Agric. Res. J. Kerala 28 (1990) : 42 - 44

EXTRACTION PATTERN OF SOIL MOISTURE BY BITTERGOURD (*Momordica charantia* L.) UNDER VARYING IRRIGATION LEVELS

Information on consumptive use and soil moisture extraction pattern is important in deciding the irrigation practices of a crop. Consumptive use of a crop denotes the sum of the quantity of water transpired by it, retained in its tissues, and that evaporated directly from the soil where the crop is growing. The soil misture extraction pattnern shows the relative amounts of moisture extracted by a crop from different depths within the crop root zone.

The present investigation was conducted at the Agronomic Research Station, Chalakudy during 1983 summer season to gather information on consumptive use and soil moisture extraction pattern of bittergourd, a much cherished vegetable grown extensively in summer rice fallows. The soil of the experimental site was loamy sand in texture with bulk density ranging from 1.44 to 1.56 in the 0-90 cm depth of soil column. The field capacity of the soil ranged from 10.2 to 10.8 per cent and the moisture percentage at 15 bar ranged from 3.5 to 3.6 per cent. The ground water table remained 170 cm below the soil surface throughout the growing season. The treatments consisted of three levels of irrigation viz., irrigation at 0.4, 0.8 and 1.2 IW/CPE ratios. The depth of irrigation was 30 mm. The differential irrigation treatments were started only after the initial establishment of the seedlings (20 days after sowing).

The consumpitive use in each case was worked out from the data on soil moisture depletion as suggested by Dastane (1972). Soil samples were drawn from 0-15, 15-30, 30-60 and 60-90 cm depth before and after each irrigation and after the final harvest of the crop, and the relative soil moisture depletion from each soil layer in the root zone was worked out for each irrigation interval. Seasonal consumptive use was calculated by summing up the consumptive use values of each sampling interval. Seasonal and daily consumptive use values, mean daily pan evaporation, and Kc values worked out are presented in Table 1.

The reusults indicated that the consumptive use (seasonal as well as daily) of bittergourd increased with increase in the level of irrigation. The consumptive use values were 321.78 mm, 242.08 mm and 129.15 mm at IW/CPE ratios 1.2, 0.3 and 0.4 respectively. The corresponding Kc values worked out were 0.90, 0.68 and 0.36. It may be presumed that frequent wetting of the soil at higher levels of irrigation enhanced the rate of transpiration and evaporation. Similar observations of increased water use under higher levels of irrigation have been reported by Muktarsingh *et al.* (1968) and Sharma and Parashar (1979).

The soil moisture extraction pattern was determined by totalling the moisture depletion values obtained for ehach irrigation cycle layerwise at the end of the cropping period and expressing it in terms of percentage. The relevant data are portrayed in Fig 1. The

Table 1. Consumptive use, pan evaporation values and Kc values during the growth period of bittergourd

Irrigation levels	Seasonal consumptive use (mm)	Mean daily consumptive use (mm)	Total CPE during the period (mm)	Mean daily pan evaporation (mm)	Kc (Cu/Ep) values
IW/CPE = 0.4	129.15	1.794	356.33	4.949	0.36
IW/CPE = 0.8	242.08	3.362	356.33	4.949	0.68
IW/CPE = 1.2	321.78	4.469	356.33	4.949	0.90.

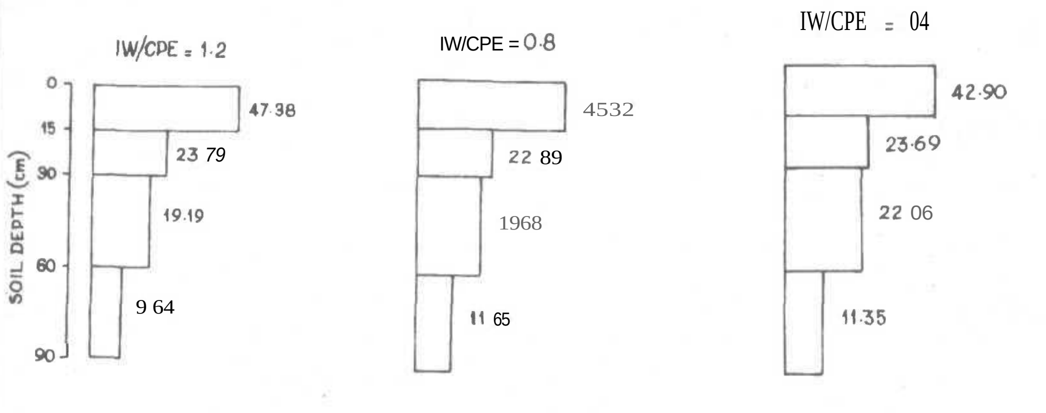

Fig. 1. Soil moisture extraction pattern (%) of bittergourd as affected by irrigation levels

figure shows that the maximum depletion of soil water (42-48%) was from the top 0-15 cm layer, irrespective of the treatment, and then gradually decreased with the increase in soil depth. However, the rate of decrease was more in wetter regimes. The high soil moisture depletion observed from the upper 15 cm layer is due to the occurrence of evaporation from soil surface, besides root absorption and consequent transpiration. The moisture use from 15-30 cm soil layer was as high (22-24%) as that from the next 30-60 cm layer (19-22%). Thus, the top 30 cm alone contributed 66-72 per cent of the total water use. The contributions from 30-60 cm and 60- 90 cm layers were only 19-22 per cent and 10-12 per cent respectively of the total moisture extraction. The results clearly suggest that maximum root activity of bittergourd is in the 0-60 cm, as about 90 per cent of the total moisture extraction is from these layers.

Very little root activity is to be expected beyond 90 cm, as the moisture extraction was rapidly decreasing with the increase in soil depth. A similar observation was made by Loomis and Crandall (1977) in cucumber. Soil moisture extraction pattern is highly influenced by root mass and their activity (Gardner, 1968). With the increase in soil depth, root mass and their activity are reduced, and therefore, less soil moisture extraction forom deeper layers.

Another trend observed was that dry regimes of irrigation extracted more water from the lower soil layers (30-90 cm) when compared to wet regimes, possibily due to the extensive proliferation of root system to utilize soil moisture from deeper layers. Muktarsingh *et. al.* (1968) in potato and Sharma and Parashar (1979) in cauliflower also observed trends similar to the above.

College of Agriculture
Vellayani 695 522
Thiruvananthapuram, India

C. George Thomas
G.R. Pillai

REFERENCES

Dastane, N.G. 1972. *A Practical Manual for Water Use Research in Agriculture.* 2nd ed. Navabharat Prakashan, Poona, p. 120

Gardner, W.R. 1968. Availability and measurement of soil water. *Water Defecits and Plant Growth,* Vol.1 (Ed. Kozlowski, T.T.) Academic Press, New York, p. 367-385

Loomis, E.L. and Crandall, P.C. 1977. Water consumption of cucumbers during vegetative and reproductive stages of growth. */. Am. Soc. hort. Sci.* 102: 124-127

Muktarsingh, Hukheri, S.B. and Singh, N.B. 1968. Response of potato to varying moisture regimes, nitrogen, phosphorus and potassium. *Indian] agric.Sci.* 38: 76-89

Sharma, R.P. and Parashar, K.P. 1979. Effect of different water supplies, levels of N and P on consumptive use of water, water use efficiency and moisture extraction pattern by cayliflower (var. Snow Ball 16). *Indian J. Agron.* 24: 315-321

DD