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SALT TOLERANT BEDDING PLANTS

B. TJIA
Department of Ornamental Horticulture
University of Florida
Gainesvile, FL 32611

AND

S. A. ROSE
Brevard County Ext. Service
Cocoa, FL 32922

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Abstract. **Bedding plants were planted in an area on the beach front where they were exposed to salt spray, and irrigated with well water containing a high salt content. Plants were evaluated for their tolerance to these conditions. Selection of bedding plants more tolerant to these conditions are possible. Bedding plant selection becomes important when plants are grown in close proximity to beach front areas where occasional salt spray occurs and where the quality of irrigation water is poor.**

Salt intrusion and the resultant contamination of well water is a serious problem in Brevvard County as well as in a number of other coastal counties in Florida. This problem, along with strong prevailing ocean breezes with their salt content, is detrimental to many bedding plants grown in beach front areas, or in close proximity to them. To assure customer satisfaction, there is a need to evaluate which of the bedding plants in the market today will tolerate these conditions. At present there is no information as to which bedding plants will perform satisfactorily under these conditions. The objective of this experiment was to determine the salt tolerance of various bedding plants grown during various times of the season.

Materials and Methods

Patrick Air Force Base, located on A1A in Brevard County, was selected for the test site. This location has constant, strong winds that often reach velocities of 30 to 55 miles per hours. Plots were located on the west side of A1A, with sand dunes and the ocean on the east side. The plot was well drained, and consisted for the most part, of pure sand with little organic matter content. The soil pH and soluble salt levels were tested at the Brevard Extension Service prior to the experiment and showed a ph of 7.3 and a salt level of 1680 ppm. First planting was started on 18 Nov. 1983. All plants originated from 4-inch pots, grown either at the Ornamental Horticulture facilities at the University of Florida, Gainesville or donated by various local bedding plant producers.

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Four replicates of six plants per area were arranged in a randomized complete block design. Plants were fertilized at planting with a 6-6-6 fertilizer at a rate of 2 pounds per 100 square feet. Plantings were continued during various seasons (Table 1), and the experiment was discontinued in June 1985. Plots were hand weeded several times during the season to remove competing nutgrass, bermuda grass, spurge, and purslane. Plants were evaluated every two weeks, and also after a freeze or exceptionally strong winds. Plants were evaluated either as acceptable (when more than 50% of plants survived) and/or grew to produce an acceptable stand) or poor (when less than 50% of plants

Table 1. Evaluation of bedding plants grown on beach front area exposed to wind and salt spray.

	Spring		Summer		Fall		Winter	
Plant name	1984	1985	1984	1985	1983	1984	1983	1984
Achillea	P[z]	—	P	—	P	—	P	—
Alyssum	S	—	P	—	P	—	P	—
Amaranthus	P	P	S	P	P	P	P	P
Aster	P	—	P	—	P	—	P	—
Begonia (fibrous)	S	S	S	S	P	P	P	P
Blue Daze	—	P	—	S	—	P	—	P
Calendula	P	S	P	P	P	P	S	S
Celosia	P	P	S	S	P	P	P	P
Cleome	P	P	P	P	P	P	P	P
Coleus	P	P	P	P	P	P	P	P
Dianthus	P	P	P	P	P	P	S	S
Dusty Miller	S	S	S	S	S	S	S	S
Feverfew	P	—	P	—	P	—	P	—
Gaillardia	S	S	S	S	S	S	S	S
Gazania	P	S	S	S	S	S	P	P
Geranium	S	S	S	P	S	S	S	S
Gerbera	S	S	S	P	S	S	S	S
Godetia	P	P	P	P	P	P	P	P
Goldenfleece daisy	—	P	—	P	—	P	—	P
Impatiens	S	S	P	P	P	P	P	P
Impatiens (New Guinea)	P	P	P	P	P	P	P	P
Lunaria	P	P	P	P	P	P	P	P
Lisianthus	S	S	S	S	S	S	S	S
Lychnis	P	P	P	P	P	P	P	P
Marigold	P	P	S	S	P	P	P	P
Mint	S	S	S	S	S	S	S	S
Morea	P	—	P	—	P	—	P	—
Kale (ornamental)	P	P	P	P	P	P	S	S
Pansy	P	P	P	P	P	P	P	P
Petunia	P	P	P	P	P	P	S	S
Plumbago	—	P	—	P	—	P	—	P
Portulaca	P	P	S	S	P	P	P	P
Purslane	P	P	S	S	P	P	P	P
Salvia (blue)	S	S	S	S	P	P	P	P
Salvia (red)	P	P	P	P	P	P	P	P
Snapdragon	P	P	P	P	P	P	S	S
Statice	S	S	P	P	P	P	S	S
Stock	P	P	P	P	P	P	P	P
Strobilanthus	S	S	S	S	S	S	S	S
Thistle	S	S	S	S	P	P	P	P
Tithonia	P	P	P	P	P	P	P	P
Torenia	P	P	P	P	P	P	P	P
Verbena	P	P	P	P	P	P	P	P
Vinca	S	S	S	S	S	S	P	P
Viola	P	P	P	P	P	P	P	P

[z]P = Poor, S = Satisfactory.

survived and/or grew poorly and did not produce an acceptable stand), and averaged at the end of each season.

Results and Discussion

On 24 Dec. 1983, the temperature suddenly dropped to 22°F, killing all the tender annuals and damaging the more cold hardy ones. Lisianthus and snapdragons survived this temperature drop. Wind reached 50 to 55 mph in Oct. 1984, resulting in severe leaf injury to most plants.

Coleus were planted every season. In all plantings, coleus plants survived less than two months. New Guinea impatiens also lived less than two months. The same held true for red salvia. Torenia survived less than two weeks. Plants that were killed by the freeze were replanted four weeks later. Results of the evaluations on bedding plants are tabulated in Table 1.

It is obvious that many of the popular bedding plants marketed today are not suitable for beach front areas exposed to the elements and irrigated with low quality irrigation water. Almost 70 percent of Florida residents live within five miles of the coastal area of the peninsula. Therefore, most of the bedding plant consumers are using bedding plants within close proximity of the coast, where both salt spray may be prevalent as well as low quality water caused by salt intrusion in these areas. As the results indicate, it is of extreme importance that these tests be continued and duplicated for several years to evaluate more accurately what bedding plants can be grown in coastal areas in Florida with success and which ones will be less of a success when grown under the same conditions.

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BORON NUTRITION IN FLORIDA ORNAMENTALS

L. P. Griffith
A & L Southern Aricultural Laboratories
1301 W. Copans Road
Bldg. D, Suite 8
Pompano Beach, FL 33064

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Abstract. **The role of boron in plant nutrition has long been established. Florida soils are normally quite deficient in boron. Therefore, deficiencies of this element are common in Florida plants, with deficiency symptoms varying greatly from species to species. Deficiency symptoms in various Florida ornamentals are discussed, including plants in the landscape as well as ornamental nurseries. Critical levels of boron in deficient plant species are discussed, as well as effective measures for curing and preventing boron deficiencies. Symptoms and sources of boron toxicity in Florida plants are outlined, as are critical levels of toxicity in leaf tissue of various species.**

The research involving the role of boron as an essential plant nutrient is extensive (2). It is known to be associated with translocation and utilization of sugars and starches, amino acid synthesis, calcium absorption, transport of nitrogen and phosphorus, and regulation of carbohydrate metabolism. The element is considered essential for all plants, and is commonly used in ornamental plant production and maintenance in Florida.

Boron differs from the other known essential trace elements in several ways. It is generally found in lower concentrations in leaf tissue than iron or manganese, but in larger concentrations than zinc, copper, or molybdenum. The main way in which boron stands out from the other trace elements is that the range between deficiency and toxicity levels in plants is very narrow. Using the Azomethine H method (7) of boron analysis on the most recent, fully-matured leaf tissue, most plants become deficient at somewhere between 15 and 25 ppm. However, toxicity begins to occur in most species between 75 and 100 ppm (Table 1). Thus, the range between deficiency and toxicity levels for boron is only from 60 to 75 ppm for most species. Such ranges of "safe levels" are much wider for most of the other trace elements.

This narrow range between deficiency and toxicity makes it difficult for growers to maintain proper boron levels in their crops. Indeed, nutritional aberrations in boron nutrition are quite commonly encountered in diagnostic work, and involve a wide variety of ornamental species.

Another difference between boron and other trace elements is that boron leaches fairly easily from most soils. Florida soils are very commonly deficient in boron, presumably because of high rainfall, high pH, and low exchange capacities. Land that has been farmed intensively for many years often shows an abundance of trace ele-

Table 1. Ornamental species sensitive to boron toxicity.

Species	Leaf analysis ranges		
	Deficient (ppm)	Normal (ppm)	Toxic (ppm)
Aechmea fasciata Lindl.	0-15	25-50	76+
Aglaonema sp. Schott	0-15	25-50	76+
Anthurium sp. Schott	0-15	25-50	76+
Araucaria heterophylla Salisb	0- 9	15-40	66+
Brassaia actinophylla Endl.	0-14	20-60	101+
Dieffenbachia sp. Schott	0-14	20-50	76+
Dracaena deremensis Engl. cv. Janet Craig	0-10	16-50	101+
Dracaena deremensis Engl. cv. Warneckii	0-10	18-50	101+
Dracaena fragrans (L.) Ker-Gawl	0-10	20-50	101+
Dracaena marginata Lam.	0-14	18-50	101+
Epipremnum aureum Linden & Andre	0-14	20-50	76+
Euphorbia pulcherrima Willd. Ex Klotzch	0-19	30-250	351+
Ligustrum lucidum Ait.	0-15	20-60	101+
Maranta leuconeura E. Morr	0-19	25-50	76+
Murraya paniculata L.	0-14	20-75	101+
Rhododendron sp. L.	0-19	25-50	101+
Rosa sp. L.	0-24	30-60	126+
Rumohra adiantiformis G. Forst	0-14	20-50	76+
Viburnum sp. L.	0-15	20-75	101+
Yucca elephantipes Regel	0-11	18-40	61+