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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 2019 16(2): 1243-1250. **OPEN ACCESS**

The Performance of Lebat-3 beans (*Phaseolus vulgaris* L.) Grown in Organic Urban Farming System

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The cultivation of beans was done in system of organic urban farming with the aim to study the influence of the bio urine and goat manure application on growth and yield of Lebat-3 beans. This research was done in February-April 2018 (in greenhouse of CV Kitri Ayu Farm, Malang). The experiment was done in polybags filled with 5 kg media in the form of a mixture of soil (4 kg) with rice husk charcoal (1 kg) and 1 plant per polybag, then it was arranged with spacing (50 x 40) cm or equivalent to 50 000 plants per ha. A Factorial Randomized Complete Design was used for arranging the 9 treatments i.e. the application of 3 dosages of cow bio urine (1500 l/ha, 3000 l/ha and 4500 l/ha) and 3 dosages of goat manure (20 ton/ha, 30 ton/ha and 40 ton/ha), and repeated 3 (three) times. The result shows that the cultivation of beans organically in urban areas and treated by the application of cow bio urine and the goat manure has no interaction. And the applied of cow bio urine 4500 l/ha, and the goat manure 40 ton/ha resulted the highest yield (428.8 g/p) and (468.1 g/p), respectively.

Keywords: Lebat-3 beans, organic urban farming, cow bio urine, goat manure

INTRODUCTION

Beans (*Phaseolus vulgaris* L.) is a vegetable pods of interest community containing source of protein, starch, vitamins, minerals, dietary fiber and other substances that are beneficial, such as iron, selenium, potassium, thiamine, molybdenum and in folatic acid (Wondimu and Tana, 2017). The needs of the beans are getting added population increased mainly in urban areas, so that needs to be done through the planting of beans needs improvement in a polybag develop urban agriculture that is utilizing the narrow land or yard house optimally in improving the availability and quality of food for urban communities. (Widaryanto et al., 2017) stated that urban agriculture also contribute in improving the quality of the environment, air quality and reduce the effects of global warming and improve the aesthetics of the city via greening plants in the courtyard of the house. Also the application of the charcoal rice husk mixed with the soil as media planting in urban farming could support the sustainable organic farming (Santoso and Romadhon, 2018).

Urban agriculture has an important role in supporting the resilience and the availability of food in which urban agriculture can integrate sustainability in terms of aspects of social, economic and environmental issues are integrated into development framework urban areas. Alaimo (2008), stated the application of urban agriculture can provide a direct impact on the economic, social, energy use, pollution (air and ground) as well as an increase in the availability and quality of food. In addition to that urban agriculture can provide a cheap solution for the people that financial difficulties by making use of plantings in yard house (Julie, 2013) as well as in the improvement of nutrition and income generate for the poor population (Midmore, 1996

). Planting beans in polybag (one of planting system in organic urban farming system) can be done with the use of organic fertilizers in the form of solid and liquid organic fertilizer for improving growth and yield of beans.

According to (Nathania et al., 2012), application of fermented urine if cow (bio urine) to the planting media can improve the physical and chemical properties of this media. The advantage of using cow bio urine is that it is easily absorbed by plants directly and contains plant growth hormones. (Ignatius et al., 2014) indicated that fermented of cow bio urine contains a hormone that stimulates plant growth and development, namely IAA hormone which can stimulate plant roots and affect the process of cell extension, cell division, cell wall plasticity and increase water absorption into cells. According to (Setiawan 2011), that liquid fertilizer is relatively more efficient and quickly shows results.

In addition to livestock urine, solid waste from livestock can be used as manure. Manure is a type of organic fertilizer which has a lot of availability and is easy to obtain. According to (Lingga and Marsono 2013), the provision of organic fertilizers can improve soil structure, increase soil absorbency in water, improve living conditions in the soil, and as a source of food for plants. One of the sources of livestock solid waste that can be used as manure is solid goat waste. (Hartatik and Widowati 2006) suggest that goat manure has high nitrogen levels (around 0.83 - 0.95% N total, Musnamar, 2004), and the water content is lower than other manure so that the weathering process of goat manure is more run fast and mature faster. In addition, goat manure also contains high enough potassium which is beneficial to plants in the generative phase.

(Maske et al., 2009), stated that the addition of nitrogen element in plants through the application of organic fertilization proved to be beneficial in improving results higher. The solid organic fertilizers of goat manure that is embedded in the media cropping, goat manure useful to plants because it contains soil microorganisms can be certain compounds and synthesizes enhance water retention (Syukur and Harsono. 2008.). can be planted intercrop Rihana et al., (2013), shows the use of manure the goat until a dose of 60 ton/ha, resulted the highest of pod fresh weight of beans Lebat-3, an average of 330.3 g/plant (34.55 ton/ha).

Organic beans cultivation can be done in a green house, and able to avoid rainfall that can cause obstruction of the formation of flowers into pods, drifting the provision of additional nutrients both liquid and solid which is added through the planting media or nutrition of the planting media itself (Effendi, 2003)

The purpose of this research was to get the right application of cow bio urine and goat manure for improving growth and yield of beans planted in the system of organic urban farming.

MATERIALS AND METHODS

Research carried out in the greenhouse of CV. Kitri Ayu Farm in town of Malang in February-April 2018. Tools used i.e. polybag size (40 x 40) cm, LAM (leaf are meter), analytic scales, ovens, sprayer, measuring cup, calculator, ruler, marker boards, cameras, labels, markers and envelope. Materials used i.e. the seed beans from Lebat-3, water, regosol soil, rice husk charcoal, bio urine of cow and goat manure. The planting medium used is a mixture of soil and charcoal of rice husk with a ratio of 4 : 1 (4 kg of soil and 1 kg of rice husk charcoal) and filled in into each polybag on average of 5 kg per polybag. Plant spacing of beans plant in the polybag to another plant in the polybag (each other) is 50 x 40 cm or equal 50 000 plants/ha, and it can be used for calculating Leaf Area Index (LAI) of beans.

A Factorial Randomized Complete Design was used for arranging the 9 treatments consist of Bio urine application (1500 l/ha, 3000 l/ha and 4500 l/ha) and goat manure (20 ton/ha, 30 ton/ha and 40 ton/ha) in detail i.e.

B1: Bio urine 1500 l/ha (30 ml/plant) and goat manure 20 ton/ha (400 g/plant),
B2: Bio urine 1500 l/ha (30 ml/plant) and goat manure 30 ton/ha (600 g/plant),
B3: Bio urine 1500 l/ha (30 ml/plant) and goat manure 40 ton/ha (800 g/plant),
B4: Bio urine 3000 l/ha (45 ml/plant) and goat manure 20 ton/ha (400 g/plant),
B5: Bio urine 3000 l/ha (45 ml/plant) and goat manure 30 ton/ha (600 g/plant),
B6: Bio urine 3000 l/ha (45 ml/plant) and goat manure 40 ton/ha (800 g/plant),
B7: Bio urine 4500l/ha (60 ml/plant) and goat manure 20 ton/ha (400 g/plant), B8: Bio urine 4500 l/ha (60 ml/plant) and goat manure 30 ton/ha (600 g/plant),
B9: Bio urine 4500 l/ha (60 ml/plant) and goat manure 40 ton/ha (800 g/plant). Each treatments were replicated three times.

The growth observed were plant length (cm), number of leaf per plant and leaf area per plant (cm2/p) and LAI (leaf area index) at 14, 28, 42, 56 and 72 dap (days after planting). The yield of

beans were observed such as, the time of first flowering, time of first pod forming, the number of pod per plant, pod fresh weight per plant, pod dry weight per plant, plant fresh weight and the plant dry weight.

The data obtained were analyzed statistically using the Excel program for Windows 7.0 version. Significant results were further analyzed using HSD 5 %.

RESULTS

The growth of Lebat-3 Varieties of Beans

In Table 1, it shows that in the analysis of the variability of beans growth there was no interaction between bio urine application and application of compost of goat manure on parameters of plant length, leaf number per plant, leaf area per plant and leaf area index (leaf area index was calculated based on distance between beans planted in polybags to each other, (50 x 40) cm, or equal 5.00 plants per m2).

Plant length and number of leaves per plant were not different, whereas in leaf area per plant and leaf area index shows different.

In Table 2, shows that plant length of Lebat -3 reached an average of 258 cm up to 264 cm (bio urine application), and 257 cm up to 261 cm (goat manure application). The number of pod per plant achieved 80 up to 86 pods per plant (bio urine application) and 82 up to 87 pods per plant (goat manure application). Whereas the leaf area per plant, can reached on average of 4565 cm2 per plant up to 5006 cm2 per plant (bio urine application) or increased 9.6 %, and by the application with the goat manure caused leaf area per plant increased 4435 cm2 up to 4998 cm2 (increased 12.6%), by the application 20 ton goat manure per ha (100 g per polybag) and 40 ton goat manure application per ha (200 g per polybag).

Table 1. Analysis of variance of the Lebat-3 beans growth (plant length, leaf number pe plant, leaf area per plant and leaf are index (LAI) observed at 72 (dap).

Anova	PL	LN/P	LA/P	LAI
Treatment	cm	sheet/p	cm2/p	m2/m2
Biourine application	NS	NS	S	S
Goat manure application	NS	NS	S	S
Interaction	NS	NS	NS	NS

Note: PL: plant length: LN/P: Leaf number per plant; LA/P: Leaf are per plant and LAI: Leaf area index
NS: no significant; S: significant;

Table 2. The average of plant length, leaf number per plant, leaf area per plant and leaf are index (LAI) of the Lebat-3 bean growth at 72 (dap)

Treatment	PL	LN/P	LA/P	LAI
	cm	sheet/p	cm2/p	m2/m2
1500	258,3	80,4	4565,6	2,28
3000	261,6	82,5	4877,4	2,48
4500	264,1	86,2	5006,1	2,51
HSD 5%	ns	ns	288,2	0,14
Treatment	cm	sheet/p	cm2/p	m2/m2
20T	257,5	82,4	4435,6	2,21
30T	259,8	84,3	4780,5	2,39
40T	261,2	87,7	4998,2	2,49
HSD 5%	ns	ns	290,4	0,15

Note: PL : Plant length 1500: Biourine 1500 l/ha20T: 20ton/ha goat manure
LN/P : Leaf number per plant 3000: Biourine 3000 l/ha30T: 30ton/ha goat manure
LA/P : Leaf area per plant 4500: Biourine 4500 l/ha 40T: 40ton/ha goat manure
LAI : Leaf area index ns : no significant s : significant
Dap : Days after planting HSD: Honestly Significant Difference

Yield of Lebat-3 bean

Based on analysis of variance (Table 3) shows that there is no interaction within bio urine and goat manure application on all parameters of yield, also in FFl and FPo, the application of bio urine and goat manure fertilizer shows no significant different. But the application of bio urine and goat manure fertilizer, respectively, shows significant different on parameters of number of pod per plant (NPo/P), pod fresh weight per plant (PoFrWg/P), pod dry weight per plant (PoDWg/P), plant fresh weight (PFrWg),and plant dry weight (PDWg/P).

In Table 4, it shows that Lebat-3 beans began to flower at the age of 38 dap and began to pod forming at the age of 43 dap, and the application of cow bio urine did not influence time of flowering or time of pod forming as well, while the other parameters yields were influenced significantly.

The application of cow biourine a number of 1500 L/ha or equivalent to 20 ml/p plant shows that the number of pods per plant (NPo/P) of Lebat-3 beans reached 87 pods/p, while the application of cow bio urine of 4500 L/ha (60 ml/p) increased the number of pods an average of 107 pods/p (increased 22.9%). The application of cow bio urine of 4500 L/ha (60 ml/p), also increased the pod fresh weight (PoFrWg/P) of Lebat-3 beans an average of 14.4% and the plant dry weight per plant ((PoDWg/P) increased by 15.9%, plant fresh weight (PFrWg) increased by 15.1% and plant dry weight (PDWg) increased by 20%.

The application of goat manure fertilizer does not affect the flowering time and the time of pod formation of Lebat-3 beans, while the other parameters are affected by the application of organic fertilizer (goat manure). By the application of 20T goat manure per ha (400 mg/p) the number of pods per plant (NPo/P) reached around of 87 pods, whereas by the application of goat manure of 40T per ha (800 mg/p), increased the number of pods to 107 pods per plants (increased by 22.9%). The pod fresh weight of beans per plant (PoFrWg/P) increase by 14.4 %, on pod dry weight per plant (PoDWg/P), increase by 15.9% (PoDWg / P), on plant fresh weight (PFrWg) increase by 15.1% and on plant dry weight (PDWg) increase by 20%.

In Table 5, it shows that there is a relationship (r) between growth and yield of Lebat-3 beans, in which the plant length has a moderate relationship with leaf area per plant (r = 0.61), number of pods per plant (r: 0.55), pod fresh weight per plant (r=0.51), plant fresh weight per plant (r=0.58) and plant dry weight (r = 0.36). The leaf area per plant was closely related to the number of pods per plant (r = 0.95), weight of fresh crop pods (r = 0.75), fresh weight of total plants (r = 0.87) and total dry weight of plants (r = 0.72). It shows that leaf area per plant as an organ of photosynthesis (as the source) have a role on the formed of the pod number per plant, pod fresh weight per plant, plant fresh weight and plant dry weight (as the sink).

Table 3. The analysis of variance of first time of the Lebat-3 bean to flower (dap)(FFl), first time of the Lebat-3 bean to form the pod (dap) (FPo), number of pod per plant (pod/p)(NPo/P), pod fresh weight per plant (g/p)(PoFrWg/P), pod dry weight per plant (g/p)(PoDWg/P), plant fresh weight (g/p) (PFrWg), plant dry weight (g/p)(PDWg/P)

Anova	FFl	FPo	NPo/P	PoFrWg/P	PoDWg/P	PFrWg	PDWg
Source of variance	dap	dap	Po/P	g/P	g/P	g/P	g/P
Bio urine	NS	NS	S	S	S	S	S
Goat manure	NS	NS	S	S	S	S	S
Interaction	NS	NS	NS	NS	NS	NS	NS

Note : FFl:First time of flowering (dap); FPo :First time of pod forming (dap); NPo/P:Number of pod per plant (pod/p);PoFrWg/P:Pod fresh weight per plant (g/p); PoDWg/P :Pod dry weight per plant (g/p) PFrWg :Plant fresh weight per plant (g/p); PDW:Plant dry weight per plant (g/p); NS:No Significant Different

Table 4. The average of yield parameters of beans e.g. FFl (first time of flowering), FPo (first time of the pod forming), and NPo/P (number of pod per plant), PoFrWg/P (pod fresh weight per plant),PoDWg/P (pod dry weight per plant), PFrWg/P (plant fresh weight) and PDWg (plant dry weight) observed at 72 dap.

Treatment	FFl	FPo	NPo/P	PoFrWg/P	PoDWg/P	PFrWg	PDWg
Unit	dap	dap	Po/P	g/P	g/P	g	g
1500	38.1	43.2	87.2	374.5	51.3	394.2	56.8
3000	37.3	45.5	103.4	408.2	56.6	430.6	62.5
4500	39.6	44.8	107.8	428.8	59.5	453.7	66.6
HSD 5%	ns	ns	9.1	44.3	7.2	51.2	8.0
Unit	dap	dap	Pod/p	g/p	g/p	g/p	g/p
20T	39.4	45.3	87.7	377.6	52.1	392.6	57.4
30T	40.1	44.7	105.3	412.7	57.3	436.2	63.9
40T	40.5	46.2	112.1	468.1	65.7	493.7	70.7
HSD 5%	ns	ns	11.7	62.8	11.4	83.1	12.2

Note : 1500 :Biourine 1500 l/ha 3000 : Biourine 3000 l/ha 4500:Biourine 4500 l/ha 20T :20 ton/ha goat manure 30T : 30 ton/ha goat manure 40T : 40 ton/ha goat manure ns : no significant s :significant dap : day after planting g:gramp: plant HSD :Honestly Significant Difference

Table 5. Matrix correlation (r) of growth and yield variables of Lebat-3 varieties of beans

Matrix correlation	PL	LA/P	NPo/P	PoFrWg/P	PFrWg	PDWg
PL	1					
LA/P	0.61	1				
NPo/P	0.55	0.95	1			
PoFrWg/P	0.51	0.75	0.94	1		
PFrWg	0.58	0.87	0.93	0.93	1	
PDWg	0.36	0.72	0.85	0.92	0.95	1

Note: PL: Plant length LA/P : Leaf area per plant; NPo/P: Number of pod per plant; PoFrWg/P : Pod fresh weight per plant; PFrWg : Plant fresh weight Total; PDWg : Plant dry weight Total

DISCUSSION

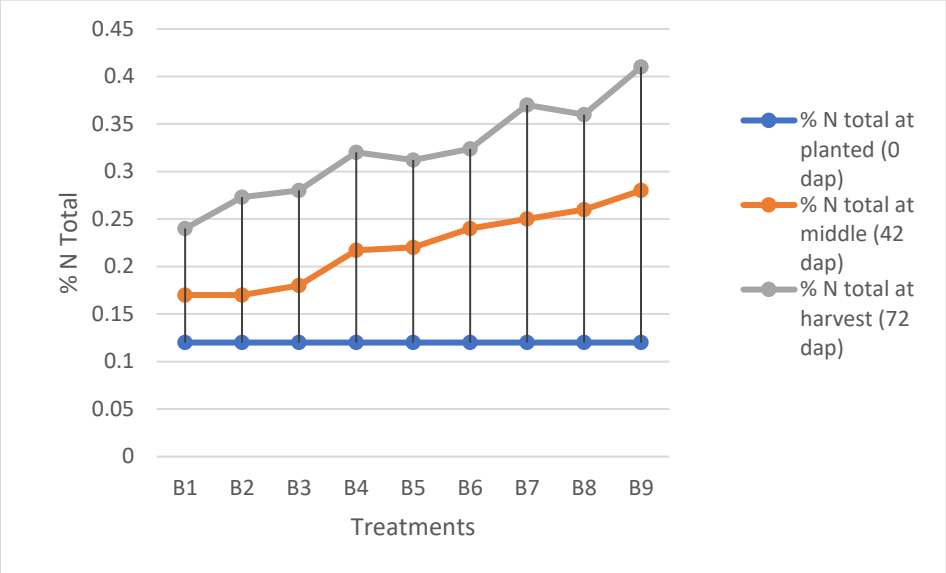
The increased needs of the beans for urban communities can be done through planting in polybag that utilizes the narrow land or yards home. The cultivation of beans in polybag can be done organically fertilizing with organic among others, Abd El-Hady and Mohamed (2014) stated the use of organic fertilizer can be recommended by farmers and researchers to replace all or part of the fertilizer the chemical that serves to improve the physical and chemical properties of the soil as well as reduce the cost of farming.

The use of organic fertilizers in the form of cow bio urine can be applied on the leaves of the plant the beans while goat manure can be immersed in the soil and planting media charcoal husks before sowing beans.

The element N total of planting medium (soil + husk charcoal) shows an average of 0.12% (low), so that needs the addition of elements from outside such as biourine application and goat manure application, unfortunetely biourine cow (which is used) contained elements of N total, an average of 0.018% (very low), conversely the goat manure (which is used) contained elements of N total, an average of 0,94% (high). This condition support the research which is reported by Uwah and Eyo, 2014.

Application 1500 L/ha, 3000 L/ha and 4500 L/ha caused the differences of the nutrition content of planting media. Based on analysis of N total (%) of the planting media at 0 dap, 42 dap and 72 dap shows that N total (%) increased gradually from an average of 0.12 %, 0.22 % and 0.32 %, respectively (Fig 1). And the increasing of N total of the planting media caused the increasing of plant leaf area (LAI) per plant, pods number per plant, pods fresh weight per plant, pods dry weight per plant, plant fresh weight and plant dry

weight.



Note :

B1: Biourine 1500 l/ha (24 ml/plant) and goat manure 20 ton/ha (320 g/plant),
B2: Biourine 1500 l/ha (24 ml/plant) and goat manure 30 ton/ha (480 g/plant),
B3: Biourine 1500 l/ha (24 ml/plant) and goat manure 40 ton/ha (640 g/plant),
B4: Biourine 3000 l/ha (48 ml/plant) and goat manure 20 ton/ha (320 g/plant),
B5: Biourine 3000 l/ha (48 ml/plant) and goat manure 30 ton/ha (480 g/plant),
B6: Biourine 3000 l/ha (48 ml/plant) and goat manure 40 ton/ha (640 g/plant),
B7: Biourine 4500 l/ha-1 (72 ml/plant) and goat manure 20 ton/ha (320 g/plant),
B8: Biourine 4500 l/ha (72 ml/plant) and goat manure 30 ton/ha (480 g/plant),
B9: Biourine 4500 l/ha (72 ml/plant) and goat manure 40 ton/ha (640 g/plant)

Figure 1. The media planting content (% N total) at days after planting (dap)

Goat manure is manure that slow release the nutrients. According to Uwah and Eyo (2014) the goat manure contains high amounts of plant nutrients that are usually released slowly and gradually absorbed by the plant as well. Such as this research shows that the results of N total (%) at first, middle and late plant growth the application of bio urine cows 1500 L ha-1 and goat manure 20 ton ha-1 (shows the lowest) achieved an average 0.12% at 0 dap to 0.20% at 44 dap and 0.27% at 72 dap.

The highest of N total was showed by combination of 4500 L per ha bio urine and 40 T of goat manure, although there are not significantly different interaction but this caused the highest yield of beans, respectively. The application of 4500 L/ha bio urine resulted the highest of pod fresh weight (428.8 g/p), and the application of 40 T of goat manure achieved the highest of pod fresh weight (468.1 g/p) or equal 23.4 ton per ha. In general, the yield of Lebat-3 beans cultivated in medium area resulted the lower than planted in the higher area, such as the yield of beans which were reported by Rihana et al., 2013, resulted 34.55 ton per ha..

CONCLUSION

The cultivation of beans organically in urban areas and treated by the application of several dosages of cow bio urine and several dosages of goat manure shows no interaction.

The application of the dosages of cow bio urine 4500 L/ha (90 ml/plant) shows the highest yield of pod fresh weight (428.8 g/p), higher 14.5 % than application the dosages of 1500 L/ha.

The application of the dosages of goat manure 40 ton/ha (800g/plant), shows the highest yield of pod fresh weight (468.1 g/p), higher 23.9 %

than application the dosages of 20 ton/ha.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEGEMENT

Present study was performed in absence of any conflict of interest the authors convey deeply to CV Kurnia of Kitri Ayu Farm which has helped in providing the location of the Greenhouse area in this research.

AUTHOR CONTRIBUTIONS

MS designed the research and perform lead the experiments and wrote the manuscript. **AL** performed the preparing of greenhouse experiment, to set up the media of planting, to provide seed, planting, to maintain plant grows. And observed the growth and yield of plants and analysis data. **MS** and **AL** designs experiments and reviewed the manuscript. All authors read and approved the final version.

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