

Commercial Production of Apples in Dwarf Hedgerows

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Growing dwarf fruit trees is an old practice in Europe where it fits well in the general scheme of intensive small-scale farming. Oregon interest in dwarf trees has increased in recent years as the results of experiments conducted by the Oregon Agricultural Experiment Station and other stations have become known.

Two of the most attractive features of dwarf trees are their ability to bear at a young age and the ease of harvesting fruit. When dwarf trees are planted close together in hedgerows, per-acre yields are sometimes quite high.

There are some important limitations to dwarf tree culture and some unknown factors. Our experience is limited primarily to the performance of a few apple varieties and a limited number of orchard sites. Water and nutritional requirements of hedgerows have not been thoroughly explored.

Site selection

Successful growing of apples in dwarf hedgerows demands the most careful management practices. But even with superior care, dwarf trees will not produce on poor orchard sites. A well-drained loam soil, 3 feet or more in depth, which has neither too much clay nor too much sand, is required. Since frosts are more common closer to the ground where the fruit on dwarf trees grows, only relatively frost-free sites are suitable.

Dwarfing rootstocks

Tree size reduction may be obtained by using a dwarfing rootstock, or to a lesser extent by using the same material as a dwarfing stempiece. Not enough is known about the "stempiece" tree at present for recommendations to be made.

Many of the dwarfing rootstocks were classified by the East Malling Experiment Station in England, and are identified by number. East Malling IX is the only fully dwarfing apple rootstock that we can recommend. Its chief limitation is root brittleness, which results in poor anchorage and necessitates tree support.

Apple varieties for hedgerows

The best varieties for hedgerows are those that combine early production with vigorous growth, such as Golden Delicious and Rome Beauty. Jonathan, Yellow Newtown, and the regular strains of Red Delicious are comparatively late in coming into bearing under Willamette Valley conditions. Gravenstein on EM IX bore more fruit than Red Delicious in the first 10 years at Corvallis. In the Hood River Valley, Red Delicious is only a moderately late cropper. Not enough is known

about the performance of the spur-type Red Delicious on EM IX to recommend it on the stock. Since Gravenstein is excessively vigorous, slow to come into bearing, and tends toward biennial bearing, it is relatively inefficient even on EM IX. Trunk scoring, chemical thinning, light pruning, and low rates of fertilization will improve this variety's performance. Gravenstein on EM IX is a larger tree and will require wider spacing and stronger support than most varieties.

Designing hedgerows

Fifteen feet between rows is sufficient to allow passage of most equipment if the trees are trained to a central leader and supported. A space of 20 feet is required for Gravenstein. Savings could be realized by the use of smaller than standard equipment in this type of planting.

Under Willamette Valley conditions, a distance of 6 feet between trees in the row utilizes space more efficiently with all varieties except Gravenstein, where the distance should be increased to 10 feet. In the Hood River Valley, 4 feet between trees utilizes space most efficiently in the early years. Then every other tree should be removed, ending with a mature planting at 8 feet in the row.

Since the trees bear heavily and before the trunk has achieved sufficient strength, support is essential. Supporting the trees on stakes has not been entirely satisfactory. Maintenance of the upright growth of the trees requires a strong wire trellis and systematic pruning. A trellis with wires at heights of 3, 6, and 8 feet is sufficient for all varieties except Gravenstein. A 10-foot trellis is needed for Gravenstein. The wire and posts used must be strong and the trellis well-built since it must hold much of the weight of heavy crops. Used tires, cut radially into $\frac{1}{4}$ -inch-wide sections, make good ties. Burlap or rubber hose, prefabricated aluminum ties, wrapped wire, or surplus nylon parachute cord may also be used. Turnbuckles in the guy wires at the ends of the trellis permit tightening before harvest. After harvest, the wires can be loosened to prevent the "dead-man" from loosening as the soil becomes saturated in winter.

Red Delicious and Gravenstein require pollenizers. Since it would not be practical to plant pollenizer varieties in the hedgerows, every second or third row should be planted to a pollenizer variety, such as Golden Delicious. Yellow Newtown, Golden Delicious, Rome Beauty, and Jonathan do not require pollenizers and can be planted in solid blocks.

Plans for irrigation should be made prior to planting.



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Planting and training

If there are strong prevailing winds, it will be easier to support hedgerows parallel to the wind. The demands of rill or furrow irrigation may outweigh all other considerations in determining row direction.

Since a planting distance of 6 x 15 requires 484 trees per acre, it is much more economical to plant 1-year-old whips than 2-year-old trees.

One efficient planting procedure is to prepare a 16- to 18-inch furrow for each row. The trees are placed at 6-foot intervals in the ditch and the soil filled in around them. If the soil is dry, the trees must be irrigated at planting time. If a tree hole auger is used, it should be 16 inches or more in diameter.

Planting the trees with the graft union 2 to 3 inches above ground will prevent scion-rooting. Often the



trees settle an inch or two after planting. The dwarfing effect of the rootstock will be lost if the scion is allowed to strike root.

Cut the whip back at planting time to within four or five buds of the graft union. When growth begins, all shoots but the most vigorous one should be rubbed off. The remaining shoot usually will grow 3 or 4 feet and branch in the first summer. It will form the central leader and, if it is long enough, it can be tied to the first trellis wire.

Pruning in the first few years is directed primarily at maintaining the central leader. Branches which form narrow angles with the central leader are likely to compete and should be bent over and tied to one of the support wires. If branches are tied to the wires in a horizontal position, vertical shoots will arise from them. Branches tied to form about a 60-degree angle with the central leader will be suppressed without producing vigorous vertical shoots.

The photographs above show the central leader system and the problem encountered when the leader is lost. Removal of the fruit from the portion of the central leader not supported by wires is necessary to maintain the central leader. Branches closer than 2 feet from the ground should be removed.

As the trees grow older, it is necessary to head back lateral branches to prevent breakage. Cutting the upper branches shorter than the lower ones will result in more even distribution of light. Cutting to a side shoot will prevent excess branching. Heavy pruning results in excess shoot growth of standard trees but not of dwarfs. Dwarf apple trees require relatively heavy pruning for adequate renewal of fruiting wood.

Soil management and weed control

Weed competition is particularly serious with dwarf trees. A weed-free strip of ground 2 feet wide on both sides of the row is desirable. Economical control is dependent upon the use of chemicals, since the trees are too low and close together for adequate under-tree cultivation. At present, simazine and amitrole or amitrole-T are registered for use in dwarf apple orchards. They must be applied after harvest in the fall, but before fruit forms in the spring. Injury may occur on light soils or if excess amounts are applied. Some hard-to-kill perennial weeds may survive this treatment. They can be controlled with oil and PCP (pentachlorophenol) contact herbicides which are currently registered for use in orchards. However, such herbicides must not contact trees or they will cause injury.

Cultivation often damages roots and creates mud and dust problems. With irrigation, maintenance of a permanent cover crop is both feasible and desirable. A grass sod of chewings or red creeping fescue makes an excellent permanent cover. Sub-clover makes a good cover where it thrives. The cover crop will require mowing and fertilization. It is not necessary to establish a permanent cover crop until the end of the second growing season.

Other cultural practices

Nitrogen is the principal fertilizer element needed. It can be broadcast with a fertilizer spreader at 50 to 100 pounds actual N per acre. An average extension growth of less than a foot often indicates nitrogen shortage. Growth of 2 feet or more in bearing trees indicates overabundance. So far no important nutritional requirements of dwarf trees beyond those of standard ones have been reported.

It is essential to irrigate dwarf apple hedgerows in all areas other than the Willamette Valley and the coast. It is not known whether irrigation is essential in the Willamette Valley, but it would probably increase fruit size and tree growth appreciably, particularly where total available moisture storage is limited. Dwarf hedgerows present an unusual sprinkler system design problem.

Spraying must follow sprinkler irrigation as closely as possible. In the case of ground application, this depends upon the rate at which the soil surface dries and the condition of the cover crop, if any.