

problem on the succulent growth of young plants if control measures are not applied.

Many cultivars can reach 6 to 8 ft in height by the end of the first year. The growth is comparable to that of a one-year budded plant, but without understock suckering. A one-year budded plant has a three-year root system, while the own-root crab has only a two-year.

There are many crabapples that do well on their own roots. The growth is the same or better than a budded type. With different propagation and cultural techniques, production of crabapples on their own roots can be commercially practiced with many taxa.

## **GROWTH COMPARISON OF CRABAPPLES: OWN ROOTS VS. APPLE ROOTSTOCK**

PHILIP L. CARPENTER AND MICHAEL N. DANA

*Horticulture Department  
Purdue University  
West Lafayette, Indiana 47907*

### **INTRODUCTION**

The merits of propagation methods of a particular plant should be based not only on the ease with which a plant can be propagated by a particular method but also on how well that plant does in its eventual planting site. Crabapples historically have been propagated by T-budding on apple rootstock and, more recently, by chip budding on apple roots. Tom Simpson described these methods in detail in a paper preceding this one. In recent years some nurserymen have used rooted cuttings as a means of propagating crabapples. The two main reasons for shifting to cuttings are: 1) cuttings require less skill to take than budding, and 2) crabapples on their own roots should have less root suckers when the plants are grown on to maturity (1). It is fairly easy to train a person to take cuttings, but T-budding or chip budding requires a longer training period and the chances of a successful take, coupled with some degree of speed, is not too great for the novice propagator. Brian Bunge described his method of cutting propagation in his paper.

Since there has been some debate as to which method produces the best landscape crabapple, our research project compares growth characteristics of crabapples propagated by budding onto apple rootstock vs. crabapples grown on their own roots.

## METHODS

The crabapples used in this experiment were obtained from the two cooperating nurseries, Simpson Nursery Co., Vincennes, IN and LaPorte County Nursery, LaPorte, IN.

Simpson supplied the budded material and LaPorte County furnished the plants on their own roots. The cultivars used were 'Indian Magic', 'Profusion', and 'Carmen'. The individual plants selected were graded so that the top growth of the plants was as nearly equal in size for both methods of propagation. Twenty trees of each cultivar for each propagation method were lined out in the field at three sites in Indiana. One site was at Purdue University, West Lafayette, IN, and the other two were at the cooperating nurseries in Vincennes and LaPorte, IN. Plants were randomized within cultivar in pairs and spacing was 4 ft in the rows with 6 ft between rows. Planting was done in May, 1987 at LaPorte and Purdue, and in July, 1987 at Vincennes. Irrigation was available and used through the season at Purdue. Each trunk was marked with paint at a height of 25 cm and a trunk diameter was determined at that height.

At the end of the first growing season every other plant was dug after leaf-drop. Prior to digging the trunk diameters were measured at the predetermined height and each tree was tagged so that it could be identified at the time of replanting in the spring. The dug plants from all three sites were placed in common storage at Hilltop Orchard Co., Hartford, MI.

In the spring of 1988 the plants were removed from storage and replanted at the different sites, though not back in the original planting holes. Spacing was the same as in 1987. The summer of 1988 in Indiana was extremely dry and irrigation was used at the Purdue and LaPorte sites during the season. The plants were thoroughly watered in at Vincennes, but irrigation was not available during the season. On November 10, 1988 all 2 year (left in-ground and transplanted) plants at Purdue were dug using a machine-mounted U-blade. The following growth measurements were taken: trunk diameter, maximum root spread, root spread along axis perpendicular to axis of maximum spread, tree height, maximum top canopy circumference, number of root suckers, and number of stem water spouts.

## RESULTS

The trunk diameters of trees left in the ground for two growing seasons were significantly greater on all cultivars for trees grown on their own roots (36.8 mm) compared to those that were budded (33.4 mm). This compares with the initial trunk diameters that were smaller (16.1 mm) for own-rooted trees, versus (17.4 mm) for the budded stock. Thus, increase in trunk diameter was significantly

greater across cultivars for the own-rooted trees (Figure 1).

The same pattern was observed in the trees that were dug, stored, and replanted (Figure 2). However, the increase in trunk caliper was substantially reduced in the second season following replanting. This resulted in smaller trunk diameters, 28.6 mm for own rooted versus 27.8 mm for budded trees, at the conclusion of the experiment (Figure 3).

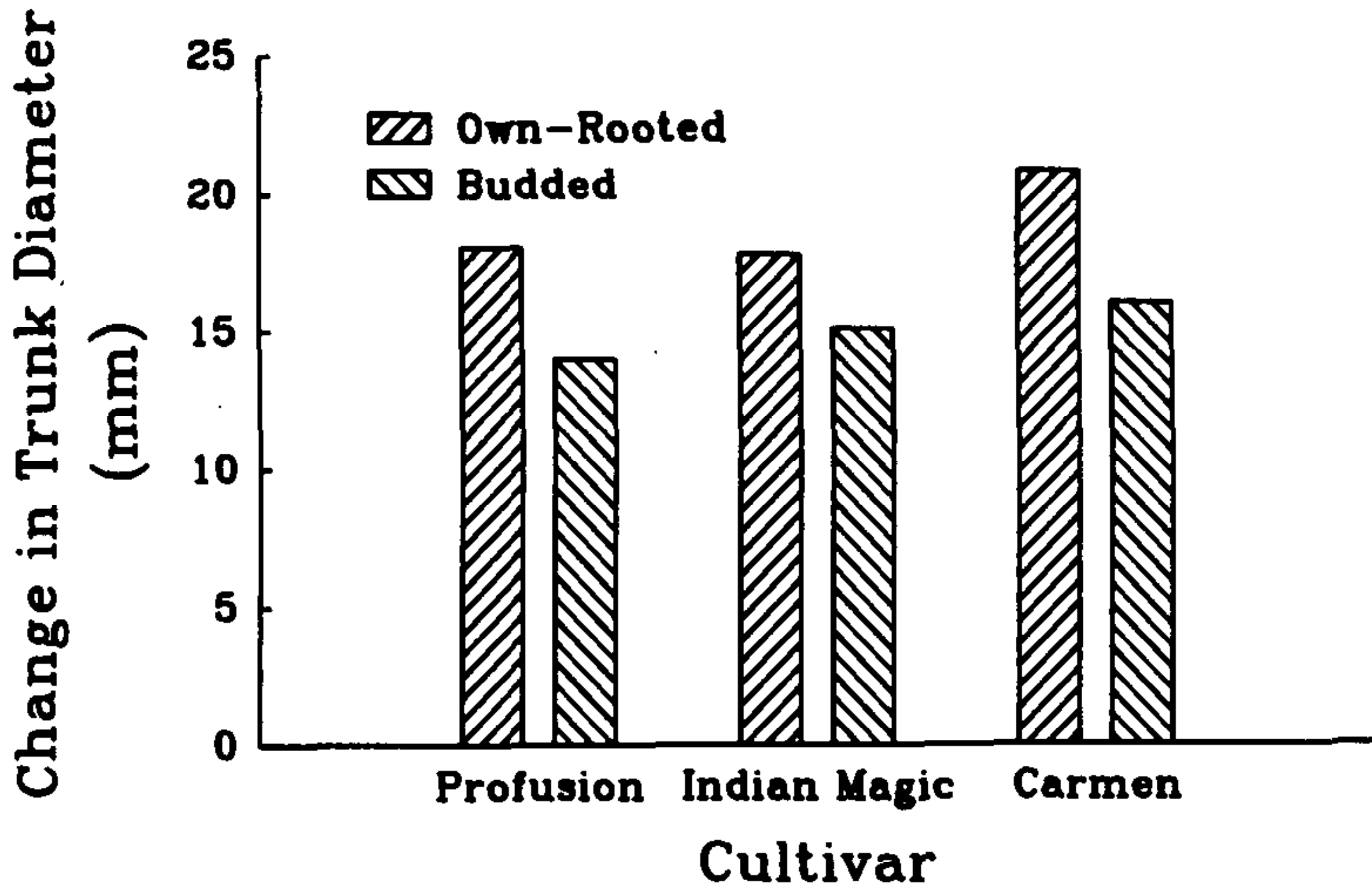


Figure 1. Change in trunk diameter for trees left in-ground two seasons.

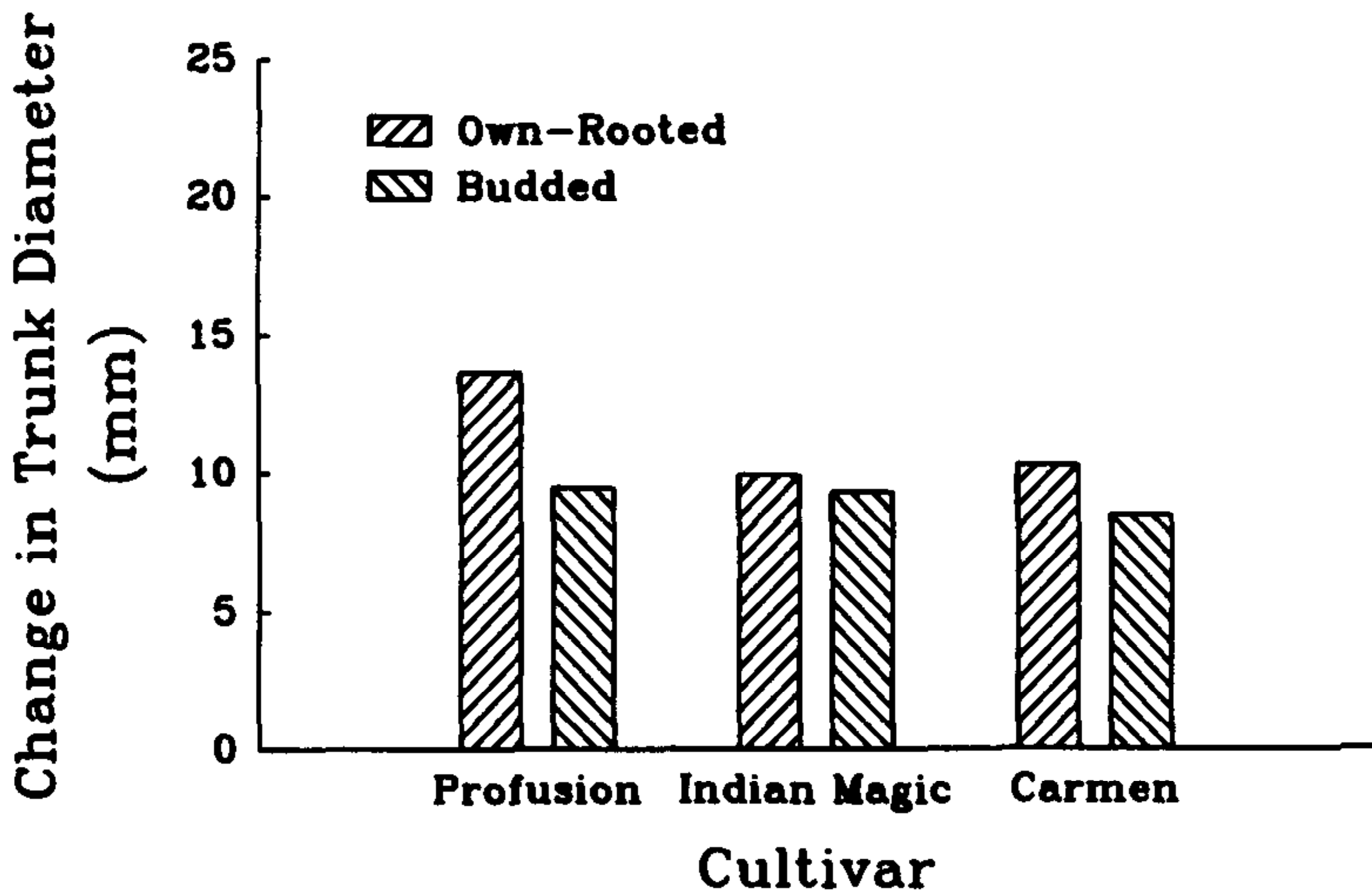


Figure 2. Change in trunk diameter for trees dug, stored, and replanted for second season.



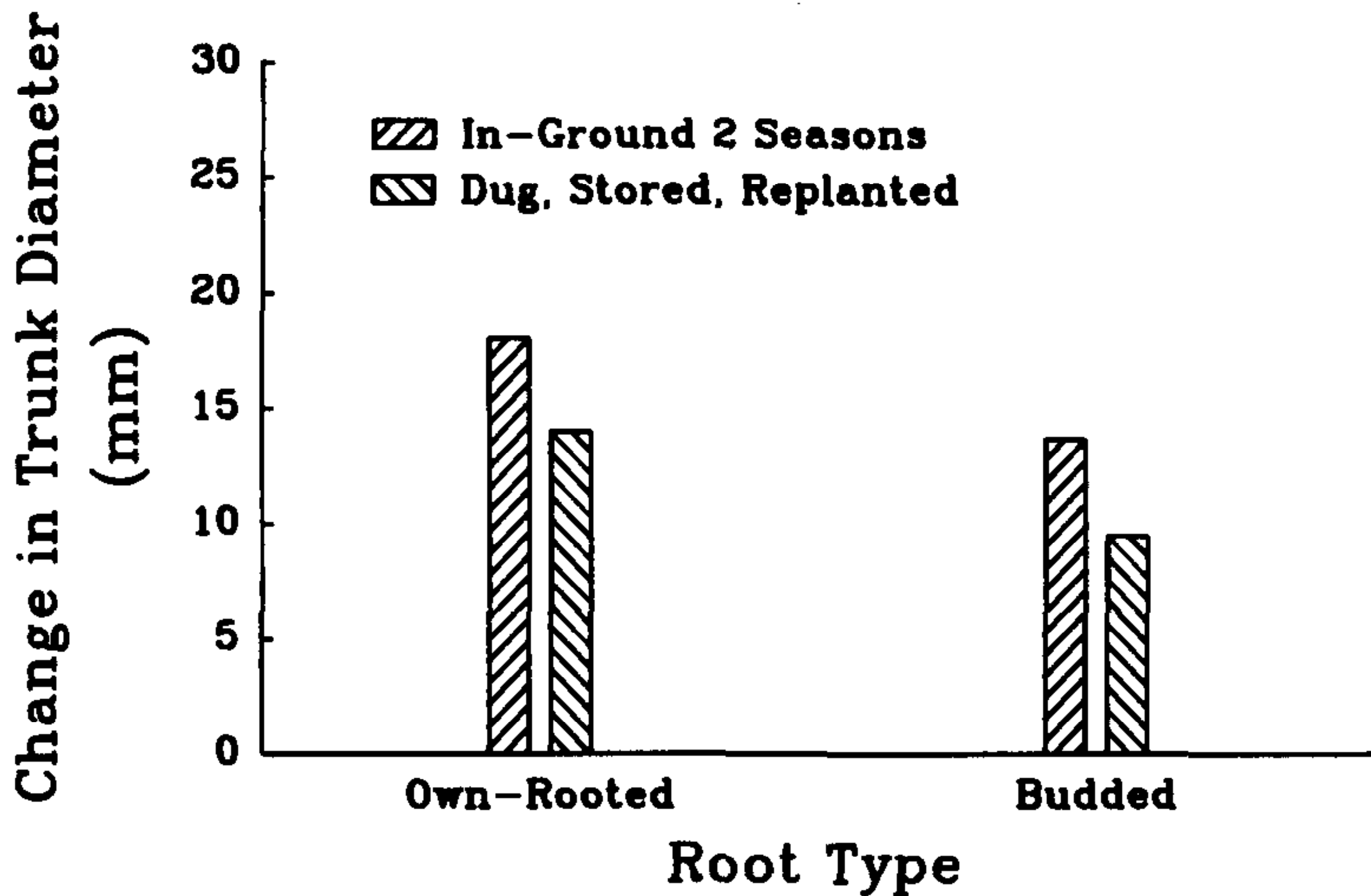


Figure 3. Change in trunk diameter for 'Profusion' comparing in-ground vs. dug, stored, replanted.

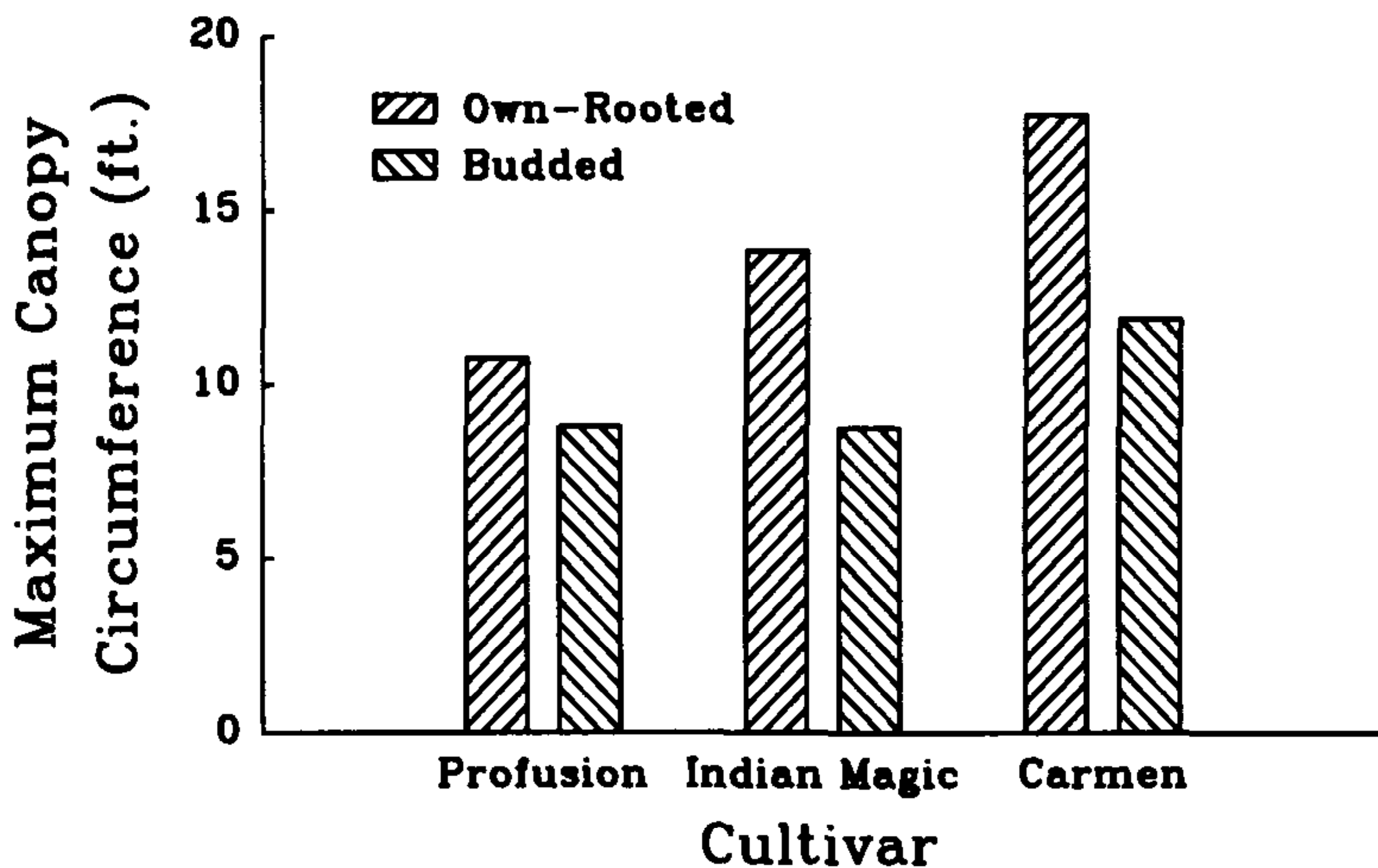


Figure 4. Maximum canopy circumference of trees left in-ground two seasons.

Maximum canopy circumference of trees left in the ground for two growing seasons was significantly greater on the own-rooted trees compared to those that were budded. 'Carmen' developed the broadest heads (Figure 4), but the greatest branch density, as indicated by total shoot weight, was observed in 'Indian Magic'. Trees that were dug and replanted showed such reduced top growth due to transplanting that no consistent differences were observed.

Root system size among trees left in the ground two growing seasons, expressed in area defined by the maximum root spread, times the root spread measured on the axis perpendicular to the maximum, was greater for own-rooted trees than for budded. 'Indian Magic' developed the largest root area coverage, with 'Profusion' and 'Carmen' being substantially smaller. Own-root 'Indian Magic' trees had a root area of 35.7 sq ft while budded trees averaged only 20.5 sq ft (Figure 5).

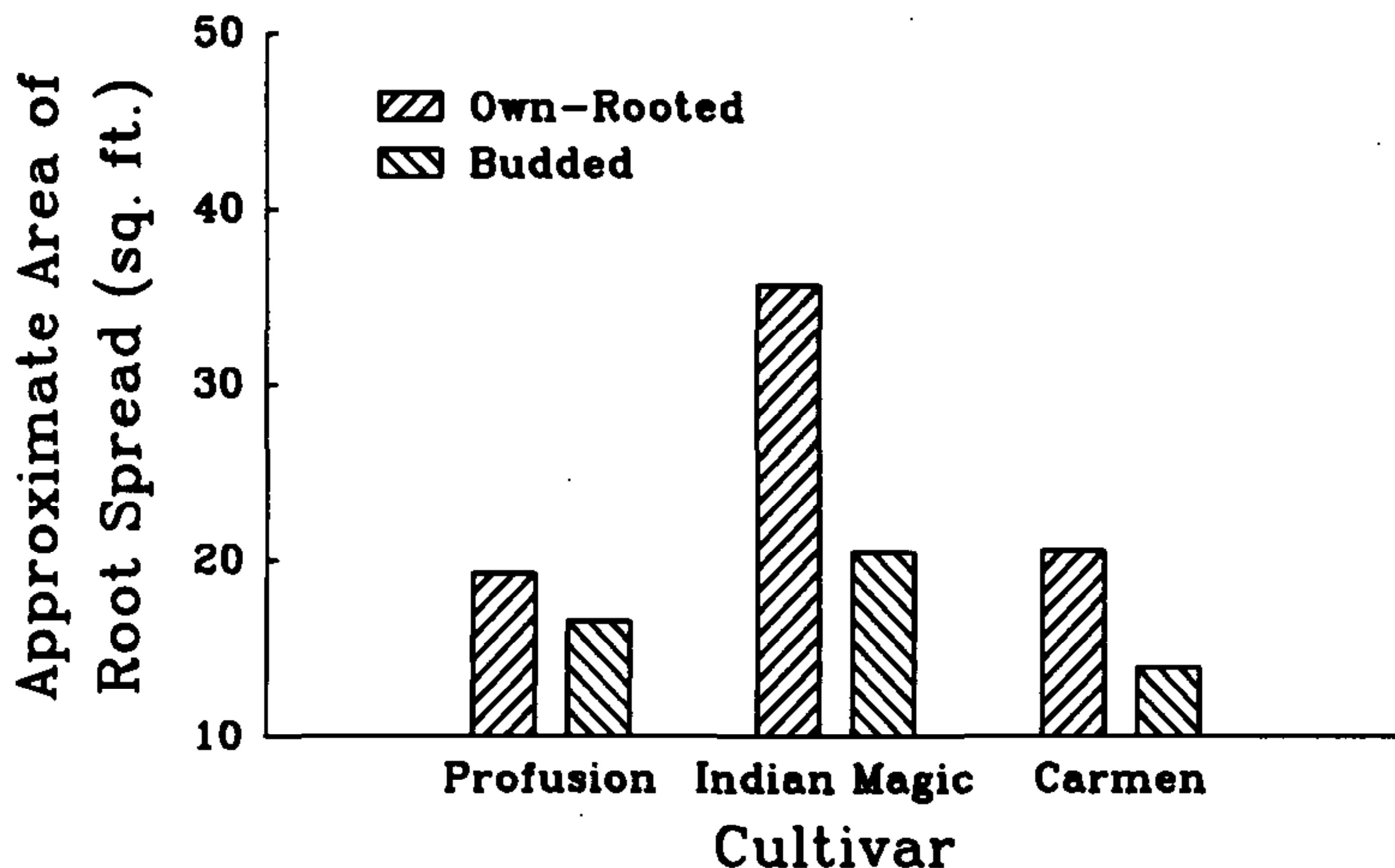


Figure 5. Approximate area of root spread of trees left in-ground two seasons.

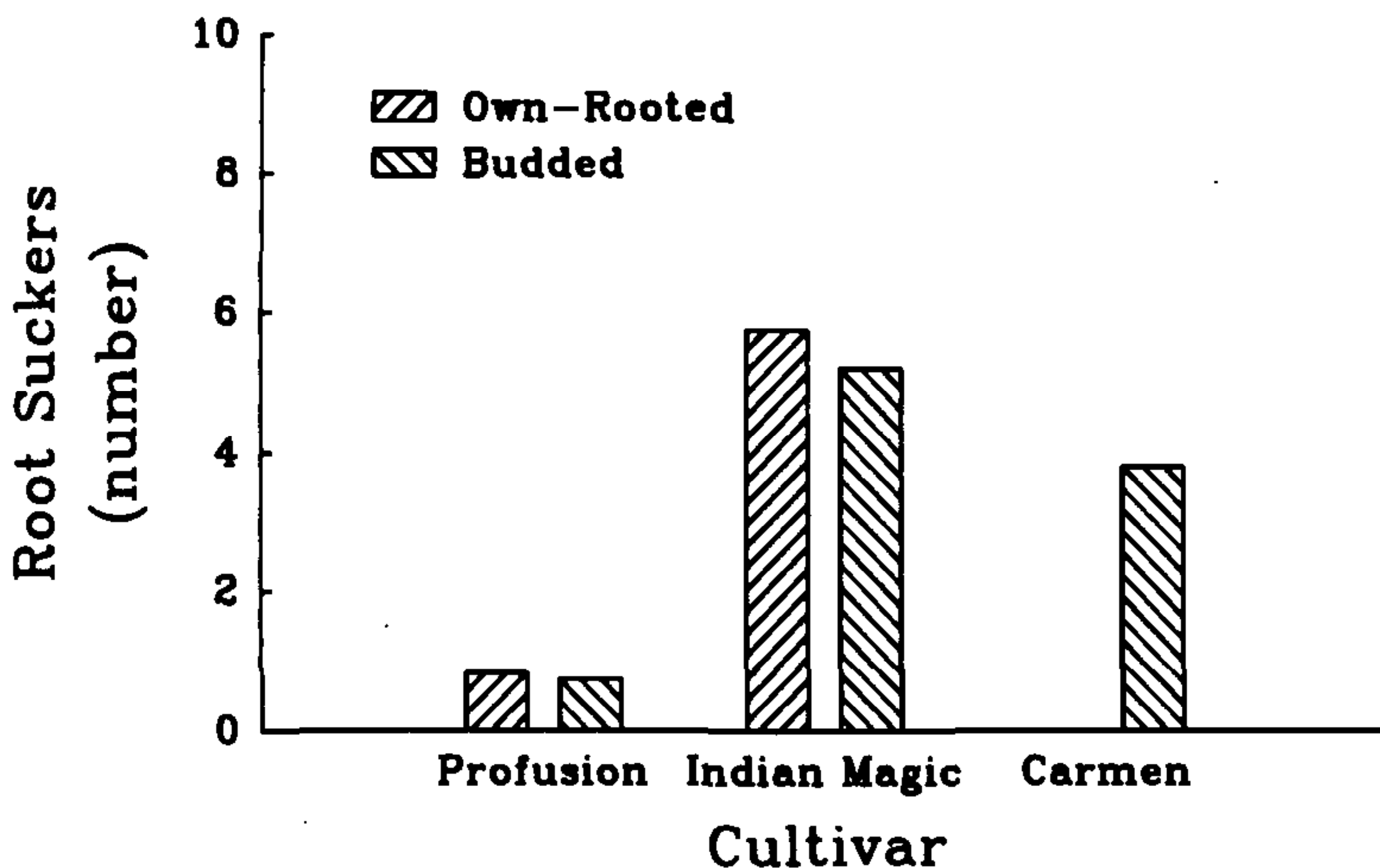


Figure 6. Root sucker number on trees left in-ground two seasons.

Root suckers occurred on both own root and budded trees, but there was a marked cultivar difference between 'Indian Magic' and 'Carmen'. Own root 'Carmen' had no suckers while own root 'Indian Magic' had as many as the budded trees (Figure 6).

### OBSERVATIONS

Sometimes field observations are as important as data taken and analyzed statistically. At planting time it was observed that the root systems of crabapples propagated by cuttings had a horizontal growth habit and were relatively shallow, but the roots on the apple rootstocks had a deeper, more vertical growth habit. At the Vincennes site the own-root plant of the 'Carmen' suffered greater plant loss than the deeper-rooted plants on apple rootstock. This appeared to be the result of dry weather. Where early planting and irrigation was available this did not occur.

During a period of high winds in the spring of 1988 at the Purdue site, own root 'Carmen' leaned several degrees from the vertical. This occurred on plants that were established for one year.

The top structure of own-root crabapple was superior in all three cultivars to that observed for budded trees.

### SUMMARY

- 1) Crabapples on their own roots develop faster and into better shaped, larger trees.
- 2) Differences in root suckering was not observed between own-root crabapple and budded trees.
- 3) Root mass development was greater on own-root crabapples.
- 4) The shallow, horizontal root development on own-root crabapples could cause problems of tipping in the wind or plant loss after transplanting if the season is dry.
- 5) Transplanting and storing crabapple trees reduces drastically the amount of growth achieved in the next growing season.

### LITERATURE CITED

1. Burd, Susan M. and Michael Dirr. 1977. Propagation of selected *Malus* taxa from softwood cuttings. *Proc. Inter. Plant Prop. Soc.* 27:427-432.

DON SHADDOW: For several years we have been growing rooted crabapple cuttings as multistem plants. That is an advantage of using rooted cuttings.