Propagation of Filberts by Stem Cuttings

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INTRODUCTION

Presently, the filbert (hazel nut) (*Corylus avellana*) is propagated primarily by layerage, because of difficulties inherent in other methods of propagation (Bergougnoux et al., 1976). Either of two factors may limit propagation of filbert by stem cuttings: poor root initiation (Bergougnoux et al., 1976; Falaschi and Loreti, 1969), or abscission of the vegetative buds on otherwise well-rooted cuttings (Lagerstedt, 1970; Lagerstedt, 1982). Bud abscission is the major problem we encounter. Rooting of terminal stem cuttings varies by cultivar but is generally excellent. Unfortunately, the percentage of these cuttings that retain buds is generally low, so the propagation rate (the percentage of cuttings with both roots and one or more vegetative buds) is low as well. Bud retention of 0 to 10% is typical of terminal cuttings of filbert cultivars.

There is interest in propagation by stem cuttings for at least three reasons: 1) With identification of Eastern filbert blight in the Willamette Valley, Oregon, rapid propagation of new, resistant cultivars is needed. 2) Non-suckering rootstocks have been introduced which, presumably, will not develop productive layerage beds. 3) There may be efficiencies in cutting propagation for production of filbert planting stock. Therefore, the purpose of this report is to describe progress made in propagating stem cuttings of filbert, and to suggest ways in which propagators and growers can use and improve these methods.

METHODS

We tested the relationship of rooting potential and bud retention to the position of the cutting on the shoot (Fig. 1). The terminal cutting consisted of the apical end of the cutting—the apical bud, one or more expanding leaves and an expanded leaf.

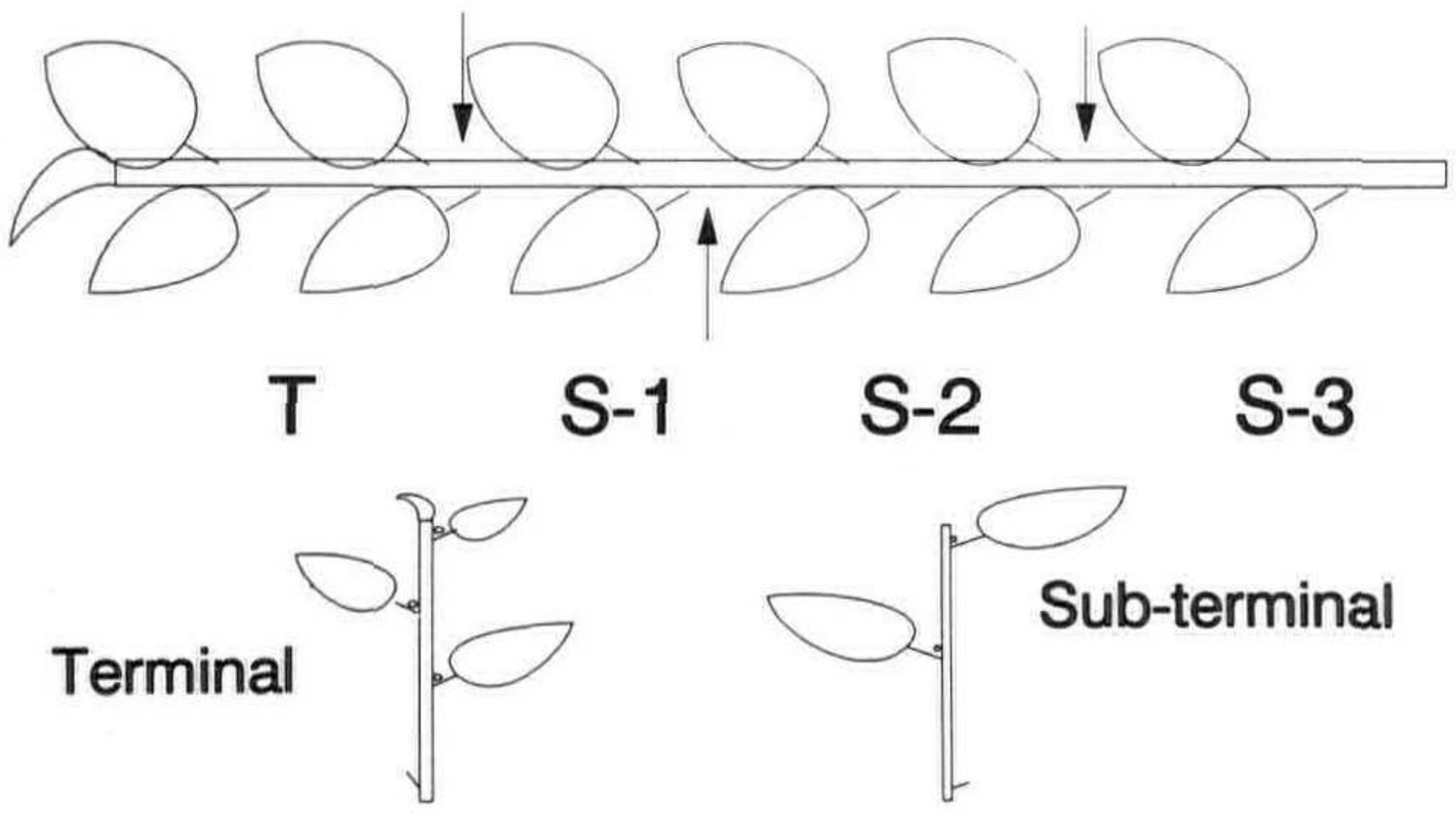

Figure 1. Identification of terminal and sub-terminal cuttings from vegetative shoots of filbert.

Cuttings below the terminal we designated sub-terminal. In the work described here, sub-terminal cuttings arbitrarily included two nodes with leaves retained and a node at the base of the cutting.

Unless otherwise stated, we applied 1000 ppm IBA to the base of the cuttings as recommended by Lagerstedt (1982). The rooting medium was composed of perlite:peat (2:1, v/v) in 8 in. deep beds at about 75° F. Intermittent mist was used to maintain water content of the cuttings. We used a timer programmed to apply mist less frequently early and late in the day and progressively more frequently, 10 sec mist at 8 min intervals, during the warmer parts of the day. Ventilation and about 50% shade were used to control air temperature.

After about 12 weeks, cuttings were evaluated for the presence of adventitious roots and axillary buds, and whether both roots and buds (R+B) were present on cuttings.

RESULTS AND DISCUSSION

Among the four cultivars tested, rooting generally declined from terminal to base of the shoot (Fig. 2). Conversely, bud retention generally improved from terminal to base. Thus, bud retention was the factor limiting propagation of terminal cuttings, whereas rooting limited propagation of sub-terminal cuttings. As a result, the percentage of cuttings with both roots and buds was highest on the first sub-terminal cutting, S-1. This percentage ranged from about 65% for 'Ennis' to over 90% for 'Butler' and 'Barcelona'. The percentage of terminal cuttings with both roots and buds ranged from 0 to 70%. 'Ennis' was the cultivar most prone to bud abscission. Propagation (R+B) of terminal, S-2 and S-3 cuttings of 'Ennis' was < 25%.

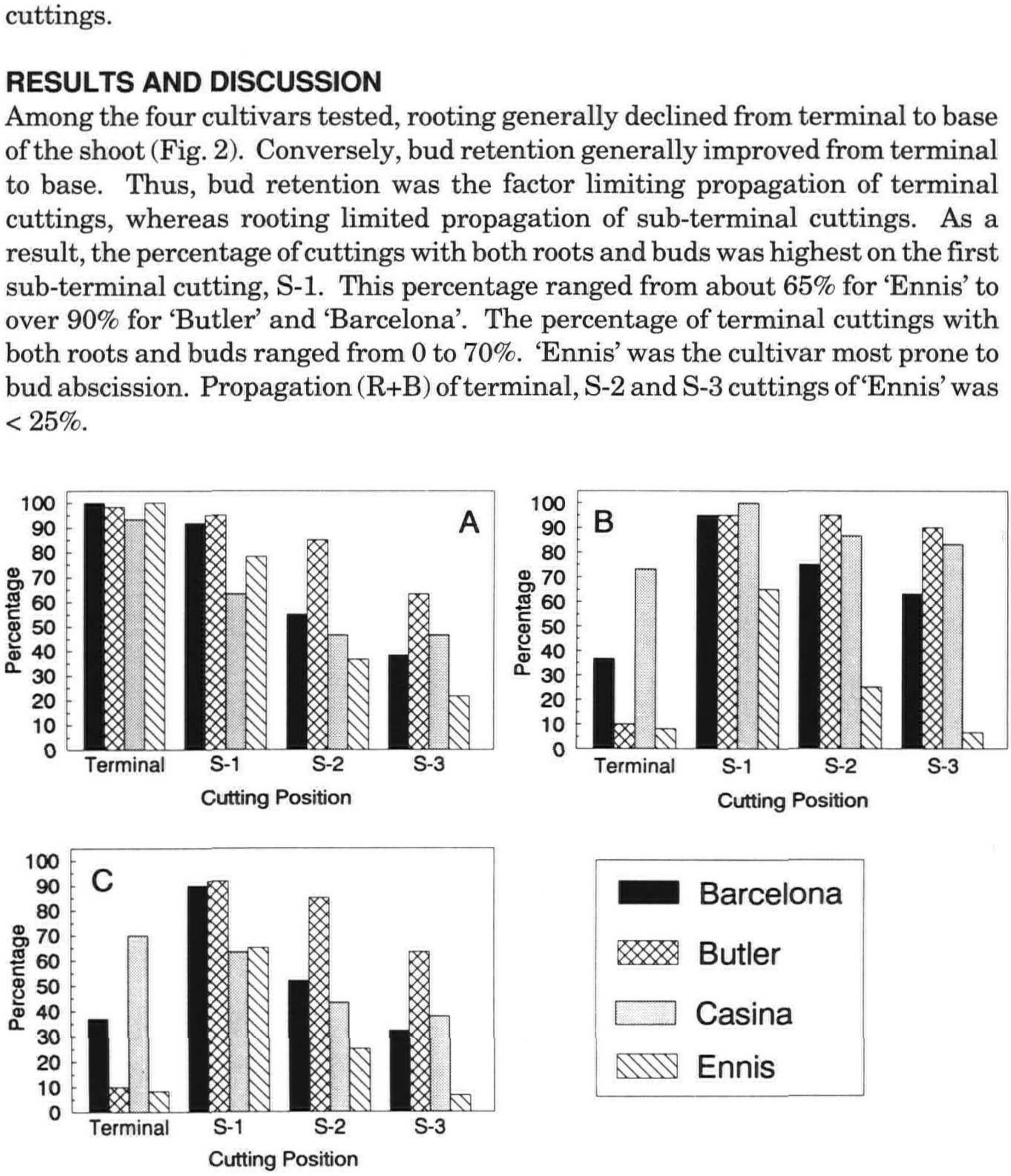

Figure 2. Effect of cutting position on the percentage of stem cuttings with (A) roots, (B) buds, and (C) both roots and buds in four filbert cultivars.

The optimal period for propagating sub-terminal cuttings was from late June to late July (Fig. 3). We used 'Casina' for this experiment and it was evident afterward that terminal cuttings of this cultivar had unusually high bud retention. As a result, the contrast between terminal and sub-terminal cuttings was blurred. However, throughout this period the inverse response of rooting and bud retention on terminal and sub-terminal cuttings was evident (Fig. 3A,B). Terminal cuttings rooted better than sub-terminal cuttings, and there appeared to be a marked decline in rooting of sub-terminal cuttings in August (Fig. 3A). In contrast, bud retention on the sub-terminal cuttings improved significantly as the shoots matured, even though bud abscission was similar during early to mid-June (Fig. 3B). The net result of this experiment, therefore, was that the performance of terminal and sub-terminal cuttings from mid-June through early August was comparable (Fig. 3C), and, thus, unique among the cultivars studied.

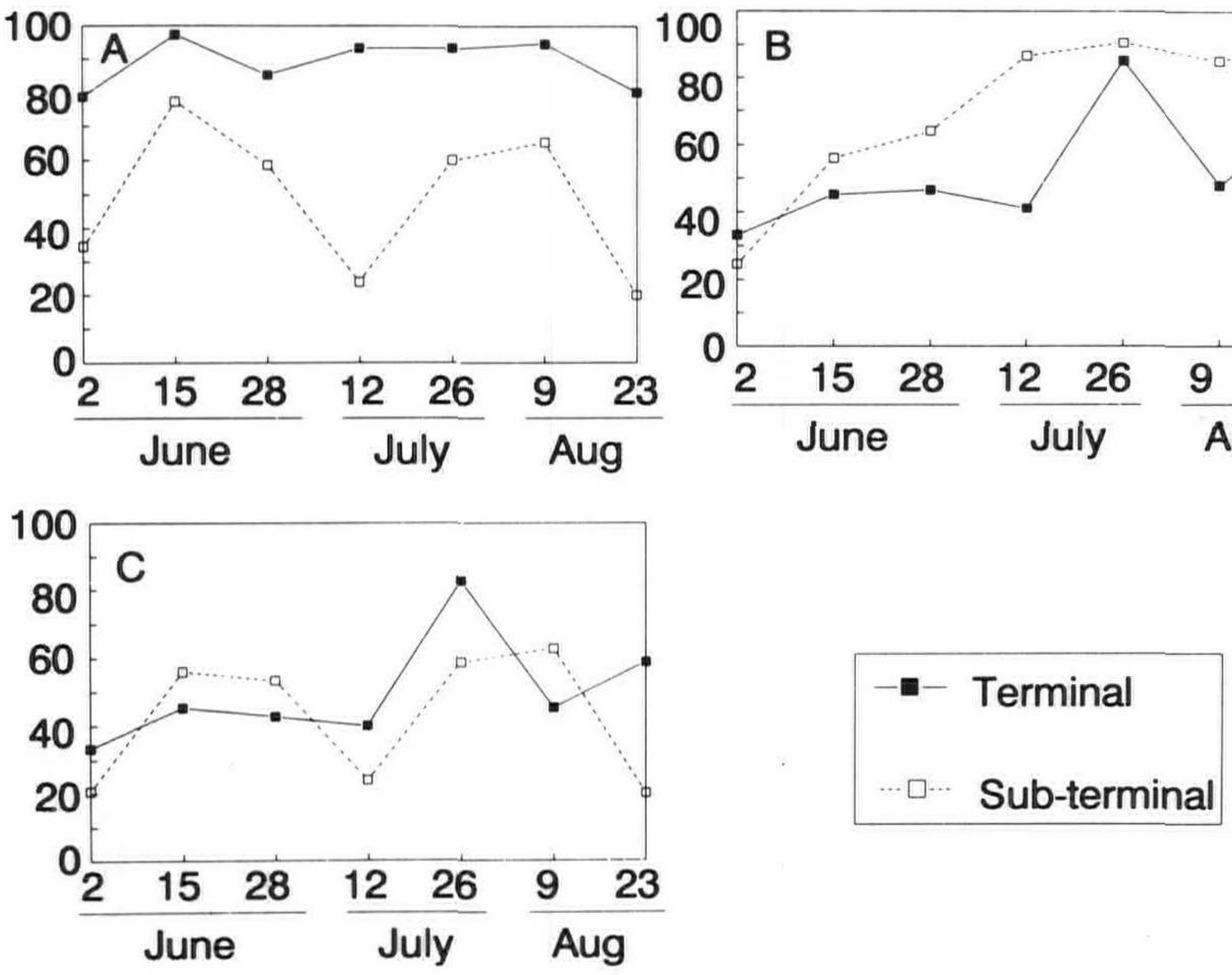

Figure 3. Effect of collection date on (A) rooting, (B) bud retention, and (C) the percentage of cuttings with both roots and buds on stem cuttings of 'Casina' filbert.

Cuttings from juvenile stock plants rooted and retained buds much better than cuttings from mature stock plants. Nearly 80% of the sub-terminal cuttings of 'Casina' from juvenile stock plants had roots and buds (Fig. 4A). On the other hand, rooting potential of sub-terminal cuttings from mature stock plants was much lower, even though bud retention was >90%, resulting in R+B < 50% (Fig. 4B).

The response of 'Casina' cuttings to IBA concentration varied with cutting position. The optimal concentration for rooting of terminal cuttings was 1000 ppm (Fig. 5). At higher IBA concentrations, bud loss on terminal cuttings increased significantly. The optimal concentration for rooting of sub-terminal cuttings was 6000 ppm IBA and the buds on these cuttings were much less sensitive to auxin.

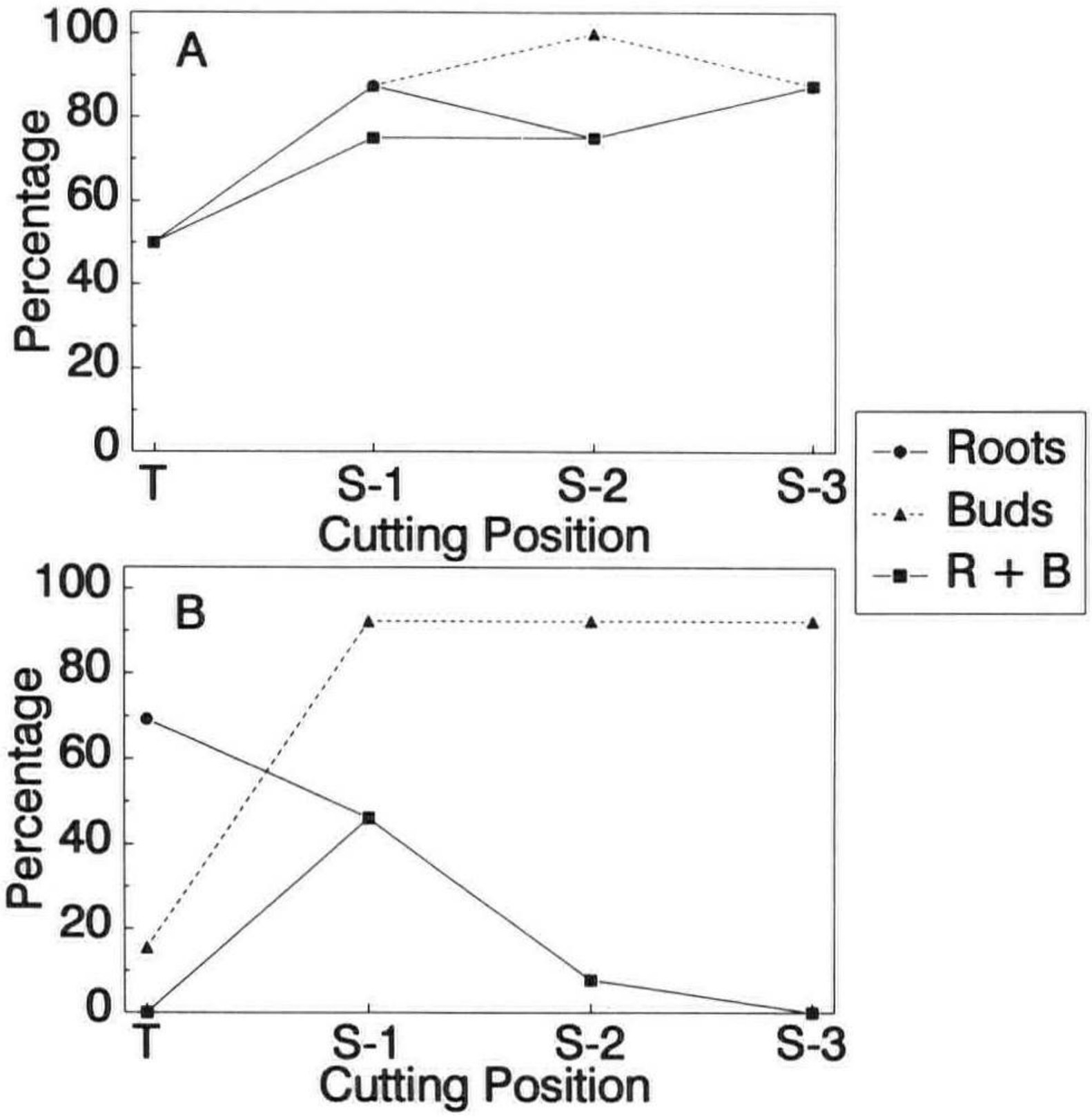

Figure 4. Rooting and bud retention of stem cuttings of 'Casina' filbert collected from (A) juvenile, or (B) mature stock plants.

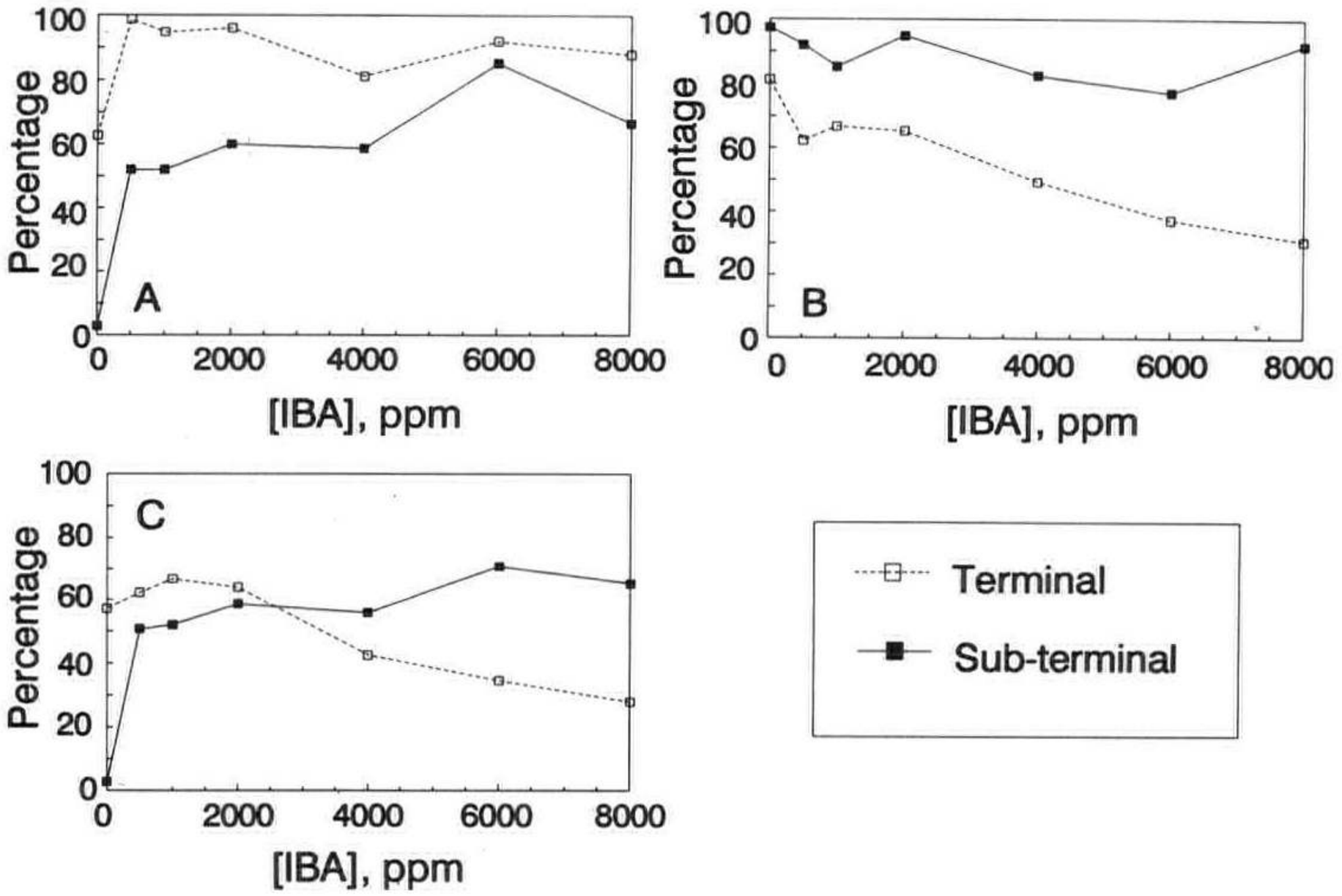

Figure 5. IBA Dose-response of stem cuttings of 'Casina' filbert. (A) rooting, (B) bud retention, and (C) the percentage of cuttings with both roots and buds.

In summary, sub-terminal cuttings of filbert had good to excellent rooting potential and significantly better bud retention than terminal cuttings, despite the unusual performance of 'Casina'. The most reliable sub-terminal cutting was S-1, though further work may improve the performance of the other sub-terminal cuttings. On S-1 cuttings, phase of the stock plant, stage of shoot development, and auxin dose have been identified as key factors in propagation of sub-terminal stem cuttings of filbert.

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VOICE: Why were the studies on *Agrobacterium* for root initiation not continued?

WM. PROEBSTING: We have been continuing this work. It seems to be a very effective rooting agent but I do not see an immediate practical use for it. Most propagators do not have the culturing facilities for it in their nurseries

VOICE: How do your own-rooted filbert plants compare in the nursery and afterwards with those started by layering?

WM. PROEBSTING: They overwinter very well. There have not been any particular problems with the cutting-grown plants but our comparative trials have not gone on very long

VOICE: How do you apply the *Agrobacterium* to the cuttings?

WM. PROEBSTING: The bacteria must be in a water suspension. We apply auxin in alcohol first, let the cuttings dry for 10 or 15 min. and then dip the base of the cuttings in the *Agrobacterium* suspension only briefly so as to not leach out the auxin