

Effect of Different Organic Fertilizers on Second Crop of Banana (*Musa acumilata*)

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ABSTRACT

Banana has become a popular fruit crop among Sri Lankan farmers due to its lucrative income generation capacity. However, certain deficiencies and diseases are associated with banana, which can be addressed through organic farming. An investigation was carried out to evaluate the effect of different organic fertilizers on second crop of field grown banana (*Musa acumilata*). Five different fertilizer treatments were applied to a banana second crop field in Randomized Completely Block Design. Growth, yield and quality parameters the banana second crop were measured. Organically fertilized plants showed early flowering and high keeping quality in second crop of banana. The other parameters were not significantly different among the treatments. The study recommends further studies on combined effect of different fertilizers.

KEY WORDS: Growth parameters, Organic fertilizers, Second crop of banana (*Musa acumilata*), Yield parameters

INTRODUCTION

Banana (*Musa acumilata*) is the most popular home garden fruit crop in Sri Lanka and one of the cheapest, plentiful and nourishing fruits amongst others (Anon, 2000). It is categorized as the fourth largest fruit crop in the world. Banana is a very nutritious healthy fruit as it contains high energy and low fat. It is also rich in many vitamins. It could be consumed as a fresh fruit or processed material. Over half of the total world production of banana is used for cooking. In some countries, the male bud considered a great delicacy (Anon, 2003).

Banana, which favors hot humid conditions, is well grown in tropics and subtropics. It was originated in the Southeast Asian and Western Pacific regions of Asia (Robinson, 1996). Banana cultivation covers over 52% of the total volume of fruit production in Sri Lanka. The extent of banana cultivation in year 2000 was 45809 ha (Anon, 2000). Kurunegala is the major banana producing district that contributes 20% to the national banana production. The next important districts are Gampaha (10%), Rathnapura (9%), Monaragala (8%) and Kegalle (7%) (Anon, 1998).

Banana has a good local and international market (Anon, 1995). Locally Ambun, Kolikuttu and Ambul are the most popular among more than 19 varieties including Ambul Banana, Kolikuttu, Apple Banana, Green Cavendish (Anamalu) and Curry Banana (Ash Plantains) (Bal, 1997). And Sri Lanka exports banana mainly to Korea, Maldives, U.A.E., Switzerland, UK and Germany (Kudagamage and Chandrasiri, 2002).

Certain problems such as various deficiencies and diseases are associated with banana cultivation resulting in low yield. This happens when banana is not provided with nutrients and other requirements at optimum level (Amar Singh, 1980). Normally, farmers use chemical fertilizers to supply plant

nutrients to banana and various chemical pesticides to control pests and diseases therein. However, due to many disadvantages in use of chemicals in modern farming, the current trend is more towards organic farming (Smith, 2002). The nutritive value and taste have been reported to be higher in organically grown foods.

Organically produced fruits also have very high demand in local and international market at very high rates (Holderness, 1999). Therefore, it is important to identify different organic fertilizers which are available in the country in improving banana cultivation. This study aims to evaluate some growth and yield parameters of second crop of banana grown under different fertilizers.

MATERIALS AND METHODS

The study was carried out at the organic banana experimental field, established on 2005.03.20 at the Regional Agricultural Research Center, Makandura, Gonawila.

The experiment consisted of five treatments; Cattle Manure, Poultry Manure, Gliricidia Leaves, Chemical Fertilizer (DOA recommendation) and Control (Without fertilizer). These five treatments were arranged in Randomized Completely Block Design with three replicates.

The field had been fertilized with above fertilizers at four-month interval. Other cultural practices have been carried out according to DOA recommendation except using chemicals. Following data were collected from the experimental field.

Growth parameters

Days for second flowering from the date of first harvest were recorded. Plant height was measured using a straight stick and a tape from the ground level at flower initiation. Plant girth was measured at 10 cm above the ground level at flower initiation.

Yield parameters

Bunches about to ripen were harvested. Hands were separated, washed and weighed after drying in the air. Finally, the total weight was calculated. Number of fingers in each hand was counted and the total number of fingers per bunch was calculated. Weight of first hand (from the top) was taken after separating hands.

Quality parameters

After ripening, first, middle and last hand of banana bunch, were used for pH measurement. Four fingers from each hand were randomly taken and chopped. Banana juice was extracted by squeezing chopped banana through a piece of cotton cloth. Immediately after the preparation, pH of the banana juice was measured using an electronic pH meter.

Three fingers from first, middle and last hands were used to measure Brix value of the banana fruit juice using a refractometer.

Three hands; first, middle and last hands of each bunch were put into three plastic trays and placed in a well ventilated place. Number of days taken by the fruit to separate from the hand was recorded.

Analysis of data

Data were analyzed using SAS statistical package using ANOVA.

RESULTS AND DISCUSSION**Growth parameters****Table 1 - Number of days for second flowering:**

| Treatment | Days to flower |
|--------------------------|---------------------|
| Cattle Manure (CM) | 130.00 ^d |
| Poultry Manure (PM) | 125.00 ^d |
| Gliricidia Leaves (GL) | 150.00 ^c |
| Chemical fertilizer (CF) | 198.00 ^b |
| Control (C) | 217.00 ^a |
| CV | 5.097 |
| LSD | 15.083 |

Means with the same letter are not significantly different at $P < 0.05$

According to the Table 1, poultry manure and Cattle manure treated plants showed the lowest number of days for flowering. Between them, poultry manure treated plants showed earlier flowering (125 days). This indicates flowering is quickened by the application of poultry manure and cattle manure.

The control showed the significantly highest number of days for flowering indicating that fertilizing is important for early flowering. Even, chemical fertilizer treated plants have taken a significantly higher number of days for flower initiation. Therefore, DOA recommended fertilizers are also inferior to the organic fertilizers with respect to the time taken for flower initiation. As same as these results, early flowering of organically fertilized plants has been observed in the first crop of this experiment (Wijesinghe, unpublished data).

Chemical fertilizers proved to delay the second flowering considerably as they promoted largely the vegetative growth. Organic fertilizers in contrast, contain trace elements that are needed for plants healthy growth. It will be, therefore, beneficial to carry out studies on crops resistance to pests and diseases under different fertilizer treatments.

Table 2 - Plant height:

| Treatment | Height (m) |
|---------------------|-------------------|
| Cattle manure | 2.65 ^a |
| Poultry manure | 2.98 ^a |
| Gliricidia Leaves | 2.92 ^a |
| Chemical fertilizer | 3.01 ^a |
| Control | 3.07 ^a |

Means with the same letter are not significantly different at $P < 0.05$

Table 3 - Girth of plant:

| Treatment | Girth (cm) |
|---------------------|--------------------|
| Cattle manure | 62.44 ^a |
| Poultry manure | 68.45 ^a |
| Gliricidia Leaves | 67.84 ^a |
| Chemical fertilizer | 69.17 ^a |
| Control | 71.68 ^a |

Means with the same letter are not significantly different at $P < 0.05$

There were no significant differences in plant height (Table 2) and plant girth (Table 3) of second crop of banana among the treatments. However, significantly higher plant girth was observed in organically fertilized plants than that of chemically treated and control plants in the first crop (Wijesinghe, unpublished data).

Yield parameters**Table 4 - Total bunch weight:**

| Treatment | Total weight(Kg) |
|---------------------|--------------------|
| Cattle manure | 16.72 ^a |
| Poultry manure | 17.15 ^a |
| Gliricidia Leaves | 14.38 ^a |
| Chemical fertilizer | 14.47 ^a |
| Control | 9.60 ^b |
| CV | 10.269 |
| LSD | 2.7963 |

Means with the same letter are not significantly different at $P < 0.05$

Total bunch weight (Table 4) and total number of fingers per bunch (Table 5) were significantly lower in control plants than that of other treatments. Although, significant differences could not be observed among the other treatments, Cattle manure and Poultry manure treated plants produced slightly heavy bunches with many number of fingers. Significant differences of these two parameters were observed among those treatments in the first crop. Further, total bunch weight and total number of fingers per bunch were much higher in the first crop than the second (Wijesinghe, unpublished data).

Decreasing bunch weight and number of fingers per bunch in second crop may be due to an inherent character of banana. However, the reason for not producing more fingers/bunch and heavy bunches by organically treated plants above chemically treated plants in the second crop is set to investigate.

Table 5 - Number of fingers per bunch:

| Treatment | Number of finger |
|---------------------|---------------------|
| Cattle manure | 229.00 ^a |
| Poultry manure | 236.00 ^a |
| Gliricidia Leaves | 213.00 ^a |
| Chemical fertilizer | 213.00 ^a |
| Control | 143.00 ^b |
| CV | 7.336 |
| LSD | 28.607 |

Means with the same letter are not significantly different at $P < 0.05$

Table 6 - First Hand weight of bunch:

| Treatment | First hand weight |
|---------------------|----------------------|
| Cattle manure | 1.8457 ^a |
| Poultry manure | 1.7737 ^{ab} |
| Gliricidia Leaves | 1.4417 ^{ab} |
| Chemical fertilizer | 1.3650 ^{ab} |
| Control | 1.3000 ^b |
| CV | 18.137 |
| LSD | 0.5277 |

Means with the same letter are not significantly different at $P < 0.05$

Highest first hand weight was observed in cattle manure treated plants (Table 6). Though there was no significant difference between poultry manure treated plants and chemically treated plants, poultry manure treated plants produced slightly heavier first hands. Control plants produced the lightest first hands.

Quality parameters

Table 7 - pH value of banana:

| Treatment | pH value |
|---------------------|-------------------|
| Cattle manure | 4.20 ^a |
| Poultry manure | 4.35 ^a |
| Gliricidia Leaves | 4.24 ^a |
| Chemical fertilizer | 4.08 ^a |
| Control | 4.08 ^a |

Means with the same letter are not significantly different at $P < 0.05$

Table 8 - Brix value of banana:

| Treatment | Brix value |
|---------------------|--------------------|
| Cattle manure | 19.20 ^a |
| Poultry manure | 20.10 ^a |
| Gliricidia Leaves | 20.50 ^a |
| Chemical fertilizer | 19.73 ^a |
| Control | 20.37 ^a |

Means with the same letter are not significantly different at $P < 0.05$

There were no significant differences in pH (Table 7) and Brix (Table 8) values of banana among

the treatments. This was observed in the first crop too (Wijesinghe, unpublished data). Though the quality (taste) of organically produced banana reported to be higher, there may be many other quality parameters that determine the quality of banana, other than the Brix value and pH value.

Keeping quality of banana

Fingers of the plants treated with gliricidia leaves and cattle manure showed highest number of days to separate from the hand showing higher keeping quality. Control plants showed significantly high keeping quality second to cattle manure and gliricidia leaves treated plants and a significantly lower keeping quality was recorded in poultry manure and chemically treated plants. Same trend has been observed in the first crop too (Wijesinghe, unpublished data).

CONCLUSIONS

Growth parameters were not affected by the application of organic fertilizers. However, application of organic fertilizers; poultry manure, gliricidia leaves and cattle manure accelerates the flowering. Therefore, bunches can be early harvested, when fertilized with organic manure. There was no significant effect of organic manure on yield parameters of second crop of banana. Keeping quality is improved with application of gliricidia leaves and cattle manure but not with poultry manure.

Certain fertilizers improve different growth, yield and quality characteristics of banana crops at different levels. Therefore a combination of above fertilizers may improve yield in quality and quantity of banana. Therefore, further researches should be carried out to evaluate the effect of different combinations of fertilizers on banana to recommend a better fertilizer mixture for banana cultivation.

It is beneficial to carry out studies on crops' resistance to pests and diseases under different fertilizer treatments.

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