University of Idaho
College of Agriculture

Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 584

April 1981

WILD OAT Cultural Control

G. A. Lee, D. C. Thill and W. J. Schumacher

Wild oat is well adapted to most regions of the world where small grain crops are grown. Native to Europe and Asia, wild oat has been introduced worldwide. The characteristics of high reproductive capabilities and persistence over a wide range of environmental conditions have allowed wild oat to become one of the most serious weed problems of cultivated land.

Scope of the Problem

Wild oat infests 85 percent of Canada's cropland and is the most widespread and troublesome weed there. In the U.S., more than 28 million acres are infested with wild oat, resulting in an estimated annual yield loss and production cost of $303.625 million.[1]

In Idaho, more than 3 million acres of cropland are infested with wild oat (Fig. 1). Idaho's crop losses caused by wild oat infestations have been estimated to exceed $34 million annually. These losses are from yield reductions; harvesting, transportation and storage costs; dockage, cleaning and lowering of grade and quality of crops; and cultural and chemical control practices.

Yield reduction is the greatest factor contributing to crop losses resulting from wild oat infestations. Small densities of wild oat can cause significant yield reductions in cereal grains, peas, sugarbeets and other crops. Several studies have indicated the importance of early and complete control of wild oat.[2] Fig. 2 shows the influence of various wild oat population densities on the yields of cereal grains. Fig. 3 shows the relationship between grain yields and the length of time during which crops and wild oat remain in competition.

Wild oat infestations are increasing in both area and intensity, causing control to become more important. Reasonably good chemical and cultural control methods have existed for several years, yet the wild oat problem is getting worse.

Wild oat populations are able to persist and intensify because of genetic and environmentally induced variability within the species. Wild oat has been able to adapt to the technological changes in agriculture that have taken place. For instance, with the advent of the modern combine, much of the wild oat seed that used to be removed from the field with the grain now ripens and shatters before harvest operations begin.

Dormancy and genetic variability within wild oat seeds allow them to germinate and emerge over an extended period of time and a wide range of environmental conditions. This adaptation usually allows a certain percentage of wild oat plants to escape various control practices. The constant use of a limited number of chemical and cultural control practices has resulted in the selection of strains of

[1]WSSA Wild Oat Situation Report. 1976.

[2]*See* Chancellor, R. J. and N. C. B. Peters. 1976. Competition between wild oats and crops, Wild Oats in World Agriculture, ed. D. P. Jones, pp. 99-112, London: The Whitefriars Press; Lee, G. A., M. E. Coleman-Harrell and G. A. Mundt. 1980. Wild oat competition and crop loss. CIS 541. Univ. of Idaho, Moscow.

22

wild oat that can either escape or tolerate these control measures.

Because of this inherent ability of wild oat to adapt and survive, control programs must include several types of practices. Integrated control programs prevent the selection for a strain of wild oat that is highly adapted and tolerant to a narrow range of control methods. Control programs must have as their goal the complete control of wild oat. Inadequate control programs will allow wild oat infestations to persist and increase.

Weed Management

Idaho farmers should develop detailed weed management programs. Wild oat, as well as many other weeds, should be the targets of specific weed programs. Programs should involve strong cultural control practices (including tillage and crop rotations) and the use of herbicides that together will provide optimum weed control. Success for this kind of management program depends on the growers' sustained effort and commitment.

Prevention

A fundamental aspect of any weed management program is the prevention of wild oat spreading to noninfested fields. A program should include:

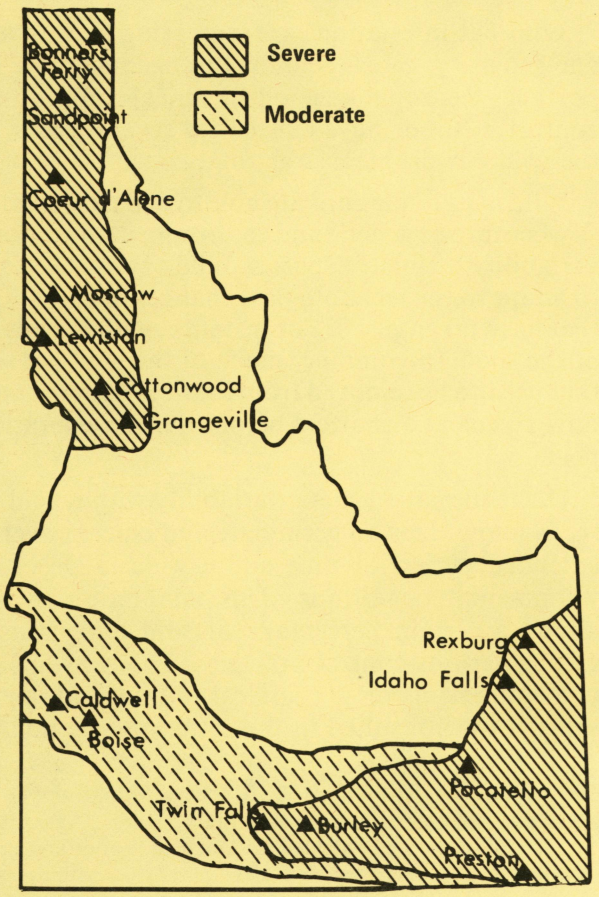

Fig. 1. Wild oat infestations in Idaho.

- Planting certified seed free of wild oat.
- Fermenting or treating manure to reduce viability of weed seed.
- Cleaning harvest equipment thoroughly between fields to remove wild oat seed.
- Keeping ditch banks, fence rows and other noncrop areas free of wild oats by mowing, cultivating, burning or chemical control.

A prevention program will eliminate both the need for subsequent wild oat control in crop areas and the resulting economic impact on potential crop production.

Cultural Control

Several cultural practices for wild oat control have been developed and include: (a) summer fallow, (b) delayed seeding, (c) postseeding cultivation,

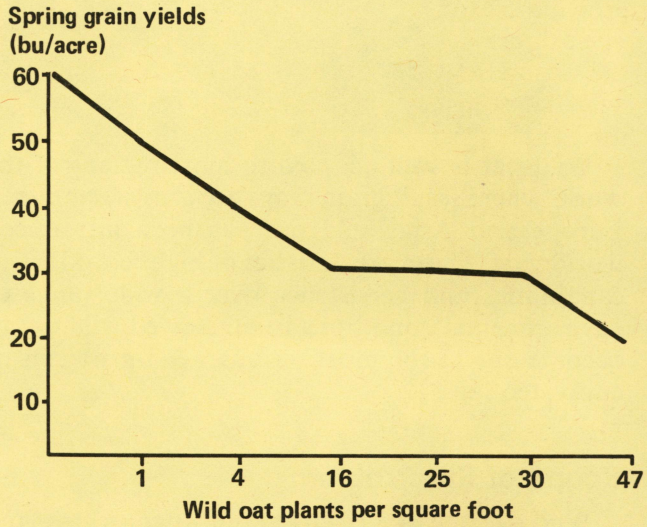

Fig. 2. The influence of wild oat population densities on the yields of spring grains.

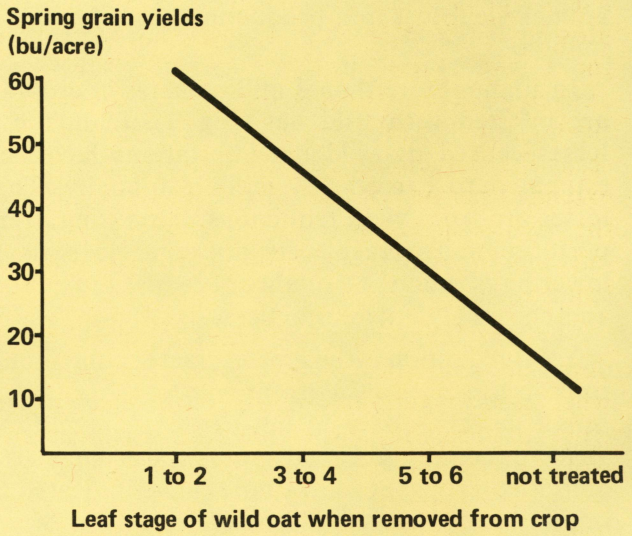

Fig. 3. Relationship between wild oat competition duration and yields of spring grains.

(d) greenfeed crops, (e) fall tillage, (f) choice of competitive crops and (g) forage crops.[3] All of these practices are valuable as control measures, but each has its limitations.

A single wild oat plant can produce 250 or more seeds. If a control practice provides only 99 percent control, the single uncontrolled wild oat plant out of each 100 plants per square yard will maintain or even increase the infestation and reduce crop yields. Cultural methods should be coupled with herbicide use to get 100 percent control of wild oat.

Summer Fallow

Wild oat seeds require a cool, moist, aerated soil condition for germination (see University of Idaho Current Information Series 540, *Wild Oat: Identification and Biology).* Thus, the main germination of wild oat occurs in the late fall and early spring.

Only a few wild oat plants emerge during the growing season. If the soil is moist, summer fallow operations may stimulate seed germination. Later in the season, however, when soils are hot and dry, few wild oat seeds will germinate and emerge. Therefore, these plants will not be susceptible to control by tillage operations.

Your cultivation must be thorough but shallow. Shallow cultivation will aerate the top 2 inches of soil, promoting seed germination while leaving a dry mulch on top of the soil. This operation will cause the wild oat seedlings to dry out. Implements you can use are spring-toothed harrows, rolling harrows, triple-Ks, flex-tine harrows and rod-weeders. These implements should be equipped and adjusted to achieve thorough but shallow cultivation.

Deep plowing is not preferred. Such plowing will turn up soil containing many weed seeds, will bury wild oat seeds that can later germinate and will dry out the soil. When plowing is necessary, however, use a chisel plow rather than a moldboard plow. Chisel plowing will leave most of the wild oat seeds in the top 1 inch of soil. Repeated moldboard plowing causes an even distribution of wild oat seeds throughout the top 7 inches of soil. These wild oat seeds that are buried deep will remain dormant for extended periods of time. In contrast, the seeds in the shallow layers of soil near the surface will germinate more readily and be susceptible to your control measures.

Summer fallow alone is generally not the most desirable wild oat control technique. However, when used in combination with other cultural control activities, you can obtain effective wild oat control.

[3]Banting, J. D. 1974. Growth habit and control of wild oat. Canada Dept. of Agr. Pub. 1531, pp. 20-23. Ottawa: Mutual Press.

Table 1. The influence of delayed and normal seeding dates on percentage of wild oat control and grain yield.

	Grain yield		Wild oat plants		
	Normal seeding	Delayed seeding	Normal seeding	Delayed seeding	Control wild oat
	(bu/acre)		(#/sq yd)		(%)
Barley	32	29	41	36	12
Barley	27	36	50	11	78
Wheat	11	8	170	9	95

Costs of energy and fuel are of utmost importance. Fallow operations are becoming increasingly expensive and frequently do not give adequate control of wild oat.

Delayed Seeding

Delayed spring seeding is considered one of the most effective cultural control methods. This practice uses early and shallow spring cultivation to stimulate wild oat seed germination. You then can kill emerged wild oat plants by cultivation just before seeding. An early-maturing spring grain variety must be used when seeding is delayed.

If an early spring cultivation is not used, up to 3 weeks may elapse before the first flush of wild oat has emerged. This long a delay in final cultivation and seeding is not recommended.

Canadian experiments have been conducted using delayed seeding as a wild oat control measure.[4] Table 1 shows grain yields and wild oat control resulting from delayed seeding at three Canadian locations. Wild oat control ranged from 12 to 95 percent. Grain yields were often reduced compared to the normal seeding dates.

Several factors may contribute to poor results with this cultural practice. Delaying the planting date may mean that the crop goes in at the end of the moisture season. The maturity of the crop may be delayed, making the crop susceptible to moisture stress or early frost damage.

Wild oat plants may be transplanted by cultivating cool, moist soils, thus lowering control. Weather conditions greatly influence the results of this practice, and results may be inconsistent from year to year.

A vigorously growing, competitive crop is essential in a delayed seeding situation. Good fertility levels of nitrogen and phosphorus must be maintained when the crop is sown late. Nitrogen fertilizers will help produce a vigorous crop, and phosphorus will hasten both initial crop growth and maturity.

Wild oat responds equally well to fertilization. Thus, a fertilization program must be accompanied

[4]Banting, J. D., *loc. cit.*

by a wild oat control program. A heavy seeding rate may also be useful. A dense crop stand will compete strongly against late emerging wild oat plants.

Greenfeed Crops

When wild oat densities are very high, and other control measures have not been implemented or have failed to provide satisfactory results, the crop and wild oat plants can be cut for greenfeed or silage. This should be done when the wild oat panicles start to emerge from the sheath.

This practice serves two purposes. First, it provides an economical use of a crop which would produce considerably poor yields. Secondly, it prevents reinfestation of new wild oat seeds into the field.

Florets in the top portion of the wild oat panicle can produce viable seed (seed capable of reproducing) if wild oat plants are cut after pollination occurs. When this is the case, viable seed can be killed in silage.

Soon after cutting the crop, you should cultivate the field to prevent regrowth. If necessary, you can use a partial summer fallow program.

Fall Tillage

Shallow fall tillage can promote germination of wild oat seeds. The effectiveness of this practice depends on the amount of dormancy in the wild oat seeds and the number of seeds which are exposed to conditions that will support germination. Warm, dry weather for 2 to 3 weeks before tillage will hasten the loss of seed dormancy. The seeds left on top of the soil will not germinate as readily as those which are lightly covered by soil or debris. Wild oat plants that emerge in the fall may be winterkilled if exposed to temperatures of 15°F or below for at least 7 days.

Fall cultivation is debatable because soil and climatic conditions greatly influence results. Also, fall tillage reduces stubble and snow cover which may lead to increased soil erosion problems.

Choice of Competitive Crops

Fall-planted cereal crops such as rye, winter wheat and barley and triticale are more competitive against wild oat than spring-planted cereals. As a spring-seeded crop, barley is more competitive than wheat. The cereal crops are generally better competitors than broadleaf crops such as rape, peas, flax or lentils.

Plants established in the fall will resume growth early in the spring before wild oat plants emerge, reducing the vigor of later starting wild oat plants. Seedbed preparation in the fall also stimulates wild oat seed germination, and fall-emerging wild oat plants may be winterkilled.

Forage Crops

Forage crops, such as grasses and legumes, will provide strong competition against wild oat. These crops must be grazed or cut before wild oat pollination to prevent reinfestation of new wild oat seeds into the fields. Wild oat seeds will remain dormant and viable for longer periods in sod than in cultivated soil.

Summary

Cultural control methods can be of great value in the fight against wild oat. Several factors, however, can contribute to poor results. Unfavorable weather is the greatest factor weakening wild oat control. Other factors contributing to poor wild oat control are:

- Failure to use clean seed.
- Early seeding in infested fields.
- Deep cultivation.
- Early fall cultivation before the wild oat seeds have ripened.
- Cultivation of wild oat plants on cool, moist days.

The most important elements of a wild oat control program are broad rotation of crops and a combining of cultural and chemical control operations. Limited crop rotations and a narrow range of control techniques will quickly lead to wild oat varieties that are able to survive and increase the problem.

A continuous change of environments that you can bring about by combining agronomic practices will tend to avert natural selection for wild oat strains. New strains of wild oat will exhibit high degrees of adaptation, making control more and more difficult.

The Authors

G. A. Lee is professor of weed science and head of the Department of Plant and Soil Sciences, University of Idaho, Moscow. D. C. Thill is assistant professor of weed science and W. J. Schumacher is a scientific aide, both in the department of Plant and Soil Sciences.

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