

## DRY MATTER PRODUCTION IN RELATION TO PAN EVAPORATION AND AIR TEMPERATURE IN PEARLMILLET (*Pennisetum americanum*)

Dry matter production in crop plants depends upon both evaporative demand, representing solar energy and potential water requirement and the ambient temperature prevailing at different stages of crop growth. The degree day concept has been utilized widely to establish linear relationship between biomass and accumulated temperature in soybean (Hunway and Weber 1971, Uchijima 1975). Linear correlations have been developed between accumulated evapotranspiration and biomass production in wheat (Hanks *et al.* 1968, Doyle and Fischer 1979), and for sorghum, oats and millet crops (Hanks *et al.*, 1968). Linear relations have been developed between accumulated temperature and evaporation with the cumulative biomass production in moong crop (Chakravarty and Sastry 1983). Here an attempt has been made to develop similar relations in pearl millet (*Pennisetum americanum*).

Experiments were carried out during the kharif seasons (June to Oct.) of 1987, 1988 and 1989 on sandyloam soil at research farm of the Haryana Agricultural University, Hisar. Two cultivars of pearl millet, *i.e.*, HHB-50 and MBH-110 were sown under four different dates of sowing, *viz.*, (7 June-D<sub>1</sub>, 26 June-D<sub>2</sub>, 23 July-D<sub>3</sub>, 22 August-D<sub>4</sub>), (3 June-D<sub>1</sub>, 26 June-D<sub>2</sub>, 20 July-D<sub>3</sub>, 12 August-D<sub>4</sub>) and (12 June, 27 June, 15 July, 1 August) during 1987, 1988 and 1989 respectively. All packages of practices recommended for the crop were applied. Dry matter was sampled at

15 days intervals. Sampling unit consisted 50 cm length from two rows randomly selected from three places within each plot. The samples were oven dried and weighed. Daily evaporation values from a class A mesh covered pan evaporimeter and air temperature values from Stevenson screen were collected from observatory near the experimental field. Evaporation value were accumulated over 15 days interval corresponding to the biomass sampling dates. Growing degree-days were accumulated using a-base temperature at 11°C with reference to the mean air temperature recorded.

Highly significant correlations ( $P < 0.001$ ) ranging from  $r = 0.90$  to  $0.96$  were observed between weekly biomass production and accumulated pan evaporation (Table 1) in all the three seasons. Lower correlations ( $0.79$  to  $0.82$ ) were observed in case of pooled data for the three seasons for both cultivars. Yet all were significant at  $P < 0.01$ . This may be due to the fact that the crop having been sown in 1987 and 1989 was subjected to relatively dry and warmer weather conditions [Seasonal rainfall (June to October) 65.1 mm in 1987, 671.3 mm in 1988 and 156.1 mm in 1989 and normal seasonal rainfall is 375.0 mm].

Accumulated heat units over 15 days interval were also found to be significantly correlated for both cultivars and in all three seasons. The correlation coefficients ranged from  $r = 0.91$  to  $0.97$  ( $P < 0.001$ ) (Table 1), whereas for the pooled data for three seasons for both cultivars, were lower ( $r = 0.81$  to  $0.85$ ). Yet still significant at  $P < 0.01$  as was observed in case of accumulated evaporation. Similar results were reported by Chakravarty and Sastry (1983) in moong crop. The correlations were lower in case of pooled data might be due to dry and warm weather conditions in 1987.

TABLE 1  
Correlation and regressions between biomass production gm/m<sup>2</sup> and accumulated heat units H (day °C) evaporation E<sub>o</sub> (mm)

Variety	Years	r	Evaporation	r	Growing degree days
HHB-50	1987	0.90	-139.79+0.48 E <sub>o</sub>	0.91	-142.10+0.24 H
	1988	0.93	-292.11+1.37 E <sub>o</sub>	0.95	-195.63+0.36 H
	1989	0.94	-229.86+1.14 E <sub>o</sub>	0.97	-197.6 +0.42 H
	Pooled	0.82	-133.1 +0.70 E <sub>o</sub>	0.85	-153.38+0.32 H
MBH-110	1987	0.91	-163.51+0.54 E <sub>o</sub>	0.91	-146.88+0.23 H
	1988	0.89	-333.46+1.66 E <sub>o</sub>	0.96	-278.95+0.48 H
	1989	0.96	-241.34+1.23 E <sub>o</sub>	0.96	-206.16+0.46 H
	Pooled	0.79	-118.29+0.46 E <sub>o</sub>	0.81	-161.16+0.30 H

In view of the high correlations obtained under different treatments, irrespective of the seasonal conditions or date of sowing, regression equations were developed between biomass production and accumulated pan evaporation/accumulated temperature. The average threshold values of 190.14 (HHB-50) and 255.2 mm (MBH-110) for the accumulated evaporation and 479.31 (HHB-50) and 526.30 day °C (MBH-110) were observed for the linear relationship to be valid in pearl-millet crop. Viets (1962), Hanks *et al.* (1968) in the case of wheat crop and Chakravarty and Sastry (1983) in moong crop also reported similar type of results. The differences noted in the regression coefficients among the three seasons may be due to contrast weather between 1987 (drought year) and 1988 (moist year).

## References

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