As expected, plants were affected more rapidly at 33° than at 23°. Symptoms developed on 80% of the plants by the 22nd or 23rd day. All jojobas, even those without symptoms, died. Again, irreversible damage to roots preceded expression of damage in shoots.

Of the 20 pear seedlings in trial 1, only 4 expressed leaf symptoms between the 18th and 37th day of waterlogging. Plants without symptoms were drained on the 37th day. Four of these died, but 12 had produced many new white roots when examined 6 weeks later. Of the 10 pear seedlings in trial two, 7 developed foliar symptoms between the 12th and 34th days. Two of these were alive when examined 6 weeks after being drained. The 3 plants without symptoms had retained their leaves and produced new roots.

All pears had considerable root damage, but some had not reached the irreversible point. When damage progresses slowly, it is not surprising that a few plants with symptoms survive and a few symptomless plants do not. This variability points to the fact that foliar symptoms are not always a precise indicator of the extent of root damage.

The greater tolerance of pear than jojoba to waterlogging found at 23°C was confirmed at 33°; however, a better estimate of the response of jojobas was desired. To further test jojoba and the application of the technique, 2 additional trials, 3 and 4, were waterlogged at 33°. Plants were drained when symptoms appeared; 20% of the plants expressed symptoms by 6 and 7 days and the 50% level was reached or exceeded (group 3 had 65%) on the 10th day (Table 1). All remaining plants were then drained. Of the 27 symptomless plants in trials 3 and 4, 21 survived (Table 1) and a few of these had resumed root and shoot growth 6 weeks later.

Irreversible damage again occurred with some jojoba plants before any waterlogging symptoms developed. This was indicated by the 6 apparent survivors that died after being drained. With all 4 trials at 33°C there was a considerable time lag between root damage and expression in the shoot.

The techniques used here have been employed to screen and select plants with increased tolerance to waterlogging (3), and results with pear indicate applicability to this species as well. Jojoba populations can also be screened for more tolerant individuals with slight modification of the usual technique. Removal of plants from treatment when about 50% expressed foliar symptoms revealed the limit of survival for the population.

Jojobas are less tolerant to waterlogging than pear but considerably more tolerant than walnut. Walnuts would have reached 100% mortality at 33°C (3) by the time 20% of the jojobas expressed symptoms. The extreme waterlogging sensitivity sometimes attributed to jojoba appears unwarranted. Lack of mortality of jojoba plants under very low supplies (1.5%) of oxygen to the soil above roots (6) supports this conclusion.

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HortScience 17(6):895–896. 1982.

Response of Mites and Leafminers to Trickle Irrigation Rates in Spray Chrysanthemum Production[1]

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Additional index words. twospotted spider mite, *Tetranychus urticae, Liriomyza trifolii, Chrysanthemum* X *morifolium*

Abstract. **The numbers of twospotted spider mites (*Tetranychus urticae* Koch) per unit of leaf area on 'Manatee Yellow Iceberg' chrysanthemum (*Chrysanthemum* X *morifolium* Ramat.) grown with 13.6, 20.3, 27.1, 33.9, or 40.7 cm of water during the crop cycle were inversely related to amounts of water provided on both of 2 sampling dates. The numbers of mites per leaf were inversely related to amounts of water provided on the first of the 2 sampling dates. There was no significant response of leafmine densities with various amounts of water provided.**

The physiological status of host plants grown under various conditions has been shown to affect mite densities (4). However, the effects of water-stressed agricultural crops on plant-feeding mites is not clear. Gould (2) found that the twospotted spider mite (*Tetranychus urticae* Koch) did not survive well on cultivars of bitter cucumber (*Cucumis sativus* L.) produced with low water regimes and proposed that the water-stressed plant increased the concentration of cucurbitacin-c, a plant substance detrimental to mites. Conversely, Chandler et al. (1) found that populations of the carmine mite [*T. cinnabarinus* (Boisduval)] and the Banks grass mite [*Oligonychus pratensis* (Banks)] were more dense on a crop not containing cucurbitacin-c, field corn (*Zea mays* L.) produced under conditions of low soil moisture (200 cb), than populations were when moisture was maintained at higher levels (≤ 50 cb). The purpose of this study was to evaluate the impact of conservative water management practices on mite and leafminer management in chrysanthemum.

Plots of 'Manatee Yellow Iceberg' chrysanthemums (0.9 × 3.7 m) were grown in a fiberglass, sawtooth greenhouse with 13.6, 20.3, 27.1, 33.9, or 40.7 cm of water delivered during the crop cycle by trickle irrigation. Precipitation and ground water were excluded from the production area. Irrigation treatments were replicated 6 times in randomized complete blocks. Rooted cuttings were set on Feb. 13, 1980. Plants were harvested on May 12; the effect of irrigation rates on cut flower production is presented elsewhere (3). Methomyl (Lannate 90SP) in-

[1]Received for publication Oct. 26, 1981. Florida Agricultural Experiment Stations Journal Series No. 3318.

Table 1. Number of motile twospotted spider mites (*Tetranychus urticae* Koch) per leaf and per unit of leaf area and number of *L. trifolii* leafmines per stem of 'Manatee Yellow Iceberg' chrysanthemum at 5 rates of trickle irrigation.

Irrigation (cm/season)	Mites/cm^2 of leaf[z]		Mites/leaf[z]		Leafmines per stem[y]
	April 16	April 22	April 16	April 22	
13.6	1.7	3.4	53.0	98.0	7.1
20.3	1.1	2.7	29.7	75.5	6.7
27.1	0.8	2.1	26.0	68.0	8.4
33.9	0.9	2.4	30.3	77.5	9.0
40.7	0.8	2.3	28.0	70.7	8.6
Significance (P value)					
Linear	.01	.07	.00	NS	NS

[z]One-tenth of the mites from 10-leaf samples/plot were counted. Data are averages of 6 replications.
[y]Data are averages per stem from 12 stems per plot replicated 6 times.
[NS]Not significant.

secticide was sprayed at 60 g/100 liters on March 17 and 31 and on April 7. The methomyl preparation tank mixed with hexakis (Vendex 50WP) miticide at 60 g/100 liters was applied on April 23 and 28.

Ten fully expanded leaves were selected at random from each plot on April 16 and April 22, soon after mite densities had begun to increase rapidly. Leaf samples were taken to the laboratory and entire samples from each plot were brushed, using 2 electrically operated, cylindrical brushes, onto a rotating 12.7-cm-diameter glass disk covered with an adhesive material. All motile mites were counted on 1/10 of the surface of the disk. Resulting data thus represented the average number of motile mites found on fully expanded leaves. No evaluations of irrigation effects on mite densities on leaves were made following the 2 applications of hexakis miticide. The average surface area (1 surface only) among the 10 leaves of each sample was determined using the electronic area meter (Lambda Instrument Corp., Lincoln, Neb.).

On May 9, all 12 chrysanthemum stems of the middle row across each plot were cut and all leafmines contained therein were counted.

Methomyl insecticide maintained lepidopterous larvae, thrips, and aphids below levels necessary to evaluate the response of those insects to irrigation variables. Populations of the twospotted spider mite and leafminer, generally not reduced by methomyl, were sufficiently dense to complete the desired evaluations.

The numbers of mites per unit of leaf area on April 16 and April 22 were related to amounts of water delivered to the plants, with the highest numbers of mites occurring at the lowest irrigation rate (Table 1). There was no significant trend in mites per leaf on April 22 when mite densities were about twice that of April 16, but the highest numbers of mites per leaf occurred at the lowest amount of water as in the April 16 sampling. At the higher tetranychid mite densities, dispersion of mites from leaves to elevated plant parts, such as blooms, occurs (5). This density dependent factor can change the population structure on chrysanthemum leaves and obscure effects of treatments on mite densities. On April 28, mite webs were being formed (an indication of high mite density) over flowers from only the lowest irrigation treatment. There was no significant relationship between the numbers of leafmines and amounts of water provided to plants (Table 1).

These data indicate that twospotted spider mite populations are responsive to amounts of water delivered to chrysanthemum by trickle irrigation. These data further suggest that irrigation below the level necessary to achieve optimal yield in chrysanthemum (3) may impose additional hazards from the twospotted spider mite.

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HortScience 17(6):896–897. 1982.

Chrysanthemum Height Control by Ancymidol, PP333, and EL-500 Dependent on Medium Composition[1,2]

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Additional index words. *Chrysanthemum morifolium*, growth regulators, pine bark, daminozide

Abstract. ***Chrysanthemum morifolium*** **Ramat. plants were grown in media with and without pine bark and treated with drenches of α-cyclopropyl-α-(4-methoxyphenyl)-5-pyrimidinemethanol (ancymidol) at 0.25 mg/pot, (2RS,3RS)-1-(4-chlorophenyl)-4,4-dimethyl-2-(1,2,4-triazol-1-yl) pentan-3-ol (PP333) at 0.25 mg/pot, or α-(1-methylethyl)-α-[4-(trifluoromethoxy) phenyl]-5-pyrimidinemethanol (EL-500) at 0.0625 mg/pot, or two 5000 mg/liter foliar sprays of butanedioic acid mono-(2,2-dimethylhydrazide) (daminozide). Foliar sprays of daminozide controlled plant height equally in both media but drenches of ancymidol, PP333, and EL-500 were not effective when pine bark was included in the medium.**

PP333 and EL-500 are experimental growth regulators which provide height control on a number of plant species (2, 3, 10, 11). These compounds could be beneficial to ornamental growers because of their effectiveness on a wide spectrum of species rather than the narrow range for the compounds currently used. Ancymidol, which has the broadest spectrum of the currently used compounds, suffers from reduced effectiveness when applied as a drench to a medium with pine bark as a component (4, 8, 12). Since ancymidol and EL-500 are substituted pyrimidines and because of the rapidly expanding use of container media with pine bark as a component, the effect of pine bark on the action of EL-500 and PP333 was evaluated.

Rooted cuttings of 'Bright Golden Anne' chrysanthemum were obtained from commercial sources, potted 5 per 15-cm pot, and held under noninductive photoperiods in a double polyethylene-covered greenhouse. After 1 week, the plants were pinched and placed under short days to initiate flowering.

[1]Received for publication June 3, 1982. Florida Agricultural Experiment Station Journal Series No. 3909.

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]This research was supported in part by a grant from the Fred C. Gloeckner Foundation. Plants were provided by Yoder Brothers, Inc. Ancymidol and EL-500 was supplied by Eli Lilly and Company. PP333 and daminozide were supplied by ICI Americas, Inc. and Uniroyal Chemical, respectively. W. R. Grace and Company, Cambridge, Mass., supplied fertilizer and some media used. Verlite Co., Tampa, Fla., supplied some media used.