3. Armitage, A.M., W.H. Carlson, and C.E. Cress. 1981. Determination of flowering time and vegetative habit of *Tagetes patula* through response surface techniques. J. Amer. Soc. Hort. Sci. 106:632–638.
4. Björkman, O. 1981. Responses to different quantum flux densities, p. 57–107. In: O.L. Lange, P.S. Nobel, C.B. Osmond, and H. Ziegler (eds.). Encyclopedia of plant physiology, Vol. 12A, physiological plant ecology I, response to the physical environment. Springer-Verlag, New York.
5. Carpenter, W.J. 1975. High intensity lighting of pot chrysanthemum. Flor. Rev. 156:19–20, 59–60.
6. Causton, D.R. 1983. A biologist's basic mathematics. Edward Arnold, London.
7. Charles-Edwards, D.A., K.E. Cockshull, J.S. Horridge, and J.H.M. Thornley. 1979. A model of flowering in chrysanthemum. Ann. Bot. 44:547–556.
8. Dewey, D.R. and K.H. Lu. 1959. A correlation and path coefficient analysis of components of crested wheatgrass seed production. Agron. J. 51:515–518.
9. Duarte, R.A. and M.W. Adams. 1972. A path coefficient analysis of some yield component relationships in field beans (*Phaseolus vulgaris*). Crop Sci. 12:579–582.
10. Gardiner, D.A., R.G. Cragle, and P.T. Chandler. 1967. The response surface method as a biological tool. Tenn. Agr. Expt. Sta. Bul. 429:25–40.
11. Hancock, J.F., M.P. Pritts, and J.H. Siefker. 1984. Yield components of strawberries maintained in ribbons and matted rows. Crop Res. 24:37–43.
12. Heins, R.D., M.G. Karlsson, J.A. Flore, and W.H. Carlson. 1986. Effects of photosynthetic rate maximization of growth and development in chrysanthemum. J. Amer. Soc. Hort. Sci. 111:42–46.
13. Hicklenton, P.R. 1984. Response of pot chrysanthemum to supplemental irradiation during rooting, long day, and short day production stages. J. Amer. Soc. Hort. Sci. 109:468–472.
14. Hughes, A.P. 1973. A comparison of the effects of light intensity and duration on *Chrysanthemum morifolium* cv. Bright Golden Anne in controlled environments. I. Growth analysis. Ann. Bot. 37:267–274.
15. Hughes, A.P. and K.E. Cockshull. 1971. The effects of light intensity and carbon dioxide concentration on the growth of *Chrysanthemum morifolium* cv. Bright Golden Anne. Ann. Bot. 35:899–914.
16. Hunt, R. 1978. Plant growth analysis. Edward Arnold, London.
17. Karlsson, M.G. 1987. Characterization of development and growth responses to irradiance and temperature for model development in chrysanthemum. PhD Diss., Michigan State Univ. East Lansing.
18. Karlsson, M.G. and R.D. Heins. 1986. Response surface analysis of flowering in chrysanthemum 'Bright Golden Anne'. J. Amer. Soc. Hort. Sci. 111:253–259.
19. Larson, R.A. (ed.). 1980. Introduction to floriculture. Academic, New York.
20. Laurie, A., D.C. Kiplinger, and K.S. Nelson. 1969. Commercial flower forcing. McGraw-Hill, New York.
21. Lee, S.M. and P.B. Cavers. 1979. The effect of shade on growth, development and resource allocation patterns of three species of foxtail (*Setaria*). Can. J. Bot. 59:1776–1786.
22. Nie, N.E., C.H. Hull, J.G. Jenkins, K. Steinbrenner, and D.H. Bent. 1975. Statistical package for social sciences (SPSS). 2nd ed. McGraw-Hill, New York.
23. Pritts, M.P., J.H. Siefker, and J.F. Hancock. 1984. Yield component variation in wild and cultivated blueberries. Proc. Blueberry Res. Workers Conf. 5:30–37.
24. Pritts, M.P. and J.F. Hancock. 1985. Lifetime biomass partitioning and yield component relationships in the highbush blueberry, *Vaccinium corymbosum* L. (*Ericaceae*). Amer. J. Bot. 72:446–452.
25. Ranalli, P., M. DiCandilo, I. Giordano, and B. Casarini. 1981. Correlation and path analysis in peas (*Pisum sativum* L.) for processing. Z. Pflanzenzuchtung 86:81–86.
26. Shasha's, N.S., W.P. Nye, and W.F. Campbell. 1973. Path coefficient analysis of correlation between honey bee activity and seed yield in *Allium cepa* L. J. Amer. Soc. Hort. Sci. 98:341–347.
27. Siefker, J.H. and J.F. Hancock. 1986. Yield component interactions in cultivars of the highbush blueberry. J. Amer. Soc. Hort. Sci. 111:606–608.
28. Stephanis, J.P. and R.W. Langhans. 1982. Quantum flux density studies of chrysanthemum in a controlled environment with high-pressure sodium lamps. II. Long day and short day studies. J. Amer. Soc. Hort. Sci. 107:461–464.
29. Wright, S. 1921. Correlation and causation. J. Agr. Res. 20:557–585.
30. Wright, S. 1934. The method of path coefficients. Ann. Math. Stat. 5:161–215.

HortScience 23(2):375–378. 1988.

Screening Rootstocks of *Prunus* for Relative Salt Tolerance

Yvonne Ottman and David H. Byrne

Department of Horticultural Sciences, Texas A&M University, College Station, TX 77843-2133

Additional index words. stone fruit, peach, *Prunus persica*, Nemaguard, Nemared, plum, *Prunus cerasifera, Prunus mexicana*, almond, *Prunus amygdalus* var. *amara*, 'Titan' almond x Nemaguard, sodium, calcium, magnesium, chloride, sulfate, salinity

Abstract. **A nondestructive method for evaluating the salt tolerance of *Prunus* seedlings was devised for greenhouse sand-culture with 60 days of saline drip irrigation. The treatments contained half-strength Hoagland's solution using distilled water and supplementary chloride and sulfate salts of Na, Ca, and Mg to reach 1.5 $dS \cdot m^{-1}$ for control, 4.5 $dS \cdot m^{-1}$ for the first trial, and 6.0 $dS \cdot m^{-1}$ for the second and third trial screenings. After 60 days of irrigation with 6.0 $dS \cdot m^{-1}$ Nemaguard, the standard peach [*P. persica* (L.) Batsch] rootstock averaged 46% of the fresh weight, 53% of the volume, 66% of the height, and 74% of the foliar health ratings of the control seedlings. Percent of control values were compared for a tentative ranking of salt tolerance: 'Titan' almond x Nemaguard and *P. mexicana* Wats. > Nemaguard and Nemared > Myrobalan plum (*P. cerasifera* J.F.Ehrh.) and bitter almond (*P. amygdalus* var. *amara* Focke.). Correlation coefficients were used in selecting useful sets of evaluation parameters. Height was rejected as a screening parameter. Final fresh weight and a final foliar health rating are recommended for cursory screenings of *Prunus* germplasm. The last three weekly foliar health scores are useful for comparing rates of decline. Volume displacements are useful for comparing root vs. shoot growth.**

Growers of almonds and fresh-market peaches, plums, and apricots are attracted to the lower latitude, semi-arid regions where earlier market windows and fewer chemical inputs combine for a better return on investment than obtained elsewhere. These same regions are facing a steady deterioration in the quantity and quality of available irrigation water. One-third of the world's irrigated acreage already is affected adversely by salinity (15).

There is little information available on the relative salt tolerance of *Prunus* spp. to help growers select rootstocks for new plantings. Current generalizations (2, 14) are based on a few long-term studies at the United States Salinity Laboratory (1, 3, 9) and observations in the field (4). A soil is not classified as saline until 4 $dS \cdot m^{-1}$ ECe (20), yet Maas (14) has calculated a threshold of 1.5–1.7 $dS \cdot m^{-1}$, beyond which *Prunus* spp. begin to show symptoms of yield depression, stunting, foliar burn, and premature senescence (9–11). Maas (14) calculated slopes of decline that rank salt tolerance of the commercial *Prunus* spp. as plum > almond > peach > apricot. Bernstein (2) ranked rootstocks in terms of tolerance to soil chloride: Marianna plum >> Lovell peach ≥ Shalil peach > Yunnan peach. Field observations reviewed by Day (4) ranked rootstocks in terms of tolerance to excess alkali salts as almond > apricot > Myrobalan plum ≥ peach. Studies outside of these reviews have found Marianna 2624 to be more salt-tolerant than Myrobalan 3-J (19); Lovell peach to be more

Received for publication 22 June 1987. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

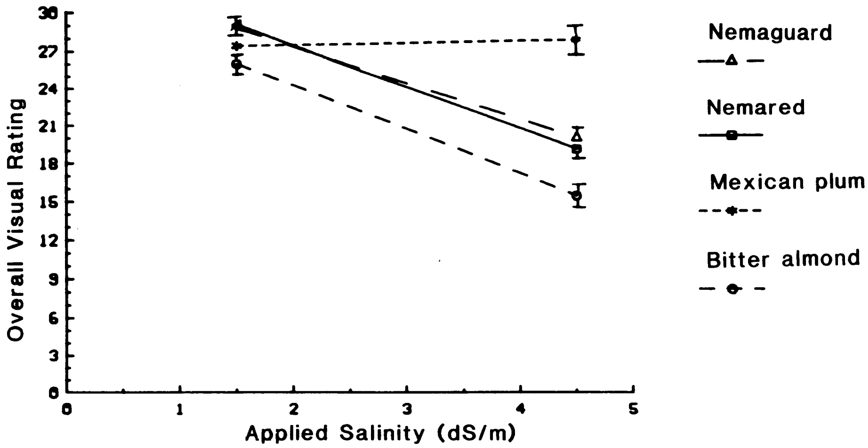

Fig. 1. The relative declines in foliar health of young seedlings of four *Prunus* spp. in response to 74 days of saline drip irrigation at 4.5 dS·m^{-1} in relation to a 1.5 dS·m^{-1} control. Visual ratings were combined for 6 weeks with 30 possible points for healthy leaf color and extent of leaf burn. Bars indicate SE.

Table 1. Least square mean final relative growth rates, volume displacements of root and shoot, and root : shoot ratio of Nemaguard and 'Titan' x Nemaguard F_1 seedlings after 60 days of 6.0 dS·m^{-1} of applied salinity treatment.

Rootstock and treatment	Final relative[z] growth rate (%/week)	Volume displacement (ml) Root	Volume displacement (ml) Shoot	Root : shoot ratio
Nemaguard:				
Control	7.7 a[y]	12.6 a	17.7 b	0.71[x]
6.0 dS·m^{-1}	3.0 b	6.9 b	12.7 c	0.54
Titan x Nemaguard:				
Control	7.7 a	15.1 a	21.4 a	0.72
6.0 dS·m^{-1}	4.6 ab	10.2 b	14.1 c	0.72

[z]Final weekly height increase as percent of previous week's height.
[y]Least square means separated in columns at the 5% level.
[x]Least square means not separated in this column due to lack of significance in the model.

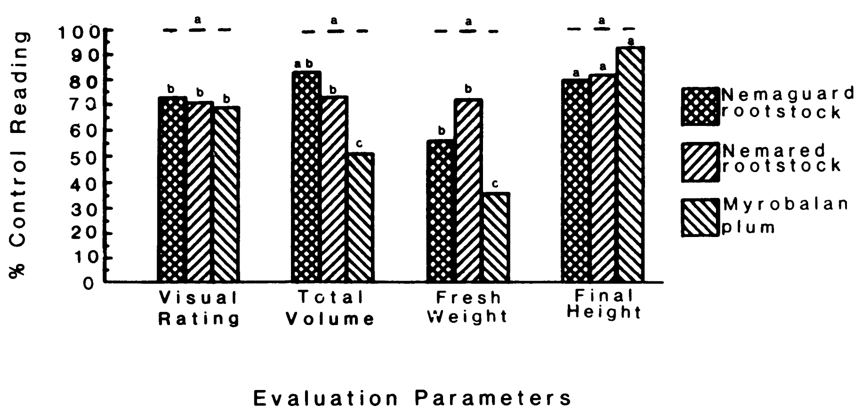

Fig. 2. A comparison of three *Prunus* spp. for salt tolerance after 60 days of saline drip irrigation at 6.0 dS·m^{-1} in relation to a 1.5 dS·m^{-1} control. Least square means for each of the four parameters were separated at the 5% level. Visual ratings were based on leaf color and extent of leaf burn.

tolerant to sulfate and chloride toxicity than Mahaleb cherry rootstock (5); and sandcherry (*Prunus besseyi* L.H. Bailey) more tolerant to NaCl than Nanking cherry (*Prunus tomentosa* Thunb.) (6).

At the U.S. Salinity Lab, Francois (7) evaluated commercial woody plants for several years in fields salinized with local irrigation water and equal weights of Na and Ca chlorides. Breeding for salt tolerance in orchard crops will require more rapid (18) and nondestructive methods of screening germplasm than these tests offer. Hassan (8) reported a screening technique based on the survival rate of apricot seedlings grown in community pots in greenhouse sand culture under two levels of NaCl treatment.

The purpose of this study was to design and apply a nondestructive, short-term screening procedure for salt tolerance in rootstock candidates for *Prunus* crops.

Dried *Prunus* seeds were stratified at 7°C in vermiculite saturated with 1% to 2% 3a,4,7,7a-tetrahydro-2-[(trichloromethyl)thio]-1*H*-isoindole-1,3(2*H*)-dione (captan) until emergence of radicles. The seedlings were acclimated to greenhouse temperatures and then planted in single-seedling polyethylene nursery bags holding 1.3 kg of acid-washed, medium-grade blasting sand. The seedlings were then given 3 to 4 weeks for establishment prior to salt treatment. The number of seedlings per species per treatment varied from 10 to 22. A preliminary study compared four levels of salinity with the control using four seedlings per pot of 4.6 kg of sand, and the performance of 14 Nemaguard seedlings per treatment was used to select the salt treatment level for the first trial.

The first trial screened Nemaguard, Nemared, *Prunus mexicana*, and bitter almond seedlings at 4.5 dS·m^{-1} in spring. In early summer, the second trial screened Nemaguard, Nemared, and Myrobalan plum seedlings at 6.0 dS·m^{-1}. The third trial began in mid-summer using Nemaguard and 'Titan' almond x Nemaguard F_1 progeny at 6.0 dS·m^{-1}. A mist system was employed in mid-summer to keep the small seedlings hydrated during establishment. The seedlings were removed from the mist and put under saline drip irrigation the same day.

The nursery bags were randomized in 162 cells of a wooden grid. A partially buried plastic straw centered the drip emission from a micro tube. The system was calibrated to deliver 50 ml to each seedling within 5 min before noon each day. Some leaching of old solution occurred through drain holes in the bags.

The control was half-strength Hoagland's solution using distilled water and supplemented with ions to meet Maas' calculated threshold of 1.5 dS·m^{-1}. The critical elemental content of the control was 88 ppm Na, 88 ppm Ca, 23 ppm Mg, 102 ppm Cl, and 71 ppm S. The salt treatments were control plus equal weights of Na and Ca chlorides to apply 4.5 dS·m^{-1} in the first trial screening and 6.0 dS·m^{-1} in the second and third trials. At 6.0 dS·m^{-1} of applied salinity, the critical elemental contents were 876 ppm Na, 648 ppm Ca, 23 ppm Mg, 2170 ppm Cl, and 71 ppm S. The solutions were unbuffered, but slightly acidic. The desired treatment period was 60 days, but the first trial screening was extended by 2 weeks due to slow response at 4.5 dS·m^{-1}.

After the salt treatments were begun, the performance of the seedlings was evaluated in four, nondestructive ways: 1) weekly heights marked on nylon monofilament anchored near each stem, 2) weekly visual ratings of foliar health, 3) final fresh weights, and 4) separate final volume displacements of root and shoot. The visual ratings were defined with 5 for healthy coloring and no leaf burn; 4 for slight off-coloring and <20% leaf area damaged; 3 for ashen or chlorotic leaves and/or 20% to 40% damaged; 2 for 40% to 60% damaged; 1 for 60% to 80% damaged; and 0 for >80% damaged.

A 500-ml plastic graduated cylinder was modified for the volume displacement readings by the insertion of a 5-mm glass tube into the 450-ml mark (300 mm height). The distal end of the 1.2-m glass tube was clamped at a height of 355 mm. The movement of the meniscus was calibrated by pipette. The

Table 2. Mean correlation coefficients within and between groups of growth parameters and foliar health ratings from two trial screenings of *Prunus* seedlings at 6.0 $dS \cdot m^{-1}$ of applied salinity.

Correlated parameters	Final growth parameters: Height	Volume	Weight	Foliar health rating[z] tally: 6 weeks	3 weeks	Final
Final growth parameters		*Within*				
Final height	1.00	0.62***	0.71***			
Total volume[y]	0.62***	1.00	0.93***			
Fresh weight	0.71***	0.93***	1.00			
Foliar health rating tallies		*Between*			*Within*	
6 weeks	0.57*	0.52**	0.80***	1.00	0.97***	0.95***
3 weeks	0.52*	0.46**	0.78***	0.97***	1.00	0.99***
Final week	0.50*	0.42*	0.76***	0.95***	0.99***	1.00

[z]Sum of weekly visual ratings (5 = best, 0 = worst) of leaf color and extent of leaf burn over a period of 1 to 6 weeks before harvest.

[y]Sum of volume displacements of root and shoot systems.

*,**,***Significant at the 5%, 1%, and 0.1% levels, respectively.

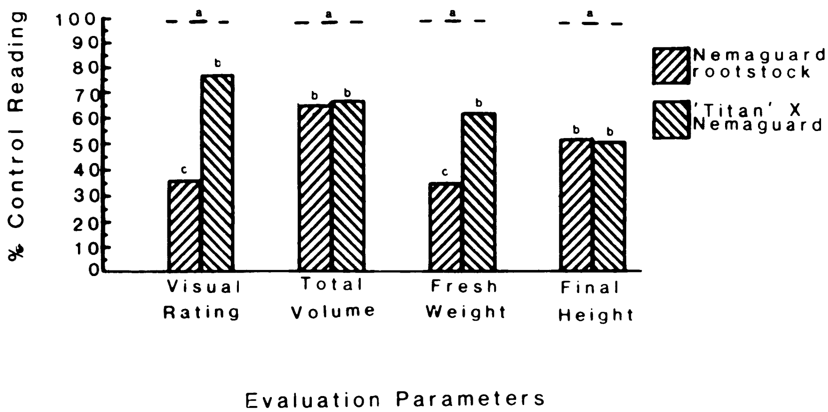

Fig. 3. A comparison of two *Prunus* spp. for salt tolerance after 60 days of saline drip irrigation at 6.0 $dS \cdot m^{-1}$ in relation to a 1.5 $dS \cdot m^{-1}$ control. Least square means for each of the four parameters were separated at the 5% level. Visual ratings were based on leaf color and extent of leaf burn.

roots were submerged for the first reading, then the seedling was inverted for submersion of the shoot system. After screening, the seedlings were transplanted to the field to test the nondestructive quality of the procedure.

The weekly height data were analyzed as growth intervals, relative growth rates, and total height. From the original nine weekly visual rating scores, separate analyses were done for the last week, the last 3 weeks, and the last 6 weeks to determine the optimum number of weeks. The volume readings were analyzed as root volume, shoot volume, total volume, and root : shoot volume ratio. A germplasm × treatment effect was included in the analysis of variance for each screening to compare degrees of salt tolerance. The least square means procedure was used because significant separations (at the 5% level) could be made for germplasm, treatment, and germplasm × treatment data. Correlation coefficients for every pair of evaluation parameters were generated for the two screenings at 6.0 $dS \cdot m^{-1}$.

Calibration studies in winter indicated that values significantly different from the control with minimal casualties could be measured after 60 days of treatment with as low as 4.5 $dS \cdot m^{-1}$. At 5.5 $dS \cdot m^{-1}$ and higher, at least one of the four seedlings per pot died, often enhancing the subsequent performance of the remaining seedlings. It was concluded from these preliminary studies that single-seedling containers were necessary to avoid rootspace competition, and salt treatments should begin at 4.5 $dS \cdot m^{-1}$.

First trial. Without rootspace competition and in the better growing conditions of spring, the effect of 4.5 $dS \cdot m^{-1}$ of applied salinity appeared slowly. Harvest of the first trial screening was delayed 2 weeks, and subsequent screenings were done at 6.0 $dS \cdot m^{-1}$.

Prunus mexicana scored as high in foliar health at 4.5 $dS \cdot m^{-1}$ as the control, whereas Nemaguard, Nemared, and bitter almond had significantly lower scores (Fig. 1). Although the shoots of *P. mexicana* appeared unaffected after 74 days at 4.5 $dS \cdot m^{-1}$, some root dieback was noted. Hassan (8) noted on apricot seedlings that salt damage also appeared on the roots earlier than on the shoots. The salt tolerance of *P. mexicana* warrants further study.

Bitter almond did not perform as well as Nemaguard or Nemared peach rootstocks. The current generalization that almonds are more salt-tolerant than peaches (1, 3, 4, 14) should be re-evaluated after thorough screening of both groups. Earlier studies (1, 3) only evaluated two almond scions on peach rootstocks and did not include bitter almond, Nemaguard, nor Nemared. Field observations (4) indicated that almonds on almond rootstock yielded better with excess alkali salts than almonds on peach rootstock.

Second trial. Final heights were not useful for distinguishing treatments nor rootstocks (Fig. 2). Visual ratings of foliar health were significantly different only between treatments, not rootstocks. Myrobalan plum had significantly lower percent control values for fresh weight and volume than Nemaguard and Nemared. The current generalization that plums are more salt-tolerant than peaches (1–3, 14) should be re-evaluated after thorough screening of both groups. Previous studies compared Marianna plum (*P. cerasifera* x *P. munsoniana*) with Lovell, Shalil, and Yunnan peach rootstocks (1, 3). Marianna was found to be more tolerant than Myrobalan to NaCl in vitro (19). Some plums (Marianna and *P. mexicana*) may prove more salt-tolerant than the Nemaguard standard and some (Myrobalan) less tolerant.

Although there were no significant differences between the percent control values for Nemaguard and Nemared, there were some interesting differences in absolute values and variability. Nemared is derived from a cross between Nemaguard and a red-leafed peach. It was generally taller, more robust, and less branching than Nemaguard. There was more variability among the Nemared seedlings in response to salinity than in Nemaguard: some did not show any damage at 6.0 $dS \cdot m^{-1}$ and others had salt damage of the lower leaves at 1.5 $dS \cdot m^{-1}$.

The seedlings were successfully transplanted to the nursery following screening at 6.0 $dS \cdot m^{-1}$. The procedure was reliably nondestructive.

Third trial. Nemaguard did not perform as well in late summer screening (Fig. 3), partly due to the added shock of removal from misting when the salt treatments began. Nemaguard declined in foliar health sooner and more dramatically than 'Titan' almond x Nemaguard seedlings. The percent control values for fresh weight were also significantly lower for Nemaguard. Significant germplasm × treatment interactions for these two parameters indicate an increased degree of salt tolerance in 'Titan' x Nemaguard seedlings. There were outstanding individuals among the salt-treated 'Titan' x Nemaguard F_1 progeny, which matched the control seedlings in vigor and health. The 'Titan' almond warrants evaluation as a possible source for salt tolerance. In late summer, the seedlings from the third trial were also successfully transplanted.

Although noted in reveiws of salt tolerance (16–18), neither relative growth rate nor root : shoot ratio were reliable parameters for preliminary screening of salt tolerance in *Prunus* spp. Only in the third screening was the final week's relative growth rate (i.e., growth for the final week expressed as a percentage of previous week's height) significantly depressed by salinity (Table 1). In general, both root and shoot volumes were depressed by salinity, but root : shoot ratios were erratic, sometimes increased with salinity, sometimes decreased, as with Nemaguard in Table 1. The more salt-tolerant 'Titan' x Nemaguard retained its mean root : shoot ratio after salinity treatment.

Of the four evaluation parameters, height was the most time-consuming and least useful. Loss of lower leaves does not affect height as dramatically as it does volume and fresh weight. Correlations between height and other parameters had the lowest significance of the combinations in Table 2. After rejecting height, the remaining pairs of parameters were compared. Within a common group, parameters were highly correlated, i.e., they described the same aspect of plant performance.

Optimum combinations have high significance and lower correlation. Between the groups of growth and visual ratings, complementary pairs were selected for two screening situations: 1) a cursory screening of all available *Prunus* germplasm, and 2) a follow-up comparison of promising rootstocks supporting a standarized set of scions. Final fresh weight and a final visual rating are recommended for the first situation because they are the least time-consuming. In-depth studies of grafted subjects would profit from volume displacement of the shoot, followed by total immersion to obtain separate growth readings of the stock and scion. In addition, rates of decline could be compared using the last three weekly visual ratings.

Although excess Cl^- is typically the cause of reduced leaf salt damage in *Prunus* spp. (1, 2, 7, 9, 19), the more subtle role of energy expenditure for the greater exclusion and compartmentalization of Na^+ (9, 13, 18) should not be dismissed. In addition, plants that actively exclude Na^+ in saline conditions must channel additional resources into organic osmotica in order to maintain turgidity (13, 17, 18). The sacrifice of leaf extremities to Cl-toxicity may have less of an impact on yield than the energy drain due to Na^+ exclusion. Until mechanisms of salt tolerance (12, 13, 16–18) are more fully understood in *Prunus*, it is suggested that salt-tolerant rootstocks be screened by performance rather than by toxic ion content.

Most glycophytes selectively accumulate K^+ over Na^+ in many-fold higher proportions than the soil solution (12, 17), yet, K^+ was still noted as the key limiting nutrient for bearing peach trees under salt stress, although not for juvenile seedlings (9, 11). This observation raises the concern that this screening procedure will not safeguard against inefficient K^+ uptake in a mature orchard. A further refinement of the procedure would incorporate marginal K^+ supplies during salt tolerance screening.

In the first trial (4.5 $dS \cdot m^{-1}$), *P. mexicana* had less salt damage than Nemaguard and Nemared, whereas bitter almond was more severely affected. Nemared and Nemaguard had similar responses to salinity. In the second and third trials (6.0 $dS \cdot m^{-1}$), Nemaguard averaged 46% of the fresh weight, 53% of the volume, 66% of the height, and 74% of the foliar health ratings of the control seedlings. Myrobalan plum did not perform as well as Nemaguard and Nemared in the second trial. 'Titan' almond x Nemaguard F_1 progeny outperformed Nemaguard in the third screening.

Litrature Cited

1. Bernstein, L., J.W. Brown, and H.E. Hayward. 1956. The influence of rootstocks on growth and salt accumulation in stonefruit trees and almonds. Proc. Amer. Soc. Hort. Sci. 68:86–95.
2. Bernstein, L. 1980. Salt tolerance of fruit crops. USDA Agr. Info. Bul. 292.
3. Brown, J.W., C.H. Wadleigh, and H.E. Hayward. 1953. Foliar analysis of stone fruit and almond trees on saline substrates. Proc. Amer. Soc. Hort. Sci. 61:49–55.
4. Day, L.H. 1953. Rootstocks for stone fruits. Cal. Agr. Expt. Sta. Bul. 736.
5. Dilley, O.R., A.S. Kenworthy, E.J. Benn, and S.T. Bass. 1958. Growth and nutrient absorption of apple, cherry, peach, and grape plants as influenced by various levels of chloride and sulfate. Proc. Amer. Soc. Hort. Sci. 72:64–73.
6. Dirr, M.A. 1978. Tolerance of seven woody ornamentals to soil-applied sodium chloride. J. Arbor. 4:162–165.
7. Francois, L.E. 1982. Salt tolerance of eight ornamental tree species. J. Amer. Soc. Hort. Sci. 107:66–68.
8. Hassan, M.M., and P.B. Catlin. 1984. Screening of Egyptian apricot seedlings for response to salinity. HortScience 19:243–245.
9. Hayward, H.E., E.M. Long, and R. Uhvits. 1946. The effect of chloride and sulfate salts on the growth and development of the Elberta peach on Shalil and Lovell rootstocks. U.S. Dept. Agr. Tech. Bul. 922.
10. Hoffman, G.J., P.B. Catlin, R.S. Johnson, L. Francois, and D.A. Goldhamer. 1986. Salt tolerance of mature plum trees. Soil and plant interactions with salinity. Calif. Agr. Expt. Sta. Spec. Publ. 3315:132–135.
11. Ivanov, V.F. and A.S. Ivanova. 1977. Correlation between growth and mineral nutrition of peach under conditions of soil salinization. Soviet Plant Physiol. 24:492–498.
12. Kafkafi, V. 1984. Plant nutrition under saline conditions, p. 319–338. In: I. Shainberg and J. Shalhevet (eds.). Soil salinity under irrigation. Processes and management. Springer-Verlag, Berlin.
13. Lauchli, A. and E. Epstein. 1984. Mechanisms of salt tolerance in plants. Calif. Agr. 38:18–20.
14. Maas, E.V. and G.J. Hoffman. 1977. Crop salt tolerance-current assessment. J. Irr. Drain. Div., Proc. Amer. Soc. Civil Eng. 103:115–145.
15. Olivar, M. 1985. Salinity: a problematic by-product of irrigation. The Grower (March):8–11.
16. Poljakoff-Mayber, A. 1975. Morphological and anatomical changes in plants as a response to salinity stress, p. 97–117. In: A. Poljakoff-Mayber and J. Gale (eds.). Plants in saline environments. Springer-Verlag, Berlin.
17. Pittman, M.G. 1984. Transport across the root and shoot/root interactions, p. 93–125. In: R.C. Staples and G.H. Toenniessen (eds.). Salinity tolerance in plants. Strategies for crop improvement. Wiley, New York.
18. Shannon, M.C. 1979. In quest of rapid screening techniques for plant salt tolerance. HortScience 14:587–589.
19. Therios, I.N. and S.S. Weinbaum. 1980. Influence of salinization on growth, mineral composition, nitrate compensation point and nitrate uptake by two plum clones grown in solution culture. Z. Pflanzenphysiol. 99:305–311.
20. U.S. Salinity Laboratory Staff. 1954. Diagnosis and improvement of saline and alkali soils. USDA Hdbk. 60.