CIRCULAR NO. 9.

United States Department of Agriculture,

DIVISION OF BOTANY.

WILD GARLIC.

(*Allium vineale* L.)

The most injurious weed at the present time in the middle Atlantic States is wild garlic (*Allium vineale*). From Pennsylvania to South Carolina and Tennessee, it is known to townspeople as disfiguring lawns, to farmers and millers as a pest in wheat, and to dairymen and their customers as ruining dairy products when eaten by cows in the pastures. In different parts of the region where it grows in this country it is called "wild garlic" and "wild onion," and less frequently "field garlic" and "crow garlic."

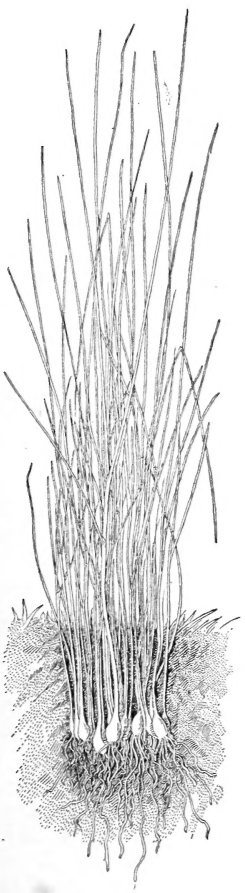

FIG. 1.—Young shoots of wild garlic, as found in pastures and lawns in fall, winter, and spring, growing from clusters of secondary underground bulbs—one-third natural size.

ORIGIN AND INTRODUCTION INTO AMERICA.

Wild garlic is not native in this country, but was introduced at an early date from the Old World. The earliest writings distinguishing it from other species, mention it as growing in fields and vineyards in Germany and France. In France it is called "ail des vignes" (onion of the vineyard), and in Germany "Ackerlauch" (field onion), or "Weinbergslauch" (vineyard onion).

One of the earliest authentic records of its presence in America is contained in Pursh's American Flora, published in 1814, in which it is said to be "in old fields; common." Between 1814 and 1825, several authors, writing on the plants of this country, state that this species was abundant and troublesome from New York to Virginia. Judging from our present knowledge of the comparatively slow distribution of wild garlic, it may be safely assumed that it would require at least fifty years to become as widespread and abundant as the records indicate its having been during the second decade of the present century.

DESCRIPTION.

Wild garlic is a perennial plant, propagating almost exclusively by means of secondary underground bulbs and aerial bulblets. The form which is most abundant in America rarely produces seeds, although in some localities seed-bearing plants are said to be common. In lawns and pastures where the tops are not allowed to develop, wild garlic reproduces itself by the small secondary bulbs or "cloves" developing at the base of the old bulb. These may be found in clusters at a depth of from three to ten inches below the surface of the ground (fig. 1). Soon after the fall rains they send up tufts of blue-green shoots, which become more prominent after the cold weather checks the growth of grass. These shoots remain green, apparently little injured by the cold of winter, and in spring are somewhat more robust, but not much taller than in the fall. The bulbs, which in autumn are but little larger than grains of wheat, grow during the winter to the size of common peas or larger, and in spring new bulbs are formed at their bases.

In grain fields, meadows, and places where the tops are undisturbed, wild garlic propagates by aerial bulblets, like the "sets" of cultivated onions, as well as by the underground secondary bulbs. In cultivated ground usually only one or two shoots appear in a place, as the clusters of secondary bulbs are scattered by the plow and harrow, thus preventing the formation of tufts such as are common in lawns. The flower-bearing stem, put forth in May or early June, is from ten to thirty inches tall. The flowers, varying from greenish-white to reddish-purple, are about one-sixteenth of an inch long in simple umbels (fig. 2, *a*). The seeds, when present, are black, flat, triangular, shriveled, and about one-sixteenth of an inch in length. The flowers are usually followed by the aerial bulblets, forty to one hundred and twenty growing on each plant. Meanwhile, secondary bulbs have been growing beneath the bulb in the ground, and thus the multiplication of the species is abundantly provided for. It has no adaptation for wide dispersion either by natural or artificial means, hence it is still confined to a comparatively small area.

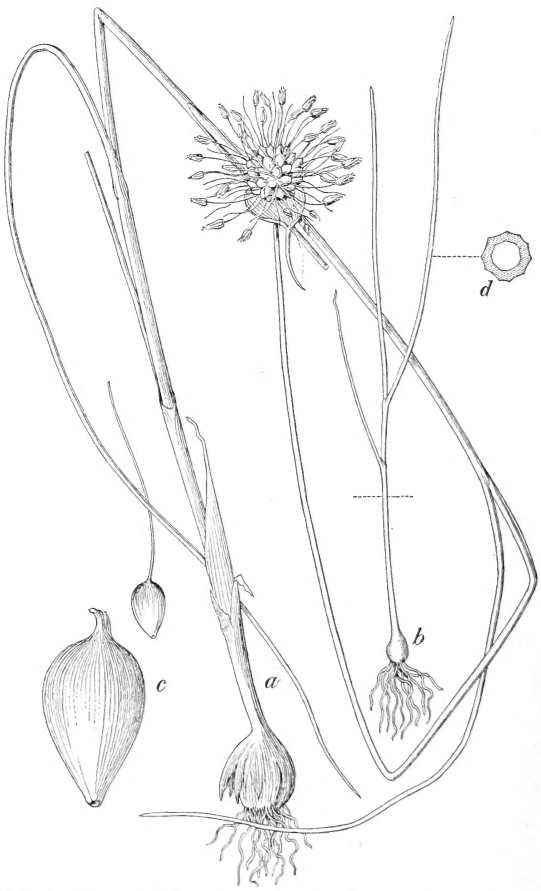

FIG. 2.—Wild garlic: *a*, mature plant bearing young bulblets and flowers closed after blooming, one-fourth natural size; *b*, young shoot, one-half natural size; *d*, transverse section of leaf enlarged five diameters; *c*, aerial bulblet, natural size, with filament, and enlarged three diameters, with filament broken off.

OTHER SPECIES MISTAKEN FOR WILD GARLIC.

There are about fifty native species of onion in the United States, and some of these are frequently mistaken for wild garlic. They all have the same disagreeable odor, but this is usually less strong than in *A. vineale*. The most common of them grow on low, wet land, and die out when the land is cultivated, while the wild garlic thrives well on high land or in dry soil, and often increases under ordinary cultivation. All of the other species east of the Rocky Mountains may be distinguished from wild garlic by having the leaves flat or channeled on one side instead of round (terete), or the flowers more than one-sixth of an inch long, or the flower cluster bent over to one side instead of erect, or the coats of the bulb fibrous instead of membranaceous.

DAMAGE CAUSED BY WILD GARLIC.

Meat.—The flesh of animals which have eaten wild garlic for some time in the pasture is tainted with garlic flavor and rendered unmarketable, unless the animals are fed on a diet free from it for several days before slaughtering.

Dairy products.—The milk of cows eating wild garlic in the pasture has the strong, unwholesome flavor of garlic, and any food containing the garlic-flavored milk is unpalatable. Cream rising from the milk has the flavor apparently intensified and butter made from the cream is worthless. The skimmed milk, clabber, and smearcase, or cottage cheese, are also spoiled. Garlic-flavored milk can not be used for making standard cheese—in fact, there is no way of disposing of it except feeding it to stock and selling it to the few people who do not object to the flavor.

Wheat and flour.—The period of growth of wild garlic coincides almost exactly with that of rye and winter wheat, and the bulblets are mature at the time these grains are harvested. As a large proportion of the bulblets are of about the same size and weight as wheat grains it is impossible to separate them either by sieves or fans unless kept until winter, when the bulblets freeze and dry up. Garlic bulblets ground with wheat impart to the flour their strong flavor, which renders unpalatable bread, cake, pastry, and everything made with the flour. The effect on rye flour is practically the same, but is of less importance since rye flour is but little used in this country. Rye and wheat needed for seeding purposes should be carefully kept free from garlic bulblets. Winter wheat and rye are sown within three months after the preceding crop is harvested and before the bulblets have dried so that it is possible to remove them.

Milling.—When garlic bulblets are ground with wheat or rye they not only spoil the flour, but they cause a further injury by forming a varnish-like coating on the rollers. This interferes with the grinding and makes it necessary to shut down the mill until the

gum is washed off, a process taking from ten to twenty minutes for each pair of rollers. It is even worse on the buhrstones than on the steel rollers, as it gums the burs, imparts its flavor to all the flour, and prevents good grinding until it is removed by dressing the burs.

Lawns.—The disfigurement of lawns is of less importance than the damages already mentioned, but the presence of the garlic is an offense to the eye of anyone who takes pride in an even greensward, and to the nostrils of anyone who delights in the odor of new-mown grass. It is true that the garlic shoots disappear during the summer months where the lawn mower is used, but the first one or two cuttings in the spring produce an intolerable odor, and the garlic reappears as vigorous as ever in the fall.

GEOGRAPHIC DISTRIBUTION IN AMERICA.

The distribution of wild garlic, so far as known at the present time, is indicated on the accompanying map (fig. 3). In Connecticut, Rhode Island, and Massachusetts it propagates slowly, and does

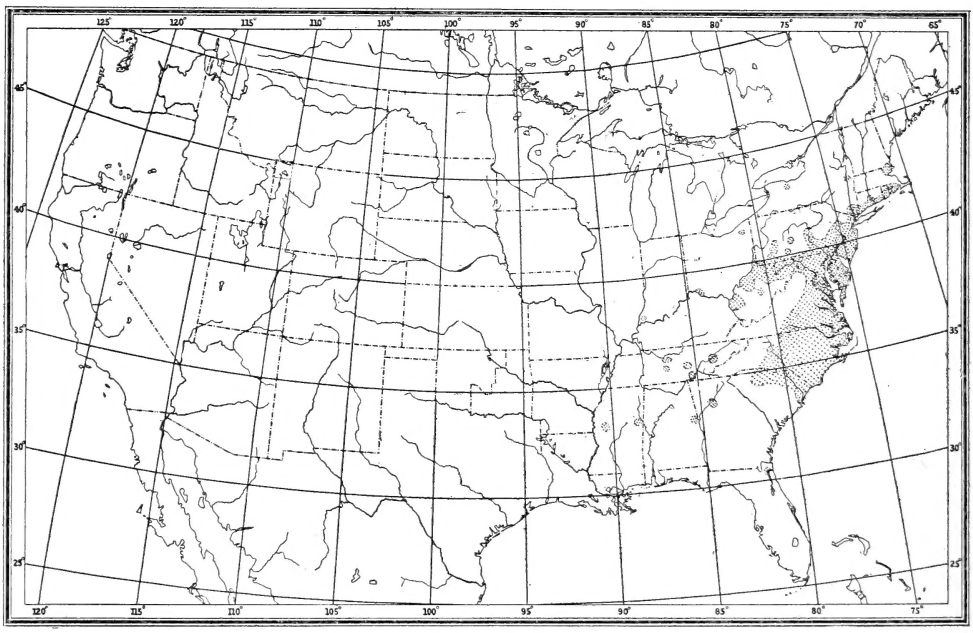

FIG. 3.—Map showing distribution of wild garlic in the United States.

not spread enough to cause much injury, while in the Carolinas it is less abundant and consequently less troublesome than in Maryland and Virginia. Where it has obtained a foothold in Tennessee it increases rapidly and is very troublesome, especially in wheat. It thrives best in regions where there are long periods in autumn and spring with the temperature varying from 35 degrees to 60 degrees F., cool enough to check the growth of grass and other vegetation, yet warm enough to permit the growth of garlic.

METHODS OF DISSEMINATION.

The introduction of wild garlic into new localities is effected chiefly through the transportation of the bulblets. These are sometimes carried with wheat and rye, as already intimated. The underground bulbs are often carried with nursery stock and flower bulbs. They were introduced at New Ross, Ind., and at Garrettsville, Ohio, with bulbs of the grape hyacinth brought from near New York City. The transportation of strawberry plants from infested localities is very likely to result in the introduction of wild garlic. The underground bulbs are often introduced into lawns with turf brought from commons or pastures for sodding the lawns.

METHODS OF ERADICATION.

Many methods for eradicating wild garlic have been tried, most of them failing thus far of complete success, but many of them effective in reducing the quantity of the weed.

A piece of land nearly an acre in extent at Germantown, Pa., was trenched by hand to a depth of about three feet and all of the garlic bulbs found were picked out and destroyed. The land was greatly improved by the process, and the quantity of wild garlic was much reduced, but enough of the bulbs escaped to reseed the land within a few years. On a very small area trenching may be practicable, but it would be easier and more thorough to dig out each tuft of plants separately in the fall and burn the bulbs, together with the earth surrounding them.

Hand pulling has been tried. This is most effective just at the flowering time, since most of the young secondary bulbs will then cling to the base of the old bulb. Some of them are likely to be left, however, even in soft, cultivated land. Moreover, the stalks are somewhat hidden by other vegetation at this time.

Cultivation with hoed crops has been tried, but this alone is ineffective, since the garlic makes its principal growth in the fall and early in the spring. To destroy wild garlic by plowing and cultivation, the land should be plowed late in the fall, the depth of the furrow varying in different soils, so as to leave as many bulbs as possible near the surface to be exposed to alternate freezing and thawing. Any surviving shoots should be destroyed by early spring cultivation, and after thorough fitting, oats or barley may be sown or corn planted. Oats or barley are better than a hoed crop unless the latter can be well cultivated until midsummer. This process repeated for two successive years will destroy nearly all the garlic, and the remaining plants may be more economically destroyed by other methods. In soils that wash badly cowpeas or crimson clover may well be substituted for oats. If these are plowed under with a lib-

eral supply of lime, they will enrich the land and aid considerably in preventing the soil from washing. The following rotation of crops is recommended by Prof. W. F. Massey, in Bulletin No. 175 of the North Carolina Experiment Station:

Plow the land before any top sets are found and sow field peas, two bushels per acre. Cut the peas for hay, chop the land over with a cutaway harrow, and sow in August crimson clover at the rate of 15 pounds per acre, with a thin scattering of winter oats. Cut oats and clover together for hay; put the land in corn and follow with winter oats and red clover. By the time this crop comes off the onions will be about gone.

The crops can doubtless be varied to advantage in different localities, maintaining always the principle of a short rotation of well cultivated crops, alternating with thick smothering crops.

Shaving the soil near the surface as often as the green shoots of garlic appear, is recommended by Mr. R. L. Watts in Bulletin No. 2, Vol. VIII, of the Tennessee Agricultural Experiment Station. This method is expensive, but if thoroughly followed out it is almost certain to prove effective. The work may be done with a tool similar to a broad scraper without a back.

A liberal application of lime in pastures and meadows will improve the growth of grasses and clovers, and thus aid in crowding out garlic. This will be found especially effective in soils deficient in lime, as is the case throughout a large proportion of the garlic-infested area.

Hogs confined on garlic patches in sandy land will root out the bulbs and destroy them, and in some instances good results have been obtained by plowing the land and turning them on. Sheep pastured in garlic-infested fields late in autumn and early in spring will thin out the plants by preventing the development of leaves. In some cases it may be necessary to salt the garlic occasionally to induce the sheep to get a taste sufficient to overcome their natural dislike for it.

After wild garlic has been thinned out by any of the above methods, or where the plants are still confined to isolated patches, complete eradication can be most economically effected by the application of carbolic acid. A single drop of strong carbolic acid on a leaf or shoot will kill the shoot and the bulb from which it grows. Half a teaspoonful applied so as to strike most of the shoots in a bunch as they grow in pastures and lawns will kill the entire bunch. The cheaper quality of commercial carbolic acid, retailing at 30 to 40 cents per gallon, is effective for this purpose. This should be used with little or no dilution. It is easily applied with a common machine oil can or a garden watering pot with a small rose or nozzle. In the grounds about the White House in Washington, D. C., comprising nearly

eight acres, a very abundant stand of wild garlic was nearly all destroyed by a single application of carbolic acid. The cost, including the carbolic acid at $13.50 per barrel, machine oil cans for applying it, and the wages of the boys who did the work, was about $75, or about $9.40 per acre. The grass was practically uninjured, and during the following season covered the spots where the bunches of garlic had been destroyed. A few bunches have come up since, probably from bulbs that had no shoots above the surface at the time the acid was applied. To complete the eradication by this method the ground should be carefully looked over during each of the two succeeding years. This may best be done in winter or early spring, when the plants are not hidden by other vegetation. Stock, being kept up at this season, is not likely to be poisoned, and doors and windows being closed, the offensive odor of the acid will be kept out of houses. Experiments have proved that carbolic acid will kill wild garlic even when the ground is frozen. While this process certainly requires some time, it takes no longer to apply carbolic acid to a garlic plant than to put Paris green on a potato plant, and it requires much less time than would be necessary to dig out the plants or chop them off with a hoe or spade, a practice that has often been tried with indifferent results. Crude sulphuric acid, such as is used in eastern Pennsylvania for destroying Canada thistles, will kill garlic, but this acid is exceedingly corrosive, and therefore can not be handled as easily and as safely as carbolic acid. A water solution of sodium arsenite or of arsenic and salsoda will kill wild garlic, but it would be less repulsive to stock than carbolic acid and more likely to result in cases of poisoning.

METHODS FOR PREVENTING MILK AND DAIRY PRODUCTS FROM BEING TAINTED.

The following information in regard to deodorizing milk and avoiding the injurious effects of garlic upon dairy products has been kindly furnished by Maj. H. E. Alvord, chief of the Dairy Division of this Department:

Many efforts have been made to avoid the tainting of dairy products by wild garlic or to remove or disguise the odor. In some localities small pieces of saltpeter (nitrate of potassium) are placed in the pail during milking. While saltpeter does not produce any immediate harmful effects when thus diluted and taken in small quantities, its continued use is very likely to result in injury.

Simple aeration by pouring the milk from pail to pail while it is still warm from the cow improves it to some extent, and in large dairies different styles of aerating machines are used with good results. Pasteurizing milk in open vessels at a temperature of about 155 degrees F. will remove the garlic flavor to a considerable extent, but experiments have shown that when heat alone is used it is necessary to boil the milk for some time to get rid of the odor. Experiments conducted

in a Virginia creamery seem to prove that a process combining aeration and pasteurization is the most successful. This treatment has the advantage of using no chemicals, and the operation is simple. Another method, recently described in a prominent dairy paper, consists in washing the cream with double its bulk of water, in which a little saltpeter has been dissolved, raising the temperature sufficiently to pasteurize the cream, and then immediately passing it through a centrifugal separator. By this process the cream loses much of its weed flavor, but as it has been pasteurized it must have a ferment or "starter" added to it to insure proper ripening.

It is difficult to remove all of the garlic flavor from milk, and dairymen generally agree that to have the milk entirely free from it the cows must be kept away from where the weed is abundant. Not only this, but the stables and dairy room where milk is to stand must be kept free from garlic odor, which, like many other odors, is readily absorbed by milk. Garlic is more penetrating and persistent (if these terms are applicable in this connection) than most of the vegetable flavors which are given to milk. In many cases these flavors or odors are acquired by the milk after it is drawn from the cow, being taken up from the breath and exterior of the body of the cow and the air of the milking place. Garlic is one of the few exceptions in which the taint is communicated through the structure of the animal itself, but when the milk is first drawn it has this flavor in a very much less degree than is generally appreciated. By far the greater part of the trouble follows the milking, and this can be prevented to a considerable extent by care and judicious management of the cows. If cows, pasturing where there is considerable garlic, are shifted to another field where there is none and where good water is obtainable, at least three hours before milking time, so that they come to the milking place with breath and bodies free from taint, the trouble will be reduced to a minimum. If a garlic-free field is not available, the animals may be brought to a stable yard and there fed lightly with hay, a soiling crop, or any long forage, and allowed to stand an hour or two before being put into the milking place.

Keeping milch cows up in spring and fall and feeding them on hay, or cutting the garlic plants by hand, or scattering salt upon them and turning sheep on to the pasture well in advance of the cows, are among the best ways of avoiding the injurious effects of wild garlic upon dairy products, without entirely destroying the plants. But these are only makeshifts. Complete eradication of the garlic plants is the only satisfactory method. This is practicable within the limits of an ordinary farm, and although involving much labor, it is probably cheapest in the end.

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Approved:
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