Effects of pH on Growth and Quality of Iris germanica L. 1

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Abstract. Highest quality of plants of greenhouse-grown 'Captain Gallant' iris as measured by plant growth and root and foliar quality were produced at pH levels of 8.0 and 9.0 in hydroponic culture and at pH levels of 7.0 to 9.5 using field soil. Plant foliage increased in quality with increases in alkalinity.

Optimal soil pH range for tall bearded iris has never been adequately determined although it has been suggested that irises can adapt to practically any pH level (1). Most published cultural recommendations, however, specify a pH range from 6.0 to 8.0 (2, 4, 7). A light application of limestone has been shown to be beneficial to growth of many iris species (5).

Two greenhouse studies were undertaken from January 20 - April 20 to acquire information on the effects of pH. Rhizome clumps of 'Captain Gallant' iris were obtained in August 1979 from an established field planting at the Arkansas Experiment Station at Fayetteville. Daughter rhizomes were separated from the mother rhizomes, plant foliage and roots pruned, and young rhizomes cured in open trays in a clear glass greenhouse at a mean temperature of 24°C for 2 weeks. Rhizomes were surface sterilized for 5 min in a 10% solution of sodium hypochlorite prior to placing into the hydroponic apparatus. Three rhizomes of uniform size and condition were set per container in a support medium of sterilized river sand. Growing containers were standard 15 cm hard rubber pots. Five pH levels (4.5, 5.5, 6.8, 8.0 and 9.0) were established and maintained by using HCl and hydrated lime, Ca(OH)2 • Mg(OH)2, in water solutions. An automatic injector was used to circulate appropriate solutions for a 5 min period every 6 hr. Pots were arranged in a randomized complete block design with 2 replications. Plants were grown in a clear glass greenhouse at a mean temperature of 26°C (+1°C) under long days. All treatments received 5 g of 14N-6.O-11.6K slow release fertilizer (Osmocote) and 0.8 g of micronutrient fertilizer (Esmigran) applied to the medium surface following planting.

At termination of this study tissue analyses were determined for roots and leaves. Tissue samples were dried, ground and digested according to Lindner (3). Phosphorus was determined colorimetrically by Shelton-Harper procedures (6), and all other elements were determined in Lindner extract by atomic absorption procedures.

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Root and leaf quality were judged on a scale of 0 (lowest) to 5 (highest). Overall quality for roots was based on root size (root length and total volume of roots) and presence of necrosis. Leaf quality was based on height and presence of chlorosis or necrosis.

Best foliar and root quality was attained at a pH 8.0 and 9.0 for hydroponically-grown plants (Fig. 1). Data from the tissue analysis suggested that higher Ca levels in root tissue tended to reduce necrosis in iris roots; and the subsequent decline in root tissue could directly lower foliage quality (tipburn). The poor plant performance at low pH was not readily explained by leaf or root tissue analyses since no nutrient level standards exist for this crop.

There were no differences between hydroponic treatments for plant height. Onset of foliar chlorosis was delayed significantly and root necrosis was minimized at pH 8.0 and 9.0.

A second greenhouse study was established to more closely duplicate field growing conditions. Iris plants were grown in clay pots containing a Pembroke silt loam (pH-5.1). This study was conducted at a mean temperature of 26°C under natural daylight. The pH levels were decreased by 1 unit using elemental sulfur at a rate of 681 g/10 m² of soil surface area and raised with hydrated lime according to Woodruff (8). Treatment levels were 4.5, 5.5, 7.0, 8.5 and 9.5.

Daughter rhizomes of 'Captain Gallant' iris were obtained as in Experiment 1 and similarly surface sterilized. Rhizomes were planted (2/pot) in 15 cm clay containers in their preadjusted soil. Treatments were arranged in a randomized complete block design with 15 replications. All treatments received 14 N·6-OP·11.6K slow release fertilizer (Osmocote) at a rate of 5 g/pot applied to the media surface following planting.

Container studies using field soil also showed a relation between low pH and foliar tipburn. Although plants at lower pH initially grew more rapidly final plant height was the same. Leaves of most soil grown plants at pH 4.5 and 5.5 had leaf tipburn while those from alkaline soil were free of foliar damage. Leaf quality ratings are shown in Fig. 2.

Information derived from both hydroponic culture and soil studies indicates that the bearded iris grows better in alkaline soils (pH 8-9) than in acid soils. Plant quality and early foliage growth is enhanced by the higher pH.

Effects of Growth Regulators on Diseases of Begonia, Chrysanthemum, Poinsettia, and Rose

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Abstract. Seven growth regulators representing ethylene-generating materials, auxins, gibberellins, cytokinins and inhibitors were applied prior to inoculation with selected pathogens of chrysanthemum (Chrysanthemum morifolium Ramat.), begonia (Begonia × hiemalis Fotech.), rose (Rosa hybrida L.), and poinsettia (Euphorbia pulcherrima Willd.). (2-Chloroethyl)phosphonic acid (ethephon) and 6-benzylamino purine (BA) increased the incidence of Ascochyta ray blight (incited by Ascochyta chrysanthemi Stevens) on 'Ritz' chrysanthemum but the other materials had no effect. None of the growth regulators influenced powdery mildew [Sphaerotheca pannosa (Wallr.) Lev.] of rose, powdery mildew [Erysiphe cichoracearum (DC.) of begonia, or grey mold (Botrytis cinerea Pers. ex Fr.) of poinsettia.

There are various examples of growth regulators increasing (1, 4, 8, 9) or decreasing (2, 4, 5) disease development. The objective of this work was to determine the effects of certain growth-regulators with potential use in greenhouse production on the incidence and severity of Ascochyta ray blight of chrysanthemum, grey mold of poinsettia, and powdery mildew of rose and begonia.

Plants of each species were grown in plastic pots in a root medium of 2 sphagnum peat moss: 1 perlite : 1 vermiculite : 1 sandy loam (by volume) amended with 2.6 g/m² of fritted trace elements, and limed to pH 6.5. Experiments were conducted in the greenhouse at a night temperature of 17°C. Other cultural procedures of fertilization, watering, and insect control were consistent with those in use for the commercial production of the crop (6). The growth regulator treatments made 1 week before inoculation with pathogens were:

1. control — water with 1% polyoxyethylene sorbitan monolaurate (Tween 20) used as a wetting agent in all treatments
2. 1:100 dilution of a seaweed extract having cytokinin activity (Cyex, Atlantic and Pacific Research, Inc., North Palm Beach, Florida)

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