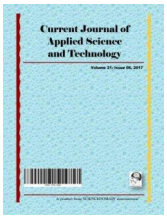

Current Journal of Applied Science and Technology

26(4): 1-6, 2018; Article no.CJAST.40696
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Organic Cultivation of Ridge Gourd (*Luffa acutangula* Roxb.)

Nishant Barik[1*], Deepa Borbora Phookan[1], Vikash Kumar[1], Thanuram Teron Millik[1] and Dhruba Jyoti Nath[2]

[1]Department of Horticulture, Assam Agricultural University, Jorhat-785013, India.
[2]Department of Soil Science, Assam Agricultural University, Jorhat-785013, India.

Authors' contributions

This work was carried out in collaboration between all authors. Author NB designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors DBP and DJN managed the analyses of the study. Authors VK and TTM managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2018/40696
Editor(s):
(1) Teresa De Pilli, Assistant Professor, Department of Science of Agriculture of Food of Environment (SAFE), University of Foggia, Via Napoli, Italy.
Reviewers:
(1) Joseph A. Orluchukwu, University of Port Harcourt, Nigeria.
(2) Aydın Adiloglu, Namık Kemal University, Turkey.
(3) Yeşim Toğay, Fethiye ASMK Vocational High School, Mugla S. K. University, Turkey.
Complete Peer review History: http://www.sciencedomain.org/review-history/23877

Original Research Article

Received 11th January 2018
Accepted 24th March 2018
Published 30th March 2018

ABSTRACT

An investigation was carried out during Kharif 2016 to study the performance of ridge gourd as influenced by organic inputs at Experimental farm, Department of Horticulture, Assam Agricultural University, Jorhat. The experiment was laid out in Randomized Block Design (RBD) with three replications comprising seven treatments. Different organic manures such as compost, vermicompost and enriched compost were applied in two different doses i.e.2.5 t ha^{-1} & 5 t ha^{-1} along with rock phosphate and biofertilizer consortium. One of the treatments consisted of the recommended dose of fertilizers (RDF) which is conventional treatment. Growth and yield attributing characters such as the highest number of fruits per vine (19.92), yield (1.95 kg $vine^{-1}$), fruit length (19.79 cm), average fruit weight (97.86 g), vine length (6.02 m) were recorded in conventional treatment (T_1). Whereas the highest fruit girth (12.78 cm) was recorded in rock phosphate + biofertilizer consortium + vermicompost at the rate of (@) 5 t ha^{-1} (T_5). The least days for male flower appearance (35.50 days) was found in rock phosphate + biofertilizer consortium + compost

**Corresponding author: E-mail: nishant.happy93@gmail.com;*

@ 5 t ha^{-1} (T_3) and for female flower appearance (37.28 days) was in enriched compost @ 5 t ha^{-1} (T_7).Treatments consisted of the organic source of nutrients recorded better performance in quality parameters as compare to the conventional treatment. The highest ash content (7.62 %), total sugar (5.43 %), reducing sugar (4.02 %) were recorded in enriched compost @ 5 t ha^{-1} (T_7) while the highest ascorbic acid content (4.51 mg $100g^{-1}$) was found in enriched compost @ 2.5 t ha^{-1} (T_6). Regarding soil parameters the highest organic carbon (1.48 %), available P (68.91 kg ha^{-1}), available K (132.41 kg ha^{-1}) were found in enriched compost @ 5 t ha^{-1} (T_7). The highest available N was recorded in rock phosphate + biofertilizer consortium + vermicompost @ 5 t ha^{-1}(T_5). Keeping all in view T_5 (rock phosphate + biofertilizer consortium + vermicompost @ 5 t ha^{-1}) can be recommended as eco-friendly and adopted in field condition to reap good sustainable yield.

Keywords: Biofertilizer consortium; enriched compost; vermicompost; compost; quality; soil health.

1. INTRODUCTION

Among cucurbitaceous vegetable crops, ridge gourd is an important vegetable. It is quite rich in vitamins and minerals. A few of the health advantages are an excellent blood purifier, possessing laxative properties, a cure for jaundice, beneficial for diabetes, aiding weight loss, anti-inflammatory and anti-biotic, fortifying the immune system, Skincare, good for the stomach. The modern day intensive crop cultivation requires the use of chemical fertilizers. Use of inorganic fertilizers not only increases the cost of production but also adds to overall soil fertility related environmental pollution. The decline of soil organic matter reserve may affect the soil microbial activity, biological degradation due to the loss of specific soil organic matter fraction is spreading gradually and reduces the microbial diversity and activity in soil and the growing crop plants are exclude from beneficial effect of micro-organisms [1]. Use of organic manures and biofertilizers can provide quality produce for human consumption by way of reduction of the chemical residues. As a strategy for growing food and managing Earth, organic principles and practices are very important, maybe even critical, to our survival. Starting with the biggest picture, the Principles of Organic Agriculture are Health, Ecology, Fairness and Care. These come from the International Federation of Organic Agriculture Movements (IFOAM) which represents grassroots organic organization from all over the planet. Maintenance of soil health is an essential pre-requisite for sustaining agricultural productivity. Biofertilizers exert a beneficial effect on plant growth and crop production systems [2]. Tyagi et al. [3] emphasized the application of biofertilizers to reduce chemical fertilizer consumption by 20 to 50%, with simultaneous increase crop yield by 10 to 20%. The efficiency of biofertilizer consortium is much higher under no chemical use situations, therefore the application of such inputs need to be ensured under all cropping situations [4]. Keeping these in view the present investigation was carried out to check the performance of organic inputs on growth, yield, quality and soil health under ridge gourd cultivation.

2. METHODOLOGY

2.1 Study Area

The present investigation was carried out at Experimental farm, Department of Horticulture, Assam Agricultural University, Jorhat, 785013 during Kharif 2016. The experimental area was located at 26º45'N latitude and 92º12'E longitude at an elevation of 87m above mean sea level and under Upper Brahmaputra Valley Agro Climatic Zone of Assam, India. The plot selected had a good drainage system. Physical properties of soil of experimental site are presented in Table 1.

Table 1. Physical properties of soil

Particulars	Values	Textural class
Coarse sand (%)	10.75	Sandy loam
Fine sand (%)	53.15	
Silt (%)	17.13	
Clay (%)	18.30	

2.2 Treatments and Design

The experiment was laid out in Randomized Block Design (RBD) with three replications comprising seven treatments (Table 2). The variety of ridge gourd was an open pollinated variety. There were twenty-one plots each having six numbers of plants with a spacing of 1.2 m × 1 m. Individual plot size was 7.2 m^2 and the total area of the experimental site was 350 m^2.

Table 2. Treatment details

T_1	RDF* (20:30:30 kg ha^{-1} NPK + FYM @10t ha^{-1})
T_2	rock phosphate + biofertilizer consortium** + compost @ 2.5 t ha^{-1}
T_3	rock phosphate + biofertilizer consortium + compost @ 5 t ha^{-1}
T_4	rock phosphate + biofertilizer consortium + vermicompost @ 2.5 t ha^{-1}
T_5	rock phosphate + biofertilizr consortium + vermicompost @ 5 t ha^{-1}
T_6	enriched compost @ 2.5t ha^{-1}
T_7	enriched compost @ 5t ha^{-1}

**RDF= Recommended Dose of Fertilizer; **biofertilizer consortium= Groups of biofertilizers (PSB, Azotobacter, Azospirillum and Rhizobium) in 1:1:1:1 ratio.*

2.3 Data Collection

The seeds prior to sowing were soaked with water along with biofertilizer consortium for overnight. Seeds were sown in basins made in each plot. Rock phosphate was applied as per the dose of single super phosphate (SSP) fertilizer and biofertilizer consortium was mixed with soil @ 3.5 kg ha^{-1}. Irrigation was practised in every 3-4 days. All plant protection measures were carried out by organic means *viz.* hand picking of insects, spraying of neem-based products. The plants were grown and fruits were harvested at proper maturity stage. Different plant growth parameters were recorded.*viz.* fruit per vine, fruit length, average fruit weight, yield per vine, fruit girth, vine length, days to first male flower, days to first female flower. In quality parameters ash content (%), ascorbic acid (mg 100g^{-1}) were calculated by the method outlined by Ranganna [5] and total sugar (%), reducing sugar (%) were calculated by using the standard method of A.O.A.C. [6]. Regarding soil parameters organic carbon, available nitrogen, available phosphorus, available potassium of before and after crop grown was calculated by following Wet Digestion Method [7] Modified Kjeldahl method [7] Bray's Method [7] Flame Photometric Method [8] respectively.

2.4 Data Analysis

All results were statistically analyzed using method advocated by Panse and Sukhatme [9]. When ANOVA showed significant differences, mean separation was carried out using critical difference (C.D) test at 5% level of significance to draw the valid conclusion.

3. RESULTS AND DISCUSSION

3.1 Plant Growth, Yield and yield Attributing Parameters

In this present investigation, the results for growth parameters were prescribed in Table 3 from which it was found that RDF (T_1) was superior to other treatments on most of the characters. The highest vine length (6.02 m), number of fruits per vine (19.92), fruit length (19.79 cm), fruit weight (97.86 g) and yield per vine (1.95 kg) were recorded in T_1. This could be due to readily available of nutrients through chemical fertilizers and their absorption and translocation by plants was more quickly, which resulted in higher photosynthetic activity than other treatments [10,11,12]. But the highest fruit girth of 12.78 cm was recorded in T_5. This result could be due to synergistic interaction between organic manures and biofertilizer consortium which helped in increasing fruit girth [10,13]. The minimum days for 1st male flower appearance (35.50 days) were observed in T_3, which was at par with all organic treatments except T_1. Similarly, the minimum days of 37.28 days for an appearance of the 1st female flower were recorded in enriched compost @ 5 t ha^{-1} (T_7) which were at par with T_5 and T_6. Such results might be due to the balanced supplement of nutrients through organic manures along with microbial action which might have led synthesis of flowering hormones in earlier days [10,11,14].

3.2 Quality Parameters

From Table 4 it was found that organic treatments showed better performance than inorganic treatment regarding quality parameters. The highest ash content (7.62%), total sugar (5.43%), reducing sugar (4.02%) was recorded in enriched compost @ 5 t ha^{-1} (T_7). The highest ascorbic acid (4.51 mg 100g^{-1}) was recorded in enriched compost @ 2.5 t ha^{-1} (T_6). This result could be due to the significantly higher amount of non-combustible substances present in organic treatments than inorganic treatment which led more ash content. Higher percent total sugar and reducing sugar might be due to a quick metabolic transformation of soluble compounds and more conversion of organic acid into sugar [15,16,17].

Table 3. Plant growth, yield and yield attributing parameters

Treatment	Vine length (m)	Days to 1st male flower appearance	Days to 1st female flower appearance	Fruit per vine	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Yield per vine (kg)
T_1	6.02	41.00	42.67	19.92	19.79	11.83	97.86	1.95
T_2	5.12	36.37	40.50	13.99	17.54	11.43	74.22	1.05
T_3	5.00	35.50	40.05	13.66	18.21	11.55	80.84	1.11
T_4	4.42	36.83	37.89	14.89	17.41	11.16	74.43	1.11
T_5	4.3	36.33	39.00	15.22	18.8	12.78	92.49	1.41
T_6	3.86	36.33	38.00	14.33	17.8	11.59	79.88	1.15
T_7	4.08	35.53	37.28	14.89	19.03	12.44	91.48	1.37
S.Ed	0.50	0.75	0.89	1.07	0.54	0.46	6.56	0.17
$C.D_{0.05}$	1.10	1.63	1.94	2.32	1.19	1.01	14.29	0.36

**S.Ed= Standard error of mean difference, **$C.D_{0.05}$= Critical difference at 5 % level of significance*

Table 4. Quality parameters

Treatment	Ash content (%)	Ascorbic acid ($mg100g^{-1}$)	Total sugar (%)	Reducing sugar (%)
T_1	6.33	3.08	4.98	3.75
T_2	6.33	3.28	5.22	3.72
T_3	6.91	3.49	5.21	3.68
T_4	6.46	3.90	5.25	3.79
T_5	7.35	3.90	5.33	3.99
T_6	7.20	4.51	5.36	3.74
T_7	7.62	4.31	5.43	4.02
S.Ed	0.36	0.42	0.10	0.06
$C.D_{0.05}$	0.78	0.92	0.21	0.14

Table 5. Soil parameters

Treatment	pH	Organic carbon (%)	Available N (kg ha^{-1})	Available P (kg ha^{-1})	Available K (kg ha^{-1})
T_1	5.57	1.15	255.23	47.02	117.14
T_2	5.34	1.22	265.09	36.47	110.59
T_3	5.46	1.38	264.68	44.61	112.78
T_4	5.43	1.29	255.48	55.56	121.50
T_5	5.52	1.44	280.99	52.77	130.23
T_6	5.63	1.33	259.24	64.91	125.87
T_7	5.64	1.48	273.04	68.91	132.41
S.Ed	0.09	0.03	3.22	8.78	4.44
$C.D_{0.05}$	0.19	0.06	7.01	19.13	9.68
Initial value before applying treatments	5.28	1.13	242.09	41.29	108.41

**Initial value is the value of respective soil parameter before crop grown.*

3.3 Soil Parameters

Table 5 showed that results of all soil parameters after application of organic inputs increased to a greater level from before. The treatments consisted of the organic source of nutrients showed comparatively healthier soil than RDF. The highest pH of 5.64 and organic carbon (OC) (1.48 %) was found in enriched compost @ 5 t ha^{-1} (T_7). The increase in pH might be due to deactivation of Al^{3+} and thereby release of basic cations by addition organic matter [18]. However, the highest OC might be due to relatively higher carbon content in organic manure compared to other organic treatments and conventional treatment. The highest available N of 280.99 kg ha^{-1} was recorded in T_5 which might be due to the ability of *Azospirillum* to fix atmospheric N in the rhizosphere throughout the cropping period [19]. In another experiment, it was illustrated that the *Azotobacter* alone could fix N equivalent to 25-30 kg ha^{-1} [18,20,21]. The highest available P (68.91 kg ha^{-1}) and available K (132.41 kg ha^{-1}) were recorded in T_7. This increase in available P might be due to the production of different organic acid by phosphate solubilising bacteria as well as during the decomposition of organic matters which helped in the availability of more phosphorus in soil [18,21]. A significant increase in available K content could be due to mineralization of insoluble silicate minerals through the action of organic acids released during the decomposition of organic manures or produced by biofertilizer microbes [21].

4. CONCLUSION

From this present investigation, we came to conclusion that though the inorganic source of nutrients have a greater role in plant growth and yield parameters. Thus, RDF influenced more vine length, bigger size fruit as well as more yield than other treatments. But the fruit qualities were better in treatments having an organic source of nutrients than inorganic treatment. Similarly available plant nutrients in soil were increased to a greater level in organic treatments. Moreover, soil health will be more sustainable for a longer period of time through the application of an organic source of nutrients. Therefore T_5 (rock phosphate + biofertilizer consortium + vermicompost @ 5 t ha^{-1}) can be recommended as eco-friendly as well as farmer's friendly treatment to reap good yield in field condition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Rao DL. Microbial diversity, soil health and sustainability. Journal-Indian Society of Soil Science. 2007;55(4):392.
2. Çakmakçı R, Kantar F, Sahin F. Effect of N2-fixing bacterial inoculations on yield of sugar beet and barley. Journal of Plant Nutrition and Soil Science. 2001;164(5):527-31.
3. Tyagi PK, Hooda MS, Singh R. Biofertilizer in integrated plant nutrition system. Indian Farmers Times. 1999;17(6):13.
4. Sateesh G, Sivasakthivelan P. Studies on the influence of bioinoculant consortium on chillies and its effects on soil health management. Int J Chem Tech Res. 2013;5:1326-8.

5. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. Tata McGraw-Hill Education; 1986.
6. Youden WJ, Steiner EH. Statistical manual of the association of official analytical chemists. Aoac International; 1975.
7. Walkley A. A critical examination of a rapid method for determining organic carbon in soils-Effect of variations in digestion conditions and of inorganic soil constituents. Soil Science. 1947;63(4):251-64.
8. Jackson ML. Soil chemical analysis. Practice Hall of Indian Pvt. Ltd. New Delhi; 1973.
9. Panse VG. Statistical methods for agricultural workers. Indian Council of Agricultural Research; New Delhi; 1954.
10. Mali MD. Effect of organic manures on yield and quality of cucumber (*Cucumis sativus* L.) cv. Himangi. M.Sc. (Agri.) Thesis submitted to MPKV, Rahuri; 2004.
11. Kameswari PL, Narayanamma M, Ahmed SR, Chaturvedi A. Influence of Integrated Nutrient Management in Ridge Gourd *(Luffa acutangula* (Roxb.) L.). Vegetable Science. 2010;37(2):203-4.
12. Bindiya Y. Studies on the effect of organic manures and biofertilizers on growth, yield, quality and post harvest shelf life of gherkin *(Cucumis anguria* L.*)*. Doctoral dissertation, Acharya N.G Ranga Agricultural University; 2011.
13. Nirmala R, Vadivel E. Effect of combined application of organic manure and biofertilizers on growth and productivity of cucumber. South Indian Horticulture. 1999; 47(1/6):252-4.
14. Renuka B, Sankar CR. Effect of organic manures on growth and yield of tomato. South Indian Horticulture. 2001;49:216-9.
15. Gawande SS, Jitonde DJ, Turkhede AB, Darange SO. Effect of organic and inorganic fertilizers on yield and quality of sapota. Journal of Soils and Crops. 1998;8(1):58-60.
16. Kumar J, Phookan DB, Barua S. Effect of organic manures and biofertilizers on yield and quality of cabbage (*Brassica oleracea* L. Var. Capitata) cv. golden acre. Trends in Biosciences. 2016;8(3):672-677.
17. Phookan DB, Barua S, Nath DJ. Effect of organic and inorganic sources of nutrients on yield and quality of tomato (var. Pusa Ruby). J. Eco-friendly Agric. 2016;11(1): 18-19.
18. Gogoi P. Performance of knolkhol (*Brassica oleracea* L. var*. gongilodes*) as influenced by organic inputs and microbial consortium. M.Sc. (Agri.) Thesis submitted to Assam Agricultural University, Jorhat; 2016.
19. Workneh F, Van Bruggen AH, Drinkwater LE, Shennan C. Variables associated with corky root and phytophthora root rot of tomatoes in organic and conventional farms. Phytopathology. 1993;83(5):581-9.
20. Bhattacharyya P, Jain RK, Paliwal MK. Biofertilizers for vegetables. Indian Horti-culture. 2000;45(2):12-3.
21. Biswas. Production of enriched compost. promising technologies. ICAR News. 2008;14(3).

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/23877