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FERNS AND CONIFERS OF ECONOMIC VALUE IN ROMANIA

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ABSTRACT

This summary lists the uses and categories of use for 57 species of ferns and 11 species of conifers. The economic value of conifers cannot be compared to that of ferns, but the ecological importance of both categories is high and cannot be assessed financially. Few ferns are used in this territory, but in the literature, we found an average of 3 uses per fern and 8 uses per conifer species. Often, a category of uses seems economically insignificant compared to one considered primary, but these are significant for biodiversity. Rare species that have special economic value are endangered, and protecting them always requires effort.

INTRODUCTION

Ferns are shade plants found in forests in mountainous areas, high hills, rocky areas, meadows, reed beds, and sometimes on the surface of water. Over time, they have received little attention from users due to their toxicity. Currently, we find that many of them can be used as medicinal plants, in cosmetics, cut leaves in bouquets or cultivated in dendro-floricultural spaces, for phytoremediation, fertilizer and insecticides for agriculture etc.
Conifers form a distinct vegetation zone, covering almost 10% of the country's territory. Depending on the forest category, they provide an annual increase in biomass measured in cubic meters of wood. On mountain slopes, they form long-lived ecosystems, provide oxygen, recreational space etc. These benefits come at a very low cost to humans. They have numerous uses, generally well known, such as for phytotherapy, juices with nutritional and therapeutic value, remedies for sick animals, in cosmetics, beekeeping, several branches of the chemical, cultural, scientific and decorative industries, as a source of fuel, agriculture, environmental protection and ecological restoration.

MATERIALS AND METHODS

In recent decades, numerous studies on plant uses have been conducted and summaries of genera, and sometimes families, have been published. Economic assessments are also necessary for vegetation studies. We have collected information from various works to complete the lists of uses.
Information is taken from academic literature, rarely from empirical resources, and authors are cited in the text and in the bibliography.
The categories of uses and their quality are classified according to Kovacs A., 1979; Pop I. 1982 and Plants for a Future 2012–2022. For edible plants, we have the following ratings: 1/5—does not comply with consumption standards; 2/5—poor quality; 3/5—acceptable for consumption, has average culinary value; 4/5—very good for consumption; 5/5—excellent.
The following ratings apply to medicinal plants: 1/5 – not effective; 2/5 – has low effectiveness; 3/5 – acceptable for home use and in supplements; 4/5 – has very good quality, is of interest for pharmaceutical standards; 5/5 – has superior quality, is of special interest for phytotherapy and medicinal teas.
Dermatological and cosmetic uses come from academic literature, and sometimes from popular sources.

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Plants with ecological importance play a role in the conservation and restoration of natural heritage and have an impact on the economy through the accumulation of salts in the soil, phytoremediation, soil protection etc.
Phytoremediation is achieved through phytoextraction, phytostabilization, degradation in leaves or roots, volatilization, capture of polluting particles in leaves, and stimulation of microbial activity in the soil. These aspects are rarely categorized as having weak, medium, or good effects.
Plants of cultural importance (Christmas trees, folklore, decorative) have special economic value.
Wild plants that are of interest for decorating green spaces in localities are cultivated in their geographical area or in appropriately arranged places.

RESULTS AND DISCUSSION

Ferns are attractive due to the shape of their leaves, and 38 species from the genera *Asplenium, Athyrium, Azolla, Botrychium, Cystopteris, Dryopteris, Equisetum, Lycopodium, Matteuccia, Ophioglossum, Salvinia, Selaginella,* and *Struthiopteris* are used for this purpose. *Dryopteris filix-mas* leaves are often used in cut flower bouquets (Table 1).
Europeans did not consume ferns in their diet, but now, thanks to much faster access to scientific information, we know that certain species were used as medicine and consumed in certain ways by other peoples. We now know that milk from cows that have been forced to consume ferns is highly toxic. Horses are very sensitive to fern consumption and can die within a month if they have had ferns in their feed, even *Equisetum arvense.* We do not recommend consuming any species of fern that contains toxic substances. However, we can include *Asplenium scolopendrium,* known to the Romanian people as Limba cerbului (deer tongue) or Limba vecinii (neighbor's tongue), in the category of medicinal-edible plants that are safe to consume. It has health benefits and can be cultivated in suitable soil and climate conditions.
The list of toxic ferns is long and comes with warnings; it is enough to mention the species of the genera *Dryopteris, Equisetum, Lycopodium,* and *Pteridium.*
For phytomedicine, the most valued ferns in our country are *Equisetum arvense, Dryopteris filix-mas, Polypodium vulgare, Lycopodium clavatum*, etc. Most are considered toxic and medicinal, the most common use being antiparasitic, especially for eliminating intestinal worms, and some of these species eliminate *Taenia.*
Veterinary medicine used antiparasitic agents from ferns before human medicine, the most commonly used being *Dryopteris filix-mas,* followed by *Equisetum arvense* and *Polypodium vulgare.*
For cosmetics, especially for eliminating dandruff and strengthening hair roots, *Huperzia selago, Dryopteris filix-mas, Equisetum arvense,* etc. are used.
In past centuries, textile fibers were dyed with vegetable dyes, and attractive shades of green were obtained from *Equisetum arvense, E. telmateja, Lycopodium clavatum, Pteridium aquilinum,* etc.
In organic farming, it is very important to control harmful insect populations and fungal infections. Effective fungicides can be obtained from *Equisetum,* and these plants are available in any quantity, but insects seem to be more difficult to control. However, the dreaded field fern, which frightens mountain locals who have hayfields, is toxic and abundant and could be used as an insecticide. Other insecticidal fern species in our country have a low biomass quantity and their harvesting has some restrictions.
The quality of soils polluted with heavy metals can be improved with plants that extract them, including ferns such as *Athyrium filix-femina, Dryopteris filix-mas, Equisetum arvense, Salvinia natans, Thelypteris palustris*, etc.
Equisetum sp., commonly known as horsetail, frequently grows on excessively moist land. It enriches the soil with minerals, often has abundant biomass, and can form natural fertilizer.
Precious metal and household items can be effectively cleaned with ash or *Equisetum* powder.

The LYCOPODIACEAE family is represented in the flora of Romania by species of the genus *Lycopodium* and *Huperzia selago*. *Lycopodium* species have many similar uses, acting effectively on the digestive, excretory, nervous, and musculoskeletal systems, etc. Their harvesting is restricted, and it is recommended they to be cultivated in conditions with soil and climate identical to those in their natural habitats.
Huperzia selago (L.) Schrank & Mart is a medicinal and toxic plant that has been used empirically by Romanians for urinary lithiasis, kidney disease, constipation, alcoholism, smoking, dermatitis, pruritic eczema, weeping eczema, psoriasis, and as a vermifuge (Crăciun F. et al., 1977; Pârvu C., 2014; Dvirna T. et al, 2019). It has recently been introduced as a palliative treatment for neurodegenerative diseases such as Alzheimer's and others (Dang Kim Thu, et al., 2019; Dymek A., et al., 2021). It has emetic and cathartic effects. Externally, it is used as a poultice to relieve headaches (Wang B., et al., 2022). In America, it was known as an abortifacient (Wang B., et al., 2022). It has some toxic effects and is administered under medical supervision.
Veterinary medicine recommends it for the treatment of eczema, dermatosis, and tapeworm (Pârvu C., 2000). In cosmetics, it is used to prevent hair loss (Pârvu C., 2000). In other countries, it has also been used to dye natural textile fibers (Plants for a Future 2012–2022).

Lycopodiella inundata (L.) Holub has effects on liver diseases, respiratory tract, nicotine addiction, bedsores, wounds, burns, frostbite, scabies, psoriasis, skin rashes, abscesses, boils, memory disorders, and Alzheimer's disease, in the form of baths for psychological disorders (Dvirna T. et al, 2019). In Romania, it is rare, vulnerable, and protected.

Lycopodium alpinum L. has the same uses as *L. clavatum*, administered for bruises, joint pain, wounds, skin rashes (Wang B. et al., 2022). It is a red-listed species and harvesting is prohibited. In Europe, its spread is endangered (Oprea A. 2005; Dihoru G., Boruz V., 2014).

L. annotinum L. has a circumpolar origin and is sporadically distributed in mountainous areas in Romania. The green parts are used in urinary lithiasis, alopecia, dermatitis, psoriasis, eczema, abrasions, bruises, contusions, scalds in children, joint pain, rheumatic numbness, arthritis, muscle cramps, asthenia, smoking, alcoholism, constipation, digestive problems and dysentery, hemorrhoids, blood stagnation, dysmenorrhea, cognitive disorders, neurodegenerative diseases, and inflammatory conditions. Due to its effects, it can replace *Huperzia selago* (Crăciun F. et al., 1977; Pârvu C., 2013, 2016; Scarlat M.A., 2019; Dymek A. et al., 2021; Wang B. et al., 2022). Treatment is carried out under strict medical supervision, as it has some toxic effects, and further scientific studies are needed.

It is cultivated as an ornamental plant and used in cosmetics, metallurgy, and fireworks (Pârvu C., 2002). It is vulnerable and protected in the EU, and threatened on other continents (Oprea A. 2005; Dvirna T. et al, 2019).

L. clavatum L., Club moss, is sporadically distributed, from the oak forest to the spruce forest, in meadows, scrublands, and forest edges.

It is traditionally used by Romanians to treat alcoholism, liver cancer, liver cirrhosis, and kidney disease (Marian S.F., 1870-1906; Crăciun F. et al., 1977; Pârvu C., 2013), but it also has toxic effects (Pop I., 1982), which is why it is administered according to the therapist's instructions. The vegetative parts contain lycopodine, which accumulates. It is necessary for treatments to be carried out with breaks of the same duration as the periods of administration. Only the ascending branches are used. It has a cholagogue and choleretic effect, restores connective tissue, and cures acute hepatitis, hepatic steatosis, and hepato-pancreatic congestion. The hepatoprotective effect is very good (Sur R.K., 1990). It improves digestion, stimulates peristalsis, and has a carminative effect. In children, it is combined with plantain to cure diarrhea, dysentery, malaria, dry cough, etc. (Plants for a Future 2012–2022).

The aerial part has beneficial effects on gout, rheumatoid arthritis, rheumatic pain, chronic constipation, hemorrhoids, kidney and bladder stones, and impotence. It has effects on the nervous system in cases of depression, hysteria, as a sedative, and muscle relaxant. It is known as a remedy for nicotine and alcohol addiction, kidney disease, and reduces prostate volume in older men. It is used predominantly for liver and biliary disorders, but in excess it leads to fatigue and vomiting. Externally, it is used for alopecia, cramps, muscle pain and cramps, rheumatism, facial paralysis, poultices on painful areas, eczema, and hemorrhoids. Together with *Viola tricolor*, it is useful for dermatoses, eczema, and psoriasis (Scarlat M.A., 2019; Vončina M. et al., 2014; Benerjel J. et al., 2014). Substances that combat Alzheimer's disease are found in the aerial parts (Dhivya P.S. et al., 2014), and it has calming effects on people who are permanently irritable and nervous (Stănescu U., 2014).

The spores are used for kidney and bladder stones, pose no risk, overdose leads to vomiting (Bojor O., 2010), and have a diuretic effect in kidney disorders. They stimulate the central nervous system, are antipruritic, decongestant, stomachic, and styptic, can be applied externally to wounds, ulcers, and irritations, absorb fluids from damaged tissues, and can be inhaled when there is nasal bleeding. In Turkey, they are used to treat gastritis and stomach ulcers (Orhan I. et al., 2006). The alcoholic extract from spores is useful in Alzheimer's disease, liver disorders, liver and colon cancer (Mandel S.K., 2009), inhibits acetylcholinesterase in neurodegenerative diseases, restores memory (Dymek A. et al., 2021), eliminates mental disorders (anxiety, forgetfulness, chronic fatigue), and in Parkinson's disease reduces oxidative stress and neuroinflammation (Jayaraj R.L. et al., 2019). They can also be used as talcum powder, powder for metallurgical molds, fireworks for explosions, and lighting effects in theater.

In veterinary medicine, it is used on wet eczema, dermatosis, and scabies.

In the past, when textile fibers were dyed with vegetable dyes, pedicula was used for green coloring (Grințescu I., 1952; Pop M., Pop O., 2007); in cosmetics to stop hair loss (Pârvu C., 2004). Recently, it has also been used as an insecticide (Dvirna T. et al, 2019) and cultivated as an ornamental plant in arboretums and botanical gardens (Pârvu C., 2002).

In Romania, the conservation status of this species has not been assessed, but it is recommended to harvest it in small quantities or every 2-3 years (Dihoru G., Boruz V., 2014). It is threatened both in Europe and in other parts of the world (Oprea A. 2005). Currently, there is cultivation technology available.

L. complanatum L., or snake moss, has a medicinal value of 3/5 and is used to treat joint and muscle pain, quadriplegia, contusions, blood stagnation, dysmenorrhea, digestive problems, cognitive disorders, and inflammatory conditions. Failure to follow therapeutic instructions can lead to mild intoxication and even loss of consciousness, as it has a hypnotic effect. The spores can be used in theater and the metallurgical industry, just like those of pedicula (Wang B. et al., 2022; Plants for a Future 2012–2022).

It is a glacial relict in the flora of Romania, harvesting is strictly prohibited, yet I have seen it sold commercially on many occasions.
L. tristachyum Pursh. is a red-listed species, globally threatened, and harvesting is prohibited in Europe (Oprea A. 2005; Dihoru G., Boruz V., 2014).
There are two species in the SELAGINELLACEAE family in the flora of Romania.
Selaginella helvetica (L.) Spreng. is common in rocky meadows in the subalpine and alpine zones.
It was first harvested for therapeutic purposes in India and China, and later studies on plants in this family appeared (Jermi A. C., 1990). It reduces fever, eliminates toxicity, eliminates blood stagnation and activates circulation, relieves cough and reduces sputum, and is used in laryngopharyngeal disorders, rheumatism, nasopharyngeal carcinoma, asthma, and traumatic bleeding (Jiang I. et al., 2018). In Romania, it has been used empirically in herbal baths to comfort and tone the body (Pârvu C., 2005; 2014).
It can be cultivated in dendro-floricultural areas (Pârvu C., 2002).
S. selaginoides (L.) P. Beauv is widespread, has been little studied phytochemically, and we believe it has some similar properties.
There are 9 species of *Equisetum* in the EQUISETACEAE family.
Their ashes and even the plants themselves have been used since ancient times to clean vessels and other objects. These plants help manage kidney conditions, including those associated with hypertension, genital and urinary tract inflammation, wounds, dermatitis, hemorrhoids, prostatitis, and musculoskeletal diseases.
Equisetum arvense L., horsetail, common horsetail, is frequently found on almost all land with excess moisture.
It is rich in silicon, contains powerful antioxidants, anti-inflammatory and anti-carcinogenic substances, and can be consumed as tea or fresh juice in small quantities. The juice is an effective fungicide, and in the food industry, the hydroalcoholic extract is used to inhibit fungi that spoil corn (Criado F.G. et al., 2012).
It is generally known as a diuretic and remineralizing plant (Criado M.G., 2017). It has long been used for brittle nails and hair loss, rheumatic diseases, tuberculosis, kidney and bladder cataracts, as a hemostatic agent in heavy menstruation, nasal, pulmonary, and gastric hemorrhages, rheumatism, gout, and wounds. Silicon strengthens bones, reduces atheromas and stone formation (Bojor O., 2010).
It has a very good diuretic and disinfectant effect, cures kidney and bladder diseases, eliminates edema caused by heart failure and trauma, lowers blood pressure, eliminates bacterial infections and inflammation of the urinary tract, albuminuria, prevents urolithiasis and the formation of calcium oxalate in kidney tissue, eliminates urinary sediment and kidney stones, inflammation and hypertrophy of the prostate, cystitis, urethritis, and urinary incontinence in children (Pârvu C., 2000; Vogl S. et al., 2013).
It has curative effects on the musculoskeletal system in rheumatic diseases, gout, trauma, reduces pain and repairs fractured bones, promotes osteoblastic response, remineralization of the body, and restoration of connective tissues. For sprains and slow-healing fractures, a decoction is used in the bath water. It is good for osteoporosis, but prolonged use causes B_1 deficiency (Hânceanu M., 2014; Pârvu C., 2000).
It has beneficial effects on the respiratory system in cases of bronchitis, tuberculosis, coughs of various etiologies, profuse sweating, gargling in inflammations and colds (Papp N. et al., 2011; Gurbuz I. et al. 2003).
For circulatory system disorders, it is a good hemostatic agent for wounds, suppuration, bleeding hemorrhoids, hematuria, stopping internal and external bleeding, nasal, pulmonary, gastric, and uterine bleeding, minor internal bleeding, vomiting blood, varicose ulcers, heavy menstruation, and frostbite. It is very good for nosebleeds and inhibits platelet aggregation (Hânceanu M., 2014; Boeing T. et al., 2021).
It cleanses the skin of eczema, ringworm, erysipelas, accelerates wound healing, strengthens brittle nails and hair (Queiraz G.M. et al., 2015).
It is beneficial in gastro-duodenal ulcers, hyperacid gastritis, and hyperacidity. The ash from this plant reduces acidity (Mannan M.M. et al., 2008; Gowami H.K. 2016).
It is a good antioxidant, used in neurodegenerative diseases, as an anxiolytic, antidepressant, stimulates memory (Batir-Marin D. et al., 2021), removes cadmium from the liver and kidneys. It has a neuroprotective effect (Pallag A. et al., 2018), is a good anti-inflammatory, and is antinociceptive (Da Mote et al., 2004). Antioxidants in the aerial parts place it in the category of rejuvenating plants (Sharma S.K. et al., 2013).
The equisetum acid in these plants requires medical supervision (Plants for a Future 2012–2022). Prolonged use leads to toxic effects such as nervous disorders, headaches, anorexia, premature births, etc. (Asgarpanah J. and Roohi E., 2012). Its diuretic effect removes vitamins B1 and K from the body. It should not be administered during pregnancy, alcoholism, or concomitantly with lithium-containing treatments. (Badole S., Kotwl S., 2014).
Veterinary medicine uses it in kidney disease, hemorrhagic cystitis, and lung disease (Pârvu C., 2000).
In cosmetics, it is of interest as an anti-aging agent, strengthens hair, prevents the appearance of gray hair, fights dandruff, and has a high silicon content that heals wounds. The juice heals and can be applied to areas with bone fractures. In folk medicine, *Equisetum* broth is often used in the form of wet compresses. It is used externally to eliminate lice and mites. (Plants for a Future 2012–2022).
Many peoples have used horsetail in the past to obtain a yellow-gray dye.
Some authors consider this plant to be decorative (Oaks A.S., 1990).

It forms dense populations that enrich the soil with minerals and at the same time represent a source for obtaining liquid fertilizer (Plants for a Future 2012–2022). It is harmful to grasslands and a weed in floodplain crops, a pioneer of vegetation, useful for phytoremediation (Pandey V.C., Maiti D., 2020), and an insignificant insecticide (Lima G.P. et al., 2023).
E. fluviatile L. is toxic and medicinal, acting on the urinary and skeletal systems, infectious diseases, gastrointestinal disorders, skin, respiratory system, and circulation (Gurbuz I., et al. 2003). It is also toxic to animals because it breaks down thiamine. In Romania, it is used empirically and rarely in fortifying herbal baths (Pârvu C., 2005; Dihoru G., Boruz V., 2014). The ash and juice are used externally as hemostatics (Plants for a Future 2012–2022).
It is harmful in meadows (Kovacs A., 1979).
For the phytoremediation of polluted sediments, it is very good for retaining As and Sb, but also smaller amounts of Fe, Mn, Pb, Cu, Cd, Zn (Hozhina E.I. et al., 2001).
E. hiemale L. is as good as *E. arvense* (Bojor O., 2010), contains nutrients, and should be consumed with caution. It is used in infectious diseases of the kidneys, bladder, and urinary tract, as a decoction on bleeding and oozing wounds, infectious diseases, gastrointestinal, skin, respiratory diseases, hypertension, strokes, etc. (Boeing T. et al., 2021; Gurbuz I. et al. 2003; Queiraz G.M. et al., 2015).
It has an effective fungicidal effect, good for liquid fertilizer, hair conditioner, vegetable dye. Fine smilgher is obtained from the ash or powdered plant (Plants for a Future 2012–2022). It enriches the soil with minerals, is harmful to grasslands (Kovacs A., 1979), decorative (Oaks A.S., 1990), and has insignificant insecticidal properties (Lima G.P. et al., 2023). It can be harvested in unlimited quantities.
E. palustre L. is considered toxic by Romanian authors and is not harvested as a medicinal plant. In Ciocârlan V.'s (2009) determiners, only this taxon within the *Equisetum* genus is listed as toxic. Warnings are also found in veterinary medicine literature. In cattle and horses, it affects the nervous system, liver, kidneys, etc. Authors who mention it as therapeutic highlight general actions that are also found in other species of this genus but require medical supervision and thorough knowledge. We believe that only external uses are safe. It is harmful in meadows.
E. pratense Ehrh. should be consumed with caution, it is slightly edible 2/5, medicinal 2/5, has the same uses as other species of this genus, enriches the soil with minerals (Plants for a Future 2012–2022).
E. ramosissimum Desf. contains significant antioxidant substances. In tribal communities in Uttarakhand, India, it is used in powder or juice form for joint pain, arthritis, and kidney stones (Balkrishna A., et al., 2022). In Nepal, a paste made from the plant is applied to bone fractures, and the ashes are used to treat scabies and burns (Josh et al., 2011). It should be consumed with caution, as it has cleansing effects on the liver, improves vision, and is used in tropical areas for hypertension, enteritis, diarrhea, hepatitis, jaundice, kidney stones, as a substitute for abrasive paper (https://tropical.theferns.info), etc.
It accumulates Al, As, B, Cd, Cr, Cu, Fe, Hg, Mo, Pb (Gajic G., et al., 2019). It is very good for the phytoremediation of Ni and Cr, good for Zn, Pb, etc. (Cornara et al., 2007).
E. sylvaticum L. has the same uses as *E. telmateja* and *E. variegate*, contains nutrients, is edible 2/5 but with caution because it also contains toxic substances (Pop I., 1982; Boeing Th., et al., 2021), medicinal 2/5, used for kidney problems, bladder problems, internal bleeding, and wounds (Plants for a Future 2012–2022). It is a good antioxidant, used in neurodegenerative diseases, as an anxiolytic, antidepressant, and memory stimulant (Batir-Marin D., et al., 2021). It can be harvested in moderate quantities (Dihoru G., Boruz V., 2014).
E. telmateia Ehrh. has the same uses as *E. arvense* (Pârvu C., 2016). According to some authors, its therapeutic uses are slightly weaker. In the short term, *E. avense* and *E. telmateia* are diuretics without electrolyte repercussions. It has high biomass and is a good source for obtaining ash and for phytoremediation of wet areas in mining waste dumps (Fernández S. et al., 2016).
E. variegatum Schleich has the same uses as other species in this genus but should be consumed with caution (Plants for a Future 2012–2022). It is decorative (Oaks A.S., 1990).

The OPHIOGLOSSACEAE family is represented in Romania by the genera *Botrychium* and *Ophioglossum.*
Botrychium lunaria (L.) Sv. has weak medicinal value, 2/5 in other countries, but in Romania it is decorative (Preda M., 1989). In countries where it is more widespread, the infusion of leaves and rhizomes is used for its tonic effect during convalescence and for the treatment of dysentery. Externally, it is used in ointments and compresses for injuries, infections, boils, contact dermatitis, contusions, and stings. It has a broad antibacterial effect, weak antimycotic and antiviral properties (Ojha R., Devkota H.P., 2021; Gowami H.K., 2016; Minarchenko V. et al., 2017; Mannan M.M. et al., 2008). We have no information about the use of this plant in Romania, harvesting is prohibited, it has very low biomass, the leaves can only be used in accidents in nature, in other situations it can be replaced.
The leaves of *B. matricarioides* (Retz) A. Braun and *B. multifidum* (S. G. Gmel.) Rupr. can be used to heal wounds (Minarchenko V. et al., 2017), but harvesting these plants is prohibited in Romania.

B. virginianum (L.) Sw. is used externally on bruises, cuts, wounds, snake bites; the tea is emetic, expectorant, induces sweating (Plants for a Future 2012–2022; Mannan M.M. et al., 2008). It is vulnerable in Europe (Criado M.G., 2017), rare in Romania, and harvesting is prohibited.

Ophioglossum vulgatum L., snake tongue, is sporadically distributed in mesophilic and very nutrient-poor grasslands from the hilly area to the spruce forest level. It has been used empirically by Romanians as a tonic and astringent medicinal plant (Țopa E., 1952; Crăciun F. et al. 1977); more recent authors from other countries mention its use as a decoction, preferably from rhizomes, in heart and lung diseases, inflammations, cancer, jaundice, and hepatitis. An ointment is prepared that can be used externally on burns, wounds, skin ulcers, and bruises (Nwosu, 2002; Singh, 2003; Benjnin et Manickam, 2007; Mannan M.M. et al., 2008; Minarchenko V. et al., 2017).

It has very little vegetation, so if this plant is to be used medicinally, it must be harvested in small quantities (Dihoru G., Boruz V., 2014). It can be cultivated in dendro-floricultural areas (Pârvu C., 2002).

The genus *Asplenium* is included in the ASPLENIACEAE family.

Asplenium ceterach L., the hart's-tongue fern, is edible and medicinal. In Romania, it is sporadically distributed on limestone rocks, mainly in Banat, and is common in Mediterranean countries where it is traditionally used as an expectorant, diuretic, and to treat spleen disorders, kidney stones, and hemorrhoids. It is contraindicated during pregnancy and breastfeeding (Živcović S. et al., 2017).

It eliminates kidney and gallstones, reduces gout pain, joint pain, colds, allergies, has pectoral effects, calms coughs and fever, and clears the airways. Externally, poultices made from rhizomes are applied to wounds, eczema, seborrhea, hair regeneration, gum strengthening, and to reduce hives. A poultice of crushed leaves is applied to irritated and reddened skin (Scarlat M.A., 2019; Guarrera P.M. et al., 2005; El Beyrouthy Mare et al., 2008). Other studies supplement its uses in prostate hyperplasia, tumors of the spleen, kidneys, and bladder, DNA protection (Minarchenko V. et al., 2017), urinary incontinence, jaundice (Mannan M.M. et al., 2008), diarrhea, dysentery, gallstones, restores liver and spleen function (Ibadullayeva S.J. et al., 2022), is hepatoprotective (Zangeneh M.M. et al., 2018), and a source of polyphenols (Farràs A. et al., 2022).

It is decorative (Preda M., 1989; www.irishwildflowers.ie).

For commercial purposes, roots and leaves are harvested in moderation, at intervals of 2-3 years, from the same place (Dihoru G., Boruz V., 2014).

A. adiantum-nigrum L., Mother of God's Hair, has sporadic distribution and a high capacity to adapt to variations in ecological factors, including nitrogen deficiency on rocky slopes.

It is a good medicinal plant, its rhizome has high antimicrobial activity, its leaves have diuretic, anti-inflammatory, antihelminthic, emetic, laxative, and ophthalmic properties, and are rich in polyphenols. All these properties combined in tiny leaves help eliminate kidney stones, stomach pain, bronchial asthma, jaundice, conjunctivitis, spleen diseases, and eliminate tapeworms together with castor oil (Bujak A., Bujak I., 2022; Durdević L. et al., 2007; Goswani H.K., 2016; Mannan M.M. et al., 2008; Minarchenko V. et al., 2017; Nwosu, 2002; Žircović S. et al., 2020).

It can be cultivated as an ornamental plant on rocky slopes (Preda M., 1989; www.irishwildflowers.ie). On polluted soil, it absorbs Cr, Zn, Ni, Cu, etc. (Cornara et al., 2007).

A. cuneifolium Viv. is used in Ukraine for menstrual pain and as a contraceptive (Minarchenko V., et al., 2017). It accumulates heavy metals, As Cr, Zn, Pb, Ni, Fe, but the reduced phytomass makes it ineffective for phytoremediation, etc. (Cornara et al., 2007), has no commercial value, and is cultivated using biotechnology (Tomiczak K. et al., 2023).

A. ruta-muraria L. contains nutrients, the leaves are harvested in spring for coughs, colds, respiratory infections, wound healing, enlarged spleen, kidney stones, swelling, rickets, jaundice, ascites, and scurvy. They are emmenagogues, decongestants, and expectorants. The rhizome has good antifungal action, and the roots are anthelmintic (Goswani H.K., 2016; Mannan M.M. et al., 2008; Minarchenko V. et al., 2017; Žircović S. et al., 2020).

The infusion and tincture are used in Indian medicine for respiratory diseases and have emollient and expectorant effects (Ibadullayeva S.J. et al., 2022).

It is decorative (www.irishwildflowers.ie), absorbs Cd and Zn from polluted areas (Mróz I., Rudecki A.L., 2009).

A. scolopendrium L. is a medicinal and edible plant (Langhansova L. et al., 2021) with excellent health benefits, found sporadically on rocks and scree slopes with a slightly alkaline to neutral reaction. The leaves have very good antioxidant activity and are astringent, cholagogue, sudorific, expectorant, and vulnerary. In past centuries, it was used to relieve chest ailments and stomach cramps (Marian S.F., 1870-1906; Grințescu G., 1952; Crăciun F. et al., 1977). For internal use, it is used for hepatic, bladder, spleen, and intestinal obstruction, urinary sand, cough, pulmonary tuberculosis, diarrhea, dysentery, fever, bronchitis, and gastroenteritis. For external use, an ointment is prepared to be applied to wounds, eczema, burns, scalds, and hemorrhoids (Pârvu C., 2013; Minarchenko V. et al., 2017; Ibadullayeva S.J. et al., 2022). The macerate or infusion can be used in cosmetics for oily skin and as a mask for fine skin.

It is cultivated to cover gravel-rich soil in the shade of maple trees in parks in mountainous areas (Grințescu G., 1952; Preda M., 1989).
The leaves are harvested very sparingly from the bush or alternatively at intervals of 1-3 years (Dihoru G., Boruz V., 2014).
A. septentrionale (L.) Hoffm. contains flavonoids (Buckingham J.V., Ranjit N.M., 2015), has astringent and expectorant properties, and is used to treat jaundice and respiratory diseases (Minarchenko V. et al., 2017; Ibadullayeva S.J. et al., 2022). It is decorative.
A. trichomanes (L.) Hoffm. is common on cliffs in oak forests up to the spruce level. It has decorative (Preda M., 1989; www.irishwildflowers.ie) and medicinal value and has been frequently used in other countries in the form of tea for chest disorders, coughs, respiratory infections, depression, jaundice, ascites, kidney stones, dandruff on the scalp, prevents hair loss, reduces rheumatoid arthritis, bronchitis, respiratory infections, depression, jaundice, ascites, stimulates the nervous system, and is administered as a tincture for paralysis (Ibadullayeva S.J. et al., 2022; Minarchenko V. et al., 2017).
Subsp. *quadruvalens* D.E. Meyr is used in veterinary medicine (Blanco E. et al., 1999) and phytoremediation Ni, Cr, Zn, Pb, As, Fe, Cu, etc. (Cornara et al., 2007). Its tempting uses require that few leaves be harvested (Dihoru G., Boruz V., 2014).
A. viride Huds. is decorative (Preda M., 1989) and beneficial in gastric ulcers and gastritis (Minarchenko V., et al., 2017).
A. adulterinum Milde is rare and vulnerable in Europe (Criado M.G., 2017).
A. lepidium C. Presl. is rare, grows on limestone cliffs, and has decorative value.

The ATHYRIACEAE family is represented by the genus *Athyrium.*
A. filix-femina (L.) Roth has medicinal properties and is used in some countries to eliminate intestinal worms, headaches, rheumatism, chronic bronchitis, coughs, enterocolitis, and dysentery. It is also a good antimicrobial agent (Ibadullayeva S.J. et al., 2022; El Beyrouthy Mare et al., 2008; Minarchenko V. et al., 2017; Salehi B. et al., 2019; Soare L.C. et al., 2012). The powdered roots are administered in very small quantities, 0.5 g/dose, with honey.
It is common in the Carpathians, forms abundant biomass, tolerates different concentrations of heavy metals but neutralizes small amounts of them (Della A.P, 2022; Aveiga A. et al., 2023).
It can be used as an ingredient in antifungal sprays, toothpaste, liquid soap, and preservatives for the food industry (Soare L.C. et al., 2012).
The herbaceous carpet dominated by this fern is light green in color and attractive in appearance, and the plants can be introduced into recreational areas (www.irishwildflowers.ie).
It has no insecticidal value (Lima G.P. et al., 2023).
We do not know of any uses for *A. distentifolium* Tausch ex Opiz, but we believe they may be similar. It is a circumpolar plant, growing in high-altitude forests in our country, and it is believed that its decline in native areas may be a climatic indicator of global warming (Della A.P., 2022).

The BLEHNACEAE family includes *Struthiopteris spicant* (L.) Weiss, an edible plant that has rarely been used in Europe for tea. It has beneficial effects in treating diarrhea, dysentery, wounds, skin conditions, coughs, colds, urinary tract infections, cancer, and intestinal worms. (Goswani H.K., 2016; Minarchenko V. et al., 2017; Bujak A., Bujak I., 2022; Waswa E.N. et al., 2022). Boiled leaves can be used for hair care.
It is a shade plant, vulnerable to deforestation, protected, prevents soil erosion. It is planted in areas landscaped as decorative in the shade of trees. Leaves harvested from nature can be used in cut flower bouquets (www.irishwildflowers.ie). It is also mentioned in folk beliefs.
The genus *Cystopteris* belongs to the family CYSTOPTERIDACEAE.
C. fragilis (L.) Bernh, rock fern, little rock fern, is a shade plant, commonly found on cliffs, from the oak forest to the subalpine juniper forest.
To date, it is said to be used empirically and rarely in Romanian folk medicine for colds and flu. Foreign authors also highlight its beneficial effects in eliminating worms with rhizomes harvested in autumn, intestinal diseases, asthma, physical fatigue, and trauma (Minarchenko V. et al., 2017; Ibadullayeva S.J. et al., 2022).
It can be planted as an ornamental plant to cover the ground in the shade of trees in recreational areas (Preda M., 1989; www.irishwildflowers.ie).
It is of no interest to organic farming and has insignificant insecticidal properties (Lima G.P. et al., 2023).
C. montana (Lam.) Desv. is sporadically distributed on cliffs and in forests, from the beech to the juniper level, and has decorative value (Preda M., 1989).
C. sudetica (A. Braun) Milde is rare and vulnerable (Oprea, 2005).
Gymnocarpium dryopteris (L.) Newman is common in forests and scrublands, in beech and spruce forests, is decorative, and can be cultivated to cover the ground with a grassy carpet (Plants for a Future 2012–2022). It is frequently used in many countries in Europe and Asia in the form of decoctions and tinctures from the leaves for

rheumatic pain, rheumatoid arthritis, osteoarthritis, wounds, ulcers, mastitis, bruises, intestinal worms, digestive diseases, spleen diseases, nephritis, and cystitis (Minarchenko V. et al., 2017).
In agriculture, it can be used as an insecticide on *Helicoverpa zee* and *Spodoptera frugiperda*, where it causes 70% mortality in larvae (Lima G.P., et al., 2023).
Gymnocarpium robertianum (Hoffm.) Newman has ecological and conservation value, growing on dolomites or sandstones, which are critical habitats for the survival of other species, and is cultivated as an ornamental plant in the West.

Family DENNSTAEDTIACEAE
Pteridium aquilinum (L.) Kuhn, the bracken fern, is the most aggressive and resistant weed in grasslands, difficult to combat in protected areas. To reduce its spread, it is mowed repeatedly during the growing season, up to three times a year, before spores form. According to Bujak A. and Bujak I. (2022), it cannot be successfully controlled by biological methods. Mechanical removal of rhizomes and the application of herbicides are preferred.
It also affects forest production because it prevents seed germination, reduces the biodiversity of grasslands and forest glades, has spread to all continents, and degrades grasslands in Europe. The damage it causes to Romanian grasslands is well known, and the mountain population knows that it must be combated. Those who did not take these measures on their property did not receive state subsidies for animal husbandry. The diversity of biotopes in which it settles is high, and in some places it has an accepted ecological role. It is rich in minerals, especially potassium in its early stages, which means that the mowed vegetation becomes fertilizer for trees. The strong, branched, and expansive root system protects land prone to landslides.
It colonizes mining areas and has high potential for phytostabilization of mine tailings contaminated with Zn and Pb, and even As in wetter areas. It strongly reduces soluble concentrations of Cu, Cd, Pb, Zn (Fernández S. et al., 2016), Pb is absorbed and accumulated very well (Sajeev S. et al. 2016) and also accumulates Fe (Pratas J. et al., 2013).
It has high phytomass production, which sometimes has household uses as animal bedding, biofuel, compost source, material for mattresses, fruit crate lining, mulch, brown and green dye, soap ingredient, etc. (Bujak A., Bujak I., 2022).
It is considered decorative (www.irishwildflowers.ie) but is no longer suitable for cultivation.
It has allelopathic effects, can be used as a biopesticide in organic farming, and has a broad-spectrum antibacterial effect (Awe Set Amobi O.O., 2015; Bouchekonic C. et al., 2019), inhibits the development of insect, mite, and nematode populations (Lovatto B.P. et al., 2016; Ibadullayeva S.J. et al., 2022; Lima G.P. et al., 2023).
The rhizomes are rich in starch and sought after by wild boars. Sometimes young plants are eaten by horses, cattle, and even sheep, accidentally in spring or in hay in winter when they are severely hungry. Containing cyanogenic glycosides, substances with an antithiamine effect, steroid molecules, and strong carcinogens, the plant has a long history of poisoning animals on pasture (Fenwick G.R., 1988; Maruşcă T., 2019; Criado M.G., 2017). This pathology is described by Vetter J. (2009) and other authors. The poisonous substances easily reach humans through milk and meat, producing immediate effects.
In phytotherapy literature, there are tempting references, such as antiparasitic effects, steam baths for painful joints (Adou L.M.D. et al., 2016), obtaining ointment from rhizomes or gelatinous sap from the rachis for healing wounds and burns, etc. (Benjnin, Manickam, 2007; Blanco E. et al., 1999; Ibadullayeva S.J. et al., 2022 etc.). Consumption of this plant by humans and animals is prohibited, as poisoning is severe. We do not recommend thermal or other treatments for consumption under any circumstances.
Oreopteris limbosperma (Bellardi ex All.) Holub is decorative (Preda M., 1989; www.irishwildflowers.ie), toxic for consumption in its early stages or for feeding goats (Minarchenko V. et al., 2017; von Anderson P., 1983).

The DRYOPTERIDACEAE family includes the genera *Dryopteris* and *Polystichum*.
Dryopteris affinis (Löve) Frass- Jenks is decorative (www.irishwildflowers.ie), contains antioxidants used for cosmetic therapy (Soare L.C. et al., 2012), can extract heavy metals from polluted soils, such as Ni etc. (Cornara et al., 2007).
From *D. cartusiana* (Vill.) H. P. Fuchs, leaves harvested in early spring are used with caution for their bacteriostatic effects, and roots harvested in autumn are effective for eliminating tapeworms and other intestinal parasites and dermatomycoses (Ibadullayeva S.J. et al., 2022; Minarchenko V. et al., 2017). It is cultivated for ground cover in urban green spaces (Plants for a Future 2012–2022).
D. cristata (L.) A. Gray is sporadically distributed in beech and spruce forests, is toxic and medicinal, with the richest concentration of filicin in its roots, and is known in other countries as an effective folk remedy for tapeworm treatment. Immediately after tea, a non-oily purgative is recommended. The root stops internal bleeding, uterine bleeding, cures mumps and febrile diseases (Bown D., 1995). However, dosages are critical due to its strong toxicity. Externally, root powder is applied to wounds, boils, and abscesses because it has an antibacterial effect on Escherichia coli and Staphylococcus aureus (Bella E.T. et al., 2024; Plants for a Future 2012–2022; Gowami H.K. 2016; Minarchenko V. et al., 2017). It is protected in Switzerland.

D. dilatata (Hoffm.) A. Gray has a sporadic distribution, is toxic and medicinally useful, 4/5, doses are critical, and it has been tested for consumption in other countries.
The root is good for eliminating tapeworms and other intestinal worms, it is used externally in powder form on cuts to speed up healing, and the infusion is used as a rinse against dandruff (Gowami H.K. 2016; Minarchenko V. et al., 2017).
It is maintained in ecologically restored areas that have reached the climax stage (Burri K. et al., 2009). It is decorative (www.irishwildflowers.ie).
D. expansa (C. Presl) Fraser-Jenk & Jermy has a poisonous root and is used for antihelminthic drugs, externally to heal wounds and remove dandruff. Treatment is carried out under strict medical supervision (Ibadullayeva S.J. et al., 2022; Minarchenko V. et al., 2017).
D. filix-mas (L.) Schott., Fern, is commonly found in forests, scrublands, and mountain weeds, from oak forests to spruce forests.
The rhizomes are used in folk medicine in many countries to eliminate tapeworms. Standardized products are also obtained for this purpose. For a long time in Romania, it was considered a medicinal and toxic plant (Marian S.F., 1906; Grințescu G., 1952; Crăciun F. et al., 1977), recommended only in veterinary medicine, where it is used to eliminate worms from the digestive system. It is very toxic to horses, destroying thiamine and causing death. Later, it was also used in humans to eliminate intestinal worms, tapeworms, rheumatoid arthritis, and gout (Pârvu C. 2014). It is traditionally used in leaf baths for rheumatoid arthritis, osteoarthritis, rheumatism, fibromyalgia, coughs, baths for children with rickets, malaise, bone diseases, angina pectoris, contraceptives (relaxes the uterus), and wounds with worms (Laza D., 2013; Scarlat M.A, 2019; Erhirhie E.O. et al., 2020). It is the fern with the best antimicrobial activity in our country (Soare L.C. et al., 2012). The method of administration must be supervised by a doctor and should not exceed 1 teaspoon of roots taken in divided doses per treatment (Bojor O., 2010).
It is also of particular interest for cosmetics because the lotions eliminate dandruff, and antifungal sprays, toothpaste, and liquid soap have been obtained (Ionescu-Călinești L., 2010; Soare L.C. et al., 2012). The leaves can be used as packaging for fish and meat, as they have a preservative effect. It is decorative and can be cultivated or used in bouquets of cut flowers (Pârvu C., 2002). For phytoremediation, it reduces very large amounts of Fe, followed by small amounts of Cr, Cu, Ni, Zn, Pb, etc. It is sensitive to F (Bolea V. et al., 2008).
It stabilizes the soil on sloping forest slopes.
It has very weak insecticidal properties (Lima G.P. et al., 2023).
It is mentioned in Romanian folk poems (Pârvu C., 2000).
Polystichum aculeatum (L.) Roth., the stag's horn fern, is widespread in Romania, resistant to environmental variations, and presents a low risk of destruction in Europe. It is decorative (Preda M., 1989; www.irishwildflowers.ie), insecticidal (Plants for a Future 2012–2022), and thrives in ecologically restored areas that have reached the climax stage (Burri K., et al., 2009). It contains antioxidant substances (Minarchenko V. et al., 2017; Soare L.C. et al., 2012; Dvotakova M. et al., 2021).
P. braunii (Spenn.) Fée is decorative, has effects on rheumatism (Alamgeer et al., 2018), and is vulnerable in Europe (Criado M. G., 2017).
P. lonchitis (L.) Roth. is common in forests and scrublands, from the beech to the juniper level, has decorative value, an ecological role, is evergreen, is used in floral arrangements, requires little maintenance (Preda M., 1989), its rhizome has some therapeutic properties for healing scars, skin rashes, spleen diseases, bile elimination, etc. (Minarchenko V. et al., 2017).
Polystichum setiferum (Forsk.) T. Moore ex Woynar is decorative (Preda M., 1989), is of interest for phytoremediation, and accumulates Cu, Fe, Pb, Zn (Pratas J. et al., 2013).
Polypodium vulgare L., sweet fern, belongs to the POLYPODIACEAE family and is common in forests, on rocks covered with bryophyte vegetation, and on stony ground, from the oak to the spruce forest level. The rhizomes of this plant are edible but have a bad taste. The whole plant has therapeutic effects, the leaves are slightly effective and are used as expectorants, in jaundice and dermatoses. The rhizomes act predominantly on the digestive system, have a laxative-purgative and cholagogue effect without drastic effects, eliminate phlegm, intestinal worms, black bile, are effective in various colics, hepatitis, indigestion, gastritis, stimulate appetite and bile secretion, and bring about a state of well-being. For the nervous system, they are recommended for epilepsy and as a protector in neurodegenerative diseases, frequently Alzheimer's, melancholy. For the respiratory system, it is good for pleurisy, cough, cold, sore throat, hoarseness, asthma, and fever. In metabolic diseases, it is used for dropsy, scurvy, rheumatic joints, swelling, and gout. There are also references to skin diseases, urticaria, poultices for infections, kidney and bladder diseases (Dar P.A., 2012; El Beyrouthy Mare et al., 2008; Goswani H.H.K., 2016; Minarchenko V. et al., 2017; Keskin M. et al., 2024; Pârvu, C., 2013; Scarlat M.A, 2019; Tiwari S., 2008 etc).
In the past, it was cited as a toxic plant, sometimes causing nausea and having side effects on the lungs and kidneys. It is contraindicated during pregnancy, breastfeeding, and for children under 10 years of age (Grințescu G., 1952; Dar P.A. et al., 2012; Kanam M., 2023).
Veterinary medicine uses it to treat intestinal worms, indigestion, and abdominal colic.
It has an insecticidal effect on various arthropods (Dar P.A., 2012).

It should be harvested in small quantities. It can be cultivated as an ornamental plant in shady areas to form a grassy carpet (Pârvu C., 2002; www.irishwildflowers.ie).
P. interjectum Shivas is rare in Romania and has properties similar to *P. vulgare*. In countries where it is common, it is used as a raw material for the manufacture of antibiotics (Kanam M., 2023).
Matteuccia struthiopteris (L.) Tod. belongs to the family ONOCLEACEAE, is decorative (Khanbabyeva O.E. et al., 2021), medicinal, and harmful to grasslands (Kovacs A., 1979). Young shoots are consumed in some countries where it is cultivated, but it has not been consumed in Romania. The tubers and leaves are used as antispasmodics against epileptic seizures, sedatives, astringents, and antitussives. The ground plant and spores have healing, anti-inflammatory, and antiseptic properties in burns, frostbite, and dermatoses (Ibadullayeva S.J. et al., 2022). In Russia, it is used as a vermifuge (Komarov 1934, from Aderkas P. 1983). in Chinese medicine it is used for pinworms, dysentery, and uterine bleeding. The rhizome has also been used for heavy menstruation, cough, asphyxia, fever, and malignant tumors (Minarchenko V. et al., 2017). In Norway, it was used in the past as a feed for goats (Gams, 1938), it is an ecological indicator, sensitive to temperature changes (Della A.P., 2022).

The THELYPTERIDACEAE family includes the genera *Phegopteris* and *Thelypteris*.
Phegopteris connectilis (Michx.) Watt grows on acidic soil and in the shade, is decorative, and attracts wildlife.
Thelypteris palustris Scott., Marsh fern, is sporadic in reeds, groves, and on the banks of waterways, from oak forests to beech forests. It is medicinal and eliminates intestinal worms. It is frequently found on the floodplains of the Danube Delta, where it works well with reeds to decontaminate the soil. Recent studies show that it removes heavy metals from water, including Zn, Pb, Cr, Ni, Cu, Fe, Mn, and Cd, and can be cultivated at wastewater treatment plants (Muliyadi M. et al., 2023; Hejna M. et al., 2020; Anderson L. Walsh M.M., 2007). Filicina has an insecticidal effect (Mannan M.M. et al., 2008). It is decorative (Preda M., 1989).

The WOODSIACEAE family includes small plants that grow on mountain cliffs.
Woodsia alpina (Bulton) Gray is rare and vulnerable (Oprea, 2005).
W. ilvensis (L.) R. Br. has good antioxidant activity (Soare L.C. et al., 2012). In Romanian folk medicine, it is used empirically and rarely, with spores being placed on cuts and wounds (Grințescu I., 1952). It is rare and vulnerable in the flora of Romania (Oprea A., 2005).
Marsilea quadrifolia L., marsh trefoil, belongs to the MARSILLEACEAE family and is sporadically distributed in stagnant waters in the plains. It is vulnerable in Europe (Criado M.G., 2017).
Young shoots are consumed in India and China, fried or in soup (Lyn Y. et al., 2012 Ojha R., Devkota H.P., 2021), and have therapeutic effects in mental illness, rheumatic pain, cough, bronchitis, diabetes, and diarrhea (Parfulla S., Singh L., 2012; Minarchenko V. et al., 2017). The juice is diuretic and febrifuge, refreshing, very nutritious, reduces heat in the body, thirst, has anti-inflammatory effects, and can be applied to abscesses. The whole plant is used to treat eye diseases, fever, insomnia, hemorrhoids, infectious diseases, fungal skin diseases, has antifungal and psychoactive effects, induces sleep, is an aphrodisiac, and the hydroalcoholic extract is a minor tranquilizer (Gopalakrishna K., Udyakuman R., 2014).
In polluted waters, it accumulates heavy metals such as Fe, Cu, Cd (Sarma H., 2011) and is included on the list of plants for phytoremediation.

The AZOLLACEAE family is represented by *Azolla filiculoides* Lam. It is rare and invasive (Oprea, 2005; Sîrbu C., Oprea A., 2007). It contains hepatoprotective and antioxidant nutrients (Minarchenko V. et al., 2017; Keskin M. et al., 2024), it cannot be used due to water contamination, and some Romanian authors have long considered it toxic (Kovacs A., 1979; Pop I., 1982).
It is suitable for removing heavy metals from wetlands, Mn, Ni, Cr, Pb, Hg, Cu, Cd, Ag, Ti, As, Hg, very good Zn accumulator, accumulates radioactive elements such as Cs and Sr (Upadyay K. et al., 2019; Rahman M.A., Hasegawa H, 2011; Sood A. et al., 2012; Hassanzadech et al. 2021, ap. Qayoon I., Jaies I., 2022; Fasani E. et al., 2022).
For agriculture, it is a source of minerals (Poveda J., 2022; Bujak A., Bujak I., 2022); a very good source of nitrogen-rich biomass, which can be used as fertilizer or for composting because it lives in symbiosis with cyanobacteria.
When mature, it reddens the water and is decorative (www.irishwildflowers.ie).
Salvinia natans (L.) All., Floating fern, belongs to the SALVINIACEAE family and accumulates most heavy metals from polluted waters. Various authors cite Cd, Cr, Cs, Cu, Mn, Ni, Pb, Sr, Zn, As, Co, Cr, Fe, Hg. However, this plant has low biomass but can be cultivated for additional cleaning of polluted industrial and residential waters (Fasani E. et al., 2022; Polechońska L. et al., 2019; Rahman M.A., Hasegawa H., 2011; Roli N.M. et al., 2007).
It covers the water surface with an attractive dark green vegetation bridge and is decorative (Preda M., 1989). It is cultivated in aquariums and ponds to reduce algae populations and provide shelter for small fish.
It is a good material for determining toxicity in water.

It is listed on red lists in Europe and other areas, it is threatened (Oprea A., 2005) but in Romania it is common in stagnant waters in the plains.

Table 1. Ferns in Romania with economic potential

No. crt.	Species	Categories of uses	Observations
1	*Asplenium adiantum-nigrum* L.	decorative, medicinal, phytoremediation	-
2	*Asplenium ceterach* L.	Edible 1/5, medicinal 2/5, decorative	-
3	*Asplenium cuneifolium* Viv.	medicinal, phytoremediation, decorative	-
4	*Asplenium ruta-muraria* L.	medicinal 2/5, edible 1/5, decorative, phytoremediation, repellent	-
5	*Asplenium scolopendrium* L.	edible 3/5, medicinal, cosmetic, decorative	-
6	*Asplenium septentrionale* (L.) Hoffm.	medicinal, decorative	-
7	*Asplenium trichomanes* (L.) Hoffm.	decorative, medicinal, cosmetic, phytoremediation	leaves are harvested in small quantities
8	*Asplenium viride* Huds.	medicinal, decorative	-
9	*Athyrium filix-femina* (L.) Roth.	cosmetic, decorative, medicinal, food industry, weak phytoremediation	-
10	*Azolla filiculoides* Lam.	phytoremediation, fertilizer, decorative	-
11	*Botrychium lunaria* (L.) Sv.	decorative, medicinal 2/5	harvesting is prohibited
12	*Botrychium matricarioides* (Retz) A. Braun	phytotherapy	rare, harvesting is prohibited
13	*B. multifidum* (S. G. Gmel.) Rupr.	phytotherapy	harvesting is prohibited
14	*Botrychium virginianum* (L.) Sw.	edible 1/5, medicinal 2/5	rare, harvesting is prohibited
15	*Cystopteris fragilis* (L.) Bernh.	edible 1/5, medicinal 2/5, decorative	-
16	*Cystopteris montana* (Lam.) Desv.	decorative	-
17	*Dryopteris affinis* (Löve) Frass-Jenks	decorative, cosmetic, phytoremediation	-
18	*Dryopteris cartusiana* (Vill.) H. P. Fuchs	edible 2/5, medicinal 4/5, decorative	-
19	*Dryopteris cristata (L.) A. Gray*	medicinal 4/5	-
20	*Dryopteris dilatata* (Hoffm.) A. Gray	edible 2/5, medicinal 4/5, toxic, decorative, soil protection -	-
21	*Dryopteris expansa* (C. Presl) Fraser-Jenk & Jermy	toxic and medicinal	-
22	*Dryopteris filix-mas* (L.) Schott.	medicinal 4/5, cosmetic, decorative, phytoremediation, folklore, very weak insecticide	-
23	*Equisetum arvense* L.	food, toxic, medicinal 4/5, veterinary medicine, effective fungicide, cosmetic, liquid fertilizer, natural dye, decorative, phytoremediation,	-
24	*Equisetum fluviatile* L.	toxic, medicinal 2/5, phytoremediation	-
25	*Equisetum hiemale* L.	edible 2/5, medicinal 2/5, toxic, domestic uses, effective fungicide, liquid fertilizer, cosmetic, dye, decorative, insignificant insecticide	-
26	*Equisetum palustre* L.	toxic	medicinal with risks
27	*Equisetum pratense* Ehrh.	edible 2/5, medicinal 2/5, household uses,	-
28	*Equisetum ramosissimum Desf.*	food 2/5, toxic, medicinal 2/5, household uses, good phytoremediation,	-
29	*Equisetum sylvaticum* L.	edible 2/5, medicinal 2/5, toxic	-

No. crt.	Species	Categories of uses	Observations
30	*Equisetum telmateia* Ehrh	food 2/5, toxic, medicinal 2/5, veterinary medicine, effective fungicide, cosmetics, liquid fertilizer, natural dye, decorative, phytoremediation,	-
31	*Equisetum variegatum* Schleich	edible 2/5, medicinal 2/5, domestic uses, decorative, effective fungicide, liquid fertilizer	-
32	*Gymnocarpium dryopteris* (L.) Newman	medicinal, insecticide	-
33	*Gymnocarpium robertianum* (Hoffm.) Newman	decorative	-
34	*Huperzia selago* (L.) Schrank & Mart.	phytotherapy, veterinary medicine, toxic, cosmetics, dyeing	to be harvested in small quantities
35	*Lycopodiella inundata* (L.) Holub	phytotherapy	rare and vulnerable, harvesting is prohibited
36	*Lycopodium alpinum* L.	phytotherapy	harvesting is prohibited
37	*Lycopodium annotinum* L.	phytotherapy, toxic, cosmetics, decorative industry	vulnerable, globally threatened and protected in the EU.
38	*Lycopodium clavatum* L.	medicinal 3/5, veterinary medicine, dye, decorative, cosmetic, insecticide.	to be harvested in small quantities
39	*Lycopodium complanatum* L.	medicinal 3/5, industry	is a glacial relict in the flora of Romania, harvesting is prohibited
40	*Lycopodium tristachyum* Pursh	phytotherapy	harvesting is prohibited
41	*Marsilea quadrifolia* L.	edible 1/5, medicinal 2/5 phytoremediation	it is vulnerable in Europe and other parts of the world.
42	*Matteuccia struthiopteris* (L.) Tod.	decorative, medicinal, slightly edible, slightly fodder	-
43	*Ophioglossum vulgatum* L	edible 1/5, medicinal 2/5, decorative	to be harvested in very small quantities
44	*Oreopteris limbosperma* (Bellardi ex All.) Holub	decorative	-
45	*Phegopteris connectilis* (Michx.) Watt	decorative	-
46	*Polypodium interjectum* Shivas	medicinal	rare in Romanian flora
47	*Polypodium vulgare* L.	edible 2/5, medicinal 3/5 veterinary medicine, decorative, insecticide	-
48	*Polystichum aculeatum* (L.) Roth.	decorative, insecticidal	-
49	*Polystichum braunii* (Spenn.) Fée	decorative, mildly medicinal	vulnerable in Europe
50	*Polystichum lonchitis* (L.) Roth.	decorative, medicinal	-
51	*Polystichum setiferum* (Forsk.) T. Moore ex Woynar	decorative, phytoremediation	-
52	*Pteridium aquilinum* (L.) Kuhn	toxic, weak ecological restoration, good phytoremediation, uses in household and organic farming, cosmetics, dyeing, decorative	-
53	*Salvinia natans* (L.) All.	good phytoremediation, decorative	globally and european threatened
54	*Selaginella helvetica* (L.) Spreng.	phytotherapy, decorative	sporadic distribution, harvested in small quantities
55	*Struthiopteris spicant* (L.) Weiss	medicinal, cosmetic, decorative, soil protection, folklore	vulnerable
56	*Thelypteris palustris* Scott.	medicinal, good phytoremediation, insecticide	-
57	*Woodsia ilvensis* (L.) R. Br.	medicinal	it is rare and vulnerable in the flora of Romania

Phylum PINOPHYTA

The value of conifers has been recognized for centuries. There are 20 categories of uses, among which we mention that in the wood and crafts industry alone, the list is very long and has been written over time. The wood is straight

and has a high percentage of utilization for lumber. The chemical industry uses wood, bark, and leaves as raw materials. The felling of native specimens of *Larix decidua, Taxus baccata, Pinus cembra* and *Pinus nigra ssp banatica* is prohibited.
Leaves, cones, and resin are used as raw materials in phytomedicine. They are effective in various treatments and are well known for their effects on the respiratory system. Juice from the buds of *Abies alba* (Fir), *Picea abies* (Spruce), and *Juniperus communis* (Juniper) can be obtained in any desired quantity. Young buds and leaves from *Pinus mugo* and other protected species are not harvested.
Veterinary medicine uses branches of *Juniperus sabina, Abies alba, Pinus sylvestris* and *Picea abies* for treatments.
Bees obtain honeydew honey, although the quantity per hectare is low, large areas of forest and late-flowering herbs provide valuable potential for organic honey.
Abies alba, Ephedra distachya, Juniperus communis, Larix decidua, Pinus mugo and *P. sylvestris* are used in cosmetics.
These plants are green during winter, the trees have an attractive columnar shape, and they are mandatorily cultivated in dendro-floricultural areas in localities.
Conifers protect the soil on steep slopes in mountainous areas very well and are frequently planted in ecological restoration projects. At the upper limit of the forests, *Pinus mugo, P. cembra,* and *Larix decidua* are the most useful plants for ecological restoration, as they are better adapted to high altitudes than spruce (*Picea abies*).
Among these particularly valuable plants, we must be aware of the toxicity of *Ephedra distachya* and poisoning from the leaves of *Juniperus sabina* and *Taxus baccata.*
Effective herbicides and insecticides can be obtained from *Juniperus sabina*, but there are only small quantities of this plant in Romania.
Phytoremediation with woody plants is a long-term process. So far, we have information about *Juniperus communis, Picea abies* and *Pinus sylvestris.*
The pulp and paper industry uses wood from *Larix decidua* and *Picea abies.*
*Pinus l*eaves are used as dyes (Table 2).

Fam. CUPRESSACEAE
Juniperus communis L. subsp. *communis* is commonly found in hilly and mountainous areas. Var. *saxatilis* Pall.(subsp. *sibirica* Burgsd.) grows lying on the ground at the upper limit of forests. Both subspecies have the same properties, with predominantly diuretic and carminative effects (Romanian Pharmacopoeia, 10th edition). Numerous studies have been conducted on this species, highlighting its remarkable uses for the economy. There is detailed information on the effects produced by berries, seeds, leaves, young shoots, and resin.
Their berries are used both in Romania and in other countries to flavor liqueurs and stews. In the food industry, they are used to flavor meats and sauces, alcoholic beverages (Beldie A., 1952; Tardio J. et al., 2006). For the food industry, juniper oil is a promising resource for food preservation, in addition to borrowing from the therapeutic virtues of this plant. To date, there are no restrictions on harvesting from the wild. When harvesting, care should be taken to avoid damaging parts of the plant.
It has beneficial effects in chronic renal congestion, cardiorenal edema, and urinary bladder lithiasis, and also acts on swollen legs, renal pain, dropsy, and urinary incontinence.
It improves digestion, treats stomach ulcers, intestinal disorders, worms, bloating, gastrointestinal infections, anorexia, chronic and epidemic hepatitis, liver failure, enteritis, and is a vermifuge and parasiticide. In metabolic problems, it is used to reduce obesity and ascites.
It offers hope in reducing certain musculoskeletal disorders such as rheumatoid arthritis, rheumatism, chronic arthrosis, chronic gout, rheumatic and muscular neuralgia. Massaging oil into joint pain acts quickly through its calming effect, removing muscle spasms and cramps. (Tahir A. et al., 2016).
It is useful for the respiratory system in cases of colds, fever, as a disinfectant, for chest problems, nausea, and bronchial asthma.
It is helpful in infectious diseases and even cholera.
The resin is antiseptic, disinfectant, and potentially treats and prevents inflammatory autoimmune diseases.
It is beneficial for the circulatory system in cases of pericarditis, stimulating peripheral circulation, and treating lymphatic stasis and hemorrhoids.
It also has effects on the skin, stopping hair loss, treating eczema, abscesses, psoriasis, and eliminating erythema and acne.
It has a tonic effect on the nerves, increases concentration, reduces cervical-branchial, trigeminal, dental, and intercostal neuralgia. The leaves contain substances that combat Alzheimer's disease and have an antispasmodic effect.
It affects potency in the reproductive system.
The leaves are disinfectants for the gastrointestinal tract, have significant hepatoprotective effects, are digestive adjuvants, have high antiproliferative effects, improve motor dysfunction, are neuroprotective and powerful

antioxidants in Parkinson's disease, and the berries eliminate urinary tract infections (Bais S. et al., 2015; Majid G.A. et al., 2024). Tea made from the branches and leaves quickly restores the condition of the leaves, improves digestion, eliminates excess water from the body, helps with detoxification and weight loss, and is useful in arthritis, skin diseases, pimples, warts, athlete's foot, and heartburn (Tahir A. et al., 2016).

The oil from the berries is an effective antibacterial, good for treating wounds, kidney disease, ankylosing spondylitis, rheumatoid arthritis, asthma, gonorrhea, bladder disorders, and mild multiple sclerosis (Fernandez A.C., Cock I., 2016; Raina R. et al., 2019; Dumitrescu E. et al., 2012), and is very good for skin problems and stress-related illnesses, etc. (Tahir A. et al., 2016). Externally, juniper berry distillate mixed with edible oil is applied to areas with rheumatic pain (Pieroni A. et al., 2003). Juniper berries are consumed in Transylvania in the form of tea by asthma patients (Papp N. et al., 2011).

The oil from the berries and leaves has an anti-Candida effect and is also effective against herpes (Pepeljak. S. et al., 2005). It is contraindicated in diabetes, pregnant women, and women with heavy menstruation. Only the oil from the branches is nephrotoxic in high doses and contraindicated in kidney inflammation. The berries are not toxic (Bojor O., 2010).

The berries and branches are used to treat chest infections in children, while the young shoots are used to treat muscle pain, stomach pain, coughs, ulcers, and asthma; they are like a panacea (Carpenter C.D. et al., 2012).

The oil from the seeds reduces fat and prolongs life. In aromatherapy, it has a beneficial effect, wards off evil spirits and plague, and was used 200 years ago for intestinal infections, typhoid fever, cholera, injuries, tuberculosis, etc. (Tahir A. et al., 2016).

Gemoderivatives are used in albuminuria, allergies, arthritis, acute cystitis, colibacillary cystitis, recurrent cystitis, liver cirrhosis, hepatic colic, dyspepsia, gout, hypercholesterolemia, hyperglycemia, liver failure, kidney failure, kidney and urinary lithiasis, mastitis, mastodynia, obesity, pyelonephritis, chronic progressive polyarthritis, nephrotic syndrome, hepatic steatosis, dyspeptic disorders, esophageal varices (Pitera F., 2001, Soescu S. et al. 2008; Pârvu C. et al., 2018).

The cones are eaten by birds and deer (Enescu C.M., 2016). For humans, they contain antioxidants, and juniper is a rejuvenating plant (Sharma S.K. et al., 2013).

For bees, it provides very small amounts of honeydew honey (Pop I., 1982; Dihoru G., 2023).

Juniper frequently grows in very poor quality mountain pastures and can only be considered harmful in areas used for grazing. The grass cover around junipers has a very small amount of useful phytomass, and it is recommended that biodiversity be protected.

The wood is hard and can be used for woodturning, making wooden pencils, household items, and it is a very good fuel.

It has various uses in cosmetics, for acne, dermatitis, eczema, hair loss, oily skin, and skin wounds (Ionescu-Călinești L., 2010). It is very good for perfumes and aromatherapy, relieves stress and anxiety, and relaxes the body. It removes unpleasant odors from the home (Scarlat M.A., 2019).

In Turkey, the resin is used to make eco-friendly white paint (Tahir A. et al., 2016).

For organic farming, it is a source of insecticides against aphids (Boulogne I. et al., 2012).

The oil has moderate antifungal effects on *Sclerotinia rolfsii*, a fungus that destroys vegetables after harvest (Falasca A. et al., 2016; Semerdjieva I. et al., 2021).

Juniper trees cultivated as ornamentals have a high accumulation capacity for heavy metals such as Zn, Cu, Fe, and a low accumulation capacity for Pb (Bolea V. et al., 2008).

The conservation status of juniper in Romania has not been assessed, but it can be cultivated in arboretums or in suitable locations in forests (Pârvu C., 2002).

Juniperus sabina Lodd., common juniper, is known among the people as a dangerous poisonous plant, is prohibited during pregnancy when taken internally, causes miscarriages, and is used with caution only in veterinary medicine. Its Romanian folk name recommends it for the external treatment of warts, and it was used in the past for venereal diseases and blisters with discharge. Fresh juice applied to warts is toxic, and an infusion of leaves or young shoots is preferred. The cones are toxic, but they also contain substances that combat Alzheimer's disease (Bojor O., 1977; Dhivya P.S. et al., 2014).

The oil is considered toxic by classical authors, but some recent studies highlight its effective antibacterial and antifungal effects. However, its use in medicine and meat preservation requires serious study, even if it is intended to be soaked into packaging paper as an antifungal agent. For this purpose, it can be replaced by other plants.

In perfumery, it is used externally in the form of creams for dermatoses, neuralgia, and alopecia. (Hănceanu M., 2014).

It is an effective insecticide (Plants for a Future 2012–2022), used in organic farming on *Tribolium confusum* (Khani A., et al., 2017), and has repellent properties against aphids. It reduces the germination of weed seeds in *Myosotis arvensis* and *Melilotus officinalis* (Semerdjieva I. et al., 2022).

It is planted as an ornamental plant for ground cover in parks and hedges (Pop I., 1982) and is highly resistant to sulfur pollution (Bolea V. et al., 2008).

It is listed on the red list, and its cones and roots can be harvested every 2-3 years.

Taxus baccata L., Yew, belongs to the TAXACEAE family. In the flora of Romania, it was sporadically distributed in beech forests and mixed coniferous and beech forests. It is a Tertiary relict, protected as a natural monument. The seedlings in pastures used for grazing are not cleared either (Maruşcă T., 2008). It is cultivated as an ornamental plant. It tolerates strong winds and pollution.
Wood has been used for centuries in construction and to make objects valued in human life, such as religious objects, wooden spears, longbows, forks, pegs, nails, sculptures, furniture etc.
It is highly toxic and was used in the past for fishing in North America (Wendt S. et al., 2022). The leaves are insecticidal, but harvesting them is strictly prohibited.
We do not recommend using this plant for medicinal purposes regardless of its effects; substitute plants can be found. The leaves contain taxol, which is an anticancer substance.
As an ornamental plant, it is resistant to pollutants (Bolea V. et al., 2008), and in recent years, new ornamental yew plants have appeared in cities across the country. When they reach maturity, they attract insects and birds to their crowns.

The PINACEAE family includes valuable tree species such as *Pinus, Abies, Picea* and *Larix.*
Pinus cembra L. is a valuable species that is planted at the upper limit of forests for ecological restoration, in windbreaks, in agroforestry, and as an ornamental. It protects slopes from avalanches and erosion as well as *Larix decidua*. The presence of these trees helps to attract wildlife. It has a lifespan of up to 1000 years, and its wood is of very good quality, dense and resistant (Biswas C., Johri D.B.M., 1997).
The seeds have been consumed for centuries by mountain dwellers.
In medicine, it is a source of turpentine, which has the same uses as other pine species, useful in rheumatic, kidney, and bladder disorders, coughs, colds, and flu. It is very good for skin conditions, wounds, burns, boils, etc.
It has honey-producing value, with approximately 10 kg of honeydew honey obtainable from 1 hectare (Dihoru G., 2023).
After the extraction of turpentine, a very sticky substance remains in the resin, which can be used in the chemical industry to obtain varnishes for waterproofing and protecting wood. The needle-like leaves, green or dry, can be used as plant material for dyeing natural textile fibers (Plants for a Future 2012–2022).
The oil is a very good antibacterial, moderately anti-Candida, and a weak antioxidant, but as it is a natural monument, cutting, harvesting buds, and branches is strictly prohibited (Dihoru G., Boruz V., 2014; Hurdu B. et al., 2022). The seedlings in the exploited meadows are not cleared either (Maruşcă T., 2008).
P. mugo Turra, Jneapăn, is sporadically distributed in the spruce and subalpine scrub layer.
For therapeutic uses, small quantities of leaves, buds, and branches are harvested. Harvesting is prohibited in nature reserves (Dihoru G., Boruz V., 2014). The leaves are used to treat respiratory diseases such as coughs, colds, bronchitis, tracheitis, laryngitis, and asthma. Heals wounds and urinary tract disorders. The buds are used to treat cystitis, urethritis, pyelonephritis, and urinary lithiasis. The resin is used for sprains (Bojor O., 1977, 2010; Manzione M.G. et al., 2024).
The volatile oil is an effective antiseptic, extracted from the leaves and shoots, and is effective in bronchitis, tracheitis, tracheolaryngitis, pyelitis, catarrhal cystitis, and urethritis. It is an adjuvant in renal calculosis (Bojor O., 2010). Externally, it is used in rheumatism, muscle stiffness, and cosmetic products for aromatization in herbal baths.
Gemoderivatives are used in rheumatoid arthritis, degenerative joint rheumatism, osteoporosis, coxarthrosis, gonarthrosis, dorsalgia, lumbalgia, lombarthrosis, synovitis, and to strengthen fractured bones (Pitera F., 2001, Soescu S. et al. 2008; Pârvu C. et al., 2019; Scarlat M.A, 2019).
Turpentine has the same uses as other pine species, useful in rheumatic diseases, kidney and bladder disorders, coughs, colds, flu, wounds, burns.
In Romania, after 1945, rosin was obtained from the resin of this shrub to polish the strings of musical instruments.
A brown or green dye can be extracted from the needles (Plants for a Future 2012–2022).
The juice, oil, and resin have insecticidal and antifungal effects (Boulogne I. et al., 2012).
It does not have any particular honey value, providing only small quantities of honeydew.
It is planted in protective crops at high altitudes (Pârvu C., 2001) and in urban tree and flower gardens (Preda M., 1989). It is a tool for monitoring environmental pollution (Manzione M.G. et al., 2024). It is harmful to grass cover and, without useful phytomass, seedlings are not cleared from exploited grasslands (Kovacs Att., 1979).
P. nigra J. F. Arnold ssp. *banatica* (Borbás) Novák is widespread as a pioneer species on rocky slopes and can be cultivated in ecological reconstruction and decorative works.
It is a species on the red list, has scientific importance, and clearing, harvesting of buds and branches is strictly prohibited (Pârvu C., 2005; Dihoru G., Boruz V., 2014).
P. sylvestris L., Pine, is sporadically distributed in the hilly and mountainous areas.
The wood is used in construction, furniture making, the chemical industry, paper production, the manufacture of various household items, and as fuel.

It is very good for environmental protection and has very broad ecological plasticity. It is often cultivated as an ornamental tree in all areas of the country and for the restoration of degraded, eroded land and in protective barriers, where it is very effective. It recovers land and binds sandy soils (Pârvu C., 2005; Durant J. et al., 2016).
The plantations yield up to 10 kg of honeydew/ha and propolis (Dihoru G., 2023). The sap has nutritional and therapeutic value similar to *P. montana*, but the buds are weaker.
In terms of quality, pine resin ranks second after spruce resin. Turpentine is used in respiratory diseases and arthritis. Pine needle baths are used in rheumatism, scrofula, insomnia, respiratory diseases, and cardiac neurosis. The oil is extracted from the leaves and shoots and is a valuable antiseptic for the respiratory system. The seeds have similar properties and contain antioxidants. In cosmetics, it is used as a tonic for oily, acne-prone skin, in cleansing products, and hair care products. Vegetable tar treats dermatitis and dermatosis; it is added to hair lotions to combat dandruff. The extract from the cones has tonic, cleansing, and anti-dandruff properties (Ionescu-Călinești L., 2009).
The main therapeutic action is on the respiratory system, the leaves cure coughs as well as plantain leaves. They have disinfectant effects on the respiratory system, in respiratory viruses, sinusitis, colds, tracheitis, asthma. On the urogenital system, they have curative effects in kidney and bladder disorders, urinary infections and inflammations, pyelitis, urethritis, and cystitis. Baths with leaf tea are comforting and treat fatigue, asthenia, nervous exhaustion, insomnia, neuralgia, and neurosis. They alleviate skin diseases, dermatitis, psoriasis, wounds, reddened, congested, and irritated skin, and diseases of the musculoskeletal system such as scapulohumeral periarthritis, rheumatism, arthritis, and muscle pain. The juice is a digestive tonic (Crăciun F. et al., 1977; Pârvu, C., 2014; Scarlat M.A., 2019; Papp N. et al., 2011; Sen S., Chakraborty R., 2011; Muntean L.S., 2007; Gămulea A., Nicolae A., 2022).
Veterinary medicine uses pine needle infusions to treat kidney and respiratory diseases (Pârvu, C., 2004).
A reddish-yellow dye is obtained from pine cones (Plants for a Future 2012–2022).
For organic farming, it is a source of insecticidal and antifungal substances (Boulogne I. et al., 2012).
Young plants are harmful in pastures of pastoral interest (Kovacs A., 1979).
It is a bioindicator of pollution, has a high capacity to accumulate Zn, Cu, Pb, F, Cl, Fe (Bolea V. et al., 2008) but its development is affected (Fasani E. et al., 2022).
After more than five decades, it has been found that at low altitudes where thermophilic species predominate, pine needles alter the pH and reduce diversity in the buffer zones of reserves by eliminating native herbaceous flora and, at the same time, some species of protective importance.
It is important for the carbon balance in nature. Except for the first 10 years, it has lower biomass accumulation than fir and spruce (Biswas C., Johri D.B.M., 1997).
Leaves, buds, and branches will be harvested depending on the number of specimens, in small quantities or every 2-3 years, and will not be harvested from Natura 2000 sites (Dihoru G., Boruz V., 2014).
Abies alba Mill., fir, is commonly found in mountain valleys, between 700 and 1200 (1800) m altitude, mixed with beech, covering 5% of Romania's forested area. It forms class I and II production forests, with a productivity of 10-12 m³/ha/year (Mauri A. et al., 2016). It is exploited for its high-quality wood used in the wood industry and as a raw material for paper, essential oil, resin, tannin, etc.
The young leaf buds, harvested in early spring, and the resin have medicinal importance. Fir syrup is obtained from young buds harvested in early spring. Essential oil is obtained from needles, cones, and bark. Resin is harvested in summer but can also be easily found in other seasons.
In past centuries, Romanians used the bark of young shoots soaked in alcohol to treat stomach pain and resin in alcohol to treat rib pain (Marian S.F., 1870).
Most Romanian authors recommend phytotherapeutic products made from fir for respiratory system disorders (decongestion of the respiratory tract, bronchitis, colds, coughs, runny nose, laryngitis, flu, pulmonary emphysema), then for the digestive system (anorexia), the nervous system (stress, moderate sedative, fatigue, psychasthenia, energizer, comforting, mental disorders, nervousness), excretory system (cystitis, leucorrhea, nephritis), ulcers, rheumatism, cardiac neurosis, and even scabies (Crăciun F. et al. 1977; Pârvu C., 2000; 2016; Muntean L.S., 2007; Burzo I., 2015; Gămulea A., Nicolae A., 2011).
Fir resin used as an ointment for varicose ulcers was the subject of a doctoral thesis defended by Vintiă Viorica in 1995 at Babeș-Boliay University in Cluj Napoca. Other authors recommend it in the form of a tincture for nephritis, pharyngotonsillitis, and fright in children (Crăciun F., et al., 1977; Pârvu C., 2016), applied as compresses on boils and arthrosis (Ancuceanu R. et al. 2023), intercostal neuralgia (Marian S.F., 1870). In folk medicine, small granules of resin are swallowed without chewing and touching the tooth enamel.
The oil has antibacterial properties and, when taken internally in the form of drops in cooking oil or honey, cures colds and coughs. It can also be applied externally to wounds and bruises. Cosmetic products are used for respiratory tract disorders, neuralgia, asthenia, as a tonic, oil for aromatic baths, rheumatic and muscular pain, household deodorant, perfumes, and in aromatherapy (Ionescu-Călinești L., 2009).
The buds harvested in spring for syrups and gemmotherapy have a cardioprotective effect in coronary artery ischemia, cardiac arrhythmia, atherosclerosis (Drevenšek G. et al., 2016), scrofulosis in children, anemia, bone

pain, demineralization in children and adults, malnutrition, erythropenia, painful teething, fever, respiratory infections, laryngitis, lymphatic disorders, osteochondritis, dysmetabolic osteopathy, osteoporosis, periodontitis, caries in children, rickets, spasmophilia, neuromuscular disorders, growth and nutrition disorders, fracture healing, periodontitis, dental granuloma, radiculitis, caries, gingivitis, stomatitis, prevention of respiratory diseases, neuromuscular disorders, bone decalcification (Pitera F., 2001, Soescu S., 2008, Pârvu C. et al., 2018), stimulates memory and concentration (Yang S.-A. et al., 2009).

Veterinary medicine uses fir products to treat gastroenteritis, anorexia, and debility (Pârvu C., 2001).

The food industry can use non-toxic coniferous oils to preserve meat and cheese products; fir oil is a safe food preservative (Yang S.A. et al., 2009).

For beekeeping, it is a honey-producing species with a good yield that provides honeydew, propolis, 15-40 kg/ha (Pop I., 1982; Pârvu C., 2001; Dihoru G., 2023), with high antioxidant value, strong anticarcinogenic and strong antibacterial properties (Broznić D. et al., 2018).

Tannin is extracted from the bark of the trees and used for tanning animal skins. In terms of tannin resources, conifer bark ranks second after oak.

Fir trees are planted to reforest degraded sites (Burri K. et al., 2009), protect the soil very well, prevent erosion, and have very good stability against strong winds (Biswas C. Johri D.B.M., 1997), maintain high biodiversity and ecological and functional balance (Mauri A. et al., 2016). It is cultivated in human settlements as an ornamental plant but is sensitive to SO_2, Zn, F (Bolea V. et al., 2008).

For medicinal purposes, buds and resin can be harvested as needed. Since ancient times, young plants have been harvested for Christmas trees during winter celebrations. It seems that the abundance of seedlings in the shade of the arboretums is very high, and their number may be endangered more by deforestation in recent decades than by the demands of the population.

Picea abies (L.) H. Karst., Spruce, occupies approximately 1/3 of Romania's forests, is a species widely used in the wood industry, intensively exploited in recent decades but less frequently planted in deforested areas. It is also sought after in other industries such as: chemical industry, pulp and paper industry, material for musical instruments, tanning, and is frequently cultivated as an ornamental plant.

Spruce forests modify the climate, provide very good hydrological and erosion protection (Biswas C., Johri D.B.M., 1997), are planted for the reforestation of degraded sites (Burri K. et al., 2009), are bioindicators of pollution, accumulating large amounts of F, N, S, Cu, Pb, Zn, Fe (Bolea V. et al., 2008). Seedlings are very tolerant to heavy metals (Fasani E. et al., 2022).

For beekeeping, it is a good source of honeydew and propolis (Dihoru G., 2023).

For food, medicine, and cosmetics, it has the same uses as fir. It has purifying effects, stimulates blood circulation, eliminates lung and gastric disorders, is diuretic, reduces skin rashes, arthrosis, rheumatic pain, intestinal colic, and varicose veins (Crăciun F. et al., 1977; Pârvu C., 2004; 2013; Scarlat M.A., 2019; Vogl S. et al., 2013); used in excess, it can cause allergies (Vončina M. et al., 2014).

The therapeutic value of spruce resin was highlighted in 2013 by authors Jokinen J. J. and Sipponen A.

The leaves have a higher vitamin C content than fir (Ancuceanu R. et al. 2023).

In veterinary medicine, it has the same uses as fir (Pârvu C., 2004).

The bark on the shoots has antifungal and antibacterial effects (Mohamed Z.M., 2016). The bark on young trees is sometimes used as a container for storing high-quality cheeses. It is a source of tannin for tanning.

The extract from the leaves and buds eliminates dandruff and seborrheic dermatitis. The volatile oil is added to cleaning products such as gels, bath foams, and bath salts (Ionescu-Călinești L., 2009).

Saplings in pastures reduce the area and have no useful phytomass (Kovacs A., 1979; Maruşcă T., 2019).

Due to its uses, it is frequently mentioned as a cultivated plant in popular beliefs.

Larix decidua Mill subsp. *carpatica* (Dom.) Simon is rarely found in the spontaneous vegetation of the spruce and subalpine zones, but is sometimes cultivated.

The wood is exceptional, very resistant, not destroyed by decay, and in plantations it reaches a biomass growth of 5-6 m. c./ha/year around the age of 100 (Biswas C., Johri D.B.M., 1997), it is rich in tannin and resin, and in construction it is very resistant to weathering and underwater. The paper is of good quality. Locals in mountainous areas used it to make various household items and long horns for blowing (Da Rouch F. et al., 2016).

The bark, which is harvested in spring from 2-4-year-old shoots, is of particular interest in medicine for the treatment of bronchitis and internal bleeding. Other complementary uses are for fever, colds, coughs, inflammation of the mouth and pharynx, common colds, susceptibility to infections, high blood pressure, cystitis, externally for chronic eczema and psoriasis, and bark powder for purulent and difficult wounds. Turpentine is a good remedy for rheumatic conditions, neuralgia, and respiratory diseases such as fever, cough, colds, and inflammation of the mouth. Some authors prohibit the use of oil and turpentine from larch in kidney diseases (Crăciun F. et al., 1977; Scarlat M.A., 2019; Pterschy-Wenzig E.M. et al., 2008). The bark extract is an antioxidant comparable to vitamin C (Baldan V. et al., 2017).

For the chemical industry, it is a good source of turpentine, tannins (10%), and volatile oil used as an expectorant in chronic bronchitis (Beldie A., 1952; Pop I., 1982). Resin is used to make varnishes for wood preservation.

It has attractive foliage and colouring, is decorative and fragrant, and is also used in aromatherapy.
Bees collect nectar for honeydew honey (Dihoru G., 2023).
In Romania, natural habitats with *Larix decidua* are strictly protected. It is very well adapted to the most difficult environmental conditions and can be cultivated as a pioneer species on deforested and exposed land, helping to stabilize ecosystems. It is globally threatened and also in Europe (Oprea A. 2005). Seedlings in exploited grasslands are not cleared (Maruşcă T., 2008).

The EPHEDRACEAE family includes the smallest species of gymnosperm in Romania, *Ephedra distachya* L., commonly known as Cârcel, after the shape of the green branches on its stems. It has been used as a medicinal and magical plant for 5,000 years and has compounds in concentrations comparable to those in *E. sinica*. In Ayurveda, it is used as a stimulant and cardiac tonic. Ephedrine from the branches is used to control asthma. Western medicine uses it predominantly for severe colds and allergies.
Green branches are used for infusion and can be harvested at any time of the year. The cones are edible and are harvested in summer. Alkaloids are only present in the green branches; the roots and cones are almost devoid of these substances. Treatments are carried out under medical supervision. Ephedrine is banned in sports competitions.
It successfully treats asthma, reduces fever, hay fever, colds, nasal congestion, common in rhinitis, and flowering branches in bronchitis. It stimulates the central nervous system, awakens, reduces headaches, and headaches caused by sinusitis. It accelerates the pulse and constricts blood vessels in the circulatory system. It has a strong diuretic effect on the excretory system and is effective in treating urinary incontinence. It is an aphrodisiac in small doses for both sexes. On the locomotor system, it is used in joint and bone diseases, strengthening athletes, increasing energy levels, and reducing inflammation. A decoction of the green branches of the stem relieves rheumatism, etc. Ephedrine has a similar effect to adrenaline, but is less toxic. It sometimes causes heart palpitations and, in cases of prostate inflammation, urinary incontinence. It is addictive. (Beldie A., 1952; Bojor O., 1977; Pop I., 1982; Pârvu C., 2013; Aprotosoaie A.C., 2014).
Side effects include insomnia and rapid heart rate. It is used in very low concentrations (Da Monte et al., 2004).
It has many contraindications: in hypertension, hyperthyroidism, glaucoma, prostate adenoma, cardiac patients, heart rhythm disorders, cardiac arrhythmia, coronary artery disease, thyrotoxicosis, pheochromocytoma, administered concomitantly with certain treatments (Bojor O., 2010), pregnancy, breastfeeding, insomnia, dry mouth, anxiety, heart palpitations, hot flashes, sleep disorders, neurological disorders, dementia, tremors, burning sensation, itching, allergies, fatigue, hypertension leading to stroke, diarrhea, increased urination, (Ghavam M. and Soleimaninejod Z., 2020), it is hallucinogenic because it induces dreams, affects the liver and kidneys. It is preferable to use the seed and flower (Uyal H. Ince M., 2024). All this shows us the situation of modern man compared to his situation in Antiquity when he had fewer health problems. It is very good for restoring eroded, sandy land and fixed dunes (Danin A. 1991; Pârvu C. 2001; Lemauviel S., Rose F., 2003).
It is extremely resistant, grows in full sun, and survives frost. In Iran, it is cultivated on desert soils to cover them. It is extremely rustic and has remarkable growth (Ghavam M., Soleimaninejod Z., 2020). It propagates by cuttings and seeds that can germinate for up to 15 years.
The cosmetics industry uses extracts from aerial parts to combat excessive sweating in weight loss and cellulite removal products (Ionescu-Călinești L., 2009). Green branches are harvested throughout the year for ephedrine extraction, but harvesting is strictly prohibited in Romania (Dihoru G., Boruz V., 2014).

Table 2: Categories of uses of conifers in Romania

No. crt.	Species	Categories of uses	Observations
1	*Abies alba* Mill.	wood industry, chemical industry, honey production, edible 2/5, medicinal 3/5, veterinary medicine, cosmetics industry, decorative, ecological restoration, pollution indicator, folk beliefs	-
2	*Ephedra distachya* L.	edible 2/5, medicinal 4/5, toxic, decorative, ecological reconstruction, cosmetics	It is protected, rare, vulnerable, and harvesting is strictly prohibited.
3	*Juniperus communis* L	edible 3/5; medicinal 3/5, cosmetic, fuel, wood for pencils, environmental protection and hunting, phytoremediation, very poor honey plant, chemical industry, agriculture	-

No. crt.	Species	Categories of uses	Observations
4	*Juniperus sabina* Lodd.	toxic, decorative, insecticide, herbicide, medicine, veterinary medicine	cones and roots are harvested every 2-3 years
5	*Larix decidua* Mill subsp. *carpatica*	wood industry, chemical industry, pulp and paper industry, ecological reconstruction, decorative, cosmetic, edible 2/5, medicinal 3/5, honey plant	natural monument
6	*Picea abies* (L.) H. Karst.	wood industry, fuel, chemical and tanning industry, pulp and paper industry, edible 2/5, medicinal 3/5, good honey plant, cosmetics, veterinary medicine, ecological reconstruction, phytoremediation, decorative, folk beliefs	-
7	*Pinus cembra* L.	edible 2/5, medicinal 4/5, wood industry, chemical industry, environmental protection and ecological restoration, decorative, honey plant, dye	protected, natural monument
8	*Pinus mugo* Turra	environmental protection and ecological restoration, decorative, medicinal, chemical industry, insecticide, antifungal, dye, cosmetic, very poor honey plant	no plant material is harvested from protected scrubland.
9	*Pinus sylvestris* L.	wood industry, domestic use and fuel, dye, decorative, edible 2/5, medicinal 3/5, veterinary medicine, cosmetics, very good ecological restoration, good phytoremediation, poor honey plant, insecticide, antifungal	-
10	*Pinus nigra* J. F. Arnold subsp. *banatica* (Borbás) Novák	ecological reconstruction, decorative, scientific importance	it is strictly protected
11	*Taxus baccata* L.		it is strictly protected

CONCLUSION

Most ferns are decorative, and we found references to 35 species. At the same time, they have attracted interest for various scientific studies, although they have never been consumed by Romanians.

Therapeutic uses have been established based on empirical information supplemented by modern studies in biochemistry, pharmacology, and phytotherapy for 43 species.

There are mentions of 17 species with poor edibility and one with moderate edibility (*Asplenium scolopendrium*).

There are 12 toxic species. *Equisetum* species should be used with caution because they are toxic and medicinal.

Very few species have been used in veterinary medicine, and these are: *Equisetum arvense, E. telmateia, Huperzia selago, Lycopodium clavatum, and Polypodium vulgare.*

The following can be used in dermatology and cosmetics: *Asplenium scolopendrium, A. trichomanes, Athyrium filix-femina, Dryopteris affinis, D. filix-mas, Equisetum arvense, E. hiemale, E. telmateia, Huperzia selago, Lycopodium annotinum, L. clavatum, Matteuccia struthiopteris, Polypodium vulgare, Struthiopteris spicant.*

Weak or notable phytoremediation processes are demonstrated in the following ferns: *Asplenium adiantum-nigrum, Asplenium cuneifolium, Asplenium ruta-muraria, Asplenium trichomanes, Athyrium filix-femina, Azolla filiculoides, Dryopteris affinis, Dryopteris filix-mas, Equisetum arvense, Equisetum fluviatile, Equisetum ramosissimum, Equisetum telmateia, Phegopteris connectilis, Pteridium aquilinum, Salvinia natans, Thelypteris palustris.*

Insecticidal effects have been demonstrated on *Equisetum hiemale, E. arvense, E. telmateia, Gymnocarpium dryopteris, Lycopodium clavatum, Polystichum aculeatum, Polypodium vulgare, and Dryopteris filix-mas (*very weak).

Fungicidal effects have been demonstrated in*: Equisetum arvense, E. hiemale, E. telmateia.*

Soil fertility improves after the decomposition of plant matter in*: Equisetum arvense, E. hiemale, E. telmateia, and Pteridium aquilinum.*

Huperzia selago, Lycopodium clavatum, Polypodium vulgare, and *Equisetum telmateia* were used for dyeing textile fibers.

Of the conifer species found in this country, five species have been frequently used over time for the wood industry, two species for paper (*Picea abies, Larix decidua*), three species for the chemical industry (*Abies alba, Picea abies, Pinus mugo*), two species for beekeeping, four species for veterinary medicine, five species for dermatology and cosmetics (*Abies alba, Larix decidua, Picea abies, Pinus mugo, P. sylvestris)*, eight species in phytotherapy, nine decorative species, three for wood fuel, and three species for dyeing textile fibers (*Pinus cembra, P. mugo, P. sylvestris*). Modern studies validate 9 species for environmental protection and ecological restoration, 3 species for organic farming (*Juniperus sabina, Pinus mugo, Pinus sylvestris).*

A few decades ago, it was claimed that the substances found in ferns are closer to those found in conifers than to those found in ferns and angiosperms, meaning that ferns and conifers had common or related ancestors. If we analyze the uses of these plants in Romania, we will notice that there are many differences and that they cannot be replaced with each other when they are not available. This finding brings us back to the idea of the polyphyletic origin of higher plants.

In 1990, Page C.N. stated that conifers are vulnerable all over the world because of their high-quality wood. After 1989, Romania's policy changed, and the effects on Romanian forests became very clear. Some authors claim that the "scars" caused will heal in 8 or 10 decades.

If we analyze their ecological requirements, we will see that ferns are shade plants and most of them grow in acidic soil, specific to coniferous forests, meaning that in our country their geographical areas overlap greatly.

The economic potential of fern and conifer species is well known and of great interest, and it is necessary for the population that exploits it to be able to clearly distinguish between levels of exploitation and degrees of protection.

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