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Short Communication

Monitoring of water requirement satisfaction index for pearl millet

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Pearl millet is the major cereal for grain or fodder in the drier areas of the Indian subcontinent and of both West and East Africa in the tracts having rainfall of 400-500 mm and can withstand drought. The FAO model for agrometeorological crop monitoring and yield forecasting indicates the moisture stress on the crop on the basis of water requirement satisfaction index (WRSI). The model can be effectively used for crop monitoring and yield forecasting for the semi-arid region (More *et al.*, 1991 and Pote, R.B., 1999).

An experiment was conducted during the *kharif* season (1998-99) at College of Agriculture Farm, Pune (18° 32'N lat., 73° 51'E long. and 559 m above MSL) on the medium black soil, clayey in texture and having uniform depth upto 1.0 m and well drained. Two-three seeds were dibbled at an inter row spacing of 45 cm and plant to plant spacing of 15 cm to achieve density of 1,48,000 plant ha^{-1}. Pearl millet genotype namely Shradha (RHRBH-8609) was used. The three sowing dates viz: first (5th July), second (13th July), third (20th July) were used as factorial randomised block design with plot size of 6 x 4.5 m^2.

Nitrogen, Phosphorous and Potassium were incorporated into soil before planting at the rate of 60, 30 and 30 kg ha^{-1} respectively. The data regarding weather parameters were collected from the agricultural meteorological observatory of the station. The crop growth monitoring was carried out through the calculation of water requirement satisfaction indices.

For the first sowing date the crop growing period was 27 to 38 meteorological weeks (MW) with a total rainfall of 508 mm received on 27 rainy days. The highest rainfall of 107 mm in 2 rainy days occurred during 30 MW. The highest water requirement of 31 mm was observed during 34 MW and the lowest of 6 mm during 27 MW. The total water requirement of the crop was 267 mm and the final WRSI under Pune conditions was 97 %. Thus, there was only 3 % reduction in the WRSI.

The total rainfall received during the crop growth period (28 to 39 MW) for second sowing date was 468 mm in 26 rainy days (Table 1). The total potential evapotranspiration was 356 mm for the crop growing period. The highest potential evapotranspiration of 49 mm was observed during the 28 MW; while the lowest of 24 mm was observed during 35 MW. The total water requirement computed was 265 mm and final WRSI was 97 %. The yield observed for this sowing date for the WRSI value of 97 was 1743 kg ha^{-1}, which was

Table 1: Effect of rainfall and WRSI on the yield of pearl millet

Treatment (Sowing date)	Normal rainfall	PET (mm)	Actual rainfall (mm)	No. of rainy days	Water requirement	Excess rainfall over normal (mm)	WRSI (%)	Yield (kg ha^{-1})
5 July 198	368	351	508	27	267	140	97	1872
13 July 198	366	356	468	26	265	102	97	1743
20 July 198	353	339	474	26	263	120	97	1820

less than those for the first and third sowing dates.

The total rainfall received during the crop growth period (29 to 40 MW) for third sowing date was 474 mm in 26 rainy days (Table 1). The total water requirement was 263 mm and the final index calculated was 97 %. The yield for this sowing date was 1820 kg ha^{-1}, which was 52 kg less than the yield of first sowing date.

Rainfall was in excess than normal by 140, 100 and 121 mm for first, second and third sowing date respectively. Within the sowing dates, the differences in actual rainfall were 38, 18, and 20 mm respectively, but WRSI remained at 97% indicating non-stress conditions during the year. The differences in yields of first and second sowing dates were 129 kg ha^{-1}, between second and third sowing dates were 77 kg ha^{-1} and between first and third sowing dates were 52 kg ha^{-1}. Though yield levels reflected actual rainfall received during the season with respect to each date of sowing, being a non-stressed season, results indicate that at WRSI of 97%, pearl millet in Pune region could yield 1743 kg ha^{-1}.

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REFERENCES

More, P.R., Varshneya, M.C. and Bote, N.L. 1991. Agrometeorological crop monitoring for dry regions in Solapur. Proc Nat Seminar Hydrometeorology. MPKV., Res Pub. N0. 8: 18-22.

Pote, R.B. 1999. Validation of FAO model for crop monitoring and yield forecasting for pearl Millet under field conditions. M.Sc. (Agri.) thesis. MPKV, Rahuri. pp 154.