The Pharma Innovation Journal 2022; 11(6): 1451-1455

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 1451-1455
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www.thepharmajournal.com
Received: 08-04-2022
Accepted: 30-05-2022

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The influence of integrated nutrient management on growth and productivity of baby corn (*Zea mays*) under Punjab conditions

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Abstract
Soil fertility has been hampered due to excessive use of synthetic fertilizers as baby corn is an exhaustive crop and it requires ample of nutrients to meet its nutritional requirements. But at the same time soil health should not be deteriorated by applying high doses of primary nutrients. So, there is a need of eco-friendly alternative system for better utilization of resources and to get high productivity with good quality. Keeping these points in mind, the present study was carried out to find out the suitable management system to enhance the productivity of baby corn under Punjab condition for sustainable agriculture. The investigation was carried out during *rabi* season 2021-22 at Lovely Professional University, Phagwara in randomised block design with three replications, nine treatments with different combinations of nitrogen, phosphorus, zinc and *Azotobacter* in baby corn. Data was collected from four randomly selected plants from each plot and analysis was done and it was observed that the growth characters and yield were significantly affected by various doses of nutrients. Application of 160 kg N + 120 kg P + 5 kg Zn + *Azotobacter* showed maximum plant height (129.83 and 222.7 cm), number of leaves (12.33 and 13.76), stem girth (28.64 and 29.96 mm) at 60 and 90 DAS, respectively and highest cob yield (44.92 q /ha) which was significantly at par with treatment T6, T7 and T8. It indicates that the integrated nutrient management has positive effect on growth and yield of baby corn.

Keywords: *Azotobacter*, baby corn, INM, nitrogen, zinc

Introduction
Maize is one of the important cereal crops after wheat and rice because of the high productivity, it is known as "Queen of cereals". It is consumed by human as well as animals. Maize can be cultivated throughout the year under Indian conditions. A newly introduced crop from maize which has very good market potential is 'Baby corn'. The cobs are harvested when length of cobs is around 6-8cm and diameter nearly 1.5cm. Baby corn has high nutritive value as 5.43 mg ascorbic acid, 17.96% protein, 5.13% ash, 5.89% crude fibre, 90.03% moisture and 2.13% fat are present per 100 gm of baby corn (Hooda *et al*., 2013) [9]. Baby corn cobs contains lower cholesterol and higher fibre content (Corleone, 2018) [5]. Baby corn has high folic acid which is good for foetus. Insect and disease incidences are very less in baby corn, and it has high economic returns. As it is short duration crop, which makes it possible to take 4 crops in a year. Acidic to saline soils are good for its growth which temperature around 300 C. In 2022, the world production was 1206.96 million metric tonnes from an area of 193.7-million-hectare land (Shahbandeh, 2022) [18].

Indian soils are deficient in supplying nitrogen that's why nearly 99% of soils respond to nitrogen application (Chander, 2016) [6]. The yield of maize increases with the increase in available nitrogen in the soil. Phosphorus is an essential major nutrient as it improves the root growth and quality of the produce. It is constituent of nucleic acids and plays role in energy transfer (Lambers *et al*., 2015) [12]. Zinc deficiency is increasing day by day as of now 48% of the soils in India are deficiency in zinc availability. White bud disease in maize is caused due to zinc deficiency. Productivity of crops and soil fertility status is maintained by biofertilizers. *Azotobacter* adds 20 to 40 kg of nitrogen per hectare. Fodder yield and cobs quality in baby corn is enhanced by seed treatment with *Azotobacter*.

Use of only major nutrient causing the deficiency of micronutrients and reducing the fertility of soil. So, integrating the major nutrient like nitrogen and phosphorus with micronutrient and biofertilizer is very important. The experiment was conducted in rabi season 2021-22 on research farm of LPU, Phagwara with the objective to study the impact of use of zinc and

Azotobacter with nitrogen and phosphorus on the growth and cob yield of baby corn.

Material and Methods

The experiment was carried out in rabi season of 2021-22 at the research farm of Lovely Professional University, Phagwara, Punjab. The soil of the farm was sandy loam in texture with pH of 8.5. Total nine treatments were taken with three number of replications. Each consisting of control NPK 120:80:60 kg / ha (T1), 140kg N +100kg P +6 kg Zn (T2), 140kg N +100kg P +6kg Zn +*Azotobacter* (T3), 140kg N +120kg P +6kg Zn (T4), 140kg N +120kg P +6kg Zn + *Azotobacter* (T5), 160kg N +100kg P +6kg Zn (T6), 160kg N +100kg P + 6kg Zn +*Azotobacter* (T7), 160kg N +120kg P +6kg Zn (T8) and 160kg N +120kg P +6kg Zn +*Azotobacter* (T9). Zinc application was done, 5.33kg Zn ha-1 in the soil application and 0.61kg Zn ha-1 through foliar spray with Zn EDTA. The randomised block design was used with three replications and 9 treatments. The plot size was 5 x 4m. Nitrogen was supplied through urea and DAP was used as source of phosphorus which also provides nitrogen. Urea doses were adjusted accordingly.

The observations were taken from the four randomly selected plants from each plot. For growth analysis, plant height, number of leaves and stem girth were observed. For stem girth, vernier calliper was used. Cobs were picked from the tagged plants and overall, three picking were taken. The data was analysed to find the difference and effects of various treatments on all the observed characters of baby corn.

Result and Discussion

Growth attributes: The recorded data of growth characters was analysed and tabulated in (Table 1). Among the nine treatments, maximum plant height (129.83 and 222.71cm) was recorded at 60 and 90 DAS, respectively in the treatment T9. It was at par with T7 and T8. Number of leaves were also maximum in T9 at 60 and 90 DAS recorded as 12.32 and 13.76, respectively. T7 and T8 were at par with T9. Stem girth of the baby corn was influenced significantly at 60 and 90 DAS.

Treatment T9 out performed all the other treatments with maximum stem girth recorded as 28.64 and 29.95 mm at 60 and 90 DAS. At 60 DAS, T9 was followed by T8. However, at 90 DAS, the stem girth was more in T7 than treatment T8.

Increased availability of nitrogen due to *Azotobacter* inoculation improves the photosynthesis activity and enhancing the plant growth. Similar findings were reported by Roy *et al*. (2019) [15] reported that nitrogen dose of 120 kg ha-1 produced highest height of plants (102.44 cm) followed by other lower doses 100 kg ha-1 and 80 kg ha-1 respectively. Singh *et al.* (2009) [19] revealed that maximum plant height (225.97cm) was obtained at harvest with application of 180-90-90 kg NPK ha- 1 followed by 120-60-60 kg NPK ha-1. Application of phosphorus fertilizers increase the P2O5 availability which is important for composition of ATP and transport of energy. Similar results were found by Sabu *et al.* (2021) [16] reported that application of 75 kg P ha-1 produced the highest plant height (95.40cm) and number of leaves (10.83). Similar findings were reported by Bhaladhare *et al.* (2018) [4]. Hekmat *et al.* (2019) [8] revealed that application of 5kg Zn ha-1 along with 90% RDF and biofertilizer produced maximum plant height (82.19cm) and number of leaves per plant (8.45). Anjum *et al.* (2017) [2] reported that application of Zinc to baby corn produced greater stem girth than no zinc application. Jeet *et al.* (2012) [10] revealed that application of 150kg N ha-1 produced maximum stem girth compared to other lower nitrogen doses.

Table 1: Growth parameters for baby corn crop in relation to different treatments

Treatment	Plant height (cm)		Number of leaves		Stem girth (mm)	
	60 DAS	90 DAS	60 DAS	90 DAS	60 DAS	90 DAS
T1: NPK 120:80:60 kg / ha	89.08	159.73	9.48	11.34	21.44	25.00
T2: 140kg N + 100kg P + 6kg Zn	93.72	164.43	9.89	11.67	22.72	25.37
T3: 140kg N + 100kg P + 6kg Zn + Azotobacter	93.48	172.27	10.09	12.00	23.82	25.99
T4: 140kg N + 120kg P + 6kg Zn	98.51	175.47	10.41	12.25	23.82	26.14
T5: 140kg N + 120kg P + 6kg Zn + Azotobacter	102.34	187.00	10.83	12.32	24.49	26.96
T6: 160 kg N + 100kg P + 6kg Zn	108.91	193.13	11.09	12.92	24.96	27.41
T7: 160kg N + 100kg P + 6kg Zn + Azotobacter	120.63	212.77	11.59	13.43	25.67	28.54
T8: 160kg N + 120kg P + 6kg Zn	118.97	205.00	11.58	13.25	26.14	27.89
T9: 160kg N + 120kg P + 6kg Zn + Azotobacter	129.83	222.70	12.33	13.76	28.64	29.96
Sd. Er	6.90	8.689	0.456	0.507	1.293	0.987
CD (0.05%)	20.69	26.049	1.367	1.519	3.876	2.96
CV	11.26	8.003	7.307	6.997	9.09	6.327

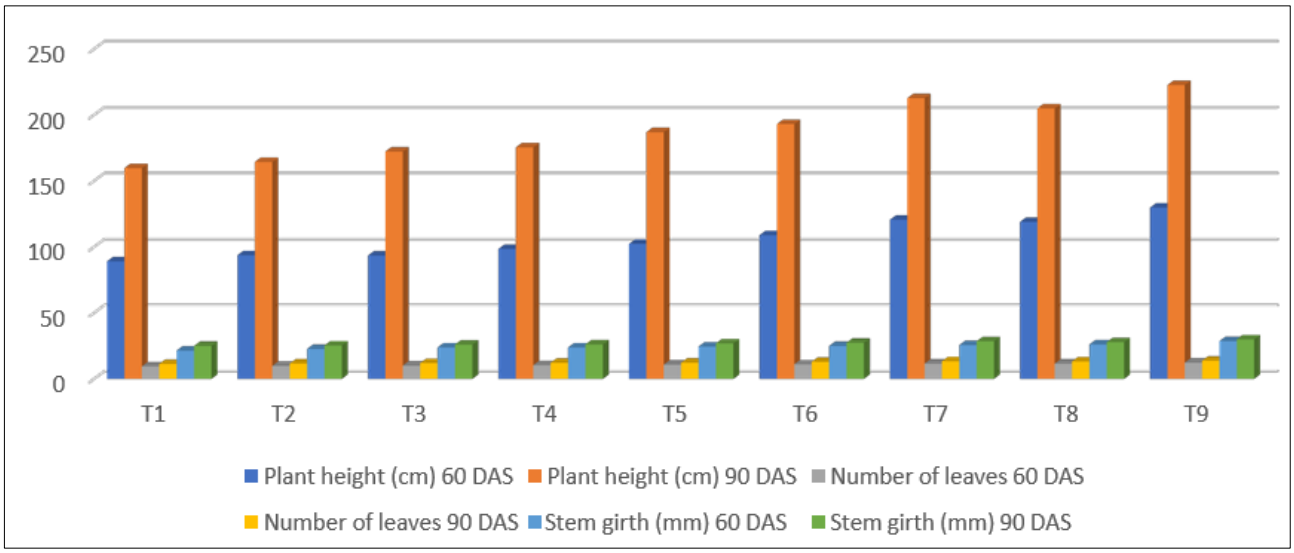

Fig 1: Growth parameters for baby corn crop in relation to different treatments

Yield: The data was recorded and analysed for cob yield of baby corn (Table 2). Among the various treatment, maximum cob yield without husk (44.86 q ha-1) was observed in T9. The treatments T7, T8 and T6 were significantly at par with the treatment T9. The cob yield was minimum under the control (NPK [120:80:60] kg ha-1).

Muthukumar *et al.* (2017) reported that application of nitrogen in split doses produced maximum cob yield (8122 kg ha-1). Godala *et al.* (2013) [7] reported that maximum cob yield (20.86 q ha-1) was obtained with application of 120 kg N ha-1. Zinc improves root development, which leads to increase nitrogen intake and quick vegetative growth (Amanullah, 2010) which might have increased the baby corn yield. Similar results were reported by Jeet *et al.* (2012) [10]. Abdullahi *et al.* (2020) [1] reported that application of 10 kg Zn ha-1 produced maximum cob yield (21.91 q ha-1) as compared to other lower doses of zinc. Tharaka *et al.* (2021) [20] also reported similar findings. *Azotobacter* improved the nitrogen availability which improves the photosynthetic activity which means more food production leading to higher crop yield. Similar findings were reported by Peng *et al.* (2012) revealed that seed treatment with *Azotobacter* produced maximum grain yield (86.65 q ha-1). Increase in maize yield with seed inoculation of *Azotobacter* was also reported by Baral *et al.* (2014) [3]. Joshi *et al.* (2019) [11] found that seed treatment with *Azotobacter* improved the cob yield by 6.7% compared to no seed treatment. Sarkar *et al.* (2020) [17] revealed that increasing the NPK dose to 125% produced baby corn yield of 3.91 ton ha-1. Similar yield response in maize was reported by Xiong *et al.* (2017) [21].

Table 2: Cob yield of baby corn as influenced by application of different treatments

Treatment	Cob yield without sheath (q ha-1)
T1: NPK 120:80:60 kg / ha	34.43
T2: 140kg N + 100kg P + 6kg Zn	36.07
T3: 140kg N + 100kg P + 6kg Zn + Azotobacter	36.98
T4: 140kg N + 120kg P + 6kg Zn	36.67
T5: 140kg N + 120kg P + 6kg Zn + Azotobacter	38.65
T6: 160 kg N + 100kg P + kg Zn	40.09
T7: 160kg N + 100kg P + 6kg Zn + Azotobacter	42.94
T8: 160kg N + 120kg P + 6kg Zn	41.24
T9: 160kg N + 120kg P + 6kg Zn + Azotobacter	44.92
Sd. Er	1.606
CV	7.112
CD (0.05%)	4.815

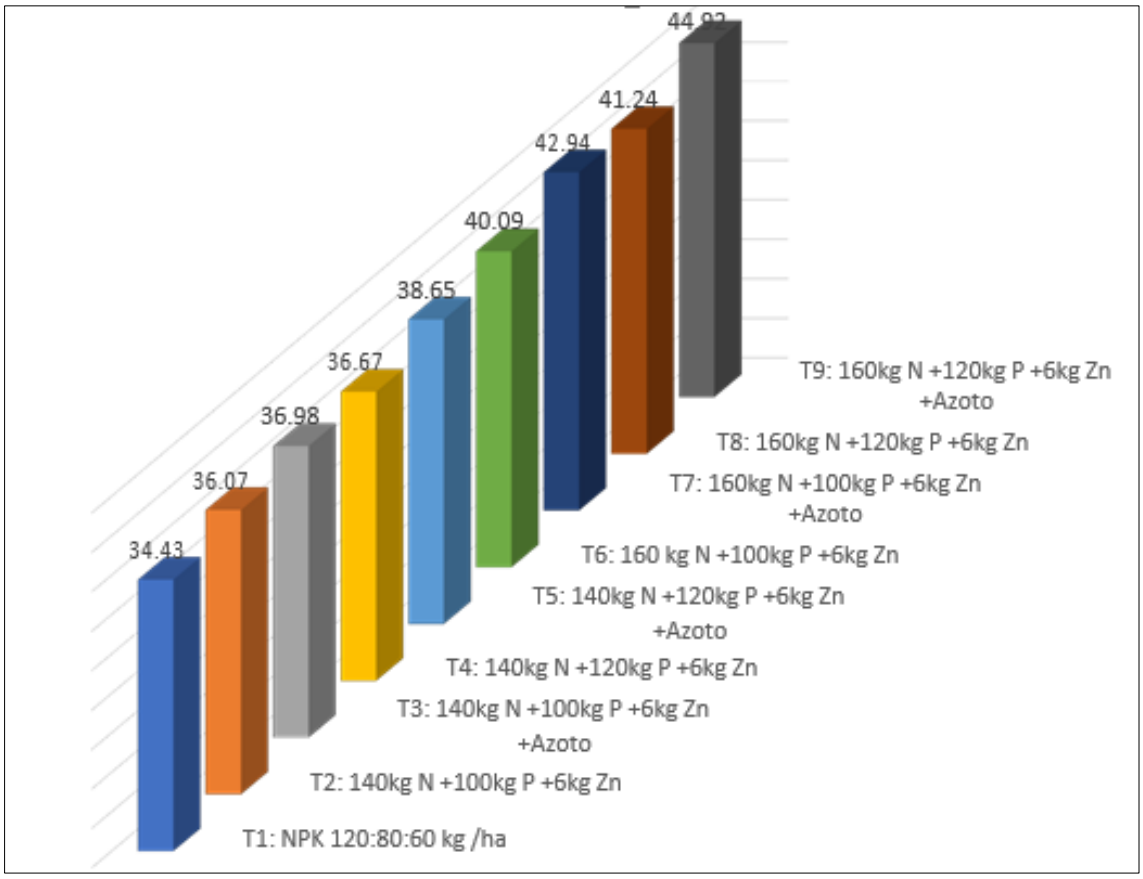

Fig 2: Cob yield (q ha-1) as influenced by application of different treatments

Conclusion

The increasing use of chemical nutrients has deteriorated the soil fertility status. Application of only primary nutrients causes the deficiency of micronutrients. Use of biofertilizers enhances the nutrient availability. Thus, reducing the use of chemical fertilizers. Therefore, 160kg N ha-1 + 120 kg P ha-1 should be integrated with 6 kg Zn ha-1 and seed treatment *Azotobacter*. Use of Zinc reduces the deficiency of micronutrient in the soil as well as in baby corn plant and *Azotobacter* enhances the nitrogen availability of soil. So, the soil fertility will be maintained with integrated nutrient management for crop production which also ensures the high productivity and quality of produce.

References

1. Abdullahi M, Bello A. Effects of different levels of phosphorus and zinc fertilizers on the yield and nutrient uptake of maize (*Zea mays* L.) on luvisols in Northern Guinea Savannah of Nigeria. Asian Journal of Soil Science and Plant Nutrition. 2020;6(4):1-7.
2. Anjum SA, Saleem MF, Shahid M, Shakoor A, Safeer M, Khan I, *et al*. Dynamics of soil and foliar applied boron and zinc to improve maize productivity and profitability. Pakistan Journal of Agricultural Research. 2017;30(3):294-302.
3. Baral BR, Adhikari P. Effect of Azotobacter on growth and yield of maize. SAARC Journal of Agriculture. 2014;11(2):141-147.
4. Bhaladhare MB, Paithankar DH, Palve MR, Bhahadure AB. Evolutionary study of nitrogen and phosphorus levels on growth of baby corn. International Journal of Chemical Studies. 2018;6(4):1116-1119.
5. Corleone J. How healthy is baby corn?, 2018.
6. Chander S. Nitrogen in Indian Agriculture. Indian Journal of Fertilizers, 2016, 12-13.
7. Golada SL, Sharma GL, Jain HK. Performance of baby corn (*Zea mays* L.) as influenced by spacing, nitrogen fertilization and plant growth regulators under sub humid condition in Rajasthan, India. African Journal of Agricultural Research. 2013;8(12):1100-1107.
8. Hekmat AW, Mohammadi NK, Gautam G. Effect of NPK, biofertilizer and zinc foliar nutrition on growth attributes of baby corn (*Zea mays* L.). International Journal of Chemical Studies. 2019;7(1):2432-2436.
9. Hooda S, Kawatra A. Nutritional evaluation of baby corn (*Zea mays*). Nutrition and Food Science. 2013;43(1):68-73.
10. Jeet S, Singh JP, Kumar R, Prasad RK. Effect of nitrogen and sulphur levels on growth and yield of quality protein maize (*Zea mays* L.) hybrids under dryland condition. Journal of Agricultural Science. 2012;4(9):31-38.
11. Joshi G, Pal MS. Effect on bio and chemical fertilizers on growth, productivity and profitability of baby corn (*Zea mays* L.). Pantnagar Journal of Research. 2019;17(1):32-39.
12. Lambers H, Plaxton WC. Phosphorus: Back to the roots, 2015.
13. Muthukumar VB, Velayudham K, Thavaprakaash N. Plant Growth regulators and split application of nitrogen improves the quality parameters and green cob yield of baby corn (*Zea mays* L.). Journal of Agronomy. 2007;6(1):208-211.
14. Peng SH, Wan-Azha WM, Wong WZ, Go WZ, Chai EW, Chin KL, *et al*. Effect of using Argo-fertilizers and N-

Fixing Azotobacter Enhanced Biofertilizers on the Growth and Yield of Corn. Journal of Applied Sciences. 2013;13(3):508-512.
15. Roy S, Singh V, Singh S, Singh AC. Effect of nitrogen and zinc levels on growth, yield and economics of baby corn (*Zea mays* L.). Journal of Pharmacognosy and Phytochemistry. 2019;8(4):1577-1580.
16. Sabu A, Dawson J, Thomas T. Effect of phosphorus and potassium levels on growth and yield of baby corn (*Zea mays* L.). The Pharma Innovation. 2021;10(10):1959-1963.
17. Sarker SK, Paul SK, Sarker MAR, Sarker SK. Impacts of plant spacing and nitrogen level on growth, yield, and quality of baby corn and green fodder from the same crop. Journal of Bangladesh Agricultural University. 2020;18(1):55-60.
18. Shahbandeh M. Corn production worldwide 2021/2022 by country. Statista, 2022.
19. Singh MK, Singh N, Singh SP. Effect of integrated nutrient management on growth, yield and yield attributes of baby corn (*Zea mays*). Vegetable Science. 2009;36(1):77-79.
20. Tharaka M, RaviChandra K, Singh V. Influence of nitrogen and zinc on growth and yield of baby corn (*Zea mays* L.). International Journal of Plant and Soil Science. 2021;33(23):64-70.
21. Xiong H, Xiong Y, Zhang G, Peng Z, He S, Xu D, *et al*. Effects of nitrogen, phosphorus and potassium on yield of sweet corn. Advances in Engineering Research, 2017, 125.