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**PERFORMANCE OF LADIES FINGER “OKRA” (*Hibiscus esculentus* L.) AS  
AFFECTED BY DIFFERENT FREQUENCY OF ORGANIC FERTILIZER  
APPLICATION**

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**ABSTRACT**

A number of organic vegetable farmers in Central Luzon, Philippines grow organic vegetables year round. However, most of these farmers usually apply the required amount of organic fertilizer only once during planting. Hence, nutrient requirement of vegetables during vegetative or reproductive stages are no longer available. This condition seriously affects the growth and development of vegetables and subsequently affecting the yield performance that may result to low yield. In order to reduce the potential effect of nutrient deficiency on organic vegetable production particularly ladies finger, the research aims to a) establish frequency of organic fertilizer application on ladies finger employing split application and b) determine the yield performance of ladies finger and net return based on the different treatments used. The research was conducted for two consecutive dry seasons (2014 and 2015) under full organic operation system. Results of the study showed that two split application of the recommended rate of organic fertilizer (T2) to ladies finger gave higher yield during the first and second trial (9.87 and 12.40t/ha, respectively) which is significantly higher by 11.40% and 14.76% from the yield obtained in plants applied with the recommended rate of organic fertilizer during planting (T1) and 14.76% and 3.22% higher to the yield obtained from the plants applied with the recommended rate of organic fertilizer split into three application (T3). Cost and return analysis showed that single application of organic fertilizer obtained the highest ROE of 33.45% and 49.45%, respectively during the first and second trial of the experiment. The result could be mainly attributed to the less labor incurred in T1 compared to the T2 and T3. In terms of yield, T2 Performed better compared to T1 and T3.

**Keywords:** Nutrient management, nutrient deficiency, nutrient requirement, split application, development stage.

**INTRODUCTION**

One of the challenges in agriculture is the development of sustainable production technologies

that can increase productivity but avoid environmental pollution and degradation. Due to this concern, appropriate solution than can reduce the potential effect of nutrient deficiency on organic vegetable production is deemed necessary to ensure crop productivity and sustainability particularly nutrient management aspect such as frequency of organic fertilizer application. Organic agriculture is developing rapidly, not only as a result of technological change but to combat the effect of global warming and climate change. Organic agriculture contributes to sustainable development, environmental protection and food safety (IFOAM, 2009). However, much has been said about the benefits of using organic fertilizer but still, much needs to be done particularly on research aspect to answer arising problem in the utilization of organic technologies.

A number of organic vegetable farmers in Central Luzon, Philippines grow organic vegetables year round in large quantity during dry season because of favorable dry and cool weather (Galindez, 2012). However, most of them usually apply the required amount of organic fertilizer only once during planting (Galindez, 2012). Hence, nutrient requirement of vegetables during vegetative or reproductive stages are no longer available. This condition seriously affects the growth and development of vegetables and subsequently affecting the yield performance that may result to low yield.

Ladies finger or known as okra (*Hibiscus esculentus* L.) is one of the most common vegetable grown by the farmers under organic system. The immature fruits can be eaten raw, boiled, blanched, or fried. It is also an indispensable component of a Filipino dish and a common ingredient in soups/sauces and a most popular and common vegetable in the market (<http://www.pcarrd.dost.gov.ph>). Okra is widely grown throughout the year because it is resistant to either drought or water logging. It is grown in area of 3,570 hectare with production of 29,716 metric tons all over the country (Bureau of Agricultural Statistics, 2010). Central Luzon has the highest production of okra in the country of about 10,851 mt or 14.6 yield/ha with an area of 743 hectares. Exportation of okra to Japan started in 2006 with an estimated export value of US\$ 7-8M at an average export price of US\$ 12-14/box of 4-6 kg net weight.

In order to reduce the potential effect of nutrient deficiency on organic vegetable production particularly Ladies finger “Okra”, the research aims to establish nutrient management for organic ladies finger “okra” production. Specifically, it aims to a) establish frequency of organic fertilizer application employing split application; and b) determine the yield performance and net return based on the different treatments used.

## **MATERIALS AND METHODS**

### **Location of the research**

The research was conducted for two consecutive dry seasons (2014 and 2015) under full organic operation system at the Ramon Magsaysay-Center for Agricultural Resources and Environment Studies (RM-CARES) experimental area, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines.

### **Treatments**

Three treatments evaluated were: T1= basal application of the recommended rate of organic fertilizer, 4.5 tons per hectare (t/ha); T2= two split application (at seed sowing and at 30 days after seed emergence) of the recommended rate of organic fertilizer, 4.5 tons per hectare (t/ha); and T3= three split application (at seed sowing, 30 DAT and 50 DAT) of the recommended rate of organic fertilizer, 4.5 tons per hectare (t/ha).

### **Test crop**

Ladies finger “Okra” (*Abelmoschus esculentus*) is the test crop. This crop was chosen because it was tested and found to be adapted under organic vegetable production system. Two week-old okra seedlings were transplanted in prepared plots with planting distance of 0.50 m between hills and 1 m between rows.

### **Experimental design**

Randomized Complete Block Design (RCBD) was used in the field lay-out. Ladies finger was planted in an area measuring 2.5 x 15 meters with three replications. The area was prepared prior to planting using small tractor to cultivate and obtain good soil tilth and to remove weeds. The required amount of organic fertilizer for each treatment was applied per hill before transplanting of seedlings for the test crop. The remaining amount of organic fertilizer was applied in accordance with the scheduled time based on the different treatment (30 days after transplanting (DAT) and 50 days after transplanting (DAT)).

### **Source of organic fertilizer**

The organic fertilizer used in this study was produced by the Ramon Magsaysay-Center for Agricultural Resources and Environment Studies (RM-CARES), Central Luzon State University, Science City of Muñoz, and Nueva Ecija, Philippines. Biodegradable wastes such as leaf litters, rice straw, carabao manure, banana bracts and madre de cacao leaves were used for composting as source of organic fertilizer with the guaranteed analysis of 1.5% N, 2.00% P<sub>2</sub>O<sub>5</sub> and 2.00% K<sub>2</sub>O.

### **Seed sowing**

Seeds of ladies finger were directly sown in a prepared plots measuring 2.5 x 15 meters. A distance of 1 meter between rows was followed while the distance between plants was 0.50 meters. Two seeds per hole were sown in each hill.

### **Organic fertilizer application**

Prior to seed sowing, application of organic fertilizer was done. The required amount of organic fertilizer based on the result of soil analysis was applied. The required amount of organic

fertilizer in each treatment was applied based on the treatment requirement and frequency of application.

### **Cultural management practices**

#### **Weed management**

To control weeds in the experimental plots, mulching was employed using rice straw. Spot weeding was done when there are grown weeds in the experimental plots.

#### **Water management**

Initial irrigation was done immediately after seed sowing to ensure availability of moisture for fast germination of the seeds. Succeeding irrigation was done at weekly interval. The experimental crop was furrow irrigated using water pump.

#### **Insect pests**

Bio-pesticides made from natural sources such as kakawate leaves, hot chili, yellow ginger and acapulco (*Senna alata*) leaves were extracted and used to control insect pest and diseases. Application rate was followed at the recommended rate of 100 ml per liter of water. Weekly application was done to prevent or limit the development of pest population and disease occurrence.

#### **Analysis of data**

All data gathered were analyzed using Randomized Complete Block Design (RCBD). A comparison among treatment means was done using Duncan's Multiple Range Test (DMRT) at 5% level of significance.

## **RESULTS AND DISCUSSION**

### **Crop Performance**

#### **Plant height**

Plant height of okra at 30 days after transplanting during the 2014 and 2015 dry seasons as affected by frequency of organic fertilizer application is shown in Table 1. Plant height at 30 DAT during the first trial showed that application of the recommended rate of organic fertilizer applied twice or thrice significantly produced comparable plant height of 42.07 cm and 41.57 cm, respectively. Second trial showed no significant differences on plant height among the three treatments evaluated.

**Table 1. Plant height at 30 days after transplanting of Ladies finger as affected by the frequency of organic fertilizer application.**

TREATMENTS	Plant Height (cm) at 30 DAT	
	2014	2015
	DS	DS
T1- Basal application of OF (at planting)	38.93 <sup>b</sup>	40.13 <sup>a</sup>
T2-Two split application of OF (at planting and at 30 DAT)	42.07 <sup>a</sup>	40.53 <sup>a</sup>
T3-three split application of OF (at planting, 30 DAT and after first harvest)	41.57 <sup>a</sup>	41.90 <sup>a</sup>

Total number of fruits harvested per plant showed that two split application of the recommended of organic fertilizer produced the highest number of fruits (13) per plant during the first trial, this result could possibly due to available nutrients during the reproductive stage which affect fruits formation of the plants. Sonon et al., 2012 states that mineralization process from organic fertilization to provide nutrients for the crop will take 31 days therefore there is no sufficient amount of nutrients that can absorbed by the plants after 31 days if the amount of recommended rate of organic fertilizer will be applied only once thereby affecting the fruits formation of the plants while single application and twice application of the recommended rate of organic fertilizer obtained similar number of harvested fruits (16 fruits) during the second trial.

**Table 2. Number of harvested fruits of Ladies finger as affected by the frequency of organic fertilizer application.**

TREATMENTS	Number of Fruits Harvested/Plant	
	2014	2015
	DS	DS

<b>T1-</b> Basal application of OF (at planting)	11 <sup>b</sup>	14 <sup>b</sup>
<b>T2-</b> Two split application of OF (at planting and at 30 DAT)	13 <sup>a</sup>	16 <sup>a</sup>
<b>T3-</b> three split application of OF (at planting, 30 DAT and after first harvest)	12 <sup>b</sup>	16 <sup>a</sup>

Computed yield per hectare showed that two split application of the recommended rate of organic fertilizer during the first trial obtained the highest yield per hectare of 9.87 t/ha while basal and 3 split application significantly produced comparable yield of 8.33 t/ha and 8.77 t/ha, respectively. Second trial showed an increase of yield but the yield obtained from two split application significantly produced comparable yield from basal application of the recommended rate of organic fertilizer with 12.40 t/ha and 12.00 t/ha, respectively.

**Table 3. Computed yield of Ladies finger as affected by the frequency of organic fertilizer application.**

<b>TREATMENTS</b>	<b>Number of Fruits Harvested/Plant</b>	
	<b>2014 DS</b>	<b>2015 DS</b>
<b>T1-</b> Basal application of OF (at planting)	8.33 <sup>b</sup>	10.57 <sup>b</sup>
<b>T2-</b> Two split application of OF (at planting and at 30 DAT)	9.87 <sup>a</sup>	12.40 <sup>a</sup>
<b>T3-</b> three split application of OF (at planting, 30 DAT and after first harvest)	8.77 <sup>b</sup>	12.00 <sup>a</sup>

**Cost and Return Analysis**

Among the treatments evaluated in ladies finger, the highest expense (PhP9,550.00) incurred on 1000 m<sup>2</sup> was on treatment applied with the recommended rate of organic fertilizer at 4.5t/ha split into three application and this could be due to added labor used during the application of organic fertilizer followed by plants applied with organic fertilizer at same rate split into two application with total expenses of PhP 9,150.00 (Table 2).

The lowest expense (PhP8,250.00) was incurred on the application of the recommended rate of organic fertilizer applied once during planting.

However, based on the cost and return analysis, basal application of the recommended rate of organic fertilizer obtained the highest net income during the first and second trial with a net income of PhP3,000.00 and PhP 5,190.00, respectively with an ROI of 36.36% and 62.91%, respectively. This is mainly attributed to low expenses incurred on labor.

**Table 4. Cost and return analysis for 1000 sq.m. Ladies finger (okra) during 2014 and 2015 dry season (DS) trials, by treatment.**

PARTICULARS	T1=Basal Application of OF		T2= Two Split Application of OF		T3= Three Split Application of OF	
	2014	2015	2014	2015	2014	2015
	DS	DS	DS	DS	DS	DS
<b>INCOME</b>						
Yield (kg)	367	411	397	448	375	440
Price/kg (PhP)	30	30	30	30	30	30
<b>TOTAL INCOME (PhP)</b>	<b>11,010.00</b>	<b>12,330.00</b>	<b>11,910.00</b>	<b>13,440.00</b>	<b>11,250.00</b>	<b>13,200.00</b>
<b>EXPENSES</b>						
Material cost						
Organic Fertilizer	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00	4,000.00
Seed	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Labor cost	1,750.00	1,750.00	2,650.00	2,650.00	3,050.00	3,050.00

Other Expenses						
Gasoline	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
<b>TOTAL EXPENSES</b>	<b>8,250.00</b>	<b>8,250.00</b>	<b>9,150.00</b>	<b>9,150.00</b>	<b>9,550.00</b>	<b>9,550.00</b>
<b>NET INCOME</b>	<b>2,760.00</b>	<b>4,080.00</b>	<b>2,760.00</b>	<b>4,290.00</b>	<b>1,700.00</b>	<b>3,650.00</b>
<b>RETURN ON EXPENSES (%)</b>	33.45	49.45	30.16	46.88	17.80	38.22

**CONCLUSION**

Based on the results, two split application of the recommended rate of organic fertilizer for ladies finger is recommended as this generated significant yield. This finding is very important to establish frequency of organic fertilizer application in organic vegetable production so that practitioners and would be organic enthusiasts will have a guide to follow.

This research is very timely in support to the advocacy to adopt organic farming and find solution to mitigate the effect of climate change.

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