THE EFFECTS OF DORMANT BRANCH THINNING ON TOTAL LEAF, SHOOT, AND ROOT PRODUCTION FROM BARE-ROOT PRUNUS CERASIFERA 'NEWPORTII'

by Philip S. Evans and James E. Klett

Abstract. Dormant branch thinning at planting time did not affect total leaf or new root production, or leaf:new root ratios of two year old, branched, bare-root *Prunus cerasifera* 'Newportii.' Variability in new root production was more than twice that in leaf production; leaf:new root ratio was determined primarily by the magnitude of new root weight. Thinning resulted in increases in the number and lengths of new shoots. Data were taken 100 days after planting.

Shoot pruning of dormant, bare-root trees at planting time is widely recommended in the scientific, educational, trade, and popular press (2, 3, 4). However, most research has not demonstrated favorable effects of such pruning on survival, growth, or shoot:root ratios, as noted in a previous paper (1). This study was initiated to continue the investigation of dormant branch thinning. Since most pruning research has been conducted with *Malus* spp., another commercially important genus was selected for study. Commercially grown trees were used, so that results might be of immediate practical value.

Materials and Methods

Seventy-two branched, two-year-old, bare-root trees (4-5' grade) of *Prunus cerasifera* 'Newportii' (Newport Plum) were purchased and planted in containers. Details of culture are identical to those reported in a previous paper (1). All branch lengths, base and tip diameters, and numbers of buds were measured before pruning. Preliminary studies showed that estimates of thinning severity were very similar, whether defined as the percentage of branch length, number of buds, or woody branch tissue removed. The percentage of woody branch tissue removed is used here, following the practice of experienced pruners who use branch thickness as one criterion for removal. Attempts by an experienced pruner to thin trees by 30% resulted in 20-50% reductions of the branch system. This variation was due to the difficulty in visually determining the precise proportion each branch is of the total, and to the necessity of removing whole branches. In field pruning the percentage of the top removed may also vary widely.

Accordingly, 56 trees were randomly thinned to produce a range of pruning severity from 21-78% (Figure 1). Sixteen trees were left unpruned to show the normal variability in leaf, shoot, and root production. Treatment effects were determined from regression analysis, since each tree received a different level of the thinning treatment. The strength of the relationship between treatment and effect is deduced from the visual appearance of the scatterplot and the associated "r^2" statistic. The "r^2" value may be defined as the proportion of the variation in the treatment effect (i.e. leaf production), which is explained by the variation in the treatment (i.e. thinning).

Trees were harvested 100 days after planting, by which date most shoots on test trees had set terminal buds and completed leaf expansion. Trees showed no signs of water or nutrient stress, and vigor was similar to that observed in local field and container nurseries during the season. Shoots less than 5 cm long were considered spurs. Spur and shoot numbers, and shoot lengths, were determined for each tree. New root growth was distinguishable from the woody root stubs by color. Leaf and root dry weights were determined after oven drying at 80°C to a constant weight.

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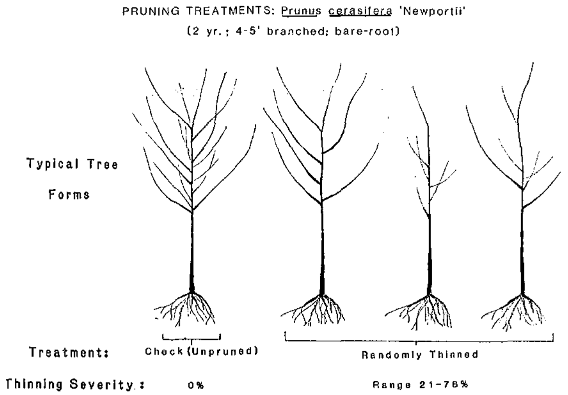

Figure 1. Diagrammatic representation of typical check (unpruned) and thinned trees, showing variability in branch size and character after thinning. Thinning severity is calculated as the percentage of woody branch tissue removed.

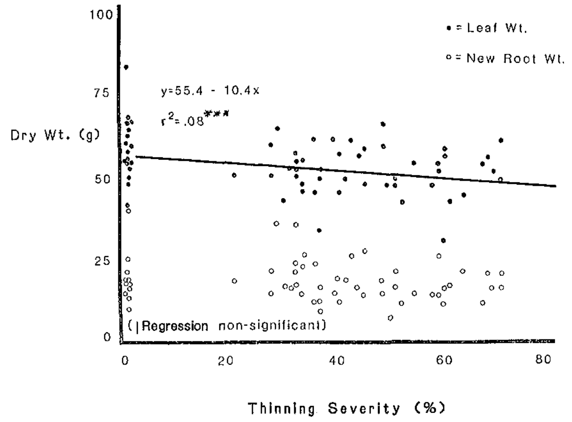

Figure 2. Relationships between thinning severity and leaf and new root weights. ***indicates 1% level of significance.

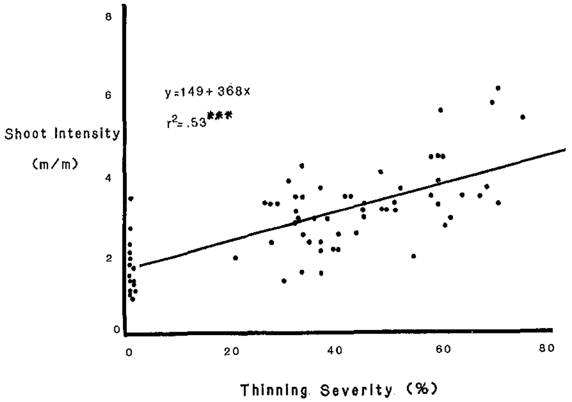

Figure 3. Relationship between thinning severity and shoot intensity (m total new shoot length per m woody branch length). ***indicates 1% level of significance.

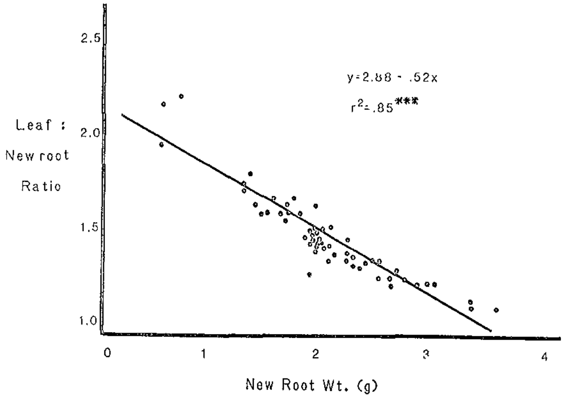

Figure 4. Relationship between new root weight and leaf:new root ratio. Correlation based on the natural logarithms of gram dry weight data. ***indicates 1% level of significance.

Results and Discussion

Dormant branch thinning had a negligible effect on total leaf production the first season (Figure 2). Although Figure 2 suggests a slight decrease in leaf production with increased thinning, the trend is exaggerated due to the influence of the highest and lowest observed values in the scattergram.

Positive shoot growth responses were observed after thinning and may account for the lack of effect on total leaf production. Although the percentage of buds breaking dormancy was unaffected, increases were found in the proportion of long shoots formed by elongating buds (r^2 = .28***), and in average shoot length (r^2 = .16***). Shoot intensity (m new shoot growth per m woody branch length) combined the influence of several shoot development parameters, and showed a significant positive increase with thinning severity (Figure 3). Similar shoot growth responses were found for *Malus sargentii* (1).

Thinning had no effect on root production in this study (Figure 2) or in previous work with *Malus sargentii* (1). Reports cited previously (1) found that heading back branches of bare-root trees reduced root growth the following season, and suggested a competitive inhibition of root production by shoot growth. However, the stimulation of shoot growth observed here after thinning did not affect root growth. In addition, no correlation was found between new root production and various traditional predictors such as the shoot:root ratio before or after pruning; or the weight of the whole tree or its root system.

The correlation between leaf and new root weights at harvest was poor (r = .32). The coefficient of variation in new root weight (38%) was much larger than that in leaf weight (16%). Consequently, the leaf:new root ratio, which may represent the balance of transpiration and absorption better for woody plants than the traditional shoot:root ratio (5), was determined primarily by the variation in new root weights (Figure 4). For *Malus sargentii* under similar conditions, there was also no effect of pruning on root production or leaf:new root ratio, although thinning had resulted in a decrease in leaf production (1). For both species, the leaf:new root ratio varied widely with no effect on tree survival or growth.

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ABSTRACT

FINCHAM, R.L. 1984. **Variegated trees and shrubs.** Am. Nurseryman 159(9): 38-43.

When discussing variegation, nurserymen do not think of blue but of different shades of gold and white. Plants with golden variegation have reduced amounts of chlorophyll in their variegated portions. Some plants are even completely gold. The presence of chlorophyll can easily be detected by placing one of these golden plants in heavy shade. It will turn green. White variegations are due to an absence of all pigmentation — no chlorophyll is present. Any completely white plant cannot survive. Many white-tipped forms show their variegation only in their summer flushes. Variegation may be due to a variety of factors. evidently, heredity plays a major role. Genetic aberrations are probably the origins of variegated seedlings that can pass the variegation trait to their decendants. Some plants originate as sports on otherwise normal plants. Such variegations are probably not genetic in origin. Insect or lightning damage or viral attacks may cause a sport. Propagations from branch mutations may retain the parents' characteristics and would be most likely to revert.