www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(12): 339-342

www.thepharmajournal.com
Received: 13-10-2021
Accepted: 21-11-2021

Arvinder Singh
Research Scholar, Department of Soil Science and Agricultural Chemistry, Formerly-Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj, Uttar Pradesh, India

Tarence Thomas
Professor, Department of Soil Science and Agricultural Chemistry, Formerly-Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj, Uttar Pradesh, India

Tarun Kumar
Ph.D., Scholar, Department of Soil Science and Agricultural Chemistry, Formerly-Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj, Uttar Pradesh, India

Corresponding Author:
Arvinder Singh
Research Scholar, Department of Soil Science and Agricultural Chemistry, Formerly-Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj, Uttar Pradesh, India

Effect of different levels of NPK and zinc on soil health, growth and Yield of baby corn (*Zea mays* L.) Cv. G-5414

Arvinder Singh, Tarence Thomas and Tarun Kumar

Abstract
An experiment was conducted during in kharif season (June 2021- Aug 2021) to study the "Effect of Different Levels of NPK And Zinc 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 Zinc (0% Zn, 50% Zn, 100% Zn,) 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 inorganic fertilizer 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 Zinc fertilizer in treatment T9 (100% NPK [N (150 kg ha-1), P (60 kg ha-1), K (40 kg ha-1)] + 100% Zinc [25kg ha-1]) maximum plant height (165.33 cm), number of leaves (11.43), cob length was (8.86 cm), Bulk density (1.28Mg m -3), Particle density (2.91Mg m-3), % pore space with 47.66%, Organic carbon (%) (0.77%), Electrical conductivity (0.26 ds m -1), Available Nitrogen (315 kg ha-1), available Phosphorous (29.3 kg ha-1), Available Potassium (198.3kg ha-1), Available Zinc (0.91kg ha-1), maximum Benefit Cost ratio(2.43), best from T1(control).

Keywords: Physico-chemical properties of soil, NPK, Zn, 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 3rd 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^{-1}. (B) Zinc (0%, 50%, and 100%) RDF ha^{-1}. 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 Zinc was applied as zinc sulfate according to the treatment combinations which then applied as a basal dose 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 hight, 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 and Zinc**.**

Table 1: Initial status of the soil before sowing of babycorn

Particulars	Scientists (Year)	Methods	Unit	Results
Physical Properties				
Bulk density	Methuval *et al.*, *(*1992)	Graduated Measuring Cylinder	Mg m^{-3}	1.30
Particle density	Methuval *et al.*, (1992)	Graduated Measuring Cylinder	Mg m^{-3}	2.5
Pore space	Methuval *et al.*, (1992)	Graduated Measuring Cylinder	(%)	51.3
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
Chemical Properties				
Soil pH	M. L. Jackson, (1958) [7]	pH meter	-	7.6
EC	Wilcox, (1950) [3]	Digital Conductivity meter	dS m^{-1}	0.16
OC	Walkley and Black, (1947) [2]	Walkley and Black wet oxidation method	Kg ha^{-1}	0.42
Nitrogen	Subbiah and Asija, (1956) [6]	Modified Akaline Permanganate oxidation method	Kg ha^{-1}	240
Phosphorus	Olsen *et al*.,(1954) [6]	Spectrophotometric method	Kg ha^{-1}	24.30
Potassium	Toth and Prince, (1949) [4]	Flame photometric method	Kg ha^{-1}	107.20
Zinc	Alan Walsh (1950)	Atomic Absorption Spectrophotometer	Kg ha^{-1}	0.32

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 Zinc 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 T_9 (100% NPK + 100% Zinc), recorded the maximum plant height at 20.2 cm, 95 cm and 165.33 cm at 20, 40 and 60 DAS respectively, while control treatment recorded the lowest plant height at 12.66 cm, 36 cm and 125.03 cm at 20, 40 and 60 DAS respectively. The Cob length and No. of cobs showed significant increase with higher levels of NPK and Zinc. The treatment combination T_9 (100% NPK + 100% Zinc) gave the highest results at 8. 86 cm and 3.06 for Cob length and No. of cobs respectively. The treatment combination T_9 (100% NPK + 100% Zinc) 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 (1.28 Mg m^{-3}) and particle density (2.55 Mg m^{-3}) of the soil after crop harvest decreased as a result of increased dosage of NPK and Zinc 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 Zinc 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 incease 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^{-1}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 Zinc showed a particular effect. Similar results were obtained by Banik and Sharma in (2014) [16]. The available values of NPK along with Zinc in the soil after harvesting showed a significant increase with increasing dosage on NPK and Zinc. Nitrogen levels were highest in 20-40 soil depth because of leaching the nitrogen with irrigation. In the treatment combination T_9 (100% NPK + 100% Zinc) showed higest NPK and Zinc and lowest in control Same result as found by raskar *et al*., (2012) [15].

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

Treatment	Bulk density (Mgm^{-3})		Particle density (Mgm-3)		Pore space (%)		OC (%)		pH (1:2)	
Depth(cm)	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
T_1	1.28	1.32	2.55	2.64	47.66	45.88	0.53	0,49	7.5	7.7
T_2	1.25	1.30	2.52	2.58	48.03	46.50	0.59	0.55	7.4	7.5
T_3	1.27	1.31	2.54	2.61	48.23	46.23	0.57	0.54	7.3	7.5
T_4	1.25	1.30	2.52	2.60	49.36	47.36	0.63	0.58	7.2	7.4
T_5	1.24	1.28	2.50	2.57	48.46	45,43	0.67	0.63	7.4	7.7
T_6	1.23	1.28	2.32	2.56	49.76	46.89	0.68	0.65	7.5	7.8
T_7	1.25	1.31	2.54	2.63	49.8	47.76	0.71	0.67	7.1	7.4
T8	1.22	1.26	2.48	2.58	50.7	47.90	0.74	0.69	7.2	7.5

T_9	1.23	1.29	2.49	2.60	50.33	48.44	0.77	0.72	7.1	7.3
S.Em. (±)	0.06	0.08	0.013	0.021	0.15	0.16	0.0124	0.0165	0.017	0.020
C. D @5%	0.18	0.21	0.040	0.032	0.45	0.66	0.03732	0.04652	0.052	0.061

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

Treatment	EC (dsm^{-1})		N (kg ha^{-1})		P (kg ha^{-1})		K (kg ha^{-1})		Zn (kg ha^{-1})	
Depth(cm)	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40	0-20	20-40
T_1	0.09	0.08	258	210	25.3	21.2	142.6	108.8	0.59	0.39
T_2	0.16	0.12	266	218	25.6	22.4	147.6	114.6	0.75	0.57
T_3	0.21	0.15	268	222	24.3	20.8	153.3	121.5	0.87	0.65
T_4	0.22	0.16	287	245	26.6	22.4	173	134.7	0.66	0.44
T_5	0.19	0.14	292	255	26.3	23.6	177.3	137.9	0.78	0.56
T_6	0.24	0.17	295	258	27.3	25.8	180	145.8	0.89	0.65
T_7	0.25	0.17	309	267	27.6	24.4	190.6	151,7	0.82	0.44
T8	0.25	0.18	305	278	28.3	25.7	195	155.2	0.86	0.56
T_9	0.26	0.18	315	285	29.3	25.9	198.3	160.6	0.91	0.66
S.Em. (±)	0.00588	0.00365	1.316	1.127	0.22	0.18	0.761	0.543	0.167	0.098
C. D @5%	0.0177	0.0124	3.961	2.891	0.664	0.617	2.29	2.13	0.502	0.386

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

Treatment	Plant height (cm)			Number of leaves $plant^{-1}$		
	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS
T_1-Absolute control	12.66	36	125.03	5.66	7.7	8
T_2-0% NPK + 50% Zinc	14.43	40.76	130.66	6.67	8.23	8.73
T_3- 0% NPK + 100% Zinc	15.1	42.23	132.8	7.16	8.56	9.73
T_4-50% NPK + 0% Zinc	16.16	49.76	136.66	7.43	9.1	10.16
T_5-50% NPK + 50% Zinc	15.93	59.1	136.3	7.63	9.33	9.96
T_6-50% NPK + 100% Zinc	17.65	66.5	144.66	7.9	9.63	10.2
T_7-100% NPK + 0% Zinc	18.3	74.3	152.33	8.3	10.16	10.56
T_8-100% NPK + 50% Zinc	18.73	85.83	154.66	8.43	10.66	10.66
T_9-100% NPK + 100% Zinc	20.2	95	165.33	9.16	11.1	11.43
S.Em. (±)	0.23	0.85	1.08	0.18	0.14798	0.17449
C. D @5%	0.67	2.497	3.17	0.54	0.44546	0.52527

Table 5: Effect of different levels of NPK and Zinc on the Yield (q ha^{-1}) of baby corn

Treatment	Cob Length (cm)	No. of cobs $plant^1$	Cob yield (q ha^{-1})
T_1-Absolute control	6.66	1.16	3.66
T_2-0% NPK + 50% Zinc	7.43	1.56	4.34
T_3- 0% NPK + 100% Zinc	7.5	1.53	4.83
T_4-50% NPK + 0% Zinc	7.63	1.66	9
T_5-50% NPK + 50% Zinc	7.76	2.16	12.17
T_6-50% NPK + 100% Zinc	8.13	2.33	13.5
T_7-100% NPK + 0% Zinc	8.43	2.67	15
T_8-100% NPK + 50% Zinc	8.66	2.83	17
T_9-100% NPK + 100% Zinc	8.86	3.06	17.76
S.Em. (±)	0.18	0.201	0.304
C. D @5%	0.56	0.607	0.917

Conclusion

Based on this study, it is concluded that, the present paper highlights the positive effect of NPK and Zinc on the growth, yield and soil properties of growing baby corn. Combined application of 100% NPK [N (150kg ha^{-1}), P (60 kg ha^{-1}), K (40 kg ha^{-1})] + 100% Zinc [25 kg ha^{-1}] is an optimum nutrient for enhancing growth, increasing corn size and yield attributes and probability of baby corn as compared to other treatment combinations.

Acknowledgement

I would like to express my sincere thanks to my Advisor Dr. Tarence Thoms Professor and Head, department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, SHUATS, Prayagraj, for his diligent guidance and constructive suggestions at every step during my work. I thank him for his creative criticism and valuable suggestions for improving the quality of this work. I also extend my gratitude to all the teaching and non- teaching staff of our department because without them I would not be able to complete my work.

References

1. Bouyoucos GJ. The hydrometer as a new method for the mechanical analysis of soils. Soil Science 1927;23:343-353.
2. Walkley A, Black IA. Critical examination of rapid method for determining organic carbon in soils, effect of variance in digestion conditions and of inorganic soil constituents. Soil Science, 1947, 632-251.
3. Wilcox LV. Electrical conductivity. American water works Association Journal 1950;42:775-776.
4. Toth SJ, Prince AL. Estimation of Cation exchange capacity and exchangeable Ca, K and NA content of soil

by flame photometer technique. Soil Science 1949;67:439-445.
5. Olsen SR, Cole CV, Watanabe FS, Dean LA. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. U.S. Department of Agriculture Circulars 1954;939:1-9.
6. Subbiah BV, Asija GL. A rapid procedure for the determination of available nitrogen in soil, Current Science 1956;25:259-260.
7. Jackson ML. The pH was determined in soil water suspensions using digital pH meter 1958;1:2.
8. Sakal R *et al*., Madras Agric. J. 1981;68:383.
9. Chhonkar PK, Tarafdar JC. Accumulations of phosphates in soils, J. Indian Soc. Soil Sci 1984;32(1):266-272.
10. Muthuvel P, Udayasoorian C, Natesan R, Ramaswami PR. Introduction to Soil Analysis, Tamil Nadu Agricultural University, Coimbatore, 1992.
11. Pandey AK, Mani VP, Prakash V, Singh RD, Gupta HS. Effect of varieties and plant densities on yield, yield attributes and economics of baby corn (*Zea mays*). Indian Journal of Agronomy 2002;47:221-226.
12. Thavaprakaash N, Velayudham K, Muthukumar VB. Effect of Crop geometry, Intercropping Systems and Integrated Nutrient Management Practices on Productivity of Baby Corn (*Zea mays* L.) based Intercropping Systems. Research Journal of Agricultural and Biological Sciences 2005;1(4):295-302.
13. Das S, Yadav VK, Jat ML, Asha K, Sujay R, Jyoti K. Baby corn in India. DMR Technical Bulletin 2008, 1-45.
14. Jagadeesh BR. Chemical, bio-chemical properties of soil subjected to permanent manurial and cropping sequence, M.Sc., (Agri.) Thesis, UAS, Bangalore, India, 2008.
15. Raskar SS, Sonani VV, Shelke AV. Effects of different levels of nitrogen, phosphorus and zinc on yield and yield attributes of maize (*Zea mays* L.). Adv. J Crop Imp 2012;3:126-128.
16. Banik P, Sharma RC. Yield and Resource Utilization Efficiency in Baby Corn—Legume-Intercropping System in the Eastern Plateau of India Research Journal of Sustainable Agriculture 2014;33(4):379-39.