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Research Article

EFFECT OF DIFFERENT LEVEL OF VERMICOMPOST AND FYM ORGANIC MANURE ON QUALITY PARAMETERS OF CUCUMBER INTERCROPPED WITH CITRUS BASED AGROFORESTRY SYSTEM

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ABSTRACT

A field study was carried out at the experimental field of Forest Nursery and research centre, College of Forestry, SHUATS, Prayagraj, India during June to Sept 2017. The experiment was laid out in RBD with 9 treatments replicated thrice on different level Vermicompost and FYM Organic Manure. The results revealed that maximum TSS (4.10^0 Brix), Vitamin C (8.39mg/100g of fruit pulp) and acidity (0.90 per cent) as quality parameters, while the lowest response in term quality of cucumber was recorded with T_0 (control) which received 0 recommended dose of vermicompost and FYM fertilizers.

INTRODUCTION

Cucumber *(Cucumis sativus L.*) is one of the most popular and widely spread grown vegetables all over India. It belongs to the family Cucurbitaceae and is reported to have originated in India. It is one of the quickest maturing vine vegetable crops and it is the second most widely cultivated cucurbit after watermelon.

It is cultivated throughout the country in the area extending from high altitude to the plains and along the riverbeds (Munshi *et al.,* 2008). At present**,** it is cultivated globally in 19,03,926 hectare with an annual production of 5,75,59,836 tonnes. In India, it is cultivated in 45,000 hectares with a total production of 6,98,000 tonnes.

The immature fruits of cucumber are used as salad and for pickling. The fruit and seed possess cooling properties. The fruit is also used as an astringent and antipyretic. The seed oil is used as antipyretic. Fruit is good for people suffering from constipation, jaundice and indigestion.

In recent years, chemical fertilizers have played a significant role in providing nutrients for intensive crop production which heralded green revolution in the country. But increased use of chemical fertilizers in an unbalanced manner has created the problem of multiple nutrient deficiencies, diminishing soil fertility and unsustainable crop yields. As INM is the prescription for soil health, it is a viable strategy for advocating judicious and efficient use of chemical fertilizers with matching addition of organic manures and biofertilizers.

Organic manures constitute a dependable source of macro and micro nutrients and are helpful in improving physical, chemical and biological health of soil, reduces nutrient losses, increases nutrient availability and uptake leading to sustainable production devoid of harmful residues, besides improving quality of vegetables (Shinde, 1992).

Among the organic manures vermicompost is easily prepared and much effective manure. By feeding these earthworms with biomass and watching properly the food (bio-mass) of earthworm. The required quantities of vermicompost can be produce. Vermicompost contains two times more N, 2-3 times P_2O_5 and K_2O and also rich in Ca, Mg, Mo, Cu, Mn etc. Thus it plays a vital role in the improvement of soil fertility through its influence on available NPK, electrical conductivity, Organic

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carbon, pH, as well as serve fast proliferation of beneficial microbes which either helps in fixing nitrogen through biological processes or enhances the availability of phosphorus through socialization. Vermicompost consist of N 1.5- 2.0%, P 0.9-1.7% and K 1.5-2.5%.

Among the organic source, the old age concept of the nutrient application is the utilization of farm yard manure. Organically produced vegetables have good taste and quality and since, Cucumber is mostly consumed as salad, quality is an important factor.

Keeping this point of view the importance of the study the present study was undertaken aiming to reduce the usage of chemical fertilizers and to integrated organic and beneficial biological organisms in cucumber production system for the better income of the farmer. An experiment entitled "Effect of Different Level of Vermicompost and FYM Organic Manure on Quality parameters of Cucumber Intercropped with Citrus based Agroforestry System" was carried out.

MATERIALS AND METHODS

The present investigation was conducted from June to September 2017. The experiment was laid out in a Randomized Block Design with 9 treatments and 3 replications in Prayagraj agro climatic condition at the experimental field Forest Nursery and Research Centre, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The experimental site is located at a latitude of 20^0 and 15^0 North and longitude of 60^0 3" East and at an altitude of 98 meters above mean sea level (MSL). The altitude of this location is above 98 meter above sea level. The site selected for the experiment was uniform and well leveled. In order to study the physical and chemical properties of the soil, a composite soil sample was taken from 0-30 cm depth by adopting appropriate soil sampling technique before sowing. The soil selected for the experiment was medium black with good texture and drainage (Table.2). The land was prepared in usual manner by ploughing, crushing and was brought to the fine tilth. The area of a Prayagraj District come under subtropical belt in the South Eastern part of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46^0 C-48^0C. The relative humidity ranges between 20 - 29 percent, with maximum annual rainfall of 100 cm from July to September, with a few showers during winter months (Table.1) (Patra *et al.,* 2016). The experiment was laid out in a randomized block design with 3 replication as described by Panse and Sukhatme (1985) on 10 June 2017. The sowing was done on a raised bed method with spacing of 60 cm and 1.5 m plant and row to row, respectively, each plot with 5 plants. Adopting the recommended cultivation practice for raising a healthy crop and use to trellis system for veins climbing. Land area inside the Citrus base Agroforestry System was thoroughly dug to a depth of 15 to 20 cm one month prior to planting. Weeds and stubbles were removed completely and brought the soil to a fine tilt. Two days later, farmyard manure is mixed in the soil. F1 hybrid Malviya (Sulabh seeds) were procured from the local market for the research work. The pit was made 60 cm × 180 cm a part means the distance between plant × plant and row to row was 60 cm and 150 cm respectively two seed were sown in each pit 5cm part with 1.5 to 2cm depth.

Table 1 Meteorological data recorded during experimental period (June – September 2017).

Weeks	Temperature °C		Rainfall (mm)	Relative Humidity (%)	
	Maximum	Minimum		Maximum	Minimum
June 2017					
1st week	44.43	24.74	1.29	50.71	27.14
2nd week	40.46	29.63	NILL	59.86	32
3rd week	40.91	30.6	NILL	62.43	32.71
4th week	41.4	30.04	NILL	63.56	32.56
July 2017					
1st week	36.57	26.43	18.03	79.74	53.86
2nd week	30.71	26.06	25.54	89.57	71.57
3rd week	36.34	28.8	NILL	90.14	51
4th week	32	27.58	14	91.56	65.6
August 2017					
1st week	35.29	28.66	1.17	90	53
2nd week	34.8	29.03	6.31	90.86	53.29
3rd week	35.23	29.37	NILL	89.57	52.71
4th week	34.91	28.91	2.62	88.22	52.5
September 2017					
1st week	36.03	30	0.11	84.71	45.86
2nd week	36.83	30.34	NILL	83.29	44.86
3rd week	36.97	29.49	NILL	86.57	47.86
4th week	35.91	29.36	1.84	87.78	53.78

(Source: Agro-meteorological Observatory Unit, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj.

Table 2 Physical properties of soil experimental field

Ingredients	percentage	Method Employed
Sand	68.5%	Hydro
Silt	11.9%	-do-
Clay	19.6%	-do-
Textural class: Sandy Loans		

Chemical composition of soil of experimental field

Ingredients	Method Employed	Open	Shade
Organic carbon	Walkely and black (1934)	12%	17%
Nitrogen (N)	Alkaline permanganate method (Shubbiah and Asija 1956)	57 kg/ha	43kg/ha
phosphorus (P)	Olsen' calorimeter method (Jackson 1958)	11kg/ha	14.6kg/ha
potash (k)	Flame photometric method (Toth and Prince, 1949)	193kg/ha	245kg/ha
Soli pH	Digital pH meter	8.1	7.6
Ec (dSm-1)	Digital conductivity meter	0.16	0.17

Thinning of seedling was done within a period of three weeks and single healthy plants were maintained at each pit in furrow. The cultural practice such as irrigation weeding and plant protection measure was carried out uniformly as and when required. All the recommended package of practice at SHUATS, Prayagraj was followed during the crop growth period. The entire plot was kept weed free by hand weeding at regular interval. First weeding and hoeing were done 30 days after sowing and later on as when required. The plots were irrigated uniformly at an interval of 5 days depending upon the soil and climate condition so as to maintain adequate moisture in the root zone. Soil was treated by Manckozeb @ 0.70% before sowing to control diseases and insect-pest. Viral diseases observed and control by spray of virokill @ 2ml per 3lit. At 4-5 days interval. Virus infected plants were also uprooted. Insect pest observed were, thrips, mites and aphids, severally infested plant were uprooted and sprayed with Calibre

@29ml per lit. and Coragan @0.2% at 4-5 interval respectively. Cucumber was ready to get harvested in 50-60 DAS. The green matured fruit was harvested as and when they attained length of more than 6 inches. The fruits were harvested from all the five tagged plant earlier for recording the yield parameters. In the field experiment detail study of entire population was very difficult, for convenience, plants were selected randomly in each plot/per replications (5 plants) and they were tagged for identification and further investigation for the following parameters viz: Total soluble solids were determined within the help of Erma hand refract meter (0.32 range), averaged and analyzed. Acidity content of juice extracted from fruits determined by titrating 10 ml of juice against N/ 10 NaOH using phenolphthalein as an in term of anhydrous citric acids per 100 ml of cucumber juice. Ascorbic acid (mg/ 100g) of fruit juice was filtered through muslin cloth 10 ml (W) of the juice was taken with the help of a pipette in 100 ml volumetric flask and the volume (V_1) was made up with 1.0% oxalic acid solution. The flask was then shaken well. The juice was then filtered known quantity (V_2) of the solution was titrated against standard dye (V) solution till a faint pink colour appeared and persisted for 15 second. The amount of ascorbic acid was calculated by the formula (A.O.A.C., 1970).

RESULTS AND DISCUSSION

Total soluble solid (^{0}Brix)

The effect of different level combination of Vermicompost and FYM on total soluble solid (^{0}Brix) presented in table.3, the effect of different level of Vermicompost and FYM shows the significant result at total soluble solid (^{0}Brix). Among all the treatments, the maximum total soluble solid (4.10^{0}Brix) was recorded with treatment T_8 Vermicompost @ 2t/ha + FYM@ 15t/ha followed by T_7 Vermicompost@ 2t/ha + FYM @ 10t/ha and T_4 Vermicompost @ 1t/ha + FYM@ 10t/ha which was (3.90^{0}Brix) and (3.81^{0}Brix).

Table 3 Effect of different level of Vermicompost and FYM organic fertilizers on Quality parameter of Cucumber Intercropped with Citrus based Agroforestry System

Treatments No.	Treatments Combination	TSS(^{0}Brix)	Vitamin C	Acidity (%)
T_0	Vermicompost@ 0t/ha + FYM@ 0t/ha	3.25	5.16	1.45
T_1	Vermicompost@ 0t/ha + FYM@ 10/ha	3.31	5.67	1.39
T_2	Vermicompost@ 0t/ha + FYM@ 15t/ha	3.48	6.21	1.33
T_3	Vermicompost@ 1t/ha + FYM@ 0t/ha	3.60	6.93	1.17
T_4	Vermicompost@ 1t/ha + FYM@ 10t/ha	3.81	7.66	0.98
T_5	Vermicompost@ 1t/ha + FYM@ 15t/ha	3.40	6.50	1.26
T_6	Vermicompost@ 2t/ha + FYM@ 0t/ha	3.53	7.01	1.03
T_7	Vermicompost@ 2t/ha + FYM@ 10/ha	3.90	7.85	0.93
T_8	Vermicompost@ 2t/ha + FYM@ 15t/ha	4.10	8.39	0.90
	F-test	S	S	S
	C.D. at 0.5%	0.49	0.95	0.17
	S.Ed(±)	0.23	0.45	0.08

As compare to all others treatments in present investigation, treatment T_0 (control) found lowest in total soluble solid (^{0}Brix) which was (3.25^{0}Brix), which shows that inadequate supply of nutrients in the form of organic manure, deteriorates the quality of fruit, lower the amount of TSS and increase the acidity and bitterness in the cucumber fruit. Similar finding was reported by Eifediyi and Remison, (2010) in cucumber. Reddy, (2000) reported that the application of vermicompost 30 t / ha^{-1} along with 200 kg N ha^{-1} recorded higher bulb yield of 43.27 t /ha^{-1}. The quality parameters such as TSS, reducing sugars and total sugars significantly increased with increased in vermicompost level from 0 – 30 t / ha^{-1} in onion.

Vitamin 'C' (mg/100g)

The effect of different level of Vermicompost and FYM on Vitamin 'C' (mg/100g) presented in table.3, the effect of the combination of Vermicompost and FYM organic manure shows the significant result at Vitamin'C' (mg/100g). The Maximum Vitamin 'C' (8.39 mg/100g) was recorded with treatment T_8 Vermicompost@ 2t/ha + FYM@ 15t/ha followed by T_7 Vermicompost@ 2t/ha + FYM@ 10t/ha and T_4 Vermicompost@ 1t/ha + FYM@ 10t/ha which was (7.85 mg/100g) and (7.66 mg/100g) respectively. As a comparison to this the lowest Vitamin 'C' content was recorded with T_0 (control), which was (5.16 mg/100g). Similar result has also been reported by Kumar *et al.,* (2015).

It is an important market vegetable rich in minerals and vitamin and constituent of medicines values. It contains 0.6 g protein, 2.6 g carbohydrates, 12 cal energy, 18 mg Ca, 0.2 mg Fe, 0.02 mg thiamine, 0.02 mg riboflavin, 0.01 mg niacin, and 10 mg Vitamin C/100g of edible portion. The results are in closely related as reported by Kumar *et al*., (2015).

Acidity (%)

The effect of different level of Vermicompost and FYM organic manure on the acidity of fruit (%) presented in table .3, the effect of Vermicompost and FYM organic manure show the significant result at acidity of fruit (%). The minimum acidity of fruit (0.90%) was recorded with treatment T_8 Vermicompost@ 2t/ha + FYM@ 15t/ha followed by T_7 Vermicompost@ 2t/ha + FYM@ 10t/ha and T_4 Vermicompost@ 1t/ha + FYM@ 10t/ha which was (0.93%) and (0.98%) respectively. As comparison to this the maximum acidity was recorded with T_0 (control), which was (1.45%). As compared to all others treatments in the present investigation, treatment T_0 (control) found lowest. Similar results were also reported by Anjaiah, (2002) by application of P in combination with FYM recorded significant increase in carotene, TSS and sugar content of carrot with increasing levels of K and FYM.

CONCLUSION

On the basis of above finding, cultivation of Cucumber in Citrus base Agroforestry system, it was concluded that the treatment T_8 (Vermicompost@ 2t/ha + FYM@ 15t/ha) was recorded the best among in all treatment combination of organic fertilizers in term of it increases the T.S.S vitamin C and acidity (%). It was revealed that for better cucumber productions the T_8 treatment was the best treatment combinations.

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