UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE

AGRICULTURAL EXTENSION SERVICE

Published and Distributed in Furtherance of Acts of May 8 and June 30, 1914,
Providing for Cooperative Extension Work in Agriculture and Home Economics
J. W. BURCH, Assistant Director in Charge of the Extension Service

CIRCULAR 387 COLUMBIA, MISSOURI JULY, 1938

Field Bindweed and Methods of Control

J. ROSS FLEETWOOD

Figure 1.—Alfalfa field overrun with field bindweed.

There are many serious weed pests in Missouri but field bindweed, because of its ability to spread rapidly, crowd out all other types of vegetation, and survive under intensive cultivation, must be classed as the most dangerous and destructive of them all. It has been a very serious menace to agriculture in such states as Kansas, Oklahoma, Nebraska, and Colorado for many years. In rather recent years it has become more serious in Missouri, Iowa, Illinois, Minnesota, Wisconsin, North Dakota, and South Dakota.

A survey of Missouri made in 1937 indicated that bindweed was present in 103 counties of the state and that over 10,000 farms were

infested. As we might expect, the areas showing the heaviest infestation are in the western part of the state.

The spread of the weed is largely through seeds carried in shipments of both seed and feed. All small grain, poultry grain mixtures, hay, straw bedding, nursery stock packing, together with legume and grass seeds, are possible carriers. The recent drought years with the attendant importation of roughages, feeds, and farm seeds undoubtedly contributed to the recent rapid spread of infestation.

IDENTIFICATION

The first essential in the control of bindweed is the ability to recognize the plant. There are two common species of bindweed both of which belong to the morning glory family. The field bindweed (*Convolvulus arvensis*) also known as European bindweed, creeping Jenny, or wild morning glory is the more serious pest, but the hedge bindweed (*Convolvulus sepium*) is also quite prevalent over the state. While these two plants are quite similar in many habits of growth the root systems are materially different. The field bindweed has a deep root system which lives over from year to year. The roots may penetrate to a depth of 15 to 20 feet. In addition to these deep roots the plant has a wide spreading lateral root system which sends up numerous stems, thus causing the plant to spread. Hedge bindweed, on the other hand, spreads by means of underground horizontal stems or rhizomes and these shallow rooted parts are the only ones that survive the winter. Due to its shallow root system and smaller food reserve the hedge bindweed is relatively easy to exterminate from an infested area.

Figure 2 illustrates the vine leaf and flower of the field bindweed (left) and the hedge bindweed (right). The illustration shows the difference in size of the leaf stem and flower; the blunt, arrowhead-shaped leaves of the field bindweed as compared to the sharp pointed leaves of the hedge bindweed; and the tiny bract about one-half inch below the flower on the field bindweed as compared to the larger bracts just at the base of the flower on hedge bindweed.

Figure 3 shows the striking difference in the root system of the two plants, the field bindweed (top) having the intricate mass of laterals and feeder roots in addition to the long tap roots, while the hedge bindweed (bottom) has the large, fleshy, almost pure white underground stems and a marked scarcity of feeder roots.

There are three common vining plants frequently confused with the bindweeds but they are rather easily distinguished. One of these,

wild buckwheat, has a heart-shaped leaf and is an annual plant. The whole root system is easily pulled out of the ground. The flowers when present are in clusters in the axils of the leaves and are very inconspicuous.

Figure 2.—Field bindweed on the left, hedge bindweed on the right.

Another is climbing milkweed. The leaves are sharp pointed but are borne in pairs directly opposite each other. Both bindweeds have alternate leaves. The climbing milkweed bears its seeds in long pods like other milkweeds as distinguished from the round balls in which bindweed bears its seeds.

The third is wild sweet potato. The leaves on this vine are shaped somewhat like grapevine leaves and the stems are large and reddish in color. At a depth of some seven inches the main root of this plant enlarges to the proportions of a large, elongated sweet potato.

Any vining plant, which does not pull easily but breaks off leaving its roots in the ground, that has arrowhead-shaped leaves, bell-shaped white to pinkish white flowers and bears its seeds in round balls about as large as the end of one's little finger, is likely to be field bindweed and should be taken or sent in to the county agent for positive identification.

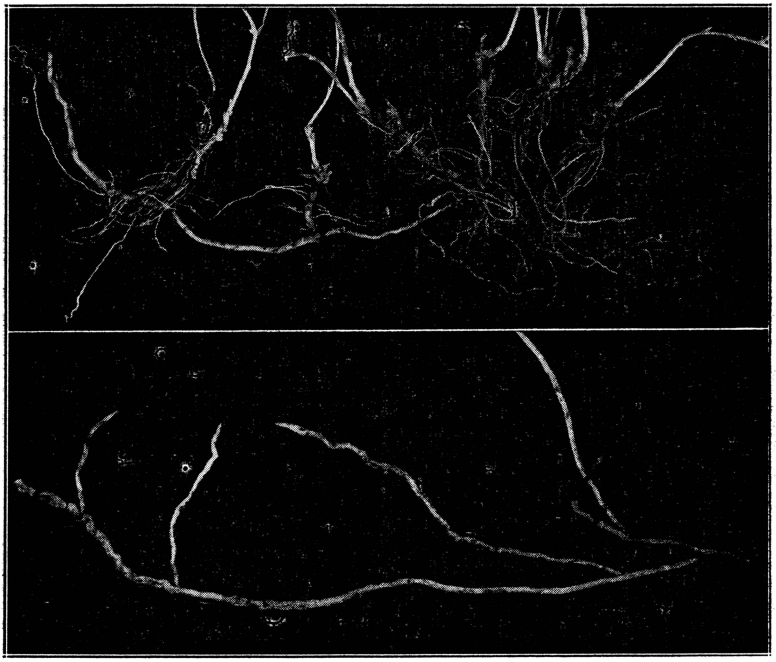

Figure 3.—Field bindweed roots in top picture and hedge bindweed roots in lower picture.

Because of the very much more serious nature of the field bindweed the rest of the discussion refers to this particular bindweed unless hedge bindweed is specifically mentioned.

SPREAD OF BINDWEED

Bindweed is spread both by seeds and roots. Seeds are transported in farm seeds, feeds, threshing machines, road machinery, manure, drainage water and other similar ways. After plants become estab-

lished in a field the roots are often dragged on farm implements to other parts of the same field or onto new fields. The Kansas Experiment Station reports that when a plant becomes established, horizontal roots are produced which have been found to grow in plowed land to a distance of 7 feet in 90 days. At distances of every foot or so these laterals send up shoots which become new plants. It is easy to see that only a few scattering plants can form a solidly infested area in a very few years. The tendency of bindweed to spread by means of lateral roots explains the circular shape of most infestations.

ERADICATION

Fortunately, most infestations of bindweed in Missouri are very small in size and many farms are not infested at all. Bindweed will spread on the farms now infested and other farms are likely to become infested unless control and eradication methods are practiced. Procedure for infested farms and at present non-infested farms is similar up to the actual point of eradication. First, get to know the weed on sight; second, mark off infested areas and do not cultivate with non-infested areas; third, select a method of eradication; fourth, utilize the eradication method selected, at the time and following the procedure recommended.

The cost of eradication of bindweed is high but failure to eradicate is even more costly. Failure to eradicate means that the infestation will eventually spread over the entire farm. Thus the cost of eradication from an area must not be figured in comparison to the cost of the land per acre of infestation but in terms of the worth of the entire farm. The cost of eradication will be smaller now than at any later time because the infested areas continually grow in size.

There are two practical methods of control available, namely, clean cultivation and chemical treatment. Either method entails loss of the use of the land for one or two seasons and is expensive—$40 to $60 per acre for chemicals, and $10 to $20 per acre for clean cultivation. Obviously the use of the chemical method is restricted to small areas or areas along fences, roads, and draws inaccessible for clean cultivation. However, this method does offer a method of eradication on such areas with the minimum of time and effort.

Clean Cultivation

Clean cultivation of infested areas over a period of two growing seasons, if carefully followed, will usually result in eradication of bindweed. Since the clean cultivation method is a starvation process it is essential that a rigid schedule of cultivation be followed. Early

in May the trash should be removed and the land plowed around 8 inches deep. After plowing, the land should be cultivated every week to 10 days with some type of tool that will cut off the plants 3 to 4 inches underground. Neither the regular corn cultivator or a disk is very satisfactory since many plants will escape being cut off. A regular duck-foot cultivator such as is pictured in Figure 4 is probably the most satisfactory tool, but duck-foot shovels or sweeps that overlap at least 3 inches can be secured for most cultivators. These shovels or sweeps are very satisfactory for use in normal crop cultivation so their purchase need not necessarily be charged to bindweed eradication.

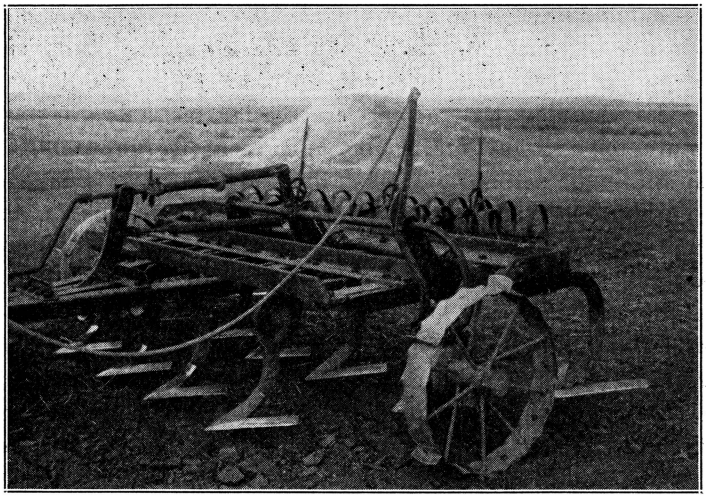

Figure 4.—Duck-foot cultivator especially adapted to use in bindweed eradication.

The weekly cultivations should be continued throughout the season until growth stops sometime around October 1. If the land is subject to serious erosion it should be seeded to a small grain, preferably rye. The small grain must be plowed under the following spring just as soon as bindweed growth starts above ground. If this is not done and the grain crop is harvested or plowing is delayed, the growth of bindweed thus permitted will store a new supply of plant food and the effects of the previous year's cultivation may be lost.

The cultivations should continue during the second year until the plants are all destroyed or until they are reduced to such a small number that they can be controlled by treating the relatively few remaining plants with chemicals.

The period between cultivations is best gauged by the recovery of the weeds. Three to five days growth above ground may be permitted but normally cultivation should be done the second or third day because unexpected delays due to rain or other causes might result in too much recovery of the roots with consequent delay in final eradication. After the weeds have all been destroyed, clean cultivated crops or small grain crops permitting summer cultivation should be used until all danger of reinfestation from seeds in the soil is past.

CAUTION: Fields particularly subject to erosion may need to be terraced and cultivated on the contour to prevent ruination from erosion while clean cultivation is in progress.

Chemical Treatment

Under Missouri conditions at the present time sodium chlorate is the most effective and economical chemical known for destroying bindweed. When applied in sufficient quantities and in such a way as to give uniform distribution it is very effective. The decision as to whether to use sodium chlorate or the clean cultivation method will depend upon the size of the area involved, the accessibility of the land to cultivation, equipment available, and other factors. Generally speaking, the use of chemicals will be confined to small areas, fence rows, ditches, and for supplementing the clean cultivation method.

The pure chemical is recommended rather than mixtures with other salts because it is usually cheaper. Atlacide, one such commercial mixture, contains approximately 40% calcium chloride and pound for pound is only about 60% as effective as is pure sodium chlorate. When priced enough lower to justify its use, however, it is effective.

Procedure Before Treatment.—No procedure prior to treatment with chemicals such as mowing, cultivation, or scraping seems to make the chemicals more effective. Therefore, only such mowing or burning as may be necessary to clearly establish the limits of infestation are recommended. In addition, any such procedures should be performed one to two months prior to actual application of the chemicals.

Time of Application.—To be effective sodium chlorate must be in solution in the soil. This requires a rather high content of moisture in the soil. Since favorable moisture conditions are more likely to prevail in the fall than during midsummer, September and October are especially recommended as the best time of treatment. Applica-

tions made in May and June may be effective if moisture conditions are favorable, but frequently dry weather follows treatment and some of the chemical may decompose before fall rains set in.

Manner of Application.—Experience in the state indicates that the chlorate can be applied in the form of a water solution sprayed on in one or more applications or spreading the dry chlorate over the infested area. The Kansas College of Agriculture recommends three sprays approximately one month apart, the first applied preferably in August. The Nebraska College of Agriculture recommends that when the spray treatment is used it be made in one application preferably in October. Since the application of the dry chemical can be accomplished without any special equipment, reduces the fire hazard almost to the vanishing point, and is seemingly equally effective, it is the generally preferred method.

Rate and Method of Application.—The amount of chlorate needed varies with the fertility of the soil. The more fertile the soil the more chemical required. Old, well established stands will require more than new thin stands. Generally speaking, 3 pounds per square rod is sufficient for the first application. On very thin soils 2½ pounds, and on the highly fertile soils 3½ to 4 pounds should cover the range of requirements. Whether the application is made as a spray or in the dry form, it should be made in such a way as to insure even distribution of approximately 3 pounds of sodium chlorate per square rod. If applied as a spray the chlorate can be mixed at the rate of 1 to 3 pounds per gallon of water and applied with any kind of spray equipment. The number of spray applications to be made will largely determine the concentration of the spray. In case three sprays are to be used, mix at the rate of 1 pound per gallon of water and spray 2 gallons per square rod for the first application and approximately ¾ to 1 gallon per square rod for the second and third sprays. Where one heavy application is made, mix 1½ pounds per gallon and spray 2 gallons per square rod or 3 pounds per gallon and spray 1 gallon per square rod. The lower concentrations increase labor but give a better distribution of the chemical. Dry applications can be made by hand or by using a 2 to 3 gallon bucket with 12 to 18 holes punched in the bottom with a 6 or 8 penny nail. Spreading one-half the material one way then crossing with the other half, as is often done with clover seed, will give more even distribution. In any event, the area should be measured into square rod areas using stakes to mark limits. The chemical can then be

weighed into 3 pound lots and applied to each square rod separately. This procedure seems essential in securing even distribution.

Follow-up Treatment.—Where treatments are made in September or October no follow-up treatment is necessary before May 15 to June 1. At this time the necessary treatment should be given and the land clean cultivated the remainder of the season to destroy bindweed seedlings. Crop sequence should be the same as recommended after the clean fallow method.

WARNING Sodium chlorate in its pure form will not burn, but when mixed with organic matter it does constitute a fire hazard. Therefore certain precautions need to be exercised in using the chemical.

1. If used as a spray wear rubber boots and old clothes which can be washed before they are allowed to dry.
2. If applied in the dry form do not apply when the foliage is wet from dew or rain.
3. Do not remove sodium chlorate from the steel container while in a building.
4. Do not allow organic material such as seeds, chaff, paper or dust to become mixed with the chlorate.
5. Spray equipment should be rinsed thoroughly after use and all wooden containers, etc., should be washed off before they dry out.
6. Livestock probably should be kept away from treated areas until after a rain, although if they are receiving an abundance of salt they are not likely to eat enough of the chlorate to poison them.

An observation of the demonstrations on bindweed control established in the state using sodium chlorate discloses some common causes of unsatisfactory results. Therefore particular attention to these details would seem worthwhile. The chemicals must be applied to an area 3 to 6 feet beyond the farthest plant; too frequently this is not done and a fringe of bindweed remains around the infested area. The chemical must be applied in sufficient quantity over all

of the area. Streaks across a treated area where the bindweed is not killed indicate the necessity of even distribution. In Figure 5 is shown a field where a good kill was secured except for one long narrow strip where the application was not heavy enough. Measuring the area into square rods and weighing out the chemical may seem to be slow and laborious but when working with expensive materials a little extra precaution to insure success often pays big returns.

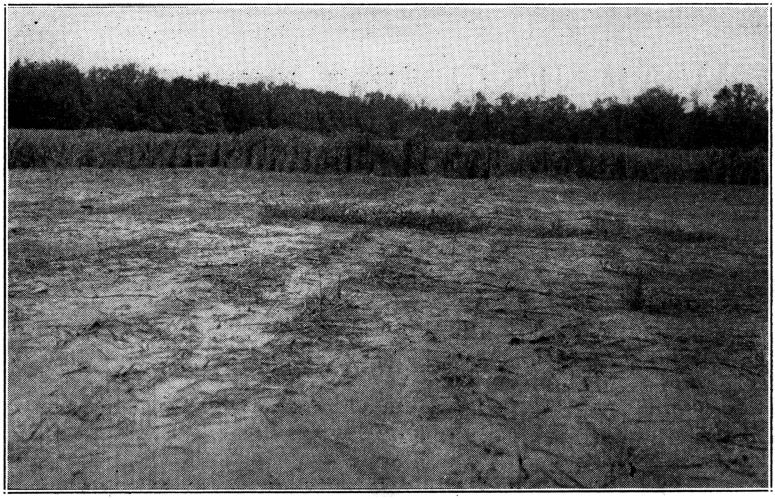

Figure 5.—Field on which bindweed has been almost completely eradicated with sodium chlorate.

Other Methods of Control

Ordinary salt applied at the rate of about 1 pound per square foot is a very effective treatment, yet it has the disadvantage of being expensive and having a very lasting bad effect on the soil.

Smothering is too difficult and on the whole too expensive to be practical. Bindweed will grow through several feet of straw, manure, or other similar material.

Pasturing small areas with hogs may kill out a small area but is not practical, because a small area can be cheaply killed out with chemicals.

Carbon bisulphide has worked very satisfactorily in an experimental way in the state but the expense of treatment is too high for all except special cases.

Certain acid arsenical sprays have shown some promise but not enough is known regarding them to justify their recommendation at this time.

Clean cultivation and smother crops are sometimes combined in such variations as follows: plowing immediately following the removal of a grain crop; practicing clean cultivation until fall; leaving fallow or seeding to a small grain during the winter; then plowing and planting to soybeans, sorghum, or sudan drilled solid at a heavy rate. These methods may have some value but have not been checked under conditions in this state. It seems most logical to utilize a method known to work on areas of appreciable size and try out unknown methods only in a small, experimental way.

The control of bindweed is a community problem since an infestation in the community increases the chances of infestation on adjacent farms. An uncontrolled infestation in a community will continue to spread, thus overrunning adjacent land. Seeds from the area may be transported by livestock, through threshing machines, combines and other machinery, by drainage water and in seeds or feeds leaving the farm. Community sentiment for control is essential to secure control on absentee landlord farms, public roads and railroad rights-of-way, public lands and on farms of certain individuals. Such community support would be necessary even though legislation to effect control were available. In addition to this community interest, individual landowners and operators need to be eternally vigilant to avoid infestation or reinfestation on their land. Low grade seeds, feeds, and roughages are more likely to contain bindweed seeds than the higher quality materials. Oats purchased for feed or seed that were grown in bindweed areas are a very good source of infestation.

Threshing machines, combines, grain drills and such machinery are very likely to carry seeds of bindweed if taken from an infested farm to a farm not infested. In essence it can be truthfully said that with the increasing threat of bindweed infestation it becomes increasingly necessary to be sure of the feeds, seeds, hay, etc., which are brought onto the non-infested farm.

HEDGE BINDWEED

Generally speaking, hedge bindweed does not cause serious interference with crops in a good cropping system. In cases where it does become a serious pest, one season of clean cultivation followed by care to control seedlings will usually suffice to eradicate it. Where desired, sodium chlorate can be used as for field bindweed.

SUGGESTED PROCEDURES TO CONTROL BINDWEED

There are many variations in procedure which suggest themselves, some of which are discussed in this bulletin. On this page however are set down in 1-2-3 order the steps recommended to secure results under two definite procedures. Generally speaking, these two procedures are believed to be the most practical in this state.

Clean Cultivation

1. Remove trash and plow at least 8 inches deep around May 1.
2. Clean cultivate, preferably with a duck-foot cultivator or duck-foot shovels on a regular cultivator every week to 10 days until October 1-15.
3. If land is subject to serious erosion, seed to rye that fall at the rate of 1½ bushel per acre.
4. Plow rye under the next spring April 15-May 1 and continue cultivations until plants are killed. (Last few plants can be spot treated with sodium chlorate when moisture conditions are right.)
5. Seed to wheat or barley the second fall, harvest grain crop, and clean fallow during the summer as required to kill seedling plants.

Chemical Method

1. Mow weeds from area in July and again in August, if necessary, to make it possible to outline boundaries of infested area.
2. About October 1 apply 3 pounds (3½ if on fertile bottom lands or high organic matter soils) sodium chlorate per square rod in the dry form. (Do not apply when foliage is wet.) Be sure to apply chlorate 6 feet beyond the last bindweed plant.
3. Spot-treat the surviving plants about May 15-June 1.
4. Start summer fallow June 1-15 to destroy seedlings.
5. Plant to small grain, harvest, and clean fallow the succeeding year if necessary to destroy seedlings.

CAUTION: *See warning on page 9, concerning the handling of these chemicals.*

University Libraries
University of Missouri

Digitization Information Page

Local identifier	Circular387-1938

Source information

Format	Book
Content type	Text with images
Source ID	Gift copy not added to collection
Notes	

Capture information

Date captured	November 2019
Scanner manufacturer	Fujitsu
Scanner model	fi-7460
Scanning system software	ScandAll Pro v. 2.1.5 Premium
Optical resolution	600 dpi
Color settings	8 bit grayscale
File types	tiff

Derivatives - Access copy

Compression	Tiff: LZW compression
Editing software	Adobe Photoshop CC
Resolution	600 dpi
Color	grayscale
File types	pdf created from tiffs
Notes	Images cropped, straightened, and brightened Canvas size: 6 x 9