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## Effect of NPK and biofertilizer on soil health, growth and yield attributes of baby corn (*Zea mays* L.) Cv. G-5414

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#### Abstract

An experiment was conducted during in kharif season (June 2021- Aug 2021) to study the “Effect of Different Levels of NPK And Biofertilizer on Soil Health, Growth and Yield of Baby Corn (*Zea mays* L) G-5414 Variety” Research farm Dept. of Soil Science and Agriculture Chemistry The experiment was laid out in randomized block design with three levels of NPK (0% NPK, 50% NPK, 100% NPK) and three levels of Biofertilizer (0% biofertilizer, 50% biofertilizer, 100% biofertilizer,) The treatment combinations were replicated three times and were allocated at random in each replication The result show that application of different levels combination of Biofertilizer increased growth, yield of maize and improved soil chemical properties, However, some parameter of soil physical properties decreased. It was recoded from the application of NPK and Biofertilizer in treatment T<sub>9</sub> [100% Biofertilizer (20 kg ha<sup>-1</sup>), + 100% NPK [N(150kg ha<sup>-1</sup>), P(60 kg ha<sup>-1</sup>), K(40 kg ha<sup>-1</sup>)] maximum plant height (178.43 cm), number of leaves (10.03), cob length was (8.56 cm), Bulk density (1.22Mg m<sup>-3</sup>), Particle density (2.55Mg m<sup>-3</sup>), % pore space with 47.44%, Organic carbon (%) (0.77%), Electrical conductivity (0.27 ds<sup>m</sup>-1), Available Nitrogen (320 kg ha<sup>-1</sup>), available Phosphorous (31.96 kg ha<sup>-1</sup>), Available Potassium (192.6 kg ha<sup>-1</sup>), maximum Benefit Cost ratio(3.14), best from T1(control).

**Keywords:** Physico-chemical properties of soil, NPK, Biofertilizer, yield

#### Introduction

Maize (*Zea mays* L.), the Queen of cereals, is considered as one of the most important cereal crops in the world. It serves as a staple food than any of the other cereal crops. Maize ranks 3<sup>rd</sup> as a food-grain crop after wheat and rice and it is not only a cereal but is also used as a vegetable and fodder crop. Maize, which was originated in America, was domesticated almost 7000 years ago, and it provides nutrients to human and as well as animals. It is also used as a source of raw material for the production of oil, protein, starch, food sweeteners, alcoholic beverages and fuel source. (Pandey *et al.*, 2002) [11]. Maize cobs used for vegetable known as baby corn. Baby corns are unfertilized young cobs harvested 2 or 3 days after silk emergence. Baby corn is an immature dehusked, unfertilized maize ear, harvested 1–2 days after silking at 2–3 cm-long silk stage and consumed as vegetables owing to its sweet flavour. Globally, as an immature vegetable, baby corn has attracted an increasing number of masses whose preference is due to the enhancement of living standards and shift in dietary habit from non-vegetarian to vegetarian. (Pandey *et al.*, 2002) [11]. High-nutritive value, eco-friendly and crispy nature of baby corn has made it a special choice for various traditional and continental dishes apart from canning in the elite society. After harvest of baby corns, economic potential is further enhanced, since it supplies green, soft, succulent, nutritious, palatable fodder with higher digestibility. 100 grams of baby corn contain 89.1% moisture, 0.2 g fat, 1.9 g protein, 8.2 mg carbohydrate, 0.06 g ash, 28.0 mg calcium, 86.0 mg phosphorus, and 11.0 mg of ascorbic acid. (Thava Prakaash *et al.*, 2005) [12].

#### Materials and Methods

Two different factors were considered: (A) NPK levels (0%, 50%, and 100%) RDF ha<sup>-1</sup>. (B) Biofertilizer (0%, 50%, and 100%) RDF ha<sup>-1</sup>. The experiment consists of 9 treatments and the field was laid out in a Factorial Randomized Block Design with three replications and treatments were assigned accordingly. Size of each plot was 2m x 2m. The seeds were sowing into the plots at a spacing of 45cm x 20cm. Standard recommended doses of Nitrogen as Urea and Phosphorus as DAP (Diammonium Phosphate) and Potassium was applied as MOP (Muriate of Potash) and Biofertilizer was applied as *Azospirillum* according to the treatment combinations which then applied as seed treatment before sowing of seed.

Nitrogen was applied at split doses, first after 20 days of sowing and the second dose after 40 days of sowing. Various intercultural operations such as irrigation, weeding, pest control etc.

Were done uniformly as required. Data from the plants were recorded and observed by selecting and tagging 3 plants at random for each treatment and plant height was observed at

20, 40 and 60 days after sowing. Plant height, no. of leaves and total yield per plot were recorded from each individual plot both before transplanting operations and also after harvest by taking soil at depth of 0-20 and 20-40 cm. The various parameters analysed were pH, organic carbon %, pore- space %, and bulk and particle density, E.C, Nitrogen, Phosphorus, Potassium.

**Table 1:** Initial status of the soil before sowing of Babycorn

Particulars	Scientists (Year)	Methods	Unit	Results
<b>Physical Properties</b>				
Bulk density	Methuval <i>et al.</i> , (1992)	Graduated Measuring Cylinder	Mg m <sup>-3</sup>	1.31
Particle density	Methuval <i>et al.</i> , (1992)	Graduated Measuring Cylinder	Mg m <sup>-3</sup>	2.4
Pore space	Methuval <i>et al.</i> , (1992)	Graduated Measuring Cylinder	(%)	52.3
Soil Colour	Munsell, (1971)	Munsell colour chart	Colour	Dry- Light yellow Wet- Oliv Brown
Soil Texture		Bouyoucos Hydrometer	Sand, Silt, Clay (%)	Sandy Loam 65, 21, 14
<b>Chemical Properties</b>				
Soil Ph	M. L. Jackson, (1958) [7]	pH meter	-	7.6
EC	Wilcox, (1950) [3]	Digital Conductivity meter	dS m <sup>-1</sup>	0.17
OC	Walkley and Black, (1947) [2]	Walkley and Black wet oxidation method	Kg ha <sup>-1</sup>	0.44
Nitrogen	Subbiah and Asija, (1956) [6]	Modified Alkaline Permanganate oxidation method	Kg ha <sup>-1</sup>	235
Phosphorus	Olsen <i>et al.</i> , (1954) [6]	Spectrophotometric method	Kg ha <sup>-1</sup>	25.36
Potassium	Toth and Prince, (1949) [4]	Flame photometric method	Kg ha <sup>-1</sup>	112.24

## Results and Discussion

As illustrated in table 1 shows the pre-transplant soil data and table 2 and 5 shows the analysed statistical data of the various effects of NPK and Biofertilizer doses on the soil properties, growth and yield parameters of baby corn of which the results are discussed below. At the stages of the growth of the plant, the treatment combination T9 (100% NPK + 100% Biofertilizer), recorded the maximum plant height at 20.34 cm, 100.62 cm and 178.43 cm at 20, 40 and 60 DAS respectively, while control treatment recorded the lowest plant height at 11.12 cm, 33.5 cm and 124.12 cm at 20, 40 and 60 DAS respectively.

The Cob length and No. of cobs showed significant increase with higher levels of NPK and Biofertilizer. The treatment combination T9 (100% NPK + 100% Biofertilizer) gave the highest results at 8.56 cm and 2.92 for Cob length and No. of cobs respectively. The treatment combination T9 (100% NPK + 100% Biofertilizer) has the highest total corn yield. The application of Potassium plays an important role in the metabolism and many processes to sustain and promote plant vegetative growth and development and also plays a major role in cell division and elongation and metabolism and synthesis of carbohydrates and protein compounds.

The bulk density (1.22 Mg m<sup>-3</sup>) and particle density (2.55 Mg m<sup>-3</sup>) of the soil after crop harvest decreased as a result of increased dosage of NPK and Biofertilizer Physical properties

do not change significantly in one cropping season. This might be reason why no significant variation in bulk density, particle density and porosity occurred with different fertility and fertilizers levels. Similar results were found by Jagadeesh in (2008) [14].

The pore space and organic carbon % in the soil showed increased with increasing dosage of NPK and Biofertilizer which might be attributed to the fact that the mean value of organic carbon (%) of soil was found significant of different levels of N and P. It was also observed the organic carbon (%) of soil were gradually increased with an increase dose of N and P. The interaction effect N and P on organic carbon (%) of soil was also found significantly. Similer result has been recorded bt Das *et al.*, (2008) [13]. The EC dS m<sup>-1</sup> value of the soil did show a slight increase after harvest and the results were found to be significant and the addition of different levels of NPK and Biofertilizer showed a particular effect. Similar results were obtained by Banik and Sharma in (2014) [16]. The available values of NPK along with Biofertilizer in the soil after harvesting showed a significant increase with increasing dosage on NPK and Biofertilizer. Nitrogen levels were highest in 20- 40 soil depth because of leaching the nitrogen with irrigation. In the treatment combination T9 (100% NPK + 100% Biofertilizer) showed highest NPK and Biofertilizer and lowest in control Same result as found by raskar *et al.*, (2012) [15].

**Table 2:** Effect of different levels of NPK and Biofertilizer on the soil properties (physical and chemical) after harvesting of Baby corn

Treatment	Bulk density (Mgm <sup>-3</sup> )		Particle density (Mgm-3)		Pore space (%)		OC (%)		pH (1:2)	
	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
T1	1.07	1.26	2.32	2.57	55.31	47.76	0.46	0.45	7.2	7.4
T2	1.09	1.27	2.38	2.59	55.86	47.90	0.48	0.47	7.2	7.4
T3	1.13	1.30	2.45	2.58	56.16	48.49	0.52	0.51	7.1	7.3
T4	1.08	1.27	2.42	2.62	52.73	47.08	0.58	0.56	7.4	7.5
T5	1.13	1.28	2.48	2.61	52.46	46.34	0.61	0.61	7.4	7.4
T6	1.11	1.27	2.50	2.60	50.87	45.88	0.62	0.60	7.3	7.4
T7	1.14	1.30	2.52	2.61	49.03	47.80	0.65	0.64	7.6	7.6
T8	1.18	1.31	2.52	2.63	48.70	46.89	0.68	0.66	7.5	7.5
T9	1.22	1.32	2.55	2.64	47.10	45.44	0.72	0.70	7.6	7.7
S.Em. (±)	0.08	0.09	0.014	0.022	0.16	0.17	0.0124	0.0301	0.017	0.021
C. D @5%	0.28	0.29	0.043	0.034	0.46	0.68	0.03732	0.04652	0.053	0.062

**Table 3:** Effect of different levels of NPK and Biofertilizer on the soil properties (physical and chemical) after harvesting of Baby corn

Treatment Depth(cm)	EC (dsm <sup>-1</sup> )		N (kg ha <sup>-1</sup> )		P (kg ha <sup>-1</sup> )		K (kg ha <sup>-1</sup> )	
	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
T1	0.09	0.08	215	202	16.13	14.80	113.13	94.80
T2	0.17	0.10	220	208	16.40	15.40	116.46	96.60
T3	0.20	0.13	225	217	16.86	15.89	117.4	100
T4	0.23	0.16	257	235	27.36	21.40	136.16	116.70
T5	0.14	0.14	267	242	28.23	22.60	139.53	117.90
T6	0.24	0.16	270	256	28.83	23.80	145.26	125.80
T7	0.25	0.17	390	270	29.90	24.40	187.06	131.70
T8	0.26	0.18	295	278	31.96	26.02	188.43	145.20
T9	0.27	0.18	320	285	33.10	25.80	192.6	160.60
S.Em. (±)	0.0065	0.0036	1.90	1.13	0.19	0.17	0.36	0.44
C. D @5%	0.0165	0.0124	5.72	2.90	0.56	0.54	1.10	1.98

**Table 4:** Effect of different levels of NPK and Biofertilizer on the Growth attributes of baby corn

Treatment	Plant height (cm)			Number of leaves plant <sup>-1</sup>		
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS
T1-Absolute control	11.12	33.5	124.12	5.79	7.52	8.16
T2-0% NPK + 50% Biofertilizer	11.03	34.29	122.18	6.06	7.72	8.42
T3- 0% NPK + 100% Biofertilizer	11.18	35.68	123.56	6.18	7.80	8.50
T4-50% NPK + 0% Biofertilizer	13.13	67.20	161.94	6.46	7.54	8.17
T5-50% NPK + 50% Biofertilizer	14.23	67.17	164.43	7.81	9.43	9.76
T6-50% NPK + 100% Biofertilizer	14.97	72.01	165.33	7.58	9.33	9.26
T7-100% NPK + 0% Biofertilizer	18.45	95.4	177.85	7.94	9	9.19
T8-100% NPK + 50% Biofertilizer	19.64	91.82	176.41	8.30	9.26	9.46
T9-100% NPK + 100% Biofertilizer	20.34	100.62	178.43	8.75	9.64	10.03
S.Em. (±)	0.30	1.64	2.34	0.37	0.26	0.33
C. D @5%	0.88	1.83	6.87	0.84	0.47	1.0145

**Table 5:** Effect of different levels of NPK and Biofertilizer on the Yield (q ha<sup>-1</sup>) of baby corn

Treatment	Cob Length (cm)	No. of cobs plant <sup>-1</sup>	Cob yield (q ha <sup>-1</sup> )
T1-Absolute control	6.53	1.03	7.65
T2-0% NPK + 50% Biofertilizer	6.93	1.13	8.15
T3- 0% NPK + 100% Biofertilizer	7.24	1.17	9.60
T4-50% NPK + 0% Biofertilizer	7.93	1.35	12.82
T5-50% NPK + 50% Biofertilizer	7.46	1.56	13.36
T6-50% NPK + 100% Biofertilizer	7.81	1.76	14.66
T7-100% NPK + 0% Biofertilizer	8.02	2.13	16.17
T8-100% NPK + 50% Biofertilizer	8.07	2.38	16.55
T9-100% NPK + 100% Biofertilizer	8.56	2.92	17.06
S.Em. (±)	0.28	0.17	0.26
C. D @5%	0.86	0.51	0.77

## Conclusion

Based on this study, it is concluded that, the present paper highlights the positive effect of NPK and Biofertilizer on the growth, yield and soil properties of growing baby corn. Combined application of 100% NPK [N (150kg ha<sup>-1</sup>), P (60 kg ha<sup>-1</sup>), K (40 kg ha<sup>-1</sup>)] + 100% Biofertilizer [20 kg ha<sup>-1</sup>] is an optimum nutrient for enhancing growth, increasing corn size and yield attributes and probability of baby corn as compared to other treatment combinations.

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