Research Note

Mulch Types on Soil Temperature at Varying Depths in Drip Irrigated Summer and Winter Peppers[1]

Mulching contributes to increased efficiency of available water for crop production.[3] Mulching has been successfully practiced in Israel, Australia and the United States[2,3,4] in drip irrigated vegetables. Use of synthetic mulches caused increases in soil temperature.

A study to determine the possibility of using different mulch types for pepper production was conducted at the Fortuna Agricultural Research and Development Center, Juana Díaz, in the southern semiarid region of Puerto Rico. The soil belongs to the San Antón soil series. The objective of this study was to evaluate effects of transparent (clear), white, black, silver coated black plastic, organic mulch and non-mulching on soil temperature at 0.0, 7.5, 15.0 and 22.5 cm depth during the morning (7:30 a.m.), noon (12:00) and afternoon (3:30 p.m.) in drip irrigated winter and summer peppers (var. Cubanelle).

Maximum air temperature during the crop season was 32.2° C for winter peppers and 33.4° C for summer peppers. Minimum air temperature was 15° C for winter and summer peppers (4). The soil temperature was recorded manually with ordinary thermometers (−20 to 110° C range), installed at 0.0, 7.5, 15.0 and 22.5 cm depth in each plot. The temperature over the plant canopy was recorded by a thermometer 1 m above the soil surface. The temperature readings were recorded daily at 7:30 a.m., 12:00 noon and 3:30 p.m.

Transparent mulch plots caused highest values of soil temperatures at 22.5 cm depth compared with other plots during winter and summer. Figure 1 shows average daily soil temperature at varying depths during winter and summer. Temperature variations during 0–30 days were more pronounced compared to variations during the rest of the crop season.

In the morning, the temperature differences were maximum in the mulched plots during winter and summer. This agrees with other

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[2] This study was conducted under H-326(S-143), Southern Region Research Project—"Trickle Irrigation in Humid Regions," Suggestions by Héctor Lugo-Mercado and José Badillo-Feliciano are duly appreciated.

[3] Waggoner, P. E., P. M. Miller and H. C. de Rao, 1960. Plastic Mulching: Principles and Benefits. Connecticut Agric. Exp. Stn. New Haven, Bull 634.

[4] Hopen, H. J. and N. F. Oebker, 1976. Vegetable Crop Responses to Synthetic Mulches. An Annotated Bibliography. NAPA Bull. No. 1 by National Agricultural Plastics Association, Maryland.

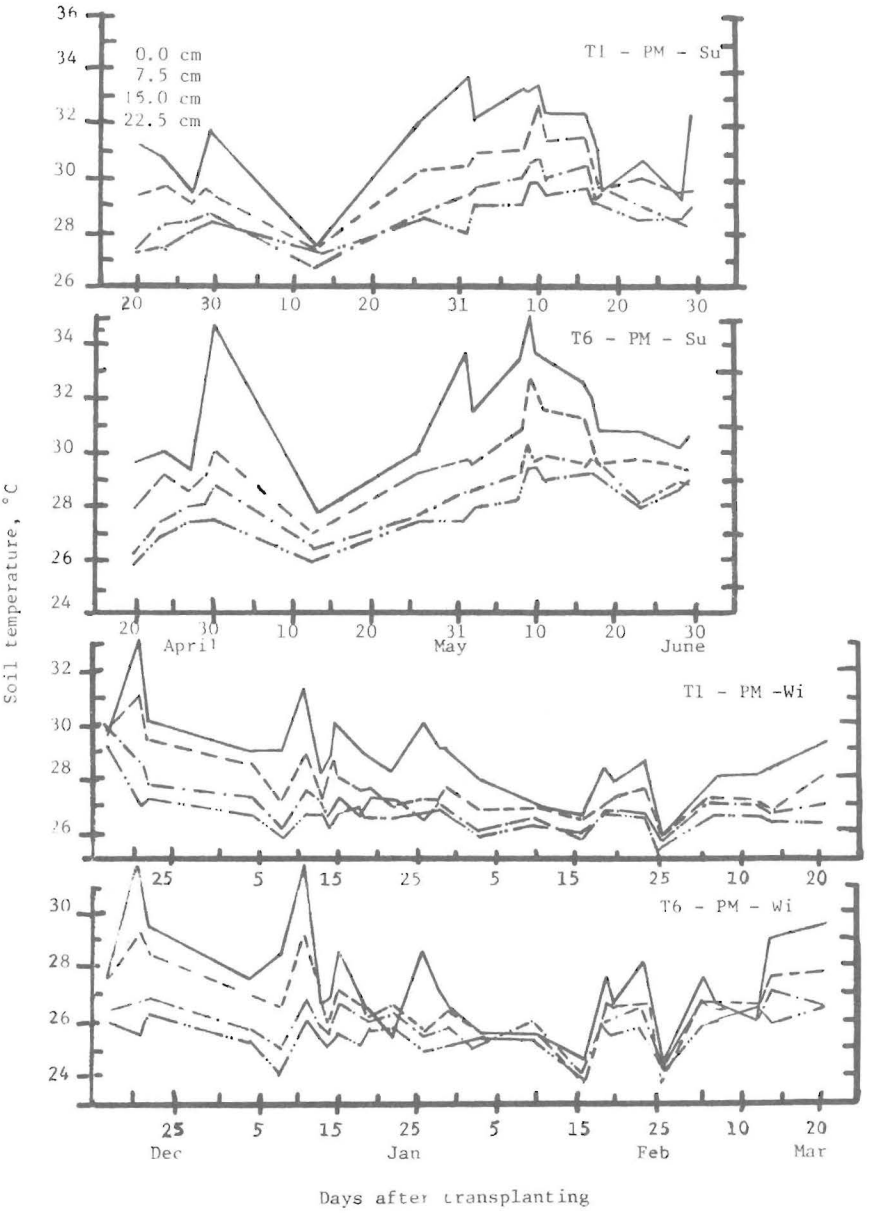

FIG. 1.—Soil temperature at 0.0, 7.5, 15.0 and 22.5 cm depth during the afternoon (3:30 pm) in drip irrigated winter and summer peppers, 1981–82.

authors[3,4,5,6] who reported that this increase was attributed to increases in heat flux and specific heat of soil. Mulching also caused increased soil water content compared with the control. The soil temperature in transparent mulch plots was significantly higher at the 5% level compared with other plots during the morning, noon and afternoon in winter and summer. The clear plastic transmits much of the incoming solar radiation[3,5] resulting in warmer soil. The soil temperature differences in the white and silver coated mulched plots were not significantly different at all depths during the noon and afternoon. Thus, use of reflective mulch (black, white, silver coated black) has little effect on the soil temperature variations in the 0–22.5 cm depth because these reflect almost all of the incoming solar radiation.[3–7]

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[7] Davies, J. W., 1975. Mulching effects on plant climate and yield. Technical note no. 136. Secretariat of the World Meteorological Organization, Geneva, Switzerland. Pages 1–92.