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Effect of Various Planting Geometries on the Growth, Seed Yield and Oil Content of New Sunflower Hybrid (SF-187)

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ABSTRACT

The effect of various planting geometries on the growth, seed yield and oil content of a new sunflower hybrid (SF-187) was studied. The experiment was laid out in split plot design with four replications and a net plot size measuring 3.6 m x 6 m. Various planting patterns (60 cm apart single rows, 90 cm apart double row strip planting, 60 cm apart ridge sowing and 90/30 cm bed sowing) and stand densities with 20 and 30 cm interplant spacing were randomized in the main and sub-plots, respectively. Amongst the planting patterns, ridge sowing (60 cm apart) produced the maximum seed yield (2600 kg ha^{-1}); whereas, 20 cm interplant spacing turned up with maximum seed yield (2560 kg ha^{-1}). However, the treatment combination (60 cm x 30 cm) resulted in higher seed oil contents.

Key Words: Sunflower hybrid; Planting geometry; Seed; Growth

INTRODUCTION

The gap between domestic needs and production of edible oil is widening at an alarming rate each year and Pakistan had to import edible oil worth Rs. 28.67 billion to fulfill its needs during 1996 (Anonymous, 1997). Under such economic pressure, there is a dire need to improve the domestic production either by improving production technology of existing oilseed crops or by introducing new oilseed crops with higher yield potential. Sunflower, a premium crop, is still under its introductory phase and seems to be the leading oil crop in future in Pakistan. Success of this crop demands for determining some important aspects of its production technology such as planting pattern and stand density (Rao *et al.,* 1976; Andrascik & Smutny, 1978; Beg *et al.,* 1983; Chatha & Aslam, 1985; Fsechie *et al.,* 1996; Waheed, 1996).

The present study was carried out to determine the suitable planting pattern and stand density for realizing higher yield of spring planted new sunflower hybrid (SF-187) under Faisalabad conditions.

MATERIALS AND METHODS

The study was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad. Experiment was laid out using split plot design with four replications and a net plot size was 3.6 m x 6 m planting patterns and stand densities were randomized in the main and sub-plots, respectively. The following treatments were included in the experiment.

A. Planting pattern. P_1 = Single rows (60 cm apart); P_2 = Double row strips (90 cm apart); P_3 = Ridge sowing (60 cm apart); P_4 Raised bed sowing (90/30 cm).

B. Stand density. S_1 = 20 cm interplant spacing; S_2 = 30 cm interplant spacing.

Crop was sown on 15th of February on a well prepared seed bed with single row hand drill in row planting system, while manually on ridges and beds using 8 kg seed ha^{-1}. The fertilizers were applied at the rate of 100-75 kg NP ha^{-1}, where ½ N with full P at sowing and remaining N was applied with second irrigation. All other cultural practices were carried out uniformly in all the plots. Crop was harvested in May. The observations on plant parameters like plant height, leaf area $plant^{-1}$, head diameter, number of seeds $head^{-1}$, 1000-achene weight, seed yield ha^{-1} and seed oil contents were recorded.

Data collected were statistically analysed by using the Fisher's analysis of variance technique and least significant difference (LSD) test at 5% probability was applied to test the differences among treatment means (Steel & Torrie, 1984).

RESULTS AND DISCUSSION

Data (Table I) indicated that ridge sown crop did not differ statistically from double row strip planted crop and produced the tallest plants recording 123.16 cm height. In the stand density, 20 cm interplant spacing resulted in significantly more plant height than wider spacing (30 cm).

Leaf area $plant^{-1}$ was also affected significantly by various planting patterns and stand densities. The plants on ridges and with 30 cm interplant spacing emerged to show the maximum leaf area $plant^{-1}$. This could be because of relatively more favorable environments under ridge and due to wider spacing increased feeding area for the plants. Waheed (1996) also reported similar results.

Ridge sown crop also exhibited the maximum head daimeter (19.81 cm) though not differed statistically from bed sown crop which produced 18.79 cm head diameter. Similarly, the crop where interplant spacing was 30 cm

produced significantly higher head diameter (19.32 cm) of seed yield.

Table I. Performance of a new sunflower hybrid (SF-187) under various planting geometries

Treatments	Plant height (cm)	Leaf area/plant (cm^{-2})	Head diameter (cm)	Number of seeds/head	1000-achene weight (g)	Seed yield kg/ha	Seed oil content (%)
A. Plant pattern							
P_1 =Single rows (60 cm apart)	120.90c	5557.85c	17.87b	997.25^{NS}	33.82c	2250c	38.85c
P_2 =Double row strips (90 cm apart)	122.95ab	5624.67c	18.08b	1005.37	34.30bc	2350bc	39.93b
P_3 = Ridge sowing (60 cm apart)	123.16a	6099.73a	19.81a	1054.87	36.55a	2600a	42.50a
R_4 = Raised bed sowing (90/30 cm)	121.80bc	5758.33b	18.79ab	1035.00	32.26b	2460b	40.35b
B. Stand density							
S_1 = Interplant spacing (20 cm)	124.87a	5686.49b	17.96b	941.37b	32.83b	2560a	39.76b
S_2 = Interplant spacing (30 cm)	119.53b	5833.79a	19.32a	1114.87a	37.13a	2270b	41.05a

Any two means not sharing a letter in common differ significantly from each other at 5% level of probability.

than the narrow spaced crop (20 cm), which expressed 17.96 cm head diameter. The increased head diameter in wider spacing could be because of better plant development due to being out of competition. These results are in line with those of Hussain *et al.* (1980).

The varying stand density affected significantly the number of seeds $head^{-1}$. Where widely spaced plants produced significantly more number of seeds $head^{-1}$ than the narrow spaced plants. This could be because, the plants under wider spacing produced significantly larger heads. The different planting patterns, however, did not affect significantly the parameter under discussion.

1000-achene weight was also found to be influenced significantly by different planting geometries. The ridge sown crop and widely spaced crop produced significantly the heavier grains than rest of all the treatments under study. These results support the findings of Jamil (1992).

The different planting geometries also had a significant effect on the final seed yield ha^{-1}. Ridge sown crop produced significantly higher seed yield (2600 kg ha^{-1}) than other planting systems. Amongst the stand densities, narrow interplant spacing (20 cm) produced significantly higher seed yield ha^{-1} because of more number of plants per unit area. Increased seed yield of sunflower planted on ridges than flat sowing or bed sowing has also been reported by Hussain (1994). Seed oil contents were also found to be affected significantly by different planting geometries. The crop planted on ridges and interplant spacing as 30 cm resulted in significantly higher seed oil contents than that in other treatments. These results are in line with those of Hussain *et al.* (1980).

CONCLUSION

It is concluded that the variety in question should be planted on ridges (60 cm apart) by maintaining 20 cm interplant spacing to exploit its maximum potential in terms of seed yield.

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