

Response of Sunflower hybrids in Uplands of Balochistan.

S. Asmatullah Taran, M. Sharif Kakar, S. Naseebullah Taran, Naeem Shahwani*, and M. Saeed*

Agriculture Research Institute, Sariab, Quetta, Balochistan. Faculty of Biotechnology, BUITMS Quetta, Balochistan*.

Fourteen hybrids of sunflower (*Helianthus annuus* L.) namely Suncremer-36, Hysun-38, ZR-123, LG-56-60, 15806, FH-106, 63 A 90, Rumbasol, Hysun-33(Check), Parsan-2(check), 63 A 82, SF-187, G-101 and 64 A 57 were compared for days to flower initiation, days to flower completion, days to maturity, plant height, head diameter, and seed yield in uplands of Balochistan during summer 2005. Highly significant differences were observed among the varieties for all the studied traits except head diameter at both locations (Quetta and Khuzdar). 63 A 90 gave highest yield of 3239 and 2938kg/ha followed by 63 A 82 giving a yield of 2975 and 2780 kg/ha in Quetta and Khuzdar, respectively. While Hysun-33 at ARI, Sariab, Quetta and G-101 at Khuzdar gave the lowest yield. The present study indicated that yield performance was significantly different for locations and varieties which show that selection of hybrids for different locations can play a good role in the yield increase per hectare of sunflower.

Keywords: Balochistan, flower initiation, head diameter *Helianthus annuus*.

Introduction

Sunflower (*Helianthus annuus*) is a non traditional crop of Pakistan. Prior to 1965 it was sown primarily for ornamental purposes due to high yield and oil and better price prompted the scientists to realize its use as oil crop. The most crucial efforts are the development of sunflower hybrid which is more in yield than that of open pollinated varieties.

It has been thought at national level that Pakistan is deficient of edible oil and 70% of our requirements are dependent on import of edible oils, which is worth 45 billion rupees approximately, it is a great loss to the government exchequer. Total area of sunflower cultivation in Pakistan during 1991-92 was 63328 hacters and production was 83312 tones. While in 2004-05 area increased to 264004 against the production of 327650 tones.

It has been revealed that sunflower has a very promising futuristic value in the province of Balochistan. It is a new crop, during 2004-05 total cultivated area was 536 hacters and the production was 537 tones. It is getting popularity owing to the reason that this crop is short maturing crop and can easily be adjusted under crop rotation as wheat sunflower wheat in uplands of the province.

Soil and climatic conditions of Pakistan particularly in Balochistan are highly conducive for the commercial

cultivation of this crop. Preliminary studies have been carried out at various levels but very little research information is available, especially in this part of the country (Balochistan) Therefore, the present research was conducted to determine high yielding sunflower hybrids best adapted to different locations/environment. Yousaf et al (1989) worked out that sunflower cultivars showed significant differences in plant height and yield attributing characters in between the two locations but non significant for head diameter. Raja and Khan (1994) studied eight exotic varieties under irrigated and rain fed conditions. Masood et al (1991) showed a significant difference for plant height, head diameter, days to maturity and seed yield. In their study peredovic sunflower cultivar gave higher yield under both the conditions. However, several studies on varieties testing are reported in other countries. Venturi et al (1981) conducted experiment comparing 18 different sunflower cultivars (8 hybrid and 10 open pollinated varieties) at 13 different locations in Italy.

It was observed that plant height of the varieties differed considerably over locations as well as within location. Seed yield was obtained up to 2500 kg/ha with very considerable difference among locations

and less but still notable difference among cultivars. Leoni and Palmieri (1981) found that the best cultivars in the central environment of Italy for seed oil and protein percentage were different from those having best meal quality. Sistachs and Lean (1976), Vannozzi (1981), Brigham and Young (1984), Ehdaie (1978) Akhtar (2004) and Umar (2004) have indicated that the sunflower varieties exhibited significant differences in their yield ability, maturity and other agronomic traits. This suggests that selection of well adopted cultivars along with other desirable characteristics is possible; therefore the present study was designed to find out well adopted and high yielding sunflower cultivars for up lands of Balochistan

Material and Methods

The experiment was conducted with fourteen sunflower hybrids namely, Suncremer-36, Hysun-38, ZR-123, LG-56-60, 15806, FH-106, 63 A 90, Rumbasol, Hysun-33(Check), Parsan-2, G-101 and 64A57 were sown at two different locations in uplands of the province i.e. one at Agriculture Research Institute(ARI), Sariab-Quetta and the other Khuzdar during 2005. The trial was sown on 11th of June and 1st of May at Quetta and Khuzdar respectively. Quetta is 30° N, 67° E and 1600 meter above sea level having mean annual air temperature 8-39°C while Khuzdar is 28° N, 66.5° E and 1400 from sea level at both location seasonal summer temperature may exceed 35 °C but in winter it drops to -10. Quetta is slightly cooler than Khuzdar. Each experiment was planted in a Randomized Complete Block Design with 4 replications. Each plot consisted of 4 rows, 5 meter long and 75m apart. Plants were spaced 25 to 30 cm apart within the rows. Fertilizer was applied at the rate of 90:60: NP kg/ha. Two weedings were done with manual labor, first when plants were 15 cm tall and second at head initiation stage. Irrigation and all other agronomic practices were carried out uniformly to raise a successful crop at both locations. Data were recorded for days to flower initiation, days to flower completion, days to maturity, plant height, head diameter, and two central rows were harvested to record the seed yield. The collected data were statistically analyzed by using analysis of variance technique and LSD at 5% level probability was used to compare the difference among hybrid means (Steel & Torrie 1986).

Results and Discussion

Days to Flower Initiation, Completion and Maturity.

Sunflower cultivars were almost uniform for the above three parameters. Although statistical significance was

shown among varieties differences to some extent at both locations almost 5 days difference on average was predicted. These characters are critical and important for recommending the hybrids for general cultivation in the province. It will ensure the timely sowing of the crop (Table 1). A considerable range of variability on average for DFI, DFC, and DM exhibited from highest 72, 79, 101 to lowest 66, 71, 97, respectively.

Suncremer on average was late maturing hybrid at both locations for all traits i.e. 75, 81, 99 at Quetta and 70, 76, and 102 at Khuzdar for DCI, DCF and DM respectively.

Rumbasol hybrid 64, 70 and 94 at Quetta while Hysun-33 hybrid, 63, 70 and 90 were early maturing hybrids at Khuzdar for DCI, DCF and DM, respectively. This is purely because of genetic behavior of the hybrids

Variety x location Interaction (Table-3) was significant for all the traits.

The above study was also confirmed by Yousaf et al (1989) and Masood et al (1991), Akhtar et al (2004) and Umar et al (2004).

It means that these hybrids duration in uplands of Balochistan differ with little fluctuation in respect of cultivation season

Plant height (cm)

Data analysis (Table 2) showed that Plant height was significantly different for hybrid individuals as reported by Raja and Khan (1984). The tallest plant of 195cm was followed by 191cm by ZR-123 and Hysun-33 at Quetta and 181cm followed by 177cm by 63A82 and LG-56-60 at Khuzdar, respectively. Lowest height of 141cm (SF-187) at Quetta and 154 cm (FH-106) at Khuzdar were observed

On average the plant height at Quetta was higher than that of Khuzdar this might be the soil condition at ARI Quetta where Nitrogen status was monitored while at Khuzdar the farmers' field was used for study where the farmers were given general recommendation for nutrients.

Variety x Location interaction

Variety x Location interaction was highly significant this also revealed that each hybrid had its own potential to grow under different environment and soil conditions and ultimately phenotype expression is always linked with Genotypic and environmental interaction (Table-3).

Head Diameter (cm).

Data presented (Table-2) on average of two locations revealed that there is small variation in head diameter

and found non-significant. This ultimately means that sunflower hybrids have equal potential of head development in uplands of Balochistan. However the head size at Quetta was more uniform and higher than at Khuzdar. Maximum head diameter 23 cm attained by Hysun-33, rumbasol, 63A82 and G-101 at Quetta while suncremer-36, ZR-123, 15806 and SF-187 uniformly attained head size of 21 cm at Khuzdar.

Variety × location interaction

Variety × location interaction (Table-3) were non significant in case of head diameter. The results are in agreement with Venozai et al (1981), Yousaf et al (1989), Akhtar et al (2004) and Umar et al (2004).

Seed Yield

Seed yield of hybrids differed significantly at both locations. (Table.2). Cumulative data of two hybrids, 63A90 and 63A82 produced the highest yields of 3088

and 2878 kg/ha, respectively. So these two hybrids may be further tested over a wide range of locations for its adoptability and higher yield in comparison with the Hysun 33(check) giving mean yield of 2559 kg/ha. The

lowest mean yield of 1766kg/ha was recorded for Hysun 38.

Mean of seed yield for two locations differed from each other significantly. On average high yield at Quetta and low yield at Khuzdar suggests further investigation on the environmental aspects of the two locations.

Variety × Location interaction was highly significant and clearly visible in ((Table-3). This significant interaction pointed out that there is a need to select suitable hybrids for sowing at different locations with stability in yield. The results are in conformity with those obtained by Sistachs and Leon (1976), Brigham (1984) and Masood et al (1991) Yousaf et al (1989), Akhtar et al (2004) and Umar et al (2004)

Table 1. Means for Days to Flower Initiation, Days to Flower Completion and Days to Maturity of sunflower Hybrids grown at ARI, Quetta and Khuzdar during summer 2005

No	Hybrids	Days to Flower Initiation			Days to Flower Completion			Days to Maturity		
		Quetta	Khuzdar	Ave	Quetta	Khuzdar	Ave	Quetta	Khuzdar	Ave.
1.	Suncremer-36	75	70	72	81	76	79a	99	102	101a
2.	Hysun-38	71	67	69a	76	72	74bcd	97	100	99ab
3.	ZR-123	72	68	70bc	77	74	75b	96	100	98bc
4	LG-56-60	69	67	68ab	75	73	74bcd	96	100	98bc
5	15806	70	68	69bcde	75	75	75b	96	99	98bc
6	FH-106	69	67	69bc	75	73	74bcd	96	99	97bc
7	63A90	67	66	66bcde	73	72	73cdef	95	99	97bc
8	Rumbasol	64	66	65def	70	72	71f	94	101	98bc
9	Hysun-33	72	63	66f	77	70	72def	96	90	98bc
10	Parsun-2	67	65	67ef	73	71	72def	97	100	99ab
11	63A82	69	68	69ef	75	74	75bc	97	101	99ab
12	SF-187	70	67	69bcd	75	73	74bcd	97	99	98bc
13	G-101	71	66	69bcd	75	72	74bcd	96	99	99ab
14	64A57	67	69	68bcde	73	75	74bcd	95	100	98bc
	LSD(5%)	1.33	1.53	1.27	1.66	1.75	2.09	1.46	2.25	LSD (5%)

Values followed by different letters are significantly different at 5% level of probability

Table 2. Means for Plant Height, Head diameter and Seed Yield of Sunflower Hybrids grown at ARI, Sariab-Quetta and Khuzdar during summer 2005.

S.No	Hybrids	Plant height (cm)			Head Diameter (cm)			Seed Yield (kg/ha)		
		Quetta	Khuzdar	Ave	Qta	Khuz	Ave	Qta	Khuz	Ave.
1.	Suncremer-36	176	176	176bc	22	21	21a	2383	2278	2331cde
2.	Hysun-38	182	170	176bc	23	20	22a	1776	1755	1766f
3.	ZR-123	195	170	196a	22	21	22a	2308	2162	2235de
4	LG-56-60	181	177	179b	22	19	20a	2524	2027	2276de
5	15806	144	159	151f	19	21	20a	2506	2189	2348cde
6	FH-106	150	154	152ef	21	20	21a	2519	2263	2391cd
7	63 A 90	152	168	161def	21	20	20a	3239	2938	3088a
8	Rumbasol	152	171	162def	23	20	21a	2674	1996	2335cde
9	Hysun-33	191	170	194a	22	19	21a	2734	2383	2559bcd
10	Parsun-2	170	172	171bcd	22	20	21a	2737	2350	2487cd
11	63 A 82	171	181	176bc	23	18	20a	2975	2780	2878ab
12	SF-187	141	157	149f	21	21	21a	2686	2434	2560bcd
13	G-101	162	160	161def	23	18	21a	2141	1733	1985ef
14	64 A 57	160	160	165cde	21	17	21a	2920	2387	2654bc
	LSD(5%)	15.78	9.69	13.35	2.68	2.68	N.S	463.7	127.6	368

Table.3 Mean Square for Days to Flower Initiation, Days to Flower Completion, Days to Maturity, Plant Height, Head Diameter and Seed Yield of Sunflower Hybrids at ARI, Quetta and Khuzdar During Summer 2005.

Source	df	Days to Flower Initiation	Days to Flower Completion	Days to Maturity	Plant Height (cm)	Head Diameter (cm)	Yield(kg/ha)
Replication	3	8.643*	4.631NS	1.619*	132.771*	9.616*	365937.699**
Varieties	13	26.481**	27.343**	6.288**	1724.031**	3.022*	0890272.976**
Location	1	137.286**	72.732**	505.750*	1026.00**	87.509*	2839427.580**
Varieties x Location	13	12.228**	16.283**	2.808**	158.388*	7.105*	66247.111**
Error	81	3.217	2.205	1.730	90.030	3.484	68550.644
Total	111						

*, ** = Significant at $p < 0.05$ and 0.01 , respectively

NS = Non significant.

References

- Agriculture Statistics of Pakistan (2004-2005). Government of Pakistan, Ministry of Food, Agriculture and Live Stock, Islamabad. pp.65
- Akhtar, A., Afzal M., Khair, S.M. (2004). Profitability of sunflower in Rawalpindi district of barani tract. Sindh Balochistan Jour. Pl. Sci. 6(1):39-45
- Brigham, R.D. (1984). Performance of Dwarf vs. normal height sunflower hybrids in Texas. Agronomy Abstracts pp.59-60.
- Ehdaie, B. (1978). Evaluation and comparison of 14 sunflowers (*Helianthus annuus* L.) under semi arid conditions. Abstract in the Newsletter. The Netherlands. 2 (3): 24.
- Hazrat, U.K. Mirza, A.W., Ansari, M.A., Jamali, N.M. Anwar, M. (2004). Yield potential of Sunflower varieties under different sowing times. Sindh Balochistan Jour. Plant Sci. 6(1): 64-70
- Lanae, O., Palmieri, S. (1981). Yield and meal quality of sunflower varieties in Italian environment. 4th Consultation F.A.O on the European Cooperation Network of sunflower, Pisa, Italy. pp 225-233.
- Masood, A.R., Khan, M.A., Yousaf, M. and Mirza, M.S. (1991). Evaluation of 26 sunflower cultivars at Islamabad. Helia, 14. Nr.14. pp.19-28.
- Raja, Z.I., and Khan, S.A. (1984). Yield performance on some sunflower varieties in world collection. Pak. Jour. Agri. Res. 5(2):136-137.
- Sistachs, M. and Leon, J.J. (1976). Comparing five sunflower varieties obtained in Cuba. Agronomia Tropical(Venezuela) 26(1):61-66
- Steel, R.G.D., and Torrie, J.H. (1986). Principles and procedures of Statistics. 2nd Ed. Me. Graw Hill book Inc. Co. Singapore, 232-251.
- Vannozzi, G.P., Salera, E. and Paolini, R. (1981). Evaluation of new sunflower(*Helianthus annuus* L.) varieties constituted by the C.N.R. research project Improvement of plant yields with food and industrial aims by breeding interventions. 4th Consultation FAO on the European Co-operative Network of Sunflower, Pisa, Italy. pp. 261-273.
- Venturi, G., Abbate, V., Amaducci, M.T., Bonari, E., Cremaschi, D., Gambelli, M.I., Savio, N.I., Manini, O.P., Marchese M., Monotti, M., Palmieri, S.; Paolini, R., Paradisi, V., Pesci, Pirani, C., Salera, V., Scarascia, E., Venezian, M.E., Sepiacci M., and Vannozzi, G.P. (1981). A comparison on sunflower cultivars in different Italian environments. 4th Consultation F.A.O. on the European Co-operative Network of Sunflower, Pisa. Italy. pp.41-96.
- Yousaf, M., Masood A.R., and Beg. (1989). Evaluation of sunflower cultivars under rain fed conditions. Sarhad. Jour. Agric., 5(1):73-76.