

GROWER'S**GUIDE**

FOR VEGETABLE CROPS

PEPPERS**AREAS OF PRODUCTION**

Peppers are successfully grown from transplants in home gardens in most of eastern Washington and also in the warmer parts of western Washington. Peppers can be direct-seeded in the Walla Walla, Tri-Cities, Yakima, and Clarkston areas, as well as in the warmer parts of the Columbia Basin. Few commercial peppers are grown in the state.

VARIETIES**Bell or Sweet Peppers**

Early hybrids: Seed companies are now introducing Fi hybrids by various names. They are early and somewhat cold resistant.

California Wonder: Large, blocky fruit with thick flesh.

Yolo Wonder: Large, blocky fruit with thick flesh—slightly later than California Wonder, but has tobacco mosaic resistance.

Idabel: Developed at the Parma, Idaho, Experiment Station—has shown resistance to curly top in Idaho, but not much in Washington—large, blocky fruits.

Hot Peppers

Hungarian Wax: Very early, heavy producer of medium-sized, pointed, canary-yellow fruits.

Long Red Cayenne: Long, brilliantly red, extremely pungent, easily dried.

Large Cherry: Produces large quantities of small, globe-shaped, highly pungent, dark green fruits ripening to brilliant red.

SOILS AND FERTILIZERS

Peppers will grow on almost all types of soil.

Sandy loams, because they warm early, are desirable for direct-seeding or for transplanting in cool areas of the state. Peppers will grow in soils having a wide pH range, although liming may be required in areas where the soil is extremely acid, below pH 6.

Peppers are not particularly subject to plant nutrient deficiencies. Except for nitrogen, soil tests are generally the best guide to plant food needs.

Grower experience will be a good guide to nitrogen application. The amount will depend on the previous cropping history of the field in which the peppers are planted. About 100 to 180 pounds of nitrogen per acre should be used in eastern and central Washington. Larger amounts should be used on new land in the Columbia Basin or on land where crops such as potatoes, corn, sugar beets, or other vegetables have been grown the previous year. Smaller quantities of nitrogen will be required if the land has been in alfalfa or a similar crop the previous year.

Part of the nitrogen fertilizer should be mixed with the soil at the time it is worked in the spring. The rest should be side-dressed at the time of direct-seeding or soon after direct-seeding or transplanting. The fertilizer bands should be two to three inches to the side of the plants and about three inches below the surface of the soil.

GROWING TRANSPLANTS

Transplants should be used in the cooler parts of Washington, or where an early crop is desired. Transplants may be grown in greenhouses, hot-beds, or cold frames—or they can be purchased.

Ideally, the growing temperatures for pepper transplants should be between 70° and 85°F.

Pepper seed should be sown in the hotbed from 8 to 10 weeks before normal transplanting time or about 5 weeks before the average date of the last spring frost. Under good conditions, 1/2 pound of seed should produce 6,000-7,000 plants, more than enough to transplant an acre. When ready for the field, the plants should be stocky and 3 1/2 to 5 inches high.

For earliest harvest, pepper seed can be sown thickly in seedling flats and transplanted into growing flats shortly after germination. The seedlings should be spaced from 2 to 3 inches apart. Plant bands of 2 1/4 inches should be used for a minimum of root damage. If plant bands are not used, it is advisable to block the plants in the flat a day or two before they are transplanted. This is done by running a heavy knife through the soil halfway between the rows leaving each plant in the center of a square of soil.

Large fields of peppers for drying or processing are generally set with plants which have been grown from seed sown thinly in beds left undisturbed until the time of transplanting. Although this method results in some root damage and the transplants will require more time to become established in the field, the cost is considerably less than where plants are grown individually in flats. If the plants are to remain in the beds until the time they are transplanted, allow for about 20 seeds per foot in rows 6 inches apart.

Watering of transplants in the hotbed or greenhouse should be done early in the day so the plants will dry before night. Good ventilation is essential and the plants should be carefully watched for aphids and other insects.

Transplanting is done by machine in most commercial fields. Special attachments may be required if the plants are grown in plant bands. Plants are pulled from the bed or taken from the

flat and laid in boxes or trays. In this way, they can be easily and speedily lifted out and placed in the transplanter mechanism.

In the field, the transplant should be set slightly deeper than it has been growing in the bed or flat. For establishing good stands of plants that will start growth quickly in the field, the soil should be well-worked, level, and loose enough for the planter to operate smoothly at an even depth. Irrigation a few days before transplanting may be necessary so the soil will firm well over the roots of the plants. Plants should be "watered in" as they are set or irrigated immediately after.

"Watering in" with a starter solution at the time of transplanting will help the plants to become established more quickly. Commercial preparations of soluble chemicals are available for making starter solutions. A homemade mixture containing about 5 pounds of N₂, 5 to 10 pounds of P₂O₅, and 5 pounds of K₂O in 100 gallons of water is also effective.

DIRECT-SEEDING

In the warmer parts of Washington, it is possible to grow peppers by direct-seeding. Pepper seed will not germinate if average soil temperature is below 65°F. Even under ideal conditions peppers are slow to germinate. The time of planting should be based on soil temperature rather than on calendar date. However, in most of the warmer sections of the state where direct-seeding is feasible, soil temperatures of 65°F should occur sometime between April 25 and May 20. The seed should be planted in rows 30 to 36 inches apart. When the plants are well established, they should be thinned to stand 12 to 18 inches apart in the row. Plant about 2 1/2 to 3 1/2 pounds of seed per acre.

The cost of production by direct-seeding is nearly the same as by transplanting, because of the cost of extra seed, thinning, and additional cultivation to control weeds. Direct-seeding is advantageous in the Inland West because the loss of yield from curly top is generally reduced

by direct-seeding.

IRRIGATION

Peppers need about 18 inches of water per season. In central Washington, irrigation a few days before planting or transplanting is generally required. The plants must have ample moisture until they become established. Irrigation with cold water during the cool days of the early part of the season will cause a delay in growth. In southern Idaho, the only practical control of fusarium wilt has been to grow peppers under relatively dry conditions. At the Columbia Basin Research Unit, irrigation of peppers at 10- to 14-day intervals during the warmer part of the growing season has proven satisfactory.

WEED CONTROL

No herbicides have been tested or approved for peppers in Washington. If the field is free from weeds when plants are set out, weeds in transplanted peppers can be readily controlled by timely cultivation. Some hand weeding in addition to cultivation is usually required for the direct-seeded crop. The crop can be weeded at the time it is thinned.

HARVESTING AND MARKETING

The stage at which the pepper is harvested will depend on the purpose for which it is being grown. Fresh market green peppers are generally harvested as soon as they have sufficient size and firmness to be salable, since the earliest fruit brings the highest price. For most varieties this would be when the peppers are 3 1/2 to 4 inches in diameter.

Later harvests for the fresh market or for processing can be delayed until just before the oldest fruits begin to lose their dark green color. By harvesting all peppers which are firm and crisp at this time, a grower can reduce the number of harvests required.

If red peppers are desired, the fruit is usually left on the vines until fully ripe. Fruit which has begun to turn red when harvested will ripen

after picking if kept at temperatures of 70° to 85°F.

Peppers should be broken from the plant with the stems left attached to the fruit. For picking sweet peppers, strong cloth picking bags, suspended from the shoulders of the pickers, are preferable to baskets or boxes.

INSECTS AND DISEASES

Curly top, fusarium wilt, and aphids could be serious problems with peppers. Flea beetles will undoubtedly be troublesome if peppers are direct-seeded.

Insect and disease control recommendations are kept up to date through information released annually by Washington State University. Publications are available through county Extension offices or through the Bulletin Department, Co-operative Extension, WSU, Pullman.

Insects

Aphids or plant lice, especially the potato aphid and the green peach aphid, develop in colonies usually on the underside of the leaves. They suck sap from the plant and can be controlled by sprays through the season. It is important to spray or dust for aphids as soon as infestation is noted.

Flea beetles are small black, brown, or striped jumping beetles. They eat tiny holes in the leaves and are particularly destructive to seedling plants.

Wireworms are immature (larval) forms of click beetles. They have shiny, wirelike, brownish yellow bodies and vary in length from 1/2 to 1 inch. Wireworm damage is confined to the underground parts of the plants and may result in death of the plant.

Tomato hornworms are large, green worms with diagonal lines along the side and a prominent horn on the rear end. They devour the leaves of pepper plants and may entirely strip them. In small fields they usually can be controlled by hand picking.

Diseases

Curly top: This virus disease could be the most limiting factor in pepper production in Washington. It is spread by the beet leafhopper, which moves from desert to cultivated fields in the spring or summer. Peppers infected with curly top show an upward rolling of the margins of the older leaves and a pronounced curling of the younger ones. The petioles of the leaves curve sharply downward. In later stages of the disease, the plant becomes yellow and is dwarfed. Fruits produced after infection has occurred are small and misshapen and usually ripen early. There is no effective means of control. The Idabel variety which was developed by the University of Idaho has shown good resistance in the Boise Valley but has only slight resistance to races of the disease found in eastern Washington. Direct-seeding and close spacings of plants seem to reduce the incidence of this disease. Curly top has been serious on recommended pepper varieties only occasionally at the Columbia Basin Research Unit near Othello.

Mosaics: Peppers are susceptible to a number of mosaic-type diseases. Three of the most common are tobacco mosaic, tobacco etch virus, and cucumber mosaic. These viruses often occur in combination in the same plant. The symptoms of these viruses vary somewhat, but all will cause greenish yellow mottling. Infected plants may also have crinkled, yellow, or withered leaves. Occasionally, yellow spots or yellow rings will occur on the fruit or leaves.

These viruses are spread by contact, or by insects, from diseased to healthy plants. Peppers, tomatoes, tobacco, the curcubits, and weeds, such as ground cherries, are the most common host plants. Tobacco mosaic will occasionally be found in dried tobacco leaves and can be transmitted by smokers who handle the plants. These viruses can also spread from greenhouse tomatoes. Persons who are handling plants should wash their hands frequently with soap and water. Bundles of transplants in which infected plants are found should not be used.

Fusarium wilt: A vascular disease caused by a soil-borne fungus, fusarium wilt is most frequently characterized by a sudden wilting of the plant. Symptoms of the disease usually occur shortly after small peppers have formed. Control is difficult, but planting on high beds and limiting the application of irrigation water has given some control in Idaho.

Verticillium wilt: The fungi causing verticillium wilt are similar to those causing fusarium wilt in that both are capable of living for long periods in the soil, and both attack the main stem and reduce movement of materials within the plant. Verticillium wilt causes severe stunting of young plants and loss of leaves and fruit in older plants. Some control of verticillium wilt is obtained by rotating with nonsusceptible crops such as alfalfa, corn, and small grains. Avoid planting on soil which has produced tomatoes or potatoes the preceding year.

Nematode: Peppers are subject to attack by various nematodes, the root knot being the most common. These small worms, seldom visible to the human eye, may cause wilting, stunting, and an unhealthy appearance without the grower being aware of their existence. The most obvious symptom is the formation of swellings or galls on the roots of affected plants. Peppers should not be planted in soil known to be infested with nematodes. Nematodes can be controlled by soil fumigation, but this is expensive. The most practical control of these pests are long rotations with cereals, grasses, and other nonsusceptible crops.

Blossom-end rot: This physiological disorder occurs when soil moisture becomes low after a period of abundant moisture during which the plants have grown rapidly. Tissues near the blossom end dehydrate and develop a dry rot. Moderate fertilizer application, uniform moisture application, and care in cultivation are usually sufficient control measures in Washington. Avoid excessive nitrogen fertilization or close cultivation shortly before harvest.

Sun scald: Sun scald occurs on peppers which are exposed to direct sunlight. It can be severe in central Washington under conditions where vegetative growth is restricted. The first evidence of the disease is a light-colored area, soft, and slightly wrinkled, on the part of the fruit exposed

to the sun. As the injured area dries, it becomes slightly sunken and has a white, papery appearance. The occurrence of this condition can be controlled by keeping the plant in a vigorous, healthy, growing condition which provides sufficient leaves for shading the fruit.

Prepared by D. R. Bienz, professor of horticulture, and R. E. Thornton, Extension horticulturist, Washington State University, Pullman.

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