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HortScience 22(2):243–244. 1987.

Prepropagation Dips of Acanthaceae Cuttings in Growth Regulators to Retard Subsequent Growth

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Additional index words. *Pseuderanthemum atropurpureum, Sanchezia speciosa, Strobilanthes dyeranus,* purple false eranthemum, Persian-shield, height control, growth retardants, growth inhibitors, morphactins

Abstract. **Total immersion of *Pseuderanthemum atropurpureum* L. H. Bailey, *Sanchezia speciosa* J. Leonard, and *Strobilanthes dyeranus* M. T. Mast. cuttings in aqueous solutions of the morphactins chlorflurecol and chlorflurenethol prior to propagation retarded plant growth 16 weeks after rooting. Height of *Sanchezia* and *Strobilanthes* also was reduced by dips of chlorfluren and dichlorflurecol and chlormequat chloride. Morphactins caused abnormal growth on *Pseuderanthemum* and *Strobilanthes*. Dips of PBA reduced the height of *Pseuderanthemum* and *Strobilanthes*. *Pseuderanthemum* height also was reduced by ancymidol and ethephon dips, and height was reduced on *Strobilanthes* by oxathiin and piproctanyl bromide. Chlorflurecol dips reduced plant dry weight of all species. Plant dry weight of *Strobilanthes* also was reduced by chlorofluren, chloroflurenthol, oxathiin, and PBA immersion. Ethephon, PBA, and chlorflurenthol dips also reduced *Pseuderanthemum* dry weight. Chemical names used: 2-chloro-9-hydroxy-9*H*-fluorene-9-carboxylic acid (chlorflurecol); 2-chlorofluorenecarbonic acid-(9)-methylester (dichloroflurecol); 2-chloro-9-hydroxyfluorene-carbonic acid-(9)-*p*-chlorophenoxyethylester (chloroflurenethol); 2-chloro-*N*,*N*,*N*-trimethylethanaminium chloride (chlormequat chloride); *N*-(phenylmethyl)-9-(tetrahydro-2*H*-pyran-2-yl)-9*H*-purin-6-amine (PBA); α-cyclopropyl-α-(4-methoxyphenyl)-5-pyrimidinemethanol (ancymidol); (2-chlorethyl)phosphonic acid (ethephon); 2,3-dihydro-5,6-diphenyl-1,4-oxathiin (oxathiin); 1-(3,7-dimethyloctyl)-1-(2-propenyl)piperidinium bromide, (piproctanyl bromide).**

The *Acanthaceae* contains many colorful tropical shrubs that are occasionally grown as potted plants. Rapid growth, large plant size, and absence of freely branching habit has limited the use of such Acanthaceae as purple false eranthemum (*Pseuderanthemum atropurpureum* L. H. Bailey), sanchezia (*Sanchezia speciosa* J. Leonard) and Persian shield (*Strobilanthes Dyeranus* M. T. Mast.). Growth regulators have been used to adapt the Goldlilocks plant (*Pachystachys lutea* Nees) to pot culture (3, 11). Preliminary work (unpublished data) by us indicated that *Pseuderanthemum, Sanchezia,* and *Strobilanthes* do not respond very well to growth-retardant sprays and drenches.

Other methods of applying growth retardants to ornamentals to increase efficiency include impregnated propagation blocks (13), soaked clay pots (1) and application through irrigation tubing (2), granular formulations (10), plaster of Paris tablets (5), and root dips (4). Treatment of stock plants with growth regulators prior to taking cuttings has yielded variable results (8, 9, 11); however, soaking the basal portion of unrooted cuttings in a growth retardant for 24 hr has been reported to be effective (12). Entire immersion of rooted cuttings in butanedioic acid mono(2,2-dimethylhydrazide) (daminozide) has been successful in controlling the height of chrysanthemum; however, ancymidol dips resulted in excessive height reduction (4). Prepropagation or pretransplanting dips of cuttings are presently used by many chrysanthemum growers to control the height of tall-growing cultivars (14).

Several growth-retarding chemicals were tested as prepropagation dips to control the height of *Pseuderanthemum, Sanchezia,* and *Strobilanthes* plants. Double-eye cuttings of *Pseuderanthemum, Sanchezia,* and *Strobilanthes* were submerged completely for 10 sec in the growth regulators listed in Table 1. The selection of growth regulators and rates was based on previous work by Shu and Sanderson (8, 9) and others (4, 7). Treated cuttings were placed in plastic bags, refrigerated overnight at 7°C, and then propagated under mist (10 sec out of every 100 sec) at 21°. Cuttings were inserted directly into a final growing medium consisting of 1 sand, 1 sphagnum peat, 1 pine bark medium (by volume) amended on a cubic-meter basis with 11.2 kg dolomitic limestone, 2.6 kg Perk minor element additive, 2.8 kg $CaNo_3$, 1.8 kg ureaformaldehyde fertilizer 31N–0P–0K, and 2.1 kg granular Aqua-Gro wetting agent. One cutting was propagated and grown in an 8 × 8-cm round plastic pot as an experimental unit. Two pots were used for each of the 13 treatments, which were replicated four times in a randomized block design. Each species was a separate experiment. Upon rooting (about 3 weeks), the plants were moved from mist into full sun (90 $\mu mol \cdot s^{-1} \cdot m^{-2}$ PAR) and grown at a temperature of 17°. Sixteen weeks after treatment, the plant height and dry weight were determined.

All cuttings rooted and, with the exception of *Pseuderanthemum* treated with chlorflurenethol, produced shoots from the axillary

Received for publication 23 Jan. 1986. Ala. Agr. Expt. Sta. J. Ser. no. 11-85889. 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.

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Table 1. Height and dry weight of three genera of Acanthaceae plants grown from cuttings dipped in growth regulators prior to rooting.

Treatment	Amount (mg· liter^{-1} a.i.)	Genus: Pseuderanthemum Height (cm)	Pseuderanthemum Dry wt (g)	Sanchezia Height (cm)	Sanchezia Dry wt (g)	Strobilanthes Height (cm)	Strobilanthes Dry wt (g)
None (check)	---	23.0 a[z]	10.0 abc	23.4 a	14.9 abc	32.1 ab	16.8 abc
Daminozide	5000	19.7 abc	9.2 a–d	23.9 a	15.7 ab	31.9 abc	18.0 ab
Dikegulac	1000	20.3 ab	11.3 a	21.9 a	14.4 abc	28.5 bc	13.1 bc
Ancymidol	67	18.0 bc	8.7 a–d	23.8 a	14.1 abc	34.5 a	19.6 a
Ethephon	1000	17.1 bcd	7.2 def	24.8 a	18.3 a	27.8 bc	13.2 bc
Piproctanyl bromide	200	20.6 ab	10.1 abc	25.8 a	16.3 ab	26.4 c	15.8 abc
Oxathiin	1000	19.0 abc	8.2 c–f	25.0 a	17.0 ab	14.9 de	4.9 ef
Chlormequat chloride	1500	22.1 a	11.0 ab	16.9 bc	13.5 abc	11.8 ef	12.1 dc
PBA	200	16.0 dc	6.3 efg	22.3 a	14.0 abc	7.5 fg	1.1 f
Dichlorofluecol	25	19.5 abc	9.2 a–d	17.3 b	8.3 dc	29.1 abc	13.3 bc
Chlorfluren	25	19.3 abc	8.3 b–e	13.4 c	10.9 bcd	18.9 d	7.8 de
Chlorflurenethol	25	14.2 de	5.6 fg	7.9 d	11.0 abc	5.5 g	4.3 ef
Chlorflurecol	25	11.3 e	4.2 g	3.8 e	4.8 d	3.1 g	3.0 ef

[z]Mean separation in columns by Duncan's multiple range test, 5% level.

buds or "eyes". Chlorfurecol- and chlorflurenethol-treated cuttings produced *Pseuderanthemum* plants with distorted, malformed, or strap-like leaves. *Strobilanthes* plants were distorted when grown from cuttings receiving dichloroflurecol. *Sanchezia* was quite tolerant of all the treatments and showed few growth abnormalities. Growth abnormalities are typical effects of morphactins on plants (6). Reduced concentrations of morphactins might eliminate growth abnormalities and reduce growth inhibition.

Height of all species was reduced when the cuttings were treated with chlorflurenethol and chlorfurecol (Table 1). Chlormequat chloride, chlorfluren, and dichloroflurecol retarded the height of *Sanchezia* and *Strobilanthes* plants. Chlormequat chloride has shown activity on another *Acanthaceae, Pachystachys* (3). *Pseuderanthemum* and *Strobilanthes* heights were reduced by growing plants from cuttings dipped in PBA. Ancymidol and ethephon reduced height of *Pseuderanthemum* plants. Tjia and Johnson (11) found ancymidol sprays ineffective in retarding height when sprayed on *Pachystachys;* however, ethephon was an effective retardant on this plant. *Strobilanthes* height was reduced when cuttings were treated with oxathiin and piproctanyl bromide. Oxathiin generally is not considered a retardant, and piproctanyl bromide has been shown to be effective on *Pachystachys* (11).

Dry weight of all the species was reduced by chlorflurecol treatment of cuttings. Oxathiin, chlorfluren, chlorflurenethol, and PBA treatment reduced the dry weight of *Strobilanthes* plants. Given the strong inhibitory effect on growth and reported reduction of carbohydrate content in some plants treated with morphactins (6), the results of morphactins on dry weight are not surprising. Ethephon, PBA, and chlorflurenethol reduced the dry weight of *Pseuderanthemum* plants.

The treatment of cuttings by total immersion in growth regulators prior to propagation is an effective, economical, and efficient method of evaluating growth-regulating chemicals on *Acanthaceae*. The efficiency of a growth regulator is increased by this method of application, as shown in chrysanthemum (4). While further work is suggested with reduced concentrations of morphactins, a prepropagation dip of cuttings in chlormequat was an effective growth retardant treatment for *Sanchezia* and *Strobilanthes*. Ancymidol and ethephon dips provided satisfactory height control on *Pseuderanthemum*. Both *Pseuderanthemum* and *Strobilanthes* were retarded by PBA cutting dips.

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