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Yield of Maize Hybrid-3335 as Affected by NP Levels

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Abstract

An experiment was carried out to see the effect of different NP levels on maize hybrid "3335". The fertilizer levels were 90-90-90, 90-120-90, 90-150-90, 150-90-90, 150-120-90, 150-150-90, 210-90-90, 210-120-90, and 210-150-90 Kg ha⁻¹ NPK including control having no fertilizer. The results revealed that maximum plant height (175.8 cm), number of cobs/plant (2.067), number of grains/cob (374.3), 1000-grain weight (226.5 g), Biological yield (15.42 t ha⁻¹), and grain yield (48.08 t ha⁻¹) was obtained by the application of NPK @ 210-120-90 kg ha⁻¹. This level proved to be the optimum for maize crop under local conditions of Dera Ismail Khan.

Introduction

Maize is an important cereal crop of Pakistan after wheat and rice. It is one of the world's major food crops feeding the humanity since ages. It absorbs large quantities of nutrients from soil during its growth (Paris, 1993). The high yielding varieties more responsive to fertilizer than local varieties and their yield potential can be realized by judicious use of fertilizer (Smith *et al.*, 1990). Nitrogen is the major plant food nutrient required in large amount by the plant. Nitrogen is responsible for the chlorophyll formation (Gardner *et al.*, 1990).

Phosphorous, one of the major nutrients, play an important role in plant nutrition. It is necessary for growth promotion, as it promotes cell division and nucleus formation. In maize Phosphorous deficiency adversely effect silking and ear formation (Toor, 1990). Usually the plant requires the same amount of potassium as that of nitrogen. If it is applied alone, it may not help in increasing the yield much but in combination with nitrogen or phosphorus gives good results (Laszity, 1989). Keeping in mind the above facts, the present study was undertaken under Agro-climatic conditions of Dera Ismail Khan.

Materials and Methods

The research project was carried out at the Agronomic Research Area, Faculty of Agriculture, Gomal University, Dera Ismail Khan, during spring 1998. The experiment was laid out in Randomized Complete Block Design with three replications, using a net plot size of 3m x 4m. The maize hybrid "3335" was sown on a well prepared seedbed by dibbling method. Row to row and plant to plant distances were 75 cm and 20 cm respectively.

Nitrogen, phosphorus and potash were applied in the form of Urea, Tripple Super Phosphate and Potassium Sulphate respectively.

The data collected was subjected to Analysis of Variance techniques (Steel and Torrie, 1980) and Duncan's Multiple Range Test (Duncan, 1955) was applied to compare the differences among the treatment means with the help of STAT package.

Detail of treatments

| Treatments | (kg / ha) | | |
|------------|-----------|-----|----|
| | N | P | K |
| T1 | 0 | 0 | 0 |
| T2 | 90 | 90 | 90 |
| T3 | 90 | 120 | 90 |
| T4 | 90 | 150 | 90 |
| T5 | 150 | 90 | 90 |
| T6 | 150 | 120 | 90 |
| T7 | 150 | 150 | 90 |
| T8 | 210 | 90 | 90 |
| T9 | 210 | 120 | 90 |
| T10 | 210 | 150 | 90 |

Results and Discussion

Number of plants: Data regarding the number of plants/m² are presented in Table 1. Analysis of mean values showed that the highest number of plants were recorded in T1, T2, and T8 followed by T3 and T7 while in the rest of the treatments the equal number of plants were recorded which were statistically at par.

Plant height: It is indicated from the Table 1 that maximum plant height was obtained in T9 followed by T8. While minimum was recorded in control plots where no fertilizer was applied. The increase in plant height might be due to increasing levels of nitrogen and phosphorus to crop.

Number of cobs per plant: It is clear from the Table 1 that maximum number of cobs per plant were recorded in T9 followed by T10. The minimum cobs per plant were obtained in control as well as in T2 plots. The table further exhibited that the dose in T9 was optimum and the fertilizer application beyond it did not significantly effected the number of cobs per plant. Ahmad (1989) investigated the effect of various levels of N and P on growth and yield of maize. He reported that by the application of N and P at the rates of 150 and 200 kg ha⁻¹ respectively, grain yield, leaf area, number of grains per cob, 1000-grain weight,

Table 1: Number of plants per m², plant height (cm) and cobs per plant as affected by different levels of NP.

| Treatments | No. of Plants | Plant height | Cobs per plant |
|-----------------|---------------|--------------|----------------|
| T ₁ | 7.00a | 106.00h | 1.00d |
| T ₂ | 7.00a | 126.60g | 1.00d |
| T ₃ | 6.90ab | 150.20f | 1.20cd |
| T ₄ | 6.80b | 151.00ef | 1.20cd |
| T ₅ | 6.80b | 135.40e | 1.40bcd |
| T ₆ | 6.80b | 158.00d | 1.40bcd |
| T ₇ | 6.90ab | 158.40d | 1.60abc |
| T ₈ | 7.00a | 170.60b | 1.80ab |
| T ₉ | 6.80b | 175.80a | 2.06a |
| T ₁₀ | 6.96a | 163.80c | 2.00a |

Means followed by different letters are significantly different at 1% level of probability.

Table 2: Number of grains per cob, seed index, biological yield (t ha⁻¹) and grain yield (t ha⁻¹) as affected by different levels of NP.

| Treatments | No. of grains | Seed index | Biological Yield | Grain yield |
|-----------------|---------------|------------|------------------|-------------|
| T ₁ | 223.3h | 158.6e | 9.447g | 2.480e |
| T ₂ | 235.0gh | 170.8e | 9.860fg | 2.810e |
| T ₃ | 245.3fg | 188.6d | 10.83ef | 3.890d |
| T ₄ | 253.3f | 192.0cd | 10.70ef | 4.030d |
| T ₅ | 277.3e | 195.9cd | 10.97ef | 5.170c |
| T ₆ | 286.0de | 204.7bcd | 11.53de | 5.390c |
| T ₇ | 301.7c | 209.2abc | 12.64cd | 6.860ab |
| T ₈ | 341.0b | 218.5ab | 13.06bc | 6.990ab |
| T ₉ | 374.3a | 226.5a | 15.42a | 7.450a |
| T ₁₀ | 292.7cd | 215.0ab | 13.89b | 6.560b |

Means followed by different letters are significantly different at 1% level of probability.

total biological yield and harvest index were increased significantly as compared with no N and P or low rates of N and P.

Number of grains: The results given in Table 2 showed that maximum number of grains per cob were recorded in T₉ followed by T₈ and minimum in control plots. The number of grains per cob increased upto T₉ but decreased with further increase in this level. The variations in number of grains per cob might be due to the variation in fertilizer levels applied. Arain *et al.* (1989) reported that maize cv. Sarhad White, Sarhad Yellow and Akbar were given 50, 100 or 150 kg N with 60 kg P₂O₅/ha or no fertilizers. Plant height and number of grains/ear increased with NP up to 100 kg N + 60 kg P₂O₅; further increases in N rate decreased plant height and grains/ear. Hassan (1991) observed that different doses of Phosphorus fertilizer application significantly affected the number of cobs per plant and grains per cob over control.

1000-grain weight : Data pertaining to 1000- grain weight (g) of maize are presented in Table 2. It is indicated from the table that maximum 1000-grain weight was attained by T₉ followed by T₈ and minimum in control plot. The 1000-grain weight increased with the increase in NP levels. But this increase declined after T₉. Similar results were obtained by Ahmad (1989) and Toor (1990) who reported

that fertilizer application invariably increased weight of grains/ cob and 1000-grain weight.

Biological yield: It is obvious from the results presented in the Table 2 that biological yield was significantly affected by various levels of NP applied. The maximum biological yield was recorded in T₉ followed by T₁₀ as against minimum in control plots. The increase in biological yield was due to increasing levels of nutrients. As a result crop growth enhanced, attained maximum plant height and ultimately produced more biological yield. Similar results were found by Toor (1990) who reported that fertilizer application increased weight of grains per cob, 1000-grain weight, grain and stalk yield of maize crop. Muthuswamy *et al.* (1990) reported that grain and straw yields of maize were largest with the optimum dose of NPK fertilizers in conjunction with farmyard manure.

Grain yield: Grain yield of maize as affected by various levels of NP are presented in Table 2. It is obvious from these results that grain yield of maize was significantly affected by various levels of NP applied. The maximum grain yield was recorded in T₉ followed by T₈, while minimum grain yield was observed in control plots where no fertilizer was applied. Evidently grain yield increased with the increase in fertilizer levels upto T₉ but it decreased after this level.

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