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CONTROL OF VOLUNTEER CROP PLANTS

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INTRODUCTION

Crop plants that volunteer in planted crops are considered weeds. Volunteer crop plants present the farmer with many of the same problems associated with traditional weeds: they reduce yields of the planted crop by competing for moisture, nutrients, and light, serve as hosts for diseases and insects that attack the planted crop, and interfere with harvesting operations. Volunteer crop plants also can reduce the quality of the harvested crop.

Under favorable climatic conditions, tillage practices, and crop rotations, almost any crop can volunteer in the subsequent crop. Some examples of crops that frequently volunteer are alfalfa, asparagus, barley, cereal rye, corn, dill, Jerusalem artichokes, potatoes, rape, and winter wheat.

CONTROL STRATEGIES

To control volunteer crops successfully, farmers usually must combine strategies. The following methods, alone or in combination, can control volunteer crops.

1. **Prevention.** Early harvest of crops reduces seed shattering and subsequent volunteers. Thorough or clean harvesting of crops also prevents or greatly reduces the amount of seed left in the field.
2. **Hand roguing.** If volunteer crop plants are not too dense, remove them by hand pulling or cutting.
3. **Tillage.** Depending on the volunteer crop, shallow tillage or deep plowing can prevent crop plants from volunteering. Some volunteer crop plants can be controlled by timely, shallow cultivations in the subsequent crop.
4. **Crop rotations.** Careful selection of subsequent crops can eliminate or greatly reduce the problem of volunteer crop plants. When possible, select crops you can protect with herbicides effective against the volunteer crop; or select crops that will compete effectively against the volunteer crop plants.
5. **Herbicides.** Selective or positional application of labeled nonselective herbicides can control some volunteer crop plants. Glyphosate (Roundup) applied with a wiper applicator to volunteer corn growing in forage grasses or legumes is an example of positional application of a nonselective herbicide. Examples of selective herbicides follow in the section on control of specific volunteer crops.
6. **Biological.** In some limited situations farmers have used animals such as pigs or chickens to control volunteer crop plants.

CONTROL OF SPECIFIC VOLUNTEER CROPS

Alfalfa. Preventing alfalfa from becoming a problem in subsequent crops starts at the end of the last alfalfa growing season. Once established in a subsequent crop, alfalfa may be extremely difficult to remove, especially from other broadleaved crops. Time the last alfalfa harvest so that 4 to 6 inches of regrowth appear before hard frost. Spray regrowth with 2,4-D at 2.0 pounds acid equivalent/A (per acre) before the first frost. About 7 to 10 days later, disc or rotary till the field to cut alfalfa crowns, then follow with deep plowing. Deep plowing disrupts the plant by bringing the roots to the surface where they will desiccate or freeze. Although fall is the best time to kill alfalfa with 2,4-D and tillage, you may delay spray application until spring, but do not plant any crop for 3 months or until chemical has disappeared.

In crops such as field corn or small grains, you can use dicamba (Banvel) to kill or suppress alfalfa in the growing crop. In corn, you can use dicamba at 0.25 to 0.5 pound acid equivalent/A, depending on the growth stage of the crop. In small

grains, the dicamba application amount will vary with the crop.

Asparagus. Volunteer asparagus from seed is one of the most serious problems confronting asparagus growers. Crowns of volunteer asparagus develop shallowly. Spears arising from them are usually too small to be of commercial value. These plants compete with the planted crop and interfere with the harvest of spears. Their early fern growth can serve as host for the asparagus aphid that later attacks the crop.

In established asparagus fields, volunteer asparagus is an ever-present problem. Thorough tillage as deep as possible without injuring crowns of the crop asparagus will eliminate many volunteer plants. Volunteer asparagus is a greater problem in fields tilled only 1 or 2 inches deep. Of the herbicides registered for use in asparagus, simazine (Princep) is the most toxic to seedling asparagus. Where possible, include this herbicide in the weed control program. Simazine plus thorough tillage has been used to clean up some fields infested with volunteer asparagus.

Other herbicides showing activity against seedling asparagus are norflurazon (Solicam) and trifluralin (Treflan). Trifluralin is effective only on germinating seeds and only at rates of 1.0 pound active ingredient/A or higher. Also dicamba applied at 0.5 pound active ingredient/A or dicamba plus 2,4-D at 0.5 plus 1.5 pounds acid equivalent/A has killed emerged seedlings 2 to 3 inches tall. Volunteer asparagus in an established asparagus field was successfully controlled by applications of trifluralin plus diuron (Karmex), and thorough tillage before and immediately after the harvest season. In experiments at Prosser, Washington, simazine, metribuzin (Sencor or Lexone), diuron, trifluralin, terbacil (Sinbar), norflurazon (Solicam), and hexazinone (Velpar) applied preemergence controlled volunteer asparagus from seed.

Volunteer asparagus is also a serious problem in grapes. Birds carry berries from the asparagus fields to vineyards, where they eat the fleshy part of the berry and drop the seed to the ground. Volunteer asparagus not only competes with the grapes directly, but also produces berries that contaminate machine harvested grapes, thus reducing juice quality.

In vineyards, simazine, dichlobenil (Casoron or Norosac), diuron, and norflurazon will prevent the establishment of volunteer asparagus plants. Volunteer asparagus plants more than 1 year old are very difficult to kill. Annual applications of dichlobenil or simazine will retard development of established volunteer asparagus plants. Volunteer asparagus can be hand rogued where populations are small. Careful use of the grape hoe also prevents establishment of asparagus seedlings. An integrated program using the grape hoe, hand roguing and either simazine, dichlobenil, or norflurazon may be necessary to control dense infestations of volunteer asparagus in vineyards. Some growers have controlled volunteer asparagus in vineyards by using a 2% solution of glyphosate in water.

Cereal rye. This winter annual plant is sometimes grown as a crop, but once the seed population is established in the soil, it can be a serious weed problem. Rye in winter wheat reduces wheat yield by competition and reduces wheat quality where its seed contaminates the harvested grain. Crop rotations where neither winter wheat nor winter barley is grown for two consecutive years greatly reduces the amount of cereal rye. Summer fallow and spring barley or spring wheat are the most common rotations. Where rye populations are small, existing plants can be hand rogued. Wiper applications of glyphosate (Roundup) can be used in wheat after the rye is at least 6 inches taller than the crop.

Selective chemical control of cereal rye has been only partially effective. Paraquat (Gramoxone) is registered for postemergence application in wheat as a salvage treatment.

Corn. Volunteer corn can be a serious problem in beans and potatoes. Corn competes with these crops and can reduce yields. More important, it interferes with normal harvesting of the beans and potatoes. Clean, efficient, and timely harvest of the corn crop is the first and most economical strategy for the control of volunteer corn. Volunteer corn can be hand rogued if not too dense. Volunteer corn occurred in large quantities in a field that was disced twice and rotary tilled 8 inches deep, whereas volunteers were sparse in fields that were ridge-tilled only. Diclofop (Hoelon) will selectively control 12- to 14-inch tall volunteer corn in dry peas and other crops for which it is labeled.

Where labeled, both Sethoxydim (Poast) at 0.28 pound active ingredient/A plus oil concentrate and fluazifop (Fusilade) at 0.094 pound active ingredient/A plus oil concentrate controls volunteer corn.

Where it is labeled, glyphosate applied with a rope-wick applicator to corn taller than the crop is an effective and economical control practice for volunteer corn.

Dill. When grown for seed, dill shatters easily during threshing, often leaving large numbers of

seed in the field. We have greatly reduced the problem of volunteer dill by very shallow (1 inch or less) tillage immediately after harvest. Shallow tillage followed by thorough irrigation stimulates dill seed to germinate. Subsequent tillage then can kill emerged seedlings. If possible, a second irrigation and tillage will reduce volunteers even more.

Because dill seedlings are highly sensitive to competition, select rotational crops after dill that emerge and grow rapidly and form dense canopies. Also, select crops for which dicamba can be used. Dill is tolerant of linuron (Lorox) and trifluralin, but is sensitive to dicamba. Crops such as small grains, corn, or sorghum, in which dicamba is registered for use, are excellent crops to follow dill.

Similar control strategies can reduce the numbers of volunteer carrot, rape, and radish.

Jerusalem artichokes. Once established in a field, Jerusalem artichokes can become a persistent problem. These perennial plants reproduce mainly from small pieces of tubers left in the ground. Jerusalem artichokes are tolerant to most soil-active herbicides used selectively in row crops. Dicamba, 2,4-D, and clopyralid plus 2,4-D (Curtail) should control volunteer Jerusalem artichokes selectively in wheat and barley. Jerusalem artichokes have been controlled in soybean with glyphosate or 2,4-D applied with the rope-wick applicator, although at least two applications are necessary.

Atrazine plus crop oil, dicamba, and dicamba plus 2,4-D applied postemergence control Jerusalem artichokes selectively in field corn. Bentazon (Basagran) plus crop oil retards the growth of Jerusalem artichokes and may be useful in large-seed legume crops. Based on available control measures, growers should plant barley, corn, or wheat in fields infested with Jerusalem artichokes, and use appropriate herbicides.

Potatoes. Potato tubers left in the field frequently survive winter conditions in the Northwest and can be a serious problem in wheat, corn, and potatoes. In some cases, volunteers may persist and produce tubers each year, and thereby occur as a problem in potatoes planted several years later. Volunteer potatoes not only compete with crops for light, moisture and nutrients, but they also interfere with harvest and have been implicated as the chief source of inoculum and aphids causing massive potato virus disease epidemics. No herbicide will reliably control volunteer potatoes in small grains. Dicamba and 2,4-D will retard the growth of volunteer potatoes, but will seldom eliminate them as a living reservoir of virus infestation. Glyphosate applied to volunteers in cereal stubble will kill 50% to 90% of the plants, but this treatment is too late to keep aphids from spreading viruses from volunteers to nearby potato crops. Cereals grown at denser than normal seeding rates may reduce the number of volunteers; however, many volunteers can still survive.

In corn, atrazine at 1.0 pound active ingredient/A or above will control volunteer potatoes. Use of atrazine may necessitate growing corn or sorghum the year following application to ensure that atrazine residues are dissipated sufficiently to grow other rotational crops.

USDA-ARS scientists located at Prosser have studied the influence and timing of tillage after harvest on the survivability of potato tubers. Volunteers are controlled best when fields are not tilled until after a hard freeze has killed tubers on or near the soil surface. Plowing then exposes additional tubers to freezing. Planting a wheat cover crop after plowing further reduces the numbers of volunteers. Fumigation of soil with 1,3-dichloropropene plus chloropicrin (Telone C-17) controls volunteer potatoes.

Oxyfluorfen (Goal) applied postemergence in onions retards the growth of volunteer potatoes.

Barley and winter wheat. Small grains such as barley and winter wheat frequently overwinter and interfere with subsequent crops. When the plants have lodged, or where combine efficiency is low, many seeds may fall to the ground. Resulting volunteer cereals can be very dense. Deep plowing in the fall buries the seeds and prevents emergence. However, in limited or no-tillage systems, the cereal seeds remain on or near the surface and can easily germinate and become established. Volunteer cereals have been particularly troublesome in crops such as alfalfa and turnips seeded in the late summer after shallow grain stubble tillage. In alfalfa, EPTC (Eptam) at 2.0 to 4.0 pounds active ingredient/A or benefin (Balan) at 1.12 to 1.5 pounds active ingredient/A applied and incorporated prior to planting alfalfa will control small grain seedlings. After alfalfa emerges, sethoxydim at 0.28 pound active ingredient/A plus oil concentrate controls volunteer cereals selectively.

Shallow tillage after harvest, followed by irrigation, will germinate much of the small grain seed lying on the soil surface. After the small grain seed has germinated and emerged, shallow tillage or applications of glyphosate at 0.3 pound acid equivalent/A will kill volunteer plants and thus reduce the seed population.

Selective cultivation early in the growing sea-

son will control most volunteer cereals in the interrow spaces in row crops; however, those in the rows will persist. Recently, herbicides have been developed that control volunteer cereals in several broadleaf crops. Volunteer cereals can be controlled very effectively in several broadleaf crops with fluazifop, sethoxydim, and similar herbicides. However, the problem of volunteer barley and wheat remains serious in Northwest wheat fields.

Volunteer small grains not only compete with the planted crop for light, moisture, and nutrients, but they also serve as hosts for diseases that attack the planted crop and reduce the quality of the harvested grain. The problem is especially troublesome in limited or no-tillage systems and where one small grain crop follows another. The inclusion of a non-small-grain crop such as peas, lentils, or winter rape into the crop rotation has effectively controlled volunteer small grains. In the case of volunteer barley, the problem can be greatly reduced by growing non-winter-hardy varieties. Steptoe barley, the most common variety grown in Washington, has considerable tolerance to cold temperatures and frequently survives over the winter in eastern Washington. At present, no herbicides selectively control volunteer barley and wheat in small grain crops.

Canola or rape. This annual plant is becoming increasingly popular as a crop in the Pacific Northwest. In Canada, rape frequently volunteers. Crop rotation to one of the small grains and using 2,4-D or MCPA at 0.5 pound acid equivalent/A in the grain crop are recommended by some Canadian workers.

Shallow tillage followed by thorough irrigation stimulates rape seed to germinate. Subsequent tillage then can kill emerged seedlings. If possible, a second irrigation and tillage will reduce volunteers even more.

In summary, whatever crop was grown last year can become this year's weed if proper management practices or control measures are not used. A well-planned program that integrates mechanical, cultural, and chemical control methods will yield the best results.

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