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## EC128 Barberry Eradication in Nebraska

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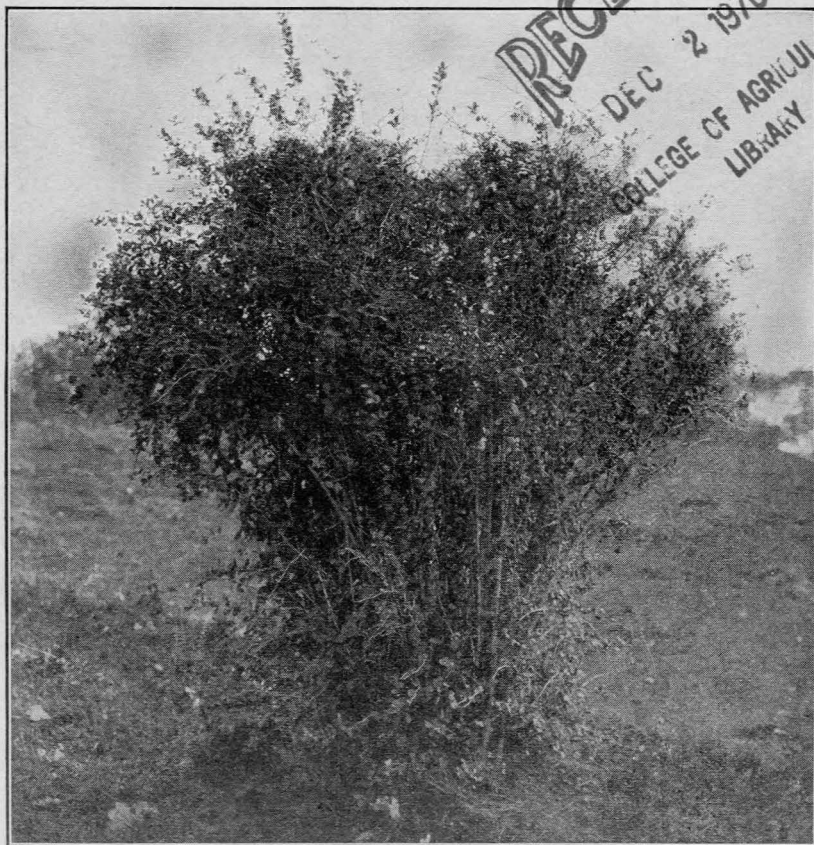
E.C. #128

THE UNIVERSITY OF NEBRASKA  
AGRICULTURAL COLLEGE EXTENSION SERVICE

June, 1925

Extension Circular 128

## Barberry Eradication in Nebraska



The common barberry which spreads stem rust. Destroy it.

UNITED STATES  
DEPARTMENT OF AGRICULTURE

UNIVERSITY OF NEBRASKA-LINCOLN



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## Barberry Eradication in Nebraska

A. F. THIEL \*

The barberry eradication campaign in Nebraska began in the spring of 1918. At the same time similar campaigns started in Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. The demand for increased food-production during the late war and the enormous loss from stem rust in 1916, were chiefly responsible for the starting of the eradication campaign by the Office of Cereal Investigations of the United States Department of Agriculture, in cooperation with the Colleges of Agriculture, State Departments of Agriculture and other agencies in these 13 States.

One way to increase crop-production is to reduce the great losses due to insect and fungous pests. The average annual loss of all small grains due to stem rust in these 13 principal grain-growing States is estimated at slightly over \$60,000-000 † for the ten-year period, 1915 to 1924. The average loss in dollars from this source for Nebraska alone is estimated at over \$3,000,000 annually for this period. Barberry eradication will eliminate all spore-material of stem rust which gets its start from the barberry in the spring. It is believed that this will materially decrease or eliminate the recurring losses due to stem-rust epidemics. The results already obtained in many of the States indicate that, in localities where barberries have been completely eradicated, stem-rust losses have been reduced.

### PROGRESS OF BARBERRY ERADICATION IN NEBRASKA

Every city, town, and village of the State has been surveyed for the common barberry. A farm-to-farm survey also has been made over the entire State. The upper rows of numerals on the State map (Fig. 1) show the total numbers of properties upon which barberries were found and the lower rows of numerals show the total numbers of barberry bushes found in each county. During the seven years from 1918 to 1924, inclusive, 94,273 common barberry bushes

\* Associate Pathologist, Office of Cereal Investigations, Bureau of Plant Industry, United States Department of Agriculture, in charge of Barberry Eradication in Nebraska.

† Crop Losses from Plant Diseases in the United States in 1924. U. S. Department of Agriculture Plant Disease Survey estimates, unpublished.

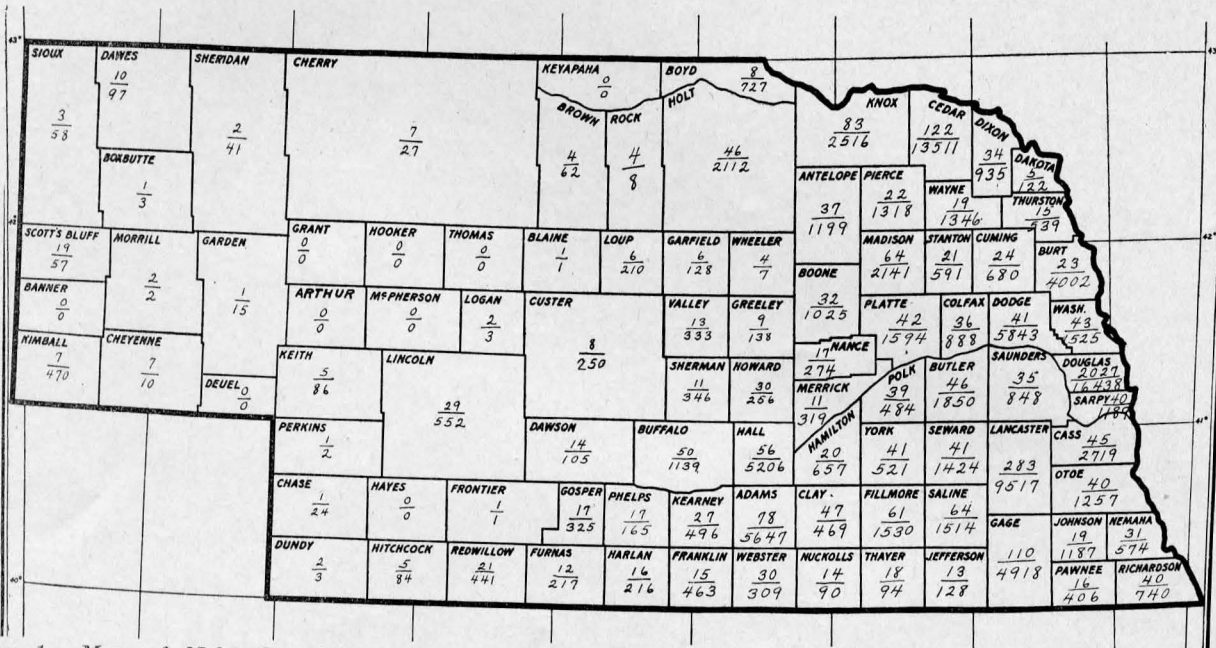


Fig. 1. Map of Nebraska showing by counties (upper numerals) the total numbers of properties in both towns and country upon which common barberries were found and the total numbers of barberries (lower numerals) found in each county.



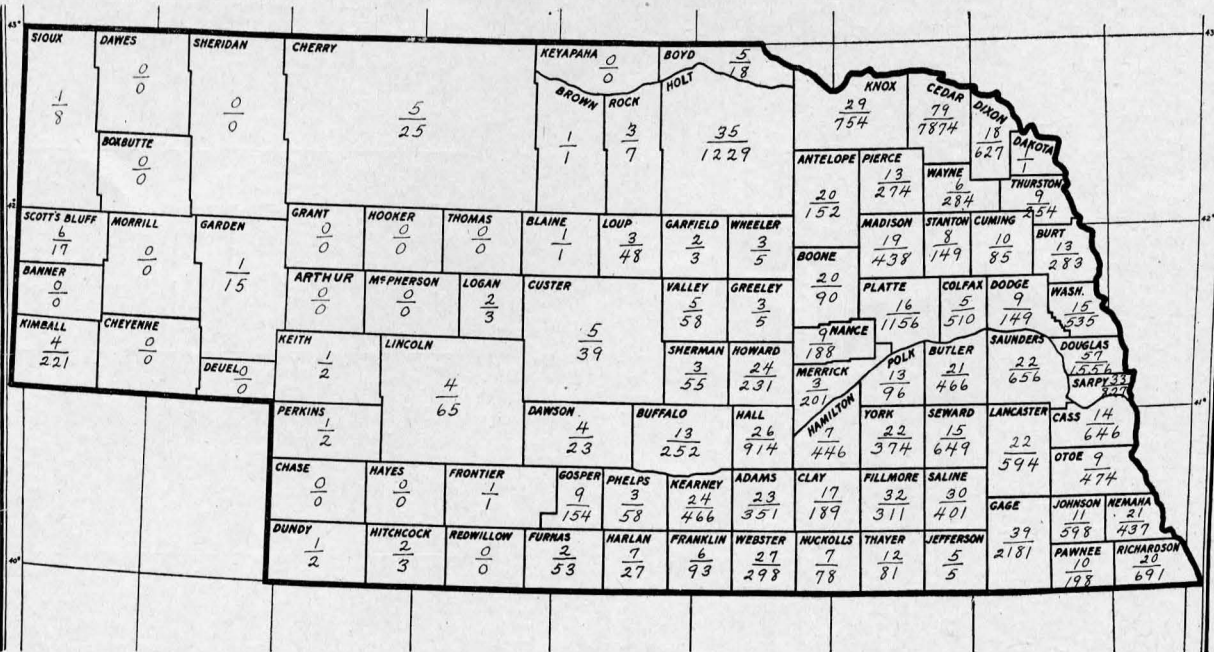


Fig. 2. Map showing by counties (upper numerals) the total numbers of farm properties having barberries and the total numbers of barberries found on farms (lower numerals).

and 9,365 seedlings were found and destroyed on 3,868 properties. On the reinspection, locations where bushes were cut off or improperly dug, 15,488 sprouting bushes were found and destroyed. About two-thirds of these were found in cities and towns but barberries also were numerous on farms as 30,711 bushes were found on 1,007 farm properties (Fig. 2). The majority of these were found in the eastern half of the State.

#### RESULTS OBTAINED IN THE ENTIRE ERADICATION AREA

Since April 1, 1918, every city and village property and every rural property in Indiana, Iowa, North Dakota, South Dakota, Wisconsin, Wyoming, and Nebraska have been covered by a first survey for barberries. There still remain 59 counties to be surveyed in Illinois, about 20 counties each in Michigan and Ohio and 10 or more counties in Montana. Colorado and Minnesota have small portions of counties remaining to be surveyed.

The following table shows, by States, the total numbers of barberry bushes found and the numbers found in the cities and towns, and in the country from the beginning of the campaign to December 31, 1924.

Table 1. Data showing, by States, the numbers of barberry bushes found in cities and towns and on the farms from April 1, 1918 to December 31, 1924.

State	In cities and towns	On farms	Total
Colorado .....	19,593	4,757	24,350
Illinois .....	106,872	165,679	272,551
Indiana .....	77,220	117,560	194,780
Iowa .....	649,279	142,597	791,876
Michigan .....	53,827	412,987	466,814
Minnesota .....	592,361	191,863	784,224
Montana .....	6,884	3,308	10,192
Nebraska .....	73,081	21,192	94,273
N. Dakota .....	14,401	7,774	22,145
Ohio .....	215,104	45,969	261,073
S. Dakota .....	23,654	35,486	59,140
Wisconsin .....	280,608	3,092,175	3,372,783
Wyoming .....	3,946	196	4,142
Total .....	2,116,830	4,241,513	6,358,343

In addition to the 6,358,343 barberry bushes found, 4,607,-142 barberry seedlings and 273,619 sprouting bushes have been found. This makes a grand total of 11,239,104 bushes, sprouting bushes and seedlings found in the entire eradication area.

#### RELATION OF THE COMMON BARBERRY TO STEM RUST

Stem rust attacks wheat, oats, barley, and rye. In addition to these cereal crops, there are about sixty different kinds of grasses which likewise are attacked. Stem rust is caused by a parasitic fungus or tiny, mold-like plant. It spends part of its existence on grain crops and grasses, and part on the leaves of the common barberry (Fig. 3). In the spring, usually about the middle of April in Nebraska, the black stem-rust spores which have overwintered on grain or grass stubble germinate and produce other small spores. These new spores are blown about by the wind. Those which fall on the leaves of the common barberry, which is the harmful kind, germinate and enter the tissues of the leaves. They produce an infection called the cluster-cup or yellow-spore stage of the rust (Fig. 4). These cluster cups are filled with thousands of spores which are likewise blown about by the wind. The cluster-cup spores which fall on grain plants germinate, if weather conditions are favorable, and infect the plant.

The rust infection which has spread from barberries usually appears on the grains or grasses about May 20 in this state. This early infection on the plants is the red-spore stage of the stem rust. Stem rust is usually found on the stems and sheaths of the grain plants but it also occurs on the leaves and heads. It appears as elongated, reddish-brown pustules. The red spores from these pustules are blown about by the wind to other grain plants where, under favorable weather conditions, they germinate and in seven to ten days produce a new crop of spores. This process continues until the ripening of the grain or cool, fall weather make conditions unfavorable for the rust. Then the red spores are replaced by the black spores. The black spores are the winter spores and these remain dormant during the fall and winter on grass and grain stubble. The black spores cannot reinfect the grains or grasses but produce spores which can infect only the common barberry. If the barberry is eliminated, the life cycle of the rust is broken. There-



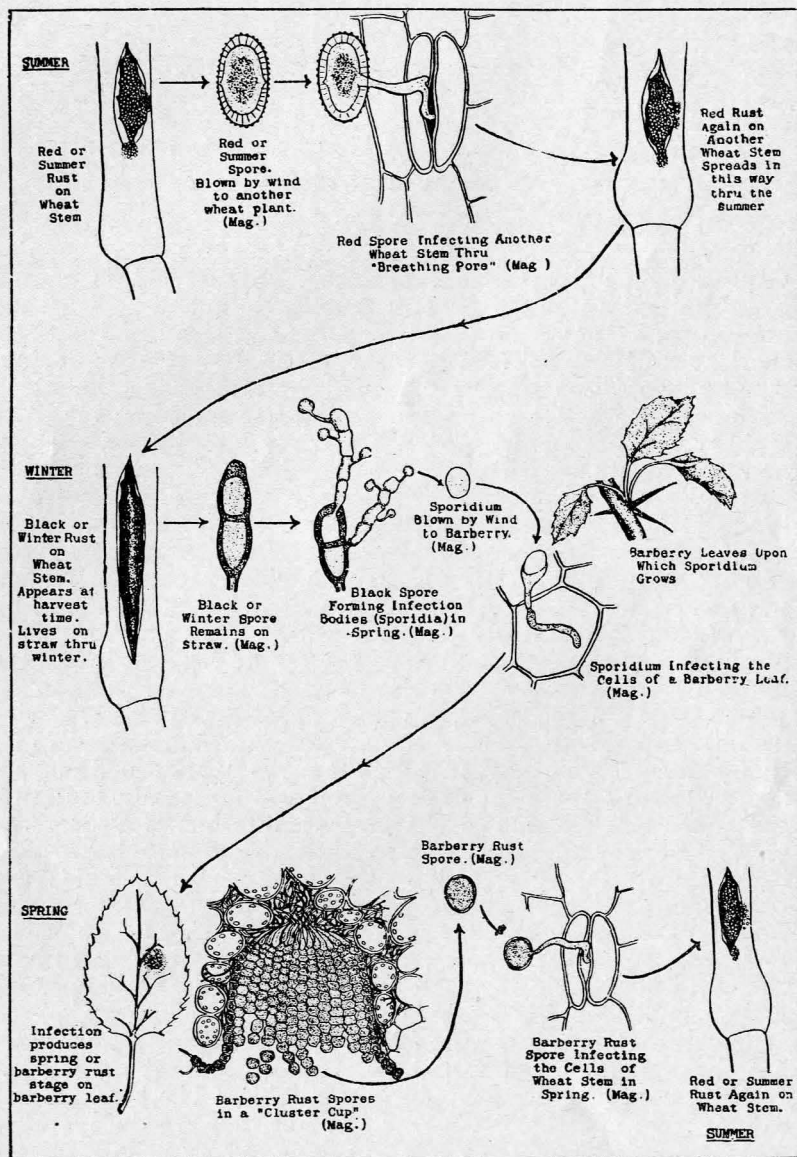


Fig. 3. Life story of stem rust of grain. Follow the arrows. (Mag. = magnified — as seen through the microscope).

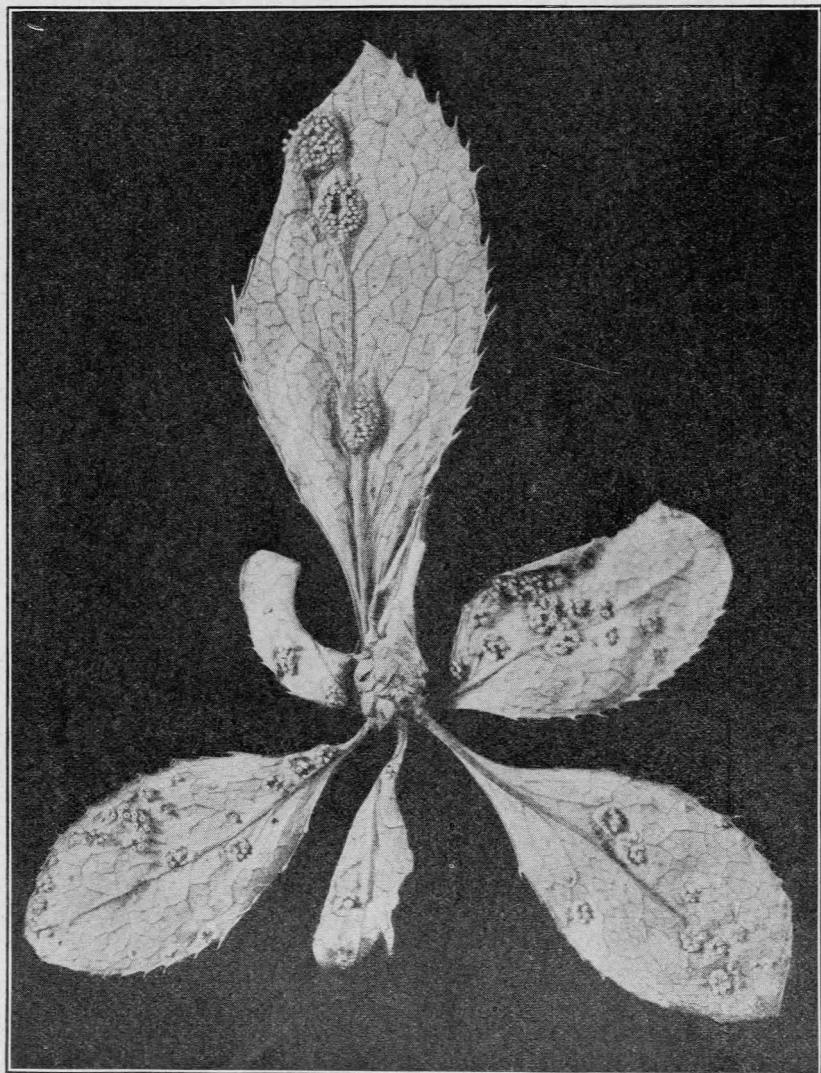


Fig. 4. Cluster-cup stage of stem rust on leaves of the common barberry.

fore, the eradication of the barberry will prevent stem rust from getting a start from this source in the early spring in Nebraska.

#### **WILL BARBERRY ERADICATION ELIMINATE ALL STEM RUST?**

Investigations made by the United States Department of Agriculture show that the red spores of stem rust are able to live through the winter in the extreme southern and western parts of the United States. In those areas the rust is able to infect the new cereal and grass crops in the spring without the aid of the common barberry. Experiments and observations made by the writer which have extended over a period of seven years show conclusively that stem rust does not overwinter in the red-spore stage in Nebraska. The red spores are very thin-walled and a majority of them perish early in the winter. The remainder are killed by the sudden changes of temperature throughout the winter and early spring.

Barberry eradication may not eliminate all stem rust. Some of the rust which overwinters in the southern part of the United States may be carried northward by the wind and infect our grain crops. Observations which were made during the last four years show that some of the rust which develops in Nebraska comes from an outside source. The source of this rust material has not been determined. There are two sources from which stem rust arises in Nebraska. First, from cluster-cup spores from infected barberries, and, second, from stem-rust spores carried by the wind from rusted areas outside of the State.

The common barberry is the only plant which is known to harbor the spring stage of the stem rust. Its removal from Nebraska will eliminate one important source of stem-rust infection and severe stem-rust epidemics may no longer be possible.

#### **HOW COMMON BARBERRIES SPREAD RUST**

A typical case of the spread of stem rust from an infected common barberry is shown in Fig. 5. Observations on the spread of rust from this barberry bush to a winter-wheat field were made in the spring of 1922. The barberry became infected during the last week in April. By May 10, the cluster-cup stage of the rust appeared on the barberry leaves. By May 30, the red-spore stage of the stem rust was first

observed on nearby wheat. The diagram in Fig. 5 shows the extent of the development of stem rust on successive dates during the next three weeks.

The weather conditions of each season are one of the greatest factors in the spread of stem rust from barberries. Cool weather or hot, dry weather retard the germination of the spores. Hot, damp weather is ideal for their germination, and their reproduction under these conditions occurs every seven to ten days. Heavy dews furnish sufficient moisture for the germination of the spores.

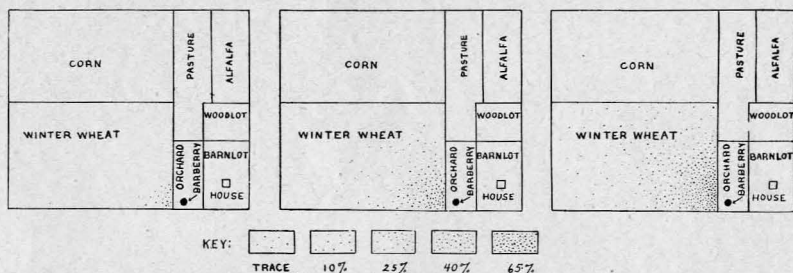


Fig. 5. Diagram showing the spread of stem rust from an infected barberry bush to winter wheat in Adams County on successive dates in 1922. The diagrams, from left to right, show the severity of stem-rust infection on May 22, June 10, and June 20, respectively.

### THE COMMON BARBERRY AND JAPANESE BARBERRY CONTRASTED

The common barberry (*Berberis vulgaris* L.) including all green and purple varieties, usually grows to a height of 5 to 10 feet in Nebraska (Frontispiece). Very old bushes sometimes attain a height of from 12 to 16 feet. The leaves have bristle-toothed edges. The yellow flowers and oblong red berries are borne in clusters like currants. The spines usually are in groups of threes or more. On young branches the number of spines may vary from one to many (Fig. 6).

The Japanese barberry (*Berberis thunbergii*) does not spread stem rust and can be planted if desired. It is a beautiful bush (Fig. 7) which seldom grows more than 3 or 4 feet high in this State. The leaves are small and have smooth margins. As on the common barberry, the flowers are yellow but the round red berries are borne singly or in small clusters of two or three. The spines generally occur singly or in twos (Fig. 6).



**PREVENT BARBERRIES FROM ESCAPING OR  
RUNNING "WILD"**

The common barberry is not native in the United States. It was introduced from Europe by the early colonists. It was cultivated chiefly as an ornamental bush and for various drinks and jellies that were made from the berries (Fig. 8). In more recent years, it has become distributed over the whole country. Since nurserymen have learned about the harmful effects of the common barberry, they have cooperated by destroying their own bushes and in assisting in the destruction of the other bushes. The common barberry has escaped from cultivation in large numbers in all of the States of the eradication area. Various kinds of birds feed com-

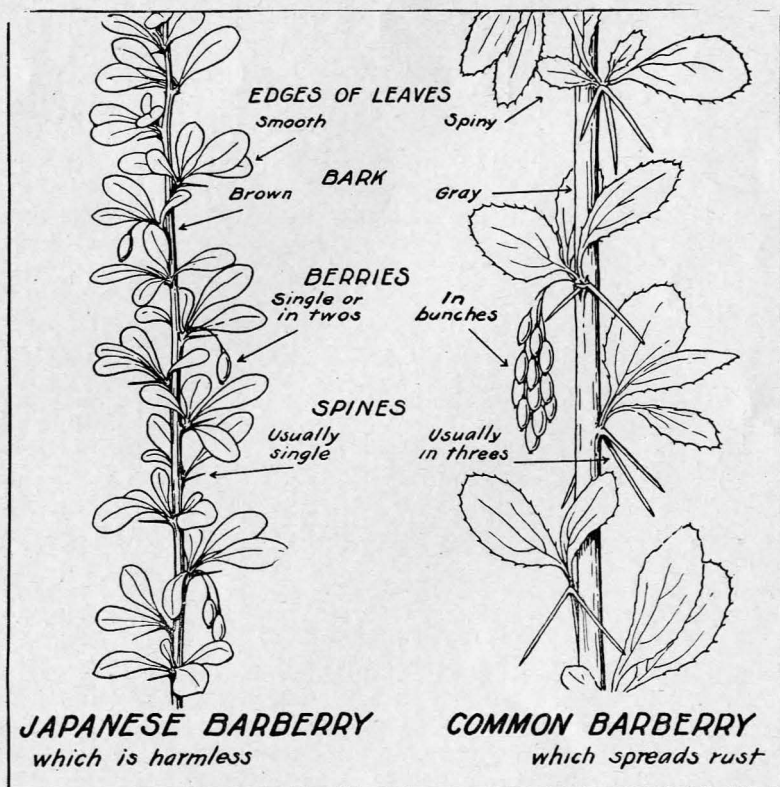


Fig. 6. Twigs of Japanese and common barberry showing the characteristic differences.



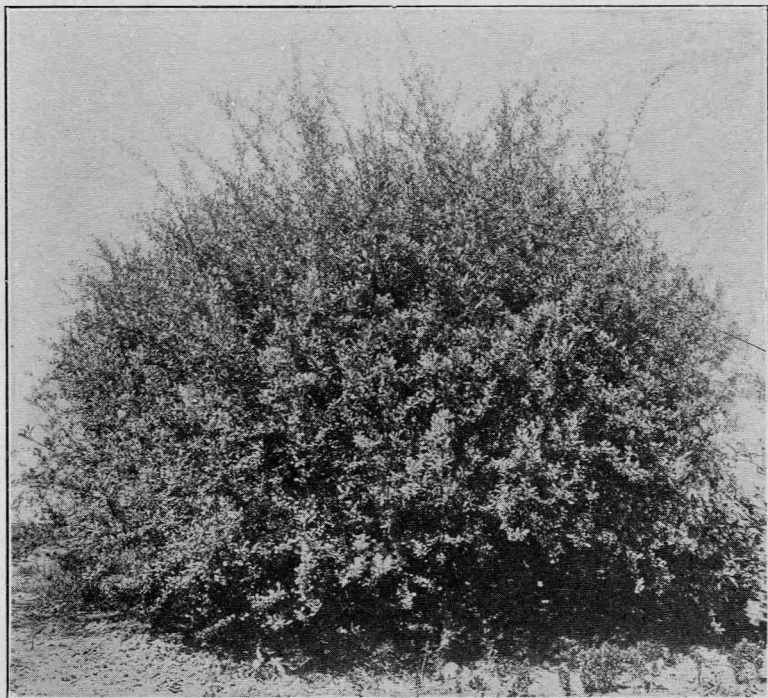


Fig. 7. A Japanese bush showing spreading habit of growth. It does not spread stem rust.

monly on the berries and seeds have become scattered in orchards, woodlots, brushy pastures, along fence rows, and on stream banks. In figure 9 is shown a typical escaped common barberry bush. In the several northern and eastern States of the area over 5,000,000 escaped bushes have been found and destroyed.

In Nebraska 5,765 escaped bushes have been found on 102 properties. These escaped bushes were found in 34 of the eastern counties. The fact that escaped bushes have been found in so many counties suggests what might happen in the future if barberries are not eradicated now. They would continue to spread and increase in such numbers that the production of grain crops would be seriously menaced by stem rust.

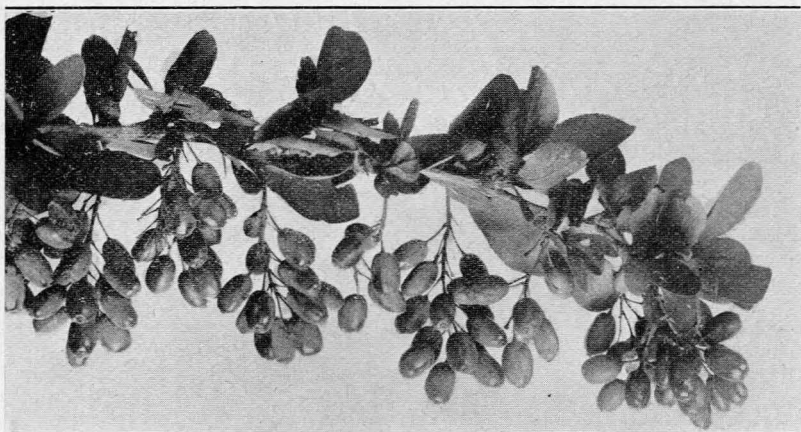


Fig. 8. A branch of the common barberry showing the clusters of berries.

#### HOW TO DESTROY COMMON BARBERRIES

The best way to kill a common barberry bush is to pile about fifteen pounds of crushed rock salt around the base of the bush. This is for bushes in which the clump of stems is approximately 12 inches in diameter at the soil surface. Proportionately more should be applied to larger and less to smaller bushes. Care must be taken to place the salt around each shoot. The plants may be cut down before treatment or they may be left standing. It is easier to find the place again when hunting for sprouts and seedlings if the bushes are left standing. Salt treatment is effective at any time of the year when the ground is not frozen. Farm animals, especially hogs and poultry, should not have access to salted bushes as too much salt may prove fatal to them. When livestock must be allowed access to salted bushes the salt should be covered with stones, brush, or dirt. As salt will kill nearby shrubbery as well as the treated barberries, property owners should dig barberries which are within four or five feet of valuable shrubs or trees.

If barberries are dug, extreme care must be taken to get all of the roots. If even a small piece of root is left in the ground it may sprout. These sprouts will soon become bushes which will continue to spread stem rust.

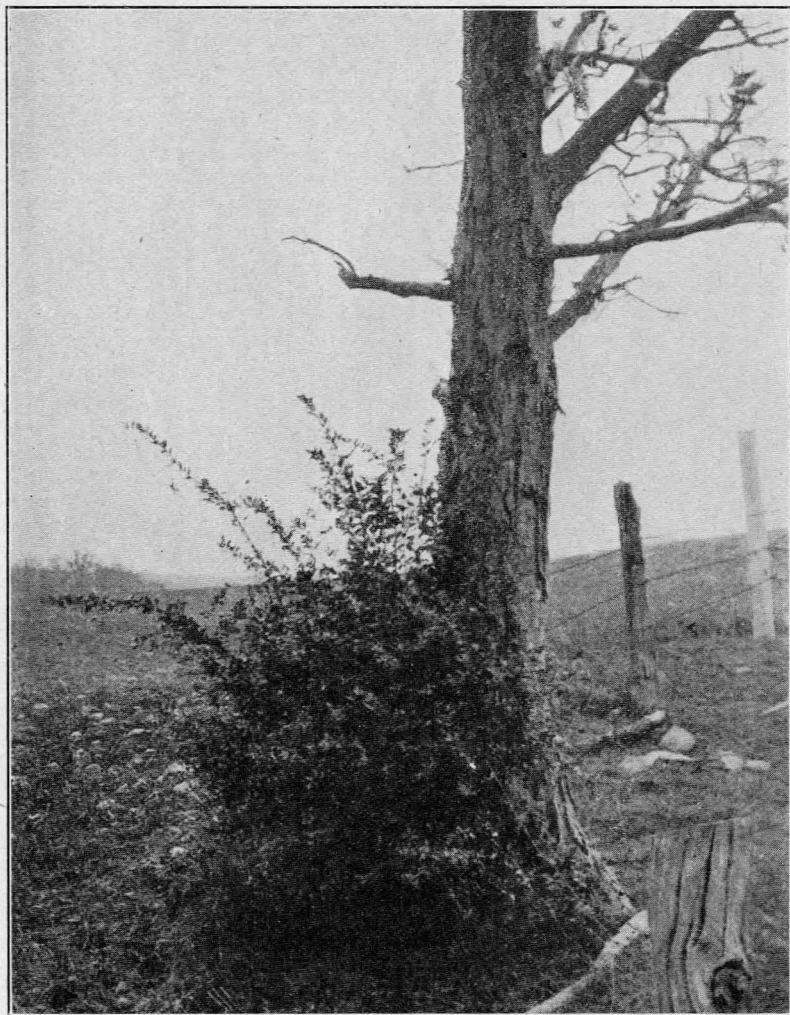


Fig. 9. A typical barberry bush which has escaped from cultivation through seeds scattered by birds.

### A SECOND SURVEY NECESSARY

It is not possible to find all of the barberries on one survey. A second survey is necessary in 46 of the eastern counties where the barberries were most numerous. It is absolutely essential that every bush be found and destroyed. A single bush remaining in each county may be the source of local stem-rust epidemics. It also may be responsible for seeds being scattered so that in time the barberries again would become widely distributed throughout the State. In the early years of the campaign, many barberry bushes were cut off or dug by the owners. No record of these locations was sent to the officers in charge of barberry eradication. When bushes are cut off or poorly dug, they invariably sprout again. When the first survey was made, these sprouts were small and covered by weeds or other vegetation. In many cases, they were missed by the field assistants. Since that time, sufficient growth has been made so that they can easily be recognized.

It is advisable to report the location of all barberry bushes to the Nebraska Agricultural Experiment Station at Lincoln, Nebraska, or to the United States Department of Agriculture. Even if the bushes are destroyed by the property owner, a report should be made. It is necessary to make a resurvey to destroy any sprouts or seedlings which may have appeared and to locate escaped bushes. Only through the cooperation of every citizen of the State can every barberry bush be found and its complete eradication be insured.

All cuts furnished by the Bureau of Plant Industry, U. S. Department of Agriculture.

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