

GROWTH AND YIELD PERFORMANCE OF VARIOUS SPRING PLANTED SUNFLOWER (*HELIANTHUS ANNUUS* L.) HYBRIDS UNDER SEMI-ARID CONDITIONS OF SARGODHA, PAKISTAN.

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ABSTRACT: An experiment was carried out at the research area of University College of Agriculture, University of Sargodha during spring season of 2010 to study the growth and yield performance of various sunflower hybrids (Hysun-33, Hysun-38, S-278, SF-187, Pioneer-64A93FH-314 and FH-337). Randomized Complete Block Design (RCBD) was used, having four replications; with each subplot of size 2.60x6 m. The results indicated that hybrids differed significantly in all studied parameters except number of days taken to emergence and number of plants m². Days taken to flower completion and to maturity of crop were more in hybrids Hysun-38, Hysun-33, where as Hybrids FH-337 and S-278 completed their flowering and reached to maturity in minimum number of days. Taller plants were noted by plots sown with hybrids Hysun-33 and Hysun-38, whereas dwarf plants were observed in SF-187 and S-278. Maximum head diameter was found in S-278 which was statistically significant than rest of the hybrids. Highest number of achene's head¹ and 1000- achene;s weight was noted by Hybrids S-278 and Hysun-33 while hybrid FH-337 gave minimum number of achene's head¹ and lowest 1000- achene's weight. Significant variation was also observed in achene's yield among the various hybrids under study. Highest achene yield was produced by hybrid S-278(2735kg ha⁻¹) followed by hybrid Hysun-33(2542 kg ha⁻¹) while Hybrid FH-337 showed minimum achene's yield (1650kg ha⁻¹). Significant increase of 65% was observed in the achene's yield ha⁻¹ of hybrid S-278 when compared with hybrid FH-337. It is concluded that the hybrids S-278 and Hysun-33 showed high yield and were best adapted to the climatic conditions of Sargodha.

Keywords- Hybrid; Sunflower; Semi-arid ; growth; yield.

INTRODUCTION

Sunflower (*Helianthus annuus* L.), is one of the best edible oil seed crops of the world on account of its wide range of adaptability and high oil contents (40-50 %) and 23% protein (Hatim and Abbasi [1] It is a newly introduced oil seed crop in Pakistan. The area under sunflower crop in 2011-12 was 877 thousand acres with 473 thousand tons achene yield [2]. Among the non-conventional oil seed crops by growing sunflower crop, the existing gap between production of edible oils in Pakistan and its imports can be fulfilled (Khan et al., [3]. Under the prevailing conditions, per hectare yield of this crop is much lower than potential of different cultivated varieties. Among the factors of low yield, the major factor is improper selection of hybrids under different ecological zones. Eva and Andrei [4] observed that achene's ranged from 4.3 to 4.72 t ha⁻¹ in hybrid Festive, when compared with hybrid Fundulea 206. Bakhat [5] worked out that hybrid DKS-4040 was the best for achene's yield (3389 kg ha⁻¹) in Peshawar valley. Noman [6] reported that XIYU-12 gave maximum harvest index(24.66), where as SF-187 gave maximum achene's yield(3891 kg ha⁻¹) Selection of hybrids with characteristics which are best suited to our agro-ecological conditions needs emergent attention. Research efforts have been under way to define characters and management strategies that confer sunflower with adaptation to Pakistan's high temperature and moisture limited environments. Keeping in view the current scenario, present studies were conducted to investigate the comparative yield performance of various sunflower hybrids so as to choose the best one suitable for semi arid irrigated conditions at Sargodha District.

MATERIALS AND METHODS

Sunflower hybrids performance was studied at research area of University College of Agriculture, university of Sargodha, during spring season 2010. The design used in this experiment was a randomized complete block design (RCBD) with four replications. A net plot size was 2.60 x 6 m and the treatments were;

Treatments	Hybrids.
H ₁	Hysun-33
H ₂	Hysun-38
H ₃	S-278
H ₄	SF-187
H ₅	Pioneer-64A93
H ₆	FH-314
H ₇	FH-337

Treatments were randomized in each replication. The Crop was sown during first week of March on ridges 65cm apart by dibbler by dibbler method at plant spacing of 22.5 cm using 6 kg ha⁻¹ Seed rate. NPK in the form of urea, DAP and potassium sulphate, respectively, at the rate of 150-70-35 kg ha⁻¹ was applied. Whole dose of phosphorus and potassium while 1/3rd of nitrogen was given as a basal dose. Remaining nitrogen was broadcasted in two equal splits at the time of first irrigation and at button (head formation stage). After 1st irrigation, weeds were removed by hoeing. All other agronomic practices were same for all hybrids. The following observations were noted; Number of days taken to emergence, number of days taken to flower completion, number of days taken to maturity, number of plants m², Plant height at maturity, head diameter, number of achene's per head, 1000-Achene weight and achene's yield.

Number of days taken from the date of sowing to emergence was noted when more than 75% of seed got emerged in each plot. Similarly days taken for flower completion were also calculated from the date of sowing till when more than 75% flower had shed pollen grains. When back side of about 90% head turned yellow and outer bracket turned brownish then total numbers of days to maturity were recorded. In each sub plot, the number of plants was noted and then converted into plants m^{-2} . A sub sample of 10 plants was taken for the determination of different yield components. To record seed achene's yield per plot two central rows from each treatment were harvested, threshed and weighted then production was converted into kg per hectare. The date collected were analyzed statistically by the analysis of variance technique and treatment means were compared using LSD test at 5 % level of probability (Steel et al., [7]).

RESULTS AND DISCUSSION

A. Days taken to emergence

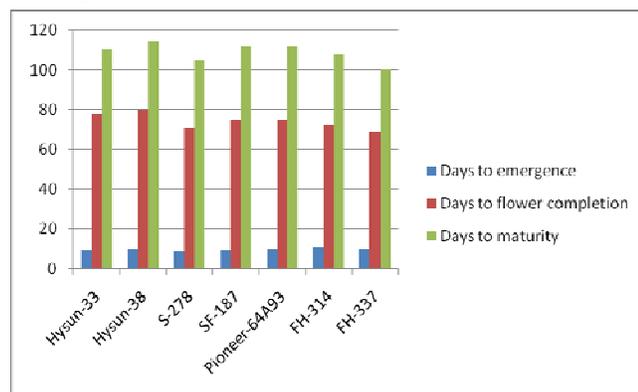
Number of days from sowing to emergence in various hybrids was not significantly different as shown in the graph while number of days taken to emergence noted in hybrid FH-314 (11.00 days) was maximum while the minimum days to emergence were observed in hybrid S-278(9.00days).The results obtained are contrary to the findings of Bakhat (2006).

B. Daystaken to flower completion

Graph indicates that hybrid Hysun-38 have taken significantly more number of days (80)which is statistically at par with Hysun-33(77.50 days) and was closely followed by SF-187 and Pioneer-64A93, both of these completed their flowering in 75 days. On the other hand, FH-337 flowered earlier (68.50 days) than all the hybrids. These results are partially in line with those of Laureti [8] and Akhtar [9].

C. Days takento maturity

Graph indicates that there was a significant difference among various hybrids as regard to number of days taken to maturity. Hybrid Hysun-38, took more number of days (114) that was statistically similar withSF-187(112 days), Pioneer-64A93 (112 days) and Hysun-33(110 days), from sowing to maturity. Bakht et al. [5] observed significant difference among hybrids with respect to number of days taken to maturity.



D. Number of plants m^{-2}

Plant population per unit area is considered as a mean to determine the status of corps stand. Results regarding the number of plants m^{-2} at harvest are given in table. It is clear from the data that the final plant population was not affected significantly by various hybrids. However, it varied from 4.80 to 5.00 per meter square in case of hybrid S-278 and FH-337, respectively. These results are supported by Barros et al, [10] but contrary to present findings of Bakhat [5] who reported significant differences among sunflower hybrids. These results suggested that factors like soil moisture, nutrients and environment required for seed germination and subsequent plant growth and development were similar through out the experimental area and plants of all the hybrids under study availed similar environments in all plots.

E. Plant height at maturity (cm)

It is obvious from the data shown in table that taller plants 213.10 cm and 210.12cm were attained in those treatments which were sown with hybrid Hysun-33 and Hysun-38 respectively, followed by plots seeded with FH-314 (205.73cm) and FH-337(204.00cm).SF-187 being short stature gave minimum plant height (167.35cm).These results are in line as reported by Mazher [11] and Razzaq [12].

F. Head diameter (cm)

It is more or less a genetically controlled character but the environment in which the crop is grown also influences it. Hybrid S-278 exhibited the maximum head diameter (28cm) which was significantly different than rest of the hybrids, while it was followed by plots seeded with hysun-33(24cm).However, the difference among Pioneer-64A93 and FH-314 were found to be non significant obtaining head diameter , 19.5cm and 19.00cm respectively and in Hybrid FH-337, minimum head diameter (17.5cm) was noticed. The higher head diameter in S-278 was attributed to its semi-dwarf character of growth. These results are agree with those reported by Waheed [13], Sassikumar and Gopalan [14] and Nouman [6] but contradictory to bakhat [5] who observed non significant variation among various hybrids.

G. Number of achene's head¹

Statistical analysis of data on number of achene's per head is represented in table. Highest number of achene's per head (1980) was recorded in Hybrid S-278 than other hybrids under study but was at par with Hysun-33 (1775 achene's head¹).while the lowest number of achene's per head (1005) was noted in hybrid FH-337.These results agree with those reported by Hanif et al.[15], Razzaq [12] and Bakhat [5].

H. 1000- achene's weight (gm)

The data regarding 1000 achene's weight is given in table , indicates that S-278 ranked first by giving 72.47 g of 1000 achene's weight which is statistically at par with Hysun-33 hybrid (70.25g). Hybrid Hysun-38 showed significantly higher test weight (65.33g) than SF-187, Pioneer-64A93, FH-314 and FH-337.These findings were supported by Pirani and Gupta [16] and Bakhat [5] who reported significant variation for test weight and other agronomic traits due to various sunflower hybrids.

I. Achene's yield (kg ha⁻¹)

Statistical analysis of the data also revealed that sunflower hybrid had significantly affected achene's yield. Highest achene's yield of 2735 kg ha⁻¹ was observed in hybrid S-278 followed by plots which were sown with hybrid Hysun-33 having achene's yield of 2542 kg ha⁻¹. The lowest achene's yield was recorded in hybrid FH-337 with an average production of 1650 kg ha⁻¹. Significant increase of 65% was observed in the achene's yield ha⁻¹ of hybrid S-278 when compared with hybrid FH-337. These results are supported

by Dash et al.[17] and Bakhat [5] who reported significant differences for achene's yield kg ha⁻¹ among various hybrids.

CONCLUSION

Hybrid S-278 has better potential for achene's yield as compared to other hybrids, and it was followed by Hysun-33. So hybrid S-278 is best suited to semi-arid conditions of Sargodha.

Table : Number of plants m⁻², Plant height, head diameter, number of achene's head⁻¹, 1000- achene's weight and achene's yield of various hybrids of sunflower.

Treatments. (Hybrids)	Number of plants m ⁻²	Plant height at maturity(cm)	Head diameter(cm)	Number of achene's head-1	1000-achene's weight(g)	Achene's yield(kg ha ⁻¹)
Hysun-33	4.85	213.10 a	24.00 b	1775 ab	70.25 ab	2542 b
Hysun-38	4.83	210.12 a	22.00 c	1390 b	65.33 b	2124 c
S-278	5.00	188.75 c	28.00 a	1980 a	72.47 a	2735 a
SF-187	4.87	167.35 d	22.00 c	1365 b	60.55 c	1920 d
Pioneer-64A93	4.87	200.14 b	19.5 d	1147 c	58.20 cd	1885 d
FH-314	4.82	205.73 ab	19.00 d	1120 c	54.34 d	1857 d
FH-337	4.80	204.00 ab	17.50 e	1005 d	48.44 e	1650 e

REFERENCE

- [1] Hatim, M. and G.Q. Abbasi (Ed.). 1994. Oil seed crops. In crop production. National Book Foundation, Islamabad, Pakistan.
- [2] Anonymous, 2011-12. Agricultural statistics of Pakistan, Govt. of Pakistan, Ministry of Food, Agriculture and livestock, Economic wing, Islamabad, Pakistan..
- [3] Khan, M. S., M.S.Swati, I.H. Khalil and A.iqbal 2003. Heterotic studies for various characters in sunflower. Asian J. plant Sci., 2: 10 10-1014.
- [4] Eve, B. and E. Andrei.1990. Studies on the response of some homologous sunflower hybrids and the prospective in agro-ecological conditions at the Podu-lloaiei-lasi Agricultural research station. Cercetari Agronomice in Moldova.24: 68-74.
- [5] Bakhat J., S. Ahmad, M. Tariq, H. Akbar and M. Shafi. 2006. Performance of various hybrids of sunflower in Peshawar valley. J.Agr.Sci., 3: 25-29.Guozan, N.L., Yuanfan, W. Yuying H. Vanling and Y. Daiguan. 1985. Inoculation of *Rhizobium* on clover. Chinese Prairie 3:60-63.
- [6] Nouman M., (2009). Comparative growth and yield performance of sunflower hybrids. Msc(Hons) thesis, Deptt. Of agron., Univ. of Agri., Faisalabad.
- [7] Steel, R.G.D., J.H. Torrie and D. A Deckey. 1997. *Principles and procedures of statistics: A biometrical approach*. 3rd ed. McGraw Hill book Co. Inc. New York: 400-428.
- [8] Laureti, D. 1982. Planting dates and density effects on sunflower. Riv. Agron.J. 15(2): 115-125. (Bio. Abst. 74(2): 7394-1982.
- [9] Akhtar, M.R. 1989. Studies on growth and yield of five sunflower cultivated plants in two different geometrical patterns. Msc(Hons) thesis, Deptt. Of agron., Univ. of Agri., Faisalabad.
- [10] Barros, J.F. C., M.de Carvalho, G. Basch 2004. Response of sunflower to sowing date and plant density under Mediterranean conditions Europe.J. Agron. , 21: 347-356.
- [11] Mazhar, M. 2005. Evaluation of comparative growth and yield performance on sunflower hybrids planted in autumn season. Msc(Hons) thesis, Deptt. Of agron. Univ. of Agri., Faisalabad.
- [12] Razzaq. A.H. (2006). Determination of growth, yield and quality performance of different spring planted sunflower hybrid. Msc(Hons) thesis, Deptt. Of agron. Univ. of Agri., Faisalabad.
- [13] Waheed, A., 1996.Effect of plant spacing on growth, yield and quality of two sunflower hybrids. Msc(Hons) thesis, Deptt. Of agron., Univ. of Agri., Faisalabad.
- [14] Sassikumar, D. and A. Gopalan.1999. Heterosis for seed yield and its components in sunflower. Madras Agri. J., 86: 565-567.
- [15] Hanif, M., Farhatullah and Raziuddin.1996. Corellation studies of grain yield and other characters in sunflower varieties. Sarhad J.of Agri.12 (6): 649-652.

- [16] Pirani, V and A. Gatto. 1995. Characyeristics of some sunflower hybrids in the course of being entered on the national Register of varieties. Sementi Elette. 41: 27-30.
- [17] Dash, S. S., D. N. Singh, D. S. Singh and S. Srivastava.1996.Evaluation of hybrids of sunflower for quantitative traits. J. Appl.Biol.6: 39-41.