than total amount of rainfall accumulated during the month, the correlation coefficients improved to 0.592 for *Helicotylenchus* spp. and 0.887 for *M. incognita*, the latter figure being highly significant ($P = 0.01$). When nematode populations were correlated with total days of rainfall during the preceding month, rather than during the month before the preceding month, the correlation coefficients were 0.594 and 0.604 for *Helicotylenchus* spp. and *M. incognita* respectively, which, while still substantial, are not statistically significant ($P = 0.05$).

Thus, there are indications that nematode populations on bananas in Florida may follow rainfall-dependent fluctuations similar to those observed in the tropics. This may account for the maximum population levels observed at the end of the rainy season, or during the months of Oct.-Dec. in southern Florida (Figs. 1-2). However, in subtropical Florida, the coolest time of the year will follow these peaks, during which the bananas will experience the temperatures most unfavorable for growth (19). Thus, bananas and plantains in Florida may be subject to the greatest nematode populations at the time of the year during which they are under the greatest climatic stress. If an effective nematicide were available, the optimum time for application on bananas and plantains would probably be immediately after the rainy season, since nematode populations are at their highest points, leaching of materials would be minimized, and plant vigor will be lowest in the coming months. It may be possible to schedule applications to derive the maximum benefit of the material and to avoid applications at those times of the year when they may be less effective.

Literature Cited

1. Ayoub, S. M. 1977. Plant nematology: an agricultural training aid. State of California Dept. Food Agric. Div. Plant Ind., Sacramento. 157 pp.
2. Blake, C. D. 1972. Nematode diseases of banana plantations. *In* J. M. Webster (Ed.), Economic nematology. Academic Press, New York.
3. Broadley, R. A. 1979. Non-volatile nematicides for control of burrowing nematode in banana plantations in North Queensland. Aust. J. Exp. Agric. Anim. Husb. 19:626-630.
4. Brooks, T. L. 1954. The host range of the burrowing nematode internationally and in Florida. Proc. Fla. State Hort. Soc. 67:81-83.
5. Caveness, F. E., and T. Badra. 1980. Control of Helicotylenchus multicinctus and Meloidogyne javanica in established plantain and nematode survival as influenced by rainfall. Nematropica 10:10-14.
6. Christie, J. R., and V. G. Perry. 1951. Removing nematodes from soil. Proc. Helminth. Soc. Wash. 18:106-108.
7. Costilla, M. A., S. Gonzalez de Ojeda, and T. H. de Gomez. 1979. Helicotylenchus multicinctus in banana roots in northeastern Argentina. Nematropica 9:138-139.
8. DuCharme, E. P., and W. Birchfield. 1956. Physiologic races of the burrowing nematode. Phytopathology 46: 615-616.
9. Hutton, D. G. 1978. Influence of rainfall on some plantain nematodes in Jamaica. Nematropica 8:34-39.
10. Jones, R. K. 1979. Control of Helicotylenchus multicinctus parasitising bananas using systemic nematicides. Nematropica 9:147-150.
11. McSorley, R. 1979. Plant-parasitic nematodes associated with bananas and plantains in southern Florida. Plant Dis. Reptr. 63: 663-665.
12. Minz, G., Ziv, D., and D. Strich-Harari. 1960. Decline of banana plantations caused by spiral nematodes in the Jordan Valley and its control by DBCP. Ktavin 10:147-157.
13. Roman, J. 1978. Fitonematologia tropical. Univ. Puerto Rico Agric. Exp. Stn., Rio Piedras. 256 pp.
14. Simmonds, N. W. 1966. Bananas. Western Printing Service Ltd., Bristol. 512 pp.
15. Venning, F. D. 1958. Report on the decline of the Cuban banana industry by nematodes. Proc. Am. Soc. Hort. Sci. Caribbean Region Sixth Annual Meeting:17-20.
16. Waddill, V. H., R. McSorley, and K. Pohronezny. 1981. Field monitoring: basis for integrated management of pests on snap beans. Trop. Agric. (Trinidad) 58:157-169.
17. Wehunt, E. J., and D. I. Edwards. 1968. Radopholus similis and
18. ———————, and Q. L. Holdeman. 1959. Nematode problems of the
19. Williams, C. N. 1975. The agronomy of the major tropical crops. Oxford University Press, Kuala Lumpur. 228 pp.

Proc. Fla. State Hort. Soc. 94:323-328. 1981.

RAPID PROPAGATION TECHNIQUES FOR FRUIT CROPS

S. V. Kossuth[1]
USDA Forest Service,
SE Forest Experiment Station,
P.O. Box 70, Olustee, FL 32072

R. H. Biggs and P. G. Webb
University of Florida, IFAS,
Fruit Crops Department,
Gainesville, FL 32611

K. M. Portier
University of Florida, IFAS,
Statistics Department,
Gainesville, FL 32611

Abstract. **Rooting of cuttings from seven blueberry** (Vaccinium ashei **Reade) cultivars were tested in winter using 1) Rootone®[2], 2) Hare's powder [0.1% indolebutyric acid (IBA), 0.1% 1-phenyl-3-methyl-5-pyrazolone (PPZ), 2.0% sucrose and 97% talc], 3) Hare's powder without IBA, 4) Hare's powder with 1% saponin, and 5) Hare's powder with 1% lecithin. Summer rooting of 'Tifblue', 'Delight' and 'Woodard' blueberries, 'Valencia' orange** (Citrus sinensis **L. Osbeck), kumquat** (Citrus fortunella), **avocado** (Persea americana **Mill cv. Gainesville), jujube** (Ziziphus jujuba) **and eastern redcedar** (Juniperus virginiana **L.) was tested after cuttings were soaked for 1 hr in either 0, 1 or 2% sucrose solutions with either 0, 10, 30, 100, 300, 500 and 1000 ppm IBA. After soaking, the cuttings were dipped in a 1:99 PPZ-talc mixture. A control of only a H_2O soak was also provided. 'Delight' cuttings produced greater rooting yields in winter, 'Tifblue' cuttings produced greater rooting yields in summer and 'Woodard' cuttings produced abundant rootings in summer or winter with the proper treatment. 'Delight' cuttings had high auxin and sucrose requirements whereas 'Tifblue', 'Gainesville' avocado and 'Valencia' orange had low auxin plus high sucrose requirements for root initiation and growth. Addition of saponin or lecithin generally increased winter rooting in the blueberry cultivars. Exposure of jujube softwood cuttings, innately difficult to root, to 2000 ppm carbon dioxide (CO_2) during the first week after cuttings were taken reduced the time to rooting and increased the final amount of rooting. Avocado and 'Floradagold' peach** (Prunus persica **L. Batch) shoots girdled 2 wk before cutting exhibited increased rooting *on treated* cuttings.**

[1]Florida Agricultural Experiment Station Journal Series No. 3546.
[2]Rootone® is a commercial formulation and is used here only as a comparison formula. The use does not imply a recommendation.

Propagation of clonal material by asexual means of rooting shoot cuttings is a valuable tool for Plantsmen. It is an expensive operation so a high rooting percentage of cuttings with good quality root systems is needed (7). Also, in some cases, certain plants are very difficult to root even within cultivars of the same species, i.e., *Citrus sinensis* (11).

Many factors influence root formation in woody cuttings, both environmental and chemical (1, 2, 5, 6, 7, 11). To obtain good root formation with any cultivar, the limiting factors should be ascertained and modified. In terms of environmental factors, light, moisture, pH and CO_2 modification (5) have been beneficial to rooting, depending on plant material. Physiological state of the material when excised influences rooting as does location on plant, season, light conditions, moisture stressed and many other factors (5). Chemical factors of auxins; vitamins; substrates, i.e. CO_2 (3), sugars (3, 4), amino acids (10), lipids (1), ethylene (5), and growth inhibitors (5) can have a drastic effect on rooting. Generally, cytokinins and gibberellins have an adverse effect on rooting (5, however, both have been shown to stimulate rooting in certain cases (5, 7). There are very definite clonal differences in response to auxin and cytokinin (7).

Retention of leaves is needed on soft-wood cuttings (5) and some subtropical species for rooting of shoot pieces (6, 9). Exposure to CO_2 has increased rooting in *Pinus* spp (3) and the effect of CO_2 has been attributed to an increase in photosynthates since cuttings have a very low rate of photosynthesis (8). Shoots girdled prior to cutting have exhibited increased rooting after the cuttings were placed in a propagation bed (3).

As with tissue cultures and in-test-tube propagation systems, types and concentrations of chemical regulators vary with types of tissues even from the same plant (5) and greatly within species (7). It is evident from the many reports (5) that shoot cuttings from different species and cultivars from the same species require different chemicals at different concentration to maximize root formation with as little variability as possible among clonal material.

The approach of this study has been to recognize that there are at least four distinct stages in the rooting of woody cuttings, namely, wound healing, and in the case of softwood cuttings, leaf retention which is related to excess ethylene production, presumably initiated by the excision process; root initiation; root emergence from stem; and root development following emergence. Each stage requires energy from substrates and may be characterized by special chemical requirements. Thus, this study was undertaken to determine cultivar requirements for concentrations of sugar (sucrose) and IBA to optimize the rooting response in several fruit crops. Also tested were 1) the effect of carbon dioxide as a competitive inhibitor of ethylene, 2) girdling the cuttings before removal from the tree as a means of increasing the substrate and endogenous auxin supply, and 3) the use of saponin and 4) the use of soybean lecithin as lipodal materials in the formula.

Materials and Methods

Experiment 1. In the winter of 1980-81, hardwood cuttings were taken from seven blueberry (*Vaccinium ashei*) cvs. 'Aliceblue', 'Beckyblue', 'Bluegem', 'Delight', 'Tifblue', and 'Woodard'. Cuttings of each cultivar were treated separately with each of the following rooting powers: 1) modified Hare's powder (4) 0.1% indolebutyric acid (IBA), 0.1% 1-phenyl-3-methyl-5-pyrazolone (PPZ), a fungicide with weak auxin activity, 20% sucrose and 79.8% talc), 2) Hare's powder plus 1% saponin, a wetting agent, 3) Hare's powder plus 1% soybean lecithin, 4) Hare's powder without IBA, and 5) Rootone®.

Experiment 2. Cuttings of 'Tifblue', 'Delight' and 'Woodard' blueberries (*Vaccinium ashei* Reade), 'Valencia' orange (*Citrus sinensis* L. Osbeck), kumquat (*Citrus fortunella*), avocado (*Persea americana* Mill cv. Gainesville), jujube (*Ziziphus jujuba*) and eastern redcedar (*Juniperus virginiana* L.) were soaked in one of 21 rooting treatments for one hr, dipped in 1:99 PPZ-talc mixture and placed in the propogating bed in June-July, 1981. Treatments #1-7 were 0, 10, 30, 100, 300, 500 and 1000 ppm IBA, respectively; treatments #8-14 were 1% sucrose with either 0, 10, 30, 100, 300, 500 or 1000 ppm IBA, respectively; and treatments #15-21 were 2% sucrose with either 0, 10, 30, 100, 300, 500 and 1000 ppm IBA, respectively. Treatment #22 was 2% sucrose plus 500 ppm IBA with no fungicidal dip. Treatment #23 was Hare's powder.

Experiment 3. Avocado and 'Flordagold' peach (*Prunus persica* L. Batch) shoots were girdled in March, 1981, 1 of 3 different rooting powders applied with a camels hair brush and wrapped consecutively in wet sphagnum moss, polyethylene, and aluminum foil, latter described by Young and Saul (11). The three treatment powders were Hare's, Hare's plus 1% saponin and Rootone®. After 2 wk the girdled shoots were removed, moistened and dipped in the original treatment powder.

Experiment 4. Jujube cuttings were placed in a chamber containing 2000 ppm CO_2 in the summer of 1980. The cuttings were soaked in either distilled water or 300 ppm IBA (treatment #5 of experiment #2) for 1 hr before placement in the chambers. After 1 wk, callus had formed at the base of the cuttings and they were removed and placed in the propagating bed along with the controls. Controls for these two treatments consisted of cuttings soaked in either solution and placed in the propagating bed without exposure to CO_2.

Cuttings from all experiments were placed in a propagating bed containing a mixture of equal measures of peat and coarse perlite. Mist was applied for 5 sec every 10 min. Horticultural practices suggested by Hartman and Kester (5) were used to maintain the propagating bed and mist house. Evaluation of rooting and root quality was as described previously (7). Briefly, rooting was considered to have occurred when a root emerged from the basal stem of the cutting. Root quality was based on a rating.

Results

Rooting of the seven blueberry cultivar hardwood cuttings varied greatly among the 5 treatments (Table 1). One hundred percent of the 'Delight', 'Woodard' and 'Beckyblue' cuttings rooted after 40 days with either Hare's or Hare's + saponin powder. The best rooting combinations were: 1) 'Tifblue' cuttings: Hare's + lecithin (79%) 2) 'Bluegem' cuttings: Hare's plus saponin (83%), and 3) 'Aliceblue': Hare's minus IBA (47). Rootone® was not particularly effective with any of the cultivars.

No single treatment gave sufficient initial rooting early in the summer treatments, although treatment #20 was effective in 4 of the 8 plants tested (Table 2). Similarly, maximum rooting in each species depended on the treatment. Treatment #20 resulted in adequate rooting on the final date for five of the species, three of which were the blueberry cultivars (Table 3). One hundred percent rooting was obtained in only 4 of the species tested.

'Tifblue' and the avocado cutting yielded the highest number of rootings with 2% sucrose and fungicide (treatment #15). 'Delight' cuttings yielded a high number of cuttings that rooted (79% maximum) with auxin (100-1000 ppm) and 1-2% sucrose. 'Woodard' blueberry cuttings produced 100% rooting with no sucrose and 300 ppm IBA

Table 1. Rooting of blueberry hardwood cuttings 28 and 40 days after treatment.

	Cultivars													
	'Tifblue' n=200		'Delight' n=200		'Bluegem' n=200		'Woodard' n=200		'Alice Blue' n=12-17		'Beckyblue' n=12-17		'Southland' n=12-17	
	28 days	40	28	40	28	40	28	40	28	40	28	40	28	40
Hare's[z]	23b[y]	28c	50b	100a	16b	24c	23b	53b	8a	33a	36a	100a	1a	10b
Hare's + saponin	25b	40b	65a	92b	57a	83a	58a	100a	0	42a	41a	100a	1a	19a
Rootone	10c	12d	19d	65e	12b	43b	12c	52b	7a	29a	17b	42b	0	5c
Hare's — IBA	28b	46b	30c	83c	17b	36b	18b	54b	18a	47a	7b	43b	0	7c
Hare's + lecithin	39a	79a	29c	76d	6c	50b	25b	42c	8a	42a	0b	25b	0	5c

[z]Modified Hare's powder consists of 0.1 percent IBA, 0.1 percent PPZ, 20 percent sucrose and 79.8 percent talc. Saponin and lecithin were added at 1 percent with talc reduced to 78.9 percent.
[y]Vertical row numbers not followed by the same letter are significantly different at the 0.05 level.

Table 2. Optimum treatments for earliest rooting of softwood cuttings from eight fruit crop species.

Plant source	Earliest rooting		
	Treatment[z,y]	Days after treatment	Rooting %
'Tifblue' n=50	1	28	20
	11	28	20
	22	28	20
'Delight' n=10	14	29	10
	19	29	10
	20	40	50
	18	40	20
'Woodard' n=50	23	21	20
	5	28	80
	20	28	60
	18	28	40
'Valencia' n=10	14	28	20
	18	28	20
	19	28	20
	21	28	20
	22	28	20
Kumquat n=10	5	28	10
	14	42	10
	8	49	10
	4	49	10
Avocado n=10	15	96	60
	17	96	60
	8	96	40
Jujube n=9	5	24	86
	21	24	86
	6	24	71
	22	24	71
Eastern Redcedar n=10	21	49	30
	22	49	30
	3	49	20
	6	49	20
	18	49	20

[z]Treatment #8-14 = 1% sucrose with either 0, 10, 30, 100, 300, 500 or 1000 ppm IBA; Treatment #15-21 = 2% sucrose with either 0, 10, 30, 100, 300, 500 or 1000 ppm IBA; Treatment #22 = 2% sucrose, 500 ppm IBA and no fungicide: Treatment #23 = Hare's powder 0.1% IBA, 0.1% PPZ, 20% sucrose and 79.8 talc).
[y]All 23 treatments were conducted on all cultivars. Only the treatments that gave some rooting or better rooting are reported for brevity.

(Treatment 5). High auxin (1000 ppm IBA) and sucrose (2%) levels yielded the maximum rooting in 'Valencia' orange (100%) and jujube (86%). Maximum rooting occurred in jujube at 24 days. One percent sucrose and 10 ppm IBA yield 90-100% rooting in Eastern redcedar.

Girdled avocado shoots treated with Hare's + saponin had a 17% increase in rooting over those treated with Hare's powder (Fig. 1). The Rootone® treatment produced 2% rooting. Rooting of girdled 'Flordagold' peach cuttings was similar to that of avocado except Rootone® resulted in 10% rooted cuttings (Fig. 2).

When carbon dioxide was added to treatment #5 (300 ppm IBA, no sucrose and 1% PPZ), jujube cuttings had 43% rooting in 2 wk (Fig. 3) and 100% rooting in 4 wk. Carbon dioxide did not significantly increase rooting without IBA.

Discussion

Shoots from 'Delight' blueberry had greater rooting (100%) in a shorter time period (40 days in winter) when treated with Hare's powder (Tables 1-3); the highest summer rooting was 70%. Rooting was greater in summer than winter for 'Tifblue'; however, 100% rooting of 'Woodard' cuttings was obtained in both summer and winter. 'Tifblue' summer shoots seem to have a low requirement for additional auxin (0% IBA) which was met with the PPZ and a high substrate (2% sucrose) requirement for root initiation. Summer shoots of 'Woodard' blueberry yielded opposite results from those of 'Tifblue'. One hundred percent rooting occurred when cuttings were placed in the highest (1000 ppm) IBA and lowest sucrose (0%) solution and then dipped in the PPZ/talc mixture. Since some cultivars may yield higher rootings from cuttings at different seasons, propagators may make more efficient use of their propagating beds by working in summar or winter with cultivars that root best in summer or winter, respectively.

Table 3. Optimum treatments for maximum rooting of cuttings from eight fruit crop species.

Plant source	Earliest rooting		
	Treatment[z,y]	Days after treatment	Rooting %
'Tifblue' n=50	15	79	100
	11	79	80
	22	79	80
	20	79	80
'Delight' n=10	20	79	70
	19	79	50
	18	79	40
	14	79	40
	12	79	40
'Woodard' n=50	5	35	100
	20	32	80
	4	78	80
	13	78	80
'Valencia' n=10	21	46	100
	22	46	100
	23	68	80
	20	83	80
	6	83	70
	7	83	70
Kumquat n=10	8	93	30
	13	93	30
Avocado n=10	15	96	60
	17	96	60
	8	96	40
Jujube n=9	5	24	86
	21	24	86
	6	45	71
	22	24	71
	17	45	71
Eastern Redcedar n=10	12	103	100
	11	88	90
	18	88	90
	10	103	90
	13	103	90
	14	103	90
	20	103	90
	23	103	90

[z]Treatment #8-14 = 1% sucrose with either 0, 10, 30, 100, 300, 500 or 1000 ppm IBA; Treatment #15-21 = 2% sucrose with either 0, 10, 30, 100, 300, 500 or 1000 ppm IBA; Treatment #22 = 2% sucrose, 500 ppm IBA and no fungicide; Treatment #23 = Hare's powder (0.1% IBA, 0.1% PPZ, 20% sucrose and 79.8% talc.
[y]All 23 treatments were conducted on all cultivars. Only the treatments that gave some rooting or better rooting are reported for brevity.

It appears excessive IBA on cuttings from some cultivars, such as 'Tifblue' may be inhibitory to root initiation. Treatment on winter 'Tifblue' cuttings with Hare's powder minus IBA gave 18% higher rooting than treatment with Hare's powder. Furthermore, lecithin may be enhancing root initiation. Hare's powder plus lecithin increased rooting up to 2.8 times more than Hare's powder alone on three of

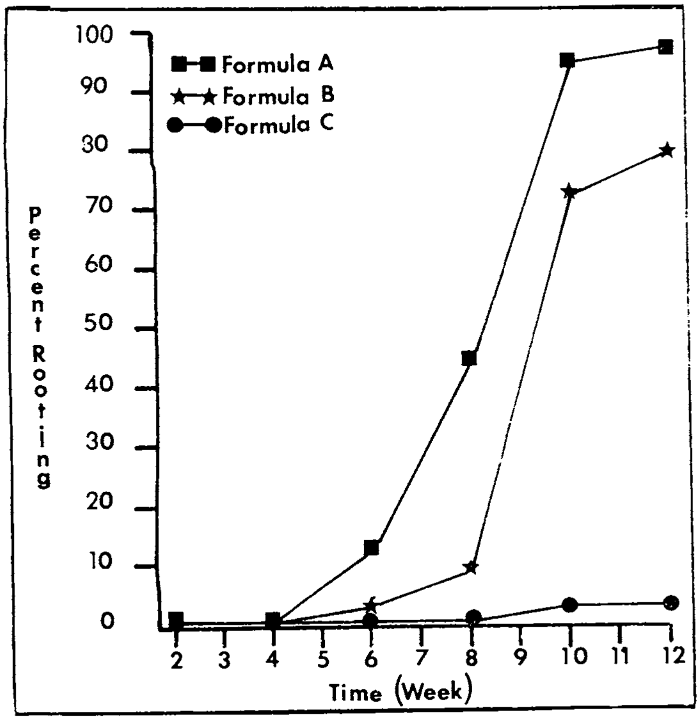

Fig. 1. Percent rooting (200 cuttings per treatment) of avocado shoots after being girdled on the tree for 2 weeks and then placed in a mist propagating bed. (Formula A is Hare's powder, B is Hare's + 1% saponin and C is Rootone).

the blueberry cultivars. The saponin additive to Hare's powder also increased rooting in cuttings of all cultivars except 'Delight' blueberry. Cuttings dipped in Hare's + saponin exhibited more rootings than cuttings dipped in Hare's minus IBA. This increase suggests that there may be root initiation activity in the saponin or that it may overcome the negative effects on root initiation of excessive IBA.

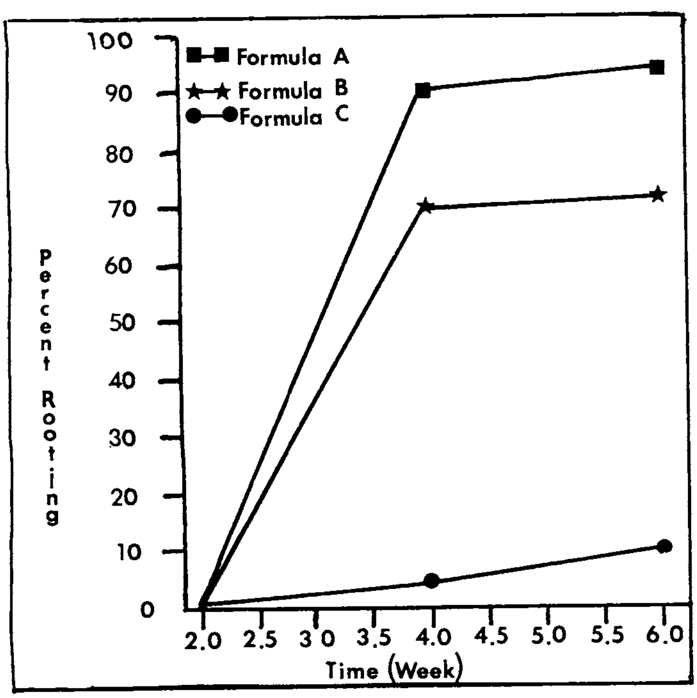

Fig. 2. Percent rooting (200 cuttings per treatment) of Flordagold peach shoots after being girdled on the tree for 2 weeks and then placed in a mist propagating bed. (Formula A is Hare's powder, B is Hare's + 1% saponin and C is Rootone).

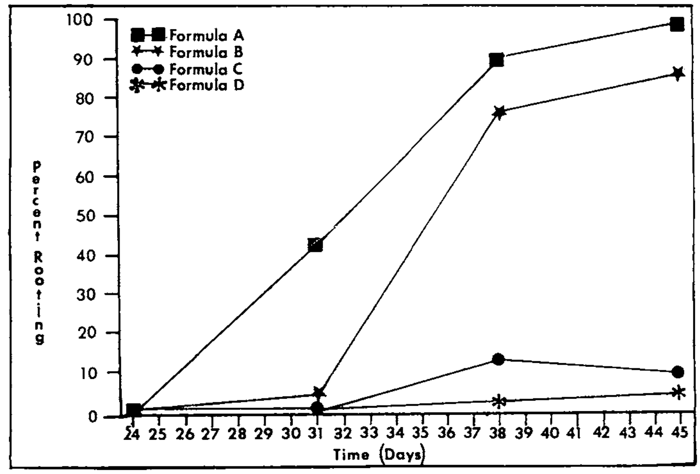

Fig. 3. Percent rooting of jujube summer cuttings as influenced by a 1-hour basal stem soak in either distilled H_2O (formula C and D) or 300 ppm IBA (formula A and B) with either 2000 ppm CO_2 (formula A and C) or without CO_2 (formula B and D).

Girdling shoots 2 wks before the cuttings were taken is done to build up the substrate and possible auxin supply at the time roots are initiated (3). The success of girdling was exhibited in the avocado shoots where rooting began at 42 days and reached 97% by 94 days (Hare's + saponin); whereas only 60% of the summer shoots produced roots in low auxin and high sucrose (2% sucrose and 0 or 30 ppm auxin) after 96 days.

Although a set-up for introducing CO_2 may be cumbersome to establish, the addition of CO_2 increases rooting in jujube when combined with auxin. It is believed that in this instance the speed and completeness of rooting in CO_2 treated cuttings was due to an inhibition of the senescense response related to wound ethylene produced since leaves did not abscise from the CO_2 tested plants. One very detrimental effect of the ethylene is to induce leaf abscission. It is well known that softwood cutting are stimulated to root by the presence of leaves (5, 6, 9). Callus formation occurred after 1 week of CO_2 enhancement. This demonstrates that the healing response occurs in the presence of CO_2 and probably at a faster rate.

Literature Cited

1. Bachelard, E. P., and B. B. Stowe. Rooting cuttings of *Acer rubrum* L. and *Eucalyptus camaldulensis* Dehn. Austral. J. Biol. Sci. 16:751-767.
2. Cameron, R. J. and D. A. Rook. 1974. Rooting stem cuttings of Radiata pine: environmental and physiological aspects. N.Z.J. For. Sci. 4:291-298.
3. Hare, R. C. 1975. Girdling promotes rooting of Slash pine cuttings. Proc. South. For. Tree. Improv. Conf. 13:226-229.
4. ————. 1981. Improved Rooting Powder for Chrysanthemums. Hort. Science 16:90-91.
5. Hartman, H. T. and D. E. Kester. 1975. Plant propagation: Principles and practices. Prentice Hall, Englewood Cliffs, N.J. 662 pp.
6. Leal, F. and A. H. Krezdorn. 1964. Rooting avocado cuttings. Proc. Fla. State Hort. Soc. 77:358-362.
7. Meredith, W. C., J. N. Joiner and R. H. Biggs. 1970. Influence of Indole-3-acetic acid and kinetin on rooting and indole metabolism of *Feijoa sellowiana*. J. Amer. Soc. Hort. Sci. 95:49-52.
8. Molnar, J. M. and W. A. Cumming. 1968. Effect of carbon dioxide on propagation of softwood, conifer and herbaceous cuttings. Can. J. Plant Sci. 48:595-599.
9. Reuveni, O. and M. Ravise. 1981. Importance of leaf retention to rooting of avocado cuttings. J. Amer. Soc. Hort. Sci. 106:127-130.

10. Taylor, J. B., and J. N. Joiner. 1959. Vegetative propagation of *Fejoa sellowiana* and *Rhodomyrtis tomentosa* as affected by various combinations of 3-indolebutryic acid, arginine, sucrose and thiamine. Proc. Fla. State Hort. Soc. 72:366-368.
11. Young, M. J. and Julian Sauls. 1979. Propagation of Fruit Crops. Inst. Food and Ag. Sciences. Fla. Coop Ext. Services circ. 456.

Proc. Fla. State Hort. Soc. 94:328-331. 1981.

SYMPOSIUM: GRAPES IN FLORIDA

GRAPE CULTIVAR TRIALS AND RECOMMENDED CULTIVARS FOR FLORIDA VITICULTURE[1]

JOHN A. MORTENSEN
University of Florida, IFAS, Agricultural Research Center, P.O. Box 388, Leesburg, FL 32748

C. P. ANDREWS
University of Florida, IFAS, Agricultural Research Center, Rt. 4, Box 263, Monticello, FL 32344

Additional index words. Breeding, *Vitis.*

Abstract. **Replicated muscadine grape trials at 3 locations (Ft. Pierce, Leesburg, Monticello) were conducted from 1972, 1974, and 1976, respectively, to date. 'Noble' yielded well at all locations . Fresh fruit taste panels held each year placed 'Noble' fairly low, but processing tests indicated good wine and juice potential. 'Sugargate' rated above all other black muscadines in taste, but yields were too low. 'Fry' and 'Summit' also rated well in taste panels, and had acceptable yields.**

Nonreplicated bunch grape trials involving over 1,000 clones indicate that 'Stover', 'Lake Emerald', and 'Blue Lake', along with breeding selections Fla. E12-59, Fla. H15-13, and Fla. L4-33 yielded well among the cultivars resistant to Pierce's disease. 'Delaware' had good quality but lacked yield, and 'Roucaneuf' and 'Black Spanish' yielded well but lacked fruit quality.

Currently recommended cultivars are presented based on the proposed use of the fruit. Cultivars tested but not recommended are also listed.

Grape production in Florida depends heavily on the use of adapted cultivars that are resistant to Pierce's disease (PD) (4, 13). A breeding program to develop such varieties was initiated in 1945 at the Agricultural Research Center, Leesburg, and has been continued to date (5, 13). Resistant cultivars released include 'Lake Emerald' (1954), 'Blue Lake' (1960), 'Norris' (1966), 'Stover' (1968), 'Liberty' (1976), and 'Dixie' (1976, jointly with N. C. State Univ.) (9). 'Welder', a muscadine cultivar originating in Lake County was described in 1977 (8). In addition, grape breeding programs at North Carolina State University, Georgia Agricultural Experiment Station, and U. S. Horticultural Field Station at Meridian, Mississippi have contributed PD-resistant cultivars that perform well in Florida (2, 7).

The purpose of this paper is to present results from replicated cultivar trials in Florida and to update cultivar recommendations over previous reports (1, 2, 3, 6, 7).

Materials and Methods

Beginning with a 16-cultivar planting of muscadine grapes in 1959, and continuing with additional cultivars planted later for observation in nonreplicated plots, over 50 cultivars of muscadine grapes have been evaluated at the Agricultural Research Center, Leesburg. The most promising cultivars were planted in replicated yield trials at Agricultural Research Centers in Fort Pierce, Leesburg, and Monticello. In 1972, a 7-cultivar muscadine planting with 4 single-vine replicates was planted at Ft. Pierce using a vertical trellis. In 1974, a 30-cultivar muscadine planting with 6 single-vine replicates was planted at Leesburg and trained to a modified Geneva Double Curtain (GDC) trellis. In 1976 and later, a 32-cultivar muscadine planting with 6 single-vine replicates was planted at Monticello. Half the replicates were trained to GDC trellis, and the other half to 2-wire vertical trellis. Spacings at Fort Pierce were 16′ in rows 10′ apart, at Leesburg 15.5′ in rows 12′ apart, and at Monticello the GDC were 18′ in rows 12′ apart and the 2-wire vertical were 18′ apart in rows 10′ apart. Harvest was accomplished with a hand-held blueberry harvester, shaking fruit into a catch frame. Yields, date of harvest, percent dry stem scar, percentage ripe, green, and rotted berries were recorded when appropriate at each location. Yield data at Monticello was pooled by year, combining data from both trellis systems on a tons/acre basis.

Bunch grapes were primarily grown in nonreplicated plantings at the 3 locations. The testing of more than 1,000 clones at the Agricultural Research Center, Leesburg, led to only 35 being planted in replicated trials. The 3 replicated bunch grape cultivar trials planted at Leesburg are not yet in full bearing stage, but yields and other data obtained over several years from older nonreplicated trials provide fairly consistent data for the bunch grape cultivars.

Fresh fruit taste panels consisting of 18 to 111 people were conducted between 1963 and 1981 on bunch grape and between 1970 and 1981 on muscadine grapes. The rating system used was excellent = 10, very good = 8, good = 5, fair = 2, and poor = 0 for each cultivar in the taste panel. Normally only 10 cultivars were used per taste panel. Processing tests were performed on the various cultivars by Bates (3).

Results

Muscadine yields at Fort Pierce were recently reported by Stoffella, et al. (12) with 'Cowart', 'Dixie', 'Welder', and 'Noble' outyielding other cultivars. Yields at Leesburg between 1978 and 1981 indicated significant differences among the 24 best cultivars (Table 1). 'Noble' was significantly higher yielding than all other cultivars except 'Regale', 'Redgate', 'Doreen' (N.C. 276-108), and N.C. 77-21. 'Noble' was the most productive entry at Monticello (Table 2). 'Carlos' yielded well initially at Monticello but in 1981 yields declined due to PD. One vine of 'Carlos' died at Leesburg from PD. 'Redgate' yielded well but bunches were excessively compact, causing tearing and rotting of berries; also, taste panel ratings were low (Table 3). The best tasting muscadines were 'Fry', 'Summit', 'Magnolia', 'Watergate' and 'Sugargate'. 'Sugargate' was the only black muscadine that ranked exceptionally high in taste but yields were

[1]Florida Agricultural Experiment Station Journal Series No. 3449.