



GROWTH RESPONSE AND PRODUCTION OF TWO VARIETIES OF OKRA (*Abelmoschus esculantus* L. Moench) ON GIVING VARIOUS TYPES OF ORGANIC FERTILIZER

Ria Anindi Antika Barus

Agrotechnology Study Program

Faculty of Agriculture, Universitas Sumatera Utara, Medan 2016, Indonesia

riaanindibarus@gmail.com

Abstract

Lady finger is the vegetables can be consumed directly although to be processed food and has a high pharmacology effect in the health. Lady finger has a good selling point to compared other vegetables. The problem that faced by Lady finger cultivation were not know it well for the population group in Indonesia. The use of organic fertilizer in Lady finger cultivation is expected to increase quantity an quality of Lady finger. This research was conducted in Pembangunan street, Medan Selayang with altitude \pm 25 meters above sea surface began from May to September 2016. This research use factorial randomized block design with two varieties Red Lady finger and Green Lady finger, and the second factor was application of organic fertilizer with four kinds without organic fertilizer, compost, kascing fertilizer, chicken manure fertilizer. The result of this research showed that varieties were significantly effect to plants length parameter on 10-14 weeks after planting, flowering date, number of fruits per plant, number of fruit of plot, weight of fruits per plant, diameter of fruit, length of fruit and wet weight of plant. Application of various of organic fertilizers were significant effect to the plant height parameter on 10-14 weeks after planting, leaf amount, number of fruits per plant, flowering date, number of fruits per plot, and weight of fruit per plant. Interaction of varieties and application various of organic fertilizers were significant effect to number of leave parameter on 11 weeks after planting, length parameter on 10-14 weeks after planting and wet weight of plant.

Keywords: drying time, soaking time, cryopreservation, rosella seeds

1. Introduction

Okra or *Abelmoschus esculantus* L. Moench is a vegetable plant originating from India known as bhindi, while in foreign countries okra is known as lady fingers. In Indonesia, this plant is still relatively rare, only in a few places and big cities this vegetable is found. The scarcity of okra is not because growing it is difficult, but because people are reluctant to consume it, because okra is a fruit that secretes mucus because it contains musilane. Whereas in the mucus that's most of the benefits and efficacy of okra fruit is stored. Okra also has a fairly high value compared to other vegetables. (Ministry of Environmental and Forests, 2009).

Among the many known legumes and vegetables, okra has the highest nutritional value. According to the DIY Provincial Food Security and Extension Agency (2003), every 100 grams of okra contains 22 cal, 1.87 mg protein, 0.21 mg fat, 4.51 mg carbohydrates, 77 mg

calcium, 0.28 mg iron, 16.3 mg vitamin C, 92.57% water compared to plants. Gambas has a nutritional value of 18 cal, protein 0.8 mg, fat 0.2 mg, carbohydrates 4.1, calcium 19 mg, iron 0.9 mg, Vitamin C 8 mg, water 94.5%.

Okra seed oil is rich in unsaturated fatty acids such as oleic acid and linoleic acid. Okra is a green vegetable that is rich in dietary fiber. Apart from fiber, okra also contains 1.0 mg of glutathione and iron in 100 g of young okra. Fiber is very important for the body because it can prevent constipation (difficult bowel movements), obesity, hypercholesterolemia (high cholesterol), diabetes (diabetes), and colon cancer (large intestine) (Agricultural Information Ciawi Bogor, 2005).

Okra which is starting to develop in Indonesia and has been circulating in the Indonesian market today is green okra and red okra. These two varieties of okra have the same nutritional content, but these two varieties of okra have their own characteristics. Green okra has a slightly bland sweet taste, is smaller in size, has a slightly soft flesh texture, and is high in fiber. In red okra, the taste is not too sweet, the flesh texture is soft, larger and longer than green okra (Ministry of Agriculture, 2005). Young okra red burgundy varieties contain protein, carotene and several minerals that are needed by the human body. From the results of research on the nutritional value of vegetables in West Kalimantan, it turns out that red okra contains carotene (pro-vitamin A) and iron which is not inferior to green okra (Craig, 2007). 1983). At this temperature, plant material almost completely does not undergo metabolic processes so that the storage period becomes unlimited, which can reach 20 years. The addition of cryoprotectants can maintain the integrity of the membrane and increase the osmotic potential of the medium so that the fluid in the cell flows out and dehydration occurs. (Hardaningsih et al., 2012).

Okra fruit in its utilization as a vegetable can be consumed directly without having to do processing first, in other words it can be consumed in a raw and fresh state. In this case the use of pesticides is not recommended because the residue of the pesticides used will affect the quality and quality of the vegetables. Utilization of organic matter in cultivation activities does not cause future damage to soil, microorganisms and the environment. Organic materials that can be used in okra cultivation are organic compost, vermicompost, and chicken coop compost. Based on research by Syafrina (2009) stated that the application of organic compost had a significant effect on plant height, number of branches, canopy dry weight, root dry weight, number of pods planted and number of pods per plot on soybean plants.

Organic matter in the form of compost is the decomposition of plant biomass that has been described through the activity of soil microorganisms. Kascing is a good organic material for optimal plant growth because in addition to improving the physical, chemical and biological properties of the soil, especially in less fertile soils, it also does not have a negative effect on the environment. The compost produced comes from decomposition by worms. Nutrient content and chemical properties of vermicompost are more diverse than compost and other organic fertilizers (Agricultural Research and Development Agency, 2001)

2. Materials and Methods

This research was carried out on community land construction road No.22, Medan Selayang sub-district with an altitude of ± 25 meters above sea level. This research was conducted from May to September 2016.

The materials used in this study were okra seeds from the okra seed distributor of the Bandung Throne Complex, Green Garibar and Red Burgundy varieties, compost, vermicompost, chicken manure, vegetable pesticides, NPK fertilizer (15: 15: 15), black polybag size 40 x 50 cm (10 kg of soil), seedlings, topsoil, water for watering plants and other materials that support this research. The tools used in this study were hoe, meter, sieve, scales, gembor, treatment label paper and sample markers, markers, ruler, digital caliper, calculator, stationery, oven, knife and other tools that support this research.

This study used a factorial randomized block design (RAK) with two factors. The results of the analysis of variance showed a significant effect, then continued with the Mean Difference Test based on the Duncan Multiple Range Test (DMRT) at the 5% level (Steel and Torrie, 1989).

Parameters observed were: Flowering age (DAT), Plant Height (cm), Number of Leaves (pieces), Number of Fruits Planted (fruit), Fresh Fruit Weight per Plant (g), Number of Fruits per plot (fruit), Fruit weight fresh weight per plot (g), fruit length (cm), fruit diameter (cm), crown wet weight (g), root wet weight (g), crown dry weight (g) and root dry weight (g).

3. Results and Discussion

Results

Based on the observational data and the results of variance, it was known that the varietal treatment was significantly different between the green and red varieties on the parameters of plant height 10-14 WAP, flowering age, fruit weight per plant, fruit weight per plot, number of fruit per plant, number of fruit per plot, fruit length, fruit diameter, canopy wet weight. The treatment of various types of organic fertilizers significantly affected the parameters of plant height 10-14 WAP, number of leaves 10-14 WAP, flowering age, fruit weight per plot, fruit weight per plot, number of fruit per plant, number of fruit per plot. The interaction between varietal treatment and the application of various types of organic fertilizers had a significant effect on the parameters of plant height 10-12 WAP, number of leaves 11 WAP, canopy wet weight.

Plant Height (cm)

Based on the observational data and the results of the variance, it was found that the treatment of varieties was significantly different between the green and red varieties on the plant height of okra 10-14 WAP. The application of various types of organic fertilizers significantly affected plant height 10-14 WAP. The interaction between varietal treatment

and the application of various types of organic fertilizers significantly affected plant height 10-12 WAP. The average plant height of okra 10-14 WAP for two varieties and the application of various types of organic fertilizers can be seen in Table 1.

Table 1. Plant height of two Okra varieties on the application of various types of Organic fertilizers at the age of 10 – 14MST

MST	Varieties	Organic fertilizer				Average
		B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
	cm.....				
10	Red Okra	27.7d	36.82cd	35.99cd	40.28c	35.20
	Green Okra	55.65 b	58.33 b	52.85b	78.95a	61.440
	Average	41.67	47.57	44.42	59.61	48.32
11	Red Okra	44.25f	50.92e	52.05d	58.41cd	51.41
	Green Okra	90.34b	92.03b	76.18c	128.74a	96.83
	Average	67.30	71.48	64.13	93.58	74.12
12	Red Okra	51.95e	60.99d	61.50cd	64.60cd	59.76
	Green Okra	95.76b	101.7b	76.20c	128.76a	100.60
	Average	73.86	81.35	68.84	96.68	80.18
13	Red Okra	61.50f	73.80de	63.43e	84.17c	70.72
	Green Okra	116.27b	118.67b	79.87d	164.63a	119.85
	Average	88.88	96.23	71.65	124.40	95.29
14	Red Okra	67.27e	79.67d	71.87de	90.23c	77.26
	Green Okra	122.70b	132.10b	86.60cd	172.77a	128.54
	Average	94.98	105.88	79.23	131.50	102.90

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 1 shows that the okra plant height in the combination treatment with chicken manure with green okra variety B3V2 obtained the highest average every week and was significantly different from other treatments, while the lowest average okra plant height was found in the combination treatment without organic fertilizer with red variety B0V1 .

Number of Leaves (strands)

Based on the observation data and the results of the variance, it was found that the treatment of varieties was not significantly different between the green and red varieties on the number of leaves of okra plants 10-14 WAP, while the application of various types of organic fertilizers had a significant effect, the interaction between the treatment of varieties and the application of various types of organic fertilizers. significant effect on the number of leaves of okra plant 11 WAP but not significant effect on 12-14 WAP.

Table 2. The number of leaves of two varieties of Okra in the application of various types of Organic fertilizers ages 10 – 14 MST

MST	Varieties	Organic fertilizer				Average
		B0 Without Fertilizer	B1 Compost	B2 Fertilizer vermicompost	B3 Chicken Feed	
	sheet.....				
10	Red Okra	12.17	11.25	10.25	12.00	11.42
	Green Okra	11.33	10.92	10.17	12.33	11.19
	Average	11.75b	11.08b	10.21c	12.17a	11.30

MST	Varieties	Organic fertilizer				Average
		B0 Without Fertilizer	B1 Compost	B2 Fertilizer vermicompost	B3 Chicken Feed	
11	Red Okra	14.50b	13.67c	12.25d	14.33bc	13.69
	Green Okra	13.50cd	14.75b	11.83e	20.17a	15.06
	Average	14.00	14.21	12.04	17.25	14.38
12	Red Okra	16.08	14.67	13.00	15.42	14.79
	Green Okra	14.5	15.92	12.33	21.75	16.13
	Average	15.29b	15.29b	12.67c	18.58a	15.46
13	Red Okra	17.25	15.17	13.33	15.33	15.27
	Green Okra	14.67	16.75	12.58	22.33	16.58
	Average	15.96b	15.96b	12.96c	18.83a	15.93
14	Red Okra	18.00	16.58	14.08	6.42	16.27
	Green Okra	15.25	17.58	12.58	23.08	17.13
	Average	16.63b	17.08b	13.33c	19.75a	16.70

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 2 shows that the application of organic fertilizer has a significant effect on the parameters of the number of okra leaves. The highest mean number of leaves was obtained with the application of chicken manure and significantly different in other treatments, while the lowest average was obtained with the application of vermicompost fertilizer. However, the observation of the number of leaves 11 WAP showed that the combination of chicken manure treatment with green varieties obtained the highest average and was significantly different from other treatments, while the lowest average was obtained in the combination treatment with pupus vermicompost and red varieties.

Flowering Age (days)

Based on the observational data and the results of the variance (Appendix 62 and 63), it is known that the treatment of varieties and the application of various kinds of organic fertilizers have a significant effect on the flowering age, but the interaction between the treatment of varieties and the application of various kinds of organic fertilizers has no significant effect on the flowering age.

Table 3. The flowering period of two varieties of Okra and the application of various kinds of organic fertilizers

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	62,417	56,083	57.194	58.000	58.424a
Green Okra	55.528	49,000	50,167	43,583	49,569b
Average	58,972a	52,542b	53,681b	50.792c	53,997

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 3 shows that the longest flowering age parameter for okra plants appeared in treatment B0 (58,972 DAP) and the fastest in treatment B3 (50,792 DAP). The treatment of B0 was significantly different from B1, B2, and B3. In the varietal treatment, the longest flowers appeared in V1 (58,424 DAP) and the fastest in V2 (49,569 DAP).

Number of Fruits Per Plant (fruit)

Based on the observational data and the results of the variance, it was found that the treatment of varieties was significantly different between green and red varieties and the application of various types of organic fertilizers had a significant effect on the number of fruits per plant, but the interaction between the treatment of varieties and the application of various types of organic fertilizers had no significant effect on the number of fruits per plant. plant.

Table4. The number of fruits per plant of two varieties of Okra and the application of various types of organic fertilizers.

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	4.31	4.75	4.50	7.08	5.16b
Green Okra	7.69	8.75	8.67	11.75	9.22a
Average	6.00b	6.75b	6.58b	9.42a	

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 4. shows that the number of fruits per okra plant was highest in treatment B3 (9.42) and the lowest in treatment B0 (6.00). Treatment B3 was significantly different from treatment B0, B1 and B2. In the varietal treatment, the number of fruits per okra plant was highest in V2 (9.22) and the lowest in V1 (9.22).

Number of fruits per plot

Based on observational data and fingerprint results, it is known that the varietal treatment was significantly different between green and red varieties, the application of various types of organic fertilizers had a significant effect on the number of fruits per plot, but the interaction between varietal treatment and the application of various kinds of organic fertilizers had no significant effect on the number of fruits per plot. plots.

Table 5. Number of fruits per plot of two varieties of okra and application of various kinds of organic fertilizers.

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	16.00	19.00	17.00	28.33	20.08b
Green Okra	30.67	35.00	34.67	47.00	36.83a
Average	23.33b	27b	25.83b	37.66a	28.46

Table 5 shows that the number of fruits per plot of okra plants was highest in treatment B3 (37.66) and the lowest in treatment B0 (23.33). Treatment B3 was significantly different from treatment B0, B1 and B2. In the varietal treatment, the highest number of fruits per okra plant was in V2 (36.83) and the lowest was V1 (20.08).

Fruit weight per plant (g)

Based on the observational data and the results of the variance, it was found that the treatment of varieties was significantly different between green and red varieties and the application of various types of organic fertilizers had a significant effect on fruit weight per plant, but the interaction between varieties treatment and the application of various kinds of organic fertilizers had no significant effect on fruit weight. per plant.

Table 6. Fruit weight per plant of two varieties of okra and application of various types of organic fertilizers

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	74.253	77,795	72,369	134,661	89,769b
Green Okra	98.497	109,512	107,548	183.030	124.647a
Average	86.375c	93,653b	89,959c	158,845a	107.208

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 6 shows that the fruit weight per okra plant was highest in treatment B3 (158.845) and the lowest in treatment B0 (86,375). Treatment B3 was significantly different from treatment B0, B1 and B2. In the varietal treatment, the highest number of fruits per okra plant was in V2 (124.647) and the lowest was V1 (89.769).

Fruit Length(cm)

Based on the observational data and the results of the variance, it is known that the varietal treatment was significantly different between the green and red varieties on the parameters of fruit length. The application of various kinds of organic fertilizers had no significant effect on fruit length and, the interaction between varietal treatments and the application of various kinds of organic fertilizers had no significant effect on fruit length and on seed life, seed storage and seed germination processes.

Table 7. Fruit length per plant of two varieties of okra and application of various types of organic fertilizers.

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	12.54	12.46	12.15	12.09	12.31b
Green Okra	13.58	13.66	13.13	13.65	13.51a
Average	13.06	13.06	12.64	12.87	12.91

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 7 shows that the fruit length parameter of okra plants was highest in treatments B0 and B1 (13.06) and the lowest was B2 (12.87). The highest variety treatment was V2 (13.51) and the lowest was V1 (12.31).

Fruit Diameter (mm)

Based on the observational data and the results of the variance, it was found that the treatment of varieties was significantly different between the green and red varieties with respect to fruit diameter. The application of various types of organic fertilizers had no significant effect and the interaction between varietal treatments and the application of various types of organic fertilizers had no significant effect on fruit diameter.

Table 8. Diameter of fruit per plant of two varieties of okra and application of various types of organic fertilizers.

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 Chicken Feed	
Red Okra	18,367	18111	17,517	18,047	18.010a
Green Okra	13,825	14,282	13,440	13,658	13,801b
Average	16,096	16,196	15,478	15,853	15.906

Description: Numbers followed by the same notation in the same row or group of columns the same indicates not significantly different according to Duncan's Multiple Distance Test at the level of =5%

Table 8 shows that the diameter of okra plants was the highest in treatment B1 (16,196) and the lowest in B2 (15,478). The highest variety treatment was V1 (18.010) and the lowest was V2 (13.08).

Head Wet Weight (g)

Based on the observation data and the results of the variance, it was known that the treatment of varieties, application of various types of organic fertilizers had no significant effect, but the interaction between the treatment of varieties and the application of various kinds of organic fertilizers had a significant effect on the wet weight of the canopy. organic fertilizers can be seen in table 9.

Table 9. Wet weight canopy of two varieties of Okra and application of various types of organic fertilizers.

Varieties	Organic fertilizer				Average
	B0 No Fertilizer	B1 Compost	B2 vermicompost	B3 ChickenFeed	
Red Okra	7.86bc	8.28b	7.90bc	7.14d	7.79
Green Okra	8.96b	7.68c	7.47c	11.98a	9.02
Average	8.41	7.98	7.68	9.56	8.41

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 9 shows that in the canopy wet weight the combination of chicken manure and green okra varieties obtained the highest average and was significantly different from the other treatments, while the combination of chicken manure and red okra varieties obtained the lowest average wet weight of crown.

4. Conclusion

Varieties treatments were significantly different between Garibar green and Burgundy red varieties on the parameters of plant height increase 10-14 WAP, flowering age, number of fruit planted, number of plots of fruit, fruit weight per plant, fruit length, fruit diameter, canopy wet weight. The best varietal treatment was obtained on the green garibar variety. The application of organic fertilizer significantly affected the parameters of plant height increase 10-14 WAP, number of leaves 10-14 WAP, flowering age, number of fruit per plant, number of fruit per plot, fruit weight per plant. The best type of organic fertilizer is obtained from chicken manure. Interaction of varietal treatment and application of various organic fertilizers had a significant effect on the parameters of plant height increase 10-14 WAP, number of leaves 11 WAP, canopy wet weight.

5. Reference

- Ministry of Environmental and Forest. 2009. Biology of Okra. India : Departements of Biotechnology.
- Wattimena, G.A., L.W. Gunawan, N.A. Matjik, E. Syamsudin, N.M.A. Wiendi, dan A. Ernawati. 1992. Bioteknologi tanaman. PAU IPB. Bogor. 306 hal. Informasi Pertanian Ciawi Bogor. 2005. Cerita Sukses Budidaya Tanaman Okra. Suara Merdeka-Nasional. Bogor.
- Kementerian Pertanian, 2005. Pelepasan Varietas Garibar Sebagai Varietas Unggul. Ditetapkan 15 Maret 2005. Jakarta.
- Hartatik, W dan L.R. Widowati. 2010. Pupuk Kandang. <http://www.balittanah.litbang.deptan.go.id>. Diunduh 12 Maret 2016.
- Sutarya, R. dan G. Grubben. 1995. Pedoman Bertanam Sayuran Dataran Rendah. Gajahmada University Press. Yogyakarta. Hal. 8, 237-240.