Control and Elimination of Russian Knapweed

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CONTROL AND ELIMINATION OF

Russian Knapweed

COOPERATIVE EXTENSION SERVICE
SOUTH DAKOTA STATE UNIVERSITY
U. S. DEPARTMENT OF AGRICULTURE
Russian Knapweed

By Lyle A. Denschcid, Extension agronomist, and
Leon J. Wragg, Extension agronomist—weeds

Use of tradenames does not imply endorsement of one product over another.

Russian knapweed is a perennial weed that spreads by seeds and underground parts. Although you will seldom find patches over 25 acres in size and the weed covers less than 1,000 acres in South Dakota, it is a serious weed. It is now present on 330 farms.

Russian knapweed will invade native grass sods. Patches of Russian knapweed will spread in alfalfa fields and will spread more rapidly in cultivated fields. Once established, it will kill out all other crops. It is more difficult to eliminate than any of the other noxious weeds.

The seeds are small, rather flat and gray. They are very difficult to remove from alfalfa or sweet clover seed. Many infestations have been established by planting these small-seeded legumes containing Russian knapweed seed.

One seedling, when not competing with other plants, is able to produce in one season a root system that penetrates 2 feet deep and spreads 2 feet in each direction. In two growing seasons the roots may go down 10 feet and spread out to form a circle 10 to 12 feet in diameter. The heavy dark brown or black vertical roots send out horizontal roots that give rise to new plants.

Russian knapweed develops earlier in the spring than any of the other noxious weeds except hoary cress and leafy spurge. It normally emerges early in May and is full grown (1 to 3 feet tall) in June. The stems and leaves are covered with a short gray knap and have a distinctive bitter taste. The lavender rose or white flowers appear during late June. They are similar to small thistle flowers and are $\frac{3}{4}$ to $\frac{1}{2}$ inch in diameter. They do not always produce seed. The early, rapid, dense, rank growth gives the weed a great competitive advantage over spring-sown crops and all low growing crops.

Stands of Russian knapweed can be reduced 75 to 90% in a relatively short time; however, the remaining 10 to 25% are considerably more difficult to kill. The weed can be almost completely eliminated while growing crop sequences adapted to South Dakota without serious soil deterioration. However, continuous pressure must be exerted from competitive crops, cultivation, or chemicals for a period of 3 to 5 years.

Follow the Label

Federal regulations make it unlawful for any person to use an herbicide in a manner inconsistent with its labeling. This includes the kind of crop and weed; rate, carrier and other application directions; storage, disposal and protective clothing; or other precautions stated. Herbicide rates suggested in this publication are based on satisfactory performance in research tests. Higher rates of chemical required to control perennial weeds may result in crop damage under some conditions. Some herbicide product labels do not include these rates. Read the label first, not afterward.

REDUCE STANDS 75 TO 90%

Combinations of cultivation, cropping, and chemicals can reduce the stand of Russian knapweed 75% or more in 1 year.

Intensive Cultivation. Cultivation, from immediately after small grain harvest until freezeup (Oct. 15), followed with a full year of intensive cultivation (May 15 to Oct. 15) the next year, will kill a high percentage of the weeds. Sometimes there will be stragglers to clean up the next year. In other cases a single year of cultivation will kill 85 to 90% of the weeds.

A duckfoot field cultivator is one of the few implements that will cut the heavy tough roots of Russian knapweed. If there is considerable plant residue on the area, use the moldboard plow for the first operation. Equip the cultivator with wide sweeps (12 to 24 inches) that overlap 3 to 4 inches. Keep them sharp; be sure they are flat when in the soil and operating at a depth of 4 to 5 inches.

It takes 7 to 10 days for new shoots to emerge after the roots have been cut. Another 7 to 10 days elapse before there are enough leaves to produce more food than is needed for growth. Therefore, little plant food is stored in the roots and the root reserves are being used for plant growth for a period of 14 to 20 days after each cultivation.

Cultivate every 2 weeks during good growing conditions and every 3 weeks during dry, hot weather when plants are growing less rapidly. This generally means that cultivation should be done at 2-week intervals during May, June, and July and 3-week intervals during August, September, and October.

Centurea repens L.
Cultivation and Summer Crops. A close-drilled crop of sudangrass is more strongly competitive than most other crops. Spray during August with 1½ pounds of 2,4-D ester per acre. Cultivate three times before seeding the crop during late June. Harvest the crop, fall plow, and cultivate once or twice. This system reduces the stand of knapweed about 70 to 80% in 1 year. It is not effective if either the fall spraying or spring cultivation is omitted.

Cultivation and Forage Crops. Cultivate with a duckfoot cultivator every 2 weeks between May 15 and August 15. Seed bromegrass or crested wheatgrass at the rate of 12 pounds per acre. Spray the grass with 1 to 1½ pounds of 2,4-D ester twice the next year. This system frequently reduces the stand of knapweed 75 to 90%, but is much less effective if the cultivation or spraying is omitted.

Grazing. Grazing sheep will considerably reduce the stand of knapweed. Start grazing during early spring. Rotate cattle ahead of the sheep, if the sheep do not keep the grass grazed. Heavy grazing will eliminate as much as 75 to 85% of the weed in 1 year. Intensive overgrazing is required to eliminate the remaining plants and sometimes does not do it.

REduce STANDS 10 TO 30%

Several combinations of crops, cultivation, and 2,4-D spraying reduce the stands of Russian knapweed 10 to 30% in 1 year.

Small Grain and 2,4-D. Russian knapweed starts early in the spring and gets ahead of spring-seeded grain. Use ½ to ¾ pound of 2,4-D ester per acre when the grain is in the 5-leaf stage to prevent the weed from going to seed and also weaken some plants. These are the lowest rates that can be used to keep the weed in check. Some crop injury may be noted. Wheat and barley are more tolerant than oats to 2,4-D ester. After treatment the small grain gets ahead of the weed and holds it in check until harvest. Spray after harvest with 1½ pounds of 2,4-D ester per acre to kill some of the weakened plants. Stands were reduced about 10% in experiments that were sprayed about 2 weeks after harvest. Late summer spraying appeared to be more effective than fall cultivation for killing weakened plants.

Cultivation and Summer Crops. A close-drilled crop of sudangrass is more strongly competitive than most other crops. Cultivate three times before seeding the crop during late June. Harvest the crop, fall plow, and cultivate once or twice. This system reduces the stand of knapweed about 30% in 1 year. Close-drilled soybeans, forage sorghum or buckwheat should be equal to sudangrass.

Cultivation and Forage Crops. Cultivate with a duckfoot cultivator every 2 weeks between May 15 and August 15. Seed bromegrass at the rate of 12 pounds per acre or alfalfa at the rate of 8 pounds per acre. The stand of knapweed is generally reduced 10 to 20% by this system.

Bromegrass and 2,4-D. Spray in the grass with 1½ pounds of 2,4-D ester during early June and again in late August. This system reduces the stand of Russian knapweed 10 to 15% each year. Consequently, this system alone requires considerable time to reduce the stand of Russian knapweed materially and seldom gives 100% elimination. It is useful as a follow-up to a system that includes a season of cultivation prior to seeding the grass. It is expected that other sod forming grasses would be as effective as bromegrass in areas where they are adapted.

PREVENT SPREADING

Spraying with 2,4-D in small grain or corn does not reduce the stand of Russian knapweed, but does keep it from spreading to any great degree. Spray either crop with one-half pound of 2,4-D ester per acre.

After the corn has tasseled, spray with a high-clearance sprayer, equipped with drop nozzles, with 1½ pounds of 2,4-D ester per acre.

Plow small grain stubble about 2 weeks after harvest and cultivate two or three times during September and early October with a duckfoot cultivator. A sharp 24- or 30-inch sweep cultivator would be an effective substitute for the plow and duckfoot cultivator. It would leave a stubble mulch on the soil surface. This system is useful when included in a rotation which also includes systems that materially reduce the stand.

Winter grain has some advantage over spring grain in that it keeps the soil covered over winter and starts growth earlier in the spring. However, early fall seeding prevents late cultivation.

2- to 4-YEAR PROGRAM

Nine of 42 combinations of crops, cultivation and spraying that were tested are given in Table 1. Several methods that did not give satisfactory results are shown to illustrate the need for a year-round program each year.

Treatments 2,3,4 and 8 are the best combinations because they keep control pressure on the weed all year each of 3 years. Failure to follow through during the fourth year allowed the weed to become thicker. Although 2,4-D was used several times in each treatment, intensive cultivation or a non-selective chemical was used whenever possible. They are more effective when trying to eliminate strains of the weed that are resistant to 2,4-D.
SMALL PATCH CONTROL

Semi-Selective Herbicides in Pasture and Range

The following treatment is intended to give 90-100% elimination of small patches of Russian knapweed in grass pasture and range. Refer to Table 2 for the amount of product required for one square rod. Control seedlings and stragglers emerging in following seasons with an annual 2,4-D application.

1. Picloram (Tordon 22K) at 2 lb/A acid equivalent. This rate is minimal and some regrowth has been noted one or two years after treating. Follow application directions, precautions and limitations on the label.

Table 1. The Average Percentage of Russian Knapweed Killed in 4 Years

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Amount per Acre</th>
<th>Cost per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SMALL PATCH CONTROL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Semi-Selective Herbicides in Non-cropland</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Numerous chemicals are effective for eliminating patches (weed nurseries) with one treatment applied to the patch and a band 6 or 8 feet wide around the outside of the patch. It kills plants in the patch and roots that extend beyond the patch. Seedling growth may appear after two or three years. These young plants can be eliminated with a 2,4-D application. Many new semiselective chemicals do not permanently injure perennial grasses, but will prevent crop growth for two or more years.

The chemicals listed in Table 2 generally give 95 to 100% elimination when applied at the rates designated. Rates are given in pounds, pints, or fluid ounces of commercial product for each square rod. Use the higher rates for summer application for those chemicals indicating a range of treatment rate.

Federal regulations concerning the use of these herbicides on cropland, pasture or range change from time to time. Therefore, it is necessary to read the label on the chemical container or consult the local county agent to determine if the chemical is cleared for use on cropland or grazing land.

PREVENT REINFESTATION

Once the old Russian knapweed plants have been killed, the seeds in the soil will produce new plants for several years. Seedlings can be killed with an application of one-third pound of 2,4-D each year. However, any old plants that may not have been eliminated require more drastic treatment to prevent them from spreading. An application of 2,4-D in the crop and either a late summer spraying in the stubble or late summer and fall cultivation are required to prevent old plants from spreading by underground roots.
Eight of the twenty 4-year treatments tested are shown in Table 3.

Although these plots had been intensively cultivated for one year, before the beginning of the experiment, there were a few plants remaining on each plot. Ordinary farming practices in treatment 1 allowed these established plants to produce new plants and the stand was over seven times as thick at the end of 4 years as it was at the beginning of the experiment. Treatments 2, 3, 4, 6, and 8 held these old plants in check for two years. The plants had not recovered from the shock of intensive cultivation before the experiment was initiated. However, they regained vigor during the third year and treatment 8 was the only treatment that prevented reinfestation for 4 years.

REDUCE STANDS IN SHELTERBELTS

AMS as suggested in Table 2 has been used to drastically reduce stands of Russian knapweed in tree plantings. No injury to trees has been reported, however AMS currently is not labeled for use in tree plantings. The manufacturer of the chemical is not responsible for any problems which result from this use. None of the other chemicals listed in Table 2 should be applied closer to a tree than the "drip line."

To reduce stands 10 to 25% in one year use 1 ½ lbs. 2,4-D acid equivalent per acre twice each season (early June and late August). Use very low volatile formulations of 2,4-D such as an emulsifiable acid formulation or an oil soluble amine formulation (tradenames "Weedone 638," "Emulsamine 3E," or "Dacamine"). To reduce stands 25 to 50% in one year, use amitrole-T (tradenames "Cytrol" or "Amitrol-T") at ½ lbs. active ingredient per acre. Do not allow spray drift to contact leaves of trees; it will cause injury. Amitrole and amitrole-T are labeled for use on noncropland areas only. Do not harvest or graze food or feed from treated areas.

### Table 3. Reinfestation by Russian Knapweed on an Area After the Weed Had Been Almost Eliminated

<table>
<thead>
<tr>
<th>Original no. of plants per sq. yd.</th>
<th>First year</th>
<th>Second year</th>
<th>Third year</th>
<th>Fourth year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>% original</td>
<td>Treatment</td>
<td>% original</td>
<td>Treatment</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------</td>
<td>-------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>1. 2.3 Oats</td>
<td>54</td>
<td>Oats</td>
<td>87</td>
<td>Wheat</td>
</tr>
<tr>
<td>2. 1.6 Oats, ½ lb</td>
<td>12</td>
<td>Oats, ½ lb</td>
<td>64</td>
<td>Wheat, ½ lb</td>
</tr>
<tr>
<td>3. 0.4 Oats, ½ lb and 1 lb</td>
<td>14</td>
<td>Oats, ½ lb and 1 lb</td>
<td>14</td>
<td>Wheat, ½ lb and 1 lb</td>
</tr>
<tr>
<td>4. 1.6 Oats, ½ lb, cult</td>
<td>15</td>
<td>Oats, ½ lb and cult</td>
<td>19</td>
<td>Wheat, ½ lb, cult</td>
</tr>
<tr>
<td>5. 1.1 Oats, ½ lb and 1 lb</td>
<td>34</td>
<td>Corn, ½ lb</td>
<td>122</td>
<td>Wheat, ½ lb and cult</td>
</tr>
<tr>
<td>6. 1.8 Oats, ½ lb, cult</td>
<td>50</td>
<td>Corn, ½ lb</td>
<td>75</td>
<td>Wheat, ½ lb, cult</td>
</tr>
<tr>
<td>7. 1.1 Oats, 2 lb 4(2,4-DB)</td>
<td>78</td>
<td>Cult, sudan</td>
<td>177</td>
<td>Wheat, ½ lb and 1 lb</td>
</tr>
<tr>
<td>8. 6.1 Oats, 2 lb 4(2,4-DB)</td>
<td>80</td>
<td>Sweet clover, cult</td>
<td>61</td>
<td>Wheat, ½ lb and 1 lb</td>
</tr>
</tbody>
</table>

*"Lb" refers to amount of 2,4-D or 4(2,4-DB) applied per acre. "Cult" refers to intensive cultivation.*