variables included in the model and, thus, the independent variables in the model adequately described the water use of the plants. Actual vs estimated values of data included in the model are shown in Fig. 1.

The purpose of the capillary mat system was to provide

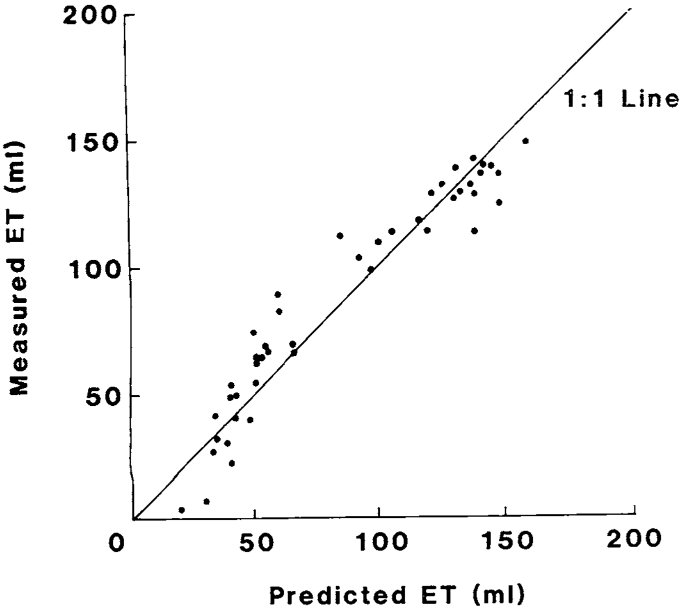

Fig. 1. Measured evapotranspiration (ET) values versus ET values predicted from Eq [2].

optimum soil mix-water conditions to the plants just prior to removal. It was also assumed that enough water was held in the pot to protect against water stress development for the test plant in the 24-hr period that it was removed from the mat. If stress should develop, then visible signs of wilt or increased variation of the data and decreased r^2 values in the models would have occurred. Since this did not occur, it was assumed that no stress developed.

The main advantages of the method are the ease of operation and rapid generation of reliable data. This method will be used to screen several plant species of ornamental crops to categorize them according to water use with relation to size and growing environment. It is hoped that by defining water needs, more efficient irrigation of potted ornamental crops will result.

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TRANSPIRATION IN GROWTH RETARDANT TREATED POINSETTIA, BEAN AND TOMATO[1]

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Additional index words. ancymidol, chlormequat, daminozide.

Abstract. **Three weeks after treatment, drenches of chlormequat at 495 mg/15 cm pot and ancymidol at 0.5 mg/pot on poinsettia** (Euphorbia pulcherrima **Wild. cv. Annette Hegg) reduced whole plant transpiration by 12 and 24 percent, respectively. At the same time, foliar sprays of daminozide at 2400 ppm and drenches of chlormequat at 619 mg/pot on bean** (Phaseolus vulgaris **L. cv. Harvester) reduced transpiration by 26 and 23 percent, respectively. These chemicals also reduced stem elongation, stem dry weight, total shoot dry weight, and leaf area. Leaf dry weight was not greatly affected. While reducing total plant water use, the chemicals did not alter transpiration rate as measured by water loss per unit leaf area or unit shoot dry weight. Transpiration in tomato** (Lycopersicon esculentum **Mill. cv. Walters) treated with chlormequat as a foliar spray was reduced during the 24 hours following treatment, but was not affected by chlormequat drench or ancymidol in either spray or drench form.**

The group of growth regulating compounds termed growth retardants have many effects on plants. Treated plants normally have stems with a larger diameter and shorter internodes and leaves which are smaller and darker green (2). These effects are due to reduced cell division (11, 15) and cells in the stems having reduced length and greater radial expansion (5, 13). In leaves the cells are smaller and more compact with less intercellular space (5, 14).

Plants treated with these compounds often display increased resistance to environmental stresses caused by low temperature, air pollution, or drought (2). Transpirational water loss is reduced in treated plants (1, 6, 7, 9, 10). These studies were initiated to determine the effects of various growth retardants on water use in bean, poinsettia and tomato.

Materials and Methods

Beans and poinsettias were grown in 15 cm plastic pots using a peat:sand:perlite (1:1:1) medium. Tomatoes were grown in 10 cm pots in the same medium. Poinsettias were obtained as rooted cuttings from commercial sources, held under noninductive photoperiods throughout the studies, and treated three weeks after potting. Beans were direct seeded and treated when the primary leaves were fully

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expanded. Tomatoes were treated 3 weeks after transplanting. All studies were conducted in a greenhouse and were set up in a randomized complete block design with 4 or 5 replications and 4 to 6 plants per replication.

Ancymidol [α-cyclopropyl-α-(4-methoxphenyl)-5-pyrimidinemethanol] was applied to poinsettias as a 120 ml soil drench at 0.5 mg/pot and to tomatoes as a 60 ml drench at 0.5 mg/pot or as a 100 ppm foliar spray. Daminozide [butanedioic acid mono (2,2 dimethylhydrazide)] was applied to beans as a 2500 ppm foliar spray. Chlormequat (2-chloroethyltrimethyl ammonium chloride) was applied as a 180 ml drench to beans and poinsettias at 495 mg/pot and to tomatoes as a 1715 ppm foliar spray or 308 mg drench in 90 ml of solution. At the time of treatment, plants receiving foliar sprays and those in the control group were watered to insure uniform soil moisture levels.

Transpiration was monitored by enclosing the pots in plastic bags and determining weight loss for a period of 24 to 72 hours. Plant height, leaf and stem dry weights, and leaf area were determined when the transpiration measurements were terminated.

Results and Discussion

Growth retardant effects on plant morphology are reflected in the size and weight measurements. For both poinsettia (Table 1) and bean (Table 2) the chemicals had little effect on leaf dry weight, while leaf area was substantially reduced. Also, the retardants reduced total shoot dry weight, but this was due to their effect on growth of stems rather than leaves. In all experiments the retardants caused a noticeable reduction in plant height and internode elongation.

It was assumed that the weight lost during the test period was representative of water loss through transpiration. Transpiration was 12 and 24% less for the poinsettias treated with chlormequat and ancymidol, respectively, than for the untreated plants (Table 1). Similar results were obtained with the greenhouse grown beans where transpiration was 26 and 14% less than controls for daminozide and chlormequat treated plants, respectively. The retardants had little effect on transpiration rate as measured by amount of water lost per unit shoot dry weight or unit leaf area (Tables 1 & 2). Transpiration appeared to be directly correlated with leaf area which indicates that water loss was reduced because there was less area for interception of light energy to drive the transpiration process.

In studies with poinsettia and bean where the retardants were applied both as a foliar spray and soil drench, transpiration measured 24 hours after treatment was not affected. However, in tomatoes chlormequat applied as a foliar spray caused a reduction in water loss during the first 24 hours after treatment, while chlormequat as a drench and ancymidol as a drench or spray had little effect (Table 3). This rapid effect on water loss by chlormequat as a spray must be a result of reduced stomatal aperture, since there would not be time for morphological and anatomical changes to occur which might reduce transpiration.

In work reported by other workers, chlormequat was shown to reduce transpiration in bean (10), tomato (6, 7, 9), and pine (1), but daminozide was reported to have had little effect on transpiration in bean (10). Mishra and Pradham (6, 7) attributed these effects in tomato to reduced stomatal aperture when they observed that stomates on treated plants were closed by 80% one day after treatment, 30-40% after 6 days, and 20% after 14 days.

Thus it appears that the growth retardants affect transpiration through two mechanisms. Prior to the development of morphological differences, some retardants cause transpiration reduction through increased stomatal resistance to diffusion. However, the reduced water loss over longer periods of time seem to be due to changes in leaf morphology.

Growth retardants can inhibit various steps in the

Table 1. Effect of ancymidol and chlormequat on poinsettia transpiration and growth measured 3 weeks after treatment.

Chemical		Transpiration (g/day)	Dry weight (g) Leaves	Stem	Total shoot	Leaf area (dm^2)	Transpiration rate g per g of shoot per day	g per dm^2 per day
Control		106	7.3	5.9	13.2	19.3	8.0	5.5
Ancymidol 0.5 mg/pot		81	6.8	3.9	10.7	15.9	7.8	5.1
Chlormequat 495 mg/pot		93	7.1	4.3	11.4	15.7	8.2	5.9
HSD	5%	19	NS	1.0	1.9	1.8	NS	NS
	1%	NS	NS	1.4	NS	2.4	NS	NS

Table 2. Effect of daminozide and chlormequat on bean transpiration and growth measured 3 weeks after treatment.

Chemical		Transpiration (g/day)	Dry weight (g) Leaves	Stem	Total shoot	Leaf area (dm^2)	Transpiration rate g per g of shoot per day	g per dm^2 per day
Control		73	2.0	2.1	4.1	8.8	17.8	8.3
Daminozide 2500 ppm (foliar spray)		54	1.9	1.1	3.0	6.7	18.0	8.1
Chlormequat 495 mg/pot		62	2.0	1.3	3.3	7.5	18.8	8.3
HSD	5%	15	NS	0.6	0.7	1.8	NS	NS
	1%	NS	NS	1.0	NS	NS	NS	NS

synthesis of gibberellins (3, 12, 16) and it is generally felt that these compounds affect growth and development through their affect on endogenus gibberellin levels. However, the mechanism for control of stomatal function is not well understood. Not all retardants have the same effect, and method of application is important (Table 3). A common side effect of chlormequat foliar applications is a slight chlorosis. This is not observed with the other retardants, thus the stomatal closure may be an injury response. Orton and Mansfield (8) examined the effect of daminozide on stomatal function and suggested that stomatal closure was due to an increase in internal CO_2 concentrations. The stomatal closure response is probably not due to the chemical's affect on gibberellin levels because there is little evidence to indicate that gibberellin plays a role in stomatal function (4).

Table 3. Effect of ancymidol and chlormequat on transpiration in tomato during the first 24 hours after treatment.

Treatment	Transpiration (g/day)
Control	40.8
Ancymidol drench 0.5 mg/pot	38.3
Ancymidol 100 ppm (foliar spray)	34.8
Chlormequat drench 308 mg/pot	38.0
Chlormequat 1715 ppm (foliar spray)	26.8
LSD 5%	12.0

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AN EVALUATION OF NEW POINSETTIA SEEDLINGS AND COLOR MUTANTS[1]

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Additional index words. capillary irrigation, ancymidol, *Euphorbia pulcherrima*, cultivars, growth regulator.

Abstract. **Advanced lines of poinsettia (Euphorbia pulcherrima Willd.) were compared with standard commercial cultivars to determine their value for production in central Florida. Two seedlings and 2 color mutants were grown in 1979 and compared to 3 named cultivars. Plants were maintained in a polypropylene covered house (25% shade) with 2 irrigation systems (capillary mat and hand-watering). Five new lines were evaluated in 1980 and were compared to 3 commercial cultivars grown in polypropylene mesh and fiberglass structures. Plants were grown as single cuttings pruned to 5 nodes in 6 inch diameter pots. Plants irrigated with the capillary mat were up to 2.5 inches taller and had a greater diameter than those hand-watered. Water source had no effect on inflorescence diameter, number of colored bracts per inflorescence, and the number of laterals. 'Glory (V-14),' with light rose-red bracts, strong upright stems, and a self-branching growth habit was rated the most desirable of the seedlings in these studies. 'Annette Hegg Top White' was an improvement over 'Annette Hegg White' because of its early bract coloration, its white (not cream) bracts, and its strong stems. 'R-13,' with vivid red bracts and dark green oak-leaf shaped foliage, was inconsistent in development of lateral shoots after removal of the terminal. 'Annette Hegg Brilliant," with red-orange bracts, could replace 'Annette Hegg Supreme' in Florida production.**

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Production of potted poinsettias (*Euphorbia pul-*