

Effects of crop load, fertilizer, and leader selection on new tree growth

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The trees ability to fill space within the orchard and achieve high yields quickly is more important than ever today given the grower's need to be profitable. Even with the higher densities being planted today where trees at planting time almost fill their space, there is still the need to achieve additional canopy volume quickly but without overgrowing the space intended. Methods for achieving maximum canopy volume have changed since the era of central leader. Central leader trained orchards needed to fill a wider space and create a tree structure that would support all the apples produced. Typically nursery trees produced were unfeathered and heading cuts were made to establish a very structured tree. Tree growth was forced by fertilization, crop load control (trees were not allowed to fruit for several years until the tree space was filled). Today nurseries are producing high quality feathered trees that are planted without much lateral space to fill. These trees usually come from the nursery with fruit buds and are on precocious rootstocks that encourage early bearing. Early cultural practices should encourage optimum growth at the expense of fruiting. Since these trees are planted with a limited root system great care need be taken to encourage this needed growth. However, growth should be moderate to prevent winter injury and encourage fruit bud formation.

For years, advisors have exhorted you to take exceptional care of your newly planted trees. Much of the information that was provided was based on observations over the years of practices that promoted growth and productivity but based on very little real data.

In short, the advices was to plant early, water in with fertilizer solution and follow up with a modest amount of ground fertilizer, prune appropriate to the planting system, deflower, control weeds, and control secondary pests. Although we are no longer trying to fill space and create a permanent structure, we still need to encourage growth to fill canopy volume.

This spring we planted a research and demonstration orchard at the Hudson Valley lab. Tree spacing is 3 X 12 ft with a density of 1340 trees per acre. We conducted three separate experiments to better understand factors which would maximize 1st leaf tree growth; the effect of leader selection, the effect of fertilizer, and the effect of flower and fruit removal.

Experiment 1. This experiment tested the effect that the distance between the leader and the nearest competing bud has on the growth of 1st leaf trees. The treatments included 1) all the lateral buds 20cm below the selected terminal removed, 2) all lateral buds 10cm below the selected terminal removed, and 3) no lateral bud removal. Treatments were arranged in a randomized complete block with 5 reps and two varieties of trees (Snow Sweet and Red Delicious). Buds were removed by rolling them with a thumb or forefinger completely removing the bud without removing any bark.

All trees were irrigated 2.5 gallons of water per tree twice a week when less than 1" of rain fell during the week. All shoot growth 60 cm above the rootstock was removed throughout the growing season. All blossoms and fruitlets were removed the day treatments were applied. All trees were fertilized twice with 4oz of CaNO₃ fertilizer 2 weeks apart.

Starting the beginning of June, leader length was measured weekly through the growing season. Other data collected included initial trunk cross sectional area measured 30 cm above the graft union at the initiation and the termination of the experiment, the total number of lateral shoots and total shoot growth.

Experiment 2

This experiment tested the effect of 3 fertilizer treatments on newly planted Rising Sun Fuji trees. There were 4 treatments, a) no fertilizer, b) a single application of 4 ounces of CaNO₃, c) a single application of 8 ounces of CaNO₃, and d) 2 applications of 4 ounces each of CaNO₃, 14 days apart. Treatments were applied 14 days after bloom. The fertilizer was applied in a circle around the base of the trunk being careful not to contact the tree. All buds within 10cm of the leader were removed on all trees. All shoot growth on the trunk 60cm above the graft union was removed as it appeared. All blossoms and fruit were removed the day of the 1st fertilizer application and then throughout the growing season. All trees were irrigated with 2.5 gallons of water twice a week when less than 1” of rain fell that week.

Data collected included trunk circumference measured 30 cm above the graft union at the initiation and the termination of the experiment, the total number of lateral shoots and total shoot growth and the length of the terminal shoot measured weekly.

Experiment 3

This experiment tested the effect of flowering and fruiting on growth of 1st leaf trees. There were 3 treatments; a) all blossoms and fruitlets removed at bloom, b) fruit allowed to set and size to 25mm then removed, c) all fruit that set were allowed to remain to harvest. There were 5 replicates and two varieties (NY1 and NY2).

All shoot growth on the trunk 60cm above the rootstock were removed. Leaders were selected by removing all lateral buds 10cm below the selected terminal bud. All trees received 2 applications of 4oz of CaNO₃ 14 days apart. Trees were irrigated with 2.5 gallons of water twice per week when less than 1” of rain fell.

Data collected included trunk circumference measured 30 cm above the graft union at the initiation and the termination of the experiment, the total number of lateral shoots and total shoot growth and the length of the terminal shoot measured weekly through the growing season. Fruit number and yield was also recorded at harvest.

Results

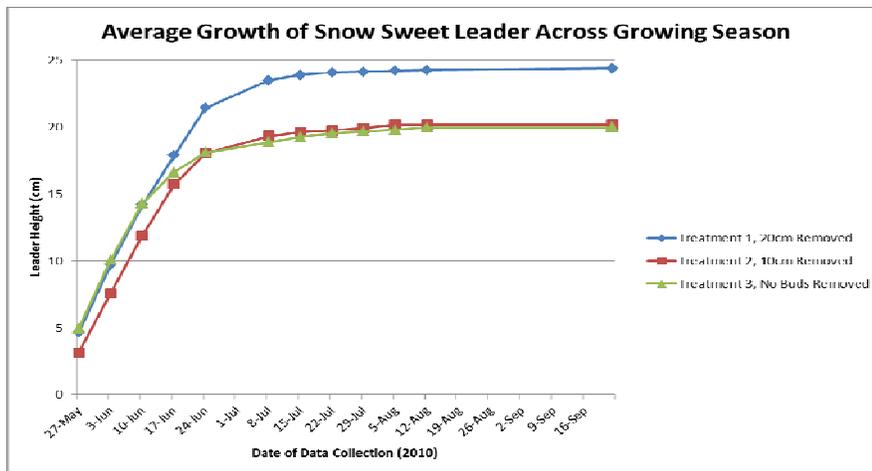


Fig1. Mean leader growth through the growing season of the 3 leader selection treatments. The rate of leader growth appears to be the same among treatments for the first three weeks sampling. At the 4th sampling period the treatment with no bud removal slows. The intermediate treatment (10 cm below the leader bud) continued growth for 1 additional week before growth slowed and stopped and the 20 cm treatment continued to grow for an additional 3 weeks after the no bud removal treatment.

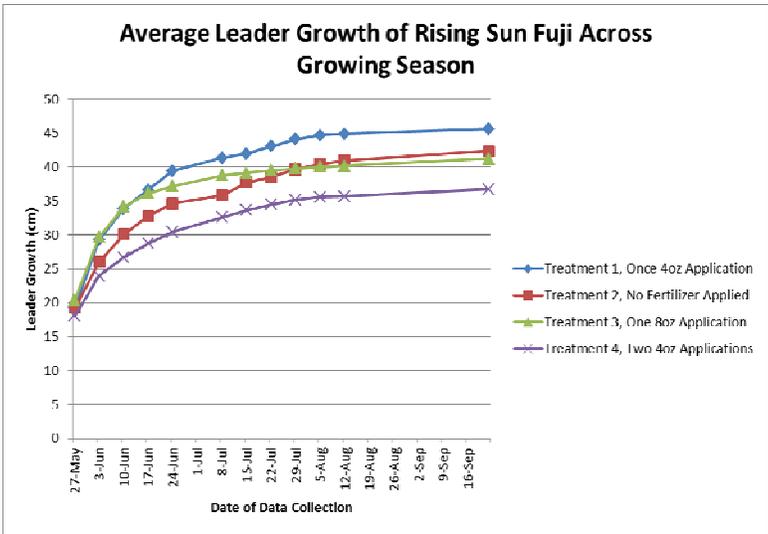


Fig.2 The effect of fertilizer treatments on leader growth throughout the season.

Figure 3. The effect of blossoms and early fruit set removed, 25mm fruit removed and no flowers or fruit removed on the average leader growth of NY2 through the growing season. This data shows that fruit and flower removal resulted in 6 cm of additional leader growth through the season. However, there was no difference whether flowers were removed or 25 mm fruit was removed on the total leader growth through the season.

