Int.J.Curr.Microbiol.App.Sci (2017) *6*(11): 3371-3376

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 11 (2017) pp. 3371-3376**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.611.396

Nutrient Management Practices for Organic Cultivation of Finger Millet (*Eleusine coracana* L.) Under Southern Transitional Zone of Karnataka, India

T. Basavaraj Naik[1,2], A.H. Kumar Naik[2*] and K.P. Suresh Naik[2]

[1]Agronomist, UAHS, Navile, Shivamogga-577225, Karnataka, India
[2]AICRP on Castor & Groundnut, ZAHRS, Hiriyur, Karnataka, India
**Corresponding author*

Keywords

Organic finger millet, Nutrient management and farmyard manure.

Article Info

Accepted:
26 September 2017
Available Online:
10 November 2017

A B S T R A C T

A field experiment was conducted during *kharif* season of 2014at Agricultural and Horticultural Research Station, Bhavikere, University of Agricultural and Horticultural Sciences, Shivamogga for nutrient management practices for organic cultivation of finger millet (*Eleusine coracana L.*) under southern transitional zone of Karnataka. Among the different treatments, application of farmyard manure (FYM) at 10 t ha^{-1} + Biodigester Liquid Manure Equivalent (BDLME with two splits) at 75 kg N ha^{-1} recorded significantly higher grain yield (18.36 q/ha), straw yield (34.88 q/ha) and harvest index (0.46) with higher growth and yield attributing characters like plant height (132.2 cm), number of leaves per plant (20.00) and number of tillers per hill (5.4), finger length (9.57 cm), 1000 grain weight (13.87 g) and panicle weight (12.22 g) and higher gross return gross return (Rs. 34233 ha^{-1}), net returns (Rs.24793 ha^{-1}) and benefit cost ratio (2.63) compared to application of FYM at 5 t ha^{-1} + BDLME(Two splits) at 25 kg N ha^{-1} recorded significantly lower grain yield (10.37 q ha^{-1}), straw yield (19.71 q ha^{-1}) and harvest index (0.41)due to growth and yield attributing characters like plant height (120.3 cm), number of leaves per plant (11.80) and number of tillers per hill (3.5), finger length (6.05 cm), 1000 grain weight (16.93 g) and panicle weight (6.64 g) and higher gross return gross return (Rs. 21694 ha^{-1}), net returns (Rs.12624 ha^{-1}) and benefit cost ratio (1.39)compared to all other treatment combinations.

Introduction

Finger millet (*Eleusine coracana*) also known as ragi or African millet ranks fourth in importance among millets in the world after sorghum (Sorghum bicolor), pearl millet (*Pennisetum glaucum*) and foxtail millet (*Setaria italica*). It is grown over 25 countries in Africa and Asia in about 4 m ha as primary food source for millions of people in tropical dryland regions because of its resilience and ability to withstand adverse weather conditions when grown in soils having poor water holding capacity (Anon., 2009). Finger millet is main dietary component in dryland region of southern Karnataka particularly in districts of Bangalore, Kolar, Chikkaballapur, Tumkur, Mysore, Chamrajanagar, Hassan, Mandya and Chitradurga (Anon., 2011).Application of farmyard manure to the crops is being practiced for long period. Well decomposed farm yard manure in addition to supplying plant nutrients act as binding material and improves the soil physical

properties of soil. Beneficial effect of cattle urine will act as support to increase the microbial populations. In recent years the potential of farmyard manure and cattle urine to supply nutrients and enhance beneficial microbes for faster decomposition is being recognized widely in field crops. Keeping this in view the prospects, of organic farming has gained popularity in recent years not only in India but also in Australia, Argentina, USA, UK, Germany, South Africa, China, Japan and other Asian countries like Srilanka and Pakistan etc. Globally, organic agriculture is practiced in over 24 million ha (Bhattacharya and Chakraborty, 2005). General acceptance of organic farming is not only due to greater demand for pollution free food but also due to natural advantage of organic farming in supporting the sustainability in agriculture.

Now, the agricultural research is focused on evolving ecologically sound, biologically sustainable and socio-economically viable technologies. There is need for a fresh look to exploit the organic farming approaches using the local manorial and bio-pesticide sources for growing organic crops. Organic farming minimizes environmental pollution and maintains sustainability of soil by maintaining high soil organic matter.

Materials and Methods

A field experiment was conducted at Agricultural and Horticultural Research Station, Bavikere, University of Agricultural and Horticultural Sciences, Shivamogga onnutrient management practices for organic cultivation of finger millet (*Eleusine coracana L.)* under southern transitional zone of Karnataka. The experiment was laid out in a randomized complete block design with different treatments like T_1: FYM at 5 t ha^{-1} + BDLME (Two splits) at 25 kg N ha$^{-1,}$ T_2: FYM at 5 t ha^{-1} + BDLME (Two splits) at 50 kg N ha$^{-1,}$ T_3: FYM at 5 t ha^{-1} + BDLME (Two splits) at 75 kg N ha$^{-1,}$ T_4: FYM at 7.5 t ha^{-1} + BDLME (Two splits) at 25 kg N ha$^{-1,}$ T_5: FYM at 7.5 t ha^{-1} + BDLME (Two splits) at 50 kg N ha$^{-1,}$ T_6: FYM at 7.5 t ha^{-1} + BDLME (Two splits) at 75 kg N ha$^{-1,}$ T_7: FYM at 10 t ha^{-1} + BDLME (Two splits) at 25 kg N ha$^{-1,}$ T_8: FYM at 10 t ha^{-1} + BDLME (Two splits) at 50 kg N ha$^{-1,}$ T_9: FYM at 10 t ha^{-1} + BDLME (Two splits) at 75 kg N ha^{-1} and T_{10}: Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1}). The soil of the experimental site was medium fertile, having sandy loam texture with slightly acidic reaction (pH 5.6), and low in nitrogen (245.96 kg ha^{-1}), medium in phosphorus (33.90 kg ha^{-1}) and medium in potassium (184.50 kg ha^{-1}). Soil of the experimental site was red sandy loam (*Alfisols*).

The experiment was laid out in Randomized Complete Block Design with three replications. Finger millet variety GPU-28 was used. Recommended dose of farmyard manure (10tons ha^{-1}) was applied three weeks prior to sowing and leveling was done in each plot manually. At the time of sowing, recommended fertilizer dose of 50 kg N, 40 kg P_2O_5 and 20 kg K_2O ha^{-1} was applied in the form of urea, single super phosphate and muriate of potash to the control plot.

Results and Discussion

Growth parameters

Among the different treatments, application of farmyard manure (FYM) at 10 t ha^{-1} + Biodigester Liquid Manure Equivalent (BDLME with two splits) at 75 kg N ha^{-1} recorded significantly higher plant height (132.2), number of leaves per plant (20.00) and number of tillers per hill (5.4) (Table 1) as compared to all the treatments and which was on par with control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1}) and FYM at 10 t ha^{-1} + BDLME (Two splits) at 50 kg N ha^{-1}.

This might be due to greater availability and steady release of nutrients from combined organic manures, which perhaps enabled the plant to grow tall and produce superior growth parameters. While most of the nutrients supplied through enriched bio-digester liquid manures are readily available for plant growth and development and also could have matched crop's demand for nutrients. Besides, they might have improved the soil aggregation, enhanced soil microbial activity and higher nutrient availability resulting in congenial soil condition. In the same line Govindappa (2003) reported that the high leaf area per plant was responsible for photosynthetic activity which in turn resulted in higher dry matter production.

Yield and yield components

Among the different treatments, application of FYM at 10 t ha^{-1} + BDLME (Two splits at 75 kg N ha^{-1} recorded significantly higher finger length (9.57cm), 1000 grain weight (13.87g) and panicle weight (12.22 g) (Table 2) as compared to all the treatments and which was on par with Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1}) and FYM at 10 t ha^{-1} + BDLME (Two splits) at 50 kg N ha^{-1}. Similar findings were reported by Suri *et al.*, (1997). The highest grain yield (18.36 q/ha), straw yield (34.88 q/ha) and harvest index (0.46) (Table 3) due to better translocation of photosynthates from source to sink and higher growth attributing characters like higher plant height, number of leaves and tiller production and its accumulation into different parts of plant and yield attributing characters like panicle length, test weight, panicle weight, no. of filled grains, number of unfilled grains per panicle. Significant difference in the grain yield of paddy obtained by more amounts of nutrients supplied through organics as evidenced by their nutrient content and more number of grains per panicle. These results are in accordance with those obtained by Veeresh (2010) and Ravikumar (2009).

This was evidenced through higher uptake of nutrients and microbial activity in soil. These findings are obtained with those of Deotale *et al.*, (2008), Jayaprakash *et al.*, (2003) and Chandrashekara *et al.*, (2000).

Table.1 Growth parameters as influenced nutrient management practices for organic cultivation of finger millet

Tr. No	Treatments	Plant height (cm)	Number of leaves	Number of tillers
T_1	FYM at 5 t ha^{-1} + BDLME at 25 kg N ha^{-1}	120.3	11.8	3.5
T_2	FYM at 5 t ha^{-1} + BDLME at 50kg N ha^{-1}	124.5	14.0	4.0
T_3	FYM at 5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	126.3	14.4	4.1
T_4	FYM at 7.5 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	122.7	13.1	3.9
T_5	FYM at 7.5 t ha^{-1} + BDLME at 50 kg N ha^{-1}	127.3	15.0	4.5
T_6	FYM at 7.5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	128.6	16.6	4.7
T_7	FYM at 10 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	121.5	12.3	3.6
T_8	FYM at 10 t ha^{-1} + BDLME at 50 kg N ha^{-1}	130.4	18.6	4.8
T_9	FYM at 10 t ha^{-1} + BDLME at 75 kg N ha^{-1}	132.2	20.0	5.4
T_{10}	Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1})	130.0	18.2	5.1
S.Em.±		1.42	0.82	0.19
C.D. at 5%		4.25	2.46	0.57

FYM :Farmyard manure BDLME: Biodigester Liquid Manure Equivalent with two splits

Table.2 Yield attributes influenced nutrient management practices for organic cultivation of finger millet

Tr. No	Treatments	Finger length (cm)	Test weight (g)	Finger weight (g)
T_1	FYM at 5 t ha^{-1} + BDLME at 25 kg N ha^{-1}	6.05	6.93	6.64
T_2	FYM at 5 t ha^{-1} + BDLME at 50kg N ha^{-1}	6.90	9.41	6.60
T_3	FYM at 5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	7.13	9.33	7.34
T_4	FYM at 7.5 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	6.67	9.10	7.89
T_5	FYM at 7.5 t ha^{-1} + BDLME at 50 kg N ha^{-1}	7.43	9.62	8.87
T_6	FYM at 7.5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	7.60	9.96	8.47
T_7	FYM at 10 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	6.34	8.71	7.31
T_8	FYM at 10 t ha^{-1} + BDLME at 50 kg N ha^{-1}	8.10	10.27	9.27
T_9	FYM at 10 t ha^{-1} + BDLME at 75 kg N ha^{-1}	9.57	13.87	12.22
T_{10}	Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1})	8.40	11.67	10.21
S.Em.±		0.14	0.47	0.58
C.D. at 5%		0.42	1.40	1.75

FYM :Farmyard manure BDLME: Biodigester Liquid Manure Equivalent with two splits

Table.3 Grain and straw yield as influenced nutrient management practices for organic cultivation of finger millet

Tr. No.	Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	H I
T_1	FYM at 5 t ha^{-1} + BDLME at 25 kg N ha^{-1}	10.37	19.71	0.41
T_2	FYM at 5 t ha^{-1} + BDLME at 50kg N ha^{-1}	10.79	20.49	0.43
T_3	FYM at 5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	12.33	23.43	0.43
T_4	FYM at 7.5 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	10.63	20.19	0.43
T_5	FYM at 7.5 t ha^{-1} + BDLME at 50 kg N ha^{-1}	13.01	24.72	0.44
T_6	FYM at 7.5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	14.55	27.64	0.43
T_7	FYM at 10 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	10.55	20.05	0.44
T_8	FYM at 10 t ha^{-1} + BDLME at 50 kg N ha^{-1}	16.21	30.80	0.44
T_9	FYM at 10 t ha^{-1} + BDLME at 75 kg N ha^{-1}	18.36	34.88	0.46
T_{10}	Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1})	17.02	32.34	0.43
S.Em.±		0.45	0.52	1.00
C.D. at 5%		1.35	1.54	2.97

FYM :Farmyard manure BDLME: Biodigester Liquid Manure Equivalent with two splits

Table.4 Economics of influenced nutrient management practices for organic cultivation of finger millet

Tr. No.	Treatments	COC (Rs. Ha^{-1})	Gross returns (Rs. Ha^{-1})	Net returns (Rs. Ha^{-1})	B:C ratio
T_1	FYM at 5 t ha^{-1} + BDLME at 25 kg N ha^{-1}	9070	21694	12624	1.39
T_2	FYM at 5 t ha^{-1} + BDLME at 50kg N ha^{-1}	9210	27605	18395	2.00
T_3	FYM at 5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	7950	25114	17164	2.20
T_4	FYM at 7.5 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	8794	25781	16987	1.95
T_5	FYM at 7.5 t ha^{-1} + BDLME at 50 kg N ha^{-1}	9347	29869	20522	2.24
T_6	FYM at 7.5 t ha^{-1} + BDLME at 75 kg N ha^{-1}	7617	24781	17164	2.27
T_7	FYM at 10 t ha^{-1} + BDLMEat 25 kg N ha^{-1}	9100	22404	13304	1.46
T_8	FYM at 10 t ha^{-1} + BDLME at 50 kg N ha^{-1}	9417	32442	23025	2.45
T_9	FYM at 10 t ha^{-1} + BDLME at 75 kg N ha^{-1}	9440	34233	24793	2.63
T_{10}	Control (FYM 7.5 t ha^{-1} + RDF: 50:40:25 kg NPK ha^{-1})	9330	33335	23691	2.54

FYM :Farmyard manure BDLME: Biodigester Liquid Manure Equivalent with two splits

Economics

Among the different treatment combination, application of FYM at 10 t ha^{-1} + BDLME (Two splits at 75 kg N ha^{-1} recorded significantly higher gross return (Rs. 34233 ha^{-1}), net returns (Rs.24793ha^{-1}) and benefit cost ratio (2.63) (Table 4) compared to farmyard manure + 100 % N equivalent farmyard manure due to utilization of on-farm nutrient sources effectively for better productivity and could be very well substituted under proper management and panicle length, test weight, panicle weight, no. of filled grains, number of unfilled grains per panicle compared with remaining treatments. The findings are in conformity with Raj Kamal Singh Mann (2006) and Ananda *et al.*, (2004). Reddy and Shivanna (2010) obtained higher B C ratio of 1.66 in finger millet with the application of farmyard manure 10 t ha-1 + bio-digester liquid manure equivalent to 60 kg N ha^{-1}.

Application of FYM at 10 t ha^{-1} + BDLME (Two splits at 75 kg N ha^{-1} recorded higher growth and yield attributing parameters and yield due to slow release of nutrients thought the growing period of crop and also improved the soil physical, chemical and mineralogical properties of soil intern increase the fertility status of soil

References

Ananda, M. G., Reddy, V.C. and Kalyana Murthy, K. N., 2004, Effect of different nutrient sources on growth and yield of groundnut. *Environ. Ecology*, 22(4): 631-635.

Anonymous, 2009, *Results of front line demonstrations (2000-2007) and technologies for increasing small millet production in India*, Project coordinating unit (small millets), ICAR, Bangalore.

Anonymous, 2011, Fully revised estimates of principal crops in Karnataka for the year 2009-10. Directorate of Economics and Statistics Bangalore. Government of Karnataka.

Bhattacharya, P. and Chakraborty, G., 2005, Current status of organic farming in

India and other countries.*Indian J. Fertilizer*, 1(9): 111-123.

Chandrashekara, C. P., Harlapur, S. I., Muralikrishna, S. and Girijesh, G. K., 2000, Response of paddy to organic manure with inorganic fertilizers. *Karnataka J. Agric. Sci.*, 13: 144-146.

Deotale, R.D., Shraddha R. Lende, Kamble, P. S., Sapana B. Baviskar and Ommala D. Kuchanwar, 2008, Effectivity of foliar sprays of vermiwash and cow dung wash on morpho-physiological parameters of soybean. *J. Soil Crop*, 18(1): 169-175.

Govindappa, M., 2003, Efficacy of different organic manures and inorganic fertilizer on growth and yield of rainfed finger millet (*Eleusine coracana*), M.Sc.(Agri.) Thesis, Univ. Agric. Sci., Banagalore.

Jayaprakash, T. C, Nagalikar, V.P., Pujari, B. T. and Setty, R. A., 2003, Effect of organics and inorganics on yield and yield attributes of paddy under irrigation. *Karnataka J. Agric. Sci.*, 16: 451-453.

Raj Kamal Singh Mann, Y.B. and Malligawad, L.H., 2006, Effect of planting patterns and row application of organics on kharif Groundnut. *Karnataka J.Agric.Sci.*,19(3): 517-522.

Ravikumar, H. S., 2009, Effect of farmyard manure and bio digested liquid manure on growth and yield of groundnut under rainfed condition. *M. Sc. (Agri.) Thesis, Univ.Agric.Sci.*,Bangalore.

Reddy. V. C. and Shivanna, H., 2010, Bio-digester a boon to organic farming (Vernacular language). Univ. Agric. Sci., Bangalore.

Suri, V. K., Jha, S. and Verma, T. S., 1997, Efficient and economic fertilization of rainfed maize for its specific yield through soil testing and integrated nutrient management.*Crop Res*, 13: 59-67.

Vasantha Rao, U. V., Reddy Ramu, Y., Radha Kumari, C. and Raghava Reddy, C., 2004, Effect of organic and inorganic sources of nitrogen on growth, yield, nitrogen uptake and economics of lowland rice. *Madras Agric. J*, 91(7-12): 389-393.

Veeresh, 2010, developing cultivation practices for organic maize production in irrigated condition. *M. Sc. (Agri.) Thesis, Univ. Agric. Sci*, Bangalore.

How to cite this article:

Basavaraj Naik, T., A.H. Kumar Naik and Suresh Naik, K.P. 2017. Nutrient Management Practices for Organic Cultivation of Finger Millet (*Eleusine coracana* L.) Under Southern Transitional Zone of Karnataka, India. *Int.J.Curr.Microbiol.App.Sci.* 6(11): 3371-3376.
doi: https://doi.org/10.20546/ijcmas.2017.611.396