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Short communication

Irrigation scheduling based on canopy- air temperature (Δ Tc) and its effect on fruit yield of brinjal

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An ideal irrigation scheduling technique could be to use the plant as the indicator of water stress since the plant responds to both aerial and soil environments (Throssel *et al.,* 1987). The IW/CPE ratios which are referred to the fixed depth of irrigation water and cumulative pan evaporation are normally used for scheduling irrigation. IW indicates taking these into account one of the most non- invasive techniques to assess plant water stress, utilizes infrared thermometry to measure canopy temperature and canopy minus air temperature differential. Its usefulness is based on the principle that water lost through transpiration cools the leaves below the temperature of surrounding air under well watered conditions. When soil water is limiting and plants become water stressed, stomata close partially or completely, transpiration decreases and plant temperature increases.

If transpiration is greatly reduced or ceases, canopy temperature will be greater than air temperature (Jackson, 1981). Based on this principle, Jackson *et al* (1981) have shown that canopy temperature minus air temperature differential can be used as an indicator of crop water stress. Accurate hand held infrared thermometer can be used for measurement of canopy temperature (Tc) and canopy – air temperature differential (Δ Tc). The infrared thermometer has quick response time and accuracy. In view of the above, the present investigation was conducted to explore the possibility of using canopy temperature for scheduling irrigation of brinjal *(Solanum melangena* L.*)*

The experiment was laid out in a randomized block design with four replications and five treatments based on irrigation at CPE values of 20, 30, 40, 50 and 60 mm during summer season of 1997-98 at Agronomy section, College of Agriculture, Pune. The ' Manjrigota' variety of brinjal was transplanted on January 10,1998. The fertilizer basal dose of 50 kg N, 50kg P_2O_5 and 50 kg K_2O ha^{-1} was applied by placement method and remaining 50 kg N , top dressed on 13.02.98. The net plot size was 4.8 X 4.2 m. Canopy temperature was measured using an infrared thermometer (Telatemp model AG-42) between 12.00 to 14.00 hr at normal incidence. It was targeted to view the crop from the height of 1 m above canopy at an angle of about 30 ^{0}. Observations were recorded just before irrigation, 48 hours after irrigation and at an interval of five days. Canopy minus air temperature differential (Δ Tc) also was obtained by infrared thermometer.

The fruits were picked as per the maturity at an interval of 4-5 days. The fruits were harvested in about 22 pickings and depending upon treatments. The fruit yield of cumulative pickings as per treatments was considered as total yield.

The average ΔTc values (X) just before irrigation (Table 1) showed second order hyperbola relationship with fruit yield. The best fit equation for the relationship was

$$Y= 8.18 + 20.19 / X + 65.67 / X^2 \qquad R^2 = 0.96$$

The fruit yield of 30.82 t ha^{-1} was recorded in 30 mm CPE treatment wherein average Δ Tc value just

Table 1: Relationship between canopy - air temperature differential (ΔTc) and fruit yield

CPE(mm)	(ΔTc)	Fruit yield (t ha^{-1}) Observed	Fruit yield (t ha^{-1}) Predicted
20	-1.4	27.26	27.25
30	2.2	30.82	30.93
40	2.8	24.40	23.77
50	3.2	19.95	20.90
60	3.5	19.75	19.31

before irrigation was 2.2 ^{0} C. From the prediction equation the maximum yield under 30 mm CPE irrigation schedule is 34.60 t ha^{-1} when Δ Tc value reaches 0.6 ^{0}C. Hence, for obtaining the maximum yield it is suggested to apply the irrigation, when the Δ Tc value of 0.6 ^{0}C is reached. The concept is simple and practicable.

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