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MOISTURE DEPLETION PATTERN AND PENULTIMATE DEPRESSION UNDER COST-FREE SURGE IRRIGATION IN SUNFLOWER (II)

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ABSTRACT

Cost-free surge irrigation method was tested involving two amendments of Farm Yard Manure (FYM) and Raw Coconut Fibre Waste (RCFW) @ 12.5 t ha^{-1} in sunflower crop. The cultivar was Co.2 raised with a spacing of 60 x 2 = 30 x 30 cm under double row planting. Cost-free surge irrigation includes waste aluminium sheets of off-set press made into inlet pipes of 52 x 6 cm and placed in the head channel to draw the water. The designed rate of flow was 1 lps and the 'ON-OFF' time was 10 minutes. The study revealed that the available soil moisture (ASM) was higher in the head and gradually decreased upto third sector and again increased in the fourth sector. Available soil moisture status was higher under RCFW as compared to FYM. There was not much difference in depletion pattern between surge and continuous flow. There was a marked reduction in the moisture status in third sector (51-75 M). Under farmers' method the depletion pattern did not vary as compared to surge or continuous flow. Soil moisture depletion was faster during the initial periods and was slowed down during later periods.

KEY WORDS : Surge Irrigation, Penultimate depression, Sunflower

Sunflower is being raised in basin method and basin-furrow method depending on spacing of the cultivar. Surge irrigation is a agronomic compulsion and a dialectical demand to save land, water and labour for many irrigated crops. Surge irrigation is the delivery of water into the furrow intermittently and relatively over short span of time. As compared to the costly automated (Rs. 1,50,000 ha^{-1}) and semi automated (Rs. 75000 ha^{-1}) designs cost-free surge irrigation was evolved and tested in Tamil Nadu Agricultural University, Coimbatore. Cost-free surge involves use of short inlet pipes (52 x 6 cm) made of waste aluminium sheets in the off-set press. These pipes were placed as inlet pipes at the head channel to deliver the water into the furrow and were manually operated. The flow rate was 1 lps (litre per second) per furrow and 4 lps were applied for four furrows at a time for surge as well a continuous flow under the conditions of the experiment. Buffer strips were maintained to overcome the inter-furrow effect on the moisture status of the soil. Besides recording other characters and water front advance, moisture status was recorded at periodical interval to study the soil moisture depletion pattern at different stages of the crops. The soil moisture depletion pattern is the cardinal factor to decide the usefulness of an irrigation method. Soil moisture depletion pattern in relation to irrigation method, amendment, and sector at selected three irrigations is presented in the present paper in view of economy even though six irrigations were given for the crop and data available.

MATERIALS AND METHODS

Field experiment were taken up during February to May 1996 at Eastern block of Tamil Nadu Agricultural University. A detailed account of the experiments were presented in the previous paper. Soil moisture sampling was done after every irrigation including soil sampling before next irrigation. The periodicity was two days starting from two days after irrigation. Soil sampling was done to a depth of 0-30 cm with the help of soil auger and collected into aluminium cup. Moisture was estimated by oven dry method. The soil moisture content was presented as available moisture taking into consideration the field capacity of 24 percent and permanent willing point of 10 percent. These two soil moisture constants were estimated with the help of pressure plate apparatus. The bulk density was 1.46 cc g^{-1} estimated by brass ring method. The data on moisture depletion for third, fifth and sixth irrigations are presented for the first crop only out of two season crops raised.

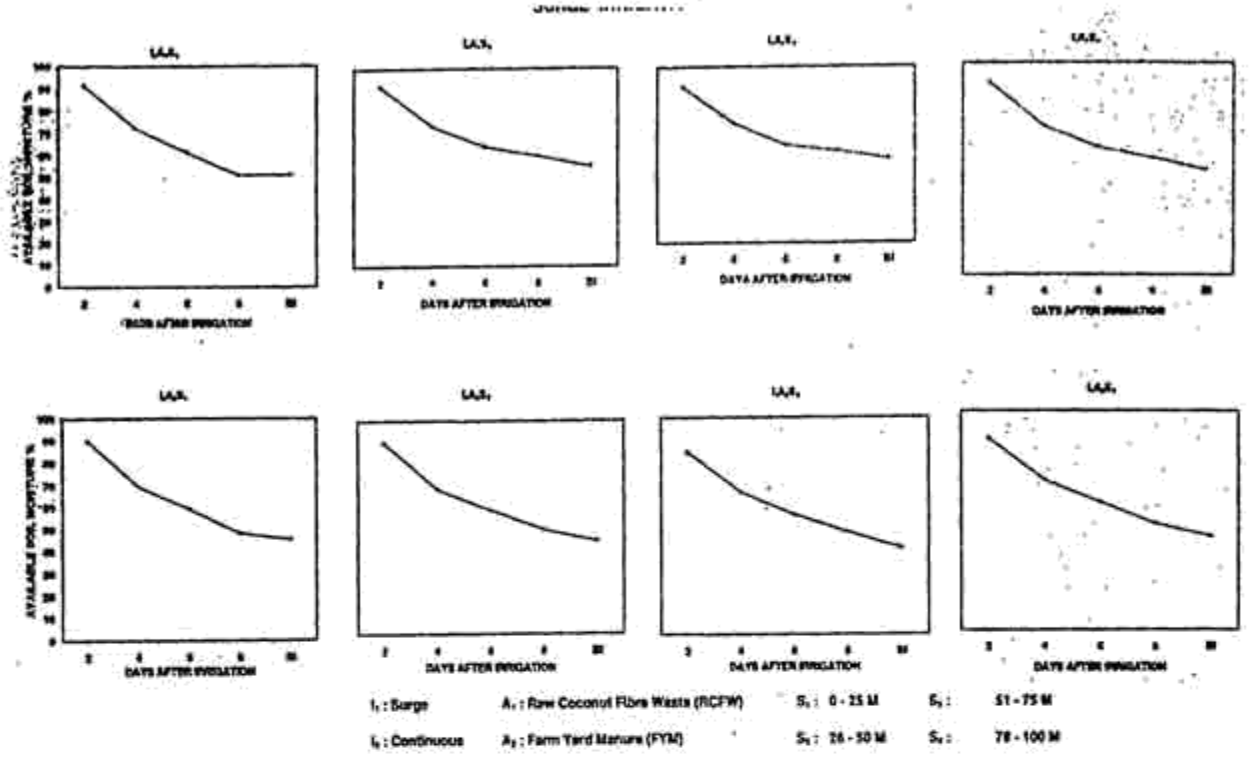

Fig. 1. Moisture depletion in relation to irrigation methods and amendment Surge-Irrigation Cycle III

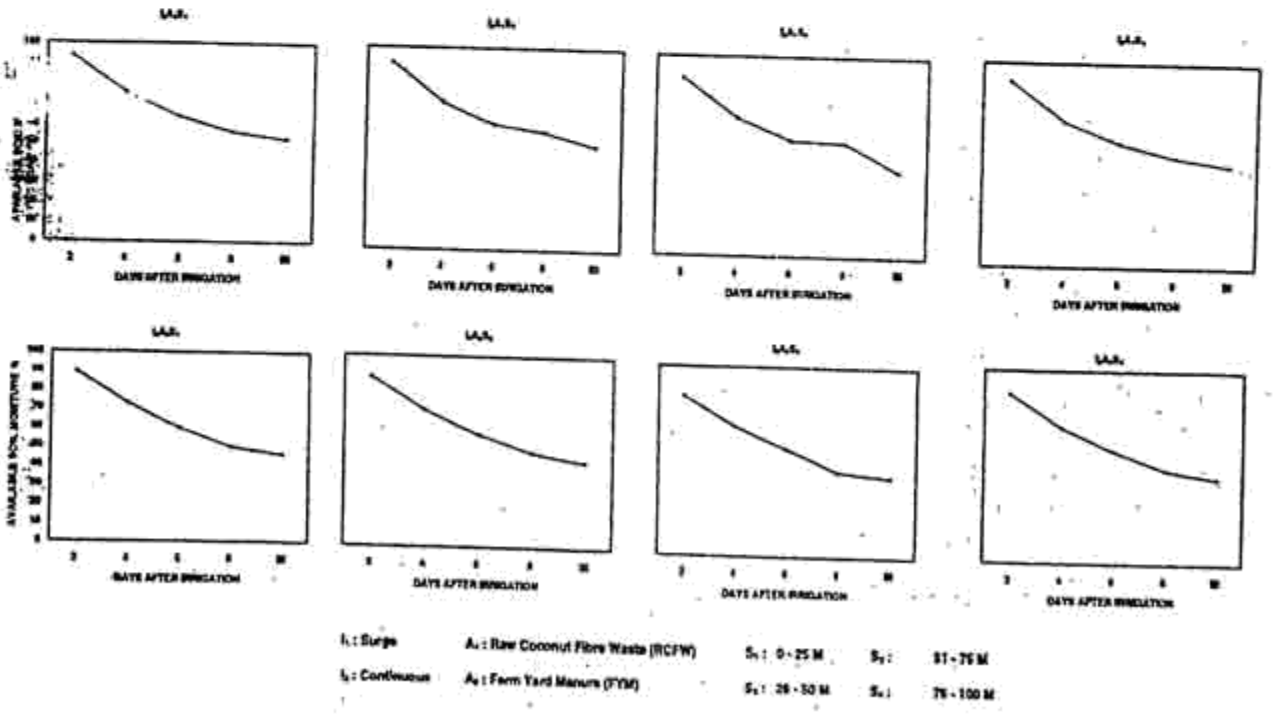

Fig. 2. Moisture depletion in relation to irrigation methods and amendment Continuous-Irrigation Cycle III

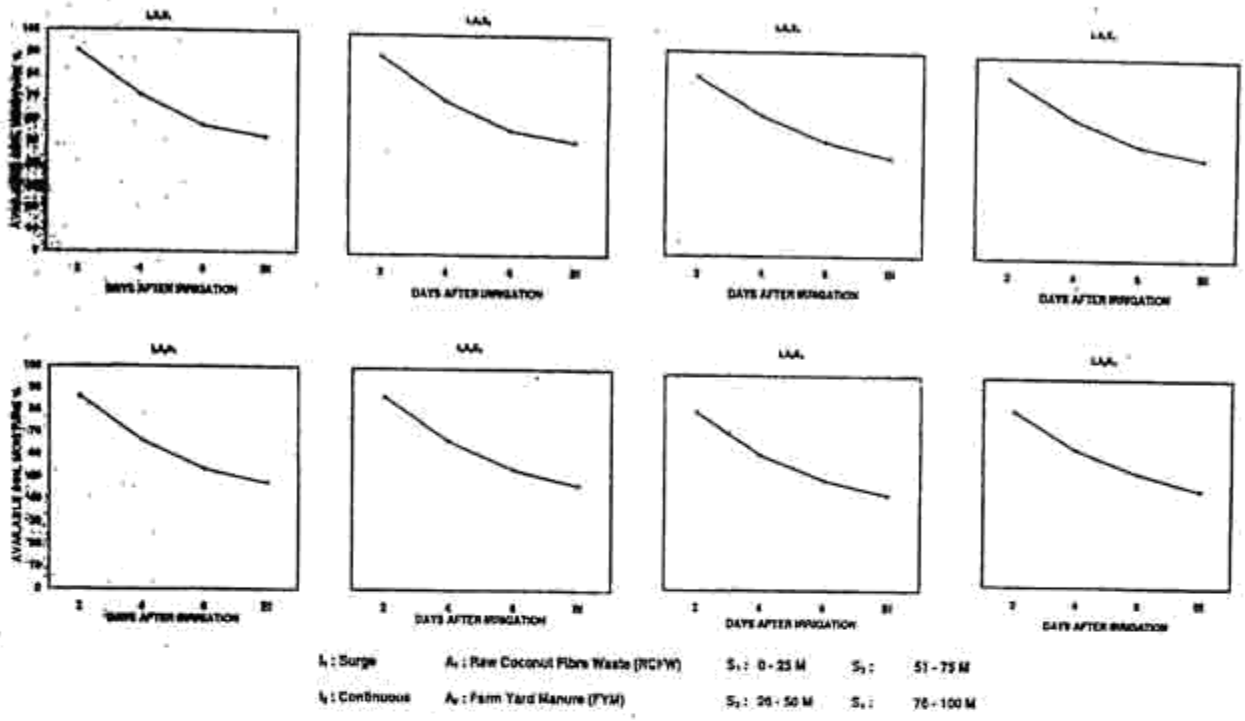

Fig. 3. Moisture depletion in relation to irrigation methods and amendment Surge-Irrigation Cycle V

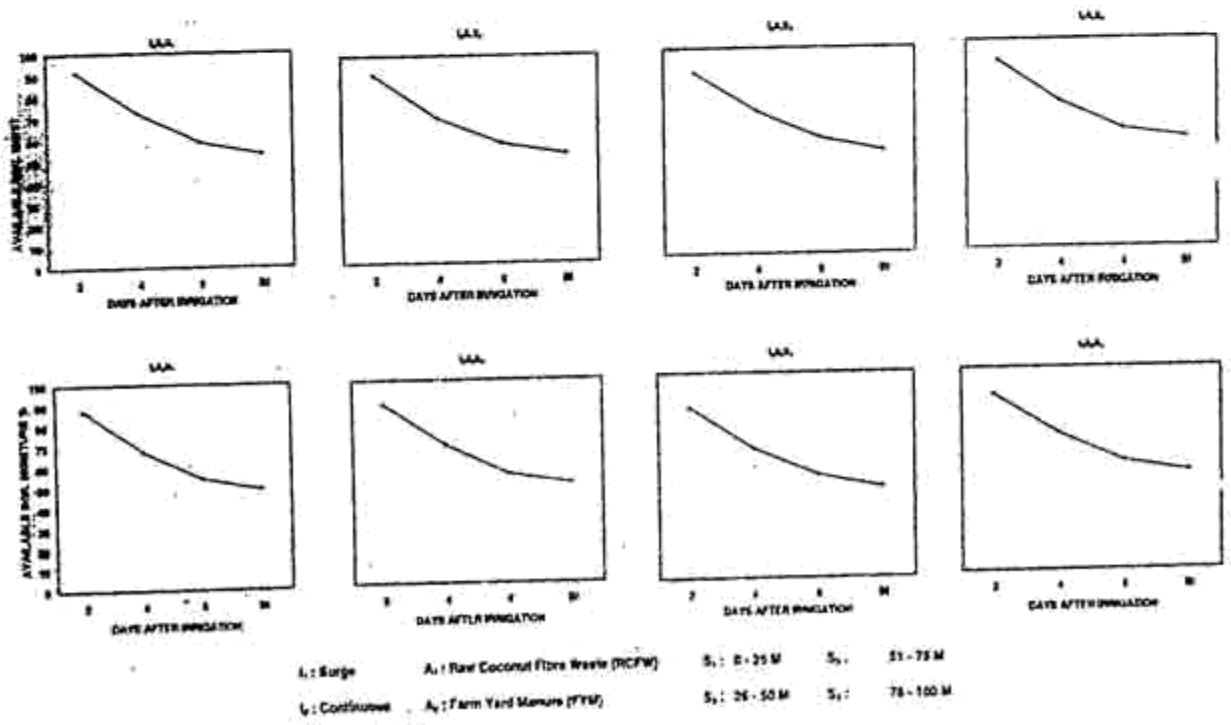

Fig. 4. Moisture depletion in relation to irrigation methods and amendment Continuous-Irrigation Cycle V

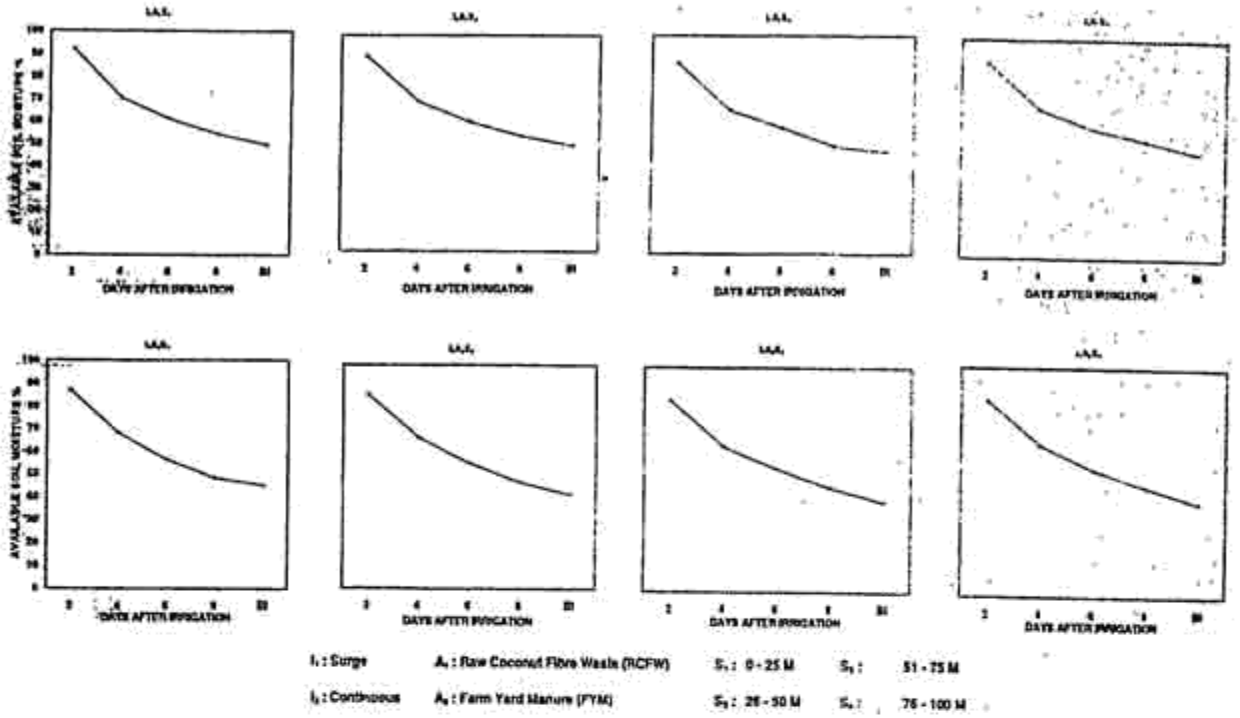

Fig. 5. Moisture depletion in relation to irrigation methods and amendment Surge-Irrigation Cycle VI

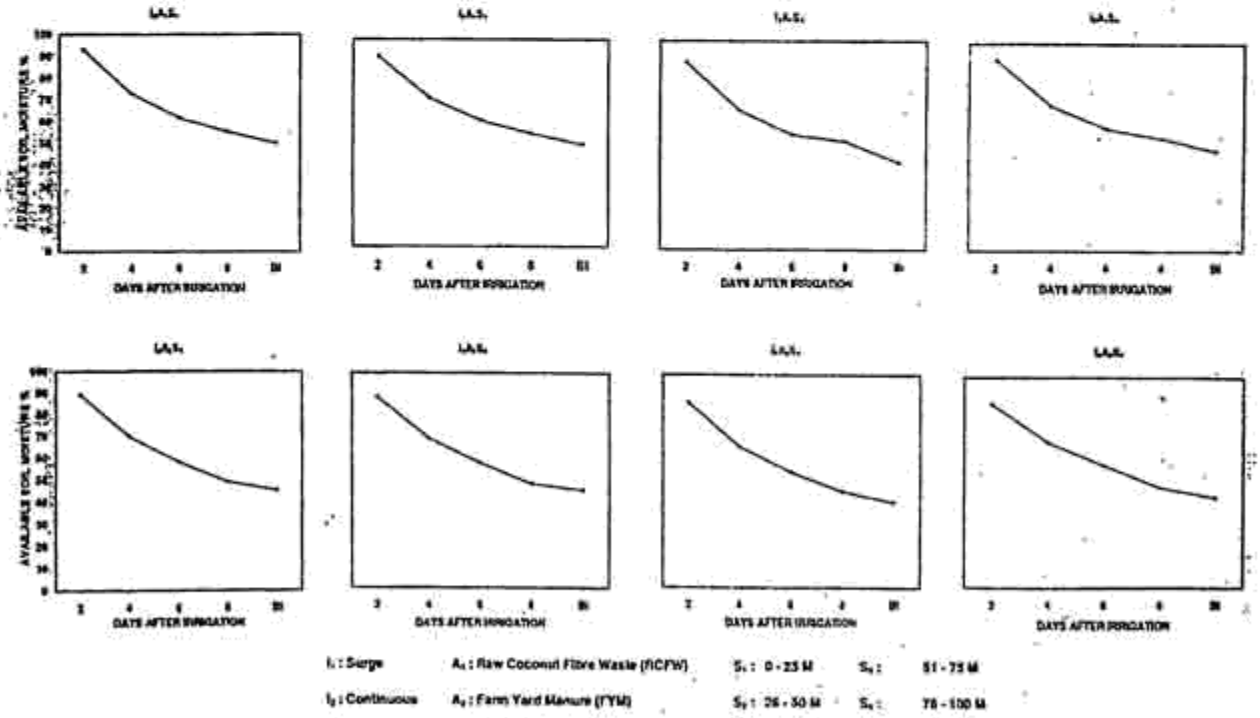

Fig. 6. Moisture depletion in relation to irrigation methods and amendment Continuous-Irrigation Cycle VI

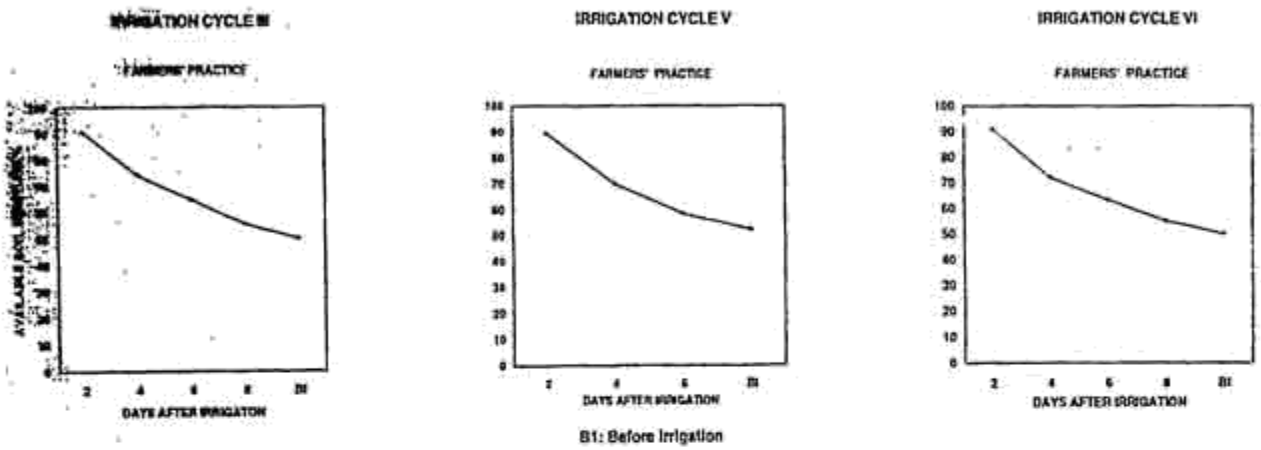

Fig. 7. Moisture depletion in relation to irrigation methods

RESULTS AND DISCUSSION

Soil moisture depletion pattern (Figures 1-7) studies showed that there was not much difference between surge flow and continuous flow (Data on depletion and available moisture are not presented). On comparing the two amendments, RCFW treatment recorded higher moisture status at different intervals. FYM treatment either under surge or continuous flow registered relatively lesser moisture status. Out of four sectors there was higher moisture status at the first sector. It gradually decreased and the decrease was very marked at third sector (51-75 M). There was significant decrease in available soil moisture status under third sector (51-75 M) under both the irrigation methods and both the amendments. This is termed as 'penultimate depression' and was recorded by Dhanapal (1996) in maize under surge and continuous flow.

It was found that surge flow resulted in water economy and continuous flow resulted in high water requirement. Inspite of higher quantum of water consumed under continuous flow there was not much difference in the available soil moisture status possibly due to evapo-transpiration and lack of precision in sampling to a depth of 0-30 cm. The soil was heavy textured as seen from textural classification, field capacity, bulk density and the vertisol type and hence infiltration was not varying much between the surge flow and continuous irrigation.

With reference to the amendments RCFW recorded higher available moisture status possibly due to high moisture retentive capacity. It is interesting that this trend was seen through out the crop period. Rangaraj (1991) also reported higher moisture status due to RCFW. In surge study in maize Dhanapal (1996) also reported similar results.

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