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Irrigation scheduling of capsicum under scarcity conditions

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ABSTRACT

The increasing global demand for food and other agricultural products calls for urgent measures to increase crop production per unit land used and per unit of water applied. The reported study was carried out at the College of Forestry and Hill Agriculture, Hill Campus, Ranichauri, Uttarakhand, India. Soil moisture content was measured using gravimetric method periodically in 0-15, 15-30, 30-45, 45-60 and 60-90 cm soil profiles. Field experiments were conducted on capsicum crop (*Capsicum annum* var. grossum) during 2003-04 and 2005-06. The crop was transplanted either in May or June and was harvested in September spanning 100 and 99 days, respectively. Five irrigation treatments were maintained based on the maximum allowable depletion (MAD) of available soil water. The treatments were 10% (T_1), 30% (T_2), 45% (T_3), 60% (T_4) and 75% (T_5) maximum allowable depletion of available soil water. No water stress was maintained at the initial stages of tile crop development in order to allow the plants attain a healthy growth. Field experiments revealed that irrigation schedule with 45% maximum allowable depletion of available soil water gives the maximum water use efficiency for capsicum crop. It was found that for scheduling of irrigation for capsicum crop 0-30 cm soil profile should be considered as most of the water was found to be extracted from this layer by the plant.

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Currently there are about 250 million hectares of irrigated land worldwide, most of which utilizes surface irrigation. Although irrigated land constitutes only 17% of the total agricultural land, it produces 36% of the world's total food requirement (Kashyap and Panda, 2002).The water requirement varies widely from crop to crop and also during the period of growth of individual crop (Doorenboss and Pruitt, 1977). In case of situations where water supply is limited, the irrigation demand of the entire cropping pattern can not be met fully. In these conditions, deliberate under irrigation, also known as deficit irrigation can play a major role (Iqbal *et al*., 1999). By deficit irrigation, crops are purposefully under irrigated during plant growth stages that are relatively insensitive to water stress as regards to the quality and quantity of the harvestable yield (Musick, 1994) Identifying growth stages of a particular cultivar under local conditions of climate and soil fertility allows irrigation scheduling for both maximum crop yield and most efficient use of scarce water resources (Doorenbos and Kassam, 1979).

Capsicum is one of the most popular crop throughout the world. Present production in India is about 42,000 tones from 5500 hectares (http://www.fao.org., 2006). It thrives well in all soil textures that have good internal drainage. It is relatively sensitive to soil water deficits. Capsicum needs frequent irrigations for its good growth and Yield (Rangarajan, 2000)

With these background considerations a comprehensive field investigation was undertaken on a silty clay loam soil at the experimental fields of Agricultural Engineering Section, Hill Campus, Ranichauri. The experimental crop cultivar *Bharat* of capsicum was selected, which is a popular variety of the region. The effects of various scheduling of irrigation on the profile soil water status, crop yield and water use efficiency were studied. Irrigation schedules were based on 15, 30, 45, 60 and 75% maximum allowable depletion (MAD) of available soil water (ASW). The major goals of the study were to investigate the effect of scheduling of irrigation on profile soil water status, yield and water use efficiency of capsicum crop.

METHODOLOGY

The reported study was carried out at the experimental field of the Agricultural Engineering Section, College of Forestry and Hill Agriculture, Hill Campus, Ranichauri, Uttarakhand, India. The field is located on a sloping terraced land situated at an altitude of 1850 m above mean sea level. Ranichauri is intersected by 30^0 18' N latitude and 78^0 24' E longitude. The local climate is sub-humid intemperate zone with an average rainfall of 1240 mm concentrated over the months of June to September. During both crop experiments, the temperatures were generally moderate and suitable for the growth of capsicum crop. The physical properties of the soil of experimental crop field used for capsicum crop are given in Table 1.

Field experiments were conducted on capsicum