

## Organic Methods To Promote Branching In Nursery Apple Trees

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We raise organic apples on our farm in southwest Wisconsin. Like many organic growers, we've experimented with grafting and raising our own planting stock. It's difficult to buy organically grown planting stock. Although organic standards permit planting non-organic trees, many organic growers prefer to graft and raise their own trees organically to reduce reliance on synthetic products and/or to grow uncommon varieties which are not readily available through commercial nurseries.

However, it's proven difficult to raise well feathered trees on our farm. Planting feathered trees increase yields in the first years of the orchard and speeds up return on investment. Commercial nurseries generally use chemical plant growth regulators (e.g., Maxcel, Promalin, and Tiberon) to promote branching and to produce feathered trees, but these products are not permitted in organic production.

With funding from a USDA-SARE Farmer Rancher grant, we evaluated organic methods of promoting branching in nursery trees. We compared manual leaf removal and organic cytokinin sprays to an untreated control. Manual leaf removal means repeatedly tearing off young leaves near the growing tip of the tree – these leaves produce auxin which suppresses lateral buds from developing into branches. Organic cytokinin sprays are derived from seaweed and we thought that they might work similarly to the synthetic cytokinin in Maxcel.

We bench-grafted sixty trees each of nine varieties onto G.41 rootstock in March, 2018 and raised them in a high tunnel during the 2018 growing season. We applied 2" of finished compost before planting to the entire tunnel, we mulched the trees heavily after planting with hardwood bark, we irrigated as needed with drip irrigation, and we controlled vegetative pests as needed with OMRI-listed pesticides. We trained the trees using standard procedures: we singulated all trees to a single shoot from the scion, we removed all branches below 22" above the graft union, and we tied the leader to a bamboo stake as it grew. Our entire farm, including this nursery, is certified organic.

We applied one of three treatments to each tree:

- (1) Untreated control
- (2) Tear off 3 young developing leaves near the growing tip three times, two weeks apart, starting when leader reached 22" above graft union
- (3) Spray Sea Crop 16 three times, two weeks apart, starting when leader reached 22" above graft union, at maximum label rate (2 cups/gallon water) to 8-10" at the top of tree. (Sea Crop 16 is an OMRI-listed plant growth regulator produced by North American Kelp, Waldoboro, ME. We selected it because it had the highest cytokinin concentration of any organically-approved plant growth regulator which we are aware of. Note that this maximum label rate of Sea Crop 16 results in 50 ppm cytokinin, which is only 10-20% of the concentration of cytokinin which is typically used when Maxcel is sprayed to promote branching in conventional nurseries).

At the end of the season we measured tree height and the number and length of all feathers >4" in length. For planting in the tall spindle system, trees will ideally have 10-15 feathers >4" in length. Statistical analysis showed the following trends:

- Taller trees had more feathers. For each increase in tree height by 6", a tree typically had one more feather.
- Varieties differed greatly in branching. For example, Golden Russet had about 5 more feathers per tree than other varieties such as Macoun and Hudson's Golden Gem.
- Leaf removal promoted branching, and the Sea Crop 16 spray actually reduced branching. But the effects were small: compared to the control, leaf removal increased the number of feathers per tree by 0.9, and spraying

decreased the number by 0.7. We don't know why the seaweed spray would have reduced branching, but it is a complex naturally-derived product which may have other active compounds beside cytokinins. The treatments did not affect average feather length.

- There was a wide variation in tree growth above the graft union, from 2.5' to 8'. In general, grafts grew more than is typical for outdoor nurseries in our experience. Treatment did not affect tree height, but varieties differed significantly in height.

The cost in materials and labor for raising a tree in this system was approximately \$12, excluding overhead costs and costs of facilities and equipment; the different treatments to promote branching had minor effects on the overall cost of raising a tree. We would recommend removing young leaves because although the effect was small, the cost in labor was minor. However the cost of raising trees in this system was considerable and may be more than the cost of purchased trees, so growers should probably consider carefully the costs and benefits of raising trees on-farm vs buying their planting stock.

A detailed report of our results is available online at [www.twoonionfarm.com/research/](http://www.twoonionfarm.com/research/) and I am happy to answer questions by email: [farmer@twoonionfarm.com](mailto:farmer@twoonionfarm.com).

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Tip of a leader four days after leaf removal treatment was applied. Notice the petiole stubs where leaves were removed.



Trees growing in the nursery



Two newly dug Grimes Golden Trees in December