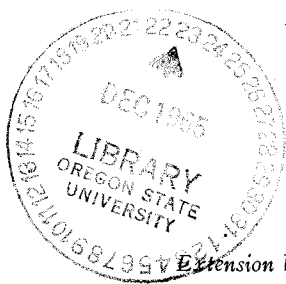


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Onion

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Onion is one of the important vegetable seed crops produced in Oregon. Most of the production has been in irrigated sections of the Snake River Valley in Malheur County. A small acreage is also grown in the Willamette Valley, but the seed yields do not average as high as in eastern Oregon and a risk is involved because of the chance of infection with downy mildew (*Pero-nospora destructor*).

Onion seed is grown under contract to a seed company or an onion grower. Onions grown for seed are handled as biennials. With the bulb-to-seed method, bulbs are stored over winter to produce the seed crop the second year. With the seed-to-seed method, seeds are planted in midsummer and the plants overwinter in the ground and produce a seed crop the following year.

Because onion varieties intercross readily, attention must be given to isolation distances in locating seed fields. Varieties of different colors should be at least 3 miles apart.

The bulb-to-seed method is preferable to the seed-to-seed method for the maintenance of stock seed and for certain very carefully selected lines such as the Oregon Yellow Globe Danvers. However, most commercial seed is now produced on a seed-to-seed basis. This method is successful where careful attention is given to the use of stock seed and where winter-hardy varieties are used.

Bulb-to-seed method

Bulb production for seed differs from commercial onion production only in that planting rates are somewhat heavier so that more bulbs are produced per acre. Oftentimes seed companies contract with onion growers to produce the bulbs for the onion seed growers. In other instances the seed growers produce and store their own bulbs.

The bulbs should be grown on soils which are highly fertile, well drained, and of a loose and porous nature. Fertilizer requirements are met by applying 30 to 60 pounds of N, 60 to 80 pounds of P₂O₅, and 60 to 120 pounds of K₂O. Amounts of K₂O in excess of 60 pounds should be broadcast before planting the seed; the remainder of the fertilizer may be banded or broadcast.

Seeding is done in early spring. The usual method is to seed with 4-row planters at a rate of 4 to 6 pounds per acre. The rows are spaced 12 to 16 inches apart and may be in beds which, in turn, are 20 to 24 inches apart. The insecticide to control root maggot should be applied at seeding (see *Oregon Insect Control Handbook*).

Harvesting bulbs for seed purposes is similar to that for harvesting table stock. Bulbs should be well matured and carefully cured. This is of particular importance for bulbs which are to be stored over winter. As soon as three-fourths of the tops fall over, the bulbs

should be lifted and placed in windrows to cure. Another method is to lift and top the onions and then cure them in slatted crates. Onions are cured when the outer scales are dry and brittle and no juice can be squeezed from the neck when cut about 1½ inches above the bulb.

If the bulbs are to be spring planted, the storage should be cool, well ventilated, and dry. Potato and apple storage facilities are unsuitable for onion bulb storage because of the humidity. A temperature between 35 degrees and 40 degrees F. should be maintained at all times.

With the bulb-to-seed method, the grower must select bulbs carefully and discard off-types, diseased bulbs, and those otherwise undesirable. Selection is done during the time the bulbs are being harvested and again at the time of transplanting.

Fall planting of bulbs is recommended in eastern Oregon. Planting in eastern Oregon should be sufficiently early that the bulbs can get well rooted before the ground freezes. Fall plantings in western Oregon should be made by mid-October. Spring planting should be done as soon as the soil can be prepared in March or early April.

Experiments at the Idaho Branch Experiment Station, Parma, have shown that the varieties Ebenezer, White Portugal, and Yellow Globe are winter hardy. Sweet Spanish, on the other hand, is not quite as hardy and will not survive all winters in that area. For such varieties it is advisable to follow either a spring planting program entirely or a combination program in which a portion of bulbs are planted in the fall and the remainder in the spring.

Medium-sized bulbs, 2¼ to 3 inches in diameter, are best for planting. Although the larger bulb size gives slightly increased yields and an increased number of seed stalks per plant, the amount of increase usually does not justify the extra expense in handling additional tonnages of bulbs. With medium-sized bulbs, spaced 6 inches apart in 3-foot rows, 7,500 to 10,000 pounds of bulbs are required to plant an acre.

In field operations the bulbs are planted upright in rows about 3 feet apart with individual bulbs spaced 2 to 6 inches apart. If bulbs are placed wrong side up, yields are reduced at least by half and the crop may be a total failure. Even when bulbs are placed on the side, yields are reduced as much as 40%. Place the bulbs so that the top of the bulb is near the level of the soil surface. Under Willamette Valley conditions, there is little difference in fall-planted bulbs between those with tops planted at the surface or 2 inches below the surface. With shallow plantings, support must later be provided to the seed stalks by hilling up. When fall planting is undertaken in eastern Oregon, extra protection should be provided by hilling up before the ground freezes.

Frequently, spring-planted bulbs of Sweet Spanish and Yellow Globe Danvers are slow in renewing growth. A single, lengthwise cut down through the side of each



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bulb induces more rapid sprouting and an increased number of seed stalks. The quicker growth from wounded bulbs is attributed to greater gas exchange, enzyme activity, and possibly light penetration.

The amount of nitrogen for bulb-to-seed production is 50 to 75 pounds per acre. P_2O_5 increases seed yields when used in combination with nitrogen at time of planting. Use 80 to 120 pounds of P_2O_5 per acre. Potassium does not increase seed yields when applied to transplanted bulbs.

Seed-to-seed method

The yield of onion seed by the seed-to-seed method is often higher than that from the bulb-to-seed method because of the greater number of plants and seed heads per acre. The lower cost of the seed-to-seed method and the higher seed yields obtained are the reasons most commercial onion seed is now produced by this method. Often stock seed produced by the bulb-to-seed method is sown. Roguing of seed-to-seed onions is not required if the stock seed is properly maintained.

Seed-to-seed onions are drilled early enough so that most of the plants will reach sufficient size to bolt the following spring. June 15 to July 15 planting dates are satisfactory for most varieties. Irrigation before seeding and during the summer months is required.

Seed is planted $\frac{1}{2}$ inch deep in rows 30 to 36 inches apart at a rate of 2 pounds per acre. Higher seeding rates at much closer row spacing (12 to 18 inches) results in higher seed yields provided irrigation is adequate and diseases, insects, and weeds are controlled. The insecticide to control onion maggot should be applied in the furrow at time of seeding.

For all pest control problems, follow the recommendations in the current issues of the *Oregon Insect Control Handbook*, *Oregon Plant Disease Control Handbook*, and *Oregon Weed Control Handbook*.

Onions are pollinated by insects (particularly honey bees); therefore, thought must be given to conserving these helpful insects during the flowering period. Three to four hives of bees should be placed at each acre.

Overwintered onions can be protected from frost by hilling and from "wet feet" by growing them on raised beds.

The onions should be grown on soils of high fertility with adequate internal or surface drainage. Loam or silty loam soils are preferred. Fertilizer requirements are met by applying 30 to 60 pounds of N, 60 to 80 pounds of P_2O_5 , and 60 to 120 pounds of K_2O . Amounts of K_2O in excess of 60 pounds should be broadcast before planting the seed; the remainder of the fertilizer may be banded.

Hybrid onion seed

Hybrid onion seed is produced by both the bulb-to-seed and seed-to-seed methods. The seed-producing or female line is designated as (A) and the pollen-producing or male line as (C). The (A) and (C) lines are maintained by the bulb-to-seed method in fields isolated by sufficient distance to prevent uncontrolled crossing.

A third line, designated (B), is to all appearances the same as (A) except that it can produce pollen; therefore, it is used to maintain seed of the male-sterile or female (A) line which otherwise could not reproduce itself.

The ratio of female (A) to male (C) rows varies with different hybrids; usually a 4-to-1 or 8-to-2 arrangement of rows is used.

(A) and (C) lines must flower at nearly the same time. Ideally the (C) line begins to flower just before (A) and continues as long as (A) is in bloom. In the case of some hybrids, the planting dates for each line are different in order to make the flowering dates coincide.

Occasionally the (A) line is grown from seed (seed-to-seed) and the (C) line from bulbs. Flowering time

is also adjusted by changing the bulb storage temperature for each line. For example, to hasten flowering of the (C) line, a portion of the bulbs may be stored for 60 to 90 days at a temperature of 50-60 degrees F., 18 degrees higher than normal; then at flowering there will be adequate early pollen. The remainder of the (C) bulbs (stored at the normal lower temperature) flower during the normal period.

Roguing of the female (A) line is important in order to remove any male or other off-type plants. Rogue the (A) line early in the morning when pollen can be detected. Pull up any rogued plants. Remove and bury on the spot any flower heads in the (A) line that produce pollen.

Three to four hives of honey bees per acre should be moved to the edge of the fields when flowering begins.

If seed of the male (C) line is not to be saved, destroy the plants by mowing or discing as soon as pollination is complete. If these plants are left standing, there is the possibility of seed heads from the (A) and (C) lines becoming intertwined by lodging, making harvest of the hybrid seed from the (A) line much more difficult.

Harvesting, drying, and threshing

Onion seed is ready to harvest in late July and August. Seed heads should be gathered when 30 to 50% of the heads have some opened fruits with the black, ripened seeds exposed. The seed turns black during the milk stage but is not mature until later. The heads, with a short piece of stalk attached, are cut or snapped by hand and are dropped into a burlap sack or bucket supported at the waist of the picker. When the container is full, it is emptied into a canvas- or plastic-covered truck bed. Two or three pickings are required in order to obtain the largest yield of ripened seed. However, it is cheaper and more practical to harvest all the heads at one time. After picking, the seed heads are hauled out of the field and transferred to curing sheds, large trays, drying crates, or canvas sheets. Care should be taken to keep the heads from heating, as this will lower the seed germination. Good ventilation is required to prevent molding and heating. During the first few days of drying, occasional stirring is necessary. Layers of seed heads should not be more than 6 inches deep. If seed heads are dried in a shed, more attention must be paid to air circulation.

As soon as the seed heads are sufficiently dry, threshing is done by various methods, including the use of an ordinary grain separator, combine, or specially built machine. Where small quantities of seed are involved, either of the following methods may be used: flailing or rubbing between boards faced with corrugated rubber matting; or rolling with a large roller on canvas or plastic sheets. Where machine methods are used, care should be taken so as not to get too close an adjustment because of the danger of injuring the seed by too much scarification and chipping. Use a magnifying glass to examine the seed. Breakage of the "buttons" (receptacles of the individual flowers) should be avoided, because this material has the same size, shape, and weight as the seed; it cannot be easily separated once it is broken and mixed in. Seed that shatters out in the trays or the canvas should be mixed directly with the threshed seed. Tailings may be rerun if good seed escapes on the first run.

Seed yields

Seed yields vary somewhat from year to year. Yields for the bulb-to-seed method range from about 300 to 500 pounds per acre; more than 1,000 pounds of seed per acre has been reported. Yields for the seed-to-seed methods range from about 500 to 700 pounds per acre; under ideal conditions, using close row spacing, 1,500-pound yields have been reported.