HORTSCIENCE 27(9):1044. 1992.

Shade during July and August Reduces Growth but Not Fruiting of Strawberry Plants

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Additional index words. *Fragaria* × *ananassa,* misting

Ferree and Stang (1988) found that 'Earliglow' strawberry plants covered with 60% shadecloth during the active runnering period had higher yield (12% to 17%) the following spring than did exposed plants. The primary objective of our study was to apply Ferree and Stang's shade-during-runnering treatment to 'Earliglow' and two other cultivars and analyze the growth and fruiting responses for possible genotype × shading interactions. A secondary objective of our study was to examine the influence of evaporative cooling (misting) during July and August on strawberry growth and fruiting as a possible means of alleviating heat stress on strawberry plants (Nonnecke, 1989).

Dormant plants of 'Allstar', 'Earliglow', and 'Tristar' were planted at the Ohio Agricultural Research and Development Center, Wooster, in a Wooster silt loam (fine loam, mixed, mesic, typic Fragiudalf) on 25 Apr. 1985. Plants were set 15 cm apart in single rows on flat beds. The design was a split plot consisting of eight replications of each cultivar (whole plots). No shade (exposed), shade, and misting were assigned randomly to lo-plant subplots within 'the whole plots. Treatments were applied from 1 July to 31 Aug. Commercial shadecloth (60% shade) was stretched across light wire frames to enclose the sides, top, and ends of the designated subplots. Subplots assigned the mist treatment were misted for 15 sec (i.e., long enough to wet the upper surface of the leaves) every 6 min when the air temperature at canopy height in a reference (no shade) subplot exceeded 27C. Mist was generated with pin nozzles attached to risers. To minimize the possibility of mist drifting onto nontarget plants, subplots were separated by a distance of 1 m within rows and 3 m between rows. Shade covers were removed and the mist turned off only during pest control spray applications. The planting was maintained in the single hill system to facilitate the application of shade and mist. All runners were removed and counted on 2 and 20 Aug. and 24 Sept. The dry weight of these runners was obtained after each removal date. One plant from each subplot was dug on 6 Sept., and the dry weight of leaves, crowns, and roots determined. In Spring 1986, ripe fruit were harvested, graded, and weighed twice a week.

Plants subjected to shade produced fewer runners and accumulated less dry matter than plants in full sun or those that were misted (Table 1). Only treatment main effects are presented because no genotype x treatment interactions were detected. Shaded plants had an average of 37% less root dry weight, 41% less leaf dry weight, and 42% less crown dry weight than exposed plants. Plants shaded during July and Aug. 1983 also produced fewer runners, but their leaf, crown, and root dry weights (as determined after the fruit harvest period) did not differ significantly from those of exposed plants (Ferree and Stang, 1988).

Despite the influence that shade had on growth in 1985, it had no detectable effect on the yield or average weight of fruit harvested during Spring 1986. The mean total fruit yield of the shaded plants was 238 g/plant, 231 g for those exposed, and 227 g for those that were misted. Mean fruit weight for shaded and exposed plants was 10.5 and 10.3 g for misted plants.

The different results obtained in 1984 (Ferree and Stang, 1988) and 1986 may be related to temperature. The treatment period in 1985 had a lower average maximum air temperature than the same period in 1983 (25.6 vs. 30.0C). Thus, shade may have provided a more beneficial effect during the higher temperatures in 1983. In 1985-86, the air reached 35C only once during the treatment period, and, therefore, heat stress on plants may have been minimal. Also, 'Allstar', 'Earliglow', and 'Tristar' were selected in Maryland and are well adapted to the warm summers of the lower midwestern United States (Luby, 1989).

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Table 1. Effect of shade and mist on the growth of strawberry plants grown at Wooster, Ohio."

Treatment	Runners/plant (no.)	Dry wt (g)			
		Runner	Root	Crown	Leaf
No shade	14.1 a	17.0 a	3.5 a	6.4 a	43.8 a
Shade	12.2 b	13.5 b	2.2 b	3.7 b	25.8 b
Mist	14.9 a	16.4 a	2.9 a	5.9 a	39.7 a

[z]Mean separation within columns by Fisher's LSD, $P = 0.05$.

Received for publication 19 Aug. 1991. Accepted for publication 11 May 1992. Salaries and research support provided by state and federal funds appropriated to the Ohio Agricultural Research and Development Center, The Ohio State Univ. Journal article no. 162-91. We are grateful to Greg Brenneman and John Schmid for their technical assistance on this project. 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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