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Effect of nitrogen and phosphorus on growth and yield attributes of sweet corn

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Abstract
A field experiment was conducted during *Rabi* 2023 at Crop Research Farm, Department of Agriculture, Ideal college of Arts and Sciences, Vidyut Nagar, Kakinada, Andhra Pradesh. The experiment was laid out in Randomized Block Design with ten treatments which are replicated thrice on the basis of one year experimentation. The treatments consisted of 3 levels of Nitrogen (80, 100, 120 kg/ha), and Phosphorus (40, 60, 80 kg/ha) and a control. Application of Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (Treatment 9) recorded maximum Plant height (221.47 cm), Dry weight (91.01 g) per plant, Number of cobs per plant (2.17), Number of rows per cobs (16.47), cob yield (6.46 t/ha).

Keywords: Nitrogen, phosphorus, sweet corn, yield attributes

Introduction
Maize, scientifically referred to as *Zea mays* L., is one of the most extensively cultivated cereals in the world and serves as a key aspect in various meals and business products. Maize, additionally referred to as corn, belongs to the circle of relatives of cornflowers and has been cultivated by way of numerous civilizations for thousands of years. Maize is broadly grown for its nutritious and flexible grain, that's used for human consumption, livestock feed and numerous commercial functions. The crop's adaptability, excessive yield capacity and flexibility make it a staple of many farming systems. After rice and wheat, corn is the 1/3 most crucial cereal crop. (Mahapatra *et al*. 2018) [4]. It has sturdy stems, massive leaves and produces each male flowers (tassels) and woman flora (ears) on the same plant, that is referred to as a monoecious flowering dependancy. Maize is characterised by means of tall, grass-like stalks that produce ears or cobs included with rows of seeds referred to as kernels, the main made from the crop. Kernels can vary in shade, size and form relying on the variety they may be rich in carbohydrates, vital nutrients (e.g. diet A, B vitamins), minerals (e.g. iron, zinc) and fiber further to getting used as a staple meals in numerous bureaucracy, corn is also processed into diverse merchandise consisting of corn flour, corn oil, corn syrup, corn starch, and animal feed. Corn nutritional profile (in keeping with 100 g): four g protein, 30 g carbohydrates, 3.five g fiber, 1.5 g fat, 3.6 g sugar, 4 mg calcium, zero.72 mg zinc, etc. (Tiwari *et al*. 2022) [5].

Nitrogen is one of the most abundant elements and is part of amino acids, proteins, nucleic acids, chlorophyll and many other metabolites necessary for plant survival. Numerous field experiments conducted around the world have shown that nitrogen is the most important growth limiting factor. Nitrogen application is one of the important soil nutrient amendments to improve the growth and yield of many crops (Reddy, 2006) [8]. Nitrogen deficiency profoundly affects the morphology and physiology of plants. Plants with low nitrogen levels will develop an increased root:shoot ratio with shortened lateral branches. Higher levels of NO3 - inhibit root growth and lead to a reduced root:shoot ratio.

Phosphorus is the second important nutrient that plants need. It is an essential part of nucleic acids, phosphorylated sugars, lipids and proteins that control all life processes. Phosphorus forms high-energy phosphate bonds with adenine, guanine, and uridine, which act as energy carriers for many biological reactions. Since phosphate availability is usually low in soil, plants have developed special adaptations to acquire it using several high-affinity transporters

(Raghothama, 1999) [7].

Materials and Methods

The experiments on the effect of Nitrogen and Phosphorus along with recommended dose of fertilizers (RDF) on the growth and yield enhancement of sweet corn were conducted at *Rabi* season of 2023 at Crop Research Farm, Department of Agriculture, Ideal college of Arts and Sciences, Vidyut nagar, Kakinada, Andhra Pradesh. Before seed sowing operation, it was ensured that sufficient moisture for germination of seed is present in the soil. The seed was sown at the rate of 8 kg/ha. In the lines at spacing of 45 x 20 cm. Immediately after sowing the lines were closed with soil and slightly pressed so as to have good contact of seed with soil to ensure good germination.

Results: Plant height

Maximum plant height (221.47 cm) was recorded with application of Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha. Whereas the minimum plant height (188.66 cm) was recorded with Control (RDF) 120:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (219.10 cm) are found statistically at par toT9.

Plant dry weight

Maximum plant dry weight (91.01 gm) was recorded with application of Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha. Whereas the minimum plant dry weight (71.82 gm) was recorded with Control (RDF) 120:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (90.55 gm) are found statistically at par toT9.

Number of cobs per plant

The highest number of cobs per plant (2.17) was observed in treatment Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha, whereas the lowest number of cobs per plant (1.34) was found in treatment Control (RDF) 120:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (2.11) are found statistically at par toT9.

Number of rows per cob

The highest number of rows per cob (16.47) was observed in treatment Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha, whereas the lowest number of rows per cob (10.11) was found in treatment Control (RDF) 120:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (16.21) are found statistically at par toT9.

Green cob yield (t/ha)

The highest cob yield (t/ha) (6.46 t/ha) was observed in treatment Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha, whereas the lowest cob yield (t/ha) (3.89 t/ha) was found in treatment Control (RDF) 120:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (6.10 t/ha) are found statistically at par toT9.

Discussion

Phosphorus fertilization, also called "energy currency", improves numerous metabolic and physiological functions. Increase in growth parameters with increase in phosphorus fertilizer was also reported by Sankadiya and Sanodiya (2021) [9]. Both levels of 90 and 60 kg N/ha were significantly better than 60 kg N/ha and absolute control of yield parameters. Lower revenue records were found with absolute control. Increase in yield parameters with increase in nitrogen fertilizers was also reported by Pal *et al*. (2017) [6], Singh *et al*. (2017) [11], Sharma *et al*. (2019) [10]. These results are consistent with the findings of Reed *et al*. (1988) [3], who reported that grain yield in maize is primarily due to grain number and ear weight. In addition, they reported that ear height, number of grains in a row and number of grains in an ear were the main factors of increased grain yield. Anderson *et al*. (1985) [1] expressed that nitrogen application resulted in increase in number of grain rows, number of grains per ear, 1000 grain weight, ear weight and grain yield as well as harvest index. The present results support a previous study by Fathi (1999) [2] who argued that nitrogen application could increase grain yield of sweet corn.

Table 1: Effect of Nitrogen and Phosphorus on growth and yield of sweet corn

S No	Treatments	Plant height	Plant dry weight	Number of cobs per plant	Number of rows per cobs	Cob yield (t/ha)
1.	Nitrogen (60 kg/ha) + Phosphorus 40 kg/ha	190.00	77.53	1.49	12.00	4.00
2.	Nitrogen (60 kg/ha) + Phosphorus 40 kg/ha	195.73	79.30	1.51	12.07	4.11
3.	Nitrogen (60 kg/ha) + Phosphorus 40 kg/ha	201.14	81.09	1.55	12.15	4.22
4.	Nitrogen (80 kg/ha) + Phosphorus 60 kg/ha	204.00	84.11	1.58	12.20	4.71
5.	Nitrogen (80 kg/ha) + Phosphorus 60 kg/ha	204.77	85.69	1.61	14.14	5.09
6.	Nitrogen (80 kg/ha) + Phosphorus 60 kg/ha	210.65	87.17	1.78	14.52	5.32
7.	Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha	217.16	88.24	2.05	14.69	5.57
8.	Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha	219.10	90.55	2.11	16.21	6.10
9.	Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha	221.47	91.01	2.17	16.47	6.46
10.	Control (RDF) 120:60:40 kg ha-1 (NPK)	188.66	71.82	1.34	10.11	3.89
	SEm±	2.62	0.66	0.14	0.02	0.04
	CD (p=0.05)	4.11	1.34	0.56	0.10	0.29

Conclusion

In conclusion, phosphorus fertilization, often referred to as the "energy currency" in plants, enhances a multitude of metabolic and physiological processes crucial for growth. Sankadiya and Sanodiya (2021) [9] demonstrated significant improvements in growth parameters with increased phosphorus fertilizer levels. Similarly, studies by Pal et al. (2017) [6], Singh et al. (2017) [11], Sharma et al. (2019) [10] underscore the positive impact of nitrogen fertilizers on yield parameters. These findings align with earlier research indicating that maize grain yield depends primarily on factors such as grain number and ear weight, as reported by Reed et al. (1988) [3]. Anderson et al. (1985) [1]

further support this by highlighting nitrogen's role in enhancing grain yield through increased grain rows, grains per ear, and overall harvest index. The present results affirm Fathi's (1999) [2] assertion that nitrogen application contributes significantly to enhancing sweet corn grain yield.

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