Influence of Foliar Urea on Branching of Apple in Response to MaxCel Application at Bloom

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The majority of apple orchards that are being planted now are high density, and the trees are invariably propagated on a dwarfing rootstock. These plantings frequently have a tree density of over 1000 trees per acre. When the required support system and usual trickle irrigation associated with these planting are added to the cost of trees, the initial investment is very high. In such plantings, it is very important to grow trees to fill their allotted space rapidly, to allow early and substantial production, and to start to receive an early return on the investment. Frequently, newly planted trees are slow to grow even when appropriate management is followed. One procedure used by many growers is to apply prior to or at bloom a spray containing benzyladenine (BA) such as MaxCel or one containing both BA and gibberellins GA such as Promalin. I have used both of these to increase branching and enhanced tree growth. Sometimes, I have been successful, and at other times, trees have not responded with increase branching and growth. Although good horticultural practices are a necessary prerequisite, sometimes increased branching is not observed even when proper care was done. What was lacking in these situations where poor response was observed?

Lailiang Cheng, Professor of tree fruit nutrition at Cornell University, published a paper in the *New York Fruit Quarterly* that appeared to provide a clue that might explain the lack of response while he was working with nursery trees. He noted that early growth of a tree in the spring is dependent upon storage nitrogen and storage carbohydrate. Carbohydrate produced by a tree in the spring is not available for growth for at least a couple of weeks after shoots start to grow. Carbohydrate to support growth must be available early, so it must come from storage reserves. If a tree grew well the previous year and terminal growth was stopped early enough to allow translocation of carbohydrate to the tree, storage carbohydrate will probably not be limiting. Dr. Cheng suggested, however, that the availability of storage nitrogen might be deficient. In his paper, he showed that even when significant amounts of nitrogen are applied to nursery trees during the growing season, much of it is not available to support growth the following spring. If he sprayed urea on a tree in October, however, much of it was translocated into the tree and was available to support growth the following spring. He further showed that a substantial amount of this foliar-applied storage

Table 1. Influence of urea spayed on young trees in the fall and benzyladenine (MaxCel) applied in the spring on lateral branching and growth of Empire/M.9 NAKBT337 apple trees.

Treatment	Lateral branches (no./tree)	Avg length of lateral branches (cm)	Total lateral shoot growth (cm/tree)	Total terminal growth (cm)	Total shoot growth (cm/tree)
Control	13.2	21.4	313	349	661
Urea[1]	14.9	23.0	283	337	602
MaxCel[2]	18.6	28.4	501	236	737
Urea + MaxCel	20.0	24.2	487	252	739
Significance					
MaxCel	**	NS	**	NS	*
Urea	NS	NS	NS	NS	NS
Urea x MaxCel	NS	NS	NS	NS	NS

[1]Urea applied as a foliar spray on October 23, 2019 as a dilute spray containing 3% urea
[2] MaxCel applied as a dilute foliar spray at bloom in 2020

nitrogen was used to support growth the following spring.

At the UMass Cold Spring Orchard, we selected a row of Empire/M.9 NAKBT337 that were planted in 2018. Accepted pomological practices were employed, such as early planting, trickle irrigation applied early, and they were planted in land that was well prepared and was in cover crops for the 2 years prior. They grew acceptably, but as is often the case with Empire, lateral branching was sparse. In this row, 40 similar trees were selected, and they were divided into 10 groups (replications) of four trees each. In the third week in October (2019), half of the trees were sprayed with a dilute 3% urea spray. No phytotoxicity was observed. In the following spring (2020) at bloom time, 10 trees that were previously unsprayed and 10 trees that previously received 3% urea in the fall were sprayed with a 300 ppm spray of MaxCel. Trees were cared for following accepted horticultural and pest management procedures. In April, one pound of 10-10-10 per tree was applied, and in May one pound of urea per tree was applied. In November (2019), all growth and branching measurements were taken. The results of the growth response to treatments are presented in Table 1.

Application of MaxCel increased lateral branching on Empire/M.9 apple trees, and it increased the total number and amount of lateral shoot growth. Urea had no influence on the number of lateral branches or the total growth of the lateral branches, and when it was combined with MaxCel it did not increase the number or total growth of lateral branches on these trees treated with MaxCel. No treatment increased the growth of terminal shoots. Total growth on these trees was increased when MaxCel was applied at bloom. All of this increased growth can be attributed to the increase in lateral shoot length. While it is disappointing that a foliar application of urea in the fall did not increase either branching or growth of the trees, with or without MaxCel application, it is reassuring to note that it appears that the nutrition program used on these trees early appeared to be sufficient to satisfy the nitrogen requirements needed for an early growth response.

Literature Cited

Cheng, L. 2002. Growth performance of apple nursery trees in relation to reserves of nitrogen and carbohydrate. *New York Fruit Quarterly* 10(3):15-18.

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