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Effect of organic sources of nitrogen on nutrient uptake and yield of baby corn

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Abstract
The experiment was conducted during *rabi* season of 2016-17 at Agronomy Organic Farm, College of Agriculture, Pune and laid out in randomized block design with twelve treatments and three replications. The treatments consisted of six different organic manures *i.e.* FYM, Vermicompost, Poultry manure, castor seed cake, cotton seed cake and neem seed cake and their combinitions. The application of 100% RDN through poultry manure recorded significantly higher nitrogen, phosphorus and potassium uptake by crop than rest of the treatments. The corresponding values were 97.94 kg ha^{-1} N, 34.09 kg ha^{-1} P and 104.26 kg ha^{-1} K, respectively. The second best treatment was application of 50% RDN through vermicompost + 50% RDN through poultry manure. However, the lowest nitrogen, phosphorus and potassium uptake by crop was noticed in absolute control. Cob yield (135.23q ha^{-1}) and green fodder yield (355.99q ha^{-1}) of baby corn were highest with application of 100% RDN through poultry manure.

Keywords: Baby corn, FYM, vermicompost, poultry manure, nutrient uptake and yield

Introduction
India's rank in terms of World's Organic Agricultural land was 15 as per 2013 data. The total area under organic certification is 5.71 million hectare during (2015-16). This includes 26% cultivable area with 1.49 million hectare and rest 74% (4.22 million hectare) forest and wild area for collection of minor forest produces (Anon., 2015) [3].

Corn (*Zea mays* L.) 'Queen of cereals' is a versatile crop and is widely used as food, feed and fodder. Baby corn is an unfertilized immature young cob of corn harvested just before or after two to three days of silk emergence. Improved production technology for baby corn can help to fetch a higher economic return (4-5 times) and a quality product as compared to grain corn. Also, early harvest of corn for baby corn gives nutritious green fodder for livestock. Thus, there is an immense scope of growing corn as baby corn to improve socio-economic status of poor farmers, and this has vast potential to generate employment opportunities in the rural areas as a small-scale enterprise (Sharma and Banik, 2014) [13].

Corn occupies an important place in food processing industry of India. The economic potential and marketing aspects of canning baby corn as a small scale food processing venture can be explored. Canning and pickling industries of baby corn offer huge export potential. Demand for baby corn as a health food is increasing in class hotels and middle class consumers. After the harvest of babies the economic potential is further enhanced since it supplies green, soft, succulent, nutritious, palatable fodder with higher digestibility.

Organic farming is an approach to produce food products that is intended to overcome the negative impacts of the Green Revolution on soil, air, water, landscape, and humans worldwide. A central element of the organic farming approach is the efficient use of on-farm and local resources such as farmyard manure, indirect crop protection and local seeds. It pursues a course of promoting the powers of self-regulation and resistance which plants and animals possess naturally (Yuda *et al.*, 2016) [19].

Material and Methods
The field experiment was laid out during *rabi* season of 2016-17 at Agronomy Organic Farm, in Plot No. 3 'B' Division, College of Agriculture, Pune (M.S.) The experiment was laid out in randomized block design with twelve treatments and three replications. The gross and net plot size were 4.20 x 3.60 m^2 and 3.80 x 2.40 m^2, respectively. The twelve treatment consisted of T_1 (100% RDN through FYM), T_2 (100% RDN through vermicompost), T_3 (100% RDN through poultry manure), T_4 (100% RDN through neem seed cake), T_5 (100% RDN through

castor seed cake), T_6 (100% RDN through cotton seed cake), T_7 (50% RDN through FYM + 50% RDN through vermicompost), T_8 (50% RDN through vermicompost + 50% RDN through poultry manure), T_9 (50% RDN through poultry manure + 50% RDN through neem seed cake), T_{10} (50% RDN through neem seed cake + 50% RDN through castor seed cake), T_{11} (50% RDN through castor seed cake + 50% RDN through cotton seed cake) and T_{12} (Absolute control).

Baby corn variety Gold-999 was sown @ 30 kg seed ha^{-1} at spacing of 60×10 cm^2, in November, 2016 and harvesting was completed in February, 2017. Nitrogen analysis of organic manures was carried out and applied @ 120 kg N ha^{-1} to soil before sowing through six organic sources as per treatments.

Result and Discussion

N, P and K (%) content and uptake in baby cob and stover

The higher values of nitrogen (1.83% and 0.60%), phosphorus (0.45% and 0.26%), and potassium (0.70% and 0.98%) content in baby corn and stover of baby corn were recorded with treatment T_3 (100% RDN through poultry manure) as summarized in table 1. The next best treatment was T_8 (50% RDN through vermicompost+ 50% RDN through poultry manure).The minimum values of these nutrients were observed in treatment T_{12} (Absolute control).

The treatment T_3 (100% RDN through poultry manure) recorded significantly higher nitrogen, phosphorus and potassium uptake by crop than rest of the treatments. The corresponding values were 97.94 kg ha^{-1} N, 34.09 kg ha^{-1} P and 104.26 kg ha^{-1} K, respectively (Table 2). The second best treatment was T_8 (50% RDN through vermicompost+ 50% RDN through poultry manure). However, the lowest nitrogen, phosphorus and potassium uptake by crop was noticed in treatment T_{12} (Absolute control).

The higher values of total nitrogen, phosphorus and potassium content and uptake with T_3 (100% RDN through poultry manure) might be attributed to significant improvement in most of growth and yield contributing characters, resulted in higher baby corn and fodder yield which in turn resulted in higher nitrogen, phosphorus and potassium uptake. Poultry manure was reported the best source among the organic sources because of higher content of N that is readily available to crop. The better response of poultry manure over other sources may be because of higher approximately 40% of total N in poultry manure in available form reported by Shepherd and Withers (1999) [14].

Similar results regarding nutrient content and uptake by plant were obtained by Dadarwal (2008) [5], Keerthirani (2015) [8], Rasool *et al.* (2016) [10] and Shah and Wani (2017) [12].

Yield Studies

The baby corn (with husk) yield differed significantly due to various treatments. It could be seen from the Table 3 that T_3 produced highest baby corn yield (135.23q ha^{-1}) which was significantly superior over the rest of the treatments but, it was at par with treatments T_7 and T8. Significantly the lowest yield (37.76 q ha^{-1}) was obtained from treatment T_{12} (Absolute control). The data regarding dry cob yield followed similar trend as fresh baby cob yield.

The differences in green fodder yield of baby corn was due to various treatments under study were found significant. From the data summarized in Table 3 it was revealed that the mean green fodder yield of baby corn under experimental conditions was 312.71q ha^{-1}. Treatments T_7, T_8, T_5 and T_{11} were at par with T_3. Treatment T_{12} produced significantly the lowest green fodder yield (164.47q ha^{-1}) compared to all other treatments.

The higher yield and yield attributes in poultry manure could be assigned to higher mineralization potential of poultry manure enabling it to active and quick release of its nutrients for plant uptake and use. The overall improvement reflected into better source-sink relationship, which in turn enhanced the yield and yield attributes. In addition to release of plant nutrients from the organic matter, the organic acids formed in the decomposition process also release the native nutrients in soil and increases their availability to plants. These results regarding baby corn and green fodder yields of experimental baby corn were similar to Boateng *et al.* (2006) [4], Farhad *et al.* (2009) [6], Udom and Bello (2009) [17], Agba *et al* (2012) [1], Ranjan *et al.* (2013) [9], Amos *et al.* (2013) [2], Shinde *et al.* (2014) [15], Sharma and Banik (2014) [13], Keerthirani (2015) [8], Hekmat and Abraham (2016) [7], Shiyam *et al.* (2017) [16], Wailare and Kesarwani (2017) [18].

Table 1: N, P and K content (%) in baby corn and stover as influenced by different treatments

Symbol	Treatment	Baby cob			Stover		
		N	P	K	N	P	K
T_1	100% RDN through FYM	1.77	0.35	0.57	0.53	0.17	0.83
T_2	100% RDN through VC	1.80	0.37	0.60	0.54	0.19	0.90
T_3	100% RDN through PM	1.83	0.45	0.70	0.60	0.26	0.98
T_4	100% RDN through NSC	1.75	0.34	0.59	0.54	0.18	0.85
T_5	100% RDN through CSC	1.80	0.41	0.63	0.55	0.21	0.92
T_6	100% RDN through CoSC	1.77	0.35	0.59	0.54	0.20	0.86
T_7	50% RDN through FYM + 50% RDN through VC	1.81	0.44	0.65	0.57	0.22	0.92
T_8	50% RDN through VC +50% RDN through PM	1.81	0.44	0.67	0.58	0.23	0.97
T_9	50% RDN through PM+50% RDN through NSC	1.75	0.34	0.61	0.53	0.20	0.84
T_{10}	50% RDN through NSC+ 50% RDN through CSC	1.73	0.36	0.60	0.53	0.19	0.90
T_{11}	50% RDN through CSC+ 50% RDN through CoSC	1.80	0.39	0.63	0.56	0.20	0.92
T_{12}	Absolute control	1.47	0.32	0.51	0.50	0.15	0.80
S. Em±		0.07	0.01	0.01	0.01	0.01	0.03
C.D. at 5%		NS	0.04	0.03	0.03	0.03	0.08
General mean		1.76	0.38	0.61	0.55	0.20	0.89

Table 2: Total nutrient uptake (kg ha^{-1}) by baby corn as influenced by different treatments

Symbol	Treatment	N	P	K
T_1	100% RDN through FYM	68.14	18.35	71.22
T_2	100% RDN through VC	75.78	21.99	83.68
T_3	100% RDN through PM	97.94	34.09	104.26
T_4	100% RDN through NSC	57.70	16.00	62.05
T_5	100% RDN through CSC	83.68	26.48	92.97
T_6	100% RDN through CoSC	72.72	21.70	77.67
T_7	50% RDN through FYM + 50% RDN through VC	87.06	28.33	94.20
T_8	50% RDN through VC +50% RDN through PM	90.65	29.92	100.43
T_9	50% RDN through PM+50% RDN through NSC	73.83	21.96	77.17
T_{10}	50% RDN through NSC+ 50% RDN through CSC	73.34	21.67	83.03
T_{11}	50% RDN through CSC+ 50% RDN through CoSC	82.13	24.62	91.60
T_{12}	Absolute control	30.45	8.32	36.33
S. Em±		3.24	0.82	3.67
C.D. at 5%		9.51	2.41	10.77
General mean		68.73	21.03	74.97

(**Note:** FYM; Farm Yard Manure, VC: Vermicompost, PM: Poultry Manure,NSC: Neem Seed Cake, CSC: Castor Seed Cake and CoSC: Cotton Seed Cake)

Table 3: Yield (q ha^{-1}) of baby corn as influenced by different treatments

Symbol	Treatment	Baby corn (with husk)	Dry cob	Green fodder	Stover
T_1	100% RDN through FYM	89.55	16.12	298.98	74.74
T_2	100% RDN through VC	98.68	17.76	324.56	81.14
T_3	100% RDN through PM	135.23	24.34	355.99	89.00
T_4	100% RDN through NSC	73.83	13.29	255.12	63.78
T_5	100% RDN through CSC	109.65	19.74	350.15	87.54
T_6	100% RDN through CoSC	95.03	17.11	314.33	78.58
T_7	50% RDN through FYM + 50% RDN through VC	113.30	20.39	351.97	87.99
T_8	50% RDN through VC +50% RDN through PM	120.61	21.71	354.17	88.54
T_9	50% RDN through PM+50% RDN through NSC	102.34	18.42	313.96	78.49
T_{10}	50% RDN through NSC+ 50% RDN through CSC	98.68	17.76	321.64	80.41
T_{11}	50% RDN through CSC+ 50% RDN through CoSC	103.44	18.62	347.22	86.81
T_{12}	Absolute control	37.36	6.73	164.47	41.12
S. E m±		7.63	1.37	9.40	2.35
C.D. at 5%		22.67	4.03	27.56	6.89
General mean		99.14	17.85	312.71	78.18

Conclusion

Application of 100% RDN through poultry manure was found the most suitable organic source of nitrogen for organic baby corn followed by combination of 50% RDN through vermicompost + 50% RDN through poultry manure and 50% RDN through FYM + 50% RDN through vermicompost.

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References

1. Agba OA, Ubi BE, Abam P, Ogbechi J, Akeh M, Odey S *et al*. Evaluation of agronomic performance of maize (*Zea mays* L.) under different rates of poultry manure application in an Ultisol of Obubra, Cross River state, Nigeria. Int. J Agric. Forestry. 2012; 2(4):138-144.
2. Amos Obi H, Izundu C, Audu L. Effect of chicken manure on the performance of vegetable maize (*Zea mays saccharata*) varieties under irrigation. Discourse Journal of Agriculture and Food Science. 2013; 1(12):190-195.
3. Anonymous, 2015. APEDA2015.http://apeda.gov.in/apedawebsite/organic/Organic_Products.htm.
4. Boateng SA, Zickermann J, Kornahrens M. Poultry manure effect on growth and yield of maize. West Afr. J Appl. Ecol. 2006; 9:1-11.
5. Dadarwal R. Integrated nutrient management in baby corn (*Zea mays* L.) M.Sc. (Agri.) Thesis submitted to MPUAT, Udaipur, 2008.
6. Farhad W, Saleem MF, Cheema MA, Hammad HM. Effect of poultry manure levels on the productivity of spring maize (*Zea Mays* L.). J Anim. Plant Sci. 2009; 19(3):122-125.
7. Hekmat AW, Abraham T. Yield and yield attributes of certified organic babycorn (*Zea mays* L.) as influenced by different organic sources and intercropping with pulses. Int. J Multidisciplinary Res. Dev. 2016; 3(7):169-173.
8. Keerthirani DS. Influence of organic sources of nutrients on growth, productivity and quality of baby corn. M.Sc. (Agri.) Thesis submitted to UAS, Bengaluru, 2015.
9. Ranjan JK, Ahmed N, Das B, Ranjan P, Mishra BK. Greentechnology for production of baby corn (*Zea mays* L.) under North-West Himalayan conditions. Int. J Chem Tech Res. 2013; 5(2):880-885.
10. Rasool S, Hamid S, Kanth RH, Khan MH. Effect of integrated nutrient management on quality, nutrient content and uptake of sweet corn (*Zea mays var. saccharata*) Am. J Exp. Agric. 2016; 13(6):1-11.
11. Rasool S, Hamid S, Kanth RH, Khan MH. Effect of integrated nutrient management on quality, nutrient

content and uptake of sweet corn (*Zea mays var. saccharata*) Am. J Exp. Agric. 2016; 13(6):1-11.
12. Shah RA, Wani BA. Yield, nutrient uptake and soil fertility of maize (*Zea mays* L.) as influenced by varying nutrient management practices under temperate conditions of Kashmir Valley, India Plant Arch. 2017; 17(1):75-78.
13. Sharma RC, Banik P. Vermicompost and fertilizer application effect on productivity of baby corn (*Zea mays* L.) and soil health. Compost science and utilization. 2014; 22(2):83-92.
14. Shepherd MA, Withers PJ. Application of Poultry Litter and Triple Super Phosphate Fertilizer to a Sandy Soil: Effect on Soil Phosphorus Status and Profile Distribution. Nutrient Cycle and Agro Ecosystem. 1999; 54:233-242.
15. Shinde SA, Patange MJ, Dhage SJ. Influence of irrigation schedules and integrated nutrient management on growth, yield and quality of *rabi* maize (*Zea mays* L.). Int. J Curr. Microbiol. Appl. Sci. 2014; 3(12):828-832.
16. Shiyam JO, Garjila YA, Bobboyi M. Effect of poultry manure on growth and yield of maize (*Zea maysvar* Praecox) in Jalingo, Taraba state, Nigeria. J Appl. Life Sc. Int. 2017; 10(4):1-6.
17. Udom GM, Bello HM. Effect of poultry litter on the yield of two maize varieties in the Northern Guinea Savanna. Journal of Tropical Agriculture, Food, Environment and Extension. 2009; 8(1):51-54.
18. Wailare AT, Kesarwani A. Effect of integrated nutrient management on growth and yield parameters of maize (*Zea mays* L.) as well as soil physic-chemical properties. Biomed. J Sci. Tech. Res. 2017; 1(2):1-6.
19. Yuda CH, Arry YN, Hariyania P. Biophysical monitoring on the effect on different composition of goat and cow manure on the growth response of maize to support sustainability. Agric. Sci Procedia. 2016; 9(2):118-127.