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Using Heading vs. Notching With or Without BA Application to Induce Branching in Non- feathered, First-leaf Apple Trees

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When planting high-density apple orchards on dwarf rootstocks, it is best to use well branched nursery trees so that early production and profitability are maximized. Often, however, nursery trees arrive with less than the optimum number of branches, or worse, are nearly ‘whips’ with no branches at all. Hence, steps are often taken to promote branching. In semi-dwarf orchard systems at wider spacing a heading cut is very effective at creating branches, however, may have an invigorating effect



Figure 2. Notching was performed with a hacksaw on 10 buds between 30 and 50 inches from the soil surface soon after planting. *J.M. Clements photo.*



Figure 1. For the heading treatment, trees were cut 40 inches from the soil surface soon after planting. *J.Clements photo.*

that is not necessarily desirable in high-density orchards. Bud ‘notching’ and benzyladenine (BA) application are two other methods to promote branching in young trees.

The objective of this research project was to measure the effects of a heading cut and notching with or without BA application on poorly feathered trees in a first-leaf apple orchard to promote lateral branching.

Non-feathered, knip-boom Lindamac/M.9 apple trees planted in spring 2008 were used for this study. The experiment was conducted in a completely randomized design as a 2-way factorial with mechanical treatment (control, heading,



Figure 3. BA (375 ppm) was applied by backpack sprayer between 30 and 50 inches from the soil surface soon after planting. *J.M. Clements photo.*

notching) and BA application (with or without) in two locations (Massachusetts and New Jersey) soon after planting in the orchard. The control was not headed or notched. The heading treatment (Figure 1) cut trees to approximately 40 inches in height shortly after planting. For the notching treatment (Figure 2), 10 buds between 30 and 50 inches from the soil surface were notched with a hack-saw blade also shortly after planting. For trees receiving BA, Promalin® Valent U.S.A., Figure 3) was applied to the leader (30 and 50 inches from the soil surface) using a backpack sprayer at

Table 1. Lateral branching of Lindamac/M.9 during the first year (2008) in the orchard as affected by various treatments in MA and NJ.^z

Category	Leader growth (cm)	Lateral shoot growth			Trunk cross-sectional area (cm ²)	Number of spurs ^y
		Total length (cm)	Number	Average length (cm)		
<i>Location</i>						
MA	46.0 a	232 a	8.6 a	28.1 a	2.7 a	---
NJ	39.3 a	133 b	6.7 b	22.4 b	2.1 b	---
<i>Treatment</i>						
Control	36.3 b	111 b	6.4 b	19.7 b	2.3 ab	29.0 a
Heading	59.0 a	211 a	7.0 b	32.3 a	2.1 b	1.9 b
Notching	31.8 b	206 a	9.1 a	22.9 b	2.5 a	27.2 a
<i>BA application</i>						
Control	40.9 a	152 b	6.0 b	25.1 a	2.4 a	21.9 a
BA	43.3 a	198 a	8.9 a	24.6 a	2.3 a	17.8 a

^z Within location and within BA application, mean not followed by a common letter are significantly different at odds of 19 to 1.

^y Spurs were counted in NJ only.



Figure 4. Untreated tree after one season. *W.P. Cowgill photo.*



Figure 5. Notched tree after one season. *W.P. Cowgill photo.*

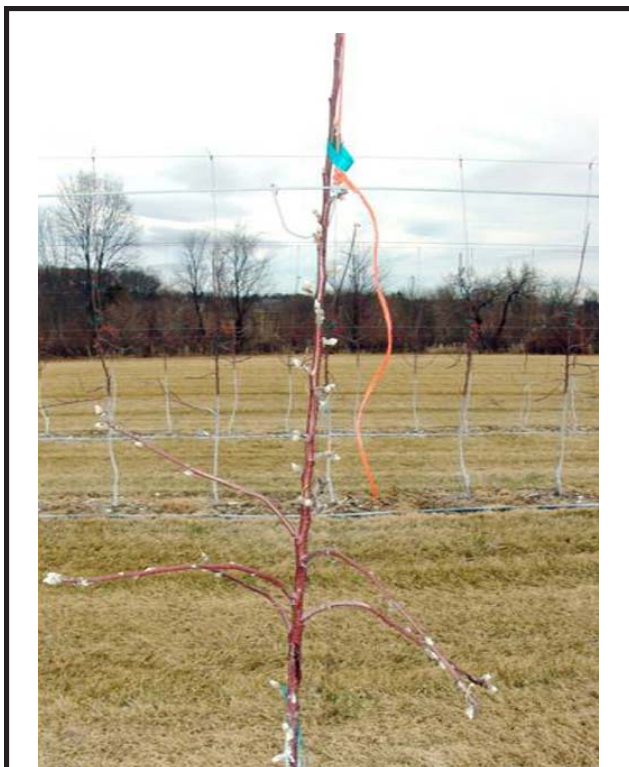


Figure 6. BA-treated tree after one season. *W.P. Cowgill photo.*

a rate of 375 ppm (12 ounces/5 gallons of water) when new terminal growth was approximately 1 to 3 inches long. There were five, single-tree repetitions of the six treatment combinations. Measurements of leader growth, trunk circumference, total shoot growth (shoots longer than 4 inches), and shoots/spurs less than 4 inches long (New Jersey only) in fall 2008. In 2009, the number of flowers (spring), number of fruit (fall), and trunk circumference were measured in Massachusetts only.

Significant differences in lateral branching (shoot growth) in 2008 (Table 1, Figures 4-7) included: 1) heading resulted in a longer leader than the control or notching; 2) total shoot length was less for the control compared to heading or notching; 3) the number of shoots was greatest for notching; 4) length of shoots was greatest for heading; 5) the control and notching had many more spurs than heading (NJ only); 6) total shoot length and number of shoots was increased with BA application; and 7) mechanical treatments and BA application did not interact to affect growth. In 2009 (MA only, Table 2), heading resulted in more fruit than the control, but did not differ from notching.

Heading and notching resulted in greater total

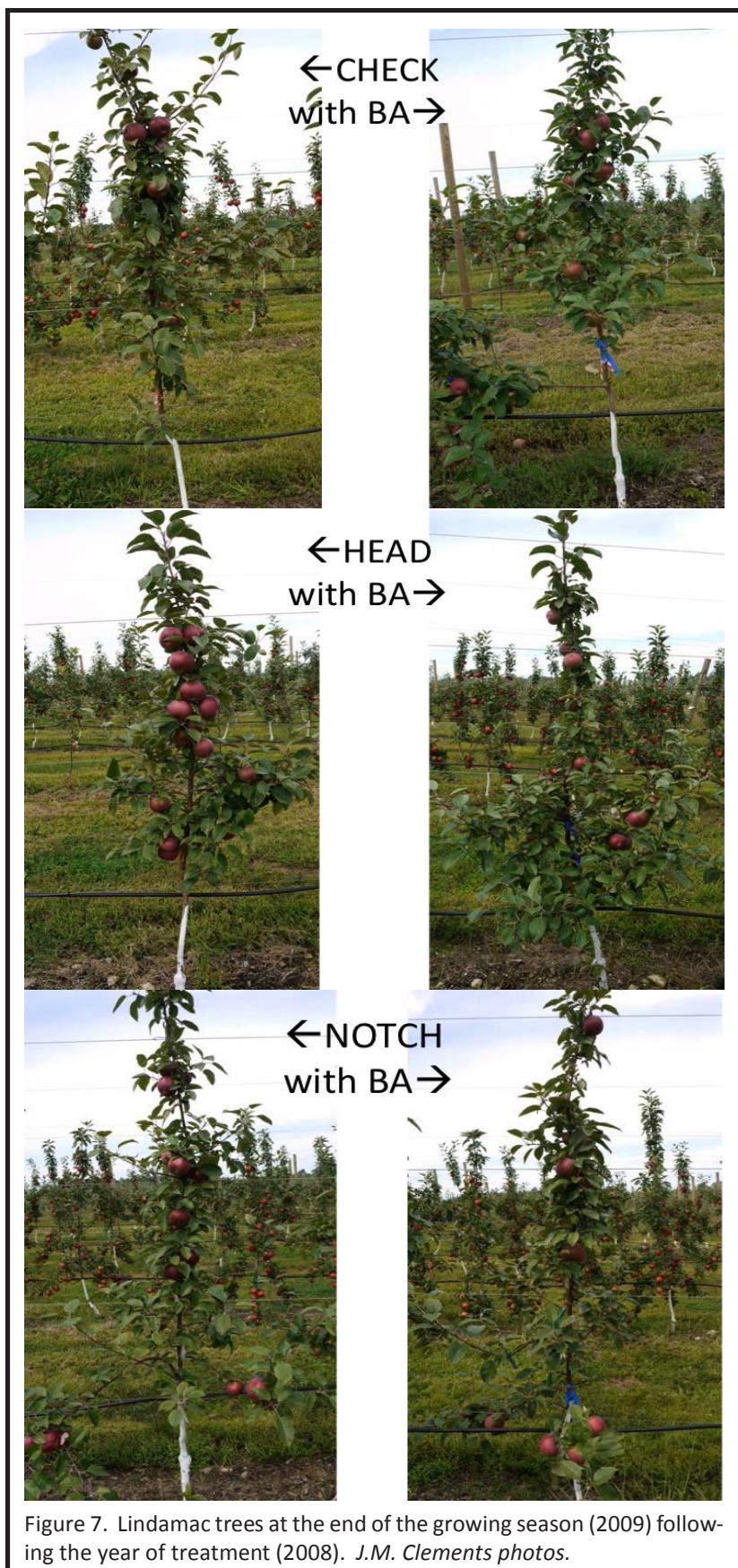


Figure 7. Lindamac trees at the end of the growing season (2009) following the year of treatment (2008). J.M. Clements photos.

shoot length than the control. Only notching increased the number of shoots, and only heading resulted in fewer spurs (NJ only). BA application increased total shoot length and number. In the year after treatment, heading resulted in more fruit than the control but did not differ from notching. This result is counter-intuitive. Overall, among the mechanical treatments, notching was the best treatment to improve branching and BA application resulted in the greatest number and length of shoots compared to no BA application. A combination of notching and BA application, or BA application alone (single or possibly multiple applications) may be the best options for improving branching in poorly branched trees.

Summary

- *No interaction of BA and the physical treatments*
- *Treatment effects were consistent across location*
- *Heading increased leader growth and total lateral growth but did not increase the number of laterals and reduced the number of short shoots (spurs)*
- *Neither notching nor BA affected leader growth, and both enhanced total lateral growth by increasing the number of lateral shoots.*

Table 2. Flowering and fruiting of Lindamac/M.9 during the second year (2009) in the orchard as affected by various treatments in MA only.^z

Category	Number flowers per tree	Number flowers per cm ² trunk cross-sectional area	Number fruit	Number fruit per cm ² trunk cross-sectional area
Treatment				
Control	41.5 a	14.9 a	12.3 a	3.7 b
Heading	43.3 a	16.4 a	17.8 a	5.2 a
Notching	53.9 a	16.5 a	17.3 a	4.4 ab
BA application				
Control	43	15.1	14.1	4.1
BA	49	16.5	17.5	4.7

^z Within treatment, means not followed by a common letter are significantly different at odds of 19 to 1.



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