

Review

People like leek, but which one?

Is traditional medicinal use of leek species mainly related to *ALLIUM SATIVUM* L. and in what cases is garlic contraindicated¹?

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Abstract

Allium sativum L., a traditional health food and medicine, has been scientifically researched and the results thereof confirmed the reputation of garlic as a valuable medicinal plant. However the variation in phytotherapy prescription in the old days was larger than at present. This study deals with two issues about the traditional use of *Allium* spp.: what species were actually in use to acquire the legendary strengthening effect of garlic, and which type of persons could (and who could not) benefit from its virtues. It is recommended to include more *Allium* spp in garlic research and to narrow down the therapeutic indications by taking into account the warnings and contraindications found in classic herbals.

Keywords: *Allium sativum*; garlic; *Allium* plantlore and etymology; Medieval European herbals.

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1. A brief introduction to the *Alliaceae* family

Any layman can recognize a species of leek above all by its strong smell and taste that stems from sulphur containing odorous compounds that are typical for *Alliaceae*. But we must also realize that jack by the hedge or garlic mustard (*Alliaria petiolata*) of the *Brassicaceae* family can admit an onion-like odour. And the taste of a few other members of the *Brassicaceae* family (radish, black radish, etc.) can also resemble the taste of onions. This is due to the glycosinolates which are characteristic for *Brassicaceae* and chemically very similar to the *Allium* sulphuric compounds. Because of their appearance (leaves, flowers, roots) however the two families are clearly distinguishable.

Allium is a genus name but also a plant family name. Because of the large number of different kinds of leek (members of the *Allium* genus) and the initial doubts whether to place them in the Lilly or Narcissi family, botanists gave it its own family, the *Alliaceae*. Don (1827) only mentioned 139 kinds of leek in 1827, Frohne and Jensen (1992) mention around 500, and Mathew (1996) speaks of more or less 750 species of leek.

The *Alliaceae* family is part of the monocotyledonae; plants that in general have the evolutionary strategy of avoidance of the damage by grazing herds. Their growing point is very low (as in grass) so they suffer less from grazing; other families (orchids, and several waterplants) moved to habitats out of reach for the herds. The rise of this families started about 100 million years ago (start of the the neophyticum era) when the earth cooled down (lowering insect damage) in the now temperate regions. In contrast the dicotyledonae, the counterparts of the monocotyledae in the domain of flowering plants, have invested more in chemical defence such as terpenoid, alkaloid and isoprene compounds (Frohne and Jensen, 1992). That is why the most important bulk food plants are domesticated species from the main monocotyledonae family (*Poaceae*): wheat, mais, rice, barley, rye etc. Like orchids *Alliaceae* are specialised to marginal habitats, probably mountains where they could

¹ A part of this article appeared in Dutch in Nederlands Tijdschrift voor Fytotherapie 2000(13)3: 9-11.

not multiply and hibernate by rhizomes, and depended on seed or bulbs to survive cold winters. Because of the lack of terpenoids and tannins the monocotyledonous plants are vulnerable for attacks by micro-organisms. *Alliaceae* did not accumulate much silicea either (like many grasses did) but they have specialised in the specific anti-fungal and antibacterial compounds mentioned above for their defence.

Well known members of the *Alliaceae* that are native to North West Europe are: ramsoms/bear-garlic (*A. ursinum*), crow garlic (*A. vineale*), field garlic (*A. oleraceum*), rocamboles (*A. scorodoprasum*) and chives (*A. schoenoprasum*). The onion and shallot (*A. cepa*), Chinese chives (*A. tuberosum*) and garlic (*A. sativum*) from Asia have been cultivated in these regions for many years as well as leek (*A. ampeloprasum* var. *porrum*).

A. scorodoprasum, rocamboles (fig. 1) is an intermediate between onion and garlic in both smell and taste. In the past it fulfilled a culinary use and was cultivated for this purpose but isn't marketed anymore.

INSERT FIG. 1

2. Remarks on garlic etymology and plant lore

The English word leek is related to the verb "to like", and the word "garlic" stems from "garden" and "leek". In the Dutch and German words for garlic "knoflook" and "Knoblauch" the part "knof/knob" refers to the bulb which is cloved in parts to form the separate cloves. And look/lauch means leek. But the German "lauch" can also relate to "schlauch" that describes a hollow stem. The Latin name *Allium*, as it is still heard today in the French "ail", stems from "alliare", meaning: to have the shape of a line, and it probably refers to the shape of the leaf. But other interpretations mention the relation to the verb "allicere" (to attract) just as in "to like", the relation to the Latin word "olere" (smell) or the Celtic word "All" (burning). (Vanderbussche, 1978, Pritzel, 1882).

The Greek word for leek is "scorodon" (hence: *Allium scorodoprasum*). Lobelis (1581) tells us about the name "Looock, in Greek Scorodon: The smell, taste, use and the medicinal properties have made Looock so famous, that has been common knowledge to all people: because it causes a strong breath odour and an unpleasant sharpness in mouth and throat when eaten and expels fowl vapours through the skin. And it causes those who eat it to stretch out and yawn which in Greek is called Scorodinismos, that is why in Greek leek is called Scordion." Thus, as is the case in most medicinal plants, a closer look at the name gives a rough indication of the value the plant had in the old days.

In several languages garlic is called "treacle of the farmer", or "treacle of the poor", indicating its valuable medicinal properties in relation to the lower price compared to expensive exotic herb mixtures meant to cure all (as treacle's were). This name goes back to Galenus (Teirlinck, 1930). In Germany the name Alterswurzel (old man's carrot) suggests geriatric benefits. The name "garden leek" confirms that the species was cultivated for food or medicinal properties. Of course the strong odour of garlic gave rise to names as "stinking onion" and "stinking rose".

A. ursinum (ransoms, wild garlic) refers in its Latin and in the old Dutch, French and English names to the bear. Probably did people notice that bears in the woods like to eat it. In several languages it is "garlic of the wood". The official Dutch name is "daslook" (badger's leek) and it is in fact one of only three plant species that are regularly eaten by badgers as I was told by the badgers rescue organisation. In Germany this is a popular herb both for culinary and medicinal use, it is also called "wild garlic" in Germany and in England (in Ireland also a variety of *A. ampeloprasum* is the wild garlic, states Allen, 2004) and in medieval books "herba salvatoris" or salutarium, indicating its medicinal value. More than 200 years ago a verb in England said: "Eate leeks in Lide, and ramsins in May, and all the yeare after physitians may play." (Lide is March, the "loud" month; Friend, 1884).

A. victorale is called in Dutch the mountain leek, but also "every man's harnas" and the same German indication, as well as its name in French: "herb of seven vests" or "herb of nine virtues", points to the protection it gives to diseases, the devil, bad gnomes and evil spells (Teirlinck, 1930).

3. Distribution and cultivation of garlic

In the past many different kinds of leek, depending on their local occurrence, have been used as food, as strengtheners or as medicine and were cultivated, bred and distributed as such world-wide. Garlic probably originated from an area in the mountains between Afghanistan, Tibet and the former Soviet-Union (fig. 1). It is the area where *A. longicuspis* can still be found, which is widely recognized as the feral ancestor of garlic. In contrast to garlic this plant does still produce seeds.

INSERT FIGURE 2

It is likely that the fertility of the garlic flowers' male sex organs have been lost due to a 6000 year period of human improvement. Nowadays many kinds of garlic are cultivated that don't flower at all. If one brings these varieties to an area with colder winters and longer days they will usually start flowering again. The ones that do flower don't produce pollen. Removing the bulbils (asexually formed "offspring") from the flowers at an early stage sometimes allows the formation of fertile pollen and, as a consequence, seed (Kik, 2004). Except for distinguishing between the flowering and non-flowering variety we also distinguish between the white and red (actually pink) variety. Cultivation of garlic requires fertilisation closer to that of leek, which is richer in nitrogen as is used for growing onions. (Engelard 1991, Van Asseldonk, 1992, Kik 2004).

4. Traditional uses and warnings

All cultures within the distribution range of the *Allium*-family hold a special place for the different kinds of *Allium*, especially garlic in both their culinary and medical traditions. Examples are given from three different healing systems.

Mediterranean and western Europe

The oldest written records of *A. sativum* and *A. cepa* are found in the papyrus Ebers (13). At the first Olympics in ancient-Greece the athletes used garlic as a strength enhancer, and garlic is what kept the pyramid builders in Egypt going.

Moreover garlic (Homerus speaks of "Moly" but its properties were adhered to garlic in later centuries) was involved in many legends, usually as a protective force against vampires, demons, and devils referring to the witch Circe who tried to cast a spell on Odysseus (15,16).

Plinius mentions no Alliums, but "herba scordeon" could be *A. vineale* (crow leek) (13).

Also Hippocrates mentions no Alliums, whereas other Greek/Latin authors mention several (table 1). Garlic, as well as onion and leek are amongst the 72 herbs appearing in the "Capitulare de Villis" enactment of Charlemagne (742-814 AD), that ordered specific plants and trees to be grown on every of his many estates and in the gardens of convents. Many of these plants became part of local herbalism and horticulture traditions.

INSERT TABLE 1

There are endless indications for garlic in the classical European literature. There is a frequently reoccurring claim that it could protect you from every poison and "venom" in every field, but each of the classical authors (5, 6, 7, 8, 9, 10,14,18) name different, more concrete illnesses like epilepsy, digestive upsets, oedema, worms, hair loss, cough and haemorrhoids. Furthermore leprosy, chest aches, heart problems and menstruation pains. Fuchs tells us garlic makes the blood thin (this was also folk knowledge on Aran Islands, reports Allen, 2004) and the cheek red.

All classical European authors agree on one aspect, the character of garlic which, without exception is described as being "dry and hot" usually subjoined to the highest (3rd or 4th) degree. From this we also gain an indication as to when not to use garlic: one must not administer garlic to people of a hot and dry disposition (sufferers of cholera) or only with great caution (Dodonaeus, Culpeper, Fuchs and the Herbarijs). Garlic (raw) can be damaging to the eyes (Aristoteles, Plinius, the Herbarijs, Fuchs and Dodonaeus). In the case of an overdose, garlic can cause flatulence, stomach aches and thirst (Plinius), or kidney damage (Dodonaeus). Fuchs mentions sleepiness, head, lung and kidney damage.

Culpeper for example states that garlic can be used, as well as the onion, for mad dogs bites and other venom and worms, to cut tough phlegm, against any plagues, sore, swellings or ulcers and lethargy. Above that garlic can cure hydrops, jaundice, falling sickness, cramps, convulsions, piles and other problems he defines as "cold". He warns however for the vehement heat of garlic, that in choleric men adds fuel to the fire and in case of melancholy will attenuate the humours and bring strange visions to the head.

Lobelius gives, apart from hot constitutions, pregnancy and lactation as contra-indications for garlic, because it stimulates the flow of menses.

Chinese tradition (11)

The Chinese word for garlic is Da Shuan. It was and still is a popular food as well as a popular medicine especially in the north west and north east of China. The oldest publication on garlic was found in a *Materia Medica* published by Tao Hongjing in 536 A.D.

The best known applications are:

- seat worms: squashed cloves are applied around the anus before going to bed at night.
- dysentery: a five percent infusion, nowadays we use capsules.
- external use in case of skin disease (carbuncle, boils): in early stages squashed cloves are applied locally.
- during epidemics of infectious diseases one should eat 3 to 5 raw cloves of garlic daily, chew thoroughly before swallowing.

And again the herb is characterized as being quite hot and spicy which makes it unsuitable to use for people suffering from yin-deficiency, sore throat, tooth ache or an inflammation of the eye because it could worsen the symptoms.

Garlic according to Ayurveda (12)

In the olden days there was no fundamental difference made between foods and medicines in India. In principal every plant could be used to strengthen the body and would be beneficial for a long life (ayurveda = science of longevity). Garlic (lasuna) is mentioned in the first ayurvedic texts like the Caraka Samhita, which originates from around 1500-1000 B.C., and was reviewed and added to by Caraka around 300-200 B.C. Around 400 A.D. this work was revised once more and written down.

Properties of garlic are:

- Rasa (taste): katu (sharp), but also sweet, salty, bitter and astringent.
- Vipaka (taste after digestion): katu (sharp).
- Guna (properties): snigdha (unctuous), tiksna (strengthening), picchila (mucilaginous), guru (heavy) and sara (flowing/laxative)
- Virya (potential): usna (warming)
- Doshakarman (effect on dosha): stabilizes and raises vatadosha (the wind element; this is a symbol for catabolism).

Lasuna is used to relieve malaria fever, epileptic seizures, asthmatic conditions (inhalation of the juice), colic, to stimulate the digestive track, for diseases caused by vata (in that case one uses oil preparations) and for inflammations of the joints, to prevent wounds from infecting (external local use) and to stimulate lactation among others.

A wide range of indications, and also the notion that garlic is a warm herb, that boosts up the energy, seems to be a broad cultural experience with garlic. A specific kind of heat in the patient (described as a constitution of congested and rising heat) is in all three systems a contraindication for garlic.

In addition to these traditions that are thousands of years old, many uses of garlic were confirmed by scientific research in the 20th century.

The traditional uses improvement of digestion and detoxification by the liver were confirmed by in vitro tests. Increase in stamina and resilience was found in animal studies. Antibiotic and anthelmintic properties were confirmed in vitro and in vivo. Increased blood coagulation time, antiatherosclerotic effects and anti-tumor effects were repeatedly found in laboratory and clinical research. The lowering of blood pressure and serum cholesterol has also been researched, with contradictory results. We have come a long way and also several contra-indications have been recorded: allergies to leek specimens, low blood pressure, reduced curdling of the blood, and overdoses of garlic have been reported causing anaemia and hypothyroidism. Overviews can be found in Lawson et al (1996), Rivlin (2001) ESCOP (2003) and in the results of the recent EU project Garlic and Health (Kik, 2004).

5. Which leek is the real thing?

Homerus spoke of "Moly", but we do not know whether this concerned *A. sativum* or another *Allium* species. Teirlinck (1930) suggests *A. victorialis* or *A. magicum* but mentions that he cannot find enough details in old herbals. According to Louis (1977) it should be *A. dioscoridis* or *A. nigrum*. Plaitakis and Duvoisin (1983) came with a complete other theory: they suggest that the witch Circe would have used anticholinergic agents (like stramonium form *Datura stramonium* or related plants) as a drug; so it could have been *Galanthus nivalis* (snowdrop) that provided the protection. From snowdrop the anticholinesterase effects are plausible as one of the compounds is registered as an Alzheimer medicine. However several other plants would serve to this purpose, sage and rosemary to mention just a few. The description of Homerus that they quote speaks of a black root, difficult to dig it up. This could also point to *Allium scorodoprasum* that has two small black cloves that are difficult to harvest (fig.1). At this moment "Moly" is sold as decorative onion-like plant. I doubt if we have to look for Moly in genus other than *Allium*.

Dioscorides spoke of the great powers of wild leek, that is much stronger than the cultivated leek, most probably *A. sativum*. But what was meant by the word "wild" in this case?

INSERT FIG 3

Brunnfels (1532) pictures (fig. 3) “wylder Knoblauch” (wild garlic) clearly as *A. ursinum* (ramsons), and also Tabernaemontanus did this in 1664. Brunnfels’ garlic (“Knoblauch”) is a simple drawing that resembles an *A. sativum* but it might even be *A. ampeloprasum* (wild leek) or its cultivar *A. porrum* (leek). The picture that is called “Lauch” (leek) clearly shows *A. schoenoprasum* (chives).

INSERT FIG 4

The famous botanist Fuchs (1543) talks about four kinds of garlic. From the illustrations (fig. 4) as well as from the description one would expect the following

“Garten knoblauch (garden garlic) is *A. sativum* (CCCCXXI).

“Wilder knoblauch” (wild garlic) is *A. vineale* (crow garlic)(CCCCXXII). It is not plausible that he meant *A. ampeloprasum* (wild leek) because cylindrical leaves are mentioned.

“Waldknoblauch” (forest garlic) is *A. ursinum* (CCCCXXIII).

“Feldknoblauch” (field garlic) is in the 2001 edition named *A. oleraceum* (field garlic); but given its flat (not cylindrical) leaf shape my best guess would be *A. scorodoprasum* (sand leek)(CCCCXXVIII).

“Eschlauch” (consumptive leek) is probably meant to represent *A. ampeloprasum* var. *porrum* (CCCLXI), although the drawing depicts a small (young?) plant that equally could be a garlic or rocambole seedling. The description of the leek that makes a big round head in the soil, and the position close to *A. schoenoprasum* (chives) fits to the older leek varieties that had a thick stem in the soil.

INSERT FIG 5

Dodonaeus (1554) knew three leek genera: “tame” leek (this seems to be, based on description as well as picture, *A. sativum*), “broad” leek (this is probably *A. ursinum*, ramsons, which has a broad leaf not unlike the lily of the valley) and “wild” leek. The latter one, the most powerful species of leek, is even more a mystery when you look at the drawings (he uses the same drawings as Fuchs, but names them a big and a small “type” of wild garlic, fig. 5, middle and right drawing). As mentioned above the left one could be *A. scorodoprasum*, rocambole (sandleek). The description mentions (not in agreement with the drawing!) hollow round leaves which means it is probably crow garlic. Dodonaeus states that the two types of wild leek not only have a different appearance, they also grow on different spots, the big one prefers to be in corn fields, the small one grows in meadows and besides hedges. (5).

Lobelius (1581) describes “wild leek from Montpelliers”, which is most similar to crow garlic (*Allium vineale*), being a medicine for grey and tough humours according to Galenus, and “wild leek with slim leaves” which seems to be rocambole (sandleek, *A. scorodoprasum*). About ramsons (*A. ursinum*), which can be found in forests and is a favourite food for badgers (and probably bears), he says: “whether ramsons is actually Hippocrates’ “Moly” as Galenus seems to have deducted is uncertain”, but it is certain, or so he says, that it is often consumed in the spring and that it is used as a medicine not only to relieve physical ailments but also as protection against witchery, although it’s really good in gravy as well (6).

In the book of Clusius (1601) more attention is paid to *Allium victorialis* (a leek plant from the alpes), he calls it *Victorialis longa*. This seems to be the same plant as the one Lobelius called “*Allium serpentinum* and *Ophioscorodon*” and also the one called *Allium alpinum* by Tabernaemontanus (1664): a hairy bulb and rather broad leaves. This plant was considered a very powerful amulet (15,16, Teirlinck 1930). Clusius mentions further five *Moly* species and two *Scorodoprasum* species, the first one might be *Allium scorodoprasum*, although the volume of both flower and bulb is rather large; the second one is definitely *Allium sativum* var. *scorodoprasum*.

INSERT FIG 6

The German edition of “Dioscorides Kreuterbuch 1610” (8) paid very little attention to “wylder lauch” and “Moly” but according to the drawings and descriptions neither can be ramsons. The most important member of the *Allium* genus in this text is garlic. There are two distinguishable groups but only one is depicted by the German publisher (fig. 6). The “tame” garlic is bigger and has a white bulb, the “wild” garlic is smaller with a purple bulb, the text calls it sandleek or rocambole, or in Greek ophioscoron, and in german wild leek. Dioscorides states that it is comparable to, but more powerful than “tame” garlic.

This statement was also taken on by the Herbarijs, a medieval handbook commented upon and published by Vandewiele (9). This describes “tame” leek as the vegetable and “wild” leek as the medicinal plant. But what is “wild” leek? Dodonaeus says that pharmacists unjustly sold *Alliara* (jack by the hedge/garlic mustard) as being “wild” leek. Vandewiele suggested that they might have meant *Teucrium scordonia* (wood sage). Given the totally different smell this seems rather unlikely. In my opinion what we now know as rocambole or sandleek (*A. scorodoprasum*) is the best candidate for “wild” leek in the olden days. In its flowering year it loses its leaves early in the season and this fits the description. Also it can produce little bulbs in the ground, connected with a thin root to the “mother” bulb, as described by Dodonaeus for wild garlic.

We should not overlook the fact that Medieval herbalists did not have a fixed binominal taxonomy and they valued the specific time and place of harvest just as much as the species name. Only recently we began to realise that these things really make a difference in the (amount of) medicinal compounds present in plants (Van Genderen et al, 1996).

6. Conclusion

In the 2000 years of written communication on European herbalism the number of species has diminished.

Ofcourse pre Linnean period..

But it seems fruitful to conduct some research in the therapeutic possibilities of some other leek species than the three that are best known to the phytotherapists nowadays (the latter being *A. sativum*, *A. cepa* and *A. ursinum*). For example *A. scorodoprasum* and *A. victoralis* could be of great value. They are probably very effective medicinal plants but their medicinal properties were possibly for reasons of convenience attached to the garlic and onion species that were more easy to grow in the herb gardens.

Modern research has enlightened many aspects of the medicinal possibilities and contra-indications for garlic. Some of the warnings and contra-indications can also be found in classic text books (for example the notion that blood becomes thin). But nothing has been done about the notable indication of heat and the warnings concerning this in the classical literature. Interesting research could be conducted using the old contra-indications as a starting point. Are there any physiological similarities to be found in garlic-users that suffer from side effects? And perhaps, due to the conclusions taken from this kind of research, we would be able to formulate the best circumstances for prescribing garlic more precisely.

Last but not least: the old books talk often about the specific date and biotope to indicate when and where the plant should be harvested. This is consistent with many findings in chemical ecology of medicinal plants.

Reading the classic text books again can be inspirational to modern phytotherapeutic researchers. We could try to find out which leek species fits which type of patients.

Acknowledgements

Many thanks to dr Sun Peilin and dr Friso Smit for providing the information about the use of garlic in traditional Chinese, respectively traditional Indian culture. I also express my gratitude to the Leiden University (prof Slikkerveer) and the Netherlands "open air" (folklore) Museum, where I had access to the old herbals for study purposes. This work was done as an IEZ project without external funding.

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Table 1 (based on A. Louis, 1974)

Allium species	Th	N	C	D
<i>A. ampeloprasum</i> L.				+
<i>A. porrum</i> L.	+	+	+	+
<i>A. sativum</i> L.	+		+	+
<i>A. arenarium</i> L.				+
<i>A. scorodoprasum</i> L.	+			+
<i>A. nigrum</i> L.	+			+
<i>A. ascalonicum</i> L.	+			
<i>A. schoenoprasum</i> L.	+			
<i>A. cepa</i> L.				+

Th = Theophrastes

N = Nikandros

C = Columella

D = Dioscorides

Fig. 1: *A. scorodoprasum*, rocambole or sandleek, grown from a population found in the wild in the Netherlands. A. Plant B. Cloves harvested.

Fig. 2: Distribution of *Allium* species, black is *Allium* section *Allium*, free to (3). The arrow is pointing out the Tien Shan mountains where we suspect garlic originated from and is now the area where *A. longicuspis* can be found (in valleys at a height of between 1350-2100 m).

Fig. 3: Three kinds of garlic in Brunnfells (1532).

Fig. 4: Five kinds of garlic in Fuchs (1543).

Fig. 5: Drawings of tame garlic (left) and "wild garlic" (middle and right figure) in Dodonaeus Cruydeboeck 1554.

Fig. 6: Moly and ("tame") garlic from Dioscorides Kreutterbuch 1610 edition.