ABOUT OUR COVER

HIGH DENSITY "TREE WALLS"

The general trend to higher tree density in apple orchards has been almost totally dependent on the use of the size-controlling rootstocks with more dwarfing rootstocks required as the tree density increased. With the use of such rootstocks becoming common in commercial orchards and the continued evaluation by researchers, a number of problems have become apparent including poor anchorage; greater susceptibility to winter injury, drought or "wet feet", root rot, crown rot and fireblight; and graft incompatibility. In the case of peaches, nectarines, and other stone fruits, the lack of satisfactory size controlling rootstocks has dampened the trend to high density as observed in apple plantings. Several peach rootstocks have been evaluated and may show promise for increased hardiness or other beneficial effects but none have more than a minimal effect on size control.

Preliminary trials in a commercial peach orchard in 1967-1968 indicated that summer pruning and tipping might be a useful technique for limiting the size and spread of peach trees. Subsequent research at Purdue over the last 7 years has confirmed the value of summer shearing or hedging as a valuable technique in controlling tree size and reducing the time required for winter pruning.

Our early experimental plantings were designed to develop particular tree shapes best suited to the high density, tree wall system and to devise specific procedures for training and pruning to maintain these tree shapes. Tree shapes developed include a 1) standard open center vase shaped tree, 2) a central leader flat fan, 3) an open center two scaffold flat fan, 4) a cylinder or pyramid tree with no permanent scaffold branches, and 5) a Belgian fence in which the trees were inclined at a 45° angle at the time of planting. Tree densities ranged from 290 to 968 trees per acre. All of the tree shapes were developed by summer tipping twice during the growing season, once when the terminal growth was eight inches long and the second approximately 30 days later. After the second or third year all summer shearing was accomplished with a tractor mounted sicklebar mower capable of operation in any position so that the top and sides of the rows could be sheared.

[1]Journal paper No. 6098 of the Purdue University Agricultural Experiment Station. Cover photograph by Jules Janick.

Aerial view (above) and over-the-row view (below) of Purdue's peach pruning experimental plots; hedged tree walls (left & center) and nonhedged trees (far right) are included in both photos.

In later plantings we have adopted the flat-, fan-shaped tree as a standard for high density tree walls with much less concern for the structure of the tree in terms of crotches and scaffold branches. The individual tree is conceived as an elongated rectangular box and all trees in the row sheared to the same dimensions. Each year the dimensions are increased until the entire tree wall reaches the mature width of 4 to 5 feet. The mature tree wall can be held at any height desired but in most of our plots we have found that a height of 10 to 11 feet can be attained in 3 to 4 years and easily maintained in subsequent years. We have also demonstrated that identical plantings can be held at a height of 7 feet or any intermediate height if this is desirable for a pick-your-own marketing system.

Yields in the second, third, and fourth year have been directly correlated with tree density. Little effect has been noted due to training system except for systems such as the open center, vase shaped trees, where more severe pruning tended to delay fruit bud formation and reduce yields in the first and second fruiting years. After the tree walls reach maturity and the entire wall space has been solidly filled there would appear to be no appreciable effects of training system on yield potential. Although repeated frost problems have complicated yield data there is no question that increasing tree numbers alone amounts to a substantial increase in yield potential in the first 5 years and that increased bearing surface per acre should maintain these higher yields throughout the life of the planting (see also p. 580).

In addition to increases in yield and earliness of bearing the tree walls offer additional advantages in better penetration of spray materials, faster drying of trees, better sunlight penetration leading to more uniform ripening and better fruit quality.

Harvesting of the tree walls has been done from a slow moving, three tiered wagon directly into retail boxes. Costs per bushel for picking have been reduced 60% as compared to standard peaches picked with ladders and picking bags. Preliminary work with an over-the-row mechanical harvester are quite promising.

Research plots with flat fan, tree wall apples has been underway at Purdue since 1962 (see cover photo) but summer shearing has only been observed for two years. These observations have, however, convinced us that the general principles will be as applicable to apples as they are to peaches. The summer shearing of apples in 1974 greatly reduced the pruning time required during the winter and increased the formation of fruit buds on the inside of the tree. It is conceivable that with summer shearing used to reduce vegetative growth and the development of water sprouts that winter pruning can be reduced to an alternate year process.

In summary, we see the concept of high density, tree wall orchards of apples and peaches as very promising as a means of obtaining early bearing, increasing yields, better fruit quality, and reducing production costs by mechanization of pruning and harvesting.

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ABSTRACTS FOR THE 73RD ANNUAL MEETING
AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE
(Concurrent with the Plant Growth Regulator Working Group)
Louisiana State University, Baton Rouge, Louisiana
August 11-14, 1976

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