



University of Idaho
College of Agriculture

Current Information Series No. 541

Cooperative Extension Service
Agricultural Experiment Station

August 1980

WILD OAT

Competition and Crop Loss

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The ability to reproduce quickly and adapt readily to a wide range of environmental conditions has made wild oat one of Idaho's most serious weed threats. Even the slightest infestations on cultivated land can have an economic impact, causing significant yield reductions in wheat, barley, peas, flax, sugarbeets and other crops.

How much wild oat reduces yields depends on the degree of infestation, time of weed emergence and removal, available soil moisture and nutrients, and the crop's competitive ability and yield potential. Fall-planted crops, such as rye, winter wheat, winter barley and triticale, are generally more competitive against wild oat than spring-seeded crops like spring grains, flax, peas, lentils and sugarbeets.

Factors of Crop-Wild Oat Competition

Competition begins when the supply of water, light or mineral resources falls below the combined requirements of the crop and the weed. The competitive effect is most intense when the competing species are alike in vegetative habits, methods of reproduction and demands upon the environment. A weed species can be especially successful in competition if it has a high seed germination rate under adverse conditions, develops a dense foliage rapidly in the seedling stage, grows tall and produces an extensive root system.

Moisture

Moisture is the most important resource to competing plants under cultivation. Because wild oat has an extensive and deep root system, it generally can utilize soil moisture more efficiently than the

plants with which it competes. When competition for soil moisture is a prime factor in survival, the crop may suffer permanent damage early in the season in the form of a reduced root system and less foliage production.

Light

Light is the second most important resource in plant competition. Taller plants successfully compete for light by overshadowing shorter plants. That means weeds that emerge before the crop plants grow above them and produce dense foliage which can reduce light intensity to the crop. For most crops grown in Idaho, wild oat fits these criteria exactly. Where light is the primary factor in competition, the damage caused by wild oat will not be evident until later in the growing season when the weed has attained some height.

Mineral Nutrients

Mineral nutrients comprise the third most important resource to competing plants. How well plants take up nutrients is generally affected by how much moisture is available. Because plants differ in their rates of root elongation and development, individual species have different potentials for moisture and nutrient absorption. For example, wild oat plants can utilize soil nitrogen as well as winter wheat and better than spring barley. When nitrogen fertilizer is applied, seed yields generally rise for both cereal crops and wild oats.

Indeed, adding nitrogen to the soil has been reported to either cause no change in crop-weed relationships or actually to further reduce crop yield. This holds for wild oat, with several studies showing that the total yield loss from this weed in

53
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wheat and peas is greater in fertilized than in unfertilized fields.

Population densities of the weed and crop also are important considerations in plant competition. A full stand of vigorous crop plants can play a significant role in full-season weed control. Competition from a dense and vigorously growing crop may reduce the competitive influence of the wild oat population and may also aid herbicides by decreasing the weed's vigor.

How soon weeds emerge and how long they remain in a crop greatly influence the degree of yield reductions. Wild oat plants are most damaging to crops when the weeds emerge before or with the crop and persist throughout the growing season. Delayed seeding has helped increase the competitive ability of spring-planted crops over wild oat plants that germinate early but are susceptible to light tillage operations.

Some plants can harm other plants through production of chemical compounds emitted into the environment, an effect known as allelopathy. Wild oat is suspected of having an allelopathic potential, which could in part account for high yield reductions even where wild oat populations are light.

Crop Losses

While crop losses also can occur through added costs and lower crop quality, wild oat causes the greatest loss by reducing yields. Grain yields suffer due to fewer tillers and heads per length of row. In sugarbeets, wild oat causes smaller beet roots with lower sugar content. In peas, the result of a wild oat infestation is fewer filled pods per plant. In newly planted bluegrass seed crops, wild oats can delay establishment and seed production. Yield reduction is influenced by both the population density of wild oat and the length of time the crop and weed compete.

Studies conducted by the University of Idaho in 1976 and 1977 showed that only a slight infestation

of wild oat — one plant per square foot — significantly reduced yields in both spring wheat and barley (Table 1). Note that the presence of even four wild oat plants per square foot, considered a mild infestation, resulted in the loss of more than a third of the crops' yield potential, and half of the grain yield was lost when 16 wild oats per square foot grew amid the crops throughout the season.

These data demonstrate three important aspects of wild oat competition:

- The first few wild oat plants per square foot cause the greatest yield reductions in small grains.
- Half of the crop yield can be lost as a result of moderate infestations.
- The greater the population density of wild oat, the lower the crop yield, although not directly proportional (Fig. 1).

These studies also found a direct relationship between spring grain yields and the length of time wild oats were allowed to remain in the crop (Table 2 and Fig. 2). When they were not removed until the 3 to 4 leaf stage, wild oats greatly reduced grain yields. Once they reached the 5 to 6 leaf stage, there was little difference between removing the weeds or allowing them to mature.

These data demonstrate three other important aspects of wild oat competition:

- Wild oat plants must be eliminated very early from the crop in order to maximize crop yields.
- The longer wild oats remain in the crop, the lower crop yields will be.
- Differences in yield reductions may not exist between eliminating wild oats in the 5 to 6 leaf stage or allowing the weeds to mature.

In other UI studies, C. I. Seely, professor emeritus of weed science, determined that dry pea yields are affected by one wild oat plant per square yard (Table 3). Competition between peas and wild oats began when the weeds were at the 2 to 3 leaf stage.

Table 1. Average percentage spring wheat and spring barley yield reductions resulting from various wild oat population densities.

Wild oat plants (per sq. ft.)	Spring wheat yield reduction (%)	Spring barley yield reduction (%)
0	0	0
1	12	18
4	34	35
16	50	35
25	51	—
30	—	51
47	65	—

Table 2. Yield reductions of spring wheat and spring barley resulting from exposure durations to wild oat populations.

Stage of wild oat when removed from crop	Spring wheat yield reduction ¹ (%)	Spring barley yield reduction ² (%)
1 to 2 leaf	0	0
3 to 4 leaf	18	20
5 to 6 leaf	50	44
Not removed	55	53

¹Wild oat population density in spring wheat was 25 plants per square foot.

²Wild oat population density in spring barley was 30 plants per square foot.

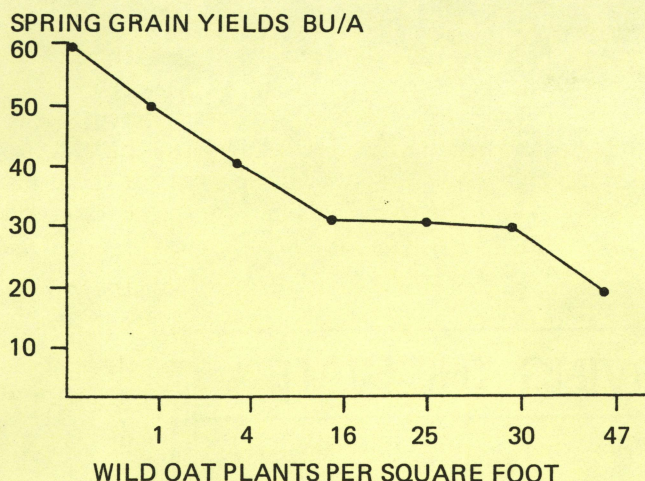


Fig. 1. Influence of wild oat population densities on yields of spring grains.

Table 3. Percentage dry pea reductions resulting from various wild oat population densities.

Wild oat plants (per sq. yd.)	Yield reduction (%)
0	0
1	9
2	15
4	31
7	33
12	38
20	45
37	51
66	67

Table 4. Influence of durations of wild oat competition on dry pea yields.

Time of removal after emergence	Wild oat stage	Dry pea yields (lb/acre)
Wild oat free	—	2749
2 weeks	2 to 3 leaf	2474
3 weeks	4 to 5 leaf	2089
4 weeks	tillering	1539
Not removed	to maturity	1100

Table 5. Wild oat densities at University of Idaho research sites and resulting wheat yields.

Location	Common wild oat (density/sq. ft.)	Average wheat yields	
		Wild oat-free	Weedy
Rexburg	less than 60	70	36
Idaho Falls	30-40	75	40
Twin Falls	10-15	90	60
Grangeville	30-200	55	16
Greencreek	20-120	68	23
Moscow	15-47	75	30
Tensed	25-40	90	45
Bonnors Ferry	20-30	90	50

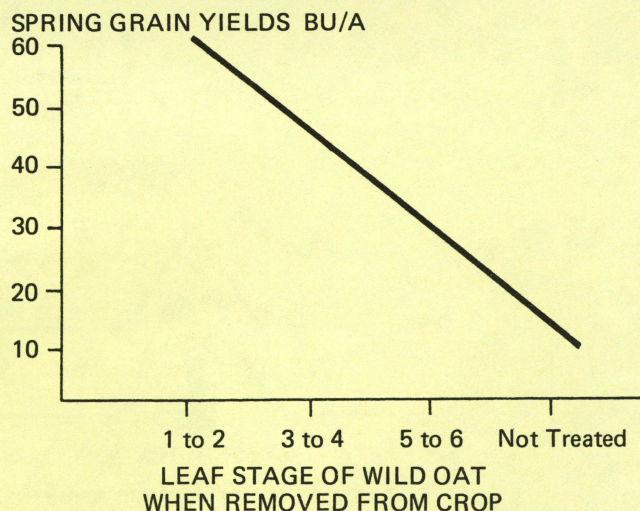


Fig. 2. Relationship between wild oat competition duration and yields of spring grains.

Table 4 shows how pea yields dropped as the duration of wild oat competition increased.

Wild oat contributes to crop losses in still other ways. A 1975 survey found that 75 percent of grain samples showed 2½ to 10 percent dockage due to wild oat seeds. That could mean a dockage loss of 10 or more bushels of grain per acre. Cleaning grain to reduce dockage also costs money, as does transporting and storing wild oat seeds along with grain seed. A grower who moves and stores 10,000 bushels of grain, 10 percent of which is wild oat seed, is essentially handling 1,000 bushels of wild oat seeds.

All these costs can be reduced or eliminated through careful prevention and control measures. While these measures add to production costs, they represent the smallest amount of crop loss expenses.

Wild Oat Densities in Idaho

Population densities of wild oats in Idaho can be broadly grouped into severe and lighter categories. Several prime grain producing areas in Idaho are severely infested also. The Palouse and Camas Prairie in northern Idaho and the area around Rexburg in eastern Idaho may have infestations of 100 to 200 wild oat plants per square foot. Such heavy infestations can essentially eliminate grain yields. (See Wild Oat: Identification and Biology, University of Idaho Current Information Series 540.)

Lighter wild oat infestations occur throughout the cultivated portions of the state. Table 5 shows common wild oat densities for various areas in Idaho and the resulting yield losses.

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