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SPUNBONDED POLYPROPYLENE COVERS AID COLD PROTECTION OF *ASPARAGUS VIRGATUS* DURING RADIATION FREEZES

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Abstract. **Temperatures under 10-m x 10-m spunbonded polypropylene row covers and outside the covers were monitored in an oak hammock fernery producing tree fern (*Asparagus virgatus* Bak.). When covers were put in place one day prior to a cold event, temperatures averaged 3.5° and 5.1°C higher than ambient under the lighter (0.02 mg·mm^{-2}, LW) and heavier (0.05 mg·mm^{-2}, HW) weight covers, respectively, when temperatures were below freezing. Placing crop covers out the evening of a cold event slowed the rate of temperature decline with the heavier cover slowing the decline more than the lighter one. By early morning when ambient temperatures were below –2°C, temperatures averaged 2.7° and 3.9°C higher under the LW and HW covers, respectively, than outside the covers. Covers produced no permanent mechanical damage to tree fern stems even when left on the crop continuously for three days. All tree fern outside the covers, but none of the tree fern under the covers, was damaged when ambient temperatures dropped below –4°.**

Many important cut foliage crops are cold sensitive members of the genus *Asparagus* and require protection from temperatures below about –2°C (3). In Florida, the predominant method of protecting these and other cut foliage crops, such as leatherleaf fern [*Rumohra adiantiformis* (Forst.) Ching], is by overhead applications of water using impact sprinklers (4). Besides numerous environmental concerns over the use of water for cold protection (5), there is the additional problem of mechanical damage to crops caused by the weight of ice that forms during cold protection. One of the most popular ornamental asparagus species, *A. virgatus* (tree fern), is particularly vulnerable to mechanical damage because of its sparse and upright growth habit. An additional consideration regarding cold protection of tree fern is that most production in Florida occurs under natural shade (oak trees) where successful cold protection using water is difficult due to the inability to adequately reduce wind movement during freezes.

Light-weight (0.02 mg·mm^{-2} or less) spunbonded row covers have been reported to offer some cold protection (generally 1.5°-3°C) for low growing crops produced in the open (1,2,6). Heavy-weight spunbonded crop covers have been shown to offer somewhat greater cold protection when used on strawberries (1). The purposes of these experiments were to 1) measure temperatures under spunbonded polypropylene covers of two different thicknesses and compare those temperatures to control temperatures outside the crop covers, 2) determine if the covers would cause mechanical damage to tree fern, and 3) ascertain whether covers could be put in place after sunset on the night of a radiation freeze and still be beneficial.

Materials and Methods

Randomized complete block design experiments with two replications were conducted in oak hammock ferneries in Crescent City, FL, during the winters of 1988 and 1989. Plots were 10-m x 10-m in size and were covered with either 0.02 mg·mm^{-2} or 0.05 mg·mm^{-2} spunbonded polypropylene crop covers (Kimberly Farms, Roswell, GA 30076), or not covered. Covers were put in place either a day before or a night of radiation freeze events. The edges of the covers were secured to the ground using galvanized wire pins. Temperatures were measured using copper-constantan thermocouples (AWG No. 20, Omega Engineering, Stamford, CT 06906) placed at the center of the plots. Thermocouple wires were attached to a multichannel thermometer (DSS-650-T, Omega Engineering) and were taped 23 cm above the soil surface to low conductivity wooden stakes that extended 46 cm above the soil surface. Thermocouple sensors were extended horizontally 10 cm from the stakes.

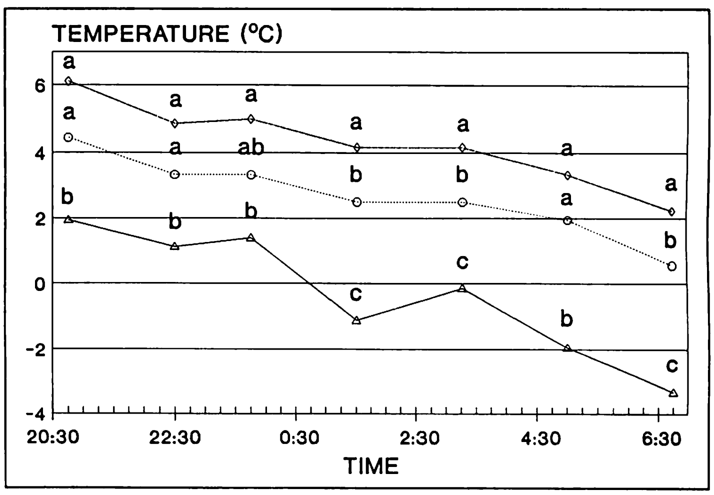

Fig. 1. Temperatures recorded 27-28 Jan., 1988, in an oak fernery measured 23 cm above the soil surface under 0.05 mg·mm^{-2} spunbonded polypropylene crop covers (---◇---), 0.02 mg·mm^{-2} spunbonded polypropylene crop covers (···○···) or no cover (—Δ—). Covers were put in place 1 day prior to the radiation cold event. Letters indicate mean separation (for a given time) by Duncan's new multiple range test, 5% level.

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Results and Discussion

Data are reported from representative radiation (calm winds, clear sky) freezes when covers were put in place either a day before a freeze or the night of a freeze. When the crop covers were put in place the day prior to a freeze event, temperatures under the row covers were higher than in the control plots (Figure 1). Temperatures were also higher under the heavier weight cover than the lighter one. Temperatures during the period when ambient temperatures were below freezing averaged 3.5° and 5.1°C higher, respectively, for the 0.02 $mg\cdot mm^{-2}$ and 0.05 $mg\cdot mm^{-2}$ covers.

When crop covers were placed out the evening of a radiation cold event rather than during the day, the crop covers slowed the rate of temperature decline under the covers compared to outside the covers (Figure 2). The heavier cover was able to slow the temperature decline more than the lighter cover. When the ambient temperatures were below freezing, temperatures averaged 2.4° and 3.5°C higher under the 0.02 $mg\cdot mm^{-2}$ and 0.05 $mg\cdot mm^{-2}$ covers, respectively. Even during the period (2100 to 0700HR) when ambient temperatures were below the critical −2°C temperature, temperatures under the lighter and heavier covers averaged 2.7° and 3.9°C higher than outside the covers, respectively. All tree fern stems outside the crop covers were cold damaged while none of the stems under the covers were injured.

Although the tips of some tree fern stems were curled when the crop covers were first removed, stems of tree fern held under the covers continuously for up to three days straightened out and were acceptable for commercial harvest. No permanent mechanical damage to the tree fern was detected.

These results indicate that spunbonded polypropylene crop covers are a promising method of cold protecting tree fern without using water; however, further testing under more severe conditions will be necessary to determine the limits of this method. Additionally, the results suggest that deployment of the covers during the day prior to a cold event, at least mild radiation events common in Florida, may not be of significant benefit. This may be due, in part, to the interception of solar radiation during the day by the oak tree canopy.

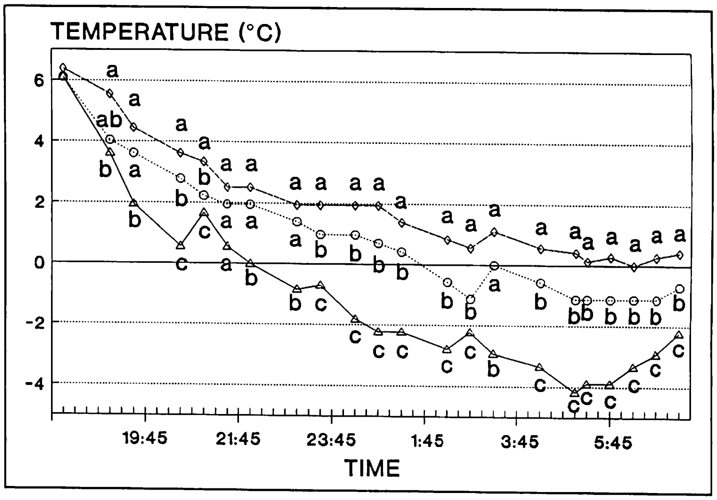

Fig. 2. Temperatures recorded 24-25 Feb., 1989, in an oak fernery measured 23 cm above the soil surface under 0.05 $mg\cdot mm^{-2}$ spunbonded polypropylene crop covers (---◇---), 0.02 $mg\cdot mm^{-2}$ spunbonded polypropylene crop covers (···○···) or no cover (—Δ—). Covers were put in place at 1800HR. Letters indicate mean separation (for a given time) by Duncan's new multiple range test, 5% level.

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GROWTH RATE OF BOSTON FERN AFFECTED BY IRRIGATION FREQUENCY

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Abstract. ***Nephrolepis exaltata*** **(L). Schott 'Bostoniensis' (Boston fern) was grown with three different irrigation frequencies, 1, 3, or 5x a week in two different commercial potting mixes, Metro 300 and Vergro Klay Mix. Height, width, growth index, leaf area, number of fronds and fresh and dry weights of fronds and roots were determined biweekly for ten weeks. Regression analysis showed plants grown in Metro 300 grew best if irrigated 3x a week. Of all variables measured, plant growth index had the highest coefficient of determination in 5 of the 6 treatments.**

Cultivars of *Nephrolepis exaltata*, primarily 'Bostoniensis' (Boston Fern), have been economically important foliage plants since the 1920's (8). However, the growth habit of *N. exaltata* and other ferns in the Polypodiaceae family differs from most other container grown foliage

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