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Irrigating Groundnut by Upward Flow Through Soil Capillary in Pots

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Irrigation has been scheduled by considering soil water to be in a reservoir, subject to depletion by evapotranspiration (ET) and to replenishment by irrigation and precipitation. Upper limit of plant available water has been taken as that retained by the soil a few days after irrigation and referred to in general terms as field capacity. Deep drainage losses often have been ignored under the assumption that at field capacity, further drainage losses are negligible. However, it has been shown that soils will drain for many days after irrigation (Robins *et al.* 1954; Ogata and Richards, 1957; Wilcox, 1959; and Miller, 1967). Soluble nutrients and other chemicals applied to or contained in soil may be dissolved by water and leached from the soil profile by percolating water (Mackenzie and Viets, 1974).

Summer cultivation of groundnut has opened new vista for farmers in Gujarat. Water requirement of the crop is met by well irrigation. Potentiality of wells in most of the areas particularly those of Saurashtra is not enough to bring more acreage under cultivation. It is known that immediately after irrigation large amount of water loss occurs through evaporation before soil water reaches at field capacity (Miller and Arstad, 1973). To overcome the problems of nutrient losses in drainage water, and to prevent water loss in deep percolation and evaporation from free water surface, an attempt has been made in the present investigation to explore the feasibility of new technique of irrigating the groundnut.

Greenhouse experiment was conducted using big iron pots (30 cm diameter and 42.5 cm height) in the year, 1978. Pots were filled up with medium black clayey soil. Two plants of groundnut (Variety GAUG-1) were maintained in each pot. Crop was fertilized with 25 kg N/ha, 50 kg P_2O_5 ha and 25 kg K_2O/ha in form of urea, diammonium phosphate and potassium chloride, respectively, before sowing. The treatments were studied viz., (i) moisture content of soil was kept in the range of zero to-0.5 bar soil-water potential by applying water on the surface of soil based on soil moisture tension curve, (ii) water was supplied to the crop from bottom of the pots. A polythelene pipe of 1.5 cm diameter

was connected at the bottom of the pots and another end of the pipe was dipped in water reservoir such that tube could work as syphon. A particular level of the water in the reservoir was mantained based on capillary potential of the soil which was determined by separate experiment. This arrangement supplied water to the root zone of the crop.

Crop was replicated three times and average growth parameter viz., leaf area, straw yield, root dry weight, total pegs, total flowers and depth of penetration of root are reported in Table 1.

TABLE 1

Influence of two methods of irrigation on growth of groundnut.

S.N.	*Parameters*	*0 to 0.5 bar*	*Upward flow*
1.	Leaf area (cm^2/pot)	6394.70	7169.95
2.	Straw yield (g/pot)	49.53	61.43
3.	Total flowers	97	116.33
4.	Total pegs	74.67	110.33
5.	Root weight (g/pot)	3.27	3.66
6.	Root penetration (cm)	26.17	36.83

Water supplied to the crop by upward flow through capillaries produced 11 per cent higher leaf area than the treatment of 0 to 0.5 bar. Effect of this leaf area was noted on haulm yield of groundnut. The haulm yield was 25 per cent higher with upward flow treatment than the yield of 49.53 g/pot obtained under 0 to 0.5 bar treatment. During flowering period of 80 days of the crop, upward flow treatment produced 116 flowers whereas 97 flowers were reported in case of 0 to 0.5 bar treatment. It was observed that at least 60 per cent flowers were opened during the first 40 days period of flowering, which could have contributed for initiation of effective pegs. As regards to the total number of pegs are concerned, out of total 116 flowers, 110 pegs were emerged under upward flow treatment; thus only 6 flowers were degenerated. Similar calculation for the treatment of 0 to 0.5 bar revealed that as many as 23 flowers were unable to produce pegs. Eventhough the moisture status of both treatments was considered to be an optimum as far as its availability is concerned; still however, upward flow treatment maintained good record of all growth parameters. One of the probable reason, which could be assigned for such differences is that the depth of penetration of root was 36 cm under upward flow treatment, which was atleast 10 cm deeper than that of 0 to 0.5 bar. This extra 10 cm depth of roots explored more volume of soil. Consequently greater amount of nutrients were available from the larger volume of soil than the treatment of 0 to 0.5 bar; which was also supported by higher dry weight of root under upward flow treatment. Secondly, as a result of upward flow of water, soluble nutrients present in deeper part of the soil were also made available to rhizosphere. It appears that more availability of free water and greater nutrient absorption from a soil might have contributed for better

growth under the treatment of upward flow through capillary.

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