EnvironmentAsia
The international journal by the Thai Society of Higher Education Institutes on Environment

EnvironmentAsia 13 (Special issue) (2020) 81-86
DOI 10.14456/ea.2020.25
ISSN 1906-1714; ONLINE ISSN: 2586-8861

Yield and Postharvest Qualities of Two Genotypes of Eggplant (*Solanum melongena* L.) Applied With Different Levels of Chicken Dung

Rosario A. Salas[1*], Reyda Mae R. Godoy[1], Felix M. Salas[2],
Neal Menzies[3], Stephen Harper[4], and Victor B. Asio[5]
[1]*Department of Horticulture, College of Agriculture & Food Science, Visayas State University, Baybay City, Leyte;*
[2]*Department of Pure & Applied Chemistry, College of Arts and Sciences, Visayas State University, Baybay City, Leyte*
[3]*University of Queensland, Australia;*
[4]*Queensland Department of Agriculture and Forestry, Australia;*
[5]*Department of Soil Science, College of Agriculture & Food Science, Baybay City, Leyte, Philippines*

Corresponding Author: rasalas_horti@yahoo.com or rosario.salas@vsu.edu.ph

Abstract

This study was conducted to evaluate the effects of the different levels of chicken dung on the yield, and postharvest qualities of two genotypes of eggplant. The pot experiment was laid-out in a split plot randomized complete block design with chicken dung levels as the main plot and eggplant genotypes (Casino &Morena) as subplot. The levels of chicken dung were divided as T1 (zero), T2 (200 g/plant), T3 (400 g/plant), T4 (600 g/plant), T5 (800 g/plant), T6 (1.0 kg/ plant, and T7 (2.0 kg/ plant). Casino genotype produced higher yield than Morena genotype under Visca agro-climatic condition. The application of 400 grams of chicken dung per plant (T3) showed the highest yield in both genotypes which were significantly different from the control (T1), T2, T6, and T7. This simply means that a cost-effective application of chicken dung at 5 tons per hectare is worth recommending for optimum eggplant production. Casino has a higher oxidation-reduction potential and ascorbic acid values but with lower electrical conductivity than Morena hybrid. This means that Morena contains higher amount of electrolytes with better storability for a longer period of time but with lesser vitamin C content than the Casino genotypes. Ascorbic acid content and electrical conductivity were enhanced by the application of chicken dung which declined beyond 800 grams per plant or at an application of 10 tons per hectare particularly with Casino hybrid for ascorbic acid and Morena hybrid for electrical conductivity. All these results would indicate the importance of organic fertilizer application to attain highest yield with best postharvest qualities of eggplant.

Keywords: Chicken dung, Eggplant genotypes, Postharvest quality

1. Introduction

Eggplant, scientifically known as *Solanummelongena L.*, is one of the most popular fruit vegetables in the Philippines. In fact, several researches have been exerted to improve the productivity of this vegetable crop. One of the improvement strategies is to look at the nutritional requirement of the crop that can play a major role for its optimum yield and quality (Masarirambi*et al.*, 2012; Salas *et al.*, 2015). Nitrogen is an essential element required for vegetative, reproductive and postharvest quality of the vegetable. Continuous cropping promotes declining soil fertility due to crop removal (Suge *et al.*, 2011). Optimum yield can never be attained unless fertility of the soil is maintained or improved. It is but necessary to add fertilizer inputs in order to have good and continuous crop yield for home consumption and for market. Such inputs can either be inorganic or organic form depending on the desire and advocacy of the farmer. With organic type of agricultural production system, nitrogen can be derived from animal manures and other agricultural wastes. An example is the utilization of chicken dung as a possible source of organic fertilizer which can be incorporated and ameliorated in the soil.

The use of chicken dung as an organic fertilizer input should be properly evaluated. Several recommendations have been published but no single recommendation for eggplant production with chicken dung in a clay type of soil under Visca agro-climatic condition has been standardized. In addition, organic fertilization provides nutritional requirement of the plant without undesirable impact on its immediate environment. Moreover, some studies have indicated the complexion of aluminum and other heavy metals with organic matter (Salas *et al.*, 1999) that may result in greater availability of phosphorus (Nierves& Salas, 2015) and reduction of aluminum toxicity (Dauda*et al.*, 2008). Addition of different sources of organic manures improves growth characteristics, number of shoots per plant, fresh weights, and dry weights of vegetables (Ouda&Mahadeen, 2008). This study was conducted to evaluate the effect of the different levels of chicken dung on the growth, yield, and postharvest qualities of two genotypes of eggplant, and determine the rate of chicken dung application for eggplant production under Visca agro-climatic condition.

2. Materials and Methods

2.1 Site description

The experiment was conducted at the Farmville Experimental Station situated at the Visayas State University, Visca, Baybay City, Leyte. It is located to the north of the City of Baybay with coordinates of 10o44'48"N 124o48'27"E. The rainfall is evenly distributed all throughout the year without a distinct dry and wet seasons. The texture of the soil is 14% silt, 41 % clay, and 45 % sand with a pH of 6.29.

2.2 Chemical analysis of chicken dung

The chicken dung as received contained 10% moisture. After drying the chicken manure, the result revealed that it contained 3.244 % N, 8.255 % P,4.19 % K, 2.161 % Ca, 687.5 ppm Mg, 6020 ppm Fe, 875 ppm Mn, 320 ppm Cu, and 273.3 ppm Zn.

2.3 Experimental Set-up

The experiment was laid out in a split plot randomized complete block design with the levels of chicken dung as the main plot and the eggplant genotype as the subplot. It is composed of seven treatment with four replications. Each replication comprised of four pots per treatment per genotype. Fourteen kilograms of soil samples were placed in 22.86 cm x 22.86 cm x 40.64 cm polyethylene plastic bag. Each plastic bag was mixed with chicken dung according to the following treatments: T1 = no chicken dung, T2 = 200 g chicken dung per pot, T3 = 400 g chicken dung per pot, T4 = 600 g chicken dung per pot, T5 = 800 g chicken dung per pot, T6 = 1.0 kg chicken dung per pot, and T7 = 1.6 kg chicken dung per pot. The gross experimental area was 7 m x 40 m (280 m2) and the net experimental area was 5 m x 40 m (200 m2). Plant spacing was 1 m between rows and 0.75 m between hills. Only three-fourth of the volume of the plastic pot was filled with the media composed of soil and chicken dung. Thirty-day old eggplant seedlings were transplanted individually in each pot.

2.4 Data Collection

The following horticultural, yield, and postharvest qualities were gathered: Number of days from transplanting to flowering and first harvest, plant height at harvest, number and weight of marketable and non-marketable fruits, fruit weight, fruit size, total yield, vitamin C content, total soluble solids, titratable acidity, conductivity and oxidation-reduction potential.

3. Results and Discussion

3.1 Horticultural characteristics of eggplants applied with different levels of chicken dung

Table 1 shows the horticultural characteristics of two genotypes of eggplant as influenced by the different levels of chicken dung. Eggplant applied with 200 g chicken dung per plant flowered and harvested earlier, but comparable to the plants applied with 400 g and 600 g of chicken dung per plant. This means that at 200 g chicken dung per plant level, enough nutrients were already afforded for its flower and reproductive development. No significant difference was observed on plant height among the different treatments at flowering, but significant differences were observed at last harvest. The application of 600 - 1,600 g chicken dung per plant still contributed increase in height up to the last harvest due to the relative abundance of nitrogen and other nutrient elements essential for plant growth. No significant difference, however, on the number of days from transplanting to flowering and first harvest between the two genotypes of eggplant.Morena eggplants were generally taller than Casino even up to the last harvest.

3.2 Yield and yield components of eggplant applied with different levels of chicken dung

Table 2 shows the yield and yield components of two genotypes of eggplant as influenced by the different levels of chicken dung. Eggplants applied with 400 – 800 g chicken dung per plant produced more number of and heavier fruits which consequently gave the highest total yield. As Treatment means with the same letter are not significantly different at 5 % level based on Tukey's HSD. the plants undergo the reproductive stage, more nutrients are required for the desired number and biomass of the fruits. This is clearly evident by the smallest number and slight weight of fruits of eggplant without chicken dung application.

Table 1. Horticultural characteristics of two genotypes of eggplant applied with different levels of chicken dung

Treatments	Days from transplanting to		Plant Height (cm)	
	Flowering	First Harvest	Flowering	Last Harvest
Levels of Chicken dung				
T1 = control	42.94 a	63.88 a	19.09	67.56 d
T2 = 200 g CD per plant	31.69 c	47.03 d	18.89	98.50 c
T3 = 400 g CD per plant	32.28 bc	47.69 cd	19.13	118.45 b
T4 = 600 g CD per plant	33.56 bc	49.94 cd	18.45	128.66 ab
T5 = 800 g CD per plant	35.09 b	51.53 c	18.85	135.31 a
T6 = 1.0 kg CD per plant	41.53 a	58.12 b	18.66	134.22 a
T7 = 1.6 kg CD per plant	42.06 a	58.44 b	18.14	129.07 ab
C.V. (%)	5.11	4.36	6.86	5.84
Genotypes				
Casino	36.95	53.38	17.89 b	110.47 b
Morena	37.1	54.23	19.60 a	121.47 a
C.V. (%)	7.18	5.29	8.09	6.72

Treatment means with the same letter are not significantly different at 5 % level based on Tukey's HSD.

Table 2. Yield and yield components of two genotypes of eggplant applied with different levels of

Treatments	Number of marketable fruits per plant	Weight of marketable fruits per plant (kg)	Polar length of fruit (cm)	Yield (tons/ha)
Levels of Chicken dung				
T1 = control	1.25 d	0.06 c	15.87 b	0.98 c
T2 = 200 g CD per plant	12.22 bc	0.98 b	19.20 a	14.93 b
T3 = 400 g CD per plant	16.53 a	1.46 a	21.22 a	20.58 a
T4 = 600 g CD per plant	14.62 a	1.29 a	21.08 a	19.32 a
T5 = 800 g CD per plant	14.41 ab	1.29 a	20.38 a	18.83 a
T6 = 1.0 kg CD per plant	10.28 c	0.93 b	20.12 a	14.70 b
T7 = 1.6 kg CD per plant	10.75 c	0.97 b	21.16 a	15.25 b
C.V. (%)	12.47	10.54	9.17	11.39
Genotypes				
Casino	11.93 a	1.02	19.82	15.50 a
Morena	10.95 b	0.98	19.90	14.38 b
C.V. (%)	14.57	13.89	12.74	12.19

Treatment means with the same letter are not significantly different at 5 % level based on Tukey's HSD.

Table 3. Postharvest qualities of two genotypes of eggplant applied with different levels of chicken dung

	EC (µS)	ORP (mV)	pH	TA (N)	TSS (brix)	Vit. C (% Asc)
Levels of Chicken dung						
T1 = control	1727.5ab	-0.20b	5.17	0.0021	2.93	0.135ab
T2 = 200 g CD per plant	1802.5ab	0.35b	5.23	0.0021	2.65	0.155a
T3 = 400 g CD per plant	1798.5ab	0.90a	5.26	0.0021	2.40	0.160a
T4 = 600 g CD per plant	1838.0a	0.35b	5.28	0.0024	2.57	0.160a
T5 = 800 g CD per plant	1834.5a	0.40b	5.29	0.0026	2.80	0.135ab
T6 = 1.0 kg CD per plant	1629.0b	-0.15b	5.28	0.0022	2.65	0.105b
T7 = 1.6 kg CD per plant	1699.0ab	-1.25b	5.36	0.0016	2.78	0.105b
C.V. (%)	0.86	3.18	0.75	14.48	3.27	14.85
Genotypes						
Casino	1716.9b	-0.14b	5.21b	0.0029a	2.78a	0.141a
Morena	1805.7a	0.26a	5.32a	0.0014b	2.59b	0.131b
C.V. (%)	0.64	2.69	0.89	15.61	3.35	14.58

Treatment means with the same letter are not significantly different at 5 % level based on Tukey's HSD.

EC = electrical conductivity in microSiemens ORP = oxidation-reduction potential in millivolts

TA = titratable acidity in NormalityTSS = total soluble solids in parts per million

Vit. C = vitamin C in percent ascorbic acid

Higher levels of chicken dung per plant were tantamount to greater amount of nutrients that can be supplied for plant's needs and physiological activities. On the other hand, more number of fruits were significantly yielded by Casino than Morena. Although Casino fruits were lighter in weight and smaller in diameter, this genotype still yielded better than Morena as the total weight of fruits per plant was just comparable between the two genotypes.

3.3 Postharvest qualities of eggplant as influenced by the different levels of chicken dung

Table 3 shows the postharvest qualities of two genotypes of eggplant as influenced by the different levels of chicken dung. The total soluble solids, pH,titratable acidityof eggplant were not affected by the levels of chicken dung application. Casinohas a higher titratable acidity, total soluble solids and ascorbic acid values but with lower pH, oxidation-reduction potential and electrical conductivity than Morena hybrid. This means that Morena contains higher amount of electrolytes with inferior storability for a longer period of time. The higher pH observed in Morena fruits could be accounted by its lesser vitamin C content than the Casino genotype. Ascorbic acid content and electrical conductivity were influenced by the application of chicken dung which declined beyond 800 grams per plant or at an application of 10 tons per hectare.The mineral ions can be provided by the growing media and chicken dung. These ions are responsible for the electrical conductivity of the vegetable fruit. The lower pH of Casino fruit is supported by its higher titratable acidity and Vitamin C content. All these results would indicate the importance of organic fertilizer application to attain highest yield with best postharvest qualities of eggplant. The variation in postharvest qualities between the two genotypes would greatly influence on their utilization, processing, and preparations as food commodity.

4. Conclusions

From the result of the study, the following conclusions were drawn:

1.The application of 200 – 600 g chicken dung per plant flowered and harvested earlier regardless of eggplant genotypes;

2.The application of 400 – 800 g chicken dung per plant produced more number and heavier fruits with Casino exhibiting better yield;

3. Casino fruit is more acidic due to its higher titratable acidity and vitamin C content; while Morena exhibited higher electrolytic activity with slight storability; and

4. An application of 400 g chicken dung per plant is hereby recommended for eggplant production under Visca agro-climatic condition.

Recommendations

The following suggestions are recommended for future direction of this study:

1. The same study be conducted using other genotypes of eggplant under Visca agro-climatic condition;

2. The same genotypes of eggplant be grown at different levels of chicken dung under other agro-climatic conditions; and

3. Other sources of animal manure be tested on various fruit vegetables under different agro-climatic conditions.

Acknowledgement

The authors would like to acknowledge the support extended by the Australian government through the Australian Centre for International Agriculture Research (ACIAR) and the Visayas State University, Visca, Baybay City, Leyte, Philippines.

References

Dauda, S.N., F.A. Ajayi and E. Ndor. 2008. Growth and yield of water melon *(Citruluslunatus L.)* as affected by poultry manure application. J. Agric. Soc. Sci.,4:121-124.

Masarirambi, M.T., P. Dlamini, P.K Wahome and T.O. Oseni. 2012. Effects of Chicken Manure on Growth, Yield and Quality of Lettuce (*Lactuca sativa L.*) 'Taina' Under a Lath House in a Semi-Arid Sub-Tropical Environment. American-Eurasian J. Agric. & Environ. Sci., 12(3):399-406.

Nierves, M.C.P. and F.M. Salas. 2015. Assessment of Soil Phosphorus and Phosphorus Fixing Capacity of Three Vegetable Farms at Cabintan, Ormoc City, Leyte, Philippines. World Journal of Agricultural Research, 3(2):70-73

Ouda, B.A. and A.Y. Mahadeen. 2008. Effects of fertilizers on growth, yield, yield components, Quality and certain nutrient contents in Broccoli (*Brassica oleracea*

L.). Int. J.Agric. Biol.,10:627-632.

Salas, R.A., V.N. Pole, F.M. Salas and M.A. Quevedo. 2015. Shelf-life and Free Radical Scavenging Activity of Harvested Eggplant (*Solanummelongena L.*) Coated with Phytochemical Extracts. ActaHortic., 1088:251-254.

Salas, F.M., M. Chino, S. Goto, H. Masujima and K. Kumazawa. 1999. Plant Availability of Five Heavy Metals in Long Term Applied Andisolwith Sewage Sludges. Jour. Agri. Sci., 43(4):279-291.

Suge, J.K., M.E. Omunyin and E.N. Omami. 2011. Effect of organic and inorganic sources of fertilizer on growth, yield and fruit quality of eggplant (*Solanummelongena L.*). Archives of Applied Science Research, 3(6):470-479.