



UNIVERSITY OF LIFE SCIENCES "KING MIHAI I" FROM TIMISOARA

"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH IN APPLIED LIFE SCIENCES"

13-14 November, 2025



"Young people and multidisciplinary research in applied life sciences"

The Phytopharmaceutical Properties of Six Segetal and Ruderal Weed Species - A Review

Diana-Ioana MARCU¹, Sandra-Florina LELE¹, Ioan PET¹, Gheorghe DAVID², Saida-Roxana FEIER-DAVID¹

¹ University of Life Sciences "King Mihai I" from Timisoara, ¹Faculty of Bioengineering of Animal Resources, Calea Aradului,, 300645, Timisoara, Romania, ²ULS "King Mihai I" from Timisoara, Faculty of Agriculture, Calea Aradului, 119, 300645, Timisoara, Romania

Corresponding author: saida.feierdavid@usvt.ro

Abstract: Currently, the market for supplements and natural remedies in our country is constantly expanding. Against the backdrop of the COVID-19 pandemic, there has been a rise in public concern about improving and maintaining overall health, and topics such as prevention, early treatment, integrative medicine, and promoting longevity are attracting an increasing interest. Typically associated with a healthy lifestyle, proper stress management, promoting quality interpersonal connections, and spending time in nature, these biotechnological products have proven their therapeutic value over time, through their special biochemical properties and antibacterial, antiviral, anti-inflammatory, or antitumor effects, addressing a wide range of conditions, such as gastrointestinal, cardiovascular, diabetes, autoimmune diseases or even oncological conditions. This manuscript aims to highlight and explore the distinguished phytopharmaceutical properties of six species that are less known in Europe for their qualities and uses. These plants: *Xanthium strumarium*, *Cirsium arvense*, *Convolvulus arvensis*, *Artium lappa*, *Agropyron repens* and *Capsella bursa-pastoris*, are mainly known as segetal and ruderal species. They are part of four different botanical families, but share a remarkable biochemical potential, including the possibility to be used in various natural remedies, as well as in preparations and pharmaceutical products characteristic for classical medicine.

Introduction

Alternative medicine has gained more traction in the last years due to the desire for more trustworthy, tangible sources for medicine. Although there are many well known medicinal species, there are many more unknown in the European sphere, possibly due to the negative connotations these species have in agriculture and even our daily encounters.

In this paper we present the phytopharmaceutical properties of six species that are often considered agricultural pests in fields, disturbed land and neglected public spaces. Even so, these species are well known and appreciated in certain cultures which recently inspired researchers in studying their properties and extracted biochemical compounds more closely.

Articum lappa

Arctium lappa, also known as the Burdock, is a biannual plant part of the *Astraceae* family. It is commonly found in Europe and North-Western Asia and generally considered an invasive weed species. With an edible, nutrient-rich root, it is consumed by Japanese people and in some European regions. In China, its fruits were used since antiquity for their pharmaceutical properties and prescribed for fevers and gastrointestinal disorders. Its main bioactive chemical compounds are volatile oils, phenolic acids, fatty acids and terpenoids.

Clinically, it is used as an aid in the treatment of rubella, measles, cold and many other health issues. *Arctium lappa* contains numerous lignans and polyphenols that exert anti-inflammatory, anticancer, antidiabetic, antimicrobial and antiviral activities. Lignans such as Lappaol F and diartigenin strongly suppress nitric-oxide (NO) production in LPS-stimulated RAW 264.7 macrophages with IC₅₀ values of 9.5 µM and 9.6 µM, respectively, by inhibiting iNOS expression.

Capsella bursa-pastoris

Native to the European continent, *Capsella bursa-pastoris* L. (shepherd's purse) is a spontaneous species belonging to the *Brassicaceae* botanical family. It presents a high ecological amplitude, characterized by a wide distribution in different pedoclimatic conditions. In our country, the plant is known as a segetal species that frequently appears in some ruderal areas, on meadows, but also in agricultural or vegetable crops. From a therapeutic point of view, the benefits of using the plant extracts from shepherd's purse have been studied for many years, presenting notable antibacterial, anti-inflammatory, and antioxidant effects. In terms of chemical content, this species is a remarkable source of flavonoids, fatty acids, amino acids, polypeptides, histamine, choline, sterols, organic acids, sulfuraphane, as well as trace elements, vitamins, and other compounds.

Tea and tincture obtained from processing the plant are used as traditional treatments for combating imbalances in the female reproductive system (menorrhagia, PMS, cystitis), lower blood pressure, combat headaches, but also in cases of burns, bruises, or varicose veins. Studies in recent years continue to explore the phytopharmaceutical potential of this species for the treatment of some serious diseases such as cancer, multiple sclerosis, and liver toxicity.

Cirsium arvense

The Creeping Thistle, an *Asteraceae*, although usually considered a noxious weed by most farmers, was often used by Native American Tribes as a medicinal plant in its entirety. Recent studies uncovered a diverse range of phytoconstituents such as sterols, terpenoids, alkaloids, flavonoids, tannins and phenolic acids, all with phytopharmaceutical potential.

The antioxidative properties of *C. arvense* roots, leaves and inflorescences were studied and all displayed *in vitro* antioxidant activity against various radicals. Different extracts also presented antiproliferative properties against cancerous cell lines such as cervix epithelial and breast epithelial adenocarcinomas, with an efficacy of between 2.88-21.15%. It is also proven to have an inhibitory effect against bacteria species such as *Staphylococcus aureus* (with a minimum inhibitory concentration (MIC) of 12.5 mg/ml), against *Bacillus subtilis* (MIC of 50 mg/ml), *Pseudomonas aeruginosa* (MIC of 50 mg/ml) and *Candida albicans* (MIC of 1.56 mg/ml).

Convolvulus arvensis

It is a herbaceous, perennial, voluble species. It belongs to *Convolvulaceae* and it is native from Europe and Asia but has spread to other parts of the world where it is considered an invasive plant, frequently found in crops. It has been utilized since the 18th century for its medicinal properties, being used for various conditions such as infections, diabetes, and digestive problems. The parts used are the stem, leaves, and flowers (*Convolvuli Herba*). Studies conducted to date show that *Convolvulus arvensis* has countless pharmaceutical and biological uses, including antioxidant, hypertensive, antibacterial, anti-arthritic, anti-tumor, anti-diabetic, liver-protective, and anti-proliferative properties.

It is also proven that it has antimicrobial activities, such as its ethanolic extract, which displayed concentration dependent antimicrobial activity by inhibiting *Listeria innocua*, *P. aeruginosa*, *Escherichia coli* and *S. aureus* with MICs ranging from 18.75 mg/ml (*S. Aureus* and *L. innocua*) to 75 mg/ml (*P. Aeruginosa*) and producing inhibition zones up to 17 mm at 800 mg/ml.

Elymus repens

Known in the phytopharmaceutical field as medicinal couch grass, *Elymus repens* L. (*Agropyron repens* L.) belongs to the monocotyledonous weed category and frequently appears in agricultural crops of fodder plants and hoeing plants. Products obtained from the rhizomes of this species (*Graminis rhizomata*) in the form of tea, liquid extract, or tincture are mainly recognized for their diuretic effects, support of kidney function, reduction of inflammation caused by rheumatism, treatment of cystitis, but they can also contribute to increasing the body's immunity or even lowering blood pressure. The use of this medicinal plant is based on tradition and the custom of treating certain urinary tract disorders with herbal treatments.

Although, from a chemical composition point of view (polysaccharides, volatile oil, saponins, potassium salts, salicylic acid, B vitamins, carotenoids), the species has numerous therapeutic benefits, extensive studies are still needed to determine whether these properties can also be used in the treatment or even prevention of other types of conditions.

Xanthium strumarium

The Rough Cocklebur, also part of the *Asteraceae* family, is well known and very appreciated in Asian countries in traditional treatments for its extensive phytopharmaceutical properties, with a rich history of medical practice. So far, 170+ chemical compounds were extracted from this species, including fatty acids, alkaloids, phenols, glycosides and lactones.

Traditionally, it was and still is often used in nasal and head ailments such as sinusitis and rhinitis, against fungal infections, in the relief of rheumatic and arthritic pain, as well as against gastritis and urticaria.

Modern studies uncovered a large spectrum of pharmacological activity, especially from its fruit. 8 sesquiterpene were isolated, most with potent anti-viral, -microbial, -inflammatory, -tumor properties. 45 phenylpropanoids were discovered and isolated from *X. strumarium*, of which phenolic acids present anti-inflammatory and analgesic effects. 21 Lignanoids and 4 coumarins were isolated, of which the xanthiumnolic B anti-inflammatory effect was demonstrated. Extensive studies were made on the effect of various compounds against lung, breast, cervical, colon and liver cancer, as well as against meningioma and leukemia.

Conclusions

- ➡ Although often overlooked and generally despised for the negative agricultural effect these species have as a result of their competition against cultivated crop species, there is strong historical evidence of the valuable properties these species have had in traditional medicine treatments throughout the globe.
- ➡ Due to the recent surge in biochemical and medicinal research as a result of the shift in preference for natural remedies over classical ones, numerous studies are published and even more undergone on the beneficial effect of these species' phytochemicals against various afflictions and diseases.