Original Research Article

Effect of Plant growth regulators and Zinc on growth and yield of Baby corn(*Zea mays.* L)

Abstract

The field experiment was conducted during *Zaid* season 2022 at Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P). The treatments consisted of three Plant growth regulators (Mepiquat chloride 180ppm, Naphthalene acetic acid 30ppm, Putrescine 40ppm) and three levels of Zinc sulphate (10, 20, 30 kg/ha $ZnSO_{4)}$ respectively. The experiment was laid out in randomized block design with ten treatments and were replicated thrice. Results defined that significantly maximum plant height (181.62 cm), dry weight (92.31 g/plant), Green fodder yield (32.7 t/ha) was recorded in Naphthalene acetic acid 180ppm + Zinc sulphate 30 kg/ha (T6) and Maximum No. of cobs/plant (2.13), length of cob/plant (21.8 cm), girth of cob (9.3 cm), cob weight with husk (49.84 g), cob weight without husk (12.11 g), Cob yield (11.03 t/ha) was recorded in Mepiquat chloride 30ppm + Zinc sulphate 30 kg/ha (T3).

Keywords: *Plant growth regulators, Zinc levels, growth and yield, Baby corn.*

Introduction

Baby corn is a smaller, immature version of maize that is harvested before the kernels have fully matured. While most maize is grown for its kernels, baby corn is grown for its tender, small ears. Baby corn is typically harvested when it is only a few inches long, before the silk and husks have formed around the ear. Baby corn is produced from certain varieties of maize that have been bred to produce small, slender ears. Once harvested, baby corn is usually blanched and canned or frozen to preserve its flavor and texture. It is often used as a vegetable in stir-fries, salads, and other dishes. Baby corn is a popular and important vegetable in India, both in terms of its nutritional value and economic significance. Baby corn is a nutritious vegetable that is low in calories and high in fiber, vitamins, minerals like potassium and magnesium. It is particularly rich in vitamin B and vitamin C, as well as antioxidants, which can help to protect the body from the damaging effects of free radicals. Baby corn is an important crop in India, particularly in the states of Tamil Nadu, Karnataka, and Andhra Pradesh.

Zinc is an essential micronutrient that plays a critical role in the growth and development of cereal crops, such as wheat, rice, and maize. Zinc is important for the synthesis of plant growth hormones and enzymes, and it is also essential for the proper functioning of plant metabolic processes. In addition, zinc is an important micronutrient for human nutrition, and cereal crops are a major dietary source of zinc for many people around the world. Therefore, ensuring that cereal crops are adequately supplied with zinc is not only important for the health of the crops themselves but also for the health and well-being of people who rely on them as a food source.

Plant growth regulators, also known as plant hormones, are organic compounds that regulate various aspects of plant growth and development. Maize crop growth and development is influenced by several plant growth regulators, including: Auxins, Gibberellins, cytokinin’s, abscisic acid (ABA), and ethylene. The balance and interaction of these plant hormones are essential for the proper growth and development of maize crops. Plant growth regulators can be applied to maize crops in the form of foliar sprays, soil drenches, or seed treatments to help regulate and optimize crop growth and yield.

MATERIALS AND METHODS

The experiment was conducted during the *Zaid* season 2022, at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (U.P.) which is located at 25^0 39‟ 42” N latitude, $81^0$67‟56” E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the Yamuna River by the side of Prayagraj-Rewa road about 5 km from the city. The experiment was laid out in randomized block design comprised of levels of Zinc and silicon with ten treatments and each were replicated thrice viz.

T_1 (MC 180 ppm + $ZnSO_4$ 10 kg/ha),
T_2 (MC 180 ppm + $ZnSO_4$ 20 kg/ha),
T_3 (MC 180 ppm + $ZnSO_4$ 30 kg/ha),
T_4 (NAA 30 ppm + $ZnSO_4$ 10 kg/ha),
T_5 (NAA 30 ppm + $ZnSO_4$ 20 kg/ha),
T_6 (NAA 30 ppm + $ZnSO_4$ 30 kg/ha),
T_7 (Putrescine 40 ppm + $ZnSO_4$ 10 kg/ha),
T_8 (Putrescine 40 ppm + $ZnSO_4$ 20 kg/ha),
T_9 (Putrescine 40 ppm + $ZnSO_4$ 30 kg/ha),
T_{10} (Control 100:60:40 kg/ha N P K).

RESULTS AND DISCUSSION

Growth attributes of baby corn

Plant height

Naphthalene acetic acid 30ppm with Zinc 30 kg/ha significantly got higher plant height (181.62 cm). Enhancement in growth parameters with NAA application might be due to cell wall extensibility and cell wall loosening and increased cell division and elongation in the presence of endogenous GA (Muthukumar et, al. 2005). Zinc involved directly and indirectly as co-enzyme in photosynthetic process which provide substrate for growth and development which seemed to be the reason behind the favorable influence on all the growth attributes of baby corn (Swathi et, al. 2021). Significant variation in the plant height is due to in time availability of the nutrients to the plant at the important growth stages and application of zinc has led to production of IAA resulting in increased plant height (Tejaswi et al. 2021).

Plant dry weight

Naphthalene acetic acid 30ppm with Zinc 30 kg/ha shows Significantly higher plant dry weight (92.31 g/plant) in baby corn due to favorable increase in dry matter of baby corn through zinc involvement in auxin synthesis, photosynthetic activity of the crop. The present study is in

accordance with the findings of Palai et al., (2018). Growth regulator application had significant influence on dry matter production (DMP) of baby corn at all growth stages. Baby corn sprayed with NAA @ 40 ppm produced higher values of growth parameters whereas Mepiquat chloride @ 200 ppm significantly reduced all growth parameters over other treatments (Muthukumar et, al. 2005).

Yield and Yield attributes

Maximum Number of cobs per plant (2.13), cob length (21.8 cm), Girth of cob (9.3 cm), cob weight with husk (49.84 g/cob) and cob weight without husk (12.11 g/cob), Cob yield (11.03 t/ha) was significantly higher in Treatment 3 Mepiquat chloride 180ppm with Zinc 30 kg/ha. While treatment 6 Naphthalene acetic acid 30ppm with zinc 30 kg/ha got significantly higher green fodder yield (32.7 t/ha). Increase in corn yield might be due to favorable influence of applied zinc on physiological and metabolic process of the plants, which ultimately enhanced corn yield. The increase in yield due to Mepiquat chloride spray might be due to increased yield attributes which in turn resulted from effective translocation of photosynthates from source to sink due to the shortening of distance between source and sink. Cob yield increased due to increased mobilization of reserve food materials to developing sink through increase in hydrolyzing and oxidizing enzyme activities. NAA application significantly enhanced the fodder yield over other treatments. Increase in fodder yield due to NAA spray might be due to increase in plant height, leaf area index and total biomass which might be due to increased cell division, cell enlargement and elongation. (V.B. Muthukumar *et al.* 2005).

CONCLUSION

From the results, it is concluded that application of Mepiquat chloride 180 ppm + $ZnSO_4$ 30 kg/ha (treatment 3) performed better in cob yield of Baby corn as compared to other treatments.

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Table 1. Effect of Plant growth regulators and Zinc levels on growth attributes of Baby Corn.

S. No.	Treatment combinations	AT 60 DAS	
		Plant Height (cm)	Dry Weight (gm/plant)
1.	Mepiquat chloride 180 ppm + $ZnSO_4$ 10 kg/ha	157.18	78.25
2.	Mepiquat chloride 180 ppm + $ZnSO_4$ 20 kg/ha	161.40	80.59
3.	Mepiquat chloride 180 ppm + $ZnSO_4$ 30 kg/ha	166.84	86.05
4.	Naphthaleneacetic acid (NAA) 30 ppm + $ZnSO_4$ 10 kg/ha	172.67	80.91
5.	Naphthaleneacetic acid (NAA) 30 ppm + $ZnSO_4$ 20 kg/ha	175.16	86.64
6.	Naphthaleneacetic acid (NAA) 30 ppm + $ZnSO_4$ 30 kg/ha	181.62	92.31
7.	Putrescine 40 ppm + $ZnSO_4$ 10 kg/ha	165.53	82.06
8.	Putrescine 40 ppm + $ZnSO_4$ 20 kg/ha	169.39	83.75
9.	Putrescine 40 ppm + $ZnSO_4$ 30 kg/ha	178.58	90.49
10.	Control (100:60:40 kg/ha NPK)	150.36	75.55
	F-test	S	S
	SEm(±)	1.11	0.59
	CD (p=0.05%)	3.32	1.77

Table 2. Effect of Plant growth regulators and Zinc levels on Yield Attributes of Baby Corn.

S. No.	Treatment Combinations	Number of cobs per plant	Length of cob (cm)	Girth of cob (cm)	Cob weight with husk (gm)	Cob weight without husk (gm)
1.	Mepiquat chloride 180 ppm + $ZnSO_4$ 10 kg/ha	1.33	19.3	7.7	45.48	10.56
2.	Mepiquat chloride 180 ppm + $ZnSO_4$ 20 kg/ha	1.67	20.0	8.9	47.87	11.83
3.	Mepiquat chloride 180 ppm + $ZnSO_4$ 30 kg/ha	2.13	21.8	9.3	49.84	12.11
4.	NAA 30 ppm + $ZnSO_4$ 10 kg/ha	1.27	17.8	6.6	42.08	9.77
5.	NAA 30 ppm + $ZnSO_4$ 20 kg/ha	1.40	18.2	7.0	44.50	10.26
6.	NAA 30 ppm + $ZnSO_4$ 30 kg/ha	1.87	21.0	8.3	47.64	11.46
7.	Putrescine 40 ppm + $ZnSO_4$ 10 kg/ha	1.53	17.7	6.8	40.28	8.64
8.	Putrescine 40 ppm + $ZnSO_4$ 20 kg/ha	1.60	18.6	7.8	42.38	9.72
9.	Putrescine 40 ppm + $ZnSO_4$ 30 kg/ha	1.93	19.4	8.5	45.11	10.67
10.	Control (100:60:40 kg/ha NPK)	1.40	17.3	5.4	39.23	8.53
	F-test	S	S	S	S	S
	SEm (±)	0.13	0.39	0.36	1.16	0.54

CD (p=0.05%)	0.38	1.16	1.09	3.45	1.63

Table 3. Effect of Plant growth regulators and Zinc levels on Yield of Baby Corn.

S.No.	Treatment Combinations	Cob yield (t/ha)	Green fodder yield (t/ha)
1.	Mepiquat chloride 180 ppm + $ZnSO_4$ 10 kg/ha	8.73	24.7
2.	Mepiquat chloride 180 ppm + $ZnSO_4$ 20 kg/ha	9.44	28.3
3.	Mepiquat chloride 180 ppm + $ZnSO_4$ 30 kg/ha	11.03	30.7
4.	NAA 30 ppm + $ZnSO_4$ 10 kg/ha	7.97	29.3
5.	NAA 30 ppm + $ZnSO_4$ 20 kg/ha	9.16	31.7
6.	NAA 30 ppm + $ZnSO_4$ 30 kg/ha	10.55	32.7
7.	Putrescine 40 ppm + $ZnSO_4$ 10 kg/ha	7.50	29.0
8.	Putrescine 40 ppm + $ZnSO_4$ 20 kg/ha	8.59	29.7
9.	Putrescine 40 ppm + $ZnSO_4$ 30 kg/ha	10.10	31.0
10.	Control (100:60:40 kg/ha NPK)	6.17	24.0
	F-test	S	S
	SEm (±)	0.16	0.66
	CD (p=0.05%)	0.48	1.98