

Comparative Performance of Sunflower Varieties in Response to Different Fertility Regimes

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Abstract: A field trial was conducted to compare the performance of sunflower varieties under different fertility regimes had significant influence on days to flowering, days to maturity, plant height, head diameter, seeds per head, seed index and seed yield; while treatment interactions exposed non-significant influence on all the growth and yield components except plant height. Varieties Ho-1 and Cargil-206 with the fertility regime 120-45 kg N-O/ha produced late flowering and maturity in tall plants, maximum head diameter, seed per head, seed index and seed yield per hectare. Among the tested varieties Ho-1 and Cargil-206 seemed to be better fertilizer responsive and performed well under higher fertility regimes. It was deduced that Ho-1 and Cargil-206 could be satisfactory high yielders if supplied with 120-45 kg N-P per hectare.

Key Words: Sunflower-Varieties-Fertility Regimes

Introduction

The sunflower (*Helianthus annuus L.*) is a member of composite, a large and successful family of flowering plants occurring throughout the world, although few species are of economic importance with cultivated plants. The genus *Helianthus* is named from the Greek, "Helios" means sun and "anthos" means flower. The sunflower seed is used for cooking, for salads and for manufacturing of margarine. It is also used in blends with linseed and other drying oils for the preparation of fine paints, soaps, lubricants and cosmetics. The seeds are used for feeding livestock, poultry and cage birds which contain 32-45% oil and 40-45% proteins. The oil cake obtained after crushing is rich in protein and is considered good for cattle feed. The hulls and the heads after threshing are also used for feeding livestock. The sunflower plants are also grown for fodder and silage for livestock and as a green manure crop (Weiss, 1984). Sunflower does comparatively well where the altitude are high, and temperature is relatively low. Because of very well developed root system, sunflower is fairly drought resistant, can thrive best on a variety of soils including sandy soil and is fairly tolerant to low soil fertility (Weiss, 1984). In Sindh province adaptability of sunflower among the farming community is increasing with a solid space. But, yet there is a long way to go for getting yields comparable with advanced sunflower growing countries. The causes of lower yields per unit area in our condition may be numerous, but concisely could say improved package of production technology alongwith high yielding varieties. Thus, the varieties with high yield and resistant to natural hazards are to top-most importance alongwith balanced application of nutrients particularly nitrogen (N) and phosphorus (P), because N and P are essential nutrient elements for sunflower cultivation. Nitrogen promotes the plant growth, green color to the leaves, and vital constituent in crop stand. Its deficiency produces yellowing of leaves, reduced root development and poor yield. Excessive application of nitrogen may cause loss of disease resistance, and leaves may grow larger than normal size. Phosphorus assists the plant in resisting disease and also influence the intake and use of many other plant in resisting disease and also influence the intake and use of many

other plant foods including water (Tripathi, 1989). Keeping in view the importance of high yielding varieties of sunflower and association of major nutrient elements with its high crop yields, an attempt has been made to compare the performance of sunflower varieties under different fertility regimes (N and P).

Materials and Methods

The field area selected for these studies was loamy type in texture. Land was prepared by thorough plowing followed by leveling, clods were also crushed to eradicate the weeds and to facilitate the uniform irrigation application in each plot. The experimental design laid out on the prepared land, was Factorial Randomized Complete Block replicated thrice. Each experimental unit plot measured 3.5 x 3.0 m (10.5 m²) and was connected with a 75 cm wide water channel to supply the irrigation water to each plot independently. The soaking dose was applied and good seed bed was prepared by plowing, clods crushing and precision leveling. The seeds for Four sunflower varieties were drilled at the seed rate of 5 kg per hectare by single coulter hand driven drill. The treatments details are furnished as under:-

Treatments

Varieties = 4
V1 Cargil-206
V2 HD-1
V3 Record
V4 Ho-1

Fertility Regimes = 3

F1 60-45 kg NP/ha
F2 90-45 kg NP/ha
F3 120-45 kg NP/ha

Phosphorus was applied in the form of Single Super Phosphate and all given at the time of sowing, while nitrogen was applied in the form of Urea (46% N) and given in full at first irrigation. All the cultural operations were practiced uniformly in all the experimental units throughout the growing period.

Results and Discussion

Days taken to 75% flowering : It is obvious from the

results variety Ho-1 took significantly greater number of days to bear flowering, followed by Gargil-206 and HD-1, where 75% flowering were observed respectively. Variety Record produced flowers earlier as compared to all other varieties. This variation in days taken to flowering by different varieties may be due to the genetical make up of their parental material. The results further stated that when the crop was fertilized with highest N-P level of 120-45 kg per hectare, the flowering (75%) delayed considerably (65.83 days) as compared to 90-45 or 60-45 kg N-P per hectare levels, where the crop completed 75% flowering in 64.25 and 63.00 days in descending order. The treatment interaction described that sunflower variety Ho-1 when fertilized with 120-45 kg N-P per hectare, it took comparatively greater number of days to bear 75% flowering, followed by treatment interaction of variety Ho-1 x 90-45 and Cargil-206 x 120-45 kg N-P per hectare, where the crop took 68.00 and 66.33 days to bear 75% flowering respectively. The minimum number of days (59.00) to flowering was observed in case of variety Record when fertilized with lowest N-P level of 60-45 kg per hectare. It was observed that, as the N-P level increased, the flowering delayed significantly which might be the role of increasing nitrogen to prolong further the vegetative phase of the crop.

Days taken to 90% maturity: The results for days taken to 90% maturity concluded that HD-1 and Record are the early maturity varieties and Ho-1 and Cargil-206 late to some extent, while the maturity period was prolonged with each increment in the N-P level, which might be due to the additional nitrogen application, which increased the growth period of the crop.

Plant height: Sunflower variety Ho-1 fertilized with 120-45 kg N-P per hectare produced significantly taller plant followed by Gargil-206. The D.M.R. test revealed 4th difference regarding plant height between varieties Record and HD-1 were non-significant. However, plant height was improved significantly after each increased application of N-P fertilizer.

Head diameter: It is conspicuous from the results maximum mean head diameter was produced by Ho-1 sunflower variety, followed by variety Cargil-206. However, the minimum head diameter was noticed in case of variety HD-1. This difference in head diameter might be due to genetical make up of their parental material. The plots supplied with highest 120-45 kg N-P per hectare produced comparatively greater head diameter, while 90-45 kg and 60-45 kg N-P levels ranked second and third in descending order.

The results further disclosed that there was a consecutive improvement in number of seeds per head with each increased level of N-P per hectare, however statistically the differences were non-significant under treatment interactions.

Seed Index Value (100 seeds weight): Significantly greater mean seed index value was recorded in case of Cargil-206 followed by Ho-1 sunflower varieties; whereas the lowest seed index value was obtained by hybrid cultivar HD-1.

Seed index value was improved successively with each increased level of N-P fertilizers, while the varieties have different trend of effectiveness, as the performance of Cargil-206 and Ho-1 is comparable, while the performance of HD-1 and Record showed similarity to some extent.

Table 1: Mean number of days taken to 75% flowering, Days taken to 90% maturity of sunflower as affected by different varieties, fertility regimes and their interaction

Varieties	Fertility Regimes (N-P kg/ha)			Mean for
	60-45	90-45	120-45	varieties
Number of days taken to 75% flowering				
V1 Cargil-206	64.00	65.00	66.32	65.11ab
V2 HD-1	63.00	63.66	65.00	65.00bc
V3 Record	59.00	60.33	61.33	60.22c
V4 Ho-1	66.00	68.00	70.67	68.22a
Mean for	63.00b	64.25ab	65.83 a	-
Fertility Regimes				
				Interaction
Varieties (V)		Fertility Regime (F)		(V x F)
S.E	0.2483	0.4966		0.2483
LSD 0.05	2.2350	3.0220		-
LSD 0.01	4.1030	6.9710		-
Days taken to 90% maturity				
V1 Cargil-206	92.67	92.67	94.00	93.11 a
V2 HD-1	85.00	86.00	87.67	86.22 b
V3 Record	83.33	85.00	87.00	85.11 a
V4 Ho-1	94.00	95.33	96.00	95.11 a
Mean for	88.75b	89.75ab	91.17a	-
Fertility Regimes				
				Interaction
Varieties (V)		Fertility Regime (F)		(V x F)
S.E	0.2157	0.2490		0.2157
LSD 0.05	1.9410	2.6240		-
LSD 0.01	3.5620	6.0530		-

Value followed by similar letters are not significantly different at 5% probability level.

Table 2: Mean plot height (cm), head diameter (cm) of sunflower as affected by different varieties, fertility regimes and their interaction.

Varieties	Fertility Regimes (N-P kg/ha)			Mean for
	60-45	90-45	120-45	varieties
Plant Height (cm)				
V1 Cargil-206	148.00	156.67	161.67	155.44 b
V2 HD-1	133.67	138.67	140.67	137.67 c
V3 Record	139.00	146.33	149.00	144.78 c
V4 Ho-1	161.00	171.33	182.67	171.67 a
Mean for	145.42 b	153.25ab	158.10a	-
Fertility Regimes				
				Interaction
Varieties (V)		Fertility Regime (F)		(V x F)
S.E	0.5939	0.6858		0.5939
LSD 0.05	5.3460	7.2270		3.6600
LSD 0.01	9.8110	16.6710		5.1310
Head diameter (cm)				
V1 Cargil-206	13.67	14.67	16.00	14.78 ab
V2 HD-1	12.33	13.33	13.66	13.11 c
V3 Record	13.00	14.00	13.67	13.56 bc
V4 Ho-1	14.33	15.33	16.33	15.33 a
Mean for	13.33 b	14.33ab	14.92 a	-
Fertility Regimes				
				Interaction
Varieties (V)		Fertility Regime (F)		(V x F)
S.E	0.2214	0.2557		1.2214
LSD 0.05	1.9930	2.6940		-
LSD 0.01	3.6570	6.2140		-

Value followed by similar letters are not significantly different at 5% probability level

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Table 3: Mean seed index value (100 seeds weight, g), seed Yield per hectare of sunflower as affected by different varieties, fertility regimes and their interaction

Varieties	Fertility Regimes (N-P kg/ha)			Mean for varieties
	60-45	90-45	120-45	
100 seeds weight, g				
V1 Cargil-206	6.46	6.76	7.03	6.75 a
V2 HD-1	5.30	6.13	6.61	6.01 b
V3 Record	5.42	6.39	6.78	6.20 ab
V4 Ho-1	6.58	6.60	6.97	6.72 a
Mean for Fertility Regimes	5.93 b	6.45 ab	6.85 a	-
				Interaction (V x F)
S.E	0.1387	0.1300		0.1387
LSD 0.05	1.7280	1.4090		-
LSD 0.01	2.8680	2.0240		-
Seed yield per hectare				
V1 Cargil-206	2.470	2.839	2.968	2.741 a
V2 HD-1	2.080	2.447	2.534	2.353 b
V3 Record	2.187	2.355	2.534	2.359 b
V4 Ho-1	2.473	2.895	3.083	2.817 a
Mean for Fertility Regimes	2.289 b	2.634 ab	2.780 a	-
				Interaction (V x F)
S.E	0.0379	0.0439		0.0379
LSD 0.05	0.3388	0.4581		-
LSD 0.01	0.6218	1.0570		-

Value followed by similar letters are not significantly different at 5% probability level

Seed Yield per Hectare: Sunflower cultivars Ho-1 and Cargil-206 gave significantly greater seed yields as compared to varieties Record and HD-1. Furthermore, higher N-P level of 120-45 kg per hectare produced significantly greater seed yield per hectare, as compared to 90-45 kg and 60-45 kg N-P per hectare. This trend of effectiveness divulged that Ho-1 and Cargil-206 have the character of more positive response to N-P fertilizers than HD-1 and Record. On the other hand, the situation exhibited the vitality of N-P fertilizer for getting higher seed yields in sunflower crop.

Seed yield was improved gradually with each increased level of N-P fertilizer, while the varieties have different trend of effectiveness, and Ho-1 and Cargil-206 proved to be more fertilizer responsive than HD-1 and Record. Thus, it is recommended that Ho-1 and Cargil-206 are the most suitable sunflower varieties which produces satisfactory seed yields, with 120-45 kg N-P per hectare fertilizers.

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