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Performance of Various Maize Varieties as Affected by Different NP Levels

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Abstract: Field experiment was conducted to study the performance of various maize varieties as affected by different NP levels. Analysis of the data revealed that days to tasseling (82.96), thousand grain weight (268 g), biological yield (20293 kg ha^{-1}), and grain yield (3193 kg ha^{-1}) was significantly affected by different varieties. In case of fertilizer levels days to tasseling (77), biological yield (20067 kg ha^{-1}), grain yield (3073 kg ha^{-1}), and harvest index (15.6) was significantly affected by different NP levels. Similarly, interaction between varieties and NP had a significant effect on days to tasseling, thousand grain weight, biological yield, harvest index and grain yield. Variety "Hybrid No. 922" produced maximum days to tasseling (83), thousand grain weight (268 g), biological yield (20293 kg ha^{-1}), and grain yield (3193 kg ha^{-1}) when compared to other varieties. When the effect of different levels of NP was taken into an account, it was revealed that plots treated with NP levels of 120: 60 kg NP ha^{-1} produced maximum grain yield (3070 kg ha^{-1}) and harvest index (14.94).

Key words: Varietal performance, NP levels, maize

Introduction

Maize is a crop with high yield potential and it occupies an important place in the cropping system of Pakistan. It not only provides food to the country fast growing population but also supplies raw materials to some of her industries. Pakistan though an agricultural country, is deficient in food grain and other food articles. The main cause of food shortage in the country has been failure of increased production of food grain to keep pace with the fast increase in population. To fill the gape between supply and demand, it is necessary to increase the production of food grain in the country. Production can be increased by bringing more culturable waste land under cultivation and increasing per unit of crop from the area already under cultivation. Maize is the third most important cereal crop in Pakistan after wheat and rice. It is grown extensively in the temperate, tropical and sub tropical regions in the world. However, it performs poorly under high temperature and low humidity conditions, damaging the foliage and interfere with proper pollination resulting in poor grain formation Much of increase in maize yield in recent decades has been closely associated with increased level of nitrogen and phosphorous. It is estimated that about 40-50% increase in yield of maize is possible if proper dose of N and P is applied. N and P above or below the optimum level will affect the maize crop severely. Alfoldi *et al.* (1994) investigated that concentration in the mature grains of maize were higher at high doses of nitrogen. N and P fertilizers at higher rate and especially in combination with lime markedly increased maize yield and NPK and Ca uptake (Invoilov *et al.*, 1990). Kostic *et al.* (1991) reported that as compared to nitrogen alone, phosphorous increased average gain yield of maize by 11.5% at a lower and 14.2% at higher nitrogen rate. Singh and Duby (1991) concluded that grain yield and net returns increased with increase in nitrogen and phosphorous rates. Similarly, Thiraporn *et al.* (1992) reported that grain and biomass yield increased up to 80 kg N ha^{-1}, higher application did not increase biomass. Manzor *et al.* (1983) and Silva (1992) reported that application of N increased significantly the yield of maize crop. Arian *et al.* (1989) and Mishra (1988) concluded that number of grains cob^{-1} and grain yield of different maize genotypes were significantly increased with increasing levels of N and P. Amoruwa *et al.* (1987) reported that grain and stover yield, number of grains cob^{-1} and 1000 grains weight increased when N was applied at the rate of 150 Kg ha^{-1}.

Keeping in view, the role of N and P in the nutritional requirements of maize crop, the present research project was carried out to study the effect of different levels of NP on maize varieties.

Materials and Methods

In order to study performance of various maize varieties as affected by different NP levels, an experiment was conducted at Malakandher Research Farm, NWFP Agricultural University, Peshawar during summer 1999. Before sowing, a composite soil sample was taken for various physiochemical properties (Table 1). The experiment was laid out in randomized complete block design (RCBD) with split plot arrangements, and were replicated four times. Varieties were allotted to the main plots and NP levels to sub plot. All standard agronomic

practices were followed during the course of study.

Maize varieties

a. Hybrid No. 922 b. Sarhad white c. Sweet Corn

NP levels (kg ha^{-1})

F_1 (00:00) F_2 (60:60) F_3 (60:120)
F_4 (120:60) F_5 (180:60) F_6 (60:180)
F_7 (120:120)

Table 1: Physiochemical properties of the soil

pH	7.0
E.C. dSm^{-1}	0.54
Organic matter (%)	0.72
Total nitrogen (before sowing) mg kg^{-1}	210
Total nitrogen (after sowing) mg kg^{-1}	3-5
Available phosphorus mg kg^{-1}	11

Data regarding days to tasseling, cob length (cm), 1000-grain weight, biological yield, harvest index, grain yield (kg ha^{-1}) were recorded and analyzed according to RCBD and upon obtaining significant differences Least Significant Differences (LSD) test was applied (Steel and Torrie, 1980).

Results and Discussion

Days to tasseling: Mean values of the data revealed that varieties and NP levels had significantly ($P \leq 0.05$) affected days to silking. Highest number of days (82.96) to tasseling was noted in case of Hybrid No. 922. NP levels showed a significant ($P \leq 0.05$) effect on days to tasseling. Maximum number of 46.33 days to tasseling was recorded from control plots and minimum of 75.25 days to

Table 2: Days to tasselling and cob length (cm) as affected by different varieties and NP levels on maize

Fertilizer doses	Varieties				Varieties			
Kg ha^{-1}	Hybrid No. 922	Sarhad white	Sweet corn	Mean	Hybrid No. 922	Sarhad white	Sweet corn	Mean
	Days to tasselling				**Cob length (cm)**			
F_1	86.25a	76.50e	75.25ef	46.33a	16.25	18.12	19.87	18.08
F_2	83.25bc	74.25f	74.00f	77.17ab	18.82	16.75	16.87	17.47
F_3	82.25bc	74.75ef	74.00f	77.00ab	22.07	23.50	15.75	20.44
F_4	81.50cd	74.25e	70.00h	75.25b	19.75	22.75	19.87	20.79
F_5	80.00d	75.25ef	71.25gh	75.50ab	20.37	23.75	14.70	19.61
F_6	84.00b	74.25f	74.00f	77.42ab	19.37	20.75	23.12	20.08
F_7	83.50bc	74.00f	73.25g	76.92ab	19.62	19.00	17.05	18.56
Mean	82.96a	74.75b	73.11		19.47	20.66	18.18	

Table 3: Thousand grain weight (g) and biological yield (kg ha^{-1}) as affected by different varieties and NP levels on maize

Fertilizer doses	Varieties				Varieties			
Kg ha^{-1}	Hybrid No. 922	Sarhad white	Sweet corn	Mean	Hybrid No. 922	Sarhad white	Sweet corn	Mean
	Thousand grain weight (g)				**Biological yiel (Kg ha^{-1})**			
F_1	249.00cd	248.30cd	211.00e	236.08	20000bc	14253ij	17753ef	17333bc
F_2	257.30bc	248.30cd	171.30g	225.58	18467de	16447gh	18333de	17753bc
F_3	273.00ab	243.30cd	191.00f	235.75	20667b	15420hi	17333efg	17807b
F_4	272.80ab	242.50cd	180.80fg	232.00	23353a	16680fg	20167bc	20067a
F_5	285.30a	253.00c	183.30fg	240.50	19780bc	14581ij	18420de	17593bc
F_6	271.00ab	257.80bc	178.50fg	235.75	19253cd	13667jk	14920ij	15947d
F_7	271.30ab	235.00d	189.50f	231.92	20513b	12833k	1667fgh	16673cd
Mean	286.50a	246.90b	181.50c		20293a	14840c	17853b	

Table 4: Harvest Index (%) and grain yield (kg ha^{-1}) as affected by different varieties and NP levels on maize

Fertilizer doses	Varieties				Varieties			
Kg ha^{-1}	Hybrid No. 922	Sarhad white	Sweet corn	Mean	Hybrid No. 922	Sarhad white	Sweet corn	Mean
	Harvest index (%)				**Grain yield (Kg ha^{-1})**			
F_1	10.65d	13.17gi	11.80jk	11.88d	2133fgh	1881hi	2100fgh	2040d
F_2	17.05bcd	13.35gj	12.75gj	14.38bc	3167bc	2200fgh	2333fg	2567b
F_3	13.30def	13.90ei	14.05eh	14.42bc	3167bc	2147fgh	2447ef	2587b
F_4	19.17a	13.22gi	12.42hk	14.94ab	4480a	2213fgh	2513def	3073a
F_5	17.45abc	13.47fj	10.67d	13.84bc	3447b	1980ghi	2013ghi	2480bc
F_6	15.72cde	12.02ijk	18.92ab	15.56a	3013c	1667i	2847cde	2513bc
F_7	14.72eh	14.47efg	12.62gj	1.77c	2920cd	1833hi	2100fgh	2280c
Mean	15.65a	13.37b	13.32c		3193a	1993c	2340b	

Mean followed by different letters are significantly different from one another at $P < 0.05$

tasseling were kept in plots treated fertilizer at the rate of 120:60. The probable reason could be that nitrogen had enhanced vegetative growth, which delayed reproductive stage. Similar results are also reported by Onisie *et al.* (1993). In case of interaction between varieties and NP levels, it was significantly affected to days to tasseling. Maximum 86 days to tasseling was recorded from plots of Hybrid No. 922 variety at control plots.

Cob length (cm): Data revealed that number of cob length was non significantly affected by different varieties (Table 2). Variety Sarhad white showed maximum (20.66 cm) cob length, while minimum cob length (18.18 cm) was recorded from those plots, which were sown with sweet corn variety. Mean values of the data (Table 2) showed that NP levels had a non significant effect on cob length. Maximum (20.49 cm) cob length was recorded in those plots, which were treated with 120:60 kg NP ha^{-1}, while minimum cob length (17.48 cm) was noted from plots in which fertilizer was used at the rate of 60:60 kg NP ha^{-1}. Similar results are also reported by Amoruwa *et al.* (1987). Mean value of the data also suggested that interaction between varieties and NP levels did not affect cob length significantly. However, highest longer cobs was recorded in case of Sarhad white treated with 180:60 or 120:60 kg NP ha^{-1}, while minimum (15.75 cm) cob length was produced from those plots, which were sown with Sweet corn and received 60:120 kg NP ha^{-1}.

Thousand grain weight (g): Data regarding thousand grains weight revealed that there was significantly ($P \leq 0.05$) affected by different varieties. Heavier grains (286.50 g) were recorded from Hybrid No. 922, while lighter grains were noted in case of sweet corn (181.50 g). NP levels had a non significant effect on thousand grain weight. Maximum grain weight (240.50 g) was produced in those plots, which were treated with NP levels of 180:60 kg ha^{-1}. While minimum 1000 grains weight (225.58 g) was recorded from plots fertilized at the rate of 60:60 kg NP ha^{-1} (Table 3). In case of interaction between varieties and NP levels, it was significantly affected on thousand grains weight. Also indicated that maximum of 285.30 g thousand grains weight was recorded from Hybrid No. 922 and receiving 180:60 kg NP ha^{-1}, while minimum thousand grain weight (171.30 g) was noted from Sweet corn in those plots which were treated with NP levels of 60:60 kg ha^{-1}. Similar results were also reported by Ram *et al.* (1993).

Biological yield: Data showed that biological yield was significantly ($P \leq 0.05$) affected by different varieties (Table 3). Maximum biological yield (20293 kg ha^{-1}) was produced (Table 3) by plots sown with Hybrid No. 922, while lowest biological yield was recorded from Sarhad white (14840 kg ha^{-1}). NP levels showed a significant ($P < 0.05$) effect on biological yield. Maximum biological yield (20067 kg ha^{-1}) was produced by those plots which were treated with NP levels of 120:60 kg ha^{-1}, while minimum biological yield (15947 kg ha^{-1}) was recorded from plots when fertilizer was used at the rate of 60:180 kg NP ha^{-1}. Similarly, in case of interaction between varieties and NP levels, a significant effect on biological yield was noted. Maximum biological yield was recorded from plots sown with Hybrid No. 922 and treated with 120:60 kg NP ha^{-1}, while minimum biological yield was in which NP was treated with 120:120 kg ha^{-1} and plots sown with Sarhad white. These results agree with Muhammad *et al.* (2002).

Harvest index: Harvest index was non significantly affected by different varieties (Table 4). However, maximum harvest index (15.6 %) was recorded from plots sown with Hybrid No. 922. When the effect of different NP combinations was taken into consideration, it was revealed that various NP levels had a significant ($P \leq 0.05$) effect on harvest index. Mean value of the data indicated that harvest index was maximum when plots were treated with NP combination of 60:180 kg ha^{-1} while minimum was noted from control plots. In case of interaction between varieties and NP levels a significant effect was noted. It can be inferred from the data that maximum harvest index was noted from plots when sown with Hybrid No. 922 and treated with 120:60 kg NP ha^{-1}, while minimum was recorded from control plots and the plots were sown with Sweet corn. Similar results were also reported by Muhammad *et al.* (2002)

Grain yield: It can be inferred from the data concerning grain yield that different varieties had a significant ($P \leq 0.05$) effect on grain yield (Table 4). Maximum grain yield was produced from plots sown with Hybrid No.922 (3193 kg ha^{-1}). While minimum grain yield (1993 kg ha^{-1}) was recorded from Sarhad white. Similarly analysis of the data also revealed that NP levels had a significant ($P \leq 0.05$) effect on grain yield. Highest grain yield (3073 kg ha^{-1}) was noted from plots treated with 120:60 kg NP ha^{-1} while lowest grain yield (2040 kg ha^{-1}) was recorded from control plots. Statistical analysis of the data also revealed that interaction between varieties and NP levels had significantly ($P \leq 0.05$) affected grain yield. Maximum grain yield (4480 kg ha^{-1}) was produced by those plots, which were sown with Hybrid No.922 and treated with 120:60 kg NP ha^{-1}. While minimum grain yield (1667 kg ha^{-1}) was noted from those plots sown with Sarhad white and 60:180 NP. These results are in line with those reported by Sharma and Sharma (1991). Similar

results are also reported by Ram *et al.* (1993), Sharma (1991), Nigrila and Negrila (1994) and Brar *et al.* (1989) and Ali *et al.* (2002)

In conclusion hybrid No. 922 and 120:60 kg ha^{-1} NP is the best dose of fertilizer for maize to achieve the highest yield.

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