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Plant Population of Sunflower under Different Planting Dates

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Abstract: Plant Population studies under different sowing dates were undertaken on sunflower at the Agricultural Research Institute Tarnab, Peshawar, during spring 1998. Sunflower hybrid ARITAR-93 was planted on the first of January, February, March and April, using 44444, 88889, 111000 and 222000 plants per hectare. The experiment was laid out in RCB design with split plot arrangement having four replications. Results indicated that there was no significant effect of plant population on days to 50% flowering and days to maturity of sunflower, while plant height increased and head diameter decreased significantly with the increase in plant population. The maximum grain yield of 2366 kg ha⁻¹ was given by the plant population of 111000 plants ha⁻¹. Days to flowering, days to maturity, plant height and head diameter decreased significantly with delay in sowing from first January, to first April. The best results were obtained when the crop was planted on first January (2290 kg ha⁻¹) followed by first February (2287 kg ha⁻¹).

Key words: Sunflower, plant population, planting dates, yield and yield components

Introduction

Sunflower is a non-traditional oilseed crop. It is a temperate crop, but is adaptable to wide range of climatic conditions. It thrives on nearly all types of soils provided they are well drained. Acidic and saline soils are not desirable, though it can tolerate a pH range from 6.5-8.0 (Hatam and Abbasi, 1994). During 1997-98 Sunflower was grown on an area of 6763 hectares in 4WFP which produced 8403 tones. In the same year total area under Sunflower cultivation in Pakistan was 98450 hectares which produced 129693 tones. (Anonymous, 1998).

Belevtsev *et al.* (1990) reported that the sowing date at which soil temperature was 10.12°C gave more yield as compared to the sowing date at which the soil temperature was 14-16°C.

Shafiullah *et al.* (1992) reported that days to maturity decreased when the crop was sown on April 1, as compared to March 1.

In spite of the large areas of deep soils, favorable topography, water wealth and suitable climatic conditions of Pakistan, the per acre yield of Sunflower is still very low as compared to other countries of the world. Its yield is 130D kg ha⁻¹ (Anonymous, 1998) which is very low as compared to other agriculturally advanced countries. Sunflower yields in France and USSR are 2595 and 1439 kg ha⁻¹ respectively (FAO, 1989). The present research work was designed to find out the most suitable plant population for sunflower under different planting dates.

Materials and Methods

In order to study the effect of different plant population on the yield and yield components of sunflower under different planting dates an experiment was conducted at the Agricultural Research Institute, Tarnab, Peshawar, during spring, 1998. The experiment was laid out in RCB design with split plot arrangement having four replications. Planting dates were allotted to main Welts while plant population treatments were allotted to sub plots. A treatment size of 4.5 × 5 m² was used.

Sowing was accomplished on the following dates:

D1: 1-1-1998 D2: 1-2-1998
D3: 1-3-1998 D4: 1-4-1998

The following plant population was studied

	Row to Row Distance (cm)	Plant to Plant Distance (cm)	Plant population ha ⁻¹
P1	75	30	44444
P2	56,25	20	88889
P3	45	20	111111
P4	45	10	222222

Sunflower hybrids ARITAR-93 was planted on proper moisture condition. Planting was done by dibbling two seeds per hill, and thinned to one plant per hill at 2 to 4 leaves stage. Standard agronomic practices were followed through out the growing period. Data were recorded on Days to 50% flowering, Days to maturity, plant height (cm), Head diameter (cm) and Achene yield (kg ha⁻¹) and analyzed statistically.

Results and Discussion

Days to 50% flowering: Mean Table 1 indicated that there was no significant effect of plant population on days to 50% flowering while dates of sowing significantly affected days to 50% flowering. Maximum days to flowering (114.2) were recorded in January 1, sowing which decreased with delay in sowing and minimum 65.00 days to flowering were observed in April sowing. Almost similar results were reported by Lupu *et al.* (1990) and Shafiullah *et al.* (1992).

Table 1: Days to 50% Flowering of sunflower hybrid ARITAR-93 as affected by different plant population and sowing dates

	P1	P2	P3	P4	Mean
D1	114	114	114	114	114.2 ^A
D2	93	93.5	93	93	93.31 ^B
D3	76	76	76	76	76.00 ^C
D4	65	65	65	65	65.00 ^D
Mean	87	87.12	87.12	87.25	

LSD value at alpha = 0.05 = 0.02312

Days to maturity: Plant population had no significant affect on days to maturity of Sunflower while days to maturity were significantly affected by planting dates (Table 2).

Days to maturity decreased when sowing was delayed from January 1 to April 1. Maximum days to maturity (150.9) were recorded in the January planted crop while minimum

Table 2: Days to maturity of sunflower hybrid ARITAR-93 as affected by different plant population and sowing dates

	P1	P2	P3	P4	Mean
D1	151.25	151.00	150.50	151.00	150.9 ^A
D2	125.00	125.25	125.25	125.25	152.2 ^B
D3	104.75	105.00	106.00	105.00	104.9 ^C
D4	93.00	93.00	93.00	93.00	93.0 ^D
Mean	118.00	117.00	118.00	116.00	

LSD value at alpha = 0.05 = 0.2585

(93) were recorded in the April sown crop. This shows that lower temperature delays maturity. Days to maturity in sunflower are therefore, effected by the environmental conditions in different months of the year. Period of maturity is shortened when the temperature is higher and therefore, the requirements of degree days are met earlier than those of cooler months. It was probably also the main reason for variation in plant height on different planting dates. Thompson and Heenan (1994) also reported similar results.

Plant height (cm): Plant height increased with the increase in plant population and the maximum height of 117.8 cm was given by the plant population of 222222 plants ha⁻¹. The increase in plant height with the increase in plant population may be due to greater competition for light. Plant height was also significantly affected by Planting dates (Table 3). The maximum plant height (142.3 cm) were recorded in the January sown crop while the minimum (96.75 cm) were recorded in April sown crop. These increase and decrease in Plant height was probably because of temperature fluctuations and photoperiod. These results are in line with the findings of Swallers and Fick (1973) who reported increase in plant height with increase in plant population and Shafiullah *et al.* (1992) who reported decrease in plant height with delay in planting.

Table 3: Plant Height (cm) of sunflower hybrid ARETAR-93 as affected by different plant population and sowing dates

	P1	P2	P3	P4	Mean
D1	138.56	139.5	141.75	149.50	142.3 ^A
D2	100.50	111.5	108.75	108.50	107.3 ^B
D3	92.75	101.5	114.50	117.00	106.4 ^B
D4	90.75	104.0	96.00	96.25	96.75 ^C
Mean	105.110D	114.1C	115.20B	117.6A	

LSD value at alpha = - 0.05 = 7.611

LSD value at alpha = 0.05 = 1.049

Head diameter (Cm): Results presented in Table 4 reveal that head diameter was significantly affected by plant population and sowing dates. Maximum head diameter of 19.06 cm was recorded in the plots where minimum plant population was maintained while head diameter decreased with the increase in plant population and minimum 15.56 cm head diameter was recorded in the maximum plant population. Head diameter decreased with delay in sowing from January to April. Maximum head diameter of 18.56 cm was recorded in the January sown crop followed by 17.81 cm head diameter in the February sown crop. Similar results were also reported by Shafiullah *et al.* (1992).

Achene yield (kg ha⁻¹): Results presented in Table 5 revealed that achene yield was significantly affected by

plant population and sowing dates. The plant population of 111111 plants/ha gave maximum achene yield of 2366 kg ha⁻¹, while the plant population of 44444 plants/ha gave minimum yield of 1823 kg ha⁻¹.

Table 4: Head Diameter (cm) of sunflower hybrid ARITAR-93 as affected by different plant population and sowing dates

	P1	P2	P3	P4	Mean
D1	20.00	19.00	18.50	16.75	18.56 ^A
D2	19.00	18.25	18.00	15.50	17.81 ^B
D3	18.00	16.7	16.75	15.00	16.81 ^C
D4	18.00	16.50	16.75	15.00	16.56 ^D
Mean	19.06 A	17.625 B	17.50 B	15.56 C	

LSD value at alpha = 0.05 = 0.3092

LSD value at alpha = 0.05 = 0.285

Table 5: Achene yield (kg ha⁻¹) of sunflower hybrid ARITAR-93 as affected by different plant population and sowing dates

	P1	2	P3	P4	Mean
D1	1976	2522	2539	2127	2290 ^A
D2	2675	2645	2208	2223	2287 ^B
D3	1514	1591	2579	2374	2016 ^B
D4	1729	1966	2141	2114	1988 ^B
Mean	1823 ^C	2181 ^B	2368 ^A	2211 ^{AB}	

LSD value at alpha = 0.05 = 209.45

LSD value at alpha = 0.05 = 175.22 = Abstracts, 1993-7/95

The highest achene yield of 2290 kg ha⁻¹ was obtained when sowing was done on 1st January, while the minimum (1988 kg ha⁻¹) was given by the April sown crop. Similar results were obtained by Gimeno *et al.* (1989).

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