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PERFORMANCE OF VARIOUS HYBRIDS OF SUNFLOWER IN PESHAWAR VALLEY

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ABSTRACT

An experiment on the "Performance of various hybrids of sunflower under Peshawar valley conditions" was conducted at Malakandher Research Farms, NWFP Agricultural University Peshawar during spring 2004. Ten hybrid of sunflower (G-101, Hysun-38, Mehran-11, SF-187, DKS-4040, Hysun-33, FH-106, FH-315, Bemisal-205, Parsun-2) were included in the trail which was sown on 5th March 2004. The experiment was laid out in Randomized Complete Block Design (RCBD) having four replications; with each sub plot size of 4x3 m^2. Statistical analysis of the data showed significant differences for all the parameters except days to flower initiation, days to flower completion and head diameter. It was observed that maximum days to emergence were recorded in the hybrids FH-315 while minimum days to emergence were noted in the hybrids Mehran-11. Highest number of plants m^{-2} was produced in plots sown with hybrids Mehran-11 and Hysun-38 while Bemisal-205 and FH-315 showed less number of plants m^{-2}. Days to maturity were more in hybrids DKS-4040, FH-187 and Hysun-38 whereas hybrids FH-315 and Bemisal-205 recorded minimum days to maturity. Taller plants were attained by plots sown with hybrids Mehran-11, Hysun-38, whereas dwarf plants were noted in FH-315 and FH-106. Among the ten hybrids highest number of seed head^{-1} was produced by plots seeded with hybrids G-101 and Mehran-11 whereas hybrids SF-187 and FH-106 recorded lowest number of seed head^{-1}. Seeds were heavier in hybrids DKS-4040 and Hysun-33 while Hysun-38 and Mehran-11 noted lowest hundred seed weight. Significant variation was also observed in grain yield among the various hybrids under study. Maximum grain yield was produced by hybrid DKS-4040 while hybrids FH-315, Hysun-38 and Parsun-2 showed minimum grain yield. It is concluded that the hybrids DKS-4040, Hysun-38, and G-101 showed high productivity and were best adapted to the climatic conditions of Peshawar valley.

Keywords: sunflower, hybrid, performance, yield, productivity, Peshawar.

INTRODUCTION

The present situation of oilseed in Pakistan is that the total requirements of edible oil are 1.9 million tons and domestic production is 0.665 million tons whereas total imports of oilseed is 1.281 million tons. The value of imported edible oil is 41.30 billion rupees. The per capita consumption is 11.95kg annum^{-1}. The pace of increase in domestic edible oil production is around 7.3% whereas the growth in demand is 10%, leaving a gap of around 3%. The domestic requirement for oilseed has almost doubled during the last 7-8 years as a result of high rate of consumption. The annual growth in consumption of edible oil is 9%. The edible oil requirement for the country was 1.9 million tons in 2002-03 as compared to 1.7 million tons in 2001-02 (Pakistan Statistics Year book 2002-03).

One of the reasons for low sunflower seed production is the cultivation of exotic hybrids, which are not well adapted to agro-climatic conditions of Pakistan. We need hybrids that can produce high yield, mature early with improved oil content under intense summer temperature and drought conditions. Intensive agriculture systems in Punjab, Sindh and NWFP need short duration, early maturing and short stature hybrids. To make sunflower as a successful crop in Pakistan, we have to develop our own hybrids which mature early, give higher yield and can easily fit in our existing cropping pattern and in changed conditions.

NWFP has a unique agricultural environment where raising of two crops of sunflower in a year are possible by adopting appropriate cultural practices. Agriculture in Pakistan and particularly in NWFP is limited especially in Peshawar where others remunerative crop like sugarcane, tobacco and cereals are given preference over others. In NWFP vast acreage of irrigated land in Peshawar valley and dry land in the high rainfall areas is available for sunflower cultivation during the month of June till October. The lands are vacated from tobacco in July; some are vacated from wheat, barley, rape and mustard in May. Sunflower is the best alternative which can fill up this gap because hybrids/varieties of sunflower are available that can mature in 95-110 days.

Eva and Andrei (1990) observed that seed yield and seed oil yield ranged from 4.3 to 4.72 t ha^{-1} and 2.2 to 2.55 t ha^{-1} in hybrid Festive, respectively when compared with hybrid Fundulea 206. Maddonni and Satorre (1992) reported that hybrid Contiflor-3 had the highest seed yield and dry matter yields in the early sown trial. Similarly, Mancuso (1992) reported that hybrid Cargill S400 had the highest oil content (46.2%), but the most suitable cultivar for use across favorable environments was Peredovick (43.9%). Rahim and Siraj (1993) concluded that the highest yield was given by hybrid No.6 and hybrid NK-265. Similarly, Hanif et al. (1996) worked out that variety NK-212 was the best for plant height and 1000-grains weight whereas, Hysun-44 gave maximum grains per plant. Varietals means were significantly different for all the parameters except stem thickness, leaf area and 1000-grain weight.

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Work on development of sunflower hybrids in the country is inadequate and therefore demand of seed is met out through import. The present research was conducted to determine high yielding sunflower hybrids best adapted to climatic condition of Peshawar valley.

MATERIALS AND METHODS

In order to study the performance of various hybrids of sunflower under Peshawar valley conditions, an experiment was carried out at Malakandher Research Farm, NWFP Agricultural University Peshawar, Pakistan during spring 2004. Ten hybrid of sunflower (G-101, Hysun-38, Mehran-11, SF-187, DKS-4040, Hysun-33, FH-106, FH-315, Bemisal-205, Parsun-2) were included in the trail which was sown on 5th March 2004. The experiment was laid out in Randomized Complete Block Design (RCBD) having four replications; with each sub plot size of 4x3 m^2. The rows plot^{-1} were five in number with row spacing of 75cm and plant to plant spacing was 20cm. The experimental field was thoroughly prepared and all agronomic practices were uniformly applied to each subplot. The following observations were recorded during the course of study:

- Days to emergence
- Days to flower initiation
- Days to flowering completion
- Number of plant m^{-2}
- Days to maturity
- Plant height (cm)
- Number of leaves plant^{-1}
- Head diameter (cm)
- Number of seed head^{-1}
- Hundred seed weight
- Seed yield (kg ha^{-1})

The above mentioned parameters were recorded in the following manner:

Data on days to emergence was recorded from the date of sowing till when more than 80% of seed got emerged in each plot. Days to flowering initiation were recorded from the date of sowing till when more than 80% flower opened in each sub plot. Days to flower completion were also calculated from the date of sowing till when more than 80 % flower had shed pollen grains. In each sub plot, the number of plants was determined and then converted into plant m^{-2}. Days to maturity were recorded when back side of about 95 % head turned yellow and outer bracket turned brownish. Height of ten plants randomly selected from the central two rows in each treatment was measured from ground level to the top edge of the collar disc and then their average was calculated. Number of leaves plant^{-1} was recorded from ten plants taken randomly selected from central row in each sub plot and then their average was work out. Head diameter was measured from one edge of the head to the other in ten head and their average was worked out. Two representative discs were chosen in each sub plot and then total grains disc^{-1} were counted. Hundred grains from each subplot were counted and their weight was recorded. Two central rows from each treatment were harvested, threshed and weighted to record seed yield plot^{-1} then converted into kg ha^{-1}. The data collected during the experiment was analyzed according to RCB design and upon obtaining significant differences; Least Significant Differences (LSD) test was applied (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Growth and development:

Data regarding comparative emergence performance of various sunflower hybrids in Peshawar valley is presented in Table-1.

Table 1: Days to emergence, flower initiation and flower completion of various hybrids of sunflower under Peshawar valley condition.

S. No	Hybrids (Treatments)	Days to emergence	Days to flower initiation	Days to flower completion
1.	G-101	20.50 bcd	72.75	87.00
2.	Hysun-38	22.50 abc	80.00	88.75
3.	Mehran-11	16.25 e	81.00	89.50
4.	SF-187	22.00 abcd	69.25	83.50
5.	DKS-4040	19.50 cde	80.50	87.50
6.	Hysun-33	20.25 bcd	76.50	84.50
7.	FH-106	20.75 bcd	75.25	84.25
8.	FH-315	25.00 a	77.00	81.50
9.	Bemissal-205	24.00 ab	72.50	82.00
10.	Pursun-2	18.50 de	68.50	80.25
	LSD value (0.05) =	**3.948**	**NS**	**NS**

Mean values of the same category followed by different letter are significantly different at (p < 0.05) level of probability using LSD test. NS = Non-significant.

Statistical analysis of the data revealed that days to emergence was significantly (p < 0.05) affected by various hybrids of sunflower. Maximum of 25 days to emergence was recorded in hybrid FH-315 followed by

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hybrids Bemisal-205 with 24 days to emergence. Minimum numbers of 16.25 days to emergence was recorded in hybrid Mehran-25, which was followed, by hybrid Parsun-2 with 18.50 days to emergence. These differences in germination might be due to the seed viability, genetic and environmental factors. Mean value of the data regarding days to flower initiation is shown in Table-1. Analysis of the data showed that days to flower initiation was non significantly affected by various hybrids of sunflower. It can be seen from the mean values of the data that maximum number of days (81) to flower initiation was recorded in hybrid Mehran-11 which was at par with plots sown with hybrid DS-4040 (80.5 days to flower initiation). Similarly, hybrid Parsun-2 took minimum (68) days to flower initiation. Hanif *et al.* (1996) reported that a non-significant correlation was found for

days to flower initiation and completion among the various varieties. Table-1 also shows comparison of various sunflower hybrids in terms of days to flower completion. Statistical analysis of the data showed that days to flower completion was non significantly affected by various hybrids of sunflower. However, maximum number of 89.50 days to flower completion was recorded in hybrid Mehran-11 which was closely followed by hybrid hysun-38 with 88.75 days to flower completion. It is also clear from the mean values of the data shown in Table-1 that minimum of 81.50 days to flower completion was observed in plots sown with hybrid FH-315. These results agree with those reported by Hanif *et al.* (1996).

Mean value of the data regarding number of plants m^{-2} is presented in Table-2.

Table 2: Number of plants m^{-2}, days to maturity plant height (cm) and number of leaves plant^{-1} of various hybrids of sunflower under Peshawar valley condition.

S. No	Hybrids (Treatments)	Number of plants m^{-2}	Days to maturity	Plant height (cm)	Number of leaves plant^{-1}
1.	G-101	2.94 bcd	117.8 c	175.0 cd	21.25 bc
2.	Hysun-38	3.71 ab	122.0 ab	188.3 b	20.25 bcd
3.	Mehran-11	3.81 a	119.0 bc	211.3 a	24.25 a
4.	SF-187	3.08 abcd	123.0 a	149.0 e	21.25 bc
5.	DKS-4040	3.40 abc	125.3 a	173.3 cd	21.25 bc
6.	Hysun-33	3.40 abc	119.0 bc	182.5 bc	22.75 ab
7.	FH-106	2.80 cd	116.3 cd	148.5 e	21.50 bc
8.	FH-315	2.58 d	110.3 e	140.5 e	18.50 d
9.	Bemissal-205	2.52 d	113.3 de	151.0 e	19.25 cd
10.	Pursun-2	3.06 abcd	114.0 d	163.5 d	21.00 bcd
	LSD value (0.05) =	**0.792**	**3.395**	**11.83**	**2.678**

Mean values of the same category followed by different letter are significantly different at (p < 0.05) level of probability using LSD test.

Statistical analysis of the data indicated that number of plants m^{-2} was significantly ($p \leq 0.05$) affected by various hybrids of sunflower. It can be inferred from the data that maximum number of 3.81 plants m^{-2} was produced by hybrid Mehran-11 which was statistically at par with plots sown with hybrid Hysun-38 having 3.71 plants m^{-2}. Minimum number of 2.52 plants m^{-2} was observed in the hybrid Bemisal-205 followed by hybrid FH-315 with 2.58 plants m^{-2}. Table-2 also present data regarding days to maturity. Analysis of the data showed that days to maturity were significantly ($p \leq 0.05$) affected by various hybrids of sunflower. Mean value of the data showed that maximum of 125.3 days to maturity were taken by hybrid DKS-4040 followed by hybrid SF-187 with 123.0 days to maturity. Similarly, minimum of 110.3 days to maturity was noted in plots sown with hybrid FH-315. Mean value of the data regarding comparative performance of sunflower hybrids due to plant height is presented in Table-2. Statistical analysis of the data revealed that plant height was significantly (p < 0.05) affected by various hybrids of sunflower. It is obvious from the data shown in Table-2 that taller plants

(211.3cm) were attained in those treatments which were sown with hybrid Mehran-11, followed by plots seeded with Hysun-38 (188.3cm). The data also revealed that shorter plants (140cm) were recorded in hybrid FH-315. These results are supported by Espinosa *et al.* (1992), who observed significant differences for plant height and other characters among different hybrids. Data regarding number of leaves plant^{-1} is presented in Table-2. Statistical analysis of the data showed that number of leaves plant^{-1} was significantly ($p \leq 0.05$) affected by various hybrids of sunflower. Maximum number of 24.25 leaves plant^{-1} was recorded in hybrid Mehran-11 followed by hybrid Hysun-33 with 22.75 number of leaves plant^{-1}. Similarly, minimum number of 18.50 leaves plant^{-1} was recorded in by those plots which were sown with hybrid FH-315. Abdel *et al.* (1984) reported that number of leaves plant^{-1}, leaf area and grain yield showed significant difference among the hybrids.

Yield and yield components:

Table-3 presented comparative performance of head diameter in sunflower hybrids. Head diameter was

non significantly affected by various hybrids of sunflower. However, maximum head diameter (28cm) was recorded in those treatments which were grown with hybrid G-101 followed plots seeded with hybrid FH-106 (25.75cm) while minimum head diameter of 22.25cm was noticed in

hybrid Mehran-11. Yousaf *et al.* (1989) tested seven cultivars of sunflower and all the parameters showed significant difference among the hybrids except head diameter, which showed non-significant variation.

Table 3: Yield and yield components of various hybrids of sunflower under Peshawar valley condition.

S. No	Hybrids (Treatments)	Head diameter (cm)	Number of seed head[-1]	100 seed weight (g)	Seed yield (kg ha^{-1})
1.	G-101	28.00	1763 a	7.48 abcd	2861 ab
2.	Hysun-38	25.00	1568 abc	6.27 d	2222 bc
3.	Mehran-11	22.25	1708 a	6.91 cd	2333 bc
4.	SF-187	24.00	1235 e	7.71 abc	2361 bc
5.	DKS-4040	25.00	1685 ab	8.76 a	3389 a
6.	Hysun-33	25.50	1660 ab	8.61 ab	2694 b
7.	FH-106	25.75	1343 de	7.85 abc	2528 b
8.	FH-315	23.75	1557 abcd	6.93 cd	1806 c
9.	Bemissal-205	24.75	1436 cde	7.27 bcd	2556 b
10.	Pursun-2	23.75	1473 bcd	7.29 bcd	2278 bc
	LSD value (0.05) =	**NS**	**217.9**	**1.42**	**642.8**

Mean values of the same category followed by different letter are significant different
at (p<0.05) level of probability, using LSD test. NS = Non-significant.

Statistical analysis of the data showed that various sunflower hybrids had significantly ($p \leq 0.05$) influenced number of seed head[-1] (Table-3). Highest number of 1763 seed head[-1] was observed in hybrid G-101 followed by plots sown with hybrid Mehran-11 (1708 seed head[-1]). Lowest number of seed head[-1] was recorded in hybrid SF-187 and hybrid FH-106 with average number of 1235 and 1314 seeds head[-1], respectively. Significant increase of 42% was observed in the number of seed head[-1] of hybrid G-101 when compared with hybrid SF-187. These results agree with those reported by Hanif *et al.* (1996).

Data reported in Table-3 demonstrated the comparative effect of different sunflower hybrid on hundred seed weight. Sunflower hybrids had significantly ($p \leq 0.05$) affected hundred seed weight. Maximum hundred seed weight of 8.76g was observed in hybrid DKS-4040 while plots seeded with hybrid Hysun-38 and hybrid Mehjran-11 produced minimum seed weight with average weight of 6.27g and 6.91g, respectively. Significant increase of 40% in the hundred seed weight of hybrids DKS-4040 was observed when compared with hybrid Hysun-38. These findings were also supported by Pirani and Gupta (1995) who reported significant variation for 1000 grain weight and other agronomic traits due to various sunflower hybrids. Statistical analysis of the data also revealed that sunflower hybrids had significantly (p < 0.05) affected seed yield. Highest seed yield of 3389kg ha^{-1} was observed in hybrid DKS-4040 followed by plots which were sown with hybrid G-101 having seed yield of 2861kg ha^{-1}. It is also clear from the mean value of the data that lowest seed yield was recorded in hybrid FH-315 and hybrid Hysun-38 with an average production of 1806

and 2222kg ha^{-1}, respectively. These finding are supported by Dash *et al.* (1996) who reported significant differences for seed yield plant[-1] among the 18 hybrids.

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