a pallisade-like layer, whereas the variegated area was composed of isodiametric parenchyma cells. Cellular and chloroplast arrangement in green areas of *A. nitidum* correspond to that in *Alocasia macrorrhiza* grown in high light treatments, while the cellular and chloroplast arrangement in variegated areas corresponded to that in leaves of *Alocasia macrorriza* grown in low light (3). Whether variegation in Aglaonema diminishes its ability to utilize light, provides for greater efficiency under rainforest conditions or has some other function remains to be determined. It is possible that variegated leaves of *Agloanema* may have the ability to utilize whatever light is able to penetrate the canopy of the rainforest, be it low intensity diffuse light or high intensity sun flecks.

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VEGETATIVE PROPAGATION OF FLORIDA NATIVE PLANTS: V. *PRUNUS* SPP.

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Additional index words. Prunus caroliniana (Cherry Laurel), *P. serotina* (Black Cherry), and *P. umbellata* (Hog Plum).

Abstract. **Species of the genus *Prunus*, particularly *P. serotina* Ehrh. (black cherry), have long been recognized as excellent landscape, timber, and wildlife plants. Their propagation by seeds, which requires 120 days of cold stratification, has been known for many years. However, propagation by cuttings has not been reported. There appears to be a direct correlation between flowering/leaf expansion time and root initiation. The two species reported in this study differ in one major respect: *P. serotina* flowers after leaf expansion in April, whereas *P. umbellata* Ell. (hog plum) flowers before the leaves emerge in March. Consequently, best rooting in black cherry is obtained in March, after leaf expansion but before flowering, while that of hog plum is in April, after flowering and leaf expansion. In both cases, IBA treatment promoted rooting of cuttings.**

Several *Prunus* species, but particularly *P. serotina* Ehrh. (Black Cherry), have long been recognized as good timber trees and wildlife plants (8). *Prunus serotina* is a large (50 to 110 ft.) attractive deciduous tree with ascending branches, dark shiny green foliage, and small but numerous white flowers on long racemes. It is a common plant in much of Florida, characteristic of upland hardwood hammocks but also in mixed hardwood and pine, and flatwoods (1, 14). Despite excessive fruit production which may become a minor nuisance when ripe, it is considered an excellent plant for landscaping and for revegetation of disturbed sites because of its wide adaptability to adverse edaphic conditions. The reddish-brown wood has a close grain and is particularly suitable for furniture manufacturing, interior trims, veneers, and tool handles (8). In contrast, except for occasional use in making jelly and jams from the fruit, *P. umbellata* Ell. (Hog Plum) has litte economic value but is an excellent landscape plant because of its early spring flowering, crooked trunk, and spreading branches. The plant is deciduous, and the comparatively large white flowers in umbellate (hence the name) inflorescences appear before the leaves emerge. The large (1/2 to 2/3 inch) fruit is red to black and matures in late summer, providing food for birds and other wildlife (8). A third Florida native species, *P. caroliniana* (Mill.) Ait. (Cherry Laurel), a densely foliated evergreen species, is among the most attractive of all *Prunus* species for landscaping because of its dense foliage and wide adaptability. Although the seeds of all three species have a tendency toward spontaneous germination, *P. caroliniana* has a much greater inclination toward weediness. For this reason and because its mode of propagation is well-known (7) it was not included in this study.

Other than the recent enumeration of propagation methods for several *Prunus* species by Dirr and Heuser (7), only a few studies have dealt with this economically and environmentally important genus. Spellerberg (13) examined the effect of rooting conditions, addition of CO_2, extended daylength, and GA_3 treatment of *P. triloba* cuttings. Shoot growth was enhanced by all treatments, but rooting was not significantly improved. Cuttings of *P. persica* (Peach), were reported to root best in June when taken from the branches that were bent in the previous January and cuttings treated with 3000 and 4000 ppm IBA (9). Hardwood cuttings of *Prunus* 'Golden Queen' had 85% rooting when taken during winter, treated with 1000 ppm IBA, and kept on bottom heat at 23° C for six weeks (12). It has been shown in earlier studies (2, 11) that rooting of *Prunus* spp. is dependent on the time of year when cuttings are taken, usually in late spring or early summer, with the

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best rooting after flowering and when the wood has somewhat hardened. Hardwood cuttings taken during the dormant season may be kept in cold storage until spring when environmental conditions are proper for root initiation.

Propagation of *Prunus* species by seed is not difficult and has been determined by Griesez (10). Apparently there is no after-ripening period, but cold stratification for 120 days and planting in early September is recommended. However, mature seeds of some *Prunus* species when stored in a cool location in moist vermiculite, usually germinate in 30 to 60 days (Dehgan, pers. obs.). The intent of this project was to determine methods of vegetative propagation for *Prunus* spp. so that selected desirable individual plants could be propagated for landscaping and revegetation endeavors.

Materials and Methods

Semi-hardwood cuttings of *Prunus serotina* (Black Cherry) and *P. umbellata* (Hog Plum) were collected at approximately six week intervals (1986-1987), from undisturbed areas of Occidental Chemical Company Mine at White Springs (Hamilton County), and W. R. Grace and Company at Bonnie Lake and Four Corners Mines (Polk County), Florida. As in previous reports (3, 4, 5, 6) five replications of fifteen cuttings each were used per trial. All cutting bases were dipped in 0, 2500, and 5000 ppm IBA for five sec. prior to insertion. The propagation medium consisted of 1:1 (v:v) mixture of perlite and vermiculite. The cuttings were placed randomly under intermittent mist (5 sec/5 min). The greenhouse temperature was maintained at 23 ± 5° C day/18 ± 2° C night. The cuttings were examined weekly for evidence of root initiation and the final figures were tabulated when at least a minimal number appeared ready for transplanting. Data collected included percent rooting in each of the treatments, root quality based on health and number of roots (visually rated 1 to 5, poor to excellent, respectively), and length of time required to rooting. Some data have been omitted from the tables when the results for different times were similar.

Results and Discussion

Prunus serotina is among the species in the genus where the flowers appear after the leaves. Consequently, it is not accidental that the best rooting occurs soon after leaf expansion in March. The softness of the wood concomitant with the active terminal buds create the optimal phase for initiation of adventitions roots. In fact, at this time the terminal cuttings are too soft and the slightly hardened subterminal cuttings respond best to application of IBA. While only 25% of the untreated control cuttings rooted, 66.67% of those treated with 2500 ppm and 97.33% of those treated with 5000 ppm IBA rooted (Table 1). Quality and quantity of the roots were also positively affected by the higher IBA concentrations, averaging greater than 3 (acceptable) on a rating scale of 5 (excellent). In most trials untreated cuttings failed to root at all other times of year and IBA treated cuttings had unacceptable rooting percentages. Dirr and Heuser (7) cited one study in which wide variation in rooting (0 to 100%) was found in softwood cuttings of *P. serotina* taken from plants grown in pots and pruned to promote shoot formation, and treated with 8000 ppm IBA. In our study cuttings were taken from many relatively young plants from the same area (Bonnie Lake, Bartow) with no differences in rooting observed among them. *Prunus umbellata*, in contrast, blooms in early March, before leaf expansion. The highest rooting percentages occur in April, after flowering and with the fruit removed prior to insertion of the cuttings. At this time 67.67% of the cuttings rooted when dipped in 5000 ppm IBA (Table 2). In the ensuing months the number of rooted cuttings gradually decreased until October, at which time no roots were initiated. As far as we are aware this is the first report of vegetative propagation of *P. umbellata*.

As previously reported (3, 4, 5, 6) for vegetative propagation of Florida native taxa, time of year and flowering season appear to have a profound effect on rooting of cuttings. As a general rule cuttings do not root satisfactorily immediately prior to and during flowering and applications of rooting horomones are also of little consequence in promotion of root initiation at this time. Therefore, from a practical standpoint, plant propagators should be aware of such seasonal variations in rooting and plan accordingly. With proper selection of Florida native species, it is possible to occupy the propagation space throughout the year.

Table 1. Cutting propagation of *Prunus serotina* Ehrh. showing seasonal differences in rooting with various IBA treatments.

Date Stuck	Date Rated	Collection Site*	Treatment (ppm)	Mean % Rooting	Root Condition**
03/27/86	06/04/86	BL	Control	24.00 ± 17.18	<2.0
03/27/86	06/04/86	BL	2,500 IBA	66.67 ± 21.50	3.0
03/27/86	06/04/86	BL	5,000 IBA	97.33 ± 3.27	4.0
04/22/87	06/08/87	BL	Control	0.00 ± 0.00	<2.0
04/22/87	06/08/87	BL	2,500 IBA	10.67 ± 13.73	<2.0
04/22/87	06/08/87	BL	5,000 IBA	12.00 ± 10.67	<2.0
05/12/86	06/30/86	BL	Control	0.00 ± 0.00	<2.0
05/12/86	06/30/86	BL	2,500 IBA	10.67 ± 6.80	<2.0
05/12/86	06/30/86	BL	5,000 IBA	14.67 ± 16.00	<2.0
09/11/86	11/10/86	BL	Control	5.33 ± 4.99	<2.0
09/11/86	11/10/86	BL	2,500 IBA	22.67 ± 16.11	<2.0
09/11/86	11/10/86	BL	5,000 IBA	28.00 ± 4.99	<2.0

*BL = Bonnie Lake
**On a rating of 1 (poor) to 5 (excellent).

Table 2. Cutting propagation of *Prunus umbellata* Ell. showing seasonal differences in rooting with various IBA treatments.

Date Stuck	Date Rated	Collection Site*	Treatment (ppm)	Mean % Rooting	Root Condition**
04/22/87	06/08/87	BL	Control	2.67 ± 5.33	<2.0
04/22/87	06/08/87	BL	2,500 IBA	22.67 ± 7.30	<2.0
04/22/87	06/08/87	BL	5,000 IBA	62.67 ± 22.15	3.0
05/08/86	08/11/86	FCM	Control	9.33 ± 9.98	<2.0
05/08/86	08/11/86	FCM	2,500 IBA	33.33 ± 11.16	<2.0
05/08/86	08/11/86	FCM	5,000 IBA	25.33 ± 16.55	<2.0
10/27/86	12/22/86	BL	Control	1.33 ± 2.67	<2.0
10/27/86	12/22/86	BL	2,500 IBA	9.33 ± 11.62	<2.0
10/27/86	12/22/86	BL	5,000 IBA	6.67 ± 7.30	<2.0

*BL = Bonnie Lake; FCM = Four Corners Mine
**On a rating of 1 (poor) to 5 (excellent).

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RELATION OF PHOTOSYNTHESIS, GROWTH, AND ROOTING DURING POINSETTIA PROPAGATION

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Abstract. **Photosynthesis and growth of poinsettia (*Euphorbia pulcherrima* Willd. ex Klotzsch) stem-tip cuttings were studied in relation to adventitious root formation and subsequent root elongation. Photosynthesis was low in cuttings before roots were visible, and increased rapidly as roots visibly emerged from the base of the stem. Cuttings appeared to initiate roots independently of photosynthetic rate, with photosynthesis increasing upon visible root elongation. Dry weight of cuttings increased steadily during propagation, with dry weight increasing rapidly upon root emergence from the stem base. Using higher light intensities during propagation of poinsettia may not be beneficial until after the cuttings have formed visible roots.**

Use of relatively high light levels during propagation is based on the assumption that photosynthesis by cuttings enhances rooting by supplying the sugars needed for root formation. However, the recent review by Davis (2) indicated that there is limited evidence to support or reject this assumption. Researchers have suggested (7, 11), but did not document that higher light intensities would be beneficial only after root initiation. Therefore, if root formation is evaluated only at the termination of a propagation experiment, the potentially higher light needed for later visible root elongation may be masking potentially lower light requirements required during earlier, unseen root initiation stages. Rooting in poinsettia can be generally divided into two stages: 1) root initiation processes occurring inside the base of the stem before roots are visible (initiation stage); 2) root elongation growth occurring after roots become visible (development stage). To date no studies have separated out the effect of light intensity and consequent photosynthesis on the separate stages of rooting.

A range of 400-450 μmol m^{-2} s^{-1} PPFD (2700-3000 foot-candles) has been suggested as the optimum light intensity for rooting of poinsettia (8, 9). Studies evaluating light levels during rooting of poinsettia have found better rooting with light treatments lower than recommended (1, 4). However, these studies did not distinguish light intensity responses from photosynthetic or growth regulator effects during the separate root initiation and development processes.

The purpose of this research was to determine the relationship of photosynthesis to the separate stages of adventitious rooting in poinsettia.

Materials and Methods

The bottom one cm of stem tip cuttings (12 cm long) of 'V-10 Amy' and 'Lilo' poinsettia was inserted into 10 cm pots containing a fully moistened perlite:peat (3:1 v/v) medium. No rooting hormones were used, and no leaves were removed from the cuttings.

Cuttings were rooted in a growth chamber having the following environment: 16 hour uninterrupted photoperiod; 180 μmol m^{-2} s^{-1} PPFD, increased to 250 μmol m^{-2} s^{-1} on day 16; 95% or greater day/night relative humidity, reduced to 80 ± 8% on day 16; 24°C day/night temperature; 380 ± 10 ppm ambient CO_2 concentration. Light was supplied by cool white fluorescent lamps and 80 watt incandescent bulbs.

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