# Research Reports:

# Influence of Phosphorus on Nitrogen Fertilizer Requirement of *Melampodium leucanthum* (Blackfoot Daisy) Grown in Perlite-Vermiculite Medium[1]

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## Abstract

We determined the influence of N and P fertilizers on growth and tissue N concentration of container grown blackfoot daisy (*Melampodium leucanthum* Ton. & Gray), a resource-efficient native landscape herbaceous perennial for the southwestern United States. Regression equations derived from the data indicated that maximum growth could be obtained by application of 166 mg N/liter (ppm) in irrigation water if 30 mg P/liter were also applied. However, near maximum growth was obtained with 100 mg N/liter at the 30 mg P/liter level. Fifteen mg P/liter in irrigation water were not adequate for maximum growth. Tissue nitrogen concentrations in whole plants should be >1.7% for growth not to be limited by N.

**Index words:** landscape plants, native plants, N content, N uptake, fertilizer, P

### Introduction

Blackfoot daisy is a resource-efficient native herbaceous perennial that is well-adapted for use in southwestern landscapes. It is easily propagated from tip cuttings (B. J. Simpson, unreported data) and once established in the landscape requires little or no fertilization and irrigation. The blackfoot daisy reaches about 0.6 m (2 ft) in diameter and blooms from May until October in North Central Texas. Blooms are about 2.5 cm (1 in) in diameter with white petals and yellow centers. Information concerning propagation, production, and landscape maintenance of blackfoot daisy is not available because it has been previously considered a weed and efforts have been in eradication rather than propagation. Increased demand for blackfoot daisy by nurserymen and homeowners in the arid southwest has warranted research to aid nurseryman in propagation and production. Research was conducted at the Texas Agricultural Experiment Station-Dallas to determine N and P fertilizer requirements of container grown material.

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### Materials and Methods

Rooted tip cuttings of blackfoot daisy, approximately 10 cm (4 in) in length were placed in 15 cm (1 gal) plastic pots containing perlite: vermiculite (2:1 by vol). Although



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perlite: vermiculite is not a common nursery mix, it appears to be one of the best combinations for growth of blackfoot daisy, as well as several other plants native to the Southwest (B. W. Hipp et al., unpublished data). Nitrogen treatments were applied weekly by irrigating with water containing varying levels of N, and biweekly with water containing three different concentrations of P. Nitrogen levels were 12.5, 25, 50, 100, and 200 mg/liter (ppm) and P application rates were 0, 15, and 30 mg/liter (ppm). Saturated paste extracts of media at initiation of the study contained 0.3 mg/liter of water soluble P. The source of N was $NH_4NO_3$ and the P source was $H_3PO_4$. All pots were irrigated every two weeks with nutrient solution lacking N and P as described by Hoagland and Arnon (4) except chelated iron (EDDHA) was substituted for iron tartrate. Media pH was 7.9 and approximately 6.3 at initiation and termination of the study, respectively. Sufficient fertilizer solution was applied to provide about 300 ml of drainage at each fertilizer application. Irrigation water (city tap) applied at other times did not contain fertilizer. The study consisted of four replications (one plant/rep) in a randomized block design and was conducted in a greenhouse from May 18 to August 10, 1987. At termination of the study, plants were cut at media level, dried at 65°C (149°F), weighed, and ground in a Wiley mill. Nitrogen levels in plant material were determined by digestion as described by Gallaher et al. (1) and by automated steam distillation and titration.

## Results and Discussion

Application of N did not influence growth of blackfoot daisy in perlite-vermiculite media in the absence of supplemental P (Fig. 1). Maximum dry weight obtained was about 0.5 g/plant if P was not applied. However, application of 15 mg P/liter resulted in a sharp increase in plant growth with increasing N rates to 100 mg/liter. The polynomial regression curve ($Y = 0.22 + 0.103X - (3.65 \times 10^{-4}) X^2$, $R^2 = 0.88$) generated from the data indicated that maximum growth at the 15 mg/liter P level could be obtained with application of 141 mg N/liter. Application of 100 mg N/liter resulted in 91% of maximum growth in the presence of 15 mg P/liter. Application of 30 mg P/liter resulted in increased plant growth (over 15 mg P/liter) at N rates higher than 50 mg N/liter. The curvilinear regression equations obtained indicated the maximum N fertilizer concentration needed at the 30 mg P/liter treatment was 166 mg/liter, although near maximum yield was obtained with 100 mg N/liter. Nitrogen accounted for 12, 88, and 93% of the variation in plant dry weight at the 0, 15, and 30 mg P/liter level, respectively. These N fertilizer requirements are slightly less than those needed for *Salvia greggii* (3) but are similar to the optimum rates for *Leucophyllum candidum* (2). Very little growth of blackfoot daisy was observed in this study at N rates less than 25 mg/liter regardless of P rate.

The data contained in Fig. 2 provide information concerning the N concentration required in tissue for growth of blackfoot daisy. The third order regression curve depicted in Fig. 2 indicated that whole plant tissue containing N concentrations of about 1.8% were associated with maximum plant growth. This is considerably less than the 2.2% N required for *Salvia greggii* (3) but slightly higher than the 1.5% required for *Leucophyllum candidum* (2). Plant growth was reduced by 50% if plant tissue levels were 1.45% or less and very little growth was obtained if tissue N levels were less than 1.3%.

Nitrogen uptake (% N x wt) by plants was increased by N application at the 15 and 30 mg/liter P application rate but was not affected by N if P was not applied. N uptake as a function of N fertilizer rate was dramatically increased by applying 15 and 30 mg P/liter, particularly at the 100 and 200 mg/liter N rate (Fig. 3). Regression curves for N uptake (Y) and N applied (X) were similar to those depicted in Fig. 1. The data in Fig. 3 illustrate evidence that adequate P application is necessary for maximum utilization of applied N by blackfoot daisy.

## Significance to the Nursery Industry

Blackfoot daisy is a resource-efficient native herbaceous perennial that is gaining in popularity for landscapes of the

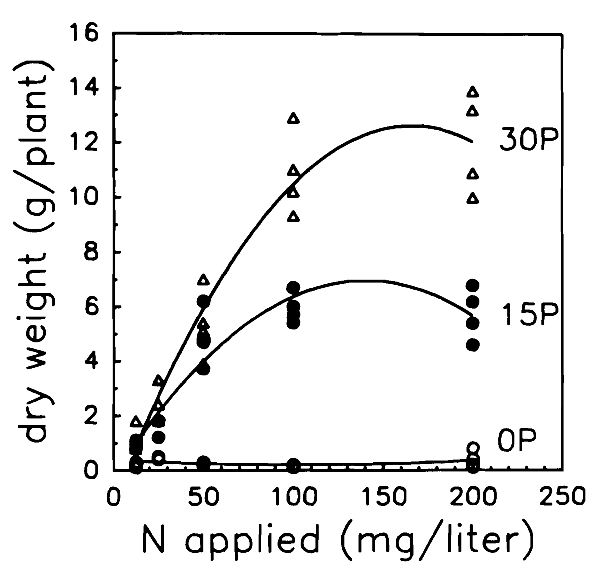


**Fig. 1. Influence of applied N on dry weight of blackfoot daisy at 3 rates of P fertilizer.**

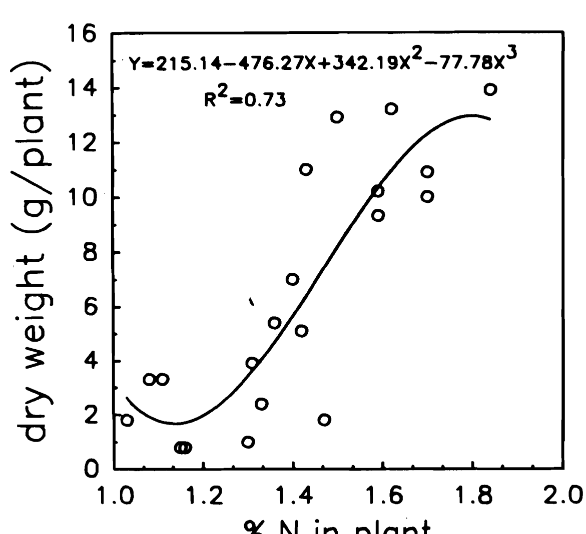


**Fig. 2. Relationship between % N in blackfoot daisy and plant dry weights.**

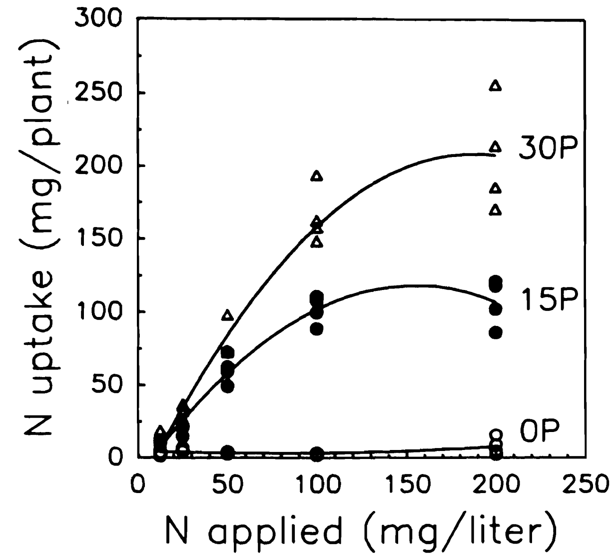


**Fig. 3.** **N uptake by blackfoot daisy at 3 P fertilizer rates.**

southwestern United States. It must be produced by nurserymen before it can be made available in quantities sufficient to meet consumer demands. These research findings furnish nitrogen and phosphorus fertilizer guidelines for container production of this resource-efficient native landscape plant.

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# Damage Caused by Wind-Borne Salts to Landscape Plants and its Prevention by a Wind-Controlled Sprinkler System[1]

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## Abstract

Ocean spray carried by wind was shown to be the main cause of leaf scorching of vegetation along the Mediterranean coast of Israel. An overhead sprinkling system was designed to be activated when wind velocity reached a critical level. It was shown to reduce leaf scorching. The degree of protection depended on plant species. Plants showed different degrees of sensitivity to wind-borne salts in the following increasing order: Japanese Pittosporum (*Pittosporum tubira* Ait.), Thorny Elaeagnus (*Elaeagnus pungens* Thunb.), Common Oleander (*Nerium oleander* L.), Tamarisk, Athel (*Tamarix aphylla* Karst.).

**Index words:** sea, ocean, irrigation, salt tolerance, salt toxicity, salt spray
**Species used in this study:** Japanese pittosporum (*Pittosporum tubira* Ait.), thorny elaeagnus (*Elaeagnus pungens* Thunb.), common oleander (*Nerium oleander* L.), tamarisk, athel (*Tamarix aphylla* Karst.).

## Introduction

The main reason for the destruction of landscape plants in parks located on the Tel Aviv coast is the damage caused by wind-borne salts (1). Foliar injury by air-borne sea salt was described and studied previously (3, 4). As indicated by Boyce (2), a critical level of wind velocity of 7.0 m/sec (23 ft/sec) is required in order to create wind-borne salt. In a preliminary study (1) we demonstrated that this damage can be prevented by a wind-controlled overhead sprinkler system which washes the air-borne salt from the leaves during dry storms.

The purpose of the present work was to study the relative sensitivity of four commonly grown landscape plants to wind-borne salts, and to evaluate the effectiveness of wind-controlled overhead sprinkling in preventing leaf scorching in these species at various distances from the sprinkling system.

## Materials and Methods

Experimental plots were set up in the "Atzmaut" and "Clore" parks located along the Tel Aviv coast. The plots in Atzmaut Park were located on a sandstone cliff overlooking the sea at a height of 20 m (66 ft) above sea level starting 30 m (100 ft) from the shore. In Clore Park, plots were located on flat sandy land, 3 m (10 ft) above sea level starting 30 m (100 ft) from the shore. In each park two plots

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