

The Fruiting Wall Concept using Tall Spindle Trees and Mechanical Pruning

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Over the last 15 years we have developed a new high-density apple planting system named the Tall Spindle which has higher yield potential than traditional orchards and is rapidly gaining popularity among NY apple growers. The Tall Spindle system utilizes highly feathered nursery trees planted at a density of 1,000-1,300 trees/acre. The trees are pruned minimally after planting but feathers are tied below horizontal soon after planting. The tree is grown rapidly to 10-11 ft. tall with no heading of the leader and little pruning for the first 4-5 years after which tree height is limited each year to 11ft by cutting to a side branch. The mature tree is pruned using limb renewal pruning by removing 2-3 of the largest limbs (>2cm diameter) in the canopy each year by cutting them back to a 2-3 cm long stub. At maturity this system gives a narrow, tall fruiting wall with good fruit quality due to good light exposure in the narrow canopy. Our trials indicate that the Tall Spindle system has been the most profitable system evaluated. Early yield of recent trials has exceeded 3,000 bu over the first 5 years. After year 5, partial mechanization of dormant pruning by using labor positioning platforms has increased dormant pruning labor efficiency by 25-40%. Further mechanization of pruning by using side wall shearing of the tree canopy in the summer with a cutter bar may offer further reductions in annual pruning costs of the tall spindle.

Materials and Methods: In the summer of 2012 we initiated 5 summer sidewall shearing pruning studies at Vandewalle Orchards (Alton, NY), Crist Bros Orchard (Marlboro, NY), Lamont Fruit Farms (Albion, NY), Everett Orchards (Peru, NY) and at the Experiment Station in Geneva, NY. In each study we evaluated the effect of timing of summer sidewall shearing (first week of June, first week of July and first week of August) on Tall Spindle apple trees. At the Lamont site we also evaluated an earlier timing (first week of May) and at the Everett site we only evaluated the early August timing. At each site the hedger cutting bar was positioned at a slight angle along the edge of the canopy 24 inches from the trunk at the base of the canopy and 12 inches from the trunk at the top of the canopy. We evaluated proportion of shoots on the whole tree which were cut by the machine, number of fruits cut off, shoot re-growth, light intensity in the canopy at 3 heights and fruit quality at harvest. We plan to evaluate return bloom next spring (May 2013). At each location fruit yield was recorded at harvest and a fruit sample was collected to evaluate fruit color and sugar content.

Results: Summer sidewall shearing was fast and left the trees with a “manicured” look (Fig. 1). The cost and time amounted to a fraction of the time (5%) to do manual summer pruning. When the sidewall shearing was done at bloom there were some flowers cut off but the grower viewed it as a dormant pruning. However, when the sidewall shearing was done in June, July or August some fruits were cut off and the growers were more concerned. Fruit counts showed that then number of fruits cut off was 3-8% and would be no more than dropped to the ground by hand thinning.

Light exposure measurements at each site showed that the summer sidewall shearing improved light intensity in the lower part of the canopy by about 10%. There was little improvement of light exposure in the top of the canopy. The trees we used in these studies the canopies were already quite well shaped for good light distribution and the shearing removed only a small portion of the shoots and thus had a small effect on light distribution in the canopy.

The sidewall shearing treatments did not induce vigorous shoot regrowth regardless of the timing of the mechanical pruning. However, with the early timing (early June) we saw the development of short re-growths (8 inches) with a terminal bud, which likely will be flower buds next spring. With the July timing regrowth was about 5 inches and at the August timing there was no regrowth at all.

At harvest there were no large differences in fruit color among treatments. However, the sidewall shearing treatments had slightly better fruit color than the unshowered controls.

Discussion: Our results with summer sidewall shearing were positive in 2012 but will require 2 more years to fully determine if this approach has long term positive results or if negative tree growth will negate the labor savings from mechanical sidewall shearing. If side-wall shearing in the summer can reduce summer pruning costs by 95% and improve fruit color without negative effects on return bloom or vigorous growth response it will also have a significant impact on orchard profitability. Results from 2012 are encouraging so far in that there was no regrowth from the sidewall shearing treatments with the Tall Spindle system.

A long-term strategy that we envision is to use annual side-wall shearing of Tall Spindle trees for 3 successive years with no other dormant pruning but in the third year to add a dormant winter corrective pruning to remove limbs that have become large and are causing internal canopy shading and poor fruit quality. Such a pruning strategy could reduce total annual pruning costs in Tall Spindle orchards by about 65% (averaged over 3 years) and result in a narrow, tall fruiting wall. This will help NY apple growers remain profitable and competitive.



Fig. 1. Narrow tree wall canopy achieved with hedging machine. The narrow trees allow for better light exposure of the fruits and better fruit quality.