

cultivated in gardens for use as cathartics, under the name of spurge or spurge seeds, and this habit has not entirely died out. They produce, in overdoses, poisonous results similar to those of ricinus.

*Coral Bean*.—Acting by a toxalbumin similar to ricin, or even more like abrin (see *Jequirity*), the seeds of several species of *Sophora*, especially *S. coralloides* Benth. (fam. *Leguminosae*), have produced fatal poisoning in Texas and the regions to the southwest. These coral beans resemble a common bean in form, some being larger, some smaller, and are of a bright scarlet color. They grow in a brown or brownish cylindraceous pod, which is constricted between the seeds, so as to resemble beads upon a stick, and separating readily into its one-seeded joints. Treatment of this poisoning has proved difficult and uncertain.

*Lupines* (fam. *Leguminosae*).—Many species of the genus *Lupinus* (wild bean or blue bean) are employed, in both Europe and America, either as fresh fodder or for the production of a hay very similar to clover hay. Although these fodders are used upon a great scale, with only the best results in most cases, yet wholesale and fatal poisoning has at times resulted. Many observations, together with some careful experimentation, have apparently determined the fact that the poisoning is due to the seeds, which resemble small beans and are produced in bean-like or pea-like pods. When the herbage is eaten previous to the formation of these seeds, or after they have been discharged from the pods, no bad results follow; but if the seeds are eaten, especially when ripe, either acute or chronic poisoning may follow. The symptoms indicate a poison similar in its general nature to digitalis or, still more so, to sparteine or ononis. There is cerebral congestion, with frenzied and very active delirium. The heart is slow and strong, the blood pressure high. Convulsions, with extreme alternations of strength and weakness, and finally prostration occur. There is powerful diuresis, the urine being often bloody, as in digitalis poisoning. Death usually occurs in acute cases within two hours of the appearance of the first symptoms.

*Esculus*.—The common horse chestnut (seed of *A. Hippocastanum* L., fam. *Hippocastanaceae*) is regarded as slightly poisonous, and certainly contains acrid saponin-like principles (*argyræscin* and *aphrodiscin*) which, consumed in large amount, would prove disastrous. Deprived of this principle by powdering and maceration in alcohol, the residue of the kernel is highly nutritious (protein eight per cent., fat seven per cent., non-nitrogenous extract containing among other constituents fourteen per cent. of sugar), and it is now being so manufactured in Germany. It is readily conceivable that, as this industry extends, insufficient purification may lead to the distribution of a poisonous product. A western and southwestern species (*A. Pavia* L.), the buckeye, is apparently much more active, various fatal cases of poisoning by it being on record. Its poisonous constituent is similar to, but distinct from, argyræscin. The symptoms are violent emesis and catharsis, convulsions, and other common accompaniments of poisoning by the saponin group. It would appear from the accounts that narcosis comes on rather more quickly than in cases of poisoning by other saponin-containing drugs.

POISONOUS BARKS.

In the nature of the case poisoning of human beings by barks is not at all likely to occur, except in medical cases where a poisonous bark has been taken by mistake, or overdoses of the bark have otherwise been given. It is true that many barks are employed by savages as arrow poisons (see *Curare*), but this subject scarcely pertains to the present article. The poisoning of stock by the eating of nutritive barks is in general prevented through the natural instinct of the animal. In times of scarcity of food, however, grazing animals sometimes eat the bark of the common locust tree (*Robinia pseudacacia* L.) with poisonous results. This tree pertains to the family Le-

guminosae, or bean family, so noted for its production of albuminoid nutrients. Its poisonous constituent has been determined by Power as a toxalbumin, very subtle and difficult of isolation. Nothing is known of the treatment, except what is derived from a knowledge that the chief symptom is extreme nausea with violent retching, persisting for days, accompanied by dizziness and great depression. In animals marked salivation has been noticed. The barks of wild cherry and of several Ericaceous plants are poisonous to stock in the same way as their foliage, and the latter will be considered under *Herbage*. The barks of various species of elder (*Sambucus*) are more or less poisonous, though it does not appear that they produce accidents. This subject will be considered under *Roots*.

POISONOUS ROOTS.

Besides the true roots, that name is generally applied by the public to all underground parts, such as mandrake, lily of the valley, Solomon's seal and other rhizomes, the potato and the artichoke, which are tubers, and the onion and garlic which are bulbs. All these are therefore here considered together.

The two important poisonous roots of our region are pokeroot and Cicuta. Probably no year passes without some fatal cases of poisoning by these, and it occasionally happens that quite a number of them occur at about the same time.

*Pokeroot* has already been considered at length as a drug, under that title, and its fruits have been elsewhere discussed in this article. The root has been quite often eaten by mistake for horseradish, which it rather closely resembles, and for other edible roots. The strong acridity of horseradish tends to avert the suspicion which would otherwise be excited by that of the pokeroot. When freshly dug it is quite attractive, being large, whitish, fleshy, and succulent, and containing large amounts of starch and sugar, so that it is readily mistaken for a wholesome and nutritious article. Suspicion once aroused, pokeroot is easily recognized. The base of the stem, which is usually present in a broken condition, is seen to be divided by thin transverse partitions. The surface is finely papillose, and usually presents a spiral appearance, and the cross section exhibits a conspicuous concentric arrangement of the tissues. Since the young shoots are often cut and eaten as a substitute for asparagus, portions of the root are apt to be thus taken by too deep cutting. Thorough cooking ameliorates, but does not destroy its activity.

*Cicuta* (Water Hemlock, Cowbane, Brook Tongue, Children's Death, Spotted Parsley, Beaver Poison, Muskuash Poison, etc.; Ger., *Wasserchierling*, *Giftwueetherich*; Fr., *Cigue viveuse*) is the root of various species of the genus *Cicuta* L., fam. *Umbelliferae*, a genus closely related and very similar to conium, some of the species even having gone by that name (see Figs. 3850 and 3851). These plants grow in swamps or other wet locations, along lakes, streams, and ditches throughout almost the entire North Temperate zone, and are particularly common and abundant in Eastern and Central North America. Our illustrations give an excellent idea of the roots, foliage, inflorescence, and fruits. The plant grows to a height of from three to five feet, and branches and spreads rather widely. The stems and leaf bases are thick, hollow, crisp, and juicy, and the former are usually more or less purplish and glaucous. The base of the petiole clasps the stem. The leaf blade as a whole, though successively much divided into small segments, is very large, often two feet or more broad and long, and is thin and quite green. The entire plant is smooth, and exhales a not unpleasant odor when bruised. The fine white flowers are in decomposed umbels, terminating the branches. The base of the stem, when longitudinally cut, exhibits thin transverse partitions, though these are obscure in some species. The roots, in fascicles like dahlia roots, are usually from three to ten in number. They have about the consistency of a raw potato, are starchy, crisp, and juicy,

somewhat aromatic, and not unpleasant to the taste. They are externally of a brownish color, internally white. They are about the size of Jerusalem artichokes, which they somewhat resemble, and for which they have been mistaken. Boys visiting swamps for calamus often get hold of them. Frequently also they are turned out in

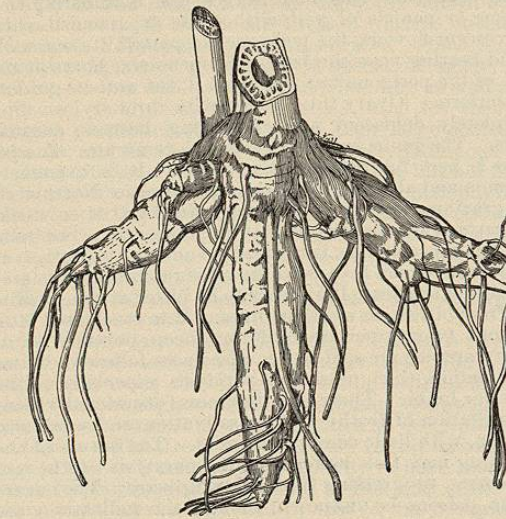


FIG. 3850.—*Cicuta maculata*. (One-half natural size.)

ditching operations, and they have then been experimentally eaten by workmen with fatal consequences. The aromatic stem and the fruits have also been mistaken for angelica. The constituents are believed to include conium (see *Conium*). Cicutoxin is also a very active constituent. Although the nature of the poison partakes of



FIG. 3851.—*Cicuta maculata*. (One-fourth natural size.)

that of conium, yet there is far more of a tendency toward irritation and convulsions. Tremors, violent contractions and relaxations of the muscles, astonishing mobility of the eyeball and eyelashes, widely dilated pupil, frothing, often bloody, of the mouth and nose, epilepsy, and after death a peculiar greenish fluid in the stomach

and exuding from the mouth, cold, contracted, pale surface and some diarrhoea have been noted. Prompt emesis

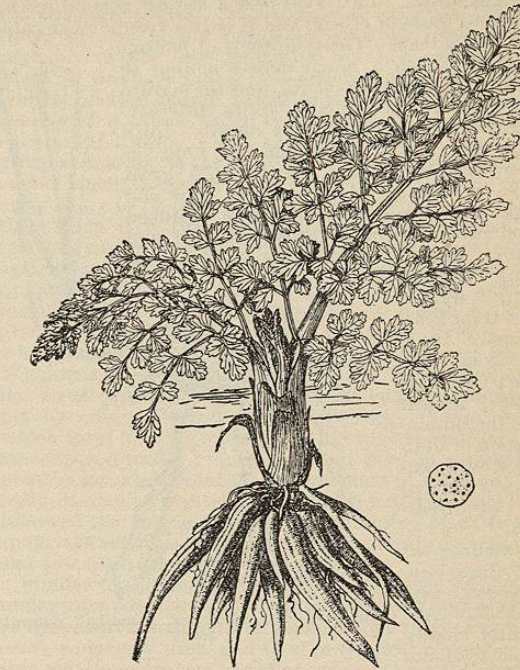


FIG. 3852.—*Enanthe crocata*. Reduced. (After Holmes.)

by the aid of zinc sulphate has been found effective. The further treatment is indicated by the symptoms.



FIG. 3853.—*Sambucus Canadensis*. (One-third natural size.)

*Enanthe Crocata*.—In Europe this species, closely related and rather similar to cicuta, is regarded as taking



first rank among poisonous plants. Like cicuta, it grows in damp soil and produces a fascicle of fleshy roots (see Fig. 3852). Its leaves bear a strong general resemblance to those of celery, and it is free from disagreeable or warning taste. The symptoms of poisoning are only in a minor degree similar to those resulting from cicuta, and the nature of the poison is probably quite different. The symptoms develop very rapidly, death frequently occurring within an hour or two. Dryness of the mouth, with great thirst, vomiting, then dizziness, slow and weak pulse, pale and cold skin, reduced blood pressure, pupils greatly dilated and failing respiration, inducing convulsions, result. Death occurs apparently from heart failure. Judging from these symptoms, it would appear that the administration of digitalis would constitute a rational line of treatment.

*Sambucus* or Elder (fam. *Caprifoliaceae*). (See Fig. 3853.)—Apparently closely related to cicuta

as a poison, is the root of the common elder, and probably of other species of the genus. These roots (or more properly rhizomes) are elongated, cylindrical, crooked, somewhat branched, whitish, and possessed of a rather thick, juicy bark. Commonly, some small shoots can be seen upon them, and these are usually of a bluish-purple color at the place where the young leaves are forming. When bruised, these roots exhale a rather disagreeable odor, and the after-taste is acrid. Coniine is said to have been extracted from some of the elders. The symptoms of poisoning are much like those from cicuta, and promptly fatal results have been recorded.

*Iris* or *Blue Flag* rhizome (fam. *Iridaceae*), growing commonly in swamps or low ground, along with calamus or sweet flag, is liable to be mistaken for the latter. The distinctions between the two, once known, are sufficiently easy for recognition. *Iris* grows in small or only moderately large clumps, while calamus covers large patches, almost to the exclusion of other growth, and usually in wetter situations. Its leaves are longer, narrower, less thick and fleshy, and are greener, lacking the bluish-green tinge of *iris*. The plant is also taller. The rhizome of calamus is long and rather uniform in thickness for a considerable distance. That of *iris* is much thickened at short intervals. Calamus is bitter and somewhat acrid, so that the acridity of *iris*, though greater, is apt to be endured by the heroic calamus chewer, thinking that he has the rhizome of the latter. The properties of *iris* have already been considered (see Fig. 3854). The fresh rhizome is much more irritant and violently emetic and cathartic than the dry drug.

*Veratrum* (fam. *Melanthaceae*).—Growing in the same swamps with *iris*, though usually in more wooded or shaded situations, *veratrum* is often found. Although a mistake is here not easy, such a possibility should not be overlooked, as the rhizome is fleshy and succulent. Beyond referring to our illustration and to our account of the drug (see Fig. 3856) this subject requires no discussion.

*Camas*.—Various western species of the genus *Zygadenus* Mx., of the same family with *Veratrum*, are known by this name, and several of them are recognized poisons, especially *Z. venenosus* Watson, or Death camas, a name which has been applied to a polymorphous species,

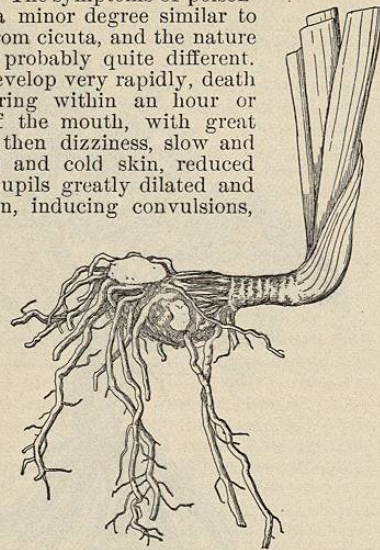


FIG. 3854.—*Iris versicolor*. (One-half natural size.)

or a group of very similar species, according to the varying views of different botanists. In all probability most, if not all, of the species of this genus are poisonous, but only the death camas has produced serious results. The genus is characterized as follows: Plants smooth, perennial, from rhizomes or bulbous bases, the stem bearing linear, somewhat succulent leaves, and terminating in a raceme or panicle of yellowish-white or greenish-white marcescent flowers, the perigone six-parted, its segments gland-bearing near the base. Stamens six, borne at the base of the perigone but free from it, the anthers cordate or reniform. Ovary three-celled with three styles. Pod completely dehiscent and containing narrow, angular seeds. The genus is closely related to *veratrum*. *Z. venenosus* is here figured (see Fig. 3855). It is extremely common and abundant in Montana and other Northwestern grazing regions, and is very destructive to stock. All parts of the plant appear to be poisonous. The bulb, which is especially so, is recognized among the Indians as dangerous to man because of its close resemblance to several edible species. It appears to be bitter at times, quite free from bitterness at other times. It is considered fatal to about twenty per cent. of the sheep poisoned by it. The symptoms are said to be uneasiness followed by incoordination, then muscular paralysis, especially of the posterior limbs. There are dizziness, disordered vision, regurgitation of frothy matter, salivation and weak respiration, with little cerebral disorder. The nature of the poisons is unknown, though the indications are those of one or more glucosides. They are extracted both by alcohol and by water. Potassium permanganate appears to be a very efficient antidote.

Closely related to *Zygadenus*, and by some botanists regarded as pertaining to it, is *Chrosperma muscaloricum* (Walt.) Kuntze (*Melanthium m.* Walt.; *Amianthium m.* Gray) the Fly poison, Crow poison, or Fall poison, a common bulbiferous perennial of sandy soil of the Eastern United States, especially near the coast, and in parts of the Southern Central States. It reaches a height of two to three feet, bears long, linear grass-like leaves, nearly an inch in breadth at the base, and large, much-branched panicles of greenish-white flowers, about a half inch broad. The perigone consists of six distinct parts, without glands, and is marcescent. The stamens are six in number, and borne upon the base of the perigone segments. Ovary and pod are three-celled, the latter splitting only at its upper portion, the styles persistent upon the valves. The ovoid brown seeds are

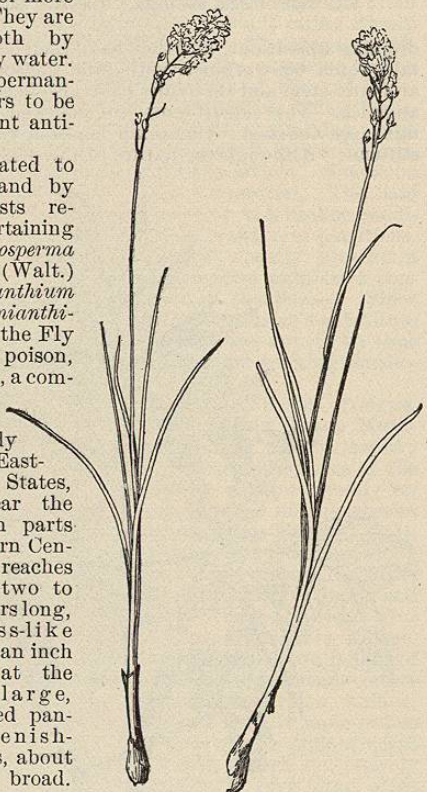


FIG. 3855.—Death Camas. (One-fourth natural size.) (After United States Department of Agriculture.)

few and are apparently more poisonous than any other part of the plant. As its names indicate, this plant, especially the seeds, is in use as an insecticide, and it is poisonous to birds. Little is known about the nature and treatment of the poisoning, but it appears to be in a general way quite closely related to *veratrum*.

More or less closely allied to the above-named bulbs, as well as to colchicum, are those of various species of *Narcissus*, *Hippeastrum*, and *Amaryllis*, which are severely poisonous. A number of species of agave, pertaining to this family (the *Amaryllidaceae*), as well as of *Liliaceae*, yield so-called soap roots, used for their detergent properties on account of their large content of saponin, and for the same reason actively poisonous.

Other similar articles, poisonous if eaten, but not likely to be eaten except through mistake, are podophyllum, sanguinaria, leptandra, arum, and actaea, all elsewhere considered, and all so strongly acrid and disagreeable, or even painful, that no considerable amount could be consumed by a sane individual.

With convallaria, aconite, Solomon's seal, and apocynum the case is somewhat different. *Convallaria* (see *Lily of the Valley*) rhizome is sweetish and not unpleasant except in the after-taste; and it is so highly poisonous that it would not be improbable for a child to eat enough to produce poisonous symptoms. So common an ornamental plant requires no description.

*Aconite*.—The fresh tuber of this highly ornamental garden flower is said not infrequently to have been mistaken for horseradish, incredible as this may seem. Its biting taste is even exceeded by that of the horseradish, so is not apt to excite suspicion, but it even more closely resembles other roots which might grow in the garden beside it. It is to be regarded as an exceptionally dangerous article. Its toxicology has been sufficiently described under the title of the drug.

*Apocynum* or *Dogbane* possesses a long cylindrical rhizome, running horizontally at a short distance below the surface, and fleshy and milky-juiced. It has an amylaceous taste, only slightly acrid, and might be eaten. Its properties have already been discussed.

*Violet*.—The roots of pansies and all other violets, though not likely to be eaten, should be remembered as possessing emetico-cathartic poisonous properties, almost identical with those of ipecac.

*Euphorbia*.—The large, fleshy, and milky-juiced roots of *E. corollata*, *E. ipeacuanha*, and other euphorbias, have been well-known and much used cathartics.

*E. corollata* is known as the Blooming, White, Purslane, or Large-flowered spurge, Apple root or Wild hippo, and is abundant in Eastern and Central North America. It reaches a height of about three feet, is slender, widely branched and smooth, and the flower clusters which terminate its branches are subtended by showy and petallike white involucres, each bract of which bears a green gland at its base. The root is cylindrical, an inch or more in thickness, and one and a half or two feet long, of a very dark or blackish-brown externally when dried, much lighter brown when fresh. It has a thick white bark in cross section and a radiate spongy central cylinder. Its taste is at first sweetish and pleasant, though the after-taste is a little acrid. Its active constituent is a resin. Overdoses are very powerfully emetico-cathartic, the action being much like that of ipecac.

*E. ipeacuanha* is known as the White, Wild, North American, Milk, or Spurge ipecac or Ipecac spurge, and is very abundant in sandy soil along the Atlantic coast. Its very slender, much-branched stems are numerous and prostrate, so as to form a sort of a mat-like growth. The leaves are of most diverse forms on different plants, ranging from narrowly linear to broadly oval. The herbage and inflorescence may be light green or more or less purple. The root itself is vertical, much longer and more slender than that of the last, rather lighter in color, but the woody centre more yellowish. Its properties, as well as its uses, are identical with those of the last.

*Potato*.—Our consideration of poisonous roots may well

close with a few words concerning the poisonous properties of the tuber, and more especially of the sprouts, of the common potato. The potato at all times contains traces of the highly poisonous alkaloid solanine, and probably others, but ordinarily the percentage is too slight to produce perceptible effects. Since the greater portion of this poison exists in the external layer, the peeling of potatoes which contain it in excess, may easily prevent trouble. The substance appears to exist in greatest amount in the rhizome of the potato, upon the end of which the tuber develops. It is therefore much more likely to be present in the young ("unripe") potato than when it is fully developed. Similarly, when the sprouts (young rhizomes) develop upon potatoes in storage, the solanine becomes present in them in considerable quantity. When the sprouts are first forming and of a lurid purple color, the percentage of poison is large, gradually decreasing as they elongate, thicken, and whiten, and especially as they put forth green leaves. Wholesale poisoning has resulted when, in times of scarcity, an attempt has been made to eke out the potato supply by consuming the young sprouts. Potato tubers which form above ground or at its surface, so that they are exposed to the atmosphere and develop a purplish-green color, also contain larger amounts of solanine. Finally, it may be mentioned that very serious results have followed the eating of potatoes containing black fungus spots, the solanine percentage being greatly increased in and just about the spots themselves.

Similar to the potato, in that it is perfectly wholesome under some conditions and highly poisonous under others, is the cassava, manihot, or tapioca root (fam. *Euphorbiaceae*), so largely used as a food in tropical America. Of this root there are two varieties—the one sweet, the other, bitter. The former is in general not poisonous, or not so much so but that thorough cooking renders it wholesome. Nevertheless, a small percentage of hydrocyanic acid is almost always contained in or to be yielded by its bark or the tissues near it. In the bitter variety an important amount of this deadly poison is always found, so that it is not safe to employ it, even for the manufacture of tapioca, without a thorough preliminary maceration and perfect cleansing. There are certain species of yams eaten in the East Indies which also have to be treated by thorough washing in order to remove a poisonous bitter constituent, although not in this case hydrocyanic acid.

The poisonous nature of the roots of belladonna, bryonia, spigelia, caulophyllum, colchicum, squill, and hellebore, will be found discussed under those respective titles, as drugs.

POISONOUS HERBAGE.

In the nature of the case poisonous herbage is far less likely to be eaten by human beings than are fruits, seeds, or roots, and similar organs. Nevertheless, the use of leaves as salads and potherbs, especially in times of scarcity of food, as during famines or in the course of explorations, renders necessary a careful attention to some of them. Furthermore, the frequency of stock poisoning through their use is greater than that resulting from any other portion of the plant; and a reference to the more serious stock-poisoning agents is not out of place in an article of this kind.

As human poisons, tansy, aconite, chelidonium, lobelia, henbane, conium, belladonna, and viola, may be dismissed with the statement that they are scarcely likely to become effective except through accidents attending their use as drugs, which subject will be found discussed under their respective titles in that connection. Tobacco may poison, partly in this way and partly through its use as a popular narcotic, or during its application for parasites infesting plants and domestic animals, under which circumstances it has frequently caused poisoning by its entrance to the system through wounds or other openings in the skin. The symptoms and treatment of tobacco poisoning are elsewhere fully described. Absinthium is a well-known poison, either acute, through overdosage,