International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(2): 2188-2190

Received: 18-01-2018
Accepted: 20-02-2018

Satybhan Singh
Department of Ag. Sciences & Engg., IFTM University, Moradabad, India

Virendra Singh
Department of Ag. Sciences & Engg., IFTM University, Moradabad, India

Rabish Datt Shukla
Department of Ag. Sciences & Engg., IFTM University, Moradabad, India

Kuldeep Singh
Department of Ag. Sciences & Engg., IFTM University, Moradabad, India

Correspondence
Virendra Singh
Department of Ag. Sciences & Engg., IFTM University, Moradabad, India

Effect of fertilizer levels and Bio-fertilizer on green cob yield of corn (*Zea mays* L.)

Satybhan Singh, Virendra Singh, Rabish Datt Shukla and Kuldeep Singh

Abstract
Result of a field study conducted during *summer* 2017 showed that the combined application of 100% RDF + PSB produced significantly more cob and green fodder yields than other treatments. Highest plant growth (plant height and stem girth) and green fodder yield was recorded with the application of 150% RDF + PSB while, yield attributes, green cob yield was maximum with the application of treatment 100% RDF + PSB. Treatment 100% RDF + PSB was recorded higher net returns over rest of the treatments (Rs. 97466.66 ha^{-1}) and B: C ratio (2.77). This is an important finding in green cob and fodder production of corn.

Keywords: Green Cob, PSB, RDF, yield and economics

1. Introduction
Corn (*Zea mays* L.) is the world's leading crop and is widely cultivated as cereal grain and a major source of carbohydrate. It is second after rice in the trade of agricultural product nationally and internationally. It is one of the most versatile emerging crops having wider adaptability. Apart from this, corn is an important industrial raw material and provides large opportunity for value addition (Paroda, 2000) [9]. Corn is considered a promising option for diversifying agriculture in upland areas of India. It now ranks as the third most important food grain crop in India. Since opportunities are limited for further expansion of corn area, future increases in corn supply will be achieved through the intensification and commercialization of current corn production systems.

The production of green cob shows a successful result in India should more attention is given to scientists and farmers in order to find out its potentials for obtaining maximum returns to the farmers. Corn occupies an area of 66 lakh hectares with production of 133 lakh tones and productivity of 2015 kg ha^{-1} in India (Singhal, 2003) [15]. The application of chemical fertilizer may assist in obtaining maximum production of baby corn but keeping in mind that chemical fertilizer may lead to hazardous effect on environmental health besides increasing production cost as such the judicious uses of fertilizers from different source will maintain the environmental health and sustainability (Dadarwal *et al*., 2009) [2]. However, Integrated Nutrient Management (INM) is a judicious use of the fertilizers or manures from different sources will maintain the environmental sustainability and reduce the production cost, thereby increasing the economic returns to the farmers and also increases the supply and availability of soil nutrients to the crop as well as increasing the soil fertility and reduce soil pollutants. Objective to be realized through this research were to determine the combined use of fertilizers and biofertilizer with their recommended dose.

2. Materials and Methods
A field experiment was conducted at Agronomic Research Farm of IFTM University Moradabad, India during *summer* 2017. The soil of experimental field is characterized as sandy loam in texture, well drained and having good water holding capacity. The soil was low in available nitrogen (213.48 kg ha^{-1}), medium available phosphorus (28.98 kg ha^{-1}) and high available potassium (367.60 kg ha^{-1}). The soil was found slightly alkaline (pH 7.3) with low in organic carbon (0.6). The experiment consisting of eight treatments *viz.*, T_1- Control, T_2- PSB, T_3- 50% NPK, T_4- 50% NPK + PSB, T_5- 100% NPK, T_6- 100% NPK + PSB, T_7- 150% NPK, and T_8- 150% NPK + PSB in randomized block design with three replications. *NMH 707* cultivar of Nuziveedu Seeds was sown at a spacing of 45X20 cm with help hand marker.

The recommended dose of fertilizer (RDF) 150: 75: 75 kg ha^{-1} applied as per the treatments.

3. Results and Discussion

3.1 Growth Parameters

The findings showed that plant height and stem girth was significantly influenced by application of various fertilizer treatments with biofertilizer. The highest plant height and stem girth was recorded with the combined application of 150% RDF + PSB, significantly greater than the control (Table 1). It showed that combined effect of NPK and PSB plays an important role due to their synergetic effect. The nitrogen from chemical fertilizer helped in the promotion of growth during the early stages while PSB increase the availability of phosphorus that improved root development. Similar results were also reported by Kumar *et al.* (2007), Jaliya *et al.* (2008), Sarwargaonkar *et al.* (2008) and Zehra (2011) [5,7, 13, 18].

Significant improvement in number of leaves $plant^{-1}$ over the control was recorded with the application of various treatments. Maximum number of leaves was recorded with the application of 100% RDF+PSB. It may be attributed due to the appropriate nutrient supply to plants by the soil because a balanced used of fertilizers with phosphate solubilizing bacteria (PSB). Similar results were also reported by Kumar *et al.* (2007) and Gul *et al.* (2015) [3, 7].

Application of PSB also enhanced the total dry matter accumulation by the crop plant. At harvesting application of 100% RDF + PSB was recorded significant increase in total dry matter accumulation (Table 1). Phosphate solubilizing microorganisms (PSMs) are ubiquitous in soils and play an important role in supplying P to plants in a more environmentally and sustainable manner (Gyaneshwar *et al.*, 2002 and Richardson, 2001) [4]. It may be attributed due to the more number of leaves per plant. Similar results were also reported by Kumar *et al.* (2007), Jaliya *et al.* (2008), Baloach *et al.* (2014) and Jat *et al.* (2014) [5, 6, 7, 13,].

Table 1: Effect of RDF levels with and without PSB on growth and yield attributes of corn

Treatment	Plant height (cm)	Stem girth (cm)	No. of leaves $plant^{-1}$	Dry weight (g)	Cob weight (g) with cover	Cob length (cm)	Number of rows cob^{-1}	Number of grains row^{-1}
T_1- Control	181.22	6.62	14.22	255.53	235.22	21.54	13.72	25.11
T_2- PSB	185.55	6.77	14.45	266.33	236.56	22.00	14.00	26.44
T_3- 50% RDF	198.11	6.78	14.56	283.33	246.89	22.22	14.89	27.77
T_4- 50% RDF + PSB	200.67	7.03	14.78	308.33	255.89	22.22	15.22	31.33
T_5- 100% RDF	212.00	7.51	15.00	309.00	310.00	23.42	15.56	32.67
T_6- 100% RDF + PSB	213.78	7.54	16.00	369.00	322.89	27.07	16.67	34.11
T_7- 150% RDF	222.44	7.80	14.44	330.00	276.89	24.53	15.67	32.67
T_8- 150% RDF + PSB	225.33	7.91	14.44	338.33	310.22	25.98	16.22	33.77
SEm±	6.830	0.218	0.335	12.642	20.623	1.205	0.591	1.364
C.D. at 5%	20.917	0.667	1.026	38.717	63.159	3.690	1.809	4.178

3.2 Yield Attributes

The yield attributes of corn *viz.,* Cob weight (g) with cover, cob length (cm), number of rows per cob, number of grains per row were significantly influenced with the application of various treatments (Table 1). It may be attributed due to the more number of leaves per plant, more dry matter accumulation per plant (g) and dry matter is positively correlated with photosynthesis, more photosynthesis is correlated with yield attributes. Similar findings were also reported by Kumar *et al.* (2007), Jaliya *et al.* (2008) and Jat *et al.* (2014) [5, 6, 7] .

3.3 Green Cob Yield

Cob yield of corn with cover (t ha^{-1}) was significantly increased with the application of 100% RDF + PSB (Table 2). It may be attributed due to the more number of leaves, more dry matter accumulation (g), more cob weight (g), more cob length (cm) were found in this treatment and ultimately cob yield (t ha^{-1}). Same results were also reported by Kumar *et al.* (2007), Rasool *et al.* (2015) and Jaliya *et al.* (2008) [5,7, 10].

3.4 Green Fodder Yield

Green fodder yield of corn (t ha^{-1}) was significantly increased with the application of 150% RDF + PSB. It may be attributed due to the maximum plant height and stem girth was recorded in this treatment. More plant height is a symbol of more vegetative growth and less height of the plant indicates under plant growth. Both of them causes poor grain development and results in decrease of final grain yield and increase in straw yield. Findings of the study in accordance with Sarawgi *et al*. (1999) and Verma *et al*. (2006) [12, 17].

3.5 Economics

The highest net realization of ₹ 97466.66 ha^{-1} and B: C ratio of 2.77 (Table 2) recorded with application of 100% RDF + PSB. This could be attributed to cob yield as well as green fodder yields recorded with this treatment. Among the treatments control recorded lowest net returns ₹ 33673.33 ha^{-1}. The reason is self-explanatory as cost of cultivation was reported higher with 150 % RDF + PSB which increase the total cost of cob production. While lower levels of 100 % RDF + PSB are cheaper, which effect on net realization and B: C ratio of the treatments under study. Similar observations were also observed by Singh *et al.* (2017), Mued *et al.* (2017) and Tomar *et al.* (2017) [8,16, 17].

Table 2: Effect of RDF levels with and without PSB on cob yield and economics of corn.

Treatment	Cob yield with cover (t ha^{-1})	Fodder yield (t ha^{-1})	Net returns (₹ ha^{-1})	B: C ratio
T_1- Control	6.26	17.33	33673.33	1.18
T_2- PSB	7.72	17.50	48523.33	1.69
T_3- 50% RDF	9.07	20.04	58866.67	1.85
T_4- 50% RDF + PSB	9.60	20.96	64050.00	2.00
T_5- 100% RDF	11.44	24.86	79393.34	2.26
T_6- 100% RDF + PSB	13.27	25.71	97466.66	2.77
T_7- 150% RDF	12.22	27.00	83923.34	2.19
T_8- 150% RDF + PSB	10.43	27.09	65883.34	1.71
SEm±	0.499	1.374	4971.35	0.145
C.D. at 5%	1.528	4.209	15225.15	0.443

4. Conclusion

Thus, it can be concluded that the highest fresh cob yields, net income and B: C ratio was recorded with the application of 100% RDF + PSB. This treatment was found more beneficial and cost effective. The integration of different levels of RDF with PSB have been proven to be recorded success in this study than sole use of RDF levels and this system is not only improving the total crop productivity but it also maintains and sustains soil health for future generation as well as improving the economic stability of the farmers.

5. References

1. Baloach N, Yousaf M, Akhter WP, Shah Fahad, Ullah Bashir, Qadir Ghulam *et al.* Integrated effect of phosphate solubilizing bacteria and humic acid on physiomorphic attributes of Maize. International Journal of Current Microbiology and Applied Sciences. 2014; 3(6):549-554.
2. Dadarwal RS, Jain NK, Singh D. Integrated nutrient management in baby corn (*Zea mays*). Indian journal of Agricultural Science, 2009; 79(12):1023-1025.
3. Gul Shamim Khan MH, Khanday BA, Sabeena Nabi. Effect of Sowing Methods and NPK Levels on Growth and Yield of Rainfed Maize (*Zea mays* L.). *Scientifica*. 2015, 1-6.
4. Gyaneshwar P, Kumar N, Parekh LJ, Poole PS. Role of soil microorganisms in improving P nutrition of plants. Plant and Soil. 2002; 245(1):83-93.
5. Jaliya MM, Falaki AM, Mahmud M, San YA. Effect of sowing date and NPK fertilizer rate on yield and components of quality protein Maize (*Zea mays* L.). *ARPN* Journal of Agricultural and Biological Science. 2008; 3(2):23-29.
6. Jat PC, Rathore SS, Sharma RK. Effect of Integrated Nitrogen Management and Intercropping Systems on Yield Attributes and Yield of Maize. Indian Journal of Hill Farming. 2014; 27(1):52-56.
7. Kumar MA, Arun Gali SK, Hebsur NS. Effect of Different levels of NPK on Growth and Yield Parameters of Sweet Corn. Karnataka J Agric. Sci. 2007; 20 (1):41-43.
8. Mued Mohd, Singh Virendra, Meraj Khan Mohd, Mubeen. Effect of different nutrient management practices on the economics of late sown *kharif* Maize (*Zea mays* L.) in Western Uttar Pradesh, India. Int. J. Curr. Microbiol. App. Sci. 2017: 6(9):2455-2457
9. Paroda RS, Kumar P. Food production and demand in South Asia. Agricultural Economics Research Review. 2000; 13(1):1-25.
10. Rasool Shahid, Kanth RH, Hamid Shabana, Raja W, Alie BA, Dar ZA. Influence of integrated nutrient management on growth and yield of Sweet Corn (*Zea mays* L. *saccharata*) under temperate conditions of Kashmir Valley. American Journal of Experimental Agriculture. 2015; 7(5):315-325.
11. Richardson AE. Prospects for using soil microorganisms to improve the acquisition of phosphorus by plants. Australian Journal of Plant Physiology. 2001; 28 (9):897-906.
12. Sarawgi SK, Tiwari PK, Tripathi RS. Growth nodulation and yield of chickpea as influenced by phosphorus, bacterial culture and micro inoculants under rain-fed conditions. The Madras Agricultural Journal.1999; 86 (4):181-185.
13. Sarwargaonkar GL, Shelke DK, Shinde SA, Shirsagar SK. Performance of *Kharif* maize based legume intercropping system under different fertilizer doses. International Journal of Agricultural Sciences. 2008; 4(1):152-155.
14. Singh Satybhan, Singh Virendra, Mishra Parmanand. Effect of NPK, boron and zinc on productivity and profitability of late sown *kharif* maize (*Zea mays* L.) in western Uttar Pradesh, India. Ann. Agric. Res. New Series. 2017; 38 (3):310-313.
15. Singhal V. Indian Agriculture. Indian Economics Data Research Scientists Centre, New Delhi, 2003, 164
16. Tomar SS, Singh Adesh, Dwivedi Ashish, Sharma Rahul, Naresh RK, Kumar Vineet *et al.*, Effect of integrated nutrient management for sustainable production system of maize (*Zea mays* L.) in indo-gangetic plain zone of India. International Journal of Chemical Studies. 2017; 5(2):310-316.
17. Verma Arvind, Nepalia V, Kanthaliya PC. Effect of integrated nutrient supply on growth, yield and nutrient uptake by maize (*Zea mays* L.)-wheat (*Triticum aestivum* L.) cropping system. Indian Journal of Agronomy 2006; 51(1):3-6.
18. Zehra Ekin. P-Solubilizing Bacteria, Phosphorus fertilizer. applications to sunflower improves seed set, seed filling efficiency and concentration of macro-and micro nutrients of seeds. Turkish Journal of Field Crops. 2011; 16(2):183-189.