Apple tree conversion to narrow walls via hedging, root pruning

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Fruit trees are pruned to maintain a desired tree shape and size to increase light penetration into the canopy, thereby enhancing fruit quality and flower bud development. Most modern apple orchards consist of high-density plantings, and they must be managed to maximize

light interception and distribution throughout the canopy. Pruning is essential, especially in modern high-density operations and represents approximately 30% of the apple production costs for trees trained as central leaders

Renewed interest in mechanical hedging of trees (pruning with slotting saws, minimizing hand pruning) has come about and pushed growers to re-evaluate their training systems. With increasing labor costs across the United States, alternatives to hand-pruning and current training systems are being considered.

One management strategy involves transitioning tall spindle trees to a narrow tree wall and simplifying labor-intensive activities of apple production, such as pruning, harvesting, and fruit thinning. The objective is to form the orchard system into a "fruiting wall" that makes fruit more visible and accessible, thus facilitating harvesting.

The objectives of a new study were to evaluate four management practices (tall spindle; narrow tree wall with manual pruning; narrow tree wall with dormant and summer hedging; and narrow tree wall with dormant hedging, summer hedging, and root pruning) and their effects on light distribution in the canopy, vegetative growth, yield, fruit quality, and flowering when transitioning an intensive orchard from a tall spindle system to a narrow tree wall.

The research is published in the journal *HortScience*.

The researchers found that summer and dormant hedging did not confer a clear benefit to the orchard management practices and fruit quality characteristics when not complemented by root pruning. Although hedging and root pruning reduced shoot growth the year after treatment and increased red fruit color, other fruit quality characteristics suffered, such as firmness, soluble solids concentration, and distribution of fruit

size.

A proper economic analysis factoring in fruit size distribution and red color percentage is needed to determine the impact of treatments. Hedging without root pruning produced higher yield compared with manual pruning, although these fruits were smaller in size. The insignificant increase in canopy light conditions with hedging failed to explain the yield increase, although a slight improvement in light conditions could have translated into a significantly higher yield.

Finally, the results indicate this shift to narrow tree walls did not provide much benefit and often caused other issues, such as smaller fruit. The team does not recommend the transition to mechanical hedging in commercial orchards, agreeing with previous research conducted in the 1960s to 1980s.

First author Thiago Campbell is a Ph.D. student at Washington State University focusing on apple tree physiology.

According to the author, "This research was conducted due to increased interest in mechanical hedging as an alternative to manual pruning in commercial apple orchards in the Mid-Atlantic region. Our project aimed to determine the effectiveness of mechanical hedging as an alternative to root pruning in Mid-Atlantic apple orchards."

More information: Thiago Campbell et al, Converting Tall Spindle Apple Trees to Narrow Walls with Summer and Dormant Hedging Plus Root Pruning, *HortScience* (2023). DOI: 10.21273/HORTSCI16927-23

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