

Destroy

**THE RUST-SPREADING
BARBERRY . . .**

Protect Small Grains



STEM RUST is a costly disease of small grains. Once it becomes established in a field, there is practically no way to control it. These three preventive measures are urged upon all Illinois farmers:

- 1** Destroy all rust-spreading barberry plants. Report the number and location of those destroyed to the local farm adviser or to the COLLEGE OF AGRICULTURE, UNIVERSITY OF ILLINOIS, Urbana, Illinois. See page 13.
- 2** Plant such rust resistant and early-maturing varieties of grain as are recommended for the locality.
- 3** Sow spring crops early. Sow winter crops according to seeding dates announced each year.

Front cover shows barberry bush being destroyed with salt.

DESTROY THE RUST-SPREADING BARBERRY

By MAC A. CAMPBELL, ROBERT W. BILLS, and BENJAMIN KOEHLER¹

ALARGE PART of Illinois has been cleared of the rust-spreading barberry, but a big job still remains. The map on page 16 shows the areas that are now free of these bushes and those where more work must be done. The rust which is harbored and spread by these bushes is still a serious threat to the small-grain crops in Illinois. A single bush growing in a community not only may cause serious damage to grain crops but may also produce seed from which new bushes will grow. Every bush is also a possible source of



In wheat fields where rust is severe, the kernels are shriveled and light in weight. Note the contrast in kernels from rust-free plants (*left*) and from rusted plants (*right*). Similar contrasts could be shown in grain from other cereal plants, such as oats, barley, and rye. Fig. 1

new races of the rust fungus. Some of these new races may attack varieties of grain that are resistant to the races already established.

¹ MAC A. CAMPBELL, Leader in charge of barberry eradication in Illinois, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture, from March 24, 1942, to April 2, 1945. ROBERT W. BILLS, Leader from March 17, 1928, to March 23, 1942, reinstated from military furlough April 3, 1945. BENJAMIN KOEHLER, Chief in Crop Pathology, Illinois Agricultural Experiment Station.

There is not a year that stem rust does not cause some damage to small grains. When it takes the form of an epidemic, severe losses and crop failures result. The nature of the damage is shown in Figs. 1 and 3.

How Stem Rust Spreads

Stem rust is caused by a fungus that lives in the northern states on certain kinds of barberry bushes and grains and on many wild grasses. The rust is spread from one host plant to another by spores that are carried by the wind.

This rust lives thru the winter in the form of black spores on wild grasses, grain stubble, and in straw piles. In the early



The cluster cups shown on the leaves of this barberry contain the spring spores which can infect nearby grasses and grains. The black spores that live thru the winter on wild grasses, grain stubble, and in straw piles germinate in the early spring and produce the spores that cause this infection on the barberry in April or May.

Fig. 2

spring the black spores germinate and produce a new crop of spores which are carried by the wind to the barberry bushes. On these bushes the new spores produce cluster cups (Fig. 2). These cups contain the spring spores, which can infect wild grasses and grain plants near-by. On the wild grasses and grains the destructive red stage, known also as the summer stage, develops.

During the rest of the season the rust develops independently of the barberry. Several generations of spores are produced on the grains and grasses before they mature. By means of these spores, rust spreads from plant to plant and from field to field, sometimes taking in large areas, for each spore is capable of infecting another plant.

As the grain and grasses mature, the black spores form on



The stem-rust fungus grows as a parasite on the stems of grains and grasses. It gets its food from these plants. The rust breaks the stems open, letting the water evaporate. The plants are thus robbed of the plant food and moisture that would otherwise go to produce plump, healthy kernels. These stems happen to be those of wheat plants. Fig. 3

the stems (Fig. 3). These spores are carried thru the winter to start another cycle of infection in the spring.

Thus the life cycle of this rust fungus in the North-Central states (Fig. 4) depends on the barberry. When the rust-spreading barberry is destroyed, stem rust cannot live

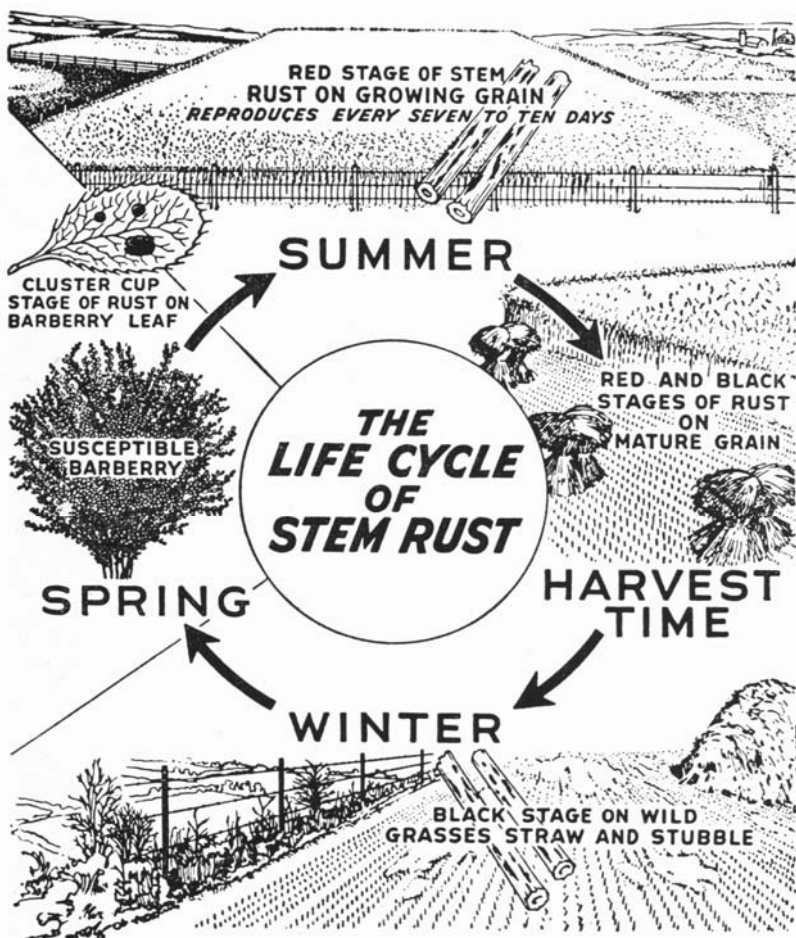
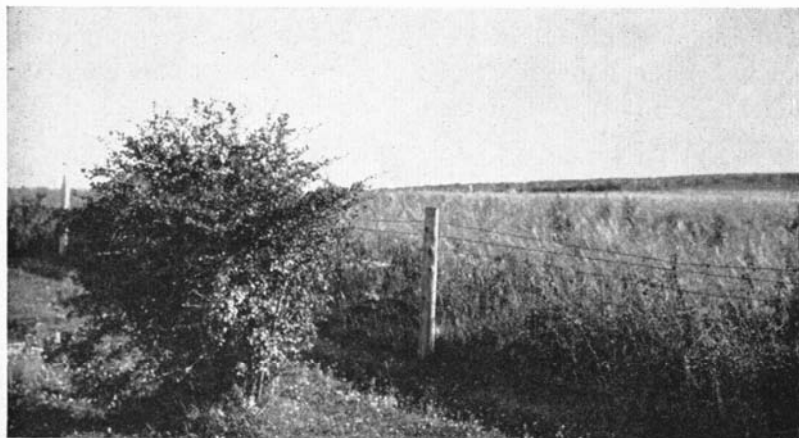


Fig. 4

here from one season to the next. And until it is destroyed, farmers in this important grain-growing region will continue to suffer losses that they could avoid.

Stem rust also develops on the small-grain crops in Illinois from spores that have been blown from infected areas in adjoining states. It may also in some years come up from Texas and northern Mexico. Under some conditions the red (summer) spores that survive the mild winters in that territory multiply and develop infection centers there. These spores, which are extremely small and light, may then be blown in by



This barberry bush was responsible for the stem rust that had attacked an adjacent field of small grain. One hundred seventeen similar instances of this rust having spread from barberry bushes to grains and grasses have been recorded in Illinois. These cases are, of course, only a fraction of all that have been observed. Furthermore, new races of stem rust can hybridize on the rust-spreading barberry. These races may attack varieties of grain now considered rust-resistant.

Fig. 5

the wind. The disease spreads northward as the crops develop. In some years considerable rust is blown into Illinois from the south, but usually it arrives too late to cause much damage.

More Damage in Warm, Muggy Weather

The development of stem rust and the amount of damage it does depend on the growth of the crop and the weather. The less mature the crop is when rust hits it, the greater the damage.

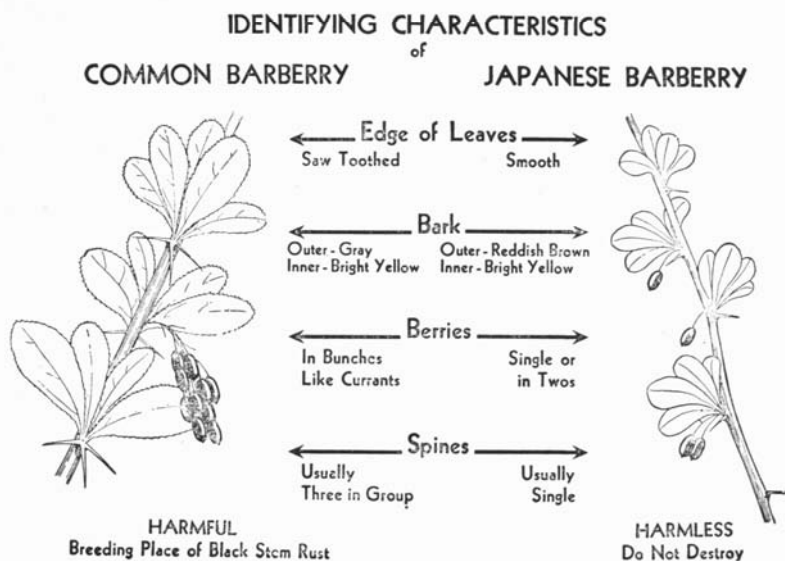
Warm, muggy weather favors the development of rust. Dry weather and low temperatures hold it back. Infection starts

when moisture and temperature are favorable for the germination of the spores. Even under the most favorable conditions, however, there can be no stem rust unless the spores of the fungus are present.

Rust-Spreading Barberry Easy to Identify

The barberry that harbors and spreads stem rust is easy to tell from the harmless varieties. It is a tall, thorny plant with many canes (Fig. 5). In shape it resembles the well-known spirea, honeysuckle, and mock orange. It may be of any height up to 12 feet, depending on its age. The main differences between the rust-spreading barberry and the harmless Japanese variety are shown in Fig. 6.

The leaves of the rust-spreading barberry are oval and have fine saw-toothed edges. They grow in clusters on the stems and may be either green or purple. The thorns grow either 3 or 5 in a place. The flowers grow in clusters and are yellow. The berries grow in bunches like currants and turn



Rust-spreading barberry bushes are not hard to tell from the harmless ornamental barberry. They differ in type of leaf, in color of bark, in the way the berries are borne, and in number of spines.

bright red in the fall. The outer bark is gray, the inner bark bright yellow.

The Japanese barberry is a low-growing shrub, seldom more than 5 feet high. It is widely grown in Illinois as a hedge and ornamental plant. The leaves, like those of the rust-spreading variety, are either green or purple but have smooth edges. The outer bark is reddish brown. The thorns are usually only 1 or 2 in a place. The flowers and berries resemble those of the rust-spreading variety but grow either singly or two together.

There are a few kinds of barberry besides the Japanese that are not susceptible to stem rust and may also be used wherever desired.

Common Salt Will Destroy Bushes

Common salt is the best material to use to kill barberry bushes (*see front cover*). It must be applied separately to each shoot coming from the roots. In yards or pastures where livestock or poultry might eat too much of the salt, kerosene can be used. It is equally effective.

Neither salt nor kerosene should be used, however, to kill bushes growing on lawns or near valuable trees or shrubs. The best way now known to get rid of such bushes is to dig them out (Fig. 7) taking care to get all the roots, or new bushes may spring up.¹

Some Varieties of Grain are Resistant

Oats. Plant breeders have made remarkable progress in developing high-yielding oats that are resistant both to stem rust and to crown (leaf) rust. New varieties recommended for the northern two-thirds of Illinois are **Clinton**, **Tama**, **Vicland**, and **Marion**. These new varieties are definitely superior to the older ones. They differ some, however, in their adaptation to local areas. The local farm adviser can say which ones are likely to do best in a given locality.

¹ Some new chemicals give promise of being very effective in killing barberries. They have not yet, however, been thoroly enough tested to justify their being recommended for general use.



When barberry bushes are growing on lawns or near valuable trees or shrubs, they should not be killed with salt or kerosene. The thing to do is to dig them out, being careful to get all the main roots so new shoots won't sprout.

Fig. 7

Wheat. Some new varieties of spring wheat that are resistant to rust appear to be desirable for northern Illinois.

Several varieties of winter wheat have been developed which, besides having other excellent qualities, have some resistance to stem rust. Each one of these varieties, however, has one or more drawbacks, such as serious susceptibility to some other disease, grain lacking in quality, or tendency to lodge.

For recommendations concerning wheat varieties write to AGRONOMY DEPARTMENT, UNIVERSITY OF ILLINOIS, *Urbana*, and state the locality where the wheat is to be grown.

Planting Dates Make a Difference

Generally speaking, the earlier the grain matures the greater are its chances of escaping damage from stem rust. Spring crops should therefore be sown early; and wherever it is practicable to do so, early-maturing varieties should be grown.

Winter crops should be sown as soon as possible after danger from Hessian fly is past.¹ Seeding them too early may increase the losses from Hessian fly, while seeding them too late may result in excessive winter-injury.

New Races of Rust Are Always a Threat

New varieties of grain have been developed from time to time that appear to be able to resist stem rust, and more and better varieties are sure to be developed by plant breeders working on this problem. No variety has yet been produced, however, that is immune to all races of stem rust, and some 200 races of this rust are known.

Since each race of stem rust differs from the others in its ability to attack different kinds of small grains, and since varieties of grains differ in their resistance to the different races, there is always the possibility that a new race will appear and attack grain that is thought to be resistant. This threat is a very real one as long as there are any susceptible barberry bushes in an area.

New races of stem rust are produced only by the hybridizing of existing races on the leaves of barberry bushes.

Barberry Not Native to Illinois

The rust-spreading barberry is not native to Illinois. Early settlers brought the bushes into the state, the first ones being planted in about 1844. The settlers used them for hedges and

¹ The office of the farm adviser will supply the date each year.

ornamental plantings. They also made jelly and wine from the berries and medicine from the roots. From these and later plantings the bushes spread over the state. They spread into the woods and other uncultivated areas from seeds dropped by birds or carried by other natural agencies.

With the barberry came local epidemics of stem rust in fields of wheat, oats, barley, and rye. Fanning out from these local areas, the disease often caused widespread damage. In some places the losses were so severe that farmers stopped growing wheat and turned to some other crop. Not until some years later was it known that this apparently harmless bush had anything to do with these epidemics. In 1918 systematic work was started to rid the state of these bushes.



These wild barberry bushes sprang up in a wooded area from seeds dropped by birds. Such seeds sometimes lie dormant in the soil for ten years or more before germinating. Areas where barberry bushes have grown therefore need to be inspected regularly in order that new bushes can be destroyed before they can produce seed.

Fig. 8

YOUR HELP is urgently needed in the effort to eradicate the rust-spreading barberry from the state. No one person can find and destroy all the plants a mature bush creates. For one thing, birds scatter barberry seed over a wide area.

For the protection of your fields and those in your community, you are asked to report on the blank below the destruction or the presence or suspected presence of barberry bushes on your property, and the presence or suspected presence of such bushes in your community.

(Fold here)

(Number of bushes destroyed or growing on your premises)

(Distance and direction of your premises from nearest town)

(Location of known or suspected bushes in your community)

(Your name and address)

Can you use more information on barberry eradication? _____

(Fold here)

(By folding this page you can use
it as an envelop if you wish.)

Place
3 cent
stamp
here

To

**BARBERRY ERADICATION OFFICE
POST OFFICE BUILDING
URBANA, ILLINOIS**

What Has Been Accomplished

Since 1918 federal, state, and local agencies have worked together to destroy all the rust-spreading barberry bushes in a large part of Illinois. Cities, towns, farmyards, and other places where bushes might have been planted have been carefully inspected. In the northern part of Illinois, wooded areas, fencerows, stream banks, and other uncultivated places where the bushes might be growing wild (Fig. 8) have been systematically surveyed one or more times by men working singly or in crews. Bushes have been found in 100 of the 102 counties of the state (Fig. 9).

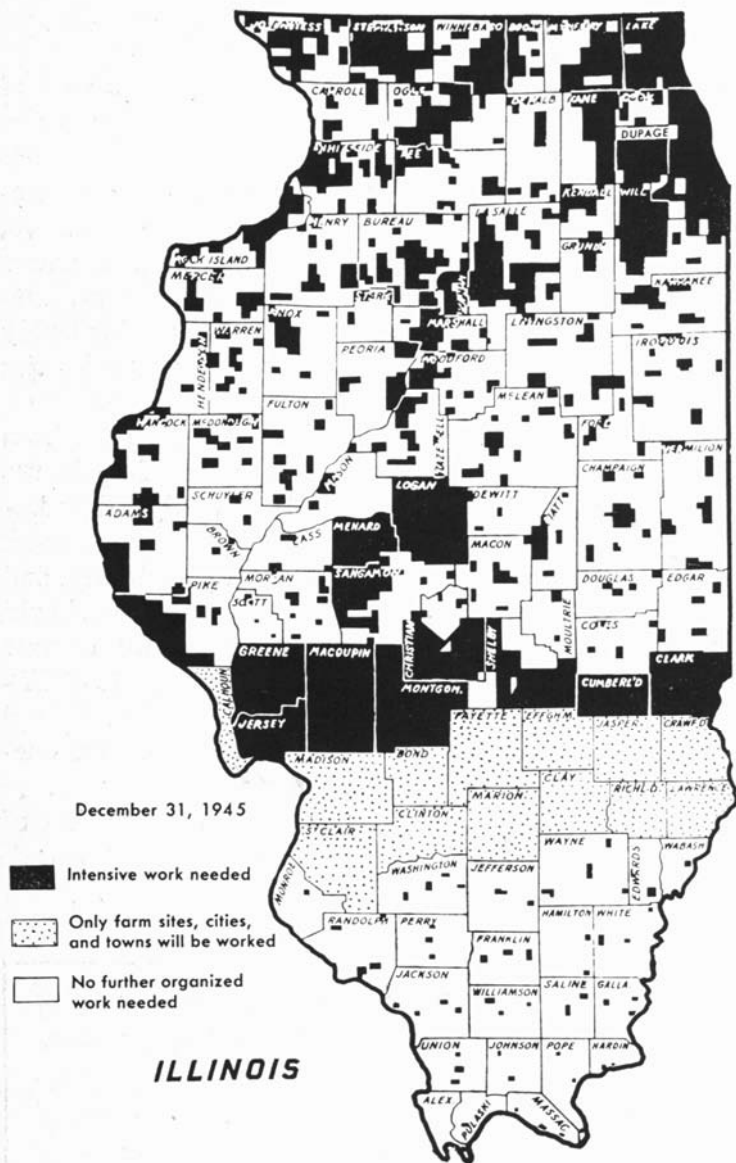
Some 2,738,500 rust-spreading barberry bushes have been destroyed on 19,641 properties, and the number of epidemics of stem rust, local and state-wide, have been vastly reduced.

Since a large part of the income of Illinois farmers comes from the growing of the cereal crops—wheat, oats, barley, and rye—it is highly important that the work of eradication should go on until this disease is no longer a threat locally or over larger areas in the state. During the ten years 1934-1943 Illinois grew 156 million bushels of these cereal grains. Valued at 81 million dollars, these grains accounted for about one-eighth of the total farm income of the state.

Barberry eradication in Illinois is a cooperative project of the U. S. Department of Agriculture, the State Department of Agriculture, and the College of Agriculture.

Destroying existing bushes is the first step in ridding an area of the rust-spreading barberry. But it is only the first step. New bushes will come up from seed for about ten years after a mature bush has been killed. These seedlings must be destroyed before they in turn produce seed. Only then will the danger from stem rust be over.

Barberry bushes found strewn over several square miles have been traced to a single mother-bush.



Intensive work to rid the state of the rust-spreading barberry still has to be done on some 21,000 square miles, as shown by the black areas on this map. Almost 35,000 square miles are believed to be free from these bushes and will need no more work.

Fig. 9