Int.J.Curr.Microbiol.App.Sci (2017) *6*(11): 2745-2750

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 11 (2017) pp. 2745-2750**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.611.324

Integrated Nutrient Management for Yield and Economics of Maize (*Zea mays* L.) In-Rice-Gingelly-Maize Cropping System through Integrated Farming System

K. Maruthupandi* and C. Jayanthi

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641003, Tamil Nadu, India
**Corresponding author*

Keywords

Cropping system, Integrated farming, Nutrient management, Maize (*Zea mays*).

Article Info

Accepted:
20 September 2017
Available Online:
10 November 2017

A B S T R A C T

A field experiment was conducted during 2014-15 and 2015-16 at Coimbatore in a clay loam soil, wetland to study the response of maize (*Zea mays* L.) to integrated nutrient management practices. Thirteen treatments were allotted to the randomized block design with three replications. Yield were higher for integrated nutrient management of resulting in higher grain yield in 100% RDF + vermicompost 5 t/ha (T_1) 5358 kg/ha, Stalk yield 8350 kg/ha, Harvest Index 0.39 and net returns Rs.54888/ha, benefit cost ratio 2.78. This on par with 100% RDF + goat manure as pond silt 5 t/ha (T_4) 5132 kg/ha, stalk yield 8050 kg/ha, harvest index 0.39. The net returns Rs.51272 ha, benefit cost ratio 2.66 for 2014-15 duration. The similar results followed resulting in higher gain yield in100% RDF + vermicompost 5 t/ha (T_1) 5480 kg/ha, stalk yield 8542 kg/ha, harvest index 0.39, net returns Rs 56840, benefit cost ratio 2.84. This on par with 100% RDF + goat manure as pondsilt 5 t/ha 5280 kg/ha Stalk yield 8210 kg/ha, Harvest Index 0.39, net returns Rs 53000, benefit cost ratio 2.72 for the duration of 2015-16. This followed treatment comparable to the75% RDF+ vermicompost 5 t/ha. It was expressed better yield and economics in integrated nutrient management for maize in-rice-gingelly-maize cropping system through integrated farming system

Introduction

Maize (*Zea mays* L.) is an important one in rice–gingelly-maize cropping system of Southern India. The productivity of this system, as the maize crops are high nutrient-requiring ones and respond well to higher levels of chemical fertilizers. But deterioration in soil health associated with global crises of energy, escalation in the prices of chemical fertilizers and environmental hazards due to excessive use of fertilizers, lead to emphasize on supplementation or substitution of chemical fertilizers with low priced nutrient sources such as organic and biosources. Application of these nutrient sources alone or in combination with inorganic, organic sources had been found beneficial not only in enhancing the productivity of maize in the cropping system (Jamwal, 2005), but also had the beneficial impact on soil properties (Pathak *et al.*, 2005). The beneficial effect of organic sources applied in preceding crops was recorded in succeeding maize crop

(Yadav *et al.*, 2005, Yadav *et al.*, 2008). The carry over effect of fertilizers and manures applied to rice-gigelly had also been reported in maize (Jamwal, 2005, Kumar and Ahlawat, 2004, Tiwari *et al.*, 2004). However, on the fertility after rice-gingelly, the full yield potential of improved because of their integrated nutrient management. Therefore, an attempt was made to study the effects of inorganic and organic fertilizers on the productivity and soil properties of maize by rice-gingelly-maize cropping system through integrated farming system.

Materials and Methods

The experiment was conducted at the wetland farm, Tamil Nadu Agricultural university, Coimbatore, Tamil Nadu situated at 11' N latitude, 77' E longitude and 426.7 meters above mean sea level during the rabi seasons of 2014-2015 and 2015-2016. The soil of the experimental site was clay loam in texture with pH 8.42 organic carbon 5.4 g/kg and available N, P and K, 310, 12.9 and 712 kg/ha. The total amounts of rainfall received during the cropping seasons were 198.4 and 163.7 mm, respectively. The mean maximum and minimum temperatures of both the seasons were within the optimal range of 27.6, 36.2 0C and 18.1, 25.5 0C, 27.3, 37.9 and 16.7, 26.0 0C in 2014-15 and 2015-16, respectively. The experiment was laid out in a randomized block design with three replications and thirteen treatments. The physic chemical characteristics according to the methods as described measurements are presented in Table 1. Vermicompost, FYM, Turkey manure as pond silt, Quail manure as pond silt and Goat manure as pond silt used as organic manure for field application and inorganic fertilizer. Organic manure was applied before transplanting of rice only. Treatment details wise applied (Table 2). As regards to fertilizers, was applied basal. Maize (COH6) @ 15 kg seed/ha was sown at 60 x 25 cm spacing. Observations on crop yield were recorded yield Parameters. The economics was calculated as per the official market price for different commodities.

Results and Discussion

Grain yield, stalk yield, harvest index

Significant variation in grain and stover yields and harvest index of maize was recorded due to nutrient management practices in both the years (Table 3). Higher grain yield in 100% RDF + vermicompost 5 t/ha (T1) 5358 kg/ha, Stalk yield 8350 kg/ha, Harvest Index 0.39 was recorded as compared to other treatments. However, different integrated nutrient management treatments did not differ with each other during the first year. During second year application higher gain yield in100% RDF + vermicompost 5 t/ha (T1) 5480 kg/ha, Stalk yield 8542 kg/ha, Harvest Index 0.39 was at par with recommended dose of the 75% RDF+ vermicompost 5 t/ha. This was attributed to the better growth to yield parameters on the same nutrient management treatments. (Table 3) Mazzonccini *et al.*, (2008) also reported the similar results the grain and straw yield of maize recorded the highest value in both the years. In general, grain and straw yields were higher during second year in comparison to first year and the increase in yields was higher in the treatments of combined use of different nutrients sources. The results are in agreement with that of Kumar and Ahlawat (2004) and Kumar (2008).

Economics

The cost of cultivation/ha of maize varied from Rs 27710 to Rs 30840 for both the years (Table 4). The treatments comprising organic sources of nutrients had higher cost than the fertilizer based treatment 100% RDF + vermicompost 5 t/ha (T1) due to higher cost

of vermicompost, manure as pond silt, farmyard manure than inorganic fertilizer. However, net returns (Rs 54888 and Rs 56840/ha) and net returns/rupee (Rs 2.78 and Rs 2.84) were highest with the application of 100% RDF + vermicompost 5 t/ha, while the treatment 50% RDF + quail manure as pond silt 5 t/ha t recorded lowest values of net returns and net returns/rupee invested. Similar findings were agreement with that of Bellakki (1998) and Yadav (2008).

Table.1 Physico chemical characteristics of the experimental field

1.Physical properties	Units	Quantity
a. Mechanical analysis		
1. Sand	(%)	36.40
2. Silt	(%)	19.20
3. Clay	(%)	44.10
2. Chemical properties		
a. pH (1:2.5 soil/water)	-	8.42
b. Electric conductivity	(ds/m)	0.39
c. Organic carbon	(Kg/ha)	0.54
d. Available Nitrogen	(Kg/ha)	30
e. Bray-P(Kg ha^{-1})	(Kg/ha)	12.90
f. NH_4OAC-K	(Kg/ha)	712

Table.2 Treatments details

T_1	100% RDF +vermicompost 5 t/ha
T_2	100% RDF + turkey manure as pondsilt 5 t/ha
T_3	100% RDF + quail manure as pondsilt 5 t/ha
T_4	100% RDF + goat manure as pondsilt 5 t/ha
T_5	75% RDF + vermicompost 5 t/ha
T_6	75% RDF + turkey manure as pondsilt 5 t/ha
T_7	75% RDF + quail manure as pondsilt 5 t/ha
T_8	75% RDF + goat manure as pondsilt 5 t/ha
T_9	50 % RDF + vermicompost 5 t/ha
T_{10}	50 % RDF + turkey manure as pondsilt 5 t/ha
T_{11}	50 % RDF + quail manure as pondsilt 5 t/ha
T_{12}	50 % RDF + goat manure as pondsilt 5 t/ha
T_{13}	RDF+ FYM 12.5 t/ha
	RDF: As per the recommendation to individual crop
	OM : First crop in the system

Table.3 Effect of integrated nutrient management on grain yield (kg/ha) and stover yield (kg/ha) and harvest index of maize in rice-gingelly-maize cropping system

Treatment	2014-2015			2015-2016		
	Grain yield (kg/ha)	Stover yield (kg/ha)	Harvest Index	Grain yield (kg/ha)	Stover yield (kg/ha)	Harvest Index
T_1 - 100% RDF + vermicompost	5358	8350	0.39	5480	8542	0.39
T_2 - 100% RDF + turkey manure as pondsilt	4798	7956	0.38	5120	8106	0.39
T_3 - 100% RDF + quail manure as pondsilt	4614	7865	0.37	5036	7924	0.39
T_4 - 100% RDF + goat manure as pondsilt	5132	8050	0.39	5240	8210	0.39
T_5 - 75% RDF + vermicompost	5004	8150	0.38	5180	8360	0.38
T_6 - 75% RDF + turkey manure as pondsilt	4458	7685	0.37	4680	7895	0.37
T_7 - 75% RDF + quail manure as pondsilt	4174	7458	0.36	4356	7668	0.36
T_8 - 75% RDF + goat manure as pondsilt	4688	7892	0.37	4822	8102	0.37
T_9 - 50% RDF + vermicompost	4388	7545	0.37	4660	7755	0.38
T_{10} - 50% RDF + turkey manure as pondsilt	3878	7175	0.35	3930	7385	0.35
T_{11} - 50% RDF + quail manure as pondsilt	3588	6817	0.34	3710	7027	0.35
T_{12} - 50% RDF + goat manure as pondsilt	4218	7450	0.36	4340	7560	0.36
T_{13} - 100% RDF + FYM at 12. 5 t/ha	4838	7880	0.38	4932	8090	0.38
SEd	**251**	**407**	**0.20**	**264**	**425**	**0.20**
CD (P = 0.05)	**518**	**820**	**0.041**	**532**	**856**	**0.042**

T_1 to T_{12} - Organic manure at 5t/ha; DAS - Days after sowing

Table.4 Integrated nutrient management on economics of maize in rice-gingelly-maize cropping system

Treatment	2014-2015				2015-2016			
	Cost of Cultivation	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio (Rs/ha)	Cost of Cultivation	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio (Rs/ha)
T_1 - 100% RDF + vermicompost	30840	85728	54888	2.78	30840	87680	56840	2.84
T_2-100% RDF + turkey manure as pondsilt	30840	76768	45928	2.49	30840	81920	51080	2.66
T_3 - 100% RDF + quail manure as pondsilt	30840	73824	42984	2.39	30840	80576	49736	2.61
T_4 - 100% RDF + goat manure as pondsilt	30840	82112	51272	2.66	30840	83840	53000	2.72
T_5 - 75% RDF + vermicompost	29790	80064	50274	2.69	29790	82880	53090	2.78
T_6 - 75% RDF + turkey manure as pondsilt	29790	71328	41538	2.39	29790	74880	45090	2.51
T_7 - 75% RDF + quail manure as pondsilt	29790	66784	36994	2.24	29790	69696	39906	2.34
T_8 - 75% RDF + goat manure as pondsilt	29790	75008	45218	2.52	29790	77152	47362	2.59
T_9 - 50% RDF + vermicompost	27710	70208	42498	2.53	27710	74560	46850	2.69
T_{10}- 50% RDF + turkey manure as pondsilt	27710	62048	34338	2.24	27710	62880	35170	2.27
T_{11} - 50% RDF + quail manure as pondsilt	27710	57408	29698	2.07	27710	59360	31650	2.14
T_{12} - 50% RDF + goat manure as pondsilt	27710	67488	39778	2.44	27710	69440	41730	2.51
T_{13} - 100% RDF + FYM at 12.5 t/ha	30840	77408	46568	2.51	30840	78912	48072	2.56

T_1 to T_{12} - Organic manure at 5t/ha; Data not analysed

For getting the better productivity and returns from maize in cropping system, 100% RDF + vermicompost 5 t/ha (T1), followed by application of 100% RDF + goat manure as pond silt 5 t/ha (T4), which resulted in 25% NPK saving in further cropping sequence period and the rice-gingelly-maize cropping system to reduce fertilizer usage and optimization followed in fertilizer utility to can derive sustainability.

References

Bellakki M.A, V.P. Bahadur and Setty, R.A. 1998. Effect of long term integrated nutrient management on some important properties of a vertisol. Journal of Indian Society of Soil Sciences 46: 176-180.

Jamwal J.S. 2005. Productivity and economics of maize (*Zea mays*) - wheat (*Triticum aestivum*) cropping system under integrated nutrient supply system in rainfed areas of Jammu. Indian Journal of Agronomy 50 (2): 110–12.

Kumar Ashok. 2008. Direct and residual effect of nutrient management in maize (*Zea mays* L.) - wheat (*Triticum aestivum* L.) cropping system. Indian Journal of Agronomy 53 (1): 3 - 41.

Kumar, V. and Ahlawat, I.P.S. 2004. Carry over effect of biofertilizers and nitrogen applied to wheat (*Triticum aestivum* L.) and direct applied N in maize (*Zea mays* L.) in wheat - maize cropping system. Indian Journal of Agronomy 49 (4): 233–6.

Mazzoncini, M., P. Migliorini, D. Antichi and Vazzana, C. 2008. Effects of green manure and organic fertilizers on organic maize (*Zea mays* L.) in south Tuscany. Poster presented at cultivating the Future based on science: 2nd Conference of the International Society of Organic Agriculture Research ISOFAR, Modena held at Italy during 18–20 June, 2008.

Pathak, S.K., S.B. Singh, R.N. Jha and Sharma, R.P. 2005. Effect of nutrient management on nutrient uptake and changes in soil fertility in maize (*Zea mays*) - wheat (*Triticum aestivum*) cropping system. Indian Journal of Agronomy 50(4): 269 - 73.

Tiwari, R.C., P.K. Sharma and Khandelwal, S.K. 2004. Effect of green manuring through *Sesbania cannabina* and *Sesbania rostrata* and nitrogen application through urea to maize (*Zea mays*) – wheat (*Triticum aestivum*) cropping system. Indian Journal of Agronomy 49(1): 15–21.

Yadav, M.P., M. Aslam and Kushwaha, S.P. 2005. Effect of integrated nutrient management on rice (*Oryza sativa*)-wheat (*Triticum aestivum*) cropping system in Central Plains Zone of Uttar Pradesh. Indian Journal of Agronomy 50(2): 89–93.

Yadav, R.L, D.V. Yadav and Duttamajumdar, S.K. 2008. Rhizospheric environment and crop productivity: A review. Indian Journal of Agronomy 53(1): 1–17. 23

How to cite this article:

Maruthupandi, K. and Jayanthi, C. 2017. Integrated Nutrient Management for Yield and Economics of Maize (*Zea mays* L.) In-Rice-Gingelly-Maize Cropping System through Integrated Farming System. *Int.J.Curr.Microbiol.App.Sci.* 6(11): 2745-2750.
doi: https://doi.org/10.20546/ijcmas.2017.611.324