INSECT (NEUROPTERA:LEPIDOPTERA) CLOGGING OF A MICROSPRINKLER IRRIGATION SYSTEM IN FLORIDA CITRUS

CARL C. CHILDERS,[1] STEPHEN H. FUTCH,[1] AND LIONEL A. STANGE[2]
[1]Citrus Research and Education Center
University of Florida, Institute of Food and Agricultural Sciences
700 Experiment Station Road, Lake Alfred, Florida 33850

[2]Florida Department of Agriculture and Consumer Services
Division of Plant Industry, Gainesville, Florida 32602

The use of subcanopy irrigation, including microsprinkler systems, has been steadily increasing over the past 15 years by the Florida citrus industry (Smajstrla et al. 1992). Reduced water volume, more efficient delivery of irrigation water to the tree roots, limited water application to competitive weeds all provide the grower with incentives to use these systems (Parsons 1989, Zekri & Parsons 1988, 1989). This technology is especially important to growers because of freeze protection.

Various insect and mammal problems have been identified in recent years in association with irrigation systems in Florida. Fire ant colonies, mainly *Solenopsis invicta* Buren (Hymenoptera: Formicidae), have been observed by the first author to utilize the solar heating potential of the black polyethylene tubing to maintain their eggs and developing young. The eggs and immature ants are found along the underside of feeder lines that run parallel to tree rows in Florida citrus groves. Fire ant species in Florida have caused occasional localized problems by clogging tubing and individual emitters (L. R. Parsons, University of Florida, IFAS, Citrus Research and Education Center, personal communication). Secondary nests of the Argentine ant, *Iridomyrmex humilis* Mayr, have been found in sprinkler heads in California citrus groves (Haney 1984).

Mature larva of *Selenisa sueroides* (Guenee) (Lepidoptera: Noctuidae) have damaged microsprinkler irrigation systems in several citrus groves in central and southwest Florida since 1987 (Brushwein et al. 1989). The mature larvae leave their host plants (i.e., *Aeschynomene* spp., *Sesbania* spp. and *Macroptilium lathyroides* (L.)) prior to pupation in October and November, climb nearby irrigation sprinklers and chew holes in the flexible pvc tubing. The larvae then enter the tubing and pupate. The level of damage caused by *Selenisa sueroides* was shown to be related to the abundance and distribution of certain legume host plants, larval population levels, sprinkler type and grove cultural practices (Brushwein et al. 1989). Damage to sprinklers and connecting tubing averaged $797 per site in 1987 (Brushwein et al. 1989).

Four species of rodents including the house mouse, *Mus musculus* L., the cotton mouse, *Peromyscus gossypinus palmarius* Bangs, the rice rat, *Oryzomys palustris natator* Chapman and the hispid cotton rat, *Sigmodon hispidus floridanus* A. H. Howell were associated with damaged sections of irrigation tubing in tomato fields in southwest Florida (Stansly & Pitts 1990). The rodents had chewed on irrigation tubing resulting in leaks. Of 45 leaks observed in the field, eight were found to be caused by mice and 37 by the two rat species. Most of the damage occurred on 4 mil tubing compared with damage on the 15 mil irrigation tubing.

A 52.6-ha citrus grove was planted southeast of Arcadia in DeSoto County during the first 3 weeks in July, 1991. The trees were set at 3.05 × 7.62 m (= 430.5 trees per ha). The citrus varieties included 'Hamlin' orange on Bittersweet rootstocks and 'Rohde Red Valencia' orange on Swingle rootstocks. Japanese millet, *Setaria italica* (L.) Beauvois, was planted throughout the citrus grove about 1 June 1991.

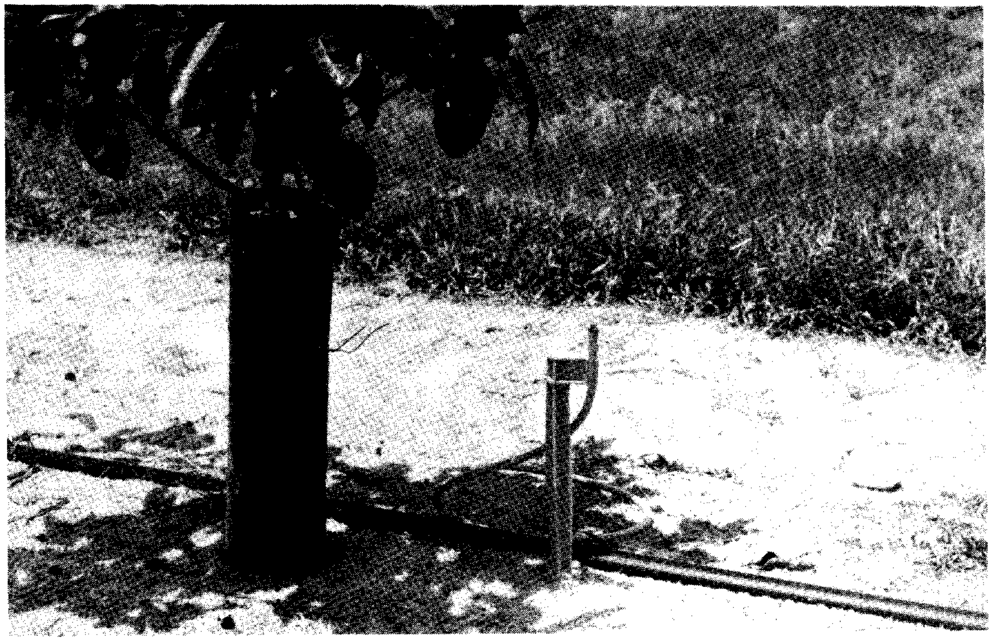


Fig. 1. Position of an Olson "O"-Jet emitter in the microsprinkler irrigation system.

A low volume microsprinkler irrigation system was established in the grove site prior to planting. Black polyethylene lateral lines were placed on the surface of the ground along each tree row. One red #3 Olson "O"-Jet emitter (Olson Irrigation System, Santee, CA) was positioned to provide complete water spray coverage of each newly set tree. Emitters were placed at 45 to 60 cm from each tree on the north to northwest side and elevated on a plastic stake 27 to 30 cm above the ground (Fig. 1).

On 1 September, the grower discovered that from 10 to 30% of the emitters were clogged depending upon location in the grove. The worst clogging, occurred where the millet was allowed to grow late into September. The number of microsprinkler emitters that were clogged within the 52-ha citrus grove was estimated at 17% or approximately 4,000 emitters.

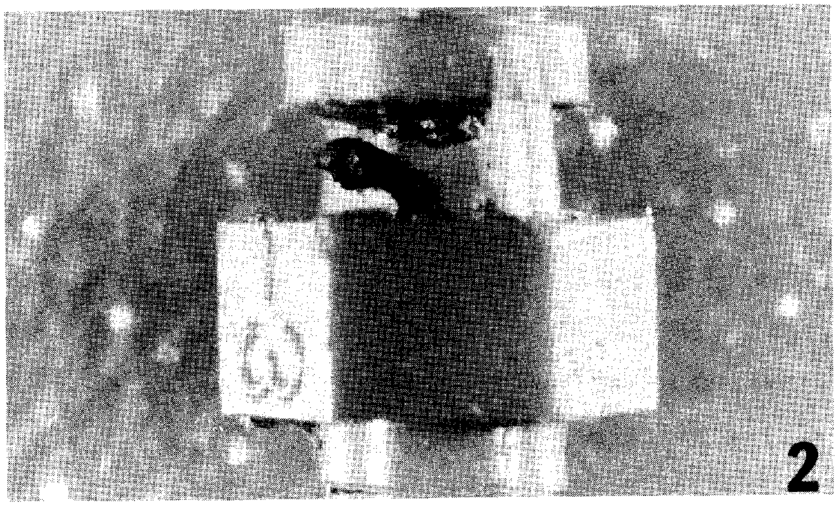
Examination of the clogged emitters revealed the presence of individual larvae and pupae of an unidentified species of Tortricidae (Lepidoptera) within the 1 mm diameter orifice (Fig. 2). Many of the larvae had been parasitized. In addition, there were (usually) one or two pupal cases of *Chrysoperla externa* (Hagen) (Neuroptera: Chrysopidae) attached to the rim of the emitter, or a single pupal chamber was present within the orifice (Fig. 3). The dense silk webbing associated with the pupal cases of both insects partially or completely blocked water movement through the emitters (Fig. 4). The

---

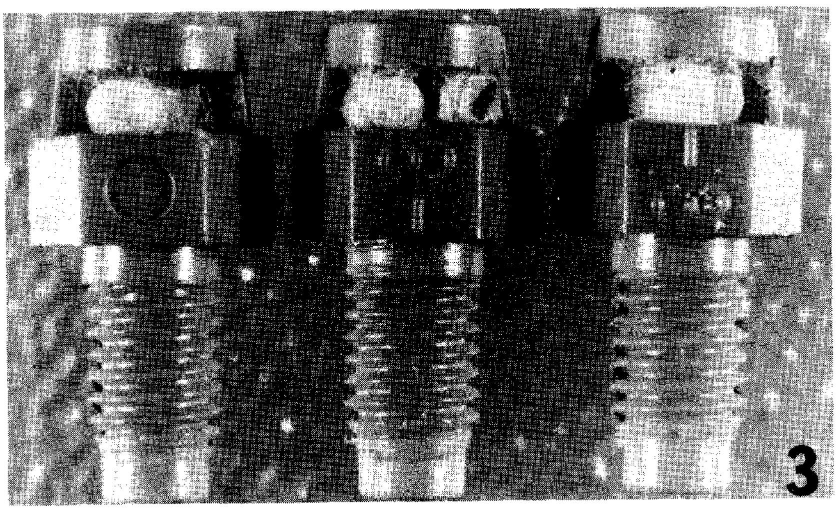
Fig. 2. Unidentified species of Tortricidae (Lepidoptera) larva within the 1 mm diameter orifice of an Olson "O"-Jet emitter.

Fig. 3. Pupal cases of *Chrysoperla externa* (Hagen) attached to the rim of Olson "O"-Jet emitters.

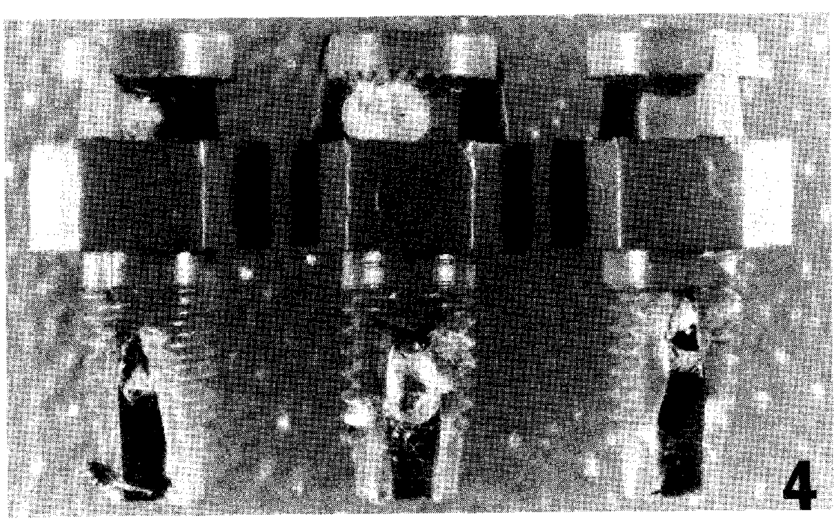
Fig. 4. Pupae of either Neuroptera or Lepidoptera that had plugged individual orifices of Olson "O"-Jet emitters.



2



3



4

association of the chrysopid with the lepidopteran species does not imply predation. They are merely reported as being present on many of the same emitters. Samples of clogged emitters were received too late for identification of all larvae and pupae of the lepidopteran species. The insect infested emitters were collected into glass containers and sealed by the owner. One week passed before they were received for identification. In addition, the parasite complex associated with the lepidopteran larvae was not identifiable.

The microsprinkler nozzles cost 10 cents each and it required 1 h to repair 20 emitters. Average labor cost was $9.76 per hour plus transportation costs for labor to the grove site (Muraro & Holcomb 1991). This resulted in $400 for emitter replacement costs, and $1,952 for labor plus the undetermined labor transportation costs to the grower.

Many planned citrus grove sites are planted with millet, various legumes and grasses prior to setting young trees. These provide ground cover and food for certain birds or animal species, maintain good soil moisture or improve the nitrogen content of the soil. Plantings of Japanese millet in citrus groves should be accompanied by close observation to avoid economic loss from clogging of microsprinkler irrigation systems by insects.

Use of uniformly spaced, specific colored emitters may offer a way to collect or survey for certain lepidopteran and neuropteran larvae and pupae in the field along with their associated parasites and predators. This recommendation arises from our repeated observations of pupae either at the emitter head or within the core and complete absence of pupae on either irrigation tubing or the risers. Provision of artificial pupation sites for lacewing or other neuropteran larvae at uniform intervals in an agricultural habitat has not been previously reported.

Florida Agricultural Experiment Station Journal Series No. R-02369.

References Cited

BRUSHWEIN, J. R., C. H. MATTHEWS, AND C. C. CHILDERS. 1989. *Selenisa sueroides* (Lepidoptera: Noctuidae): A pest of subcanopy irrigation systems in citrus in southwest Florida. Florida Entomol. 72: 511-518.

HANEY, P. 1984. A different approach to the Argentine ant problem. Citrograph 69: 140, 2-3, 6.

MURARO, R. P., AND E. D. HOLCOMB, JR. 1991. Budgeting costs and returns for southwest Florida citrus production, 1990-1991. Univ. Florida, IFAS, Econ. Info. Rep. EI91-6.

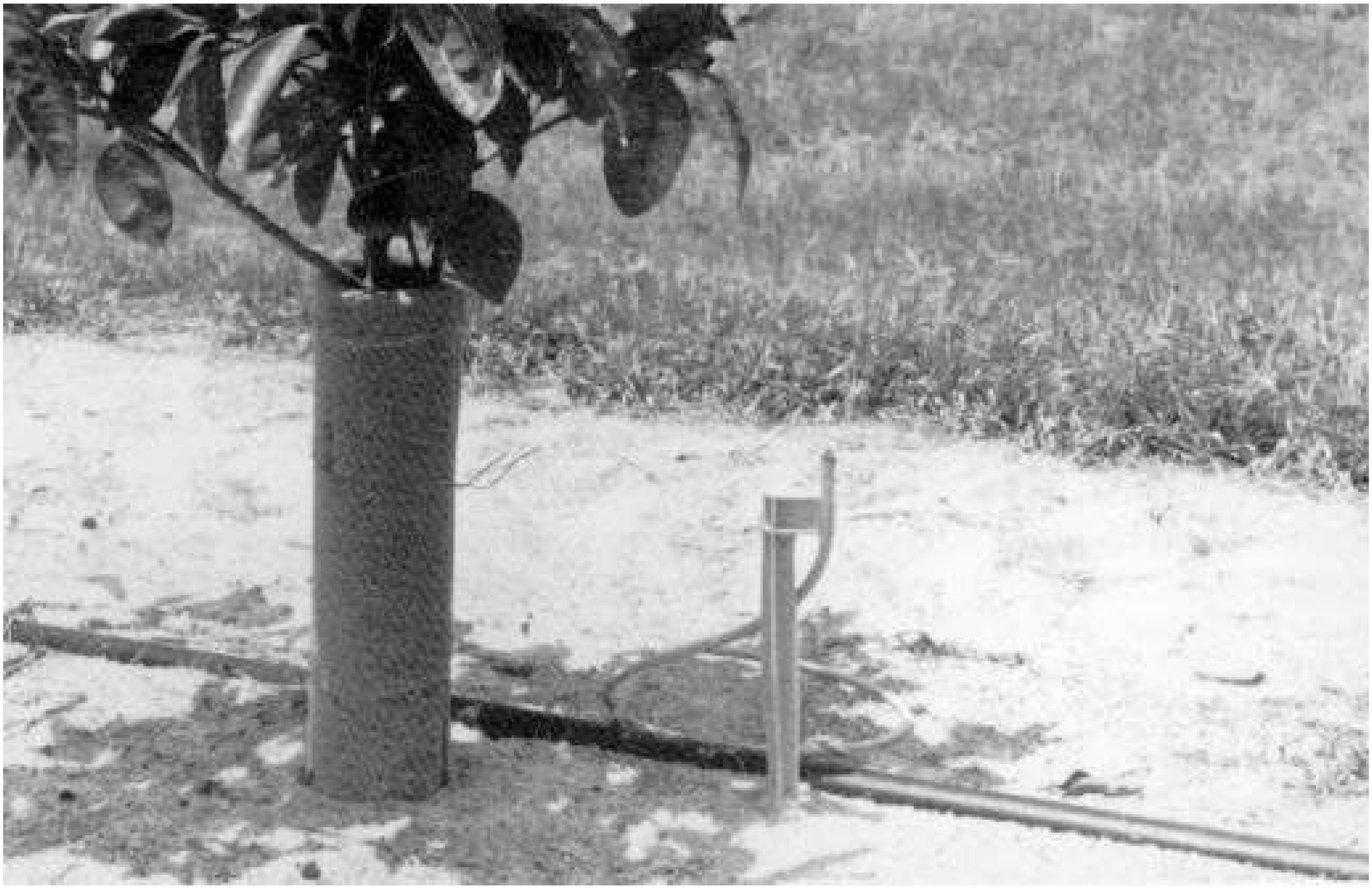
PARSONS, L. 1989. Management of micro-irrigation system for Florida citrus. Univ. Florida, IFAS. Fruit Crops Fact Sheet FC-81.

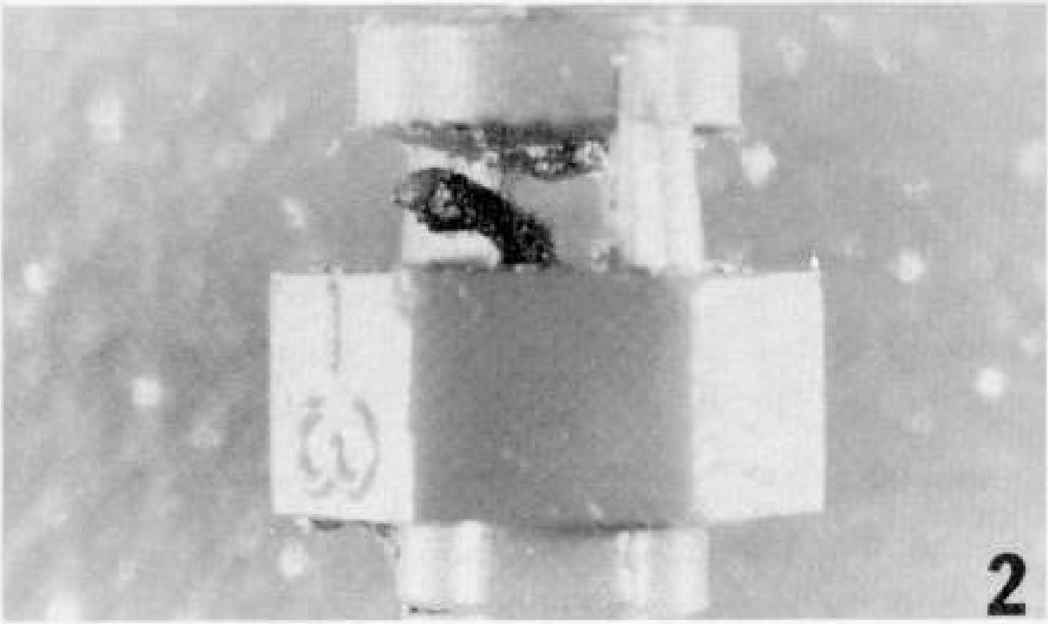
SMAJSTRLA, A. G., F. S. ZAZUETA, AND D. Z. HAMAN. 1992. Summary of irrigation uses in Florida. Irrig. J. 42(1): 21.

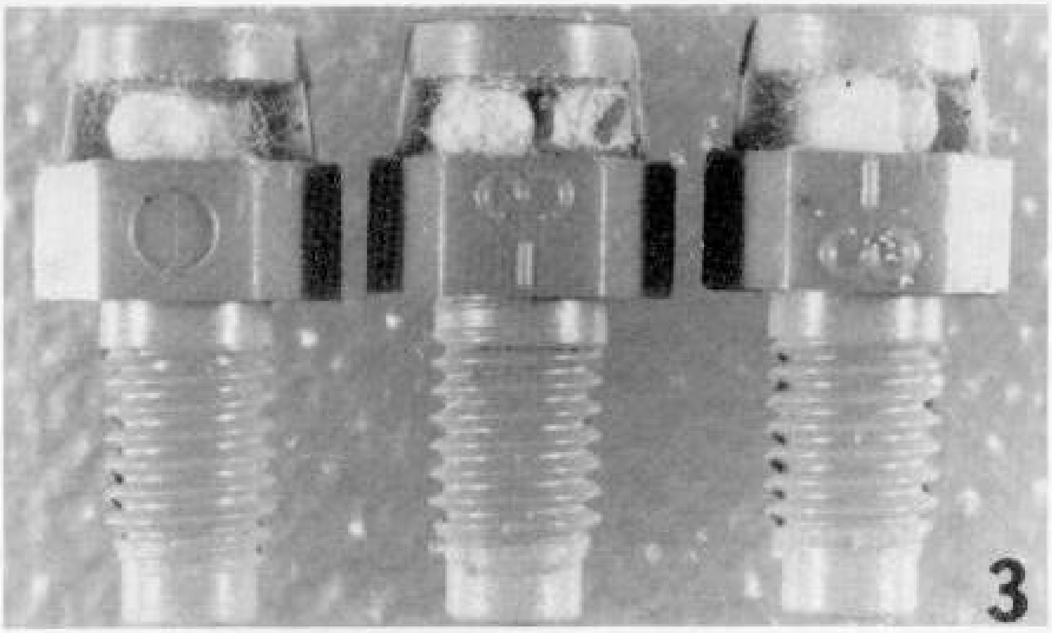
STANSLY, P. A., AND D. J. PITTS. 1990. Pest damage to micro-irrigation tubing: Causes and prevention. Proc. Florida State Hort. Soc. 103: 137-139.

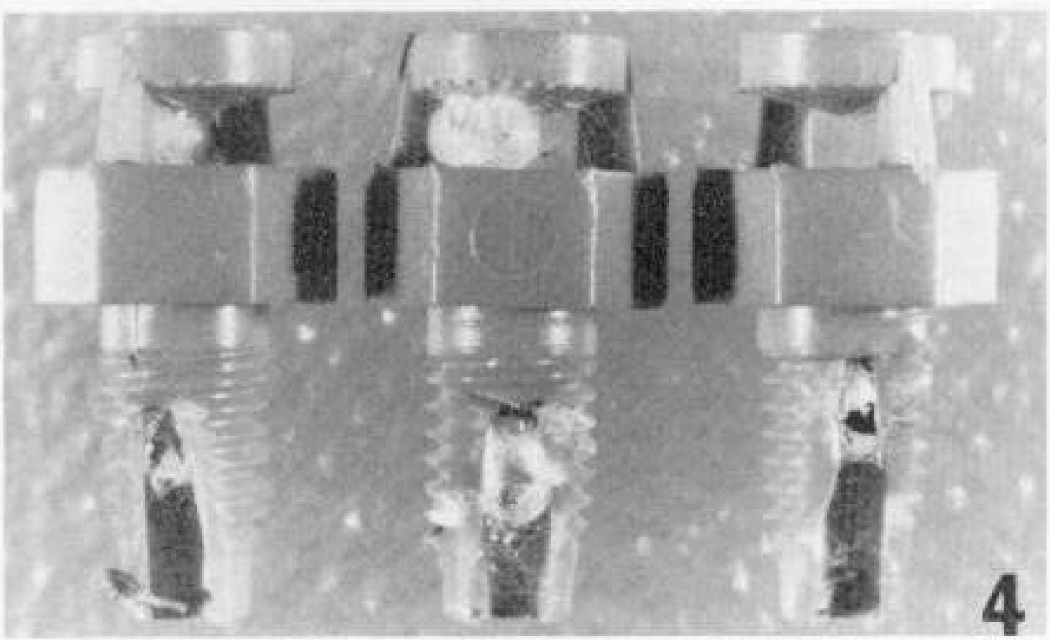
ZEKRI, M., AND L. R. PARSONS. 1988. Water relations of grapefruit trees in response to drip, microsprinkler, and overhead sprinkler irrigation. J. American Soc. Hort. Sci. 113: 819-823.

ZEKRI, M., AND L. R. PARSONS. 1989. Grapefruit leaf and fruit growth in response to drip, microsprinkler, and overhead sprinkler irrigation. J. American Soc. Hort. Sci. 114: 25-29.




2


3


4