Cooperative Extension

College of Agriculture & Home Economics

Washington State University

EB1383

Asparagus Integrated Pest Management

Dennis A. Johnson, Daniel F. Mayer, Robert Parker and Gaylord I. Mink

Diseases, insects and weeds damage asparagus and affect production in Washington. Fusarium wilt and crown rot, rust, the asparagus aphid, the common asparagus beetle, cutworms, and many species of broadleaf and grassy weeds reduce asparagus yields. Growers use a variety of cultural practices and pesticides to manage asparagus pests.

In 1982, Washington State University Cooperative Extension and the Washington Asparagus Growers' Association initiated an integrated pest management program for asparagus. Objectives of the program are to improve timing of pesticide applications and to coordinate growing practices and pest control strategies for asparagus pests. The program should help improve pest control, reduce the cost of controlling pests, and increase asparagus yields.

How The Program Works

A field scout visits asparagus fields of participating growers at two-week intervals to monitor pests. The scout moves through fields in a pattern of two V's or a W (Fig. 1), sampling for rust, asparagus aphid, common asparagus beetle, cutworms, weeds, and beneficial insects. The scout gives or mails a written report to the grower after completing sampling and aphid extraction. The grower can then base pest management practices on the population levels of the pest.

Descriptions and management practices follow for diseases and pests that affect asparagus in Washington State.

DISEASES OF ASPARAGUS

Rust

Asparagus rust, caused by the fungus *Puccinia asparagi*, occurs sporadically in eastern Washington. This disease can cause severe damage when weather is favorable.

Symptoms and disease cycle. Rust first appears in the spring. It produces three different types of pustules during the growing season. The first pustules to appear on plant foliage, *aecia* (Fig. 2), are usually sparse and easily overlooked. These are oval in shape, and light orange in color. The blisters are raised at first; later the center of the pustule sinks as it ages. These pustules may form on volunteer asparagus, on plants in young uncut beds, and in seedlings growing in commercial beds. The spring pustules give rise to the repeating, or summer pustule stage, *uredia* (Fig. 3), an early source of inoculum (spreading spores) for rust epidemics.

The most commonly noticed pustules are the *uredia* that appear on fern foliage from early to late summer. Summer stage pustules arise as blisters, and rupture the outer layer to expose brownish-red powdery spores. These wind-borne spores infect healthy plants. Repeated infections of the wind-borne summer spores occur every 10 to 14 days during wet weather and can be very damaging. Sprinkler irrigation also contributes to the spread of the disease.

Pustules with black spore masses, called *telia* (Fig. 4), replace the spore-spreading summer stage pustules in early fall. Spores overwinter in these fall pustules and give rise to a new disease cycle in the spring.

Control. An important step in managing rust is preventing the

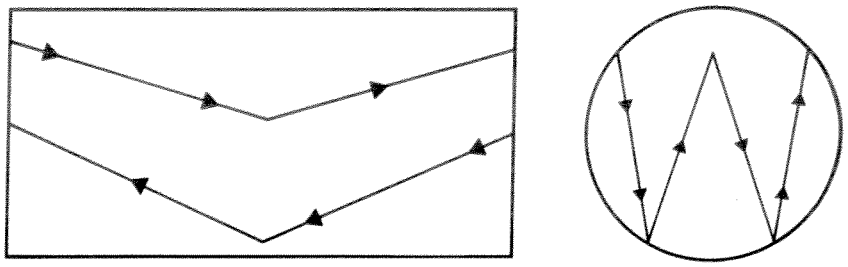
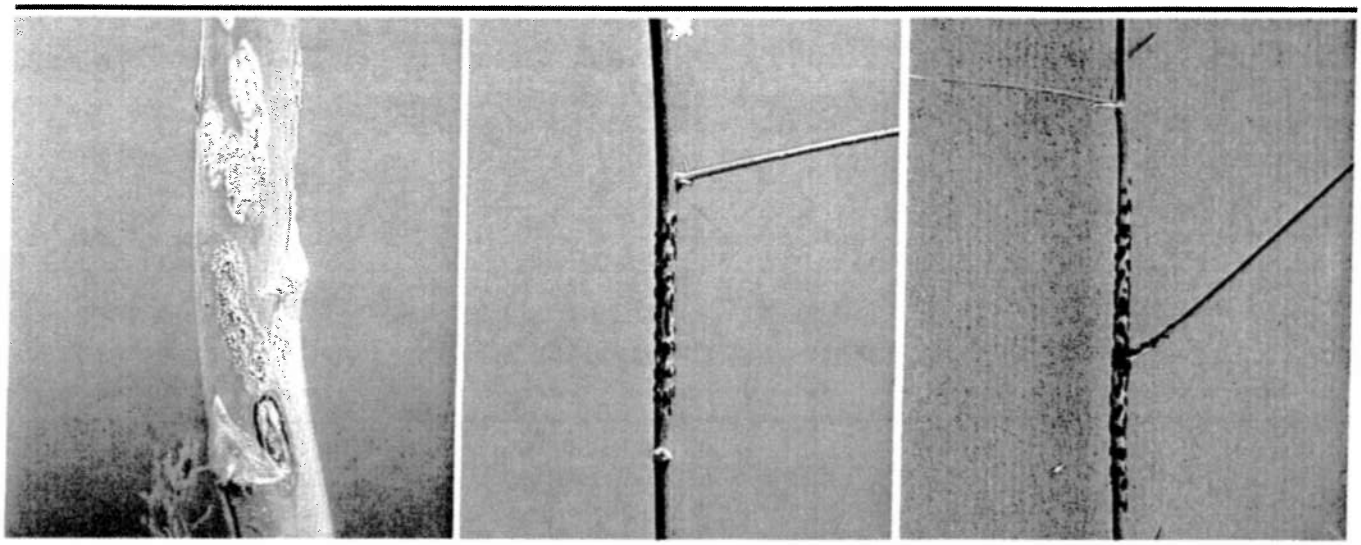


Fig. 1. Field scouts use these V or W patterns to sample asparagus fields for pests. The patterns may be used for rectangular or circular shaped fields.



Figures 2, 3, and 4, above, show the three stages of rust on asparagus spears and asparagus ferns. The early spring stage of rust (*aecia*) as it appears on asparagus, left; summer pustules of rust (*uredia*) shown on asparagus fern, center; and the overwintering black masses of rust (*telia*), again on asparagus fern, right.

development of *aecia*, the early spring pustules. Cutting spears regularly until early summer eliminates one summer spore source. However, *aecia* develop on nonharvested plants, such as volunteers, seedlings, and those in new beds, providing a source of summer inoculum. In newly established fields that are not harvested, rust severity can be especially high because of the availability of spreading spores and early development of the fern.

Growers can control rust by preventing growth of volunteer plants during the cutting season and by isolating seedling beds from commercial fields. Avoid planting asparagus beds in areas with poor air drainage, or where dew frequently occurs, since moisture on plant foliage favors rust development.

Resistant and moderately resistant varieties retard rust development, even though they may become infected. Delmonte 361, Jersey Giant, and Jersey Centennial are resistant; UC 157 is moderately resistant; selections of Mary Washington range from moderately susceptible to susceptible; and WSU-1 is susceptible to rust.

Fungicide applications may be necessary some years. Monitor fields carefully and regularly during midsummer for spore-forming *uredia*. A small number of these pustules can rapidly produce high levels of disease. Apply a labeled fungicide, mancozeb (Dithane M-45 or Manzate 200), when these pustules are easily found before late summer. Fungicides are not effective after high levels of disease are reached or when the black pustule stage forms in the fall.

Stemphylium Purple Spot

Symptoms. The fungus, *Stemphylium vesicarium*, sometimes causes small, slightly sunken, purple spots on asparagus spears just before harvest (Fig. 5). Asparagus ferns also become infected, showing tan to brown lesions from ⅛- to ½-inch in length with dark purple margins (Fig. 6).

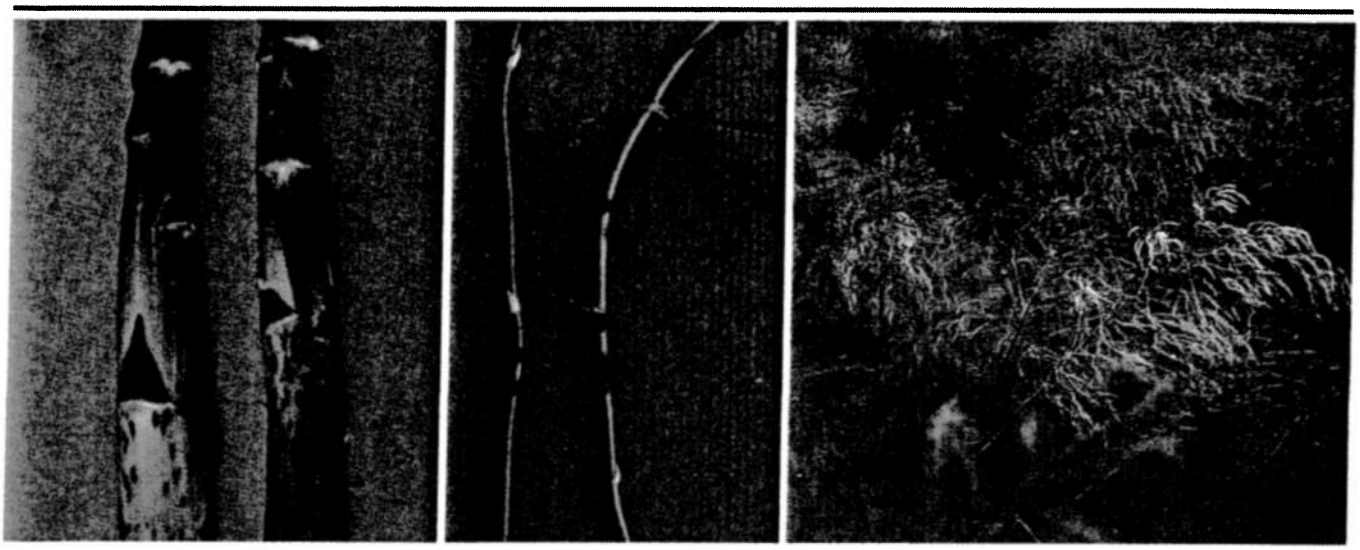
The fungus needs moist conditions from dew or rain to infect plants. The fungus enters asparagus through wounds and plant breathing pores (stomata). More severe purple spot occurs on spears during the early part of the harvest season following wet weather and cool temperatures. When rainfall ceases and temperatures warm, purple spot infections fail to develop.

Control. Applying fungicide to spears is not a satisfactory method of controlling purple spot. Fungicides, if applied near harvest, would leave a residue. Because new spears emerge daily, it would be impractical to cover and protect all plant tissue surfaces.

Destroying overwintering sources of inoculum such as old, infected ferns and plant debris will reduce disease incidence on spears. Completely burying infected ferns by cultivation during the fall or early winter will reduce inoculum levels and subsequent infections the next spring. However, take care not to create conditions that favor blowing sand, because infections readily occur through wounds. Planting cover crops that reduce windblown sand may aid in disease control.

Fusarium Wilt and Fusarium Crown Rot

Fusarium wilt, caused by *Fusarium oxysporum F.* sp. *asparagi*, and Fusarium crown rot, caused by *F. moniliforme*, are widespread in Washington. High incidences of these diseases cause decline of asparagus stands and loss of grower profits. Plant



Figures 5 and 6, above, show Stemphylium purple spot of asparagus on asparagus spears just before harvest, left; and on asparagus fern, center; Figure 7 shows plants with yellowed stalks dying prematurely in the field from Fusarium wilt, right.

stress, virus infection, high soil temperature and light soils increase the disease problem.

The Fusarium fungi, which live in the soil, are easily spread on contaminated seed.

Symptoms. Infected seedlings may fall over on the ground, due to destruction of seedling tissue near the soil line. This process is called damping off. On young infected crowns, needles near the tip of primary shoots turn yellow, and the growing point dies. The entire stem will eventually turn yellow and die.

On mature plants, a distinct wilt occurs that is most noticeable in the heat of July and August. Infected stalks turn yellow and die (Fig. 7). One or two shoots of a crown may show symptoms while the others appear normal, or the entire hill may yellow and die. Usually scattered throughout the field, affected plants may be more numerous in low areas or on sandy slopes. Reddish-brown lesions may appear at and below the soil line of yellowed shoots. A reddish-brown discoloration is evident in the vascular tissue of the crown and roots. Large, fleshy storage roots may become hollow and limp; crowns rot or eventually die.

Control. Treat seed and crowns with a fungicide (Benlate). Avoid old asparagus soil for producing crowns and establishing permanent plantings. Also avoid soil with corn debris until the corn material has decomposed. Manage asparagus stands to reduce plant stress. Common causes of plant stress are overcutting, drought, overwatering, insect injury, inadequate weed management, disease, and soil compaction. To eliminate avenues for infection, be as careful as possible during tillage practices to avoid wounding fleshy roots and crowns.

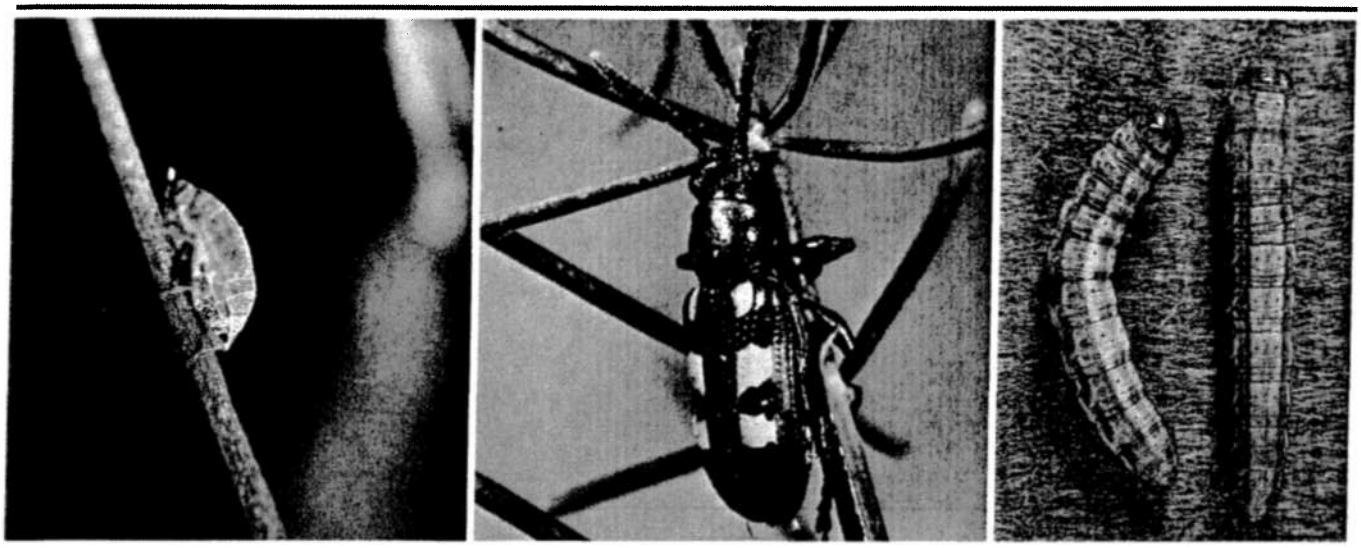
Virus-Induced Stand Decline

Three different viruses, which cause stand decline, can be isolated from asparagus in Washington. These are tobacco streak virus (TSV), asparagus virus-1 (AV-1), and asparagus virus-2 (AV-2).

Symptoms. Each virus reduces plant vigor and productivity. Plants infected by TSV are stunted and produce small spears. Growth of plants infected by either AV-1 or AV-2 alone may be reduced by as much as 20%. Plants infected with both AV-1 and AV-2 decline and die, usually within 2 to 3 years after double infection. Symptoms of virus-induced decline resemble decline caused by many other factors, especially fusarium wilt. Research suggests that asparagus plants infected with AV-2 become much more susceptible to fusarium wilt than non-infected plants. None of these viruses can be diagnosed on the basis of symptoms alone.

Disease cycle. AV-1 is spread by many common aphid species that feed briefly on spears, but which do colonize asparagus ferns. These include the green peach and potato aphids, both of which are omnipresent in the spring and fall. AV-1 is not transmitted by the asparagus aphid. In the Yakima Valley, AV-1 infects nearly all commercial and volunteer asparagus plants within 5 to 7 years.

AV-2 is seedborne and appears to be transmitted through pollen. The incidence of AV-2 in commercial seed lots ranges from trace levels to above 50%. Because virus-infected seedlings usually survive, many young plants will be infected when planted if the incidence of AV-2 is high in a given seed lot. As AV-1 is spread into the field over the succeeding years, plants which become infected with both viruses begin to decline and die. Since AV-2 can also spread within fields, the number of double infected, declining plants increases pro-



Figures 8, 9, and 10 show insects which attack asparagus. The asparagus aphid, above left, is a powdery gray-green; the colorful adult asparagus beetle, center, attacks an asparagus fern. Redback cutworm larvae, right, attack spears from mid-May through June.

gressively with time, and the stand decreases.

Although TSV has been found in a few fields, its mode of spread is unknown. In other Washington crops, TSV is spread by the common flower thrip.

Control. Because AV-1 is generally distributed throughout eastern Washington and is easily spread by a variety of aphids that visit asparagus only briefly, it is virtually impossible to control. Although pollinating insects are suspected of spreading AV-2, no effective control practices are known. However, virus-induced stand decline can be reduced substantially, perhaps eliminated, in isolated fields by the use of virus-free seed. Although virus-free seed is not currently being produced, methods are available to test seed lots for the presence of AV-2 prior to planting.

INSECT PESTS OF ASPARAGUS

Asparagus Aphid

The asparagus aphid, *Brachycorynella asparagi*, was first found in Washington in 1979. This pest now occurs throughout the asparagus growing region.

Aphids are about 1/16-inch long, powdery gray-green to green, and lack cornicles (Fig. 8). Eggs are green to black. Overwintering eggs are laid in the fall (September to November) on asparagus fern. Eggs hatch in the spring. The first winged females appear about mid-May. Winged and wingless aphids are produced throughout the summer. There are several generations. All life stages appear on asparagus; no other plant host is known.

Aphids feed in the axils of the ferns where the leaves join the stem. They cause a marked stunting of fern growth. Heavily infested plants have a large number of severely stunted, (Bonzai effect), blue-gray shoots around the base of the plant, and an abundance of aphid honeydew is present. Seedlings and one-year-old plants may be killed.

Sampling should be carried out when plants are in the fern stage. Collect one secondary branch from each of 200 plants and count the number of aphids found on each. Or, place the branches together in a paper bag for 2 or 3 days so the aphids die and fall off the shoots. Dump the bag contents on a sheet of white paper and count the dead aphids. Treat the field if any aphids are found during June. An average of 5 or more aphids per plant found during August will probably cause damage. The field should be treated. Destruction of dormant foliage in the fall and shallow rototilling of the field in the spring greatly reduce aphid populations. Malathion at 2 pounds active ingredient per acre is registered for control of asparagus aphid. Di-Syston at 1 pound active ingredient per acre, applied in mid-September, probably provides the best chemical control of the aphid.*

Asparagus Beetles

The common asparagus beetle, *Crioceris asparagi*, can reduce asparagus yields or contaminate plants, resulting in cullage.

Adult beetles have blue-black wing covers with three yellow spots along each side and reddish margins (Fig. 9). Larvae are dull blue-gray with black head capsules. Beetles overwinter as adults, and the females begin laying eggs on asparagus spears in April. There are two to five generations per year.

*A special local needs registration (WA840036) has been granted for this use in Washington under Section 24(c), FIFRA.

Asparagus spears damaged by asparagus beetles or found with beetle eggs on them are culls. Beetle feeding on fern can injure newly established beds and reduce vigor of mature stands.

Sample in fields when plants are in the fern stage. Count the number of beetles found on 200 plants per field. If there is an average of five beetles per plant, the field should probably be treated with an insecticide. Malathion, methomyl, methoxychlor, Sevin XLR and rotenone are registered for control of asparagus beetle.

Cutworms

Two cutworm species are found in asparagus fields (Fig. 10). Spotted cutworm, *Amathes c-nigrum*, larvae are found feeding usually near the spear tips during late April and early May. The brownish larvae have a pair of dark hash marks on the rear end. Redback cutworm, *Euxoa ochro-gaster*, larvae are found feeding on spears from mid-May through late June. They usually feed on the side of spears, at or below the ground line. Larvae are pale yellow to dark red and up to 2 inches long when full grown.

Monitor fields for cutworm damage to spears during the cutting season and look for poor producing crowns. If plants are not producing adequate new growth, examine the soil around crowns for cutworms. Permethrin (Pounce Ambush) at 0.1 pound active ingredient per acre provides excellent control. Methomyl, Sevin* and Sevin bait are also labeled for cutworm control on asparagus. Weeds and cutworms are associated, since female moths prefer to lay their eggs on weeds. Good weed control will reduce cutworm populations in asparagus fields.

Bee Poisoning

Honeybees forage blooming asparagus fields. Do not apply any pesticides hazardous to bees to fields being foraged by honeybees.

WEED CONTROL IN ASPARAGUS

Weeds are a serious problem in asparagus production. They compete with asparagus plants for light, moisture, nutrients, and interfere with harvesting, thus reducing yields. Unlike many other crops, asparagus is a poor competitor against weeds. The crop does not produce much shade until late in the growing season. All types of weeds infest asparagus, including annual and perennial grasses, and annual, biennial, and perennial broadleaves. Mechanical cultivation has been used effectively to control early season weeds, but cannot be continued after cutting begins without loss of spear production.

Without the use of herbicides, asparagus rows usually must be cultivated and hilled during and after the cutting season to control annual weeds. Each cultivation during the cutting season causes the loss of from five to seven days of spear production. Mechanical cultivation methods and loss in production are even more costly for control of quackgrass, bermudagrass, or other perennial weeds.

Using herbicides which will control both broadleaf and grass weeds is a cost-effective alternative to cultivating during the cutting and growing season. In recent years, several herbicides have been registered for weed control in asparagus. All asparagus-registered herbicides (Table 1) have certain characteristics that have restricted their use. For more information regarding the use of herbicides in asparagus, consult EB 1145, *Chemical Weed Control in Asparagus*. When using any herbicide, read and carefully follow the directions given on the label. Table 2 indicates the expected response of selected weeds to the herbicides mentioned in Table 1.

*Sevin XLR is registered for use on asparagus, but not for cutworms. It is effective, and can be used legally for this purpose, provided all other label directions are followed.

Table 1.
Herbicides available for use during establishment of direct-seeded and crownplanted asparagus:

Common Name	Trade Name	Remarks
Paraquat	Paraquat Plus, Gramoxone	Apply to growing weeds before crop emerges.
Chloramben	Amiben	Apply before emergence of weeds and crop. Direct seeded asparagus only.
2,4-D Sodium Salt	2,4-D Sodium Salt	Apply to weeds less than 2 inches tall.
Linuron	Lorox	Apply preemergence to asparagus planted with carbon band or postemergence to crop.
Terbacil	Sinbar	Apply preemergence to asparagus planted with carbon band.
Fluazifop	Fusilade	Apply to actively-growing grass weeds.

Herbicides available for use in established asparagus:

Glyphosate	Roundup	Apply to actively-growing weeds prior to crop emergence, after last harvest or after ferning.
2,4-D Sodium Salt	2,4-D Sodium Salt	Apply to actively-growing broadleaf weeds.
2,4-D Alkanolamine Salt	Formula 40	Apply to actively-growing broadleaf weeds.
Dicamba	Banvel	Apply to actively-growing broadleaf weeds.
Dalapon	Dowpon Dalapon	Apply to actively-growing grass weeds.
Diuron	Karmex Direx Diuron	Apply during fall or spring at least 4 weeks prior to asparagus emergence and/or after harvest.
Linuron	Lorox	Apply prior to or after weed and asparagus emergence.
Metribuzin	Sencor Lexone	Depending on product, apply before asparagus emerges, or as a split application, preemergence and after harvest.
Simazine	Princep Sim-Trol	Apply in fall, following fall reworking of field.
Napropamide	Devrinol	Apply in fall or spring prior to crop and weed emergence.
Trifluralin	Treflan	Apply and incorporate in winter or early spring before crop emerges and/or after harvest.

Table 2.
Weed response to selected herbicides

This chart may serve as a guide in the selection of some of the herbicides registered on asparagus. Plant response may be altered by growing conditions, genetic variations, soil type, pH, organic matter, and rates of application.

Rates necessary to obtain the control suggested may vary from season to season and may differ among geographical areas.

	Chloramben	Dicamba	2,4-D	Diuron	Glyphosate	Linuron	Metribuzin	Napropamide	Paraquat	Simazine	Terbacil	Trifluralin
GRASS WEEDS												
Barnyardgrass	○	■	■	●	●	▲	○	●	▲	●	○	●
Crabgrass	●	■	■	●	●	●	○	●	●	▲	■	●
Green foxtail	○	■	■	●	●	■	○	●	●	○	■	●
Yellow foxtail	○	■	■	●	●	■	○	●	●	○	●	●
Sandbur		■	■	▲	●		□	●	▲	▲	○	●
BROADLEAF WEEDS												
Black nightshade	●	●	●	●	●	●	□	■	●	●	●	■
Common lambsquarters	○	●	●	●	●	○	●	●	○	●	●	○
Hairy nightshade	●	●	●	●	●	●	□	■	●	●	●	■
Kochia	○	○	○	■	●	■	○		●	○	○	○
Mallow		●	■	▲	●	■	●	□	■	●	●	■
Pigweed	○	●	●	●	●	●	●	●	●	●	●	●
Prickly lettuce	●	●	●	●	●	●	●	○	●	●	●	■
Prostrate knotweed	●	●	■	●	●	■	●	●	▲	●	●	●
Puncturevine		●	●	■	●	■	○	▲	●	■	▲	▲
Purslane	●	●	○	●	●	●	○	●	●	●	●	●
Russian thistle	●	●	○	■	●	■	●	▲	●	□	●	▲
Smartweed	▲	●	■			■	●			●		■
Wild buckwheat		●	■	●	●	□	○			●		■
Volunteer asparagus	■	●	■	■	▲	■	▲	□	□	▲	○	▲

● = Good Control; ○ = Good-Fair Control; ▲ = Fair Control; □ = Fair-Poor Control; ■ = Poor Control.

By Dennis A. Johnson, Extension Plant Pathologist; Daniel F. Mayer, Extension Entomologist; Robert Parker, Extension Weed Scientist; and Gaylord I. Mink, Plant Pathologist, Washington State University Irrigated Agriculture Research and Extension Center, Prosser.

▲Warning The law requires that pesticides be used as the label directs. Uses against pests not named on the label and low application rates are permissible exceptions. If there is any apparent conflict between label directions and the pesticide uses suggested in this publication, consult your county Extension Agent.

Use pesticides with care. Apply them only to plants, animals, or sites listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

Issued by Washington State Cooperative Extension, J.C. Engibous, Interim Director, and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Cooperative Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, color, religion, national origin, sex, age, or handicap. Trade names have been used to simplify information; no endorsement is intended. Published December 1986. $1.50

EB1383