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## Effect of Various Irrigation Frequencies on the Yield and Yield Components of Sunflower

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### Abstract

The effect of irrigation frequencies i.e. 0, 2, 4, 6 and 8 was studied at the Faculty of Agriculture, Gomal University, Dera Ismail Khan, during the year 1995. The parameters like plant height, head diameter, number of grains per head, 1000-grain weight and grain yield per hectare were significantly affected by irrigation levels and six irrigations were found optimum for obtaining good yield of sunflower. On the basis of research findings, six irrigation are recommended for sunflower crop to obtain maximum seed yield under irrigated conditions.

### Introduction

Sunflower (*Helianthus annuus* L.) is considered to be the most important oilseed crop of the world due to its wide range of adaptability and highest seed oil contents ranging from 40-50 percent. Research trials show that the soil and climatic conditions of Pakistan are quite suitable for the cultivation of sunflower. Moreover, it is a short duration crop and can be grown twice a year successfully. During 1991-92, in Pakistan oil seed crops were grown on 523000 hectares (2% of the total cropped area), while the edible oil requirement of the country was 1262 thousand tonnes and domestic production was only 338 thousand tonnes which was 30 percent of the total requirement (Anonymous, 1992). Pakistan imported edible oils worth Rs. 10025.2 million during 1991-92 (Hatim and Abbasi, 1994). Since water serves as a medium for nutrient absorption by the plants, its availability in proper quantity at various growth stages affects both the yield and chemical composition of the produce. Thus for each of the cultivated crop to realise its full economical yield, irrigation is one of the major factors of crop production. Sunflower is generally considered drought resistant but the water requirements of this crop are higher than for other crops (Hatim and Abbasi, 1994). Application of six irrigation is economical for getting higher production of sunflower (Saeed, 1997).

So, it has been contemplated in this study to explore the effect of irrigation frequencies for obtaining maximum yield of spring sunflower crop under the agro-climatic conditions of Dera Ismail Khan.

### Materials and Methods

The study was undertaken at the Faculty of Agriculture, Gomal University, Dera Ismail Khan, during the year 1995. The experiment was laid out in randomized complete block design with three replications keeping a net plot size of (3 × 5 m<sup>2</sup>). The experiment comprised the irrigation frequencies as follow:

Treatment	Number of irrigations
T <sub>1</sub>	No irrigation (Control)

T <sub>2</sub>	Two irrigation
T <sub>3</sub>	Four irrigation
T <sub>4</sub>	Six irrigation
T <sub>5</sub>	Eight irrigation

The crop was sown 60 cm apart in rows using hand driven plough on a well prepared seed bed. The recommended seed rate of 6 kh ha<sup>-1</sup> of variety Cargill-204 was used. Nitrogen at the rate of 85 kg ha<sup>-1</sup> in the form of urea was applied in two splits. Phosphorous was applied as a basal dose at 60 kg ha<sup>-1</sup> in the form of single super phosphate. Plant to plant distance of 25 cm was maintained at the time of second hoeing. Thinning and earthing up was done 3 weeks after sowing when the plants attained and earthing up was done 3 weeks after sowing when the plants attained height of 40-50 cm. All other recommended cultural practices were followed uniformly. First irrigation was applied to all the treatments except control about 30 days after sowing and after that irrigation intervals were scheduled accordingly.

The data were analysed statistically by using analysis of variance techniques (Steel and Torrie, 1980) and Duncan's Multiple Range Test at 5% level of significance was applied compared the difference among treatment means.

### Results and Discussion

**Plant Height (cm):** The data presented in Table 1 revealed that the taller plants (144 cm) were produced by T<sub>4</sub> followed by T<sub>5</sub> (139), T<sub>3</sub> (127) and T<sub>2</sub> (116 cm) respectively. Shortest plants (107 cm) were obtained from control plot (T<sub>1</sub>). Karami (1987) recommended six irrigation and observed that with increasing irrigation levels from six, the plant height of sunflower was decreased.

**Head Diameter:** The data on head diameter showed that the maximum head diameter (16 cm) was recorded in T<sub>4</sub> followed by T<sub>5</sub> (15), T<sub>2</sub> (14) and T<sub>3</sub> (13 cm) respectively (Table 1). The lowest mean value (11 cm) was observed in control plot (T<sub>1</sub>). Similar findings were also reported by Saeed (1997).

**Bakhsh *et al.*: Sunflower, *Hehanthus annuus*, Irrigation, Yield**

Table 1: Plant height (cm), Head diameter (cm), Seeds per disc, 1000-grain weight (g) and Grain yield (kg ha<sup>-1</sup>)

Treatment	Plant height (cm)	Head diameter (cm)	Seed per disc	1000-grain (g)	Grain yield (kg ha <sup>-1</sup> )
T1 No irrigation (control)	107c	11c	547c	20c	336c
T2 Two irrigation	116c	14ab	833ab	24b	711b
T3 Four irrigation	127b	13c	752bc	26b	1011a
T4 Six irrigation	144a	16a	992a	33a	1133a
T5 Eight irrigation	139a	15ab	830ab	31a	1122a

Means not sharing a letter in common differ significantly at 5% level of probability

**Number of grains per disc:** Maximum grains per disc (992) were obtained by T4 (992). As regards other treatments, T2 produced 883 number of grains per disc, T5 (830) and T3 (752) respectively. The seeds produced by control plot were minimum (547). Mehar (1989) recorded good plant height, number of grains per disc and grain yield by giving six irrigation to sunflower crop.

**1000-grain weight (g):** It is also revealed that heavier seed weight (33 g) was produced by T4 (six irrigation). As far as the other treatments are concerned, T5, T3 and T2 produced seed weight of 31, 26 and 24 g respectively. The control plot produced minimum grain weight (20 g). These findings are supported by Saeed (1997) who suggested six irrigation for getting higher production of sunflower.

**Grain yield per hectare:** Among the treatments, T4 produced the highest grain yield (1133 kg ha<sup>-1</sup>). It was followed by T5 (1022 kg ha<sup>-1</sup>), T3 (1011 kg ha<sup>-1</sup>) and T2 (711 kg ha<sup>-1</sup>), respectively. Lowest yield of 336 kg ha<sup>-1</sup> and T2 (711 kg ha<sup>-1</sup>), respectively. Lowest yield of 336 kg ha<sup>-1</sup> was recorded in T1 (control). These findings confirm the results reported by Alessi *et al.* (1977) and Saeed (1997), who observed that maximum yield was obtained from sunflower by the application of four irrigation during autumn and six irrigation during spring season.

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The correlation results showed that the seeds number per head was main yield components associated to seed yield when sunflower plants were grown under the full-irrigated and extreme water deficit. The results showed that the Euroflor and Allestar hybrids had highest seed yield in full and limited irrigation condition, respectively. The correlation results showed that there was a high, positive and significant correlation among seed yield and CAT in water irrigation deficit condition. Moreover, the GPX and CAT content can be used as a drought tolerance index to selection tolerant genotypes und