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Yield and Yield Components of Sunflower as Affected by Various NPK Levels

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Abstract: Field experiment was conducted to determine N, P and K requirements of sunflower (*Helianthus annuus* L.) grown under Bahawalpur irrigated conditions on medium heavy loam soil. Four levels of N (0,60,120,180 kg NPK ha^{-1}) four levels of P_2O_5 (0,30,60,90 kg NPK ha^{-1}) and four levels of K_2O (0,60,120,180 kg NPK ha^{-1}) in combinations were put to test. Data collected on seed yield and yield components were subjected to standard statistical analysis. The crop indicated positive/significant response to N, P and K application. Significant positive correlation was observed between seed yield and head size. Optimum fertilizer requirement computed was 120-90-60 kg NPK ha^{-1} for sunflower crop under experimental condition.

Key words: Sunflower, NPK response, yield

Introduction

Sunflower (*Helianthus annuus* L.) is an important source of high quality edible oil. In Pakistan It is grown on area of 114000 hectares with an average yield of 1311 kg ha^{-1} (Anonymous, 1999). It is considered to be the most important oil seed crop of the world due to its wide range adaptability and highest oilseed contents (40-50 %). Agro climatic conditions of Pakistan are such type that this crop can be grown twice a year successfully (Baksh *et al*., 1999). Therefore efforts have been made to increase the area and production of this crop in the country. Accurately quantifying the optimum fertilizer rate is essential to maximize profitability and minimize potential negative environmental impact (Chaudhry and Sarwar , 1999). Hermati (1993) reported that sunflower hybrids were given 0-150 kg N, 0-150 kg P_2O_5 and 0-180 kg K_2O ha^{-1} Increasing nitrogen application rates slightly increased yield. Optimum yields were obtained with 30-60 kg P_2O_5 and 60 kg K_2O ha^{-1}. Based on these findings the present study was conducted with the objectives to study the effect of NPK levels on yield and yield components of sunflower and identify optimum NPK level for maximum yield.

Materials and Methods

The study was carried out at Arid Zone Research Institute, Bahawalpur during the year 2000. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Sunflower variety Hysun-33 was planted on February 03 , 2000, in a plot size 2.4*13m.sq. having row to row and plant to plant distances as 75 and 25 cms respectively. The fertilizer used were Urea, Triple Super Phosphate (TSP) and Sulfate of Potash (SOP). All of the TSP, SOP and half of the Urea were applied at the time of sowing and remaining dose of Urea was applied at the time of flowering. First irrigation was applied after 30 days of sowing. Subsequent irrigation was applied whenever needed. All the plant protection measures and cultural practices were performed as usual. Data regarding yield and yield components were recorded and analysed statistically (Steel and Torrie, 1980).

Results and Discussion

The data presented in the table revealed that different NPK levels significantly affected the plant height. The increase in NPK dose increased the plant height. The maximum plant height was observed for the plots fertilized with 120-90-60 kg NPK ha^{-1} followed by plots received fertilizer dose 120-60-180 kg NPK ha^{-1}. Decrease in phosphorus dose from 90 to 60 kg ha^{-1} and increase in potassium dose from 60 to 180 kg ha^{-1} have no significant affect on plant height. Minimum plant height was observed for plots which received no fertilizer and 0-60-60

Table 1: Yield and yield components of sunflower as affected by various NPK levels

Treatments N-P-K	Plant height (m)	No. of leaves/ plant	Head diameter (cm)	Grain yield kg ha^{-1}
0-0-0	1.220	22.93	9.20	1334
0-60-60	1.347	22.70	11.73	1655
60-60-60	1.500	24.20	11.70	2124
120-60-60	1.630	24.53	14.93	2754
180-60-60	1.370	24.67	13.87	2371
120-0-60	1.600	25.83	14.43	2792
120-30-60	1.490	25.83	14.00	2668
120-90-60	1.653	28.33	15.10	2828
120-60-0	1.610	24.83	14.00	2524
120-60-120	1.570	25.10	13.03	2297
120-60-180	1.650	27.67	14.93	2779
L.S.D	0.1616	0.2900	0.3692	18.85
C.V	6.19	0.68	1.63	0.47

kg NPK ha^{-1}. High NPK doses extended growth period and thus increased plant height. Similar findings were also reported by Robison *et al.* (1979).

Table 1 indicates that maximum number of leaves were recorded in plots fertilized with 120-90-60 kg NPK ha^{-1} followed by 120-60-180 kg NPK ha^{-1}. Minimum number of leaves per plant were observed at 0-60-60 kg NPK ha^{-1}. Increasing NPK doses accelerated plant height and vegetative growth which could be responsible for Increasing number of leaves per plant. These results are tally to the work of Nagar and Allam (1991)

Head diameter was significantly affected by the NPK levels. A reference to Data given in the table shows that head diameter increased with increasing NPK levels. The highest head diameter was recorded for plots received 120-90-60, 120-60-180 and 120-60-60 kg NPK ha^{-1} whereas lowest head diameter was recorded in plots receiving no fertilizer. Phosphorus application increases yield and yield components such as head diameter. These results are tally to the work of Mallikarjuna *et al.* (2000).

Table 1 also indicates that different levels of NPK significantly affected the grain yield of sunflower. A probe to said table indicates that maximum grain yield was recorded for plots which received 120-90-60 kg NPK ha^{-1}. Whereas minimum grain yield was recorded for control plots. Grain yield increases as the NPK levels are being increased. These results are in conformity with those of Devi *et al.* (1999), Stulin (1999) and Sathiyavelu *et al.* (1994). From these results an increase in the magnitude of almost all characters of sunflower studied with the increasing levels of NPK. It is concluded from the discussion that fertilizer rate of 120-90-60 kg NPK ha^{-1} was better for getting higher grain yield of sunflower as compared with other fertilizer doses under climatic conditions of Bahawalpur.

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