

Intriguing World of Weeds ---

Poison-Hemlock (*Conium maculatum* L.)¹

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"He that bites on every weed must needs light on poison." *Compleat Collection of English Proverbs*. John Ray, 1742

INTRODUCTION AND ETYMOLOGY

The genus *Conium* is comprised of two or three temperate species of biennial herbs with highly divided leaves and compound umbels of small white flowers. All parts of *C. maculatum* have long been recognized as



being highly poisonous; it was the plant used to kill Socrates in BC 399 (Gledhill 1985; Holm et al. 1997; Hyam and Pankhurst 1995). *Conium* is a member of the Umbelliferae or Apiaceae, the carrot family, which accommodates 300 genera and between 2,500 and 3,000 species. Umbelliferae is one

of the best known families of flowering plants because of its characteristic inflorescences and fruits and the distinctive chemistry reflected in the odor, flavors, and even toxicity of many of its members (Heywood 1993). The genus *Conium* is the only umbellifer with alkaloids that may act as parts of coenzymes in the oxidation-reduction processes (Mabberley 1989).

The generic name *Conium* is from the Greek *koneion* or *konas*, to spin or whirl, referring to the disastrous effects of poison-hemlock on the body. The specific epithet *maculatum* is from the Latin and means "spotted," "blotched," or "bearing spots," alluding to the purplish mottling of the stems. According to legend, the purplish mottling represents the brand of Cain, put there after he had committed murder (Gledhill 1985; Le Strange 1977). The ancient Roman name for poison-hemlock was *Cicutula*, a Latin word used throughout the medieval period until 1541, when it was transferred to waterhemlock (*Cicutula virosa*), a related plant. To avoid confusion, Linnaeus in 1737 designated poison-hemlock as *Conium maculatum* (see Figure 1). The name *hemlic* or *hymelic*

has been used to designate this plant since the Anglo-Saxon period (Le Strange 1977).

The Old English *hymlice* was a medicinal plant, probably *Conium*, but in Modern English the plant is chiefly referred to as a weed. The definite reference to it as poisonous appears to begin with the 16th century herbalists. The term hemlock for *Conium maculatum* first appeared in about AD 700 as *hymblicae*. Through the centuries, spelling and pronunciation took on many forms, ranging from *hymlice* to *hymlic*, *hemeluc*, *hemlake*, *hemlocke*, *hemloc*, and finally *hemlock*. William Shakespeare, in *Life of Henry the Fifth*, first used the modern spelling. Wrote the bard, "Her fallow Leas, The Darnell, Hemlock, and ranke Femetary, Doth root upon" (Simpson and Weiner 1989).

Poison-hemlock is native to Europe, northern Africa, and western Asia and was often introduced to new areas as an ornamental garden plant (Holm et al. 1997). In Australia, it was cultivated as carrot fern (Everist 1974).

The plant's other common names include common hemlock, deadly hemlock, poison parsley, spotted parsley, poison stinkweed, conium, spotted hemlock, spotted cowbane, herb bennet, spotted corobane, musquash root, beaver poisoner, and kex (Georgia 1914; Le Strange 1977).

DESCRIPTION

The signature for *C. maculatum* is its long, whitish taproot, the purple-spotted hollow stem, carrotlike leaves, numerous white flowers, and a powerful, disagreeable "mousey" odor of the plant when crushed (Holm et al. 1977).

The plant is a coarse, herbaceous biennial with a long, white and unbranched taproot and stout, whitish stems from 1 to 2 m high. The smooth, pale green branches usually are covered with purple spots. The stems, hollow except at the nodes, possess fine, shallow, longitudinal ridges. The large, carrotlike leaves are deeply and repeatedly dissected into many narrow segments and may

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Poison-Hemlock (*Conium maculatum* L.).

be borne as a rosette from the crown or alternately on the stem; they range from 20 to 40 cm long. The inflorescence, 4 to 6 cm across, is comprised of large, open, and compound umbels. The small white flowers are borne in large, loose clusters. The oval-to-circular fruit is composed of two grayish-brown seeds with five prominent, wavy, somewhat knotted, longitudinal ridges (Everist 1974; Holm et al. 1997). The two-seeded fruit distinguishes poison-hemlock from any other similar plant (Allan 1978).

Poison-hemlock resembles the related wild carrot (*Daucus carota* L.). The two may be distinguished because the leaves of wild carrot are distinctly hairy. The dissected leaf of *Conium* gives it a lacy, fernlike appearance (Kingsbury 1964). Poison-hemlock is frequently confused with waterhemlock (*Cicuta* spp.). The clusters of fleshy roots, cross-partitions at the stem base, broader leaflets, and wetter habitats of waterhemlock are sufficient characteristics to distinguish these plants (Frankton and Mulligan 1970).

DISTRIBUTION

Poison-hemlock inhabits waste ground, hedgerows, roadsides, banks of streams and rivers, pastures, and wood lots. It is reported as a weed in North and South America, Europe, including the British Isles, temperate Asia and North Africa, Australia, and New Zealand. It is now widely naturalized in North America, where it is found from eastern Canada and British Columbia to New England and the Middle Atlantic States, westward to

Michigan and Indiana, southward to Virginia; it also occurs in California and Louisiana (Frankton and Mulligan 1970; Georgia 1914; Kingsbury 1964; Le Strange 1977). Plants prefer moist, fertile soils (Holm et al. 1997; Kingsbury 1964).

A single plant may produce 38,000 seeds (Whittet 1968), which usually fall near the parent plant but also can be spread by water, rodents, and birds (Holm et al. 1997; Panter et al. 1988). Plants establish readily on disturbed sites and may displace thin forage stands; shade enhances seedling survival (Holm et al. 1997). Warned Georgia (1914), "So dangerous a neighbor should never be allowed on any farm land, and in particular the roads of the countryside should be free from its presence." Now poison-hemlock may readily be controlled with herbicides (Kingsbury 1964).

TOXICITY

The most widely known and researched aspect of poison-hemlock is its potential toxicity. It is famous as a poison, and plant extracts were used often to execute criminals and political prisoners in ancient Greece (Holm et al. 1997; Parsons 1973). The plant contains a number of closely related pyridine alkaloids. The main one is coniine, a colorless, volatile, and strongly alkaline oil. The alkaloids are lost by slow drying or boiling (Everist 1974; Kingsbury 1964). Coniine was one of the first alkaloids to be discovered, in 1827, and was one of the first to be prepared synthetically (Fuller and McClintock 1986).

Hemlock poisoning is recorded in humans who have mistakenly eaten the plant's leaves for parsley [*Petroselinum crispum* (Mill.) Nym.], the roots for parsnips (*Pastinaca sativa* L.), or the seeds for anise (*Pimpinella anisum* L.). Children have been fatally poisoned by blowing through the hollow stems fashioned into flutes or whistles (Everist 1974). Native North Americans used poison-hemlock to their advantage in making poisoned arrow tips (Parsons 1973). While the roots and seeds are especially poisonous, its toxicity is not as great as that of water hemlock, *Cicuta* spp. (Fuller and McClintock 1986).

While eight alkaloids are found in poison-hemlock, the most active are coniine and coniceine. Environmental conditions, season of growth, location, collection within locations, and time of day affect their concentration (Panter et al. 1988). When plants are grown in hot, dry regions, higher concentrations of alkaloids are found in the fruits and seeds (Holm et al. 1997; Parsons 1973).

The primary action of poison-hemlock is on the cen-

tral nervous system. Activity is similar to nicotine poisoning because conium alkaloids are structurally related to nicotine and function somewhat similarly (Fuller and McClintock 1986). The classic symptoms of hemlock poisoning are nervousness; trembling; difficulty in movement, particularly in the legs of humans or the hind limbs of livestock; dilation of the pupils; slow, weak pulse, later becoming rapid; often rapid respiration; heavy salivation; frequent urination; nausea; convulsions; lowering of body temperature; stupor but not necessarily loss of consciousness; and eventually death from respiratory failure due to paralysis. The heart may continue to beat after breathing has ceased. Stimulants such as coffee or tea are effective as first-aid treatments (Forsyth 1968; Kingsbury 1964).

Poison-hemlock is one of the first plants to green up in the spring, at a time when coniceine predominates (Panter et al. 1988). Livestock generally do not eat the plant voluntarily in the green state. Since poison-hemlock is also one of the few green plants in late winter pastures, hungry livestock may eat it. Occasionally, however, a particular animal may take a liking to it (Fuller and McClintock 1986). Older animals usually avoid the plant. Undoubtedly, hemlock's strong odor reduces fresh consumption, but animals can be readily poisoned from eating contaminated fresh hay or silage (Holm et al. 1997).

Poison-hemlock is toxic to cattle (*Bos* spp.), sheep (*Ovis aries*), horses (*Equus caballus*), pigs (*Sus scrofa*), goats (*Capra hircus*), and poultry (Forsyth 1968). In the U.S., congenital deformities in calves and pigs have followed grazing by pregnant animals on pastures or consumption of hay containing hemlock (Keeler 1978). Cattle are the most sensitive, sheep and goats are intermediate, and pigs are the least sensitive to hemlock poisoning (Kingsbury 1964). Animals that consume hemlock regularly develop a tolerance to the alkaloids, which are excreted by the lungs and kidneys. The breath and urine of poisoned animals have the same mousey odor as the plant (Holm et al. 1997).

Poisoned animals who survive for 8 h after the onset of symptoms usually recover fairly quickly, although pregnant animals may abort within a few days. The alkaloids are excreted by the lungs and kidneys, and the characteristic mousy odor in the breath and urine of poisoned animals is diagnostic (Forsyth 1968). In addition to killing livestock, poison-hemlock consumption lowers meat and milk production, may cause abortions or deformed offspring, and imparts a foul flavor to milk (Holm et al. 1997).

To supply the U.S. demands of the drug trade prior to World War I, about 14,000 kg of its seeds and 7,000 to 9,000 kg of its dried leaves were imported annually (Georgia 1914).

WEEDINESS

Poison-hemlock is a weed of nine crops in 34 countries and is a frequently reported pasture weed. It is considered a serious or principal pasture weed in Italy, New Zealand, Sweden, and the U.S. It also infests pastures, cereals, vegetable crops, and orchards in many countries (Holm et al. 1997).

MEDICINAL PROPERTIES

While poison-hemlock has sometimes been employed for medicinal and veterinary purposes, its medicinal uses are limited because of the closeness between therapeutic and toxic levels (Case 1957; Holm et al. 1997). Naturally, such a poisonous plant had to be administered very carefully for medicinal purposes. During the medieval period, it was taken only for "the bite of mad dogge," such was the fear of rabies. The hemlock's bitter juice was mixed with betony [*Stachys officinalis* (L.) Trev.] and fennel (*Foeniculum vulgare* Mill.) seed, which was not only applied to the bite, but mixed with wine and drunk. Later in history, the juice was occasionally administered as a last resort, as an antidote for strychnine and other virulent poisons (Le Strange 1977).

Poison-hemlock was used safely in poultices and ointments to "risings, hard or otherwise, inflammations indolent turnouts, tumults and swellings, wheals, pushes, creeping ulcers, pains of the joints all over, scrofulous affections" and "to St Anthony's Fire" (Gunther 1959). Religious sects of the 15th and 16th centuries also used the roasted root for relieving the pains of gout and applied it not only to the painful part affected, the foot, but to their hands and wrists. In the 1760s, it began to be used both externally and internally as a cure for cancerous ulcers (Le Strange 1977).

The juice of poison-hemlock is still valued by druggists. Coniine and other alkaloids are extracted from the leaves and young shoots, just as the fruits begin to form. It is prescribed under strict medical supervision in tinctures and extracts for its sedative, anodyne and antispasmodic effects, in such illnesses as asthma, epilepsy, whooping cough, angina, chorea, and stomach pains. Overdoses are to be avoided as they produce narcotic poisoning with paralysis and loss of speech (Le Strange 1977).

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