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IMPACTS OF HEADING HEIGHT AT PLANTING ON GROWTH DYNAMICS OF 'IVANHOE' WALNUTS

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Background

Seedling 'Paradox' walnut rootstocks are typically planted in the field as bare root trees and then headed above the graft union leaving three to five buds in place to generate a central leader in the first season. Studies conducted on 'Chandler' have demonstrated that this field-heading practice of removing one year of nursery scion growth from the original bud may set the tree back a year in development due to the need to regenerate a central leader. 'Ivanhoe' is a new variety largely planted in the southern San Joaquin Valley; consequently, there is no data available to assess the potential for unheaded trees to generate primary scaffolds during the first season in the field.

Methods

A field trial was established in February 2019 in a commercial 'Ivanhoe' block on seedling 'Paradox' rootstock in Tulare County, California to evaluate the potential for reduced heading practices at planting to promote primary scaffold development during the first field season. This study was maintained through the 2019 and 2020 growing seasons. Two-year-old bare root trees from a commercial nursery were planted on January 20, 2019, with a 22' x 24' offset spacing with rows running east-west. Prior to planting, trees were headed at the nursery to approximately 60" (152 cm) tall. In February 2019, three heading strategies were implemented (unheaded, intermediate headed, and standard (heavy heading leaving 3-5 buds)) soon after planting. The three heading treatments were applied to the orchard using a randomized complete block experimental design with the three treatments replicated over six blocks. Each plot contained 12 trees, with six trees in each of two adjacent rows to allow for future mechanical harvest in the center of plots. The standard/headed trees were headed above the graft union with the goal of leaving 3-5 buds from which to regenerate a central leader during the first field season. The unheaded trees were not cut in the field; however, it is important to note that they did receive a heading cut (60") at the nursery. The intermediate treatment was operationally defined as making a cut between the typical region of headed and unheaded trees. At this time, the initial caliper diameter of the rootstock and the cut end of the scion were recorded (Table 1). The length of the shoot that was cut off at heading was measured, as was the height of the remaining tree. The number of buds remaining on each tree was counted, and the remaining necked buds were counted and then removed. Bud break on each tree was monitored from late March through early May 2019.

Treatment	Shoot length removed by heading (cm)	Caliper of scion at cut end (mm)	Tree height after heading (cm)	Buds remaining after heading (#)
Headed	62.1 a	22.6 b	91.8 c	3.9 c
Intermediate	37.4 b	25.0 a	115.3 b	6.2 b
Unheaded	0 c	21.5 b	151.6 a	8.8 a
	p≤0.0001	p≤0.0001	p≤0.0001	p≤0.0001

Table 1. Characteristics of ‘Ivanhoe’ trees on seedling ‘Paradox’ rootstock upon implementation of heading treatments: wood removal, diameter of scion cut, resulting tree height, and number of remaining buds.

Results & Discussion

The influence of heading treatments at planting on both rootstock and scion caliper, tree height, light interception, and number of scaffolds developed in year one were assessed. After heading, the number of buds remaining for spring regrowth varied by treatment, with ranges of 2-6, 3-11, and 4-15 buds per tree remaining in the standard, intermediate, and unheaded treatments, respectively (Figure 1A). Unheaded trees exhibited earlier bud break than those in the other two treatments; however, headed trees exhibited the highest percent bud break by May 2019 (Figure 1B).

During the first field season (2019), the unheaded trees had significantly more scaffolds per tree than trees in both headed treatments. All standard-headed trees had one leader per tree after one year of growth; however, the intermediate and unheaded treatments had up to 3 and 6 scaffolds per tree, respectively. Also, after the first season tree height did not vary between pruning treatments. Neither rootstock nor scion diameter varied significantly between treatments after two field seasons; however, crown gall incidence was highest in the headed trees (9.7%), followed by the unheaded (5.6%) and intermediate-headed trees (4.2%).

Progression of spring bud break was negatively correlated with rootstock diameter, as evidenced by delayed bud break on larger trees (Figure 2).

The results indicate the potential for reduced heading at planting to result in earlier primary scaffold development in ‘Ivanhoe’; however, future studies are needed to address the implication of these training techniques on canopy structure, precocity, and yield. The current study was ceased in December 2020 due to orchard removal by the grower cooperator. Similar studies can be established in 2021 or 2022 if the industry has further interest in developing orchard establishment recommendations for ‘Ivanhoe.’

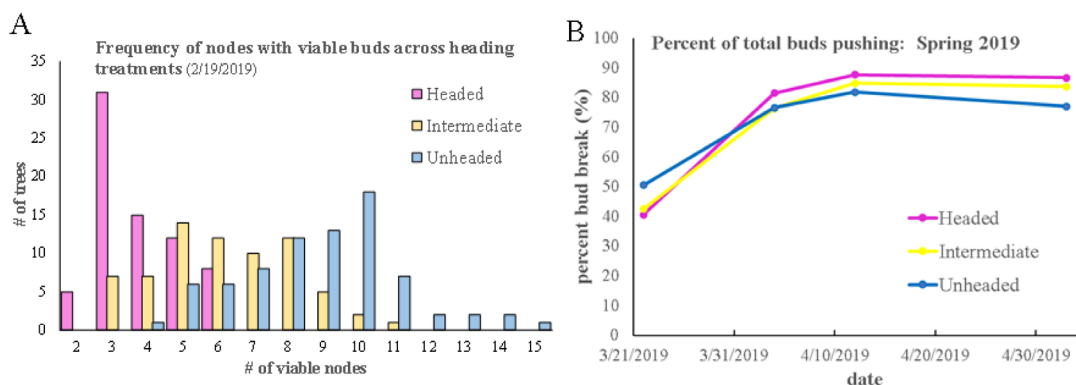


Figure 1. The frequency of nodes with viable buds varied across heading treatments (A) and the percent of buds pushing varied between treatments over time (B).

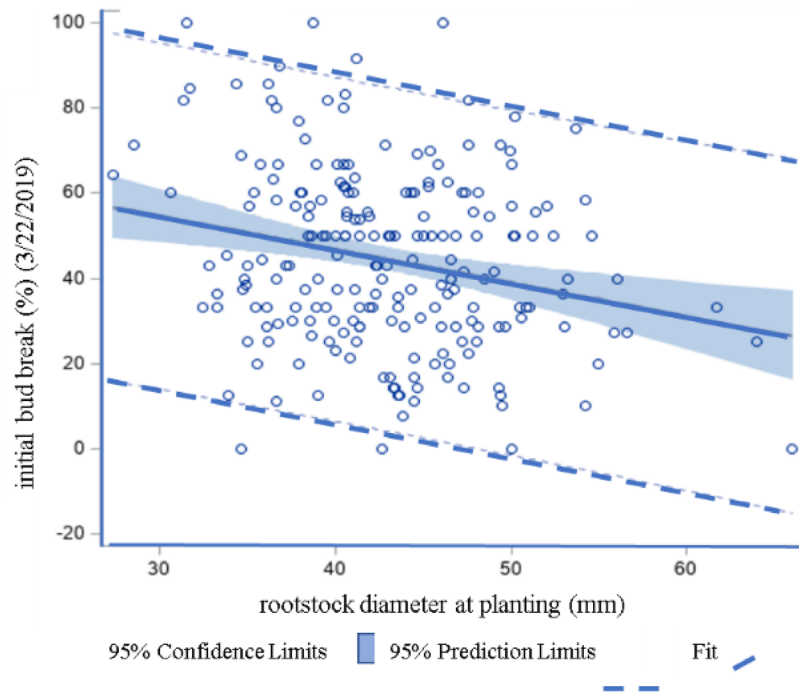


Figure 2. Rootstock caliper at planting was inversely related to initial scion bud break in March 2019 ($p \leq 0.0005$). In the field, trees with smaller caliper rootstocks exhibited bud break ahead of larger caliper trees.