Wild Garlic Control in Illinois

MAR 18 1930

BY J. J. PIEPER AND L. E. ROSE

UNIVERSITY OF ILLINOIS

Plow in the Spring!

University of Illinois
College of Agriculture and Agricultural Experiment Station
Circular 383
Cooperation of All Interests Needed to Solve Wild Garlic Problem

1. Producers of clean wheat should be rewarded by receiving the full market price for clean wheat, while the prices paid for garlicky wheat should reflect the actual difference in market value.

2. The market should distinguish between garlic-tainted animal products and those free from garlic flavor.

3. Farm advisers can help by encouraging the adoption of organized, systematic plans for the eradication of wild garlic in counties where the weed is a problem. A project for this purpose is outlined by the Extension Service of the College of Agriculture.

4. The Experiment Station will continue its study of control methods and will also identify suspicious specimens which farmers may send in. The identifying of the weed is an important step in eradicating new infestations before they become general.

5. Farmers should adopt a workable plan of control and eradication based upon the best information available, and carry such a plan thru to completion.

Urbana, Illinois March, 1930
Wild Garlic Control in Illinois

By J. J. Pieper and L. F. Rickey

The presence of wild garlic (*Allium vineale* L.) in the wheat areas of the southern half of Illinois is resulting in serious losses yearly to the farmers of that region. Introduced into the wheat-growing region of the southwestern part of the state about fifty years ago, this weed has spread until hardly a county in the southern third of the state where wheat is grown is free from it. Recent surveys show that it has spread during the last ten years to the central and west-central counties, where its distribution seems to be confined at present to the areas of heavy winter-wheat production, especially along the Illinois and Mississippi rivers.

Millers in the early infested areas in the southwestern part of Illinois report substantial increases in the past ten years in the amount of garlicky wheat received. The greatest increase in the southern third of the state has been in the river counties and in the regions of largest wheat acreage.

It is significant to note that wild garlic is spreading farther north, and that it is becoming more serious in the infested areas.

Garlicky Wheat Subject to Heavy Discounts

The greatest loss from wild garlic has come to the winter wheat growers. More than 10 percent of the wheat inspected at East St. Louis is classified as garlicky (Table 1), but the actual production of garlicky wheat in the infested area must be higher than this since (1) the St. Louis market draws considerable wheat from non-infested areas; (2) some of the garlicky wheat is freed from garlic by drying and cleaning before being put on the central market; and (3) so far as possible garlicky wheat is kept off the central markets because of the heavy discounts and is utilized locally as feed.

At the St. Louis market garlicky wheat during the past three years (1927-1929) has been subject to the following discounts from prices for wheat of the same grade: light garlicky, 2 7/8 cents; medium garlicky, 6 1/8 cents; and heavy garlicky, 8 3/4 cents per bushel. The discounts during the season of heavy receipts in July and August tend to be larger than at other times during the year. A conservative estimate of annual losses incurred by wild garlic from the infested area of Illinois on the central markets is $150,000. Since only about half the wheat grown in these areas is shipped out, the rest being marketed locally, the total annual loss must be well above $300,000.

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TABLE 1.—PERCENTAGE OF WHEAT CLASSED AS GARLICKY AT EAST ST. LOUIS DURING THE YEARS 1925-1929*  

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<thead>
<tr>
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<th>1925</th>
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<td>13.24</td>
<td>7.71</td>
<td>11.85</td>
<td>11.08</td>
</tr>
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*Data furnished by C. B. Barron, Grain Supervisor, Bureau of Agricultural Economics, U. S. Department of Agriculture.  "Summaries are calculated from the total number of cars of garlicky and garlic-free wheat for the period involved, and are not the averages of the monthly or yearly percentages.

Coupled with this very direct loss is the reduced yield of grain on infested land, the cost of storing, drying, and cleaning infested grain, the cost of control measures, and the total loss of badly infested land for grain crops in general. In some districts wheat has been forced out of the cropping system by the wild garlic problem.

**Wild Garlic Often Confused With Similar Plants**

Many farmers make no distinction between wild garlic (*Allium vineale* L.), wild onion (*Allium canadense* L.), and other bulb-forming

![FIG. 1.—WHEAT MIXED WITH WILD GARLIC AND WILD ONION BULBLETS](image_url)

Similar in size to wheat grains, these bulblets are difficult to remove from the wheat. On the market "garlicky wheat" is subject to heavy discounts.
plants such as the star-of-Bethlehem (*Ornithogalum umbellatum* L.), all of which are to be found in the garlic-infested area. Writers on the subject have added to the confusion by failing to distinguish between the wild onion and the wild garlic. This confusion would not be so serious if it were not for the fact that wild garlic because of its peculiar means of propagation is the most difficult of all these weeds to eradicate and hence by far the most serious pest.

![Map of the United States showing the distribution of wild garlic.](image)

**Fig. 2.—Distribution of Wild Garlic in the United States**

Introduced into the United States from Europe about two centuries ago, wild garlic (*Allium vineale* L.) has spread west thru the winter-wheat belt into the Mississippi valley. By the middle of the eighteenth century it had become a serious menace to wheat growing in the eastern part of the United States. (Map reproduced from Farmers Bulletin 610, U. S. Department of Agriculture.)

There are many species of the genus to which the wild onion and wild garlic belong. Some species form underground bulblets as does wild garlic, and because of this fact are very difficult to eradicate. Other species, such as the wild onion, since they do not form underground bulblets are less difficult to control. Wild garlic is sometimes referred to as field garlic, meadow garlic, crow garlic, garlic, wild onion, and onion.

Wild garlic grows to a height of 1 to 3½ feet, wild onion to a height of 1 to 2 feet. Both plants come to maturity at wheat harvest time, and thus clusters of small aerial bulblets (Figs. 3 and 4) are harvested with the grain. It is these bulblets, which are similar in size to wheat kernels (Fig. 1), that cause the wheat under certain conditions to be classified on the market as garlicky.
Occasionally these two species produce true seeds in the flower cluster which arises among the aerial bulblets. The garlic plant in addition develops at its base one soft-shelled bulb and a half dozen, more or less, hard-shelled bulblets (Fig. 5). The soft-shelled bulb is inclosed in a smooth, white, delicate covering and the hard-shelled
bulblets in a thick, hard, brown shell. The wild onion plant produces no such underground bulblets (Fig. 6), and the covering of the bulb is rough and net-like.

The leaves of wild garlic are hollow, slender, and circular in cross-section, and are borne along the stem up to and past the middle. The leaves of wild onion are flat in cross-section and are borne at the base of the plant.
Control studies have been confined largely to the one species of wild garlic and the one species of wild onion mentioned above. It is believed, however, that control measures effective against one species of wild garlic will be equally effective against all the others. Fortu-

![Old Wild Garlic Plants Showing Bulbs at Base](image)

One soft-shelled bulb and a half dozen, more or less, hard-shelled bulblets are to be found at the base of every old wild garlic plant. By their delayed germination the hard-shelled bulblets make the wild garlic plant difficult to eradicate.

nately the methods suggested for controlling wild garlic will also eradicate the wild onion.

There is evidence that the wild onion (*Allium canadense* L.) is a native of the United States and that it has been associated with wild garlic during most if not the entire period since the introduction of wild garlic into this country.
Growth Habits on Which Eradication Is Based

While life-history studies of the wild garlic plant are not yet completed, enough is known of the various means by which the plant reproduces itself to make general recommendations for control and eradication reliable.

At wheat-sowing time the wild garlic plant is to be found in a variety of stages. Dead remnants of old plants of the previous season will be found. The aerial bulblets from such plants will have fallen

Fig. 6.—Underground Bulbs of the Wild Onion Plant

When mature, the covering of the underground bulb is rough and netted, while the soft-shelled bulb of the wild garlic plant is inclosed in a smooth, white, delicate membrane. The wild onion has no underground bulblets, as does wild garlic, but propagates exclusively by means of the aerial bulblets borne at the tops of the stems.
FIG. 7.—A CLUMP OF WILD GARLIC AS IT APPEARS IN THE FALL

The overlapping of generations makes the wild garlic plant difficult to eradicate. Old dead plants, large plants with soft-shelled bulbs, small sturdy plants that have developed from the hard-shelled bulblets, delicate plants from the aerial bulblets, and ungerminated hard-shelled bulblets are all to be found in such a clump as the above.

to the ground in most cases and will have started germination. Plants with soft-shelled bulbs, which began growth early in the spring, may be a foot or so high. These plants can usually be distinguished from the plants growing from the bulblets by their larger growth. Some of the hard-shelled bulblets produced early in the season will
have germinated and the plants may be found in various sizes because of having begun growth at different times. Some hard-shelled bulblets will be found in the dormant stage, and these may not germinate for several years.

Nothing is known of the growing habits of the few seeds which may have been produced in the flowering head except that very few if any of them germinate.

The wild garlic plantlets grow during the winter months when the ground is not frozen. Some time in late winter or early spring more hard bulblets are formed, even before all the hard bulblets of the previous year have germinated. This overlapping of generations is the condition which makes wild garlic so difficult to eradicate (Fig. 7). Undisturbed, the plant from the soft-shelled bulb comes to maturity at grain harvest time. Whether most of the plants resulting from the hard-shelled bulblets and the aerial bulblets of the year previous come to maturity at the same time or continue growth until the next year still remains to be determined. The more important thing to know, however, is the time of formation of the various bulblets, so that cultivation practices may be adopted to prevent reproduction. It seems safe to say that aerial bulblets are produced at wheat harvest time and underground bulblets in late winter or early spring.

Chemical Control Is Expensive

The demand from the beginning has been for a cheap chemical which could be applied easily and effectively to the garlic plant. While many chemicals have been tried, none have met with complete success.

As early as 1897 the U. S. Department of Agriculture experimented with the use of fertilizers and chemicals. Among the chemicals used were crude carabolic acid, fuel oil, sodium arsenite, and common salt. All these chemicals killed top growth, but that will not eradicate the plant since new growth will spring up from the hard-shelled bulblets.

In 1914 the Purdue Station conducted extensive experiments with orchard heating oil and several years later the Ohio Station used fuel oil. Kerosene and waste oils, including crank case oil, have also been tried. With all of these oil sprays, three applications for three successive years, before "heads" are formed, are necessary for eradication. The high cost of using the most successful of these oils has kept them from being widely adopted.

Recently the Illinois Station has been conducting extensive experiments with the use of chlorates in the eradication of wild garlic and other noxious weeds. While it is still too early to predict with accuracy the success of these new chemicals in the eradication of wild garlic, they do not appear as effective with this plant when used in small amounts as with some of the other weeds.
The use of chemicals on entire fields is impractical because of its cost, but may be employed to advantage in eradicating small patches in cultivated fields and pastures or in cleaning up fence rows or other waste places.

If one wishes to try chlorates for small patches, he should use about 2 pounds of sodium or calcium chlorate per square rod. These chemicals can be applied either in solution or as dust. Fall application has given best results in one year's test. More definite information about their use may be had by writing the Experiment Station. (*Special care is always needed with chlorates because of fire hazard.*)

If oils are used, they should be applied with a sprayer or sprinkling can at the rate of 1/2 gallon of oil per square rod. All the leaves of the plant should be well covered, but the soil should not be saturated, as this prevents all plant growth. The oil should be applied before the heads of the plants form, which is between April 15 and May 1. Waste oils should be strained to remove impurities and heavy oils should be diluted with kerosene to facilitate spraying. The sprayer should be cleaned at once after using, as the oil destroys rubber.

**Cultural Methods Most Effective**

Eradication of the wild garlic plant from cultivated fields by means of simple cultural practices continues to be the most practical method of controlling this weed. No special equipment other than found on the average farm is necessary, no extra outlay of money is required, no skilled labor is needed, and finally, the method, when carefully followed, is highly successful.

The cultural method takes into account the life history of the wild garlic plant, particularly its reproduction periods. Two practices are essential: plowing the land in the fall and plowing again in the spring.

These practices must be followed out for at least three years on every field in order that the plants growing from the hard-shelled bulblets after delayed germination may be killed.

**Plow in the Fall**

The object of fall plowing is to kill as many wild garlic plants as possible before the period of reproduction starts in the spring. Fall plowing will kill the large plants that have developed from the soft-shelled bulbs, the delicate plants arising from the aerial bulblets, and the small but vigorous plants growing from the hard-shelled bulblets.

The garlic plant which, thru top growth, has exhausted the bulk of its stored plant food is most easily killed. The larger the garlic plants at the time of plowing, the more successful, therefore, will be the operation. Then, too, the delay in plowing will allow more of the hard-shelled bulblets to germinate, and some of the ungerminated bulblets
that are turned up late in the fall are likely to be killed by freezing weather. For these reasons plowing should be delayed until November 1 or later.

**Plow in the Spring**

Plowing in the spring has the same object in view as plowing in the fall, but in addition it has the more important object of preventing underground bulblets from being produced. Under no conditions can disking be substituted for plowing.

The time of this plowing is also very important. It should be done as late in the season as possible and still take place before new bulblets are produced. April 1 is suggested as the latest date for spring plowing.

It was believed by earlier workers that the growing of oats aided materially in eradicating wild garlic, but it is now believed that the practice of plowing the land in the spring in preparation for the oats was far more responsible for the effectiveness of the measure than was the particular kind of crop that followed.

The success of the cultivation plan for eradication depends upon the wild garlic plants being completely covered in the plowing operations.

Pulling or digging wild garlic plants has not been successful, as the hard-shelled bulblets remain in the soil to germinate and grow.

**Advantage of Cultivated Crop**

The planting of infested fields to a cultivated crop is a further aid in eradicating wild garlic. By this means any stray garlic plants that may have germinated after the ground was plowed, or which may have been missed in previous plowings, will be killed before they have a chance to reproduce. The cultivated crop, furthermore, is not likely to become contaminated with the garlic bulblets and act as a new source of infestation. It is important that no plants be allowed to reproduce since these will be sources of new infestations.

Cultivation also helps to prevent the growth of new garlic plants.

**Avoid Reinfestation of Clean Soil**

After a program of control and eradication has been started, reinfestation of the farm must be prevented. The following precautions should be carefully adhered to:

1. Sow only garlic-free seed wheat.
2. Inspect the threshing machine and other implements before using them on a clean field.
3. During cultivation use care to avoid scattering plants from one place to another on the farm.
4. Avoid using contaminated hay, straw, or barnyard manure on or near clean soil.

5. Plan the eradication program for the different fields so that clean fields will not become contaminated from foul land by soil erosion and washing.

6. Clean up fence rows and waste places by use of chemicals.

Follow a Definite Plan

A farmer who undertakes to clear his fields and pastures of the wild garlic plant will need to make a systematic plan that will measure up to his particular needs, and then carefully adhere to the plan. A small field on high ground that will not become contaminated again by washing is a good place to start operations. There the success of the method may be proved or corrected before a larger area is undertaken. In this way one will become better acquainted with the most effective methods and will be prepared to attack a larger field with more chances of success. With the wild garlic once eliminated, any cropping system may be adopted which seems most profitable and which at the same time will keep the land free from reinfection. A rotation should be adopted in which there is opportunity to do some fall plowing, and wheat should not be allowed to follow wheat.

Since most farmers will be unable to put into operation the eradication program on their entire farm at one time, it is advisable to select certain fields to start on and let the program progress over the entire farm as facilities permit. Meanwhile the other fields may be farmed according to one of two plans: (1) A type of agriculture may be followed in which the presence of wild garlic does least damage to the agricultural products. Such a system may include horticultural crops, or cultivated legumes such as soybeans or cowpeas and cultivated grain crops such as corn and sorghum. (2) A cropping system may be adopted which interferes with or in a large measure prevents the production of aerial and underground bulblets. In such a rotation spring grains may be included but not winter grains. Control rather than complete eradication would be the aim of this plan.

Delay Marketing Garlicky Wheat

Garlicky wheat is defined in the federal grain standards as follows: "Garlicky wheat shall be all wheat which has an unmistakable odor of garlic or wild onions, or which contains garlic or wild onion bulblets in a quantity equal to one or more bulblets in 1,000 grams of wheat. . . . ‘Light garlicky’ is hereby defined to mean garlic or wild onion bulblets in an amount equal to 1 to 3 bulblets, inclusive, in 1,000 grams; ‘Medium garlicky’ is hereby defined to mean garlic or wild onion bulblets in an amount equal to 4 to 15 bulblets, inclusive, in 1,000 grams; and ‘Heavy garlicky’ is hereby defined to mean garlic or wild onion bulblets in an amount equal to more than 15 bulblets in 1,000 grams.” (One thousand grams equals about 2.2 pounds.)
The percentage of garlicky wheat arriving on the market is lowest immediately following harvest (Table 1). This probably is the result of three circumstances: shipment of new garlicky wheat to the central markets is discouraged, discounts on garlicky wheat are greatest at harvest time, and the quality of garlicky wheat is improved in storage by drying. The greatest bulk of garlicky wheat comes to market during July and August. This is due to the fact that nearly half (48 percent) of the wheat from this area is marketed during the first two months following harvest. Because of the large amounts of new garlicky wheat on the market at this time, such grain should be stored on the farm until it can be marketed to better advantage.

Many, tho not all, of the garlic bulblets can be removed from the grain by storing until completely dry, and then cleaning with a reliable fanning mill. Altho a period of six months is required to dry out the garlic bulblets, yet the discount saved well repays for the time and labor involved. Just the storing and drying of the garlic bulblets without making separation will improve the quality of the grain.

The percentage variation from year to year of garlicky wheat arriving on the market is probably due to climatic factors which may modify the total production of wheat in different sections or which may also have some effect on the amount of garlic.

The discounts on heavy garlicky wheat are so large that it will usually pay to utilize such grain by feeding it on the farm.

Wild Garlic Also Troublesome to Dairy and Stockman

The livestock industry, especially the dairy branch, is also affected by the wild garlic plant. Not only is milk tainted when cows graze in infested fields, but it is claimed also that eggs and meat from animals grazing in such fields will carry a garlic flavor. Besides suffering a discount on tainted products, the farmer interested in livestock or dairying must devote time and labor in attempting to prevent or reduce the garlic flavor. Also, the quality and quantity of forage are reduced on infested grazing lands, and in the most severe cases the land is lost entirely for grazing purposes.

Until such time as the wild garlic plants can be eradicated, garlic-tainted milk may be avoided best by judiciously pasturing infested areas. If milk cows are removed from the pasture 4 hours before milking, the garlic flavor and odor will not be very noticeable in the milk. Four hours after milking, the last traces of garlic disappear almost entirely. It is reported that in some parts of the country wild garlic is put up with the hay, and when fed results in garlicky cream all months of the year. This is a serious handicap when marketing the butterfat.

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Plow in the Fall!