Studii şi Cercetări	Martie 2023	Biologie	32/1	79-87	Universitatea"Vasile Alecsandri" din Bacău

ECONOMICALLY IMPORTANT SPONTANEOUS PLANTS OF THE FAMILY *BRASSICACEAE* FROM THE TERRITORY OF ROMANIA

Milian Gurău

Key words: *phytoremedying, seasoning, medicinal*

INTRODUCTION

A lot of information has accumulated over time about the biochemistry and the usagepotential of spontaneous plants, and yet, at certain time intervals, new syntheses are needed to become easy working tools.

Large families of plants have specific substances that make them more prominent from both a scientific and an economic point of view. In this context, we have prepared some lists of edible, medicinal, toxic, ecologically important, decorative plants, very few of importance for biological treatments in agriculture and for oil.

MATERIAL AND METHOD

New uses have been sought for this family in order to raise the interest of those who know the plants or are eager to find alternatives to certain categories of use. Their certification provides relevant information and enables the searcher to orient much more easily in the plant lists. The focus does not lie on highlighting the value of the medicinal plants, but on providing conclusive information about them.

Food plants

In Romanian literature, the following species are cited:

Alliaria petiolata (M. Bieb.) Cavara et Grande (E.I. Nyarady, 1955, Drăgulescu C., 1992),young leaves can be consumed in sauces and salads, replacing garlic and containg vitamins A and C (Grieve, 1959)

Armoracia rusticana P. Gaertn, horseradish, aromatic alimentary (Pop I., 1982), medicinal-alimentary, seasoning (Drăgulescu C., 1992), leaves, root, seeds. Horseradish sauce should be eaten raw, not heated because its essence, i.e. the volatile oils, gets lost. Fresh roots are used.

Barbaria vulgaris, stimulates digestive functions and appetite, antiscorbutic, heals wounds, leaves and flowers are edible but kidney disorders are possible, so it is a bit toxic.

However, they have antiscorbutic and diuretic properties (E. I. Nyarady, 1955; Crăciun Fl. Et all., 1977; Drăgulescu C., 1992; Pârvu C., 2014; Kovacs Att., 1979; Pop I., 1982).

Brassica elongata Ehrh., wild white mustard is alimentary oleaginous but also toxic (Pop I., 1982)

Brassica juncea, (L.) Czern (*B. nigra x B. rappa*), oleaginous alimentary (E. I. Nyarady, 1955; Pop I., 1982), seeds are good seasoning and replace those of *B. nigra*

Brassica nigra (L.) Koch., the edible seeds stimulate digestion and eliminate hiccups.

Brassica rappa L., alimentary, oleaginous and toxic (Pop I., 1982), edible leaves and roots 3 out of 5, rich in calcium salts (1600 mg%), phosphorus (1000 mg%), potassium (4500 mg%), iron (17 mg%) and vitamin C (500 mg%); (https://pfaf.org/user)

Bunias orientalis L., food, young shoots (Părvu C., 2001), edible 4 of 5

Cakile maritima Scop. seasoning, edible 2 of 5 (Https://pfaf.org/user); Rare and protected, it grows on coastal sands

Capsella bursa-pastoris (L.) Medik., medicinal-alimentary (Drăgulescu C., 1992),

Cardamine flexuosa With in Stokes, edible 2 of 5, seasoning (Https://pfaf.org/user)

Cardamine pratensis, aromatic alimentary (Pop I., 1982), edible 3 of 5

Conringia orientalis (L.) Dumort., alimentary culinary, (A. Nyárády 1955; Pop I., 1982;

Crambe maritima L. Sea cabbage, alimentary culinary, salad or cooked, in the young stage (Pop I., 1982; Https://pfaf.org/user),

Crambe tataria Sbeók, alimentaryculinary (Pop I., 1982), toxic (S. Fl. Marian, 1870-1907; Pop I., 1982),

Hesperis tristis, alimentary oleaginous (Pop I., 1982),

Lepidium sativum, alimentary, culinary and aromatic (Crăciun Fl., Bojor O., Alexan M., 1977; Pop I., 1982)

Sinapis arvensis L., alimentaryculinary (Pop I., 1982),

In addition, on the website Https://pfaf.org/user, the culinary qualities are verified and for the analyzed flora we also find the following spice species with poor culinary value cited:

Cardamine flexuosa With in Stokes,edible (2 of 5), seasoning

Cardamine hirsuta L., edible flowers and leaves (edibility rate – 2 of 5)

Cardamine impatiens L., edible leaves and shoots (edibility rate – 2 of 5)

Coronopus didymus (L.)Sm., edible leaves (edibility rate – 2 of 5)

Diplotaxis erucoides (l.)dc.,rare, cited only from Sulina, edible leaves (edibility rating: 2 of 5)

Diplotaxis muralis (L.)DC., 3 of 5 edibility rate of leaves

Diplotaxis tenuifoila (Jusl.)DC., stinky, good edibility rate of leaves (4 of 5)

Lepidium campestre (L)R. Br., edible leaves, fruit and shoots with edibility rating: 2 of 5but toxic after(Pop I., 1982),

Lepidium densiflorum Schrad.;edibility rate – 2 of 5,

Lepidium graminifolium L., edible leaves (edibility rate – 3 of 5)

Lepidium latifolium L., horseradishy, alimentaryseasoning 3 din 5

Lepidium perfoliatum L., edible leaves with only 1 of 5 edibility rate,

Lepidium virginicum L.;edible leaves and fruit with edibility rate - 2 of 5,

Lunaria annua, honesty, seasoning roots and seeds 2 of 5.The seeds can be used as fodder, they have a total content of 30-35% inedible oil of which 45% erucic acid and 31% nervonic acid; it is inferior to corn oil, it can be used for biodiesel (Shepard A.J. et al., 1979) but also holds attention for medicine.

Rorippa amphibia, edible leaves 3 of 5

Rorippa palustris(L.) Besser; scurvy, edible 2 of 5.

Sinapis alba L. ssp. *dissecta* (Lag.) Bonnier, edibility rate – 3 of 5

There are a large number of species that find their use as spices due to their digestive stimulating properties but are not well known to the general public, which is indicated by the duplication of information on the Plants for Future website.

Seasoning plants

Alliaria petiolata (M. Bieb.) Cavara et Grande, can replace garlic, contains vitamins A and C (Grieve, 1959);

Armoracia rusticana P. Gaertn, leaves, roots and seeds are used. Horseradish sauce should be eaten raw, not heated because its essence, i.e. the volatile oils, is lost. Fresh roots are used.

Brassica juncea, (L.) Czern (*B. nigra x B. rappa*), the seeds are good for seasoning, replacing those of *B. nigra*. Https://pfaf.org/user).

Brassica nigra (L.)Koch., black mustard, edible seeds, stimulate digestion.

Cakile maritima Scop., modest seasoning value, edible 2 of 5 (https://pfaf.org/user), rare and protected, growing on beach sands, in heavily polluted biotopes.

Capsella bursa-pastoris (L.)Medik., Shepherd's purse, medicinal-alimentary (Drăgulescu C., 1992),

Cardamine flexuosa With in Stokes,edible 2 of 5, seasoning (https://pfaf.org/user)

Medicinal plants

Alliaria petiolata (M. Bieb.) Cavara et Grande: scurvy, worms, coughs, eczema and trauma, inflammation, asthma, kidney diseases (E.I. Nyarady, 1955; Crăciun Fl. et all., 1977; Drăgulescu C., 1992), Pârvu C. 2014); It is toxic (Pop I., 1982),

Alyssum desertorum Stapf. contains flavonoids (Buckingham, J.; V. Ranjit N. Munasinghe, 2015), seeds are used in cough and joint pain (Khalid Rehman et al., 2015)

Armoracia rusticana P. Gaertn, Horseradish: cough, rheumatism, gallstones, urinary stones, oral cavity hygiene, hypertension, dropsy, joint inflammation, gout, liver diseases, asthma, anorexia, viper bite, pulmonary catarrh, bronchial catarrh, heart disease, bronchitis, pulmonary congestion, anemia, hypoacid gastritis, hepatic decongestion, diarrhoea (S. Fl. Marian, 1870-1907; Crăciun Fl. et all., 1977; Pop I., 1982; Pârvu C. 2014).

It stimulates circulation, diuretic, antibiotic, urinary and respiratory infections as an antiseptic; in the liver, spleen and pancreas can replace cayenne pepper, it has a diuretic effect, treats gout, eliminates excess uric acid.

Key applications in catarrh of the respiratory tract, urinary tract infections, muscle pain, the volatile oil has a broad antimicrobial spectrum, do not administer to children under 4 years old, (Khare C.P., 2007).

Frequently used in respiratory infections, colds, respiratory catarrh, fever, flu. It is a strong digestive stimulant, useful in urinary infections, hay fever. Externally, they are used as poultices in pleurisy, arthritis, wounds, minor muscle pain.

Barbarea vulgaris, medicinal-alimentary, stimulates digestive functions and appetite, antiscorbutic, heals wounds (E. I. Nyarady, 1955; Crăciun Fl. et all., 1977; Drăgulescu C., 1992; Pârvu C., 2014), the leaves and flowers are edible, have a diuretic effect but kidney disorders are possible (https://pfaf.org/user).

Berteroa incana, sweet bugs, skin infections, leucorrhoea (Pârvu C. 2014, 2016)

Brassica nigra (L.) Koch., black mustard: tracheo-bronchitis, cold, chronic degenerative rheumatism, polyneuritis, pneumonia, scapulo-humeral periarthritis, sciatica neuralgia, joint inflammation, rubefacient seeds in flu, rubefacient poultice in rheumatism, neuralgia, spasms and congested organs, baths in colds and headaches, alopecia, epilepsy, (E. I. Nyarady, 1955; Crăciun Fl.

et all., 1977; Farmacopea Rom, ed. X, Pârvu C., 2014, 2017).

Capsella bursa-pastoris (L.) Medik., medicinal as haemostatic, hypotensive (Crăciun Fl. et all., 1977; Kovacs Att., 1979; Pop I., 1982), heart failure, arterial hypertension, angina pectoris, gastric pain, diarrhoea, urinary lithiasis, dysmenorrhea, haemophilia, small internal haemorrhages, metrorrhagia, blennorrhagia (Pârvu, C., 2013), antihemorrhagic, unwanted effects have been observed in pregnant animals, indicated in heavy bleeding, frequent menstruation and fibroids, antihemorrhagic, astringent on the reproductive system in women, diuretic (Romm Av., 2010). It is effective in treating internal and external bleeding, nosebleeds, diarrhoea, etc. but it is contraindicated for hypertensive people, thyroid problems and pregnancy (https://pfaf.org/user), medicinal-alimentary (Drăgulescu C., 1992).

Cardamine pratensis: scurvy, asthma, gout, rheumatism (Crăciun Fl., Bojor O., Alexan M., 1977; Pârvu, C., 2013, 2016)

Cardaria draba (L.) Desv., (Syn. Lepidium draba), toxic (Pop I., 1982); eczema (Pârvu C., 2016), edible leaves and shoots, scurvy, flatulence (Https://pfaf.org/user),

Cochlearia pyrenaica L.: used by Nordic peoples in scurvy, disinfectant on external ulcers (Https://pfaf.org/user); gum diseases, scurvy, scrofulosis, asthma, bronchitis, pulmonary catarrh, nosebleeds, oral cavity wounds, chronic skin, alimentary, culinary and aromatic diseases (Crăciun Fl., Bojor O., Alexan M., 1977; Pop I. , 1982; Pârvu C., 2013, 2016

Coronopus squamatus (Forskal) Ascherson, empirical treatments as antiscorbutic and diuretic (E.I. Nyárády 1955; Crăciun Fl. et all., 1977); kidney diseases (Pârvu C., 2013);

Coronopus didymus (L.) Sm., leaves edibility rating: 2 of 5 (Https://pfaf.org/user), diuretic plant used in infections, generally used as an insecticide (Khalid Rehman et al., 2015).

Dentaria bulbifera: diarrhoea (Crăciun Fl. et all., 1977, Pârvu C., 2013

Diplotaxis tenuifoila (Jusl.)DC., stinky, antiscorbutic in the past (Crăciun Fl. et all., 1977; Pârvu C. 2014). The oil has action on Gram-positive, Gram-negative germs, yeasts and mycobacteria (Nico Radulovik et al. 2011)

Erysimum odoratum Ehrh. The oil has action on Gram-positive, Gram-negative germs, yeasts and mycobacteria (Nico Radulovik et al. 2011).

Lepidium latifolium L., eczema, dropsy, elimination of toxins, kidney diseases (Crăciun Fl. et all., 1977; Pârvu C. 2013), scurvy, liver and kidney diseases, skin diseases, regulates heartbeat (https://pfaf.org/user)

Lepidium ruderale L.: fever, cancer, skin cancer, eczema, malaria, anthrax, parasites (Crăciun Fl. et all., 1977; Pârvu C. 2013; 2016); leaves edibility rate - 2 of 5, impetigo, hypertension (Https://pfaf.org/user)

Lepidium virginicum L.: detoxification, scurvy, diabetes, worms, rheumatism, cough, bronchial asthma, excess phlegm, oedema, oliguria, fluid accumulation in the thoraco-abdominal cavity, blisters on the skin, respiratory catarrh (Https://pfaf. org/user).

Nasturtium officinalis: kidney diseases, bladder diseases, bronchitis, constipation, diabetes, biliary dyskinesia, dyspepsia, stomach pain, elimination of intestinal worms, gingivitis, burns, periodontal disease, scurvy, ulcers (Pop I., 1982; Drăgulescu C., 1992; Pârvu C., 2013), good depurative in skin diseases, tonic, vitaminizing for lymphatics, rickets, convalescents (Crăciun Fl. et all., 1977); effective detoxifier, valuable in chronic diseases; the juice used in chest and kidney ailments, chronic irritations, skin irritations, externally tones hair growth (Https://pfaf.org/user). Yamuna Pandai et al. (2018) also add the following antituberculosis, anticancer, antimicrobial, antioxidant, cardioprotective and hepatoprotective effects. Haro G. et al (2018) consider it a "source of antioxidants and minerals". It contains glucosinolates (Blaževic Ivica et al., 2020).

Raphanus raphanistrum L., wild radish: kidney diseases, liver diseases, biliary calculosis, scurvy (Pârvu, C., 2013), edible 2 of 5, antirheumatic (Https://pfaf.org/user); skin diseases, scabies (Khalid Rehman et al., 2015)

Sinapis alba L. ssp. dissecta (Lag.) Bonnier: chronic constipation, anorexia, dyspepsia, pancreatic insufficiency (Pârvu C., 2017), medicinal 3 out of 5. The seeds contain calcium (500 mg%), phosphorus (800 mg%), iron (16 mg%), potassium (732 mg%), have an antibacterial, antifungal, digestive, expectorant, diuretic, cathartic effect, being recommended for respiratory infections, arthritic joints, skin rashes, the leaves are carminative. They contain 35% oil that can be used as a lubricant and for lighting. Plants can be used as green manure (Https://pfaf.org/user)

Synapis nigra , medicinal (Crăciun Fl. Et all., 1977);

Sisymbrium irio Linn., very rare in Romania. The seeds have expectorant, restorative, febrifuge, rubefacient, antibacterial properties, used in asthma. The ethanolic extract from the seeds is antibacterial, antipyretic and analgesic.

The leaves are rich in vitamin C (176 mg%), β-carotene (10,000 IU per 100 gr) and minerals. They are used in neck and chest infections (Khare C.P., 2007). In Pakistan, the seeds have been traditionally used in the treatment of gastrointestinal, respiratory and vascular diseases (Musaddique Hussain et al., 2016)

Sisymbrium loeselii Linn.: scrofulous, antiscorbutic (Khare C.P., 2007).

Sisymbrium officinale (L.) Scop.,: herbal baths for children (S. F. Marian, 1870-1907); folk medicine in aphonia, pharyngeal atony, restores the voice of artists, gastric and intestinal colic, pharyngitis, hoarseness, scurvy, cough, whooping cough, asthmatic cough (Crăciun Fl. et all., 1977; Pârvu, C ., 2013); it is a popular remedy for sore throats, coughs and hoarseness, it is recommended for singers to regain their voice, but the prescription must be respected (Politi Mşi et al., 2008). It is frequently used for respiratory conditions. Muscle relaxant in inflammations, it has an intense anticancer effect but no antimicrobial activity was found on several germs tested in the laboratory (A. di Sotto et al., 2010). toxic (Pop I., 1982),

Sisymbrium strictissimum L., folk medicine recommends it in gastric, hepatic and intestinal colic, hepatobiliary colic, fermentation colitis, paralysis, cold, cough (Crăciun Fl., Bojor O., Alexan M., 1977; Pârvu, C., 2013, 2016), weed.

Descurainia sophia (Sisymbrium sophia) The seeds have expectorant, anti-inflammatory, febrifuge, anti-dysenteric properties. The aerial parts of the plants have antiviral, hypoglycemic properties and can be used to treat ulcers. The seeds used externally can replace those of *Sisymbrium irio* (Khare C.P., 2007).

It is traditionally used in NE Asia, predominantly in Korea, Japan and China in lung disorders including cough, phlegm, caused by acute and chronic airway inflammation (Sung-Bae Kim et al., 2019). It cures allergic asthma, having anti-inflammatory and analgesic effect due to the high content of flavonoids (Nabila Abdul, 2011). Chinese medicine uses it in herbal mixtures to treat lung cancer (Nawal A. Mohamed, Atta E. Mahrons, 2009). It has effects in cancers of the colon, breast, nasopharynx, oesophagus, stomach, liver, ovaries, cervix, oral cavity.

The extract of seeds and shoots is effective in intestinal disorders, flatulence. Acute inflammations of the pharynx, cough, dyspnoea, etc. are treated with seeds. In general, it has an antibacterial and anti-infective effect due to the high content of glucosinolates. Among the side effects it is mentioned that it inhibits the uptake of thyroid iodine. "The seeds calm cough, prevent asthma, reduce oedema, promote healing, have a cardiotonic, antipyretic, antioxidant, anti-inflammatory, diuretic, anthelmintic, haemostatic and analgesic effect. In addition, they contain large amounts of volatile oil" (Muhamad Khan et al., 2012). The juice can be used for chronic cough and the seeds for asthma, fever, oedema, dysentery, worms, burns and wounds (https://pfaf.org/user).

Thlaspi arvense L., Field pennycress: kidney diseases, elimination of toxins (Crăciun Fl. et all., 1977; Pârvu C., 2013, 2016), edible 2 of 5, contains 200 mg % vitamin C, the seeds have tonic effect. The plant has an antirheumatic effect, diuretic, antibacterial action, used in appendicitis, intestinal abscesses, dysmenorrhea, endometriosis, postpartum pain (Https://pfaf.org/user). It has no known toxicity effects, it grows as a frequent weed in areas of agricultural interest.

Half of the spontaneousBrassicaceae of Romania registered specific substances, spontane din România s-au identificat substanțele specifice, glucosinolates: *Arabidopsis thaliana* (L.) Heynh; *Arabis alpina* L., *Arabis hirsuta* (L.) Scop., *Camelina alyssum* (Mill.) Thell. *Camelina microcapa* Andrz ex DC *Camelina sativa* (L.) Crantz *Conringia orientalis* (L.) Dumort., *Erysimum odoratum* Ehrh *Lepidium densiflorum* Schrad.; *Lepidium graminifolium* L.; *Lepidium virginicum* L.; *Arabidopsis thaliana* (L.) Heynh, *Arabis alpina* L *Arabis hirsuta* (L.) Scop., *Armoracia rusticana* P. Gaertn, *Barbarea vulgaris*, *Berteroa incana, Brassica juncea*, (L.) Czern (*Brassica nigra* (L.) Koch *Brassica rapa* L., *Camelina alyssum* (Mill.) Thell. *Camelina microcapa* Andrz ex DC *Camelina sativa* (L.) Crantz *Capsella bursa-pastoris* (L.) Medik. *Cardamine pratensis, Cardaria draba* (L.) Desv., *Cochlearia pyrenaica* L., *Conringia orientalis* (L.) Dumort., *Eruca sativa*, *Erysimum odoratum* Ehrh *Hesperis matronalis* L., *Lepidium densiflorum* Schrad.; *Lepidium graminifolium* L.; *Lepidium virginicum* L *Nasturtium officinalis*, *Thlaspi arvense* L., (Blaževic Ivica şi colab., 2020).

The list of **toxic** plants is short, but they are also known to be medicinal. We have not found medical literature that warns of the dangers related to the consumption of these plants, we believe that the burning substances determine the consumption dose. From the category of toxic and medicinal plants we cite the following: *Alliaria petiolata* (M. Bieb.) Cavara et Grande, *Alysssum alyssoides, Alyssum saxatile* (L.) Desf., *Barbarea vulgaris*, *Capsella bursa-pastoris* (L.) Medik., *Cardamine pratensis, Cardaria draba* (L.) Desv., (Syn. *Lepidium draba*), *Cochlearia pyrenaica* L., *Lepidium ruderale* L., *Nasturtium officinalis*, *Sinapis alba* L. ssp. *dissecta* (Lag.) Bonnier *Sisymbrium loeselii* Linn., toxic (Pop I., 1982). *Sisymbrium officinale* (L.) Scop., toxic (Pop I., 1982), weed *Thlaspi alliaceum* (Pop I., 1982)

The category of **medicinal-alimentary** plants for which toxicity phenomena were not detected includes *Alyssum desertorum, Armoracia rusticana, Brassica juncea, Brassica nigra, , Cardamine bulbifera, Crambe maritima*, *Diplotaxis tenuifoila, Lepidium densiflorum*, *Lepidium latifolium*, *Rorippa palustris, Sinapis alba, Sisymbrium officinale* (Table 1).

Table 1. Alimentary, medicinal and toxic plants of Family Brassicaceae

SPECIES	ALIMENTARY	MEDICINAL	TOXIC
Alliaria petiolata	+	+	Not known
Alysssum alyssoides	.	.	+
Alyssum desertorum	+	+	.
Alyssum saxatile	.	.	+
Arabis alpina L.,	+	.	Not known
Arabis hirsuta	+	.	Not known
Armoracia rusticana	+	+	.
Aurinia saxatilis	.	.	+
Barbarea vulgaris	+	+	+
Berteroa incana		+	Not known
Brassica elongata	+	.	+
Brassica juncea	+	+	.
Brassica nigra	+	+	.
Brassica rappa L	+	.	+
Bunias orientalis	+	.	.
Cakile maritima	.	+	
Capsella bursa-pastoris	+	+	+
Cardamine bulbifera	+	+	.
Cardamine flexuosa	+	.	.
Cardamine hirsuta	+	.	.
Cardamine impatiens	+	.	.
Cardamine pratensis	+	.	+
Cardaria draba	.	+	+
Cochlearia pyrenaica	.	+	+
Conringia orientalis	+	.	Not known
Coronopus squamatus	.	+	.
Coronopus didymus	+	+	.
Crambe maritima	+	.	.
Crambe tataria	+	+	+
Dentaria bulbifera		+	
Diplotaxis erucoides	+	.	.
Diplotaxis muralis	+	.	.
Diplotaxis tenuifoila	+	+	.
Eruca sativa	+	.	.
Erysimum odoratum	+	.	.
Erysimum repandum	+	.	.
Erysimum witmanni ssp. *transsilvanicum*	.	+	.
Hesperis tristis	+	.	.
Hesperis sylvestris	+	.	.
Lepidium campestre	.	+	+
Lepidium densiflorum	+	+	.
Lepidium graminifolium	+	.	.
Lepidium latifolium	+	+	
Lepidium perfoliatum	+	+	+
Lepidium ruderale	+	+	+
Lepidium sativum	+	.	.
Lepidium virginicum	+	.	.
Nasturtium officinalis	+	+	+
Raphanus raphanistrum	+	.	Not known
Rorippa amphibia	+	.	.
Rorippa palustris	+	+	.
Rorippa sylvestris	.	.	+
Sinaps alba ssp. *dissecta*	+	+	.
Sinapis arvensis L.	+	.	+
Synapis nigra	.	+	.
Sisymbrium irio	.	+	.
Sisymbrium loeselii	.	+	+
Sisymbrium officinale	+	+	.
Sisymbrium strictissimum	.	+	.
Descurainia sophia	.	+	+
Thlaspi arvense	.	+	.
Thlaspi perfoliatum	+	.	.

For **ecological restoration by phytoremedying**,10 species were found useful:

Biscutella laevigata is tolerant to heavy metals (Alicja A. Babst-Kostecka et al., 2016); accumulates heavy metals such as thallium and zinc, absorbs them in a highly bioavailable form, is an indicator of bioavailability (Elena Pavoni et al., 2016); it is

hyperaccumulator of thallium (Malgorzata Wierzbicka et al., 2016).

Brassica juncea, (L.) Czern (B. nigra x B. rappa) is useful for the removal of heavy metals (Takuya Abe et al., 2008). Many recent studies highlight it as a very good plant for the phytoremediation of contaminated agricultural soils.

Brassica rapa L., rapeseed, dynamic accumulator (Https://pfaf.org/user),

Camelina sativa (L.) Crantz, phytoremedying (Takuya Abe et al., 2008)

Capsella bursa-pastoris (L.) Medik., ecological restoration.

It is a dynamic accumulator, it recovers the properties of the soil by absorbing salt (Https://pfaf.org/user). It is a colonizing plant (Hurka H. et al., 2003), it produces a large amount of seeds (Müler Caroline, 2009).

Diplotaxis tenuifoila (Jusl.)DC., phytoremedying (Takuya Abe et al., 2008). It is a weed, frequently spread on ruderal and cultivated lands, in the hill and plain area. It is a colonizing plant (Hurka H. et al., 2003), phytoremedying (Takuya Abe et al., 2008)

Nasturtium officinalis is toxic in polluted waters (Pop I., 1982); dynamic accumulator (https://pfaf.org/user).

For the protection of polluted water bodies with slightly deep water, it can be used for phytoremedying because it can accumulate chromium, cadmium, uranium, arsenic in the leaves (Marta Klink-Szczykutowicz et al., 2018). It is a colonizing plant (Hurka H. et al., 2003)

*Sisymbrium altissimum,*phytoremedying (Takuya Abe şi colab., 2008),

*Sisymbrium orientale,*phytoremedying (Takuya Abe şi colab., 2008)

Thlaspi praecox tolerates the hyperaccumulation of heavy metals (Marjana Regvar, 2006)

Decorative value is presented by *Alyssum saxatile*, *Biscutella laevigata, Crambe maritima* L. *Hesperis matronalis*,*Hesperis tristis*, *Lunaria annua, Lunaria rediviva*,

High oil content is held by the following species: *Alliaria petiolata*, *Brassica elongata*, *Brassica nigra, Brassica rapa* L.,*Raphanus raphanistrum* L.,*Sinapis arvensis* L.

In the category of honey plants, the list is extremely poor, although the qualities of cultivated rapeseed honey are well known. Among the spontaneous plants only *Brassica rappa* has a good melliferous share.

The best fungicide in this family is *Armoracia rusticana.*

The following plants are insecticides: *Brassica rapa*, *Capsella bursa-pastoris, Coronopus squamatus, Lepidium ruderale* L.

CONCLUSIONS

To sum up, we update the list of economically important species as follows:

Alliaria petiolata, popular beliefs, seasoningand edible 3 of 5, medicinal: coloring oil source, toxic:

*Alysssum alyssoides,*toxic ;

Alyssum desertorum medicinal;

Alyssum montanum, decorative;

Alyssum saxatile, decorative, toxic;

Arabidopsis thaliana, cosmetic;

Arabis alpina, decorative, edible 2 of 5;

Arabis hirsuta,edible 1 of 5;

Armoracia rusticana, alimentaryseasoning, medicinal, fungicide;

Barbarea vulgaris, medicinal-alimentary, toxic, weakly melliferous, coloring;

*Berteroa incana,*medicinal;

Biscutella laevigata, decorative, phytoremedying;

Brassica elongata, alimentary,oleaginous, toxic, ligting anf painting, mediocre melliferous value;

Brassica juncea, alimentary oily, seasoning, medicinal, ecological restoration - phytoremedying;

Brassica nigra, alimentary, medicinal, fodder, veterinary medicine, oil source (lubricant, lighting, soap), agriculture - green manure;

Brassica rapa, alimentary, oleaginous, toxic, good melliferous plant, colorant galben, insecticide, ecological restoration- phytoremedying;

Bunias orientalis, alimentary, poor fodder;

Cakile maritima, medicinal, melliferous, seasoning;

*Camelina sativa,*medicinal, alimentary oleaginous, phytoremedying;

Capsella bursa-pastoris, medicinal-alimentary, cosmetic, toxic, insecticide, restaurare ecologică – phytoremedying;

Cardamine bulbifera (L.) Crantz, medicinal-alimentary;

Cardamine flexuosa, edible 2 of 5, seasoning;

Cardamine hirsuta L., edibility rating: 2 of 5;

Cardamine impatiens L., edible 2 of 5;

Cardamine pratensis, popular belief, medicinal, alimentary aromatic, edible 3 of 5, weakly melliferous, toxic, decorative;

Cardaria draba (L.) Desv.,medicinal, toxic;

Cochlearia pyrenaica, medicinal, alimentary, culinary and aromatic, toxic;

Conringia orientalis, alimentary, culinary;

Coronopus squamatus, medicinal, repelent for insects;

Coronopus didymus, edibility rating: 2 of 5, insecticid;

Crambe maritima, alimentary-culinary, decorative;

Crambe tataria, alimentary-culinary, weaky melliferous, toxic, decorative;

Descurainia sophia, medicinal, toxic
Diplotaxis erucoides, ,edible 2 of 5;
Diplotaxis muralis, edible 3 of 5;
Diplotaxis tenuifoila, medicinal, edible 4 of 5, phytoremedying;
Draba muralis, medicinal;
Draba nemorosa alimentary and medicinal 1 din 5
Draba verna alimentary and medicinal 1 din 5
Eruca sativa, alimentaryculinary şi oleaginous,cosmetic, phytoremedying;
Erysimum odoratum, medicinal;
*Erysimum repandum,*medicinal;
Erysimum witmanni ssp.*transsilvanicum*, medicinal;
Hesperis matronalis L., mediocre melliferous value, decorative, medicinal, cosmetic;
Hesperis tristis, alimentaryoily, good melliferous value, decorative;
Hesperis sylvestris, medicinal;
Lepidium campestre, edibility rating: 2 of 5;
Lepidium densiflorum, edible 2 of 5, medicinal;
Lepidium graminifolium L., edibility rating: 2 of 5;
Lepidium latifolium L., alimentary seasoning 3 of 5, medicinal;
Lepidium perfoliatum L., toxic, edible only 1 of 5, medicinal
Lepidium ruderale L., edibility rate - 2 of 5, medicinal, toxic, popularinsecticide
Lepidium virginicum L.;edible leaves and fruit, 2 of 5 edibility rate, medicinal
Lunaria annua, decorative, mediocre melliferous value, seasoning 2 of 5, fodder, biodiesel
Lunaria rediviva, decorative, mediocre melliferous value
Nasturtium officinalis, alimentary, culinary, medicinal, cosmetic, toxic, phytoremedying
Raphanus raphanistrum, medicinal, alimentaryoily and seasoning, mediocre melliferous value
Rorippa amphibia, mediocre melliferous value, edible rating of leaves: 3 of 5
Rorippa palustris (L.) Besser, edibility rating: 2 of 5;
Rorippa sylvestris, toxic
Sinapis alba L. ssp. *dissecta* (Lag.)Bonnier, edibility rating - 3 of 5, medicinal, green manure
Sinapis arvensis L., popular beliefs, food, culinary, oleaginous, melliferous,toxic, soap, good for lighting
Synapis nigra , medicinal
*Sisymbrium altissimum,*phytoremedying
Sisymbrium irio Lin., medicinal
Sisymbrium loeselii Lin., medicinal, toxic
Sisymbrium officinale (L.) Scop., toxic
Sisymbrium strictissimum L., medicinal
*Sisymbrium orientale,*phytoremedying
Thlaspi alliaceum,folk veterinary medicine
Thlaspi arvense L., medicinal
Thlaspi perfoliatum L., food, lighting
Thlaspi praecox, phytoremedying

ABSTRACT

Plants from the Brassicaceae family, found in the wild flora of Romania, are reputed for their value for nutrition, medicine, agriculture, environmental protection, horticulture and toxicology. There are 73 spontaneous species with different uses, which contain characteristic, spicy substances and impose a limitation in their consumption. Over 30 species are of interest for phytomedicine, 17 species have seasoning value as food, 2 species are of use in veterinary medicine, only 18 species are toxic, while for industry there are no species of particular economic value although 6 species contain oil. A new category of uses has emerged, including 10 species of plants that resist the accumulation of polluting substances in the soil and that contribute to the phytoremediation of areas contaminated with polluting and sometimes very dangerous substances. Only 9 species belong to the category of melliferous plants and they have no economic importance. 11 species can be cultivated for decoration. For cosmetics, there are only 6 species, whose oils are more valuable for soap making. A small number of species are useful for biological treatments in agriculture: of these, 6 species can be used to control insects and 1 species is effective to control fungi. Excepting rape, *Brassica rapa*, the wild species of this family are not of melliferous importance.

REFERENCES

1. ALTUNDAGA A., OZTURKB M., 2011 - Ethnomedicinal studies on the plant resources of east Anatolia, Turkey, Procedia Social and Behavioral Sciences 19: 756–777, The 2nd International Geography Symposium GEOMED2010.
2. BABST-KOSTECKA A., WALDMANNC P., FRÉROTD H., VOLLENWEIDER P., 2016 - Plant adaptation to metal polluted environments—Physiological, morphological, and evolutionary insights from *Biscutella laevigata,* Environmental and Experimental Botany,127:1-13.
3. BLAŽEVIĆA, I., MONTAUTB S., BURČULC F., OLSEND C.E., BUROWE M., ROLLINF P., AGERBIRKD N., 2020 - Glucosinolate structural diversity, identification, chemical synthesis and metabolism in plants Phytochemistry, 169: 57 p.
4. BLAŽEVIĆA, I., RADONIC´ A, MASTELIC´ J., ZEKIC´ M., SKOČIBUSIĆ, M., MARAVIC´A., 2010 - Hedge Mustard (*Sisymbrium officinale*): Chemical Diversity of

Volatiles and Their Antimicrobial Activity, Chemistry & Biodiversity, 2023-2034.
5. BORZA AL., 1968- Dicţionar etnobotanic, Edit. Acad. R.S. România, Bucureşti.
6. BUCKINGHAM, J.; V. RANJIT N. MUNASINGHE, 2015 - Dictionary of Flavonoids, CRC Press.
7. CONDURSO, C., VERZERA A., VINCENZA R., ZIINO,M., TROZZI, A., RAGUSA, S., 2006 -The Leaf Volatile Constituents of Isatis tinctoria by Solid-Phase Microextraction and Gas Chromatography/Mass Spectrometry, Planta Medica , 72:1-5.
8. CRĂCIUN FL., BOJOR O., ALEXAN M., 1976 – 1977 - Farmacia naturii, I-II, Edit. Ceres, Bucureşti.
9. DE VOS, PAULA, 2010 - European materia medica in historical texts: Longevity of a tradition and implications for future use Journal of Ethnopharmacology, 132: 28-47.
10. DODOS S. G., KARONIS, D., ZANNIKOS, F., LOIS, E., 2015 - Renewable fuels and lubricants from *Lunaria annua* L., Industrial Crops and Products 75: 43–50
11. DRĂGULESCU C., 1992 - Plantele medicinal-alimentare din flora spontană, Edit. Ceres Bucureşti, 112 pag.
12. GRIFFITHS, D. W., DEIGHTONA N., NICHOLAS A., BIRCHA E., PATRIANB B., BAURB R., STÄDLER E., 2001 - Identification of glucosinolates on the leaf surface of plants from the Cruciferae and other closely related species, Phytochemistry ,57: 693–700.
13. GUARINO, C., CASORIA, P., MENALE B., 2000 - Cultivation and use of *Isatis tinctoria* L. (Brassicaceae) In Southern Italy , Economic Botany, 54(3): 395--400.
14. HANNEKE VAN LEUR , CISKA E. RAAIJMAKERS, NICOLE M. VAN DAM, 2006 - A heritable glucosinolate polymorphism within natural populations of Barbarea vulgaris, Phytochemistry 67: 1214–1223.
15. HARO G., IKSEN I., RUMANTI R. M., MARBUN N., SARI R. P., GULTOM R. P. J. , 2018 - Evaluation of antioxidant activity and minerals value from watercress (*Nasturtium officinale* R.Br.), Rāsayan J. Chem., 11 (1): 232-237.
16. HURKA H., BLEEKER W., NEUFFER B., 2003 - Evolutionary processes associated with biological invasions in the Brassicaceae, Biological Invasions 5: 281–292.
17. IHSAN A. AL-SHEHBAZ, KHALIL I. AL-SHAMMARY, 1987 - Distribution and Chemotaxonomic Significance of Glucosinolates in Certain Middle-Eastern Cruciferae, Biochemical Systematics and Ecology, 15(5): 559-569.
18. IKRAM ULLAH, ABDUL WAKEEL, ZABTA KHAN SHINWARI, SOHAIL AHMAD JAN, ALI TALHA KHALIL, MUHAMMAD ALI, 2017- Antibacterial and antifungal activity of Isatis tinctoria L. (Brassicaceae) using the micro-plate method, Pak. J. Bot., 49(5): 1949-1957.
19. KHALID R., ZIA-UR-R. M., MUBARK A. K., ZAHID U., HASSAN J. CH., 2015 - An ethno botanical perspective of traditional medicinal plants from the Khattak tribe of Chonthra Karak, Pakistan ,Journal of Ethnopharmacology ,165: 251–259.
20. KHARE C.P., 2007 - Indian Medicinal Plants, Springer.
21. KHAN M., WANG N., 2012 -Review Article *Descurainia sophia* (L.): a weed with multiple medicinal uses , Punjab Univ. J. Zool., Vol. 27 (1), 45-51.
22. KJAR A., SCHUSTER A. , 1972 - Cruciferaeglucosinolates in *Syrenia cana* , Department of Organic Chemistry, Technical University of Denmark, Phytochamistry, 11: 1502 -1503. Pergamon Press. PrInted III England.
23. KLIMEK-SZCZYKUTOWICZ M., SZOPA A., EKIERT H., 2018 - Chemical composition, traditional and professional use in medicine, application in environmental protection, position in food and cosmetics industries, and biotechnological studies of *Nasturtium officinale* (watercress) – a review, Fitoterapia, 129: 283-292.
24. KOVACS ATT., 1979 - Indicatorii biologici, ecologici şi economici din flora pajiştilor, Ed. Tehnică de Propagandă Agricolă, Bucureşti, 50 p.
25. KUMAR K., SHARMA Y. P., MANHAS R.K., BHATIA H., 2015 - Ethnomedicinal plants of Shankaracharya Hill, Srinagar, J&K, India, Journal of Ethnopharmacology,170: 255-174
26. MARIAN, S.FL., 2008-2010 - Botanică Poporană Română, vol I Ed. Muşatinii Suceava, vol II-III Ed. Acad Rom ., Bucureşti, editată de Aura Brădăţan
27. MÜLLER C., 2009 - Role of glucosinolates in plant invasiveness, Phytochem Rev, 8:227–242
28. NYARADY, E.I. 1955 – Fam Brassicaceae în Săvulescu Tr., 1952- 1972 - Flora R.P. România, vol III, Ed. Acad. Rom., Bucureşti.
29. PANDEY Y., BHATT S. S., DEBBARMA N., 2018 - Watercress (Nasturtium officinale): A Potential Source of Nutraceuticals, Int. J. Curr. Microbiol. App. Sci , 7(2): 2685-2691.
30. PAVONI E., PETRANICH E., ADAMI G., BARACCHINI E., CROSERA M., EMILI A., LENAZ D, HIGUERAS P., COVELLI S., 2017 - Bioaccumulation of thallium and other trace metals in *Biscutella laevigata* nearby a decommissioned zinc-lead mine (Northeastern

Italian Alps), Journal of Environmental , Management, 186, 214-224.
31. PÂRVU, C., 2000-2004 - Enciclopedia plantelor, Ed. Tehnică, Bucureşti.
32. PÂRVU, C.,2014 - Leacuri pentru sănătate, Ed. ASAB, Bucureşti.
33. PÂRVU C., PÂRVU ALEXANDRA ŞTEFANIA, 2016 - Enciclopedia plantelor medicinale din Flora României, Ed. ASAB, Bucureşti.
34. PETELKA J., PLAGG B., SÄUMEL I., ZERBE S., 2020 - Traditional medicinal plants in South Tyrol (northern Italy, southern Alps): biodiversity and use, Journal of Ethnobiology and Ethnomedicine 16:74
35. POP I., 1982 - Plante spontane şi subspontane cu valoare economică din Flora R. S. Romania, Contrib. Bot, Cluj Napoca, 131-142
36. SÂRBU I. ŞTEFAN. N.; OPREA AD. 2013 - Plante vasculare din România, Ed. Victor. B. Victor, Bucureşti.
37. SHEPPARD A. J., FRITZ J. C., RUDOLF T. S., 1979 - Effect of Dietary *Lunaria* Oil on Chick Growth and Organ Lipid Content, Division of Nutrition, Food and Drug Administration, Washington.
38. TETIK F., CIVELEK S., CAKILCIOGLU U., 2013 - Traditional uses of some medicinal plants in Malatya (Turkey), Journal of Ethnopharmacology, 146: 331-346.
39. VAUGHN S. V. , BERHOW A. M., 2005 - Glucosinolate hydrolysis products from various plant sources: pH effects, isolation, and purification, Industrial Crops and Products 21 : 193–202.
40. WAGNER, CH.S., GEZELLEB J., ROBERTSONC M., ROBERTSONC K., WILSONA M., KOMARNYTSKYA S., 2017 - Antibacterial activity of medicinal plants from The Physicians of Myddvai, a 14th century Welsh medical manuscript, Journal of Ethnopharmacology, 203: 171-181.
41. WIERZBICKA M., PIELICHOWSKA M., ABRATOWSKA A., WIŁKOMIRSKI B., WYSOCKA I., PANUFNIK-MĘDRZYCKA D., BULSKA E., 2016 - Thallium hyperaccumulation in Polish populations of *Biscutella laevigata* (Brassicaceae), Acta Biologica Cracoviensia, Series Botanica, 58/2: 7–19.
42. ***, 2021 - Farmacopea Română, Ed. –X- a, Ed. Medicală, Bucureşti.
43. https://pfaf.org/user, 2012-2022 - Plants for a Future

AUTHOR'S ADDRESS

GURĂU MILIAN – „Vasile Alecsandri" University of Bacău, Faculty of Sciences, Department of Biology and Environmental Protection, Mărăşeşti Street no. 157, Bacau, Romania, e-mail: milian_gurau@yahoo.com.