tive and quantitative differences between the 3 extracts (Fig. 1). These differences will require further study for elucidation.

The bioassays conducted in this study indicate for the first time that susceptible cultivars of southernpeas have volatile feeding attractants which lure the insects to the pod, while the pods of some resistant lines appear to possess lesser quantities of volatile attractants or volatile components that function as repellents. The chromatographic profiles confirm that there are wide differences between the volatile constituents of pods from susceptible and resistant cultivars.

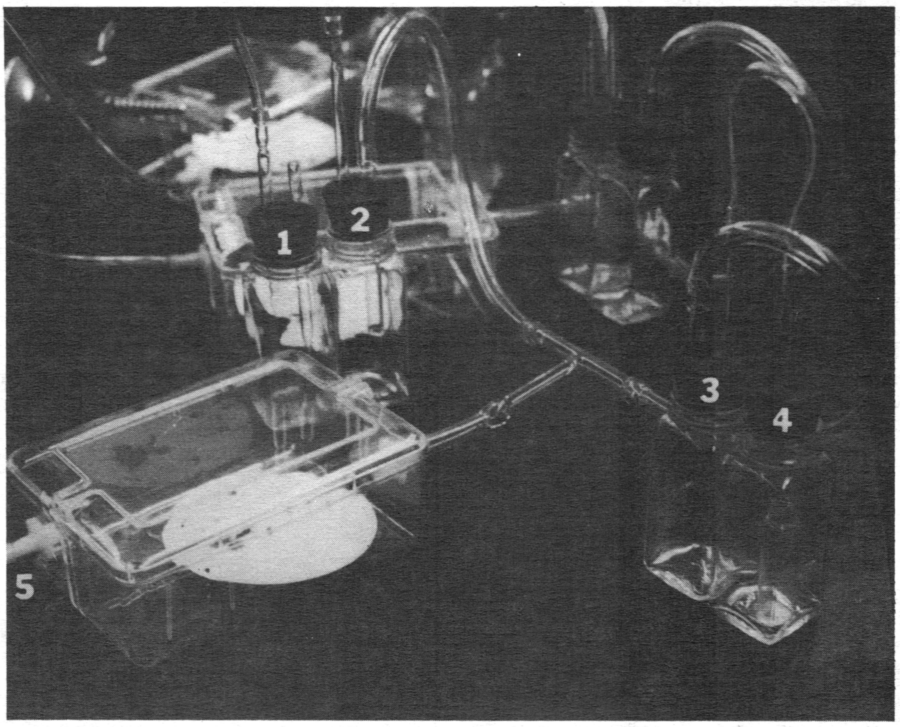

Fig. 2. Bioassay apparatus used to test the attractancy of southernpea pod volatile extracts for the adult cowpea curculio. 1. Air inlet bottle. 2. Insect trap bottle, control side. 3. Insect trap bottle, extract side. 4. Air inlet bottle with extract vial. 5. Vacuum source on plastic cage containing insects and moistened filter paper.

Literature Cited

1. Canerday, T. D. and R. B. Chalfant. 1969. An arrestant and feeding stimulant for the cowpea curculio, *Chalcodermus aeneus* (Coleoptera: Curculionidae). J. Ga. Entomol. Soc. 4:49–64.
2. Chalfant, R. B. and T. P. Gaines. 1973. Cowpea curculio: correlations between chemical composition of the southernpea and varietal resistance. J. Econ. Entomol. 66:1011–1013.
3. Cuthbert, F. P. and B. W. Davis. 1972. Factors contributing to cowpea curculio resistance in southernpeas. J. Econ. Entomol. 65:778–781.
4. Cuthbert, Jr., F. P., R. L. Fery, and O. L. Chambliss. 1974. Breeding for resistance to the cowpea curculio in southernpeas. HortScience 9:69–70.
5. Fery, R. L. and F. P. Cuthbert, Jr. 1978. Inheritance and selection of non-preference resistance to the cowpea curculio in the southernpea (*Vigna unguiculata* (L.) Walp.). J. Amer. Soc. Hort. Sci. 103:370–372.
6. Gundlach, C. B. 1977. Resistance of the southernpea, *Vigna unguiculata* (L.) Walpers to the cowpea curculio, *Chalcodermus aeneus* Boheman: the role of tannin. MS Thesis, Auburn Univ., Alabama.
7. Likens, S. T. and G. B. Nickerson. 1964. Detection of certain hop oil constituents in brewing products. Proc. Amer. Soc. Brewing Chem. p. 5–13.
8. Rymal, K. S. and O. L. Chambliss. 1976. Cowpea curculio feeding stimulants from southernpea pods. J. Amer. Soc. Hort. Sci. 101:722–724.
9. Rymal, K. S. and O. L. Chambliss. 1981. Influence of cultivar and maturity on pod wall strength. HortScience 16:186–187.
10. Schneider, D. 1969. Insect olfaction: deciphering system for chemical messages. Science 163:1031–1037.

HortScience 16(5):672–673. 1981.

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

W. K. Hurley and A. E. Einert
Department of Horticulture and Forestry, University of Arkansas, Fayetteville, AR 72701
L. E. Hileman
Department of Agronomy, University of Arkansas, Fayetteville, AR 72701

Additional index words. hydroponics

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 appeared to increase 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 sterlized 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, $CA(OH)_2 \cdot Mg(OH)_2$, 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 5g of 14N-6.OP-11.6K slow release fertilizer (Osmocote) and 0.8g 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 colormetrically by Shelton-Harper procedures (6), and all other elements were determined in Lindner extract by atomic absorption procedures.

[1]Received for publication, February 7, 1981.

Published with the approval of the Director, Arkansas Agricultural Experiment Station. This research supported in part by a grant from the American Iris Society.

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.

Trade names are used in this publication solely for the purpose of providing specific information and do not suggest endorsement of the product.

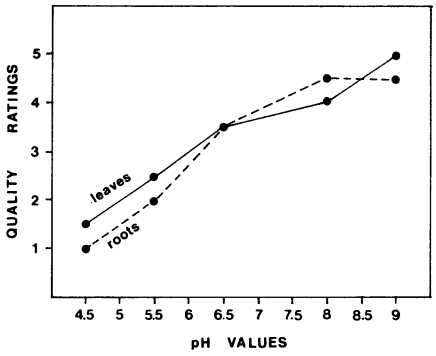

Fig. 1 Relation of root and leaf quality ratings to pH for hydroponically grown iris; 1 (poor) to 5 (excellent).

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 daylength. The pH levels were decreased by 1 unit using elemental sulfur at a rate of 681g/10 m^2 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.

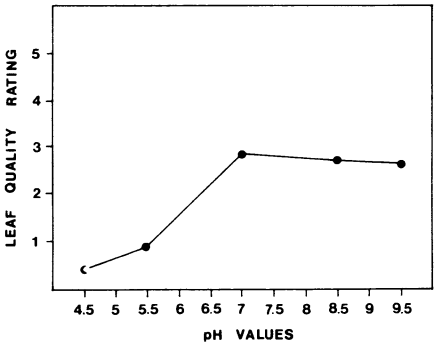

Fig. 2. Leaf rating by pH values for irises grown in soils; 1 (poor) to 5 (excellent).

Literature Cited

1. Burch, J. 1980. Sound advice? Amer. Iris Soc. Bul. 237.
2. Gaskill, F. 1964. Soil fertility for irises. Amer. Iris Soc. Bul. 174.
3. Lindner, R.C. 1944. Rapid analytical methods for some of the more common inorganic constituents of plant tissues. Plant Physiol. 19:76-89.
4. Price, M. 1966. The iris book. D. Van Nostrand, Princeton, N.J.
5. Ramsbottom, J.K. 1915. Iris leaf-blotch disease (*Heterosporium gracile* Sacc.), J. Royal Hort. Soc. 40:481-492.
6. Shelton, W.R. and A.J. Harper. 1945. Total P determination. Iowa State Col. J. Sci. 15:403.
7. Williamson, C. 1980. Soil conditioning for irises. Amer. Iris Soc. Bul. 238.
8. Woodruff, C.M. 1946. Determination of exchangeable hydrogen and lime requirements by means of a glass electrode and buffered solution. Soil. Sci. Soc. Amer. Proc. 12:141-142.

HortScience 16(5):673–674. 1981.

Effects of Growth Regulators on Diseases of Begonia, Chrysanthemum, Poinsettia, and Rose[1]

Bernard Sammons[2] and Jane F. Rissler
Department of Botany, University of Maryland, College Park, MD 20742
James B. Shanks
Department of Horticulture, University of Maryland, College Park, MD 20742

Additional index words. Botrytis cinerea, Sphaerotheca pannosa, Ascochyta chrysanthemi, Erysiphe cichoracearum, Begonia x hiemalis, Rosa hybrida, Euphorbia pulcherrima, Chrysanthemum morifolium

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* X *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 mildrew [*Sphaerotheca pannosa* (Wallr.) Lév.] 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/m^3 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 (Cytex, Atlantic and Pacific Research, Inc., North Palm Beach, Florida),

[1]Received for publication September 20, 1980. Scientific Article No. A2862, Contribution No. 5914, Maryland Agricultural Experiment Station, Departments of Botany and Horticulture, College Park, MD 20742. From a thesis prepared by the senior author in partial fulfillment of the requirements for the MS degree, University of Maryland, 1980. Computer time was supported in full through the Computer Science Center of the University of Maryland. Plants were provided by De Vor Nurseries, Inc., Pleasanton, California; Paul Ecke Poinsettias, Encinitas, California; and Mikkelsens, Inc., Ashtabula, Ohio.

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.

[2]Current address: Department of Plant Pathology and Physiology, Clemson University, Clemson, SC 29631.