (Łuczaj et al., 2021).

In Stara Planina Mt, southeastern Serbia, pot marigold infusions are used internally for blood detoxification and to alleviate weakness, while ointments are used externally to treats varicose veins (Jarić et al., 2024). In Pirot District, ethnobotanical studies across 157 villages reveal widespread external use of pot marigold in ointments for cracked skin, shoulder pain, burns, hemorrhoids, skin conditions, and varicose veins, as well as internal use in infusions for blood purification, ovarian cysts, immunity, liver cleansing, and digestive issues (Marković et al., 2024). Pot marigold leaves are also used fresh in nutrition.

Lastly, around Rujan Mt, southeastern Serbia, pot marigold is used internally for carcinoma, hemorrhoids, abdominal pain, ovarian cysts, menstrual disorders, and dry cough, and applied internally for hemorrhoids, burns, and wounds (Simić et al., 2024).

3.1. The form of pot marigold used in the Balkans

Pot marigold cream, or ointment, is the primary form of external application cited in the studies. This preparation involves an oil extract of pot marigold flowers (*Calendulae flos*), which are macerated in homemade lard, olive or sunflower oil. Traditionally, homemade lard is washed multiple times (usually nine) until it becomes white. The pot marigold flowers are then simmered with the lard to create the ointment. First, 50 grams of dried pot marigold flowers and 500 grams of warm, unsalted lard are measured out and combined. Their mixture is fried for 5 minutes, and, after 24h, reheated and strained (Filipović and Ugrenović, 2015). For the preparation of oily macerate, the authors describe the following procedure: 200 grams of pot marigold flowers are poured over with one liter of olive or sunflower oil, immersed, subsequently strained, and ready to use after one month. According to the same authors, fresh pot marigold flowers can also be mixed with coconut oil. This preparation mixture needs to be warmed slightly, and then left to cool. If the mixture is too thick, a little more of another base oil can be added to reduce the density.
Pot marigold balm, less frequently mentioned in Balkan ethnobotanical studies, is a more fluid or liquid preparation, used to heal or soothe the skin. Balms known as "mehlems" are specific to Bosnia and Herzegovina, where they are traditionally prepared from freshly chopped flowers of pot marigold mixed with warmed resins from the *Abies* species and olive oil as additives (Šarić-Kundalić et al., 2010).
Tinctures (alcohol-based extracts) are the least common for external use and are often prepared by macerating the homemade alcoholic beverage, rakija (Łuczaj et al., 2021). Hundreds of dried pot marigold flowers are placed in a liter of medicinal ethanol or rakija (Janaćković et al., 2022), and stored in a cool, dark place for a period of 2–4 weeks. The preparation method is simple and effective, aligning with the findings of scientific research, which supports pot marigold's use in the treatment of a wide range of skin conditions and the promotion of tissue repair (Dinda et al., 2015; Patil et al., 2022). The mentioned references provided highlight the active compounds in *C. officinalis* and their therapeutic applications, validating the efficacy of its tincture both in traditional and modern herbal medicine.
Internally, pot marigold flowers are used as an infusion (tea). To prepare, 1–2 teaspoons of dried flowers are steeped in one cup of boiling water for five to ten minutes. The recommended dose is two to three cups of unsweetened tea, which is bitter in taste, per day (Filipović and Ugrenović, 2015; Kemper, 1999). Pharmacological studies (Bertges et al., 2006; Dilucia et al., 2023) provide scientific support for the common uses of pot marigold infusion, noted in ethnobotanical research, offering both traditional and modern perspectives on its medicinal value.
Additionally, fresh pot marigold leaves are sometimes consumed in salads across the Balkans (Marković et al., 2024), as they are rich in vitamins and minerals, with a taste and composition similar to dandelion (*Taraxacum officinale* L.) leaves.

3.2. Comparison with traditional uses in other regions

Pot marigold flowers are traditionally used not only as an infusion, tincture, or ointment, but also as a food dye and spice (Ercetin et al., 2012), especially in regions the species is native to: Spain, Portugal, Italy, Malta, Greece, Turkey, and northern parts of Africa (Ercetin et al., 2012). The people of Greece use pot marigold orally in the form of a decoction against thrombophlebitis, stomach ulcers, liver disorders, and topically for the treatment of wounds and eczema (Hanlidou et al., 2004), as do the subjects of the above-mentioned ethnobotanical studies of Bosnia and Herzegovina, Bulgaria, Croatia, and Serbia.
In Slovenia, the population uses pot marigold internally in the form of an infusion for the treatment of intestinal problems, stomach pain, insomnia, and to treat increased vaginal secretion. A pot marigold ointment with lard is used externally for the treatment of burns, sunburns, bruises, and eczema, as well as against contusions in painful areas of knees, shoulders, and joints (Lumpert and Kreft, 2017). Similar uses were reported in our research from other Balkan countries.
Cenk (2022) has recorded that in Turkey, pot marigold was used as an antipyretic for the treatment of wounds and burns, against mental illnesses, cardiovascular diseases, gastrointestinal ulcers, dysmenorrhea, and for cancer prevention—uses similar to those observed in Balkan countries. The same author mentioned that pot marigold is used in the treatment of eczema and psoriasis among the population of Turkey, which has not been noted in ethnobotanical studies of the Balkans. Ugulu and Aydin (2011) mentioned the use of pot marigold against skin cancer, burns, and wounds in Turkey—applications similar to those recorded in Balkan countries.
The people of France usually use pot marigold flowers as a tea to lower temperature and perspiration (Sharrif Moghaddasi, 2012). Similar uses have been recorded in southeastern Serbia (Jarić et al., 2024; Simić et al., 2024).
Among the people of England, fresh juice from pot marigold was traditionally used against jaundice, constipation, as well as to shortening the duration of menstrual bleeding, while the decoction of flowers was used for the treatment of measles and smallpox (Abdelwahab et al., 2022). These uses were not mentioned in the Balkans.
The Indian population used the flowers of *C. officinalis* for the treatment of wounds, ulcers, frostbite, skin injuries, and to purify blood (Abdelwahab et al., 2022), which were uses mentioned in Balkan countries.
The people of the Balkan Peninsula use the fresh leaves of pot marigold as a salad (Marković et al., 2024), while in North America the common practice is to eat it as a soup (Sharrif Moghaddasi, 2012).

3.3. Unique uses of pot marigold in the Balkans relative to global practices

Scientific existing ethnobotanical papers from the Balkans on the traditional uses of *C. officinalis* could potentially reveal new uses or unique regional applications that may not be widely documented in other parts of the world. Ethnobotanical studies focus on the ways in which plants have been used by local populations throughout history, and the Balkans, with their rich cultural diversity and long history of traditional medicine, may hold specific uses of pot marigold that are not commonly recognized in broader scientific or global contexts.

Pot marigold has long been used to treat a range of skin conditions, but its specific uses can vary from region to region. In some parts of the Balkans, pot marigold may be applied to conditions that are specific to the local environment or climate, such as the treatment of sunburns in South Kosovo and Metohija (Mustafa et al., 2015) (Table 1).
There may be local uses of *C. officinalis* in treating respiratory issues in the Balkans. Pot marigold has been used as a tea for soothing dry coughs, or other chest-related conditions, particularly in rural or mountainous areas, where herbal knowledge is passed down through generations, as noted by Simić at al. (2024) in areas surrounding Rujan Mt (Table 1).
While *C. officinalis* is not widely known as a culinary herb globally, it may be used traditionally as food in the Balkans, in

ways that are not documented in other regions. In the Pirot District (southeastern Serbia), pot marigold leaves may be added to salads (Marković et al., 2024), while in other areas of Serbia the flowers are used as a spice in soups, broths and meals (Filipović and Ugrenović, 2015) for both flavoring and medicinal purposes, such as aiding digestion or reducing inflammation. Filipović and Ugrenović (2015) also mentioned fresh pot marigold juice, which can be prepared with fresh pot marigold flowers and stems mixed up in a blender with apple and carrot.

In some Balkan rural areas, *C. officinalis* might be used for the treatment of animal health issues, particularly in livestock. Pot marigold flowers in the form of water extract have been used in the Pirot District (southeastern Serbia) for the treatment of colds in animals such as cattle, horses, or sheep, or infections, such as swine and sheep erysipelas on the hoof (Marković et al., 2021). Šubarević et al. (2015) mentioned the antiseptic and soothing use of pot marigold salve with lard for wounds. The same author mentioned the preparation procedure for this formulation. Melt the lard and marigold petals on low heat. When everything is well combined, remove it from the heat and let it stand for 24 hours, then melt it again on low heat and strain. Once cooled down, it can be used for coating the skin of livestock. The same use was mentioned by Simić et al. (2024) at Rujan Mt. Improvement of blood count of cow, goat, and pig in the form of pot marigold infusion, taken internally, was also mentioned at Rujan Mt by the same authors. The treatment of diarrhea in ruminants with an infusion of pot marigold was mentioned by Davidović et al. (2012; 2011). It is possible that the mentioned uses of pot marigold may not be widely documented outside of the region, because traditional veterinary practices are often localized.

Finally, pot marigold has symbolic significance in some Balkan traditions and is often linked to festivals and rituals. For example, it may be used in traditional Balkan celebrations, such as those around the summer solstice or harvest, as a protection or fertility symbol. In the traditional culture of Serbia, pot marigold flowers are picked on St. George's Day, put in water together with colored Easter eggs, and this water is then used for face washing (Dajić Stevanović et al., 2014). In the folk practices of Bulgaria, the flowers of pot marigold may be used in spiritual protection rituals or to bring good luck and prosperity, in the form of amulets, i.e., wearable charms (Nedelcheva and Draganov, 2014), which may not be commonly known in global ethnobotanical studies.

4. POT MARIGOLD'S ACTIVE COMPOUNDS AND THEIR LINK TO ITS EFFECTS AND APPLICATIONS

Pot marigold is rich in a variety of bioactive compounds, including carotenoids, flavonoids, triterpenoids, glycosides, saponins, polysaccharides, steroids, sterols, quinones, essential oils, and amino acids (Ashwlayan et al., 2018; Ercetin et al., 2012; Patil et al., 2022).

The antioxidant compounds in pot marigold, notably flavonoids and carotenoids, help protect the skin from oxidative stress and contribute to the healing of various skin conditions (Bernatoniene et al., 2011). Lutein and beta-carotene, the most plentiful carotenoids in pot marigold flowers, influence wound healing (Dhingra et al., 2022), and cell rejuvenation (Ullah and Hamza, 2023). Glycosides from pot marigold show anti-inflammatory activities (Ullah and Hamza, 2023). The essential oil was found to be high in alpha-cadinol, which demonstrated antioxidative properties against different skin complaints (Dhingra et al., 2022).

Saponins isolated from pot marigold flowers have demonstrated antimutagenic properties (Prabhu Venkatesh et al., 2023), and the cytotoxic effects of pot marigold suggest its potential as a future cancer treatment (Patil et al., 2022). Additionally, the phenolic compounds in pot marigold tea may enhance its antitumor activity, particularly against melanoma cells (Matić et al., 2013). Carotenoid lutein increases tumor latency (Cruceriu et al., 2020). Calenduloside F 6′-O-n-butyl ester is effective against melanoma, leukemia and colon cancer (Ullah and Hamza, 2023).

5. PRECAUTIONS FOR USE

Pot marigold products are not considered safe for eye application due to the risk of irritation and potential infection. Allergic reactions, such as contact dermatitis, may occur, as in the case of other plant species from the family Asteraceae (Ercetin et al., 2012). Side effects include nausea, vomiting, and anorexia (Ingersoll, 2015). Pot marigold products should not be used alongside sedatives, nor administered to pregnant women, children, or nursing mothers, as toxicological data remains limited (Kemper, 1999).

Studies on the hydroalcoholic extract of *Calendula officinalis* L. indicate no toxicity in rats; however, signs of kidney and liver strain suggest potential hepatotoxic effects (Silva et al., 2007). Continued chemical and pharmacological research is necessary to establish the safe medicinal use of this plant species.

6. ALIGNMENT BETWEEN TRADITIONAL USES AND MODERN PHARMACOLOGICAL RESEARCH

Recent scientific findings mainly confirm mentioned traditional uses in treating conditions. There are alignments in the healing effects of pot marigold against skin diseases in traditional medicine, mentioned in this study, especially for the treatment of wounds of any type (Đelić et al., 2021; Jarić et al., 2007; Łuczaj et al., 2021; Šavikin et al., 2013; Simić et al., 2024; Živković et al., 2020) and pharmacological studies (Bedi and Shenefelt, 2002; Fronza et al., 2009; Givol et al., 2019; Leach, 2008). Injuries and inflammation of the skin are treated with marigold both traditionally, in mixtures with other plants species (Mustafa et al., 2020; Šarić-Kundalić et al., 2010), and through modern pharmacology, with *Calendula officinalis* listed as an ingredient of the multicomponent medication "Traumeel" (Müller-Löbnitz and Göthel, 2011).

Pot marigold is traditionally used to treat digestive disorders and gastric or duodenal ulcers (Šavikin et al., 2013), and these findings are consistent with studies in modern pharmacology (Bertges et al., 2006; Ingersoll, 2015; Ullah and Hamza, 2023). The use of pot marigold tea as an antidiarrheal agent was mentioned in an ethnobotanical study by Jarić et al., (2007) as well as in the pharmacological research of Ashwlayan et al,. (2018).

C. officinalis is being used in the traditional medicine of Balkan countries to treat hemorrhoids (Jarić et al., 2015; Marković et al., 2024; Matejić et al., 2020; Šavikin et al., 2013; Simić et al., 2024) and blood vessels (Matejić et al., 2020). These uses are in accordance with the pharmacological research of Sharrif Moghaddasi (2012) and Dhingra et al., (2022), which noted constricting effects to vessels that can terminate hemorrhoid bleeding. In addition, pot marigold provided cardiological protection by reducing myocardial infarct size (Ullah and Hamza, 2023).

C. officinalis has been also mentioned as an anticancer agent in the ethnomedicine of Rujan Mt (Simić et al., 2024), as well as in a pharmacological study by Ashwlayan et al., (2018). Pot marigold extracts show effects on different tumor cell lines derived from leukemias, melanomas, breast, cervix, colon, prostate, pancreas and lung (Ukiya et al., 2006; Ullah and Hamza, 2023).

The use of pot marigold against menstrual problems was mentioned in some ethnobotanical studies from the Balkans (Marković et al., 2024; Matejić et al., 2020; Simić et al., 2024) as well as in pharmacology (Ingersoll, 2015).

Pot marigold is traditionally used in the form of tea for the treatment of mental illnesses (Ercetin et al., 2012; Saric-Kundalic et al., 2016) have studied antioxidant activity of pot marigold extracts from Turkey that can provide neuroprotective effects against oxidative damage at the time of appearance of mental illness, such as Alzheimer's disease or Down syndrome. In addition, Jasoria et al., (2024) has also noted that pot marigold flowers are useful against neurodegeneration connected with oxidative stress, which can cause Alzheimer's disease. Furthermore, an infusion of flowers, taken internally, is beneficial as a sedative in the ethnomedicine of Pirot District (Marković et al., 2024) as well as in modern pharmacology (Ashwlayan et al., 2018).

7. CONCLUSION

The traditional uses of pot marigold on the Balkan Peninsula highlight nature's potential to address many health concerns. However, further research is necessary to validate these applications and support the development of new medicinal products, particularly for dermatological uses.

Some pot marigold uses, such as those for specific respiratory conditions, in veterinary care, or rituals, may not be found in other parts of the world. Therefore, further ethnobotanical studies from this region could uncover valuable new insights into the diverse roles of pot marigold in local traditions and health practices.

ACKNOWLEDGMENTS

The present study is part of the project: "Ethno-pharmacological study of the region of Southeastern Serbia", O-02-17, supported by the Serbian Academy of Sciences and Arts, as well as within the Agreement on the implementation and financing of scientific research work of scientific research organizations in 2024, financed by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (No. 451-03-66/2024-03/200027, 451-03-66/2024-03/200003).

This research was also supported by the Minister of Science of the Republic of Poland under the Program "Regional Initiative of Excellence," Contract No. RID/SP0010/2024/1, concluded between The State Treasury, The Minister of Science and the University of Rzeszów.

CONFLICT OF INTEREST

The authors declare that they have no financial and commercial conflicts of interest.

REFERENCES

Abdelwahab, S. I., Taha, M. M. E., Taha, S. M. E., and Alsayegh, A. A. (2022): Fifty-year of Global Research in *Calendula Officinalis* L. (1971–2021): A Bibliometric Study, *Clinical Complementary Medicine and Pharmacology*, **2**(4), 100059. https://doi.org/10.1016/j.ccmp.2022.100059

Ashwlayan, V. D., Kumar, A., Verma, M., Garg, V. K., and Gupta, S. (2018): Therapeutic Potential of *Calendula officinalis*, *Pharmacy & Pharmacology International Journal*, **6**(2). https://doi.org/10.15406/ppij.2018.06.00171

Bedi, M. K., and Shenefelt, P. D. (2002): Herbal Therapy in Dermatology, *Archives of Dermatology*, **138**(2). https://doi.org/10.1001/archderm.138.2.232

Bernatoniene, J., Masteikova, R., Davalgiene, J., Peciura, R., Gauryliene, R., Bernatoniene, R., Majiene, D., Lazauskas, R., Civinskiene, G., Velziene, S., Muselik, J., and Chalupova, Z. (2011): Topical application of *Calendula officinalis* (L.): Formulation and evaluation of hydrophilic cream with antioxidant activity, *Journal of Medicinal Plants Research*, **5**(6), 868–877.

Bertges, L. C., Gonçalves Felga, Â. M., Piccinini Teixeira, J. B., Magalhães Girardin Pimentel, C. F., and Neves, P. O. (2006): Effect of *Calendula officinalis* infusion on indomethacin-induced gastric lesions in Wistar rats, *Revista Cubana de Plantas Medicinales*, retrieved from internet: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1028-47962006000200007, **11**(2).

Cenk Paşa (2022): Compilation on the medicinal uses *Calendula officinalis* and *Calendula arvensis* species distributed in the flora of Turkey, *GSC Biological and Pharmaceutical Sciences*, **21**(3), 048–052. https://doi.org/10.30574/gscbps.2022.21.3.0451

Cruceriu, D., Diaconeasa, Z., Socaci, S., Socaciu, C., Rakosy-Tican, E., and Balacescu, O. (2020): Biochemical profile, selective cytotoxicity and molecular effects of *Calendula officinalis* extracts on breast cancer cell lines, *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, **48**(1), 24–39. https://doi.org/10.15835/nbha48111778

Dajić Stevanović, Z., Petrović, M., and Aćić, S. (2014): Ethnobotanical Knowledge and Traditional Use of Plants in Serbia in Relation to Sustainable Rural Development, 229–252 *in* A. Pieroni and C. L. Quave, eds., *Ethnobotany and Biocultural Diversities in the Balkans*, Springer New York, New York, NY. https://doi.org/10.1007/978-1-4939-1492-0_12

Davidović, V., Joksimović-Todorović, M., Maksimović, Z., Hristov, S., Stanković, B., and Relić, R. (2011): A review of plants used in ethnoveterinary medicine, *Macedonian Journal of Animal Science*, **1**(2), 377–382. https://doi.org/10.54865/mjas112377d

Davidovic, V., Todorovic, J., Stojanovic, B., and Relic, R. (2012): Plant usage in protecting the farm animal health, *Biotechnology in Animal Husbandry*, **28**(1), 87–98. https://doi.org/10.2298/BAH1201087D

Đelić, G., Simović, G., Stanković, M., Zlatić, N., Todorović, M., and Pavlović, M. (2021): Traditional use of plants in Kuršumlija, *Etnobotanika*, **1**(1), 33–55. https://doi.org/10.46793/EtnBot21.33DJ

Dhingra, G., Dhakad, P., and Tanwar, S. (2022): Review on phytochemical constituents and pharmacological activities of plant *Calendula officinalis* Linn, *Biological Sciences*, **02**(02). https://doi.org/10.55006/biolsciences.2022.2205

Dilucia, F., Rutigliano, M., Libutti, A., Quinto, M., Spadaccino, G., Liberatore, M. T., Lauriola, M., Di Luccia, A., and La Gatta, B. (2023): Effect of a Novel Pretreatment Before Freeze-Drying Process on the Antioxidant Activity and Polyphenol Content of *Malva sylvestris* L., *Calendula officinalis* L., and *Asparagus officinalis* L. Infusions, *Food and Bioprocess Technology*, **16**(10), 2113–2125. https://doi.org/10.1007/s11947-023-03035-y

Dinda, M., Dasgupta, U., Singh, N., Bhattacharyya, D., and Karmakar, P. (2015): PI3K-Mediated Proliferation of Fibroblasts by *Calendula officinalis* Tincture: Implication in Wound Healing, *Phytotherapy Research*, **29**(4), 607–616. https://doi.org/10.1002/ptr.5293

Džamić, A. M., and Matejić, J. S. (2017): Aromatic Plants from Western Balkans: A Potential Source of Bioactive Natural Compounds *in* H. A. El-Shemy, ed., *Active Ingredients from Aromatic and Medicinal Plants*, InTech. https://doi.org/10.5772/67039

Ercetin, T., Senol, F. S., Erdogan Orhan, I., and Toker, G. (2012): Comparative assessment of antioxidant and cholinesterase inhibitory properties of the marigold extracts from *Calendula arvensis* L. and *Calendula officinalis* L., *Industrial Crops and Products*, **36**(1), 203–208. https://doi.org/10.1016/j.indcrop.2011.09.007

Filipović, V., and Ugrenović, V. (2015): Pot marigold-one of the more demanded medicinal plants, J. Subić, B. Kuzman, and A. J. Vasile, eds., *Thematic proceedings, International Scientific Conference „Sustainable agriculture and rural development in terms of the Republic of Serbia strategic goals realization within the Danube region" - Regional specificitie*, 296–313.

Fronza, M., Heinzmann, B., Hamburger, M., Laufer, S., and Merfort, I. (2009): Determination of the wound healing effect of Calendula extracts using the scratch assay with 3T3 fibroblasts, *Journal of Ethnopharmacology*, **126**(3), 463–467. https://doi.org/10.1016/j.jep.2009.09.014

Givol, O., Kornhaber, R., Visentin, D., Cleary, M., Haik, J., and Harats, M. (2019): A systematic review of *Calendula officinalis* extract for wound healing, *Wound Repair and Regeneration*, **27**(5), 548–561. https://doi.org/10.1111/wrr.12737

Gostuški, R. (1973): *Lečenje lekovitim biljem*, Narodna knjiga, Beograd.
Hanlidou, E., Karousou, R., Kleftoyanni, V., and Kokkini, S. (2004): The herbal market of Thessaloniki (N Greece) and its relation to the ethnobotanical tradition, *Journal of Ethnopharmacology*, **91**(2–3), 281–299. https://doi.org/10.1016/j.jep.2004.01.007
Ingersoll, K. (2015): Diseases of the gastrointestinal tract: The pharmacy professional's role in treatment management, *Cancer*, **4**(7), 23–27.
Janaćković, P., Gavrilović, M., Miletić, M., Radulović, M., Kolašinac, S., and Stevanović, Z. D. (2022): Small regions as key sources of traditional knowledge: a quantitative ethnobotanical survey in the central Balkans, *Journal of Ethnobiology and Ethnomedicine*, **18**(1), 70. https://doi.org/10.1186/s13002-022-00566-0
Jarić, S., Kostić, O., Miletić, Z., Marković, M., Sekulić, D., Mitrović, M., and Pavlović, P. (2024): Ethnobotanical and ethnomedicinal research into medicinal plants in the Mt Stara Planina region (southeastern Serbia, Western Balkans), *Journal of Ethnobiology and Ethnomedicine*, **20**(1), 7. https://doi.org/10.1186/s13002-024-00647-2
Jarić, S., Mačukanović-Jocić, M., Djurdjević, L., Mitrović, M., Kostić, O., Karadžić, B., and Pavlović, P. (2015): An ethnobotanical survey of traditionally used plants on Suva planina mountain (southeastern Serbia), *Journal of Ethnopharmacology*, **175**, 93–108. https://doi.org/10.1016/j.jep.2015.09.002
Jarić, S., Popović, Z., Mačukanović-Jocić, M., Djurdjević, L., Mijatović, M., Karadžić, B., Mitrović, M., and Pavlović, P. (2007): An ethnobotanical study on the usage of wild medicinal herbs from Kopaonik Mountain (Central Serbia), *Journal of Ethnopharmacology*, **111**(1), 160–175. https://doi.org/10.1016/j.jep.2006.11.007
Jasoria, Y., Agrawal, M., Kumar, S., Chaudhary, H., Sahu, K. K., Singhal, M., Arora, S., Chandolia, P., Saha, S., Singh, K., Mahour, S., Akram, W., and Jain, D. (2024): In-vivo evaluation of neuroprotective effect of Chinese plant calendula officinalis Linn. Flower Extract against Aluminium chloride-induced Alzheimer's in Wistar rats, *Pharmacological Research - Modern Chinese Medicine*, **12**, 100458. https://doi.org/10.1016/j.prmcm.2024.100458
Kemper, K. J. (1999): Calendula (Calendula officinalis), *Longwood Herbal Task Force*, **1**.
Koleva, V., Dragoeva, A., Nanova, Z., Koynova, T., and Dashev, G. (2015): An ethnobotanical study on current status of some medicinal plants used in Bulgaria, *International Journal of Current Microbiology and Applied Sciences*, **4**(4), 297–305.
Leach, M. J. (2008): Calendula officinalis and wound healing: a systematic review, *Wounds: A Compendium of Clinical Research and Practice*, **20**(8), 236–243.
Łuczaj, Ł., Jug-Dujaković, M., Dolina, K., Jeričević, M., and Vitasović-Kosić, I. (2021): Insular Pharmacopoeias: Ethnobotanical Characteristics of Medicinal Plants Used on the Adriatic Islands, *Frontiers in Pharmacology*, **12**, 623070. https://doi.org/10.3389/fphar.2021.623070
Lumpert, M., and Kreft, S. (2017): Folk use of medicinal plants in Karst and Gorjanci, Slovenia, *Journal of Ethnobiology and Ethnomedicine*, **13**(1), 16. https://doi.org/10.1186/s13002-017-0144-0
Marković, M., Nikolić, B., Rakonjac, L., and Jovanović, S. (2024): *Ethnobotany*, Institute of Forestry, Belgrade.
Marković, M., Pljevljakušić, D., Matejić, J., Nikolić, B., Smiljić, M., Đelić, G., Papović, O., Đokić, M., and Stankov-Jovanović, V. (2022): The plants traditionally used for the treatment of respiratory infections in the Balkan Peninsula (Southeast Europe), *Lekovite Sirovine*, (42), 68–88. https://doi.org/10.5937/leksir2242068M
Marković, M., Pljevljakušić, D., Matejić, J., Nikolić, B., Zlatković, B., Rakonjac, L. B., Djokić, M. M., Papović, O. M., and Stankov Jovanović, V. P. (2024): Traditional uses of medicinal plants in Pirot District (southeastern Serbia), *Genetic Resources and Crop Evolution*, **71**(3), 1201–1220. https://doi.org/10.1007/s10722-023-01685-7
Marković, M. S., Pljevljakušić, D. S., Nikolić, B. M., Miladinović, D. L., Djokić, M. M., Rakonjac, L. B., and Stankov Jovanović, V. P. (2021): Ethnoveterinary knowledge in Pirot County (Serbia), *South African Journal of Botany*, **137**, 278–289. https://doi.org/10.1016/j.sajb.2020.10.025
Matejić, J. S., Stefanović, N., Ivković, M., Živanović, N., Marin, P. D., and Džamić, A. M. (2020): Traditional uses of autochthonous medicinal and ritual plants and other remedies for health in Eastern and South-Eastern Serbia, *Journal of Ethnopharmacology*, **261**, 113186. https://doi.org/10.1016/j.jep.2020.113186
Matić, I. Z., Juranić, Z., Šavikin, K., Zdunić, G., Nađvinski, N., and Gođevac, D. (2013): Chamomile and Marigold Tea: Chemical Characterization and Evaluation of Anticancer Activity, *Phytotherapy Research*, **27**(6), 852–858. https://doi.org/10.1002/ptr.4807
Müller-Löbnitz, C., and Göthel, D. (2011): Review of the clinical efficacy of the multicomponent combination medication Traumeel and its components, *Alternative Therapies in Health & Medicine*, S18.
Mustafa, B., Hajdari, A., Pieroni, A., Pulaj, B., Koro, X., and Quave, C. L. (2015): A cross-cultural comparison of folk plant uses among Albanians, Bosniaks, Gorani and Turks living in south Kosovo, *Journal of Ethnobiology and Ethnomedicine*, **11**(1), 39. https://doi.org/10.1186/s13002-015-0023-5
Mustafa, B., Hajdari, A., Pulaj, B., Quave, C. L., and Pieroni, A. (2020): Medical and food ethnobotany among Albanians and Serbs living in the Shtërpcë/Štrpce area, South Kosovo, *Journal of Herbal Medicine*, **22**, 100344. https://doi.org/10.1016/j.hermed.2020.100344
Nedelcheva, A., and Draganov, S. (2014): Bulgarian Medical Ethnobotany: The Power of Plants in Pragmatic and Poetic Frames, 45–65 *in* A. Pieroni and C. L. Quave, eds., *Ethnobotany and Biocultural Diversities in the Balkans*, Springer New York, New York, NY. https://doi.org/10.1007/978-1-4939-1492-0_4
Patil, K., Sanjay, C., Doggalli, N., Devi, K. R., and Harshitha, N. (2022): A Review of Calendula OfficinalisMagic in Science, *Journal of Clinical and Diagnostic Research*. https://doi.org/10.7860/JCDR/2022/52195.16024
Pavlović, M. M., and Marković, M. S. (2024): Plants in natural cosmetics, *Etnobotanika*, **4**, 101–118. https://doi.org/10.46793/EtnBot24.101P
Pieroni, A., Giusti, M. E., and Quave, C. L. (2011): Cross-Cultural Ethnobiology in the Western Balkans: Medical Ethnobotany and Ethnozoology Among Albanians and Serbs in the Pešter Plateau, Sandžak, South-Western Serbia, *Human Ecology*, **39**(3), 333–349. https://doi.org/10.1007/s10745-011-9401-3
Popović, Z., Smiljanić, M., Matić, R., Kostić, M., and Bojović, N. P. (2012): Phytotherapeutical plants from the Deliblato Sands (Serbia): Traditional pharmacopoeia and implications for conservation, *Indian Journal of Traditional Knowledge*, **11**(3), 385–400.
Prabhu Venkatesh, D., S, G., Ramani, P., S, R., and Ramalingam, K. (2023): *In Vitro* Evaluation of Antioxidant and Anti-inflammatory Potentials of Herbal Formulation Containing Marigold Flower (*Calendula officinalis* L.) Tea, *Cureus*. https://doi.org/10.7759/cureus.43308
Ramos, A., Edreira, A., Vizoso, A., Betancourt, J., López, M., and Décalo, M. (1998): Genotoxicity of an extract of Calendula officinalis L., *Journal of Ethnopharmacology*, **61**(1), 49–55. https://doi.org/10.1016/S0378-8741(98)00017-8
Sarić, M. (Ed.) (1989): *Lekovite biljke SR srbije*, Srpska akademija nauka i umetnosti, Odeljenje prirodno-matematičkih nauka, Beograd.
Šarić-Kundalić, B., Dobeš, C., Klatte-Asselmeyer, V., and Saukel, J. (2010): Ethnobotanical study on medicinal use of wild and cultivated plants in middle, south and west Bosnia and Herzegovina, *Journal of Ethnopharmacology*, **131**(1), 33–55. https://doi.org/10.1016/j.jep.2010.05.061
Saric-Kundalic, B., Mazic, M., Djerzic, S., and Kerleta-Tuzovic, V. (2016): Ethnobotanical study on medicinal use of wild and cultivated plants on Konjuh Mountain, North-East Bosnia and Herzegovina, *Technics Technologies Education Management*, **11**, 208–222.
Šavikin, K., Zdunić, G., Menković, N., Živković, J., Ćujić, N., Tereščenko, M., and Bigović, D. (2013): Ethnobotanical study on traditional use of medicinal plants in South-Western Serbia, Zlatibor district, *Journal of Ethnopharmacology*, **146**(3), 803–810. https://doi.org/10.1016/j.jep.2013.02.006
Schultz, V., Hänsel, R., and Tyler, E. V. (2001): *Rational phytotherapy: a physician's guide to herbal medicine* (4th ed.), Springer-Werlag Berlin, 1–264.
Sharrif Moghaddasi, M. (2012): Pot marigold (*Calendula officinalis*) medicinal usage and cultivation, *Scientific Research and Essays*, **7**(14). https://doi.org/10.5897/SRE11.630
Silva, E. J. R., Gonçalves, E. S., Aguiar, F., Evêncio, L. B., Lyra, M. M. A., Coelho, M. C. O. C., Fraga, M. D. C. C. A., and Wanderley, A. G. (2007): Toxicological studies on hydroalcohol extract of *Calendula officinalis* L., *Phytotherapy Research*, **21**(4), 332–336. https://doi.org/10.1002/ptr.2009
Simić, M. N., Joković, N. M., Matejić, J. S., Zlatković, B. K., Djokić, M. M., Stankov Jovanović, V. P., and Marković, M. S. (2024): Traditional uses of plants in human and ethnoveterinary medicine on Mt. Rujan (southeastern Serbia), *Genetic Resources and Crop Evolution*, **71**(6), 3061–3081. https://doi.org/10.1007/s10722-023-01821-3
Šubarević, N., Stevanović, O., and Petrujkić, B. (2015): Use of phytotherapy as a form of ethnoveterinary medicine in the area of Stara

planina mountain in Serbia, *Acta Medico-Historica Adriatica*, **13**(1), 75–94.

Tucakov, J. (1990): *Lečenje biljem: fitoterapija* (5th ed.), Rad, Beograd.

Ugulu, I., and Aydin, H. (2011): Research on students' traditional knowledge about medicinal plants: Case study of high schools in izmir, turkey, *Journal of Applied Pharmaceutical Science*, **1**, 43–46.

Ukiya, M., Akihisa, T., Yasukawa, K., Tokuda, H., Suzuki, T., and Kimura, Y. (2006): Anti-Inflammatory, Anti-Tumor-Promoting, and Cytotoxic Activities of Constituents of Marigold (*Calendula officinalis*) Flowers, *Journal of Natural Products*, **69**(12), 1692–1696. https://doi.org/10.1021/np068016b

Ullah, M. A., and Hamza, A. (2023): Calendula (*Calendula officinalis*) marigold as medicinal plant, *Clinic*, **1**(302), 520–2644.

Živković, J., Ilić, M., Šavikin, K., Zdunić, G., Ilić, A., and Stojković, D. (2020): Traditional Use of Medicinal Plants in South-Eastern Serbia (Pčinja District): Ethnopharmacological Investigation on the Current Status and Comparison With Half a Century Old Data, *Frontiers in Pharmacology*, **11**, 1020. https://doi.org/10.3389/fphar.2020.01020