

## MEDICINAL PLANTS

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### Summary

This article deals with medicinal plants in a narrow sense—plants which are used first of all in therapeutic applications in the form of tea mixtures or herbal preparations, consumable on a regular basis for self-curing. A representative overview is given on some selected, frequently used species, grouped according to their pharmacological properties. The applications include inflammation or catarrh of the bronchial tract, sneezing, sore throat connected with common cold or flu; appetite loss, indigestion, liver disturbances, constipation, diarrhoea, peripheral vascular disease and heart failures as well as problems of the urinary tract, sleep disorders and anxiety. For symptomatic treatment but also curing of these physical and mental diseases, a wide range of medicinal plants may be used. Twelve species are described in detail, giving a

short history, a botanical description, introduction to their ecological requirements, active materials of the utilized plant organs, areas and methods of consumption, as well as other types of utilization, and main aspects of cultivation.

## 1. Introduction

Plant species often called "medicinal plants" include a very wide range of species. Many of them also have uses not connected to their pharmacological activity, e.g. as condiments or natural sources of aromas, dyes, or as ornamentals, etc. In this article we deal with medicinal plants in a narrow sense—with plants which are primarily used in therapeutic applications.

Curing with herbs has a long tradition. Curing agents have been taken from the plant kingdom, as with foodstuffs, etc., since prehistoric times. Written records confirm the widespread utilization of herbs in therapy from ancient empires, such as that of China, Egypt, Babylon, Greece and Rome. Famous proofs are provided by the scrolls of Ebers dated back to about 1550 B.C. Egypt, which mentions, for example, celandine, anise, poppy, henbane and several other herbs. The famous Greek Hypocrites knew and utilized more than 300 plants for their curing properties. In his book *Materia Medica*, several species, used even today as medicinal plants are mentioned: hawthorn, mustard, juniper, willow, etc. No less famous in later times was Galen in Rome, who developed "curing products" from plant parts, such as extracts, tinctures, powders, and infusions, which are known even today as "galenics".

In the Middle Ages, knowledge and utilization of herbs was a fundamental part of life, both in Arabic and Christian cultures, often bound with superstitions. In the sixteenth century, Paracelsus was the first to mention certain effective materials ("quinta essentia") in healing plants; his work provided the basis of the later phytochemistry. Progress in science contributed stepwise to the better understanding of the chemical background and physiological activity of substances obtained from plants and led to the present status of phytomedicines in the developed world.

Today, several traditional and modern therapies are based on medicinal plants and/or their products. Such plants play an important role in balneotherapy (curing baths made by adding medicinal herbs); in aromatherapy (physiological or psychical effects through breathing in essential oils) and also in homeopathy. None of these therapeutical directions can be considered to be plant utilization as food sources: in the first two cases the method of application excludes the possibility and, in the case of homeopathy, the usual dose is too small for the material to be regarded as food. In phytotherapy, however, medicinal plants are consumed in a way which merits more detailed discussion. In modern phytotherapy, the biological activity of plant-originated materials is confirmed; furthermore, a well proven connection exists between the dose of application and the elicited effect.

According to the EU definitions (Directives 65/65, 75/318, 75/319), herbal medicines should contain only plant-originated materials, either in the form of crude drug, powdered drug, extract, tincture, fatty or essential oils, or juice. The herbal medicines (also known as phytomedicines or phytopharmaceuticals) should be licensed and tested

to ensure therapeutical efficacy, quality and safety, as for other pharmaceuticals. Differences in regulation exist even among EU states, and also in other countries. In USA, the characteristic legislation procedure does not recognize the term 'herbal medicine', but dietary supplements (functional foods) of eventual therapeutic properties are marketed.

Recently, also in Europe, taking medicinal plants as foodstuff is going to arise in form of food additives, often called also "nutraceuticals", which refers to the double use of these preparations as foods and as curing or health maintaining agents.

About 2000 medicinal and aromatic plant taxa are used on a commercial basis in Europe. The number of species, ever utilized in any therapy in the world may exceed 20 000.

In the following, a representative overview of some of the most frequently used species has been grouped according to their pharmacological properties.

## 2. Medicinal plants used against respiratory tract problems

Latin name	English name	Utilised organ	Main active substances	Main pharmacological effect	Forms of application
<i>Althaea officinalis</i> L.	marshmallow	root, leaf	mucilaginous polysaccharides	antitussive	cold water extract, syrup
<i>Cetraria islandica</i> Ach.	liverwort	lichen	mucilaginous polysaccharides	antitussive, stomachicum	decoction
<i>Citrus limonum</i> <i>C. sinensis</i>	lime orange	pericarp	essential oil	spasmolytic, antiseptic	essential oil inhalation
<i>Datura stramonium</i> L.	thornapple	leaf, fruit	tropane alkaloids	spasmolytic	industrial preparations (!)
<i>Eucalyptus globulus</i>	eucalyptus	leaf	essential oil	expectorant, spasmolytic	essential oil inhalation
<i>Gypsophila paniculata</i> L.	white soapwort	root	triterpene saponine-glycosides	expectorant	decoction
<i>Malva sylvestris</i> L.	mallow	flower, leaf	mucilage, anthocyanidines	antitussive	water extract
<i>Marrubium vulgare</i> L.	horehound	flowering shoot	diterpenoid lactone, mucilages	antitussive	decoction, candy
<i>Matricaria chamomilla</i> L.	chamomile	flower	essential oil, flavonoid glycosides	broncholytic, spasmolytic	infusion, extract, inhalation
<i>Mentha x piperita</i> L.	peppermint	leaf, shoot	essential oil	broncholytic	infusion, essential oil, candy
<i>Papaver</i>	poppy	capsule	morphinane	antitussive	industrial

somniferum L.			alkaloids (codein)		preparations (!)
Pinus silvestris L.	pine	shoot tip	essential oil	broncholytic	essential oil inhalation
Plantago lanceolata L.	plantain	leaf	mucilage, iridoid glycosides	expectorant, immunstimulant	infusion, extract, syrup
Primula veris Huds.	cowslip	root, leaf	triterpene saponine-glycosides	expectorant	decoction, tablets, syrup
Rosa canina L.	dog rose	fruit	ascorbic acid	immunstimulant	cold water extract
Salvia officinalis L.	sage	leaf	essential oil, tannins	anti-inflammatory, adstringent	alcoholic extract, infusion
Sambucus nigra L.	elder	flower, leaf, berry	flavonoids,	diaphoretic, antifever	infusion, syrup, jam
Saponaria officinalis L.	soapwort	root	triterpene saponine-glycosides	expectorant	decoction, tablets
Thymus vulgaris L. Th. serpyllum L.	thyme	flowering shoot	essential oil, tannins, flavonoids	expectorant, broncholytic	infusion, alcoholic extract
Tilia cordata Mill. T. platyphyllos Scop.	lime	flower	flavonoids, essential oil, mucilages	diaphoretic, antifever, antitussive	infusion
Tussilago farfara L.	coltsfoot	leaf	mucilaginous polysaccharides	antitussive	industrial preparations (!)
Verbascum phlomoides L.	mullein	petal	mucilaginous polysaccharides	expectorant	decoction, extracts

Table 1. Selected medicinal plants used against respiratory tract problems

Inflammation of different parts of the respiratory tract often occurs as a consequence of infections or allergens. In a first stage catarrh of the upper respiratory tract, nasal congestion, sneezing, dry and sore throat may appear—the usual symptoms of common cold and flu. The treatment of these complaints is rather symptomatic; curative remedies are hardly known. In prevention of infections however, herbs containing vitamins or immunostimulant agents may have a significant role (see later).

For easing breathing and decreasing nasal secretion, essential oils or infusions of medicinal plants containing essential oils are of benefit. The essential oils also act as antiseptic agents. The most often used essential oils are those of mint species, eucalyptus and *Citrus* species.

Sore throat and pharyngitis are considered to be the next stage of respiratory tract diseases. Herbs of adstringent properties, containing tannins or catechines are the most suitable to help in this stage. Drugs containing essential oils increase the efficacy through their anti-inflammatory and bacteriostatic properties. Some of the most often used herbs for this purpose are sage and lime species.

Catarrh of the bronchial tract causes cough as a well-known unpleasant and often long-lasting symptom. Dry cough may be relieved, by reducing irritability of the central nervous system, using antitussive drugs, such as codein-derivatives or those containing tropane-alkaloids, like members of the *Solanaceae* family. For supporting treatment, herbs containing mucilages are appropriate (marshmallow, mullein). Prolonged irritation of the bronchioles results in increased secretion and viscosity of mucoproteins. In this case, cough may be treated by expectorants. They contain mostly saponins (cowslip) essential oils (thyme species) or other terpenoid compounds (horehound).

### 2.1. Cowslip. *Primula veris* Huds. (Primulaceae)

Cowslip is one of the most widespread of several *Primula* species that are used for therapeutic purposes. Many other taxa are important decorative pot plants. Cowslip grows in the temperate climate zone of Europe, in grassland, forests, and hedge sides; it prefers calcareous soil and medium precipitation.

In early spring it develops a leaf rosette, followed by a flowering stem in April. The leaves are oval-elongated, wrinkled, and lanceolate; yellow flowers develop as a crown at the top of a 15 to 25 cm long stalk.

The main pharmacologically active ingredients are triterpene-saponins, up to 8% in the rhizome and somewhat lower content in the above-ground organs. Important ingredients are also phenolic-glycosides (flavonoids), especially in the leaves. There are also essential oils and a little ascorbic acid. The saponins are mainly responsible for the expectorant effect of the drugs, reducing the surface tension of the secretions in the bronchioles, and facilitating their separation and removal by coughing.

There is abundant data about utilization of cowslip from ancient times. Young leaves were eaten as salad, and flowers were applied to give fragrance to liqueurs and wines. A certain sedative effect was also attributed to this beverages, but this is not considered as proven today. Recently, the drugs, the root and rhizome, leaf and flower (according to the pharmaceutical nomenclature *Primulae radix et rhizoma*, *P. folium*, *P. flos*) have been used as constituents of tea mixtures. They are prepared as infusions or are processed in form of herbal medicines (granulates, capsules, syrup).

For therapeutic purposes, cowslip is collected from the wild, i.e. from its natural and semi-natural habitats. It is important, therefore, to be aware of the current status of the species in the region and its legal protection, as well as that of related species, with which it is easily confused. Roots are harvested in autumn or in early spring; leaves thorough the year, and flowers in spring. The petals may be collected with or without calyces (according to the pharmaceutical nomenclature *flos cum or sine calycibus*).

## 2.2. Lime tree. *Tilia* spp. (Tiliaceae)

Lime trees are best known for their delicious fragrance, when in flower during June. Several species are known to grow wild in different woodland habitats, in warm and in temperate zones, and, a few artificial hybrids and cultivars have been selected and propagated as park, avenue or garden trees. As medicinal plants, first of all small-leaved lime, *Tilia cordata* Mill., and large-leaved lime *T. platyphyllos* Scop., as well as their hybrids, are of importance. The former grows in mixed forests, in warm, moderately dry places, in calcareous soils. Large-leaved lime prefers cooler habitats, north-facing slopes of hills or higher altitudes, and wet soils.

Lime species are tall, deciduous trees. Their leaves are obliquely heart-shaped, often with hairs on the underside. In the case of *T. cordata* the hairs are brownish-red, and in *T. platyphyllos*, they are white. The flowers are yellowish-white, hanging in bunches on slender stalks, and the fruits are brownish, small, and globular.

Lime flowers accumulate many useful active ingredients: mucilages, tannins, flavonoid-glycosides (quercetin, kaempferol), phenolic acids, and essential oil (main component farnesol), all of which are supposed to act in synergism.

These species are utilized for several purposes. The wood is used for furniture, boards, and packing cases; charcoal is produced, because it is strong but light, and supposedly seldom attacked by woodworm.

Lime honey from the flowers is widely known and consumed; in some countries it is regarded as the best flavoured and most valuable. For therapeutic purposes the flowers (*Tiliae flos*) are utilized, especially for treatment of cold, flu, coughing and other symptoms. The diaphoretic effect is useful in treating feverish conditions, however in the case of heart disease the application of its drug is contra-indicated.

For coughs, consumption of lime tea or tea mixture is advised in the form of infusion, several times a day.

Lime flowers are collected from wild populations or individual planted trees, but it is not cultivated especially for drug production. Collection is optimal at the beginning of flowering; the flowers are cut with their bracts. Special care should be taken not to harm the trees.

## 2.3. Marshmallow. *Althaea officinalis* L. (Malvaceae)

Several members of this large family are used for different purposes, e.g. foodstuffs, ornamentals, fibre, and therapeutic agents. Marshmallow is indigenous in Europe; it grows in brackish coastal marshes, damp meadows, and river banks. It prefers deep, wet soils, and a temperate climate. For medicinal purposes it is regularly cultivated on a small scale in central and eastern Europe.

It is a perennial herb, 80 to 120 cm in height. The leaves are shortly petioled, ovate-cordate, entire or three to five lobed. They are covered by dense stellate hairs. The

flowers open from July to September, the petals are white, and the stamens are united into a tube. The fruits are flat and round, and are popularly called "mallow cheese".

The main active substances are mucilages, accumulating to 10 to 20% in the root and somewhat less in the green parts. Mucilages—if consumed with water—form a protective layer over the mucous membrane of the respiratory tract, preventing mechanical irritation of the receptors of the cough reflex. The plant also contains starch, pectin, sugar, and essential oil.

Records from the Middle Ages prove that the plant has been used as food by the Egyptians, Greeks, Armenians and Africans. Mallow roots were consumed boiled or fried, especially by poor people, and mallow was also used as a fodder plant. At the same time, it played a role in traditional medicine, as an anti-inflammatory agent. Hypocrites was reputedly the first to suggest its use for healing wounds. Almost each of its dried organs can be utilized as medicinal drugs: roots (*Althaeae radix*), leaves (*A. folium*), flowers (*A. flos*). The roots should be stripped of the brown outer corky layer, and is marketed as nice white cubes. Today, it is used against cough (antitussive, demulcent) as a decoction, in tea-mixtures, and sometimes as herbal medicine.



Figure 1. *Althaea officinalis* (Photo: Bernáth, J.)

Cultivation is annual or biennial. It can be raised from seeds, sown in spring. Thinning may be necessary to 60 to 70 by 20 to 25 cm. Propagation by root-cuttings in autumn is also possible. Leaves are collected during summer by hand; roots can be harvested in late autumn, by spade or nursery machines.

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### Biographical Sketch

**Dr. Éva Németh** is professor at the Department of Medicinal and Aromatic Plants at the BKA University, Budapest, Hungary. Her main topics in education and activities in research are focused on breeding, genetics, chemotaxonomy, production and physiology of medicinal and aromatic plants. In the last decade she has been the leader of 8 scientific projects and partner in further 12 ones on the development of biological bases of medicinal plant production, investigations on the influencing factors of drug quality, modernization of agrotechnology. She is one of the leaders of the PhD School in Horticultural Sciences and scientific supervisor of several students.

She has over 200 scientific publication, among them 10 books. She is known as breeder of 12 registered plant varieties and lecturer at different international and national conferences. For several years she worked as technical editor of scientific journals on medicinal plants such as *Herba Hungarica*, *ICMAP Newsletter*.

Dr. Németh has been engaged in the Hungarian and international scientific activities as secretary of the Hungarian Society for Horticultural Sciences, secretary of the Medicinal and Aromatic Plants Section in FIP, vice president of Medicinal Plant Committee of the Hungarian Scientific Academy, member of board of the medicinal Plant Section of Hungarian Pharmaceutical Society and member in the IUCN Medicinal Plant Specialists Group.