

Growth and yield of late sown winter baby corn (*Zea mays*) as influenced by NPK levels

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ABSTRACT

A pot experiment was conducted during winter (*rabi*) season of 2020–21 at research farm of Rajiv Gandhi South Campus (Banaras Hindu University), Mirzapur, Uttar Pradesh to study the effect of NPK on growth and yield attributes of late sown winter baby corn (*Zea mays* L.). Treatment consisted of 7 levels of recommended dose of fertilizer (RDF) i.e. NPK, viz. control; 20% RDF; 40% RDF; 60% RDF; 80% RDF; 100% RDF; and 120% RDF in completely randomized design, replicated thrice. Each increment in NPK levels, significantly enhanced the growth and yield parameters of baby corn, viz. plant height, leaf area/plant, number of leaves/plant, chlorophyll a and Chlorophyll b, dry weight/plant, first cob harvest and total harvest period, baby cobs/plant, baby corn length and girth, baby cob and baby corn weight, baby cob:baby corn ratio, baby cob, corn and fodder yield (g/plant) up to the highest level than other treatments. The results suggest that late sown winter baby corn can be applied with 150–75–50 kg NPK/ha for higher yields.

Key words: Baby corn, Growth, Late sown, RDF, Yield

Young, immature and unfertilized maize (*Zea mays* L.) cobs, harvested within 2–3 days after silk emergence are called baby corn, consumed as vegetables (Singh *et al.*, 2010). It is an important vegetable crop preferred by large number of people due to change in dietary habits (Prakash, 2019). The growth and development of a crop is governed by the genetic makeup; however environmental conditions and cultural practices also have large impact on the plants. Baby corn is suitable for diversification, food processing industries and value addition. Besides, it provides a significant quantity of nutritious green fodder with high digestibility, after harvest it also gives higher net profit (Jakhar *et al.*, 2022). Short duration, fast growth, high yield, and wider adaptability make baby corn a superior choice for intensive cropping systems as a potential alternative for diversification and value addition (Prakash, 2019).

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Primary nutrients (N, P, K) play an important role to achieve optimum development, production and quality of crop. Nitrogen (N) is a key element and determinant in productivity (Neupane *et al.*, 2011) and its adequate availability is necessary for optimal baby corn development during the growing season (Singh *et al.*, 2019). Nitrogen plays critical function in cell division, as cell ingredient and key element in several metabolic activities. Optimum nitrogen availability through fertilizers might contribute to improve protein synthesis and photosynthesis and ultimately fasten the cell division and extension that eventually leads better plant growth. Phosphorus (P) is essential being a component of ADP, ATP, chromosomes and is vital in transformation of energy (Neupane *et al.*, 2010). It promotes cell division, meristematic development, helps to assimilate photosynthates into other metabolites and hence, function as an active area for absorption of CO₂. Optimum supply of phosphorus enables the plant to develop quickly. Potassium (K) is involved in activation of enzymes, protein synthesis, photosynthesis, osmoregulation, energy transfer, transport of nutrients through phloem, stress resistance, carbohydrate metabolism and disease resistance (Neupane *et al.*, 2017). Adequate and balanced supply of N, P, and K to baby corn i.e., 125% recommended dose of fertilizers (RDF) enhanced the plant development (Kumar and Bohra, 2014; Kumar *et al.*, 2015). Potassium improves use of N

and P, and significantly contributes in plant growth and development. Its presence in the cytoplasm widely controls osmotic potential of the glycophytic plant cells and tissues (Singh *et al.*, 2019). Hence, proper exploitation of the production potential of late sown winter baby corn will largely depend on optimum and balanced supply of nitrogen, phosphorous and potassium. Baby corn is a new crop in Vindhyan region and requires standardization of agronomic practices for which balanced nutrition is most important. Therefore, with this background the present study was carried out to see the effect of different levels of NPK on growth and yield parameters of late sown winter baby corn.

A pot experiment was conducted during late winter (*rabi*) season of 2020–21 at research farm of Rajiv Gandhi South Campus (Banaras Hindu University), Mirzapur, Uttar Pradesh. The site is situated at 25.146° N, 82.569° E and 128.93 m above mean sea level in altitude and falls under agro-climatic zone III-A of the Vindhyan region (semi-arid eastern plain zone). The weather of experimental site is characterized with extremely hot summers and cold winters. The average temperature varied from 8.6°C in January to 40.0°C in April. Experimental pots were filled with equally weighted and representative soil (sandy loam) of the area. The soil was low in nitrogen (163.12 kg/ha) and organic carbon (0.33%) and medium in available phosphorus (P_2O_5) (20.34 kg/ha) and potassium (K_2O) (230.47 kg/ha), and neutral in reaction (*pH* 6.74). The pots were laid out in open environment with complete randomized design involving 7 levels of NPK, viz. T_0 , Control; T_1 , 30–15–10 kg/ha (0.164–0.237–0.042 g/plot); T_2 , 60–30–20 kg/ha (0.328–0.473–0.084 g/plot); T_3 , 90–45–30 kg/ha (0.492–0.710–0.127 g/plot); T_4 , 120–60–40 kg/ha (0.656–0.947–0.169 g/plot); T_5 , 150–75–50 kg/ha (0.820–1.184–0.211 g/plot); and T_6 , 180–90–60 kg/ha (0.984–1.420–0.253 g/plot) with 3 replications. The pot-based fertilizer rates were calculated according to weight of soil in the pot (5 kg/

plot) to supply the mentioned field-based fertilizer rates. Full quantity of P and K and half of the N was applied as basal while the rest N was top-dressed equally at knee height and tasseling stage. The sources used were urea (46% N), single super phosphate (SSP) (16% P_2O_5) and muriate of potash (MOP) (60% K_2O). Two seeds (water soaked for 3–4 days) of hybrid variety Hira BSHM-21 were sown in each pot and only one plant/pot retained after successful germination. Metered irrigation was provided in each pot at regular intervals. Detasseling was done in all the treatments.

The mean data (Table 1) shows that the growth attributes of baby corn, viz. plant height, number of leaves, leaf area/plant, dry matter/plant, chlorophyll a and chlorophyll b were significantly influenced by NPK levels. Use of highest NPK dose under treatment T_6 (180–90–60 kg/ha) significantly improved the plant height, numbers of leaves/plant, leaf area/plant (cm) and dry weight/plant (g) to maximum but found statistically at par with treatment T_5 (150–75–50 kg/ha). Rest of the treatments could not reach the level of significance. Dry matter build-up with higher NPK levels is the consequence of the cumulative impact of all the growth characters (Zende, 2006). Increase in NPK levels provided better nutrient supply which improved the growth attributes of the crop ultimately boosted the yield attributes of baby corn. These results are in agreement with the findings of Kumar *et al.*, (2015). Maximum values of chlorophyll a and chlorophyll b were noted when crop received highest NPK level (T_6 , 180–90–60 kg/ha) and observed statistically superior over rest of the treatments at 50 and 75 DAS (days after sowing).

The number of days taken to harvest first baby cob and total harvest period gradually reduced with each increment in the NPK level (Table 2) and reached to minimum with highest dose (T_6). However, the differences were non-significant because of lesser variability recorded in the harvest of first cob and the total harvest period. The total harvest

Table 1. Effect of NPK levels on growth parameters of late sown winter baby corn

Treatment	Plant height (cm)	Leaves/plant	Leaf area/plant (cm ²)	Dry weight/plant (g)	Chlorophyll a		Chlorophyll b	
					50 DAS	75 DAS	50 DAS	75 DAS
T_0 , Control	100.90	9.67	650.87	109.83	1.49	2.66	0.83	1.99
T_1 , 30–15–10	103.09	10.33	662.16	110.61	1.53	2.71	0.91	2.01
T_2 , 60–30–20	107.59	11.00	665.16	119.09	1.59	2.73	1.03	2.04
T_3 , 90–45–30	110.58	11.00	673.01	121.17	1.63	2.77	1.06	2.09
T_4 , 120–60–40	116.68	11.33	680.18	125.51	1.71	2.81	1.13	2.11
T_5 , 150–75–50	121.55	11.33	693.52	129.42	1.78	2.88	1.12	2.14
T_6 , 180–90–60	123.90	11.67	704.67	131.52	1.86	2.93	1.19	2.17
SEm±	0.87	0.38	1.42	1.27	0.01	0.01	0.02	0.01
CD (P=0.05)	2.64	1.15	4.31	3.87	0.04	0.05	0.07	0.04

DAS, Days after sowing.

Table 2. Effect of NPK levels on yield attributes of late sown winter baby corn

Treatment	First baby cob harvest (days)	Total harvest period (days)	Baby cobs/plant	Baby corn length (cm)	Baby corn girth (cm)
T ₀ , Control	66.33	17.33	1.33	7.29	3.21
T ₁ , 30–15–10	65.67	17.00	1.33	7.34	3.37
T ₂ , 60–30–20	65.00	16.67	1.67	7.98	3.58
T ₃ , 90–45–30	64.67	16.67	2.00	8.07	3.61
T ₄ , 120–60–40	64.33	16.33	2.00	8.86	3.65
T ₅ , 150–75–50	61.33	16.00	2.33	9.32	3.74
T ₆ , 180–90–60	61.00	15.67	2.67	9.41	3.77
SEm±	2.66	0.60	0.28	0.09	0.08
CD (P=0.05)	NS	NS	0.85	0.27	0.25

Table 3. Effect of NPK levels on yield attributes and yields of late sown winter baby corn

Treatment	Baby cob yield (g/plant)	Baby corn yield (g/plant)	Green fodder yield (g/plant)	Baby cob weight (g)	Baby corn weight (g)	Baby cob: baby corn ratio
T ₀ , Control	39.54	7.20	170.95	33.14	7.10	4.66
T ₁ , 30–15–10	40.65	7.95	178.55	33.76	7.14	4.69
T ₂ , 60–30–20	44.77	8.94	186.16	34.50	7.24	4.76
T ₃ , 90–45–30	47.49	9.59	189.15	35.10	7.30	4.80
T ₄ , 120–60–40	52.85	10.77	197.38	36.16	7.36	4.89
T ₅ , 150–75–50	56.80	11.92	200.37	37.30	7.50	4.90
T ₆ , 180–90–60	57.76	12.17	204.69	38.87	7.92	4.91
SEm±	1.12	0.96	1.20	1.14	0.15	0.08
CD (P=0.05)	3.39	2.92	4.64	3.47	0.45	NS

period slightly reduced with enhancement of NPK doses. Highest baby cobs/plant were obtained with the application of maximum NPK level (T₆), though it was significantly superior only to the treatments T₀, T₁ and T₂ while at par to treatment T₃, T₄ and T₅. Similar response noted for baby corn girth however, baby corn length attained to maximum (9.41 cm) with use of the highest NPK level (T₆) proved significantly better overall NPK levels except treatment T₅. Minimum baby corn length recorded with the control (T₀). Many researchers noticed substantial influence on number of cobs/plant, baby corn length and girth because of increased fertilizer levels (Kumar *et al.*, 2015; Jakhar *et al.*, 2022).

The data shows that baby cob and baby corn weight (g); baby cob, baby corn and green fodder yield (g/plant) varied significantly due to NPK levels (Table 3). Heavier baby cob and baby corn weight (38.87 and 7.92 g) recorded due to addition of highest NPK level (T₆) found statistically at par to T₅ (37.30 and 7.50 g) and T₄ (36.16 g), respectively though significantly superior over other treatments, viz. T₃, T₂, T₁ and T₀. The lowest cob and corn weights were noted in control treatment (T₀). The baby cob:baby corn ratio slightly improved with increase in NPK but failed to cause any significant difference. The highest ratio obtained was 4.91% with application of maximum NPK level (T₆).

In general, the maximum baby cob yield (57.76 g/plant), baby corn yield (12.17 g/plant) and green fodder yield (204.69 g/plant) harvested with highest NPK level (T₆) found significantly superior than other treatments except and was treatment T₅ which recorded at par. Whereas, in baby corn yield, T₆ (12.17 g/plant) found statistically at par to T₅ (11.92 g/plant), T₄ (10.77 g/plant) and T₃ (9.59 g/plant). The lowest values for above yield parameters were recorded under control (T₀). Results showed that the growth attributes had profound influence on yield attributes and yield. Enhanced growth and development enabled plants to produce superior yield parameters and yield. Data evince that baby cob and corn weight; and baby cob, baby corn and green fodder yield/plant were significantly influenced by varying NPK levels. Abundant availability of nitrogen, phosphorus and potassium might have increased the rate of photosynthesis and their effective translocation for the development of reproductive parts which in turn augmented the growth and development, and produced higher baby cob and corn yield/plant. The results support the findings of Neupane *et al.*, (2017a) and Kumar and Bohra (2014).

The study suggests that to harvest higher yields of late sown winter baby corn (variety 'Hira BSHM 21') and green fodder; 150–75–50 kg NPK/ha (T₅) can be applied in Vindhyan region (Mirzapur) of Uttar Pradesh.

REFERENCES

- Jakhar, B., Singh, S.P. and Prakash, V. 2022. Response of integrated nitrogen management on winter baby corn's (*Zea mays* L.) growth, yield and economics. *Journal of Applied Horticulture* **24**(3): 345–348.
- Kumar, Rakesh. and Bohra, J.S. 2014. Effect of NPKS and Zn application on growth, yield, economics and quality of baby corn. *Archives of Agronomy and Soil Science* **60**(9): 1,193–1,206.
- Kumar, Rakesh., Bohra, J.S., Singh, A.K. and Kumawat, Narendra. 2015. Productivity, profitability and nutrient-use efficiency of baby corn (*Zea mays*) as influenced of varying fertility levels. *Indian Journal of Agronomy* **60**(2): 285–290.
- Neupane, M.P., Singh R.K., Mahajan, Gaurav. and Yadav, M.K. 2010. Effect of nitrogen sources and plant spacing on yield and profitability of baby corn (*Zea mays* L.). *Environment and Ecology* **28**: 2,522–2,524.
- Neupane, M.P., Singh, R.K., Kumar, Rakesh. and Kumari, Anupma. 2011. Quality and yield performance of baby corn (*Zea mays* L.) as influenced by nitrogen sources and row spacing. *Environmental Ecology* **29**: 1,215–1,218.
- Neupane, M.P., Singh, S.P. and Sravan, U.S. 2017. Response of baby corn genotypes to soil and foliar nitrogen application schedule. *Archives of Agronomy and Soil Science* **63**(13): 1,912–1,926.
- Neupane, M.P., Singh, S.P., Sravan, U.S. and Singh, Abhishek. 2017a. Effect of soil and foliar nitrogen application on growth, yield and quality of baby corn cultivars. *Journal of Experimental Agriculture International* **16**(3): 1–11.
- Prakash, Ved. 2019. Nitrogen use efficiency in baby corn-A review. *Indian Journal of Pure Applied Biosciences* **7**(5): 547–556.
- Singh, M.K., Singh, R.N., Singh, S.P., Yadav, M.K. and Singh, V.K. 2010. Integrated nutrient management for higher yield, quality and profitability of baby corn (*Zea mays*). *Indian Journal of Agronomy* **55**(2): 100–104.
- Singh, S.P., Neupane, M.P., Sravan, U.S., Kumar, S., Yadav, T.K. and Choudhary, S.K. 2019. Nitrogen management in baby corn. *Current Journal of Applied Science and Technology* **34**(5): 1–11.
- Zende, N.B. 2006. 'Effect of integrated nutrient management on the performance of sweet corn (*Zea mays. saccharata*)'. PhD Thesis, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.