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RESPONSE OF SUNFLOWER TO FURROW IRRIGATION IN ARID REGION OF NORTHERN INDIA

C.B. SINGH, M.S. BHULLAR AND C.J.S. SINGH

See end of article for authors' affiliations

Correspondence to :
C.B. SINGH
Department of Soils,
Punjab Agricultural University,
LUDHIANA (PUNJAB)
INDIA

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ABSTRACT

Field studies were conducted for two years at the Regional Station Farm, Bathinda, to study the effects of furrow construction timing (at sowing and after second irrigation) and irrigation to each and alternate furrows as compared to flood method of irrigation on water saving and yield of sunflower. The treatments consist of flood irrigation (FLD), each furrow irrigation (EF); furrows formed at sowing (EFS) and after second irrigation (EFA), likewise AFS and AFA for alternate furrow irrigation, were laid out in quadruplicate in randomized block design. Irrigation water saved as compared to FLD was 7.3 cm for EFA, 9.9 cm for EFS, 16.9 cm for AFA and 19.8 cm for AFS. As compared to FLD, EFS, AFA and AFS reduced the grain yield of sunflower by 10.5, 5.5 and 20.0 per cent, while, EFA produced 8 per cent more yield. AFA seems to be feasible in a cool season, while, EFA, in a dry season could improve water use efficiency and productivity as compared to FLD under water scarce contingencies in this hot and dry region. The evaluation of the technology on farmers' fields revealed that it could be adopted fruitfully by adjusting the available discharge.

Key words : Sunflower, Furrow, Irrigation, Water use efficiency.

Crop diversification is necessary for a sustainable agriculture in the Punjab State. Therefore, sunflower cultivation has picked up in the recent years. However, the spring season is most suited for assured crop and high yield (Gill, 2006 and Singh *et al.*, 2004). A harsh environment occasionally accompanied by canal closures during critical growth stages is likely to adversely affect the crop yield (Unger, 1983; Connors *et al.*, 1995). So there is need for a balance between pre-and post- an thesis water supply and growth in the development and realization of yield. Contrarily, canal water remains inadequate in the southwest part of the state because of under groundwater. Thus it is a major challenge to ensure high crop yields and water use efficiency.

Irrigation water can be conserved either through optimal irrigation schedules (Unger, 1983) or through an efficient irrigation system. Alternate furrow irrigation has been shown to conserve water without affecting the yields of cotton and gobhi sarson in the region (Aujla *et al.*, 1991 and 1992). The present investigation was undertaken to study the response of sunflower to the time of furrows construction and irrigation therein.

MATERIALS AND METHODS

The location characteristics of the study site have been described earlier (Singh *et al.*, 2001). The methods of irrigation compared in quadruplicate randomized block design were, FLD – flood irrigation; EFA – irrigation to each furrow constructed after second irrigation; AFA- irrigation to alternate furrow constructed as under EFA; EFS- irrigation to each furrow constructed at sowing; AFS- irrigation to alternate furrow constructed as under EFS. The furrows were constructed manually using spade. Sunflower (*Helianthus annuus* L.) cv. MSFH-8 was sown in 65 m^2 plots after a pre sowing irrigation in the last week of January and second week of February during 1st and 2nd year, respectively. Inter row spacing was 60 cm and plants were spaced at 30 cm under each treatment. In both years 40 kg N and 90 kg P_2O_5 ha^{-1} were broadcast during preparatory tillage before planting. Another 40 kg N ha^{-1} was broadcast in the first week of March. The crop was irrigated with a stream of 20 L s^{-1}, measured with a 15 cm parshall flume (Hansen *et al.*, 1980). The mean irrigation time and wetted area of growing seasons are given in Fig. 1 and 2.

Soil moisture was determined thermogravimatrically at 15 cm increments to 30 cm depth and 30 cm increments thereafter to 180 cm depth at sowing, before and after each irrigation and at harvest during both years. The water expense of the crop was calculated as the sum total of