European Bindweed

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European Bindweed

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AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

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BOTANY SECTION

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We have in Iowa two troublesome species of morning glory. One is native and is known as the wild morning glory or bindweed (*Convolvulus sepium* L.). The other, an introduced European species, is known by many common names, the principal of which are European bindweed, field bindweed, small morning glory and creeping Jennie (*Convolvulus arvensis* L.). This circular will discuss the European morning glory, which is becoming a serious pest in many states and especially in those west of the Mississippi River. It is reported as the worst perennial weed in Colorado, California and Kansas, and a serious pest in South Dakota, Idaho, Utah and Washington. It is generally distributed in Iowa but is particularly abundant and troublesome in the northwestern part. The European bindweed reduces crop yields, increases the labor costs, menaces the adjoining clean land and finally reduces land values. Every farmer should learn to recognize the European bindweed and eradicate it before it becomes established.

**Weeds Cost Millions Annually**

It has been estimated that the weeds of Iowa cause an annual loss of many millions of dollars. The European bindweed’s share of this loss is considerable and apparently is becoming much greater each year. Many crops are seriously damaged by this weed, especially those that cannot be intensively cultivated, such as small grains and hay crops.

**Description of European Bindweed**

**STEMS, LEAVES AND FLOWERS**

The European bindweed has a thin, weak, trailing or prostrate stem which may attain a length of more than 10 feet in a single season. These procumbent stems twine about other plants with which they come in contact and either smother or pull them down. The leaves are usually dark green in color, arrow-shaped, and have prominent lobes at the base. The flowers are funnel-shaped, less than one inch in diameter, white or very slightly
Fig. 1. European bindweed. The funnel shaped flowers are white in color and usually less than an inch across. The leaves are arrow-shaped with prominent lobes at the base.

tinged with pink and borne on rather long stalks. The plant begins blossoming about June 1 and continues into August. The flowers open in the morning and usually close in the late afternoon.
SEED

Three to four seeds are borne in two-celled capsules. Each seed is large, dark brown in color, oval, one side is convex and the other possesses a broad ridge. Usually the seed is about one sixteenth of an inch long and the surface considerably roughened. A depression at one extremity of the seed represents the place of attachment in the capsule. The embryo is large and surrounded by the fleshy endosperm. The testa, or seed coat, consists of an outer row of short or elongated cells with thick walls and brownish contents. This layer is followed by a row of single cells with colorless walls. Following are 8 to 12 rows of simple parenchyma cells. The endosperm is thick walled with colorless cells. The walls are partly mucilaginous. The seed characters suggest that the seed may remain dormant in the ground for some time. It is claimed that the seed is poisonous to livestock.

ROOT SYSTEM

Like other perennial weeds, the European bindweed has an extensive root system which is mainly a network of underground rootstocks. The horizontal spread of the rootstocks is from two to four feet before they bend downward. In clay soils the development may be greater than in sand or loam. The depth of penetration depends upon the water table. In Colorado the roots have been traced to a depth of 16 feet. In Sweden the main root has been known to reach a depth of 10 feet. Often the roots are divided. They are yellowish to green in color and are very thickly set with adventitious buds. When sections of the root are cut off, as is done when the ground is plowed, pieces of the rootstocks are scattered about and new plants develop from them.

The rootstocks serve as storage organs for this plant. Unless several years old, they are light yellow or nearly white, very tender and exceedingly abundant. The older roots are brown, somewhat woody and tough. The horizontal roots are not nearly so large as the vertical growing parts of the root system. The young root is essentially an absorbing and storage organ. During the spring the developing plant is free to draw upon the food stored in the roots. If the leaves are allowed to develop, an additional amount of food will be formed and used either by the root or some other plant organ. Any system of eradication must consider these points.

How to Distinguish the Two Common Bindweeds

The European bindweed may be distinguished from our wild morning glory by the following characteristics:
EUROPEAN BINDWEEDE WILD MORNING GLORY

**Flowers**

White to pink, bell-shaped, one-half to one inch in diameter.

Flower-stalks round, longer than the flower, one to four seeds.

No bracts at base of the calyx.

White to rose, bell-shaped, one or two inches in diameter.

Flower-stalks four-angled, about the length of the flower.

Bracts large and enclosing the base of the calyx.

**Leaves**

Ovate or oblong in outline, one or two inches long, the basal lobes usually pointed.

Triangular in outline, three to five inches long, the basal lobes spreading.

**Capsules**

Egg-shaped, long-beaked, three to four seeded.

Globular, much larger, two to four seeded.

**Seeds**

One eighth by three sixteenths inch, pear shaped, surface roughened.

One fourth by three sixteenths inch, oval-shaped, smoother.

**Methods of Eradicating the European Bindweed**

Because of the various conditions prevailing in different parts of the country and the wide range of cropping practices, no one method of eradicating the European bindweed can be recommended over another.

**Modification of Cultural Practices**

The only safe way to deal with any weed is to begin eradication measures as soon as the weed is discovered. The method used must be one that disturbs cultural and cropping practices least and, at the same time, completely kills the pest.

**USE CLEAN SEED**

Prevention is always better than cure. To avoid introducing the European bindweed, only pure seed should be used. The bindweed may be common in the seed of red and sweet clover, oats, barley, wheat and flax. Seed oats is said to be very commonly infested in some sections. All seed should be thoroughly cleaned with a good fanning mill before planting. If in doubt as to the presence of bindweed seed in clover or small grain seed, one should have it tested by a seed analyst. Threshing machines and commercial feeds frequently disseminate the seed. Screenings may contain great quantities of European bindweed seed. Too much emphasis cannot be placed on the use of clean seed. In the same way, other sources of foul seed should be considered undesirable and carefully avoided. When manure contains seed of this weed, it should be allowed to heat or decompose so as to destroy the vitality of the seeds.

Just how long the seed of the perennial bindweed will remain alive in the ground is not known. Because of its rather hard cov
Fig. 2. Root system of European bindweed or creeping jennie. The roots or root stocks penetrate deeply. At various depths the roots grow out horizontally, then vertically. Where the weed has become established, the rather finely divided roots form a dense network.

... and the long compact cells directly underneath, the seed is able to remain dormant for a considerable period. They are known to be able to lie deep in the ground from one year to another and still grow when brought near the surface. Iowa farmers should be on the watch to keep this weed out of places where it is not now present. Where a few plants have started because of the use of foul seed, or from other sources, time, labor and expense will be saved if the smaller patches are dug up, and the underground rootstocks collected, dried and burned.

FALLOWING

The clean culture method of eradicating the bindweed depends upon depleting the food reserves in the root system. The cultivation must be sufficiently frequent so that all sprouts will be killed.

As the weed is spread extensively by rootstocks, attention should be focused upon the subterranean parts. The fallow system permits the weed first to come into blossom. This exhausts the plant of much of the reserve food material of the roots. For the balance of the growing season it is necessary to prevent all top growth. All infested areas should be plowed, care being taken to cover all the leaves. All leaves must be destroyed and
Fig. 3. The wild morning glory, a closely related species, is often taken for the European bindweed. The wild morning glory has a larger flower; the leaves are larger and more pointed. It is more of a climber and does not hug the ground so tightly.

at no time must they be given opportunity to develop. After plowing the ground should be thoroly cultivated with a surface
cutlivator every five days throughout the growing season. The following spring the ground should be thoroughly worked, until time for seeding, and planted to some crop that requires clean cultivation over most of the growing season. Such crops are corn, potatoes and soybeans. This method requires much labor and each operation must be done promptly and thoroughly, otherwise little good is accomplished.

SMOTHER CROPS

Sudan grass, rape, sorghums, soybeans and rye, sown thickly, are considered in some states as excellent smothering crops. They prevent the growth of weeds by occupying the space. The infested area should be worked thoroughly early in the season, then planted thickly to sudan grass or sorghum. As soon as the crop is removed, the ground should be disked and immediately thickly planted to rape or rye. The rape or rye is plowed under the following spring and is followed with some cultivated crop, or the ground is fallowed. It is not believed than an annual smother crop is nearly so effective as a perennial crop.

Alfalfa is probably the best smother crop for Iowa where it can be successfully grown. It is necessary, however, to have weakened the bindweed considerably before seeding to alfalfa. This can be done by fallowing after a small grain crop and planting alfalfa in the spring. Its quick growth and the frequent cuttings serve to keep down the top growth of the weeds. If alfalfa is grown for several years and then is followed with a cultivated crop, the land usually is free from weeds.

PASTURING WITH HOGS AND SHEEP

Pasturing with hogs and sheep, if intensive, tends to weaken the plants. Hogs root up the root stalks, which are sweet and much relished. Plowing expedites the work of the hogs. This method is advisable only where small patches are involved. Sheep eat the leaves and stems, which tends to starve the roots. Lambs pastured in corn in the fall feed generously on the bindweed when it is present.

CROP ROTATION

Much can be accomplished in the eradication of the bindweed by crop rotation. Any rotation system that combines close summer and fall pasturing with crops that require the longest cultivation, such as corn, is the most damaging to the bindweed. Lambs pastured in the corn fields in the late summer and fall are very destructive to the above-ground parts of the bindweed. Where small grain is not seeded to clover, the land should be plowed as early in August as possible. The patches where the bindweed comes up again in the fall should be stirred with a surface cultivator.
Chemical Weed Killers

The use of chemicals in killing weeds has been studied for a long time without anyone finding a cheap, non-poisonous and efficient substance. Some use has been made of common salt, sodium arsenite, carbon disulfide and sodium chlorate.

SALT

Where the land is not cropped, the application of ordinary salt is an effective measure. Its use is applicable, however, only on small patches of weeds in fence rows or other places not readily accessible to cultivation. It cannot be used about trees because its action is destructive to trees also. About 250 pounds per square rod are required. One application is usually quite effective, altho a few plants may need to be treated the second time. The action of salt is simply the formation of a solution so strong that it draws all the water out of the plant.

CARBON DISULFIDE

This chemical is a heavy liquid, evaporating readily when exposed to the air. The gas is heavier than air and very inflammable. Carbon disulfide has also been found useful to eradicate small patches of European bindweed. Holes 18 inches deep are bored 12 inches apart in the soil in rows spaced 20 inches apart. Two to five ounces of carbon disulfide are poured into each hole. This soon percolates into the soil and destroys the underground rootstocks without affecting the soil as far as the next crop is concerned. Carbon disulfide is expensive unless bought in large quantities. It retails at about two dollars per gallon. The high cost and large amount of labor involved makes this method quite impractical.

ARSENICAL SPRAYS

Arsenical sprays are extensively used for killing weeds on such places as railroad ballasts, highways, tennis courts and paths. In certain parts of California, good results in killing European bindweed have been obtained by applying four pounds arsenic trioxide dissolved in 100 gallons of water. This amount is sprayed on one acre. Late applications were found to be the most effective. Other states have been less successful with the arsenical sprays and have found much injury to the soil. Arsenic is, of course, highly poisonous to livestock and is not recommended for use as a herbicide in this state.

SODIUM CHLORATE

Experiments made in many different states indicate that the best chemical for eradicating the European bindweed is sodium chlorate. Generally when a 12½ percent solution made by dis-
solving 1 pound in 1 gallon of water and applied at the rate of 1 gallon per square rod two times during the growing season, 95 percent of the bindweed are killed. The first application is made when the plants are in full bloom. The second application should be made when the new sprouts appear. Sometimes it is not necessary to cover the whole patch the second time. Again, it may be necessary to treat some plants the third time. On a small patch the solution may be applied with a knapsack sprayer or even a sprinkling can. On larger areas, a barrel sprayer such as is used in an orchard is recommended. Where the chemical is used on a field basis, a power sprayer outfit is best if available. The action of sodium chlorate is at first slow; gradually the plants become pale green or yellow, the leaves begin to curl and finally the entire plant withers and dies. After the application the vines become more slender and assume an upright position. The sections from roots taken from the untreated plots show a considerable amount of stored starch while the treated have much less. It has also been found that the plants treated with sodium chlorate are more susceptible to injury from low temperature.

Sodium chlorate is a white crystalline salt readily soluble in water. It is a strong oxidizing agent and oxidizable material such as clothing, which has become saturated with it and then allowed to dry, will burn vigorously if ignited.

It is not definitely known whether sodium chlorate sprayed on plants is or is not poisonous to livestock. It is, however, a safe precaution to exclude livestock from fields treated with the chlorate.

The fire hazard accompanying the improper use of sodium chlorate cannot be over-emphasized. The solution soaks readily into clothing and other fibrous material which, after drying, may be easily ignited by friction as well as by a free flame. No one should allow sodium chlorate to soak into clothing. If this does happen, the clothing must be thoroughly washed before being worn again. The wearing of rubber boots and a rubber coat, which do not absorb the solution and which may be more easily washed, eliminates part of the danger.

Vegetation which has been sprayed with sodium chlorate and allowed to dry may catch fire from friction alone. Areas so treated are dangerous as long as the sodium chlorate remains on the vegetation. No one should walk across a sprayed field until sufficient rain has fallen to wash the excess sodium chlorate into the soil.

The solution should be made up in the field so as to avoid possible danger from fire which might result if the dry or sodium chlorate solution were spilled on oxidizable material during preparation near farm buildings. Due to the danger from fire
when oxidizable materials become impregnated with sodium chlorate, containers and other necessary equipment should be of metal. Spray machinery wagons, and truck floors should be painted before coming in contact with the sodium chlorate solution. Vegetation should not be burned after treatment as this will render it less effective.