GROWTH AND YIELD RESPONSES OF GINGER (*Zingiber officinale* Rosc.) TO SOLID ORGANIC FERTILIZER AND COMPOSITION OF PLANTING MEDIA

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ABSTRACT

The objective of the research was to study the response of ginger (*Zingiber officinale* Rosc.) grown in baskets system, in terms of growth and yield to the application of solid organic fertilizer and composition of planting media. The research used Factorial Randomized Complete Block Design with 2 factors and 4 replications. The first factor was solid organic fertilizer which consisted of 2 treatments: without and with solid organic fertilizer. The second one was composition of planting media with 4 treatments which consisted of compost: sand=2:1; compost: paddy chaff=2:1; top soil: cow manure: sand=3:1:1 and top soil: manure:paddy chaff=3:1:1. The results showed that solid organic fertilizers had promoting effects on ginger growth and yield as shown by increasing bud number and rhizome weight per plant. The mixture of top soil:manure:sand/paddy chaff of 3:1:1 was the best planting medium for zinger growth.

Keywords: Ginger In Baskets System, Solid Organic Fertilizer, Composition of Planting Media.

INTRODUCTION

The prospect of culturing ginger in Indonesia is especially for exporting, traditional medicine, food and drink industries and also flavor in cooking. In Indonesia, fresh ginger is exported to other countries such as to The United States of America, Japan, Hongkong, Singapore and Pakistan (Soediarto and Kemala, 1995).

According to the data released by Badan Pusat Statistik Sumatera Utara, the production of ginger in 2005 was 4294,12 tones, with field area about 289,52 ha or equal to 14,83 t/ ha. While in 2006 production of ginger in

North Sumatera decreased to 3,661 tones, with a field area of about 250,52 ha or equal to 14,61 t/ha. Based on the data, the ginger production in Sumatera Utara decreased as much as 633,12 tones. This was due to the decrease in the ginger field area in North Sumatera.

The planting of ginger by using the basket system is a modified technique in culturing ginger in order to create a loose soil or media composition. This condition will make it easier to manage the ginger, the growth and production of ginger will be better than the conventional culture system of ginger in the farm. The planting medium plays an important role in developing of ginger rhizome. Without a good medium, the rhizome production will be low and also its quality (Januwati, 1990).

Based on these, the research was carried out in order to investigate the response of ginger growth using the basket system and yield to the application of solid organic fertilizers and the composition of planting media.

MATERIALS AND METHODS

The research was performed at the public farm in Medan Johor sub district, Medan district, at the altitude of about 25 m above sea level, from June 2007 to March 2008. The materials used in this research were red ginger seedlings, top soil, sand, cow manure, husk, bamboo baskets of the size of 50 cm x 50 cm as a container for planting media, Dithane M-45 and Antracol as fungicides, *Super bionic* solid organic fertilizer and *Super bionic liquid fertilizer* as liquid organic fertilizer.

The research used Factorial Randomized Complete Block Design with 2 factors and 4 replications. The first factor was solid organic fertilizer which consisted of without and with solid organic fertilizer. The second one was composition of planting media with the followig compositions: manure : sand = 2:1, manure : paddy chaff = 2 : 1, topsoil : manure : sand = 3:1:1, topsoil : manure : paddy chaff = 3:1:1, so that 8 treatment combinations were obtained, while each treatment consisted of 6 baskets.

The land was cleaned from weeds, then the plots were made with the size of 1,2m x 1,2m with a drainage between two plots of 50 cm width. Each planting media according to the treatments were mixed throughly, made loose by using a hoe, and then filled into the baskets which had been arranged on the plots.

The red ginger seedlings were prepared by washing, and then soaked in Dithane M-45 for 1 hour to kill the fungi, leaked and cut into pieces

containing internodes of about 5-10 cm length, then the seedlings were ready to be grown in the nursery.
Ginger seedlings were transplanted into the baskets for as much as 5 seedlings per basket, after being selected from the nursery. After planting all seedlings, the baskets were covered with coconut fronds to avoid the seedlings from direct sunlight. The plants were left to grow until the height reached the frond cover.

Parameters observed were plant height, leaf number, bud number, rhizome weight/plant and rhizome weight/basket and also rhizome weight/plot. Plant height, bud number and leaf number were observed until 6 month after transplanting (MAT), while rhizome weight/plant and rhizome weight/asket and also rhizome weight/plot were observed at harvesting time (8 MAT). The data were analyzed by analysis of variance, followed by Duncan's Multiple Range Test (DMRT) 5%, if there are significant differences.

RESULTS AND DISCUSSION

Application of solid organic fertilizer tended to increase the ginger growth in terms of plant height, leaf number and bud number. It also increased significantly the rhizome weight per plant from 82,96 g to 102 58 g, or equal to increase in yield for about 24,05% (Table 1). This shows that the application of solid organic fertilizer resulted in better production than without it. Organic matter could increase the nutrients availability in the soil and their absorption efficiency. Decomposition of organic materials will release nutrients such as N,P,K and S. Although the organic nutrient content iss relative low but its decomposition is relative fast, especially in tropical area (Hsieh and Hsieh, 1990; Karama et. al, 1990; Koshino, 1990; Paje, 1990; Park, 1990).

Table 1. Mean Values of Parameters Observed Caused by Solid Organic Fertilizer and Planting Media Composition Treatments

Treatment	Plant Height (cm)	Leaf Number (piece)	Bud Number (bud)	Rhizome Weight/ plant (g)	Rhizome Weight/ bskt(g)	Rhizome Weight/ plot (g)
Organic fertilizer						
M0 = without solid organic fertilizer	71.4	19.4	6.49	82.69 b	202.06	966.13
M1 = 2 tablets of solid organic fertilizer	75.7	20.2	6.49	102.58 a	248.62	1193.52
Planting media composition						
T1= compost: sand (2:1)	74.0	19.4	6.47	99.60	231.68	1112.10
T2= compost: paddy chaff	69.7	20.2	6.49	85.97	189.10	1020.35
T3= topsoil:manure:sand (3:1:1)	75.9	19.9	6.50	104.05	231.55	1184.68
T4= top soil:manure:paddychaff (3:1:1)	74.6	19.5	6.49	80.92	249.04	1002.17
M0T1	75.21	18.97	6.36	79.75	197.25	1053.50
M0T2	65.18	19.94	6.47	75.14	192.64	792.64
M0T3	75.76	19.69	6.58	104.31	253.06	1284.31
M0T4	69.39	19.06	6.53	71.56	165.31	734.06
M1T1	72.79	19.83	6.58	119.44	266.11	1170.70
M1T2	74.23	20.50	6.50	96.81	185.56	1248.06
M1T3	76.07	20.14	6.42	103.80	210.05	1085.05
M1T4	79.84	19.97	6.44	90.28	332.78	1270.28

Note: Mean values within a colom followed by the same letter do not significantly differ based on DMRT (F = 5%).

Topsoil : manure : sand/paddy chaff (3:1:1) composition of planting medium tended to give better growth and yield of ginger than the others (Table 1). This medium contained organic matter obtained from cow manure. Harmono and Andoko (2005) stated that in order to get the optimal results, ginger need fertile and loose soil and also a good drainage.

The addition of organic fertilizer and composition of planting media were suitable and resulted an increase in the production of ginger. However, when the rhizome weight per basket obtained in this study was compared to the rhizome weight per clump as stated in the ginger description which is about 500 - 700 g per plant, then the results obtained in this study was far from expectations. This was caused by the disease that attacked the red ginger in the research at 3 MAT so it impacted ginger growth and production.

In the research, it was predicted that the *Cercospora* disease might attack the ginger plants, with the characteristics such as brown spots on the leaves that cause wilting followed by drying, so that it influenced the plant photosynthesis and reduced growth and rhizome forming. *Cercospora* disease usually spreads when influenced by weather. A high air humidity

will increase pathogen growth and the release of its spores as well. Hartana (1998) stated that the development of *Cercospora* disease was very much dependent on the weather. A very damp condition is of great benefit for *Cercospora* growth.

The forming and releasing of spores are very important matters to *Cercospora* growth. Spores were spread easily by wind, dew and rain. Besides, the conidia are extremely tolerant to drought and high temperature (Hartana, 1998). According to data of the Geophysics and Meteorological Office, Sampali Station Medan, the air humidity in July reached 83%, with a wind velocity of 1,85 m/s and the rain reached 262 mm in June. These conditions were very suitable for fungi development. Dickinson (1976) stated that weather elements that influenced fungi development are: 1) temperature, which can accelerate growth and holding up of hyphen and propagules, 2) air humidity, this influences the ability of adaptation, growth and also spore released, 3) wind, has the role as the carrier in broadcasting and reserving the conidia on the plant surface. It only needs a wind velocity of about 0,28 m/s at 25 °C to be able to broadcast the fungi spores.

CONCLUSIONS

- Organic fertilizer gave better ginger growth and yield.
- The best composition of planting medium in the research was topsoil: manure: sand/paddy chaff = 3:1:1.
- The ginger yield was not maximum because of the leaf spot disease at 3 MAT.

ACKNOWLEDGEMENT

The authors extend thank and appreciate the British Award for Poverty Alleviation II by funding the research as stated in Surat Perjanjian No. B672/KMK/D.IV/IV/2007 tanggal 27 April 2007 and also thank Yoga Lesmana for his assistance in the research.

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