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Effect of Planting Methods on the Growth and Yield Attributes of Two Sunflower Cultivars

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A study to test the influence of planting methods on the growth and yield of two sunflower cultivars was conducted at the Oilseed Section Agriculture Research Institute, Tandojam Pakistan during 1997. The experimental treatments included two planting methods viz. ridges and flat and two varieties viz: PSF-022-424 and HO-1. The results revealed that both the varieties produced significantly different seed yield ha^{-1}, whereas, planting methods had non-significant effects on the yield and its attributes. HO-1 had the tallest plants, more leaves, more stem girth, largest head size and more biomass yield under flat planting. However, higher seed yield was produced by HO-1 under ridge planting.

Key words: Sunflower, Planting methods, Yield.

Introduction

In Pakistan, edible oil has been a huge and expensive import item and a constant drain on our foreign exchange. The critical situation of vegetable oil is a consequence of an increase in total consumption far greater than increases in production (Anonymous 1997).

The oilseed crops of Pakistan comprise both conventional and non-conventional ones. For edible oil production, sunflower constitutes the second most important oil seed crop after soybean in the world (Syed 1991). Sunflower oil is used for cooking and margarine making, whereas, sunflower meal is rich in protein and is an excellent feed for animals. Sunflower has gained a promising position in boosting edible oil production in Pakisttan especially due to its high yielding hybrids. The area and production of sunflower is also increasing every year in Sindh and about 24 percent of the total production is contributed by the Sindh Province (Khan *et al* 1994).

Lack of appropriate production technology has been a limiting factor for enhancing the sunflower productivity. Besides, sunflower yield is drastically affected by cultivar, weather, soil and crop pests and diseases. However, agronomic factors like use of pure seed, optimum plant density, proper time and method of planting have great effect on sunflower growth, yield and yield attributes. The highest seed yield was obtained by growing sunflower variety HO-1 under ridge planting method with dibbling as compared to flat bed planting followed by drilling Solangi *et al* (1999) and Baloch (1991) reported that planting methods and fertilizer levels influenced significantly the seed yield and all yield components. Seed drilling gave better yield than dibbling and seed broadcasting methods. Variety HO-1 gave significantly more yield than Cargil-206. Kumar (1992) also got higher seed yield by drilling on flat bed. A positive response was noted for sunflower production grown at three locations in alternative years alongwith sowing methods (Sin *et al* 1987).

The present study was, therefore undertaken to determine the effect of two planting methods viz. dibbling and drilling on growth and yield of two sunflower cultivars grown under agro-ecological conditions of Tandojam.

Materials and Methods

The study was conducted at the Oilseed Section, Agriculture Research Institute, Tandojam to evaluate the effect of different planting methods on the growth and yield of two sunflower varieties. The experiment was laid out in a randomized complete block design with factorial arrangement having three replications. The net plot measured 3x5m. The varieties included were PSF-022-424 and HO-1 while the planting methods comprised ridge planting with dibbling and flat planting with drilling.

The seed bed was finely prepared by giving several ploughings followed by levelling. The crop was sown on September 3, 1996 on ridges bed with dibbling by hand and on flat bed by single coulter hand drill. The seed rate used was 10 kg ha^{-1}. A distance of 75cm between the rows and 25cm between the plants was maintained. Thinning was done 16 days after sowing when crop attained 15 cm height in order to maintain the required plant density for unit area.

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All the cultural practices such as weeding, interculturing and earthing up were done after the first irrigation i.e. 26 days after swoing and subsequently during plant growth.

Fertilizer was applied in a single dose at the time of sowing @ 100-50 kg NP ha^{-1}. The crop was given five irrigations from emergence to maturity. The irrigation water was applied through furrow and check flooding systems during full growth period. The crop was harvested on December 12, 1996.

Standard procedures were used to record data on growth and yield parameters. Seed yield and seed index were calculated from each plot under study. The data were analyzed statistically according to Fisher's analyses of variance techniques and the treatment means were compared by using LSD test at 0.05 P.

Results and Discussion

Plant height (cm). The results were highly significant for palnt height of both the sunflower varieties under the influence of different planting methods. Variety HO-1 attained greater plant height (186.38 cm) than PSF-022-424 (144.03 cm). The data presented in Fig 1a showed that there was constant increase in growth rate, where as sunflower variety HO-1 had greater plant height recorded on weekly basis than PSF-022-424.

Flat bed planting recorded highest plant height (166.90 cm) than ridge planting (163.47 cm). The data given in Fig 1b indicated that there was minute difference in mean plant height under both the planting methods. Flat bed planting had slightly more growth rate than ridge planting. It was concluded that variety HO-1 produced taller plants under flat bed planting than the variety PSF-022-424 under ridge planting method. The results are in conformity with the findings of Karim (1980).

Leaves per plant. The results regarding leaves per plant were statistically non-significant for both the sunflower varieties under the influence of different planting methods. However, the number of leaves per plant varied from 32.17 to 33.37 cm. The data presented in Fig 2a indicated that there was minute difference in mean number of leaves per plant of both the varieties.

Similarly flat bed planting produced slightly less number of leaves per plant than ridge planting. The data given in Fig 2b showed that ridge planting had slightly more number of leaves (recorded on weekly basis) than flat bed planting. The results lead to the conclusion that variety HO-1 produces more number of leaves per plant than PSF-022-424. Whereas, both planting methods had almost similar number of leave per plant. Contradictory results were reported by Sinha (1994) who stated that drill sowing increased plant height, stem thickness and leaves per plant.

Stem girth (cm). The data pertaining to stem girth were statistically non-significant for varieties but significant for planting methods. Variety HO-1 and PSF-022-424 had similar mean stem girth i.e. 8.35cm. The results regarding planting methods showed that ridge planting produced plants with thicker stem than flat planting. The data presented in Fig 3b indicated that ridge planting had significantly more stem girth recorded on weekly basis than flat bed planting. These results are in agreement with those of Kalyana (1993) who reported that planting methods had significant effect on all the growth characters of sunflower.

Head size (cm). The perusal of Table 1 indicates that head size is not affected significantly by the planting methods and

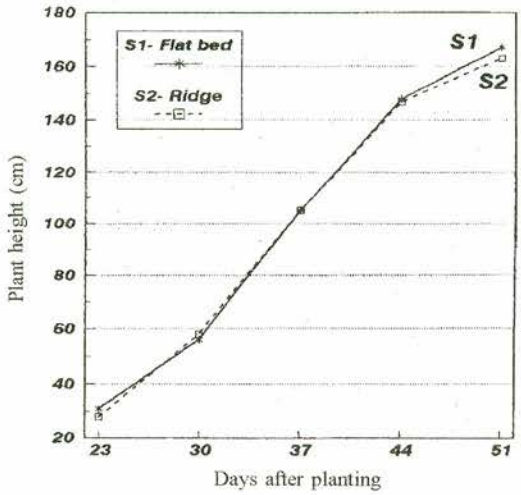

Fig 1a. Mean plant height (cm) as affected by planting methods.

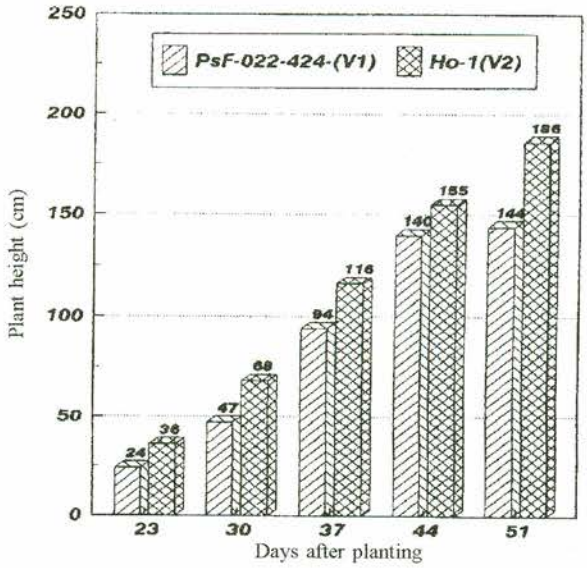

Fig 1b. Mean plant height (cm) as affected by varieties.

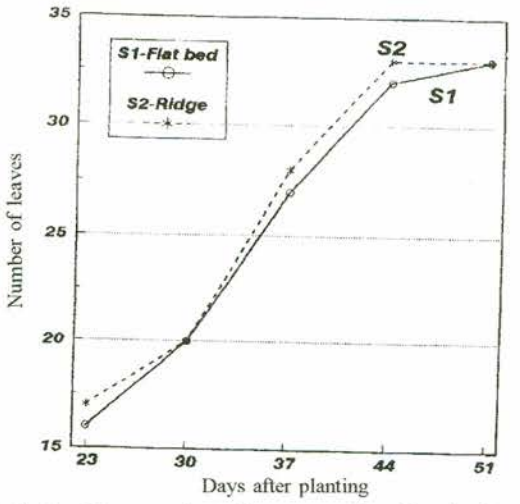

Fig 2a. Mean number of leaves as affected by planting methods.

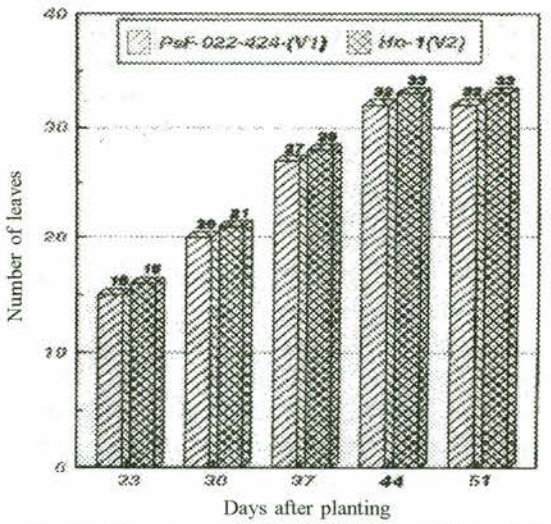

Fig 2b. Mean number of leaves as affected by varieties.

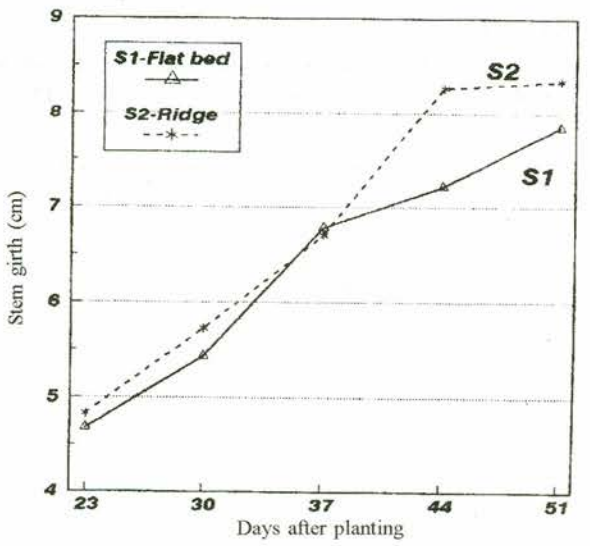

Fig 3a. Mean stem girth (cm) as affected by planting methods.

sunflower varieties. There is non-significant difference between the varieties with regard to head size under the influence of planting methods which varied from 677 to 6.99 cm. Ridge planting induced heads of significant greater size (6.92 cm) than flat bed planting (6.79 cm). There was close relationship between increase of stem grith and head size for variety HO-1. These results are confirmed by Karim (1980).

Biomass yield per plant (g). The data on biomass yield per plant revealed that there was non-significant difference between the two varieties under study. However, the biomass yield per plant varied from 901.3 to 1093. 9 g. Flat bed planting produced higher biomass yield (1035.0g) per plant than ridge planting (955.7g). It was concluded from the results that variety HO-1 gave highest biomass yield per plant under flat bed planting than PSF-022-424 under ridge planting. The results are in conformity with those of Randhawa and Tilka (1995) who reported that yield components in sunflower were increased by drilling.

Seed index (g). The seed index values for both the varieties under influence of planting methods were non-significant. However, the seed index for varieties varied from 64.01 to 71.54 g. Regarding planting methods, flat bed planting showed higher seed index (69.78 g) than ridge planting (66.27 g). Shafshak *et al* (1986) also reported that alternating 2 rows of sunflowers with 2 rows of soybean gave the highest seed index (1000-seed weight).

Seed yield (kg ha^{-1}). The data regarding seed yield (Table 2) were statistically significant for varieties and non-significant for planting methods. Variety HO-1 had more (1611.08 kg ha^{-1}) seed yield ha^{-1} than PSF-022-424 (1166.67 kg ha^{-1}).

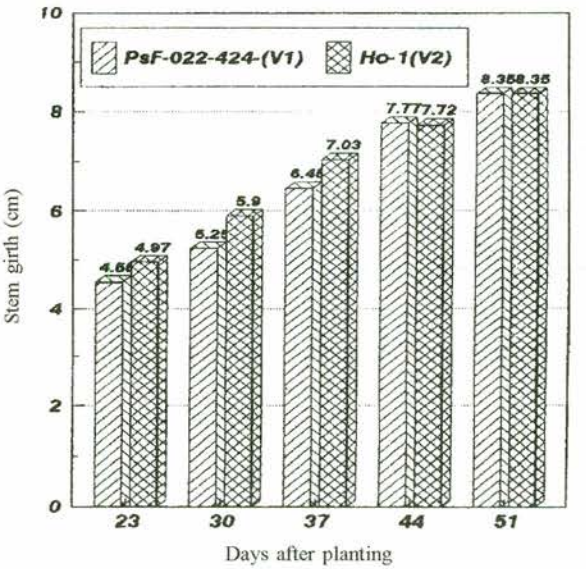

Fig 3b. Mean stem girth (cm) as affected by varieties.

The planting methods had little effect on mean seed yield ha^{-1}. However, the mean seed yield ha^{-1} varied from 1366.64 to 1444.4 kg ha^{-1}. The results had close relationship with yield attributes like head size. Milam and Hickingbottom (1987) reported similar results.

Table 1
Growth characters of two sunflower varieties as affected by planting methods

Planting methods	Varieties	Plant height (cm)	Leaves $plant^{-1}$	Stem girth (cm)	Head size (cm)
Flat bed	HO-1	188.53	34.67	7.77	7.10
	PSF-022-424	145.27	30.67	7.93	6.48
Ridgebed	HO-1	184.13	32.07	8.93	6.89
	PSF-022-424	142.80	33.67	8.77	6.94
S.E for varieties		5.9658	1.0408	0.1933	0.2918
Cd 1		23.4546	--	--	--
Cd 2		38.8098	--	--	--
S.E for Planting Methods		1.5456	0.2273	0.1061	0.3347
Cd 1		--	--	0.6452	--
S.E for interactions		8.4370	1.4720	0.2734	0.4127

Table 2
Yield parameters of two sunflower varieties as affected by planting methods

Planting methods	Varieties	Biomass yield (g)/plant	Seed index (g)	Seed yields (kg/ha)
Flat bed	HO-1	1187.73	65.25	1599.97
	PSF-022-424	882.27	73.32	1133.31
Ridgebed	HO-1	991.07	62.78	1622.20
	PSF-022-424	920.27	69.75	1200.63
S.E for varieties		72.08	1.9491	107.4934
Cd 1		--	--	422.6118
S.E for planting methods		72.08	5.8342	136.5071
Cd 1		--	--	--
S.E for interactions		101.93	2.7565	152.0186

The results lead to the conclusion that variety HO-1 produces higher seed yield ha^{-1} under ridge planting than flat planting.

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