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The effectiveness of bokashi against growth of mustard *Brassica juncea* L., *Brassica rapa* L. Pokcay And Maize *Zea mays* L.

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Abstract. This research aims to find out the effectiveness of Bokashi on growing plant. The Research used quantitative methods approach to true experimental Random Design, with complete (RAL) factorial 4 X 3 pattern, that is a factor of growing media and plant type. The plant-ing medium consists of 100% bokashi, 50% bokashi, and two media controls i.e. control by the media and the media ground chicken feces. Kind of plant used are mustard (*Bassica juncea* L.), pokcay (*Brassica rapa* L.) and maize (*Zea mays* L.). In this study there was 12 experimental which each experiment planted at 30 polybags, so there was 360 polybags. The area of the research is in the village of Kebon Agung, Jember Regency. Plants are observated over the three over the three weeks after planting. In the first week, the second week and the third week after planting. The observations focused on the ability of seeds to grow once planted that is growing or not growing. The data were analyzed with ANOVA and Duncan uses of SPSS v20. The results showed that the most effective media was 50% bokashi on *Zea mays* L.

1. Introduction

In the village of Kebon Agung Jember Regency, there are 6 (six) chicken farmer *Gallus* sp. which until recently its feces was not exploited optimally, only used as fertilizer for sengon trees after the feces have been deposited for one year. Feces from chicken farms is very smelly and annoying the residents living around the farm, this is with the [1], that chicken farm waste could cause environmental problems around settlements where the farm is located. Kebun Agung area according of usage 161 Ha rice fields, yard 13 rice/cornflower stir-fried 67 Ha. Meanwhile, the village area has terraced land topography known as terracing, so when the rainy season water flow, humus dissolved as a result of land being arid due to minimal topsoil. Access from the city of Jember towards Kebon Agung passed by Kaca Piring at 06.00 – 10.00, the sidewalk switch function into traditional markets.

The garbage either dry or wet waste piled up in the form of a few days, until the garbage transport trucks took it. This is very annoying people around or people crossing the road. The results of research conducted by [2] shows that the application of chicken manure improves some soil properties caused a significant increase in soil electrical conductivity (EC), the content of phosphorus and nitrate (NO₃⁻) depending on the number of applied and a little pickling after the application of manure. This is in accordance with the results of the research of [3], which States that the chicken litter or trash chicken based organic fertilizers can be recycled to improve the structure and fertility of agricultural lands. While the mojo as fruit vegetable insecticides as one alternative that can be used to control pest organisms plants because this insecticide susceptible and not damaging to the environment [4].

In order to avoid environmental pollution from chicken farmers, by utilizing chicken feces as well as to fertilize agricultural land, bokashi made from chicken feces with a mixture of chaff, an organic garbage and others, to increase the productivity of agricultural crops in Kebon Agung Village. It is aimed so that the community Kebon Agung can change waste be productive so that



people can be self-sufficient in agriculture for the economic prosperity of the people. Therefore studies the effectiveness of bokashi from chicken feces and waste market against crops mustard (*Brassica juncea* L.), pokcay plant (*Brassica rapa* L.) and maize (*Zea mays* L.). Plant mustard greens and pokcay much-needed community Indonesia as a vegetable, while the corn plants very popular community by rewarding because in addition to the staple food in many countries, in addition to rice and wheat. Corn is believed to be useful as an anti-inflammatory, anti-oxidant, diuretic, hypoglycemic [5]. Therefore the market demand for corn needs very high, so optimization of planting and the production is absolutely required.

2. Method

The research used quantitative methods approach to true experimental Random Design, with complete (RAL) factorial 4 X 3 pattern, i.e. a factor of growing media and plant type. The planting medium used is 100% bokashi, 50% bokashi, and two media control i.e. planting soil media and media of chicken feces. Bokashi is made from a mix-ture of: 45% of chicken feces, 38% organic waste market, 7.5% are husk, 7.5% are husk ash and 2% of lime/calcium. All the ingredients are mixed and added Organic Plant Sup-plements (SOT) of the HCS, with added 30-45% water until the mixture soil "mamel", and fermented in anaerobic at least 3 X 24 hours. Therefore the fermenters bacteria SOT is dormant, then their use is enabled in advance by dissolv-ing it with 50 ml: SOT, 200 g sugar, 50 ml of molasses and 1 liter of water, all the ingredients are incorporated and fermented in anaerobic for a minimum of 1 x 24 hours.

Results of Bokashi fermentation, aerated minimum of 7 X 24 hours, because of the bokashi is good used to embed media after 1 week or 7 days (biodiversity, 2016). Before being used as a medium for planting, bokashi, land and stool this chicken plus a tattoo of the fruit of the mojo as much as 2.5% of media is ready. The planting medium inserted into polybags size 30 X 25 cm, so the ground and feces as a control too. The planting medium for customers on the plant mustard *B. juncea* L. or known as the mustard greens or marokot, *B. rapa* L. or known by the term pockcoy or nauli and maize or *Z. mays* L. Each consists of 30 planting media polybags. The research area is in the vil-lage of Kebon Agung, district Kaliwates Jember Regency.

Observations done over the three weeks after planting, in the first week after the plant, the second week after planting and the third week after planting. The obser-vations focused on the ability of seeds to grow once planted that is growing or not growing. The data obtained will be analyzed with ANOVA and Duncan uses SPSS v20.

3. Results and Discussion

The results of research conducted a test of normality, the results are listed in table 1.

4. **Table 1.** The result of Normality test

	Treat-ment	Plant	Age	Grow-ing	Not growing	
N'	36	36	36	36	36	
Normal Parameters	Mean	2.5000	2.0000	2.0000	9.97	20.03
	Std. Deviation	1.13389	.82808	.82808	8.136	8.136
Most Ex-treme Dif-ferences	Absolute	.170	.220	.220	.160	.160
	Positive	.170	.220	.220	.160	.110
	Negative	-.170	-.220	-.220	-.110	-.160
Kolmogorov-Smirnov Z	1.022	1.318	1.318	.957	.957	
Asymp. Sig. (2-tailed)	.247	.062	.062	.319	.319	

From the results above is known that all data is normal so data is analyzed with statistical parametric test, the result of influences each treatment the growth of *B. rapa* L. presented in table 2.

Table 2. The influence of each treatment the growth of *B. rapa* L.

Test of Homogeneity of Variances				
Levene				
	Statistic	df1	df2	Sig.
	3.600	3	8	.065
Not growing	3.600	3	8	.065

From the test above, that the data homogeneous ($\alpha = 0.05$) so that, the data of the research results in the test by ANOVA, ANOVA test results are presented in table 3.

Table 3. Anova Result test against the growth *B. rapa* L.

		Sum of Squares	df	Mean Square	F	Sig.
growing	Between Groups	360.000	3	120.000	10.000	.004
	Within Groups	96.000	8	12.000		
	Total	456.000	11			
Not growing	Between Groups	360.000	3	120.000	10.000	.004
	Within Groups	96.000	8	12.000		
	Total	456.000	11			

From the result above, that all of the treatment has the real effect against the growth of *B. rapa* L., it can be seen from the value significance of 0.004 ($\alpha < 0.05$). So proceed to Duncan Test to know the difference from each treatment the growth of *B. rapa* L., presented in table 4.

Table 4. Duncan Result Test of growing *B. rapa* L.

Treatment	N	Subset for alpha = 0.05		
		1	2	3
Chicken feces	3	4.0000		
bokashi 100%	3	6.0000	6.0000	
bokashi 50%	3		12.0000	12.0000
Control	3			18.0000
Sig.		.500	.067	.067

5.

Means for groups in homogeneous subsets are displayed.

From the table above, that the control has growth of *B. rapa* L. is the best than other treatments, but did not differ significantly by administering bokashi 50%, and the granting of chicken feces that shows the lowest its growth. In other words plant *B. rapa* L. many grew up in the control treatment and the granting of bokashi 50%. As for the influence of the test results of each treatment the growth of *B. juncea* L. are presented in table 5.

Table 5. The effectiveness of each treatment the growth of *B. juncea* L.

	Levene Statistic	df1	df2	Sig.
growing	16.000	3	8	.006
Not growing	16.000	3	8	.006

6.

From the result above, that homogen data ($>0,05$), so that analysis Anova is used. The result of Anova analysis presented in table 6.

7.

Table 6. ANOVA result test against the growth of *B. juncea* L.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	362.250	3	120.750	40.250	.000
Growing Within Groups	24.000	8	3.000		
Total	386.250	11			
Between Groups	362.250	3	120.750	40.250	.000
Not growing Within Groups	24.000	8	3.000		
Total	386.250	11			

8.

From the analysis results in table 6, that all of the treatment has the real effect against the growth of *B. juncea* L., it is seen from the significance value i.e. 0.000 (< 0.05). So, it is going to Duncan test to know the difference from each treatment the growth of *B. juncea* L., is presented in table 7.

9.

Table 7. Duncan result Test against the growth *B. juncea* L.

Treatment	N	Subset for alpha = 0.05		
		1	2	3
Chicken feces	3	.0000		
bokashi 100%	3		4.0000	
bokashi 50%	3		6.0000	
control	3			15.0000
				0
Sig.		1.000	.195	1.000

Means for groups in homogeneous subsets are displayed. From the results of the analysis are presented in table 7, which on the media control by land has the best growth of *B. juncea* L. than other treatments, and media control with chicken feces showed the most growth low in *B. juncea* L. As for the results of analysis the influence of each treatment the growth of *Zea mays* L. is presented in table 8.

Table 8. The influence of each treatment the growth of *Z. mays* L.

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
growing	3.746	3	8	.060
Not growing	3.746	3	8	.060

From the results above, that a homogeneous data ($p > 0.05$), so it was going to test anova. The results of the analysis of ANOVA

Table 9. ANOVA test results against the growth of *Z. mays* L.

		Sum of Squares	df	Mean Square	F	Sig.
growing	Between Groups	1134.667	3	378.222	302.578	.000
	Within Groups	10.000	8	1.250		
	Total	1144.667	11			
Not growing	Between Groups	1134.667	3	378.222	302.578	.000
	Within Groups	10.000	8	1.250		
	Total	1144.667	11			

From the anova analysis results are presented in table 9, it is known that all of the treatment has the real effect against the growth of *Z. mays* L., it can be seen from the significance value 0.000 ($p < 0.05$). So proceed to Duncan test to know the difference from each treatment the growth of *Z. mays* L.. Duncan test results against the growth of *Z. mays* L. is presented in table 10.

Table 10. Duncan test result against the growth

treatment	N	Subset for alpha = 0.05			
		1	2	3	4
Chicken feces	3	4.6667			
control	3		8.6667		
bokashi 100%	3			11.3333	
bokashi 50%	3				30.0000
Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

From the results above, which the granting of bokashi 50% had the best growth of *Z. mays* L. than with other treatments, and media control with chicken feces showed the lowest growth. It can be said that many crops *Z. mays* L. who grew up at the treatment the granting of bokashi 50%

Based on the results of the analysis can be said that of the four treatments: 1) with the ground control 2) granting of bokashi 50%; 3) granting of bokashi 100%; 4) control with chicken feces against plant growth of *B. juncea* L., *B. rapa* L. and *Z. mays* L. has significant growth differences. It can be observed in table 11.

Table 11. Duncan test results against the growth *B. juncea* L., *B. rapa* L. and *Z. mays* L.

Plant	N	Subset for alpha = 0.05	
		1	2

<i>B. juncea</i> L.	12	6.25	
<i>B. rapa</i> L.	12	10.00	10.00
<i>Z. mays</i> L.	12		13.67
Sig.		.245	.255

Means for groups in homogeneous subsets are displayed.

From the analysis results in table 11, that of all the treatments the best impact of growing is on the plant *Zeamays* L. This is because the plant *Zea mays* L. can grow very well, and the next is currently the plant *Brassica rapa* L. who also have good growth than with the plant *Brassicajuncea* L.. The other words *Brassica juncea* L. Plants have the lowest growth compared with *Brassica rapa* L. and *Zeamays* L. overall analysis results can be seen in graph 1.

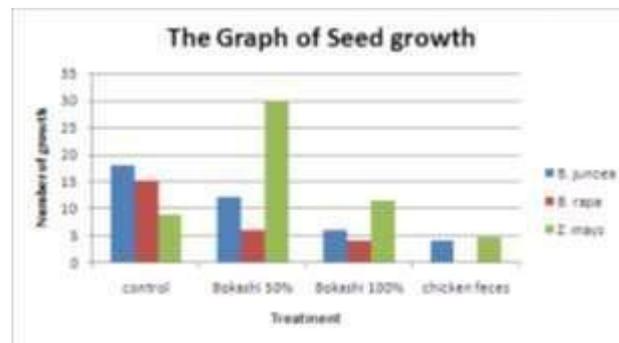


Figure 1. The growth of *B. juncea* L., *B. rapa* L. and *Z. mays* L.

On the graph of growth on media control by soil, Bokashi 50%, Bokashi 100% and controls with chicken feces against *B. juncea* L., *B. rapa* L. and *Z. mays* L. plant. It indicates that the best growth is on the media 50% on crops bokashi *Z. mays* L. This means 50% bokashi mixed media with 50% of the land is the best medium for the growth of *Z. mays* L. it is aligned with the research [6], that using Bokashi as much as 15 tons per Ha corn plant improve real results of 23.86% over without bokashi.

Bokashi is a organic fertilizer that is suitable for growth medium *Z. mays* L., other than beneficial to growth, bokashi is also influential work for growth in the vegetative phase of the corn plant parameters and number of leaves, and the real effect also on the generative phase of maize flowering age parameters i.e., male, age of flowering females and number of seeds per cob [7]. It is also aligned with the results of research that has been done by [8], which stated that the use of Bokashi cow give a very real influence towards the growth and production of corn plants especially at high plant parameters, number of leaves, the amount of cob, cob weight, the weight of the wet and dry weight.

Bokashi stands for organic materials rich in Bio-logical Resources [9], as the name implies Bokashi comes from the fermentation of organic waste that originated around the farmland. Bokashi require quite a long time to decompose into nutrient elements are easily absorbed by plants in order to increase growth and crop production [10]. Because of this, bokashi is used in this research is made from a mixture of chicken feces, organic waste market, husk, husk ash and lime/calcium, which is activated by fermenters SOT (Organic Plant Supplements). SOT is composed of several microbial dormant that serves as a pengaktif or "Starter" that can be raw organic material into a parser materials organic ready to be absorbed by the plant. The Starter has been turned on and is the appropriate media

will flourish, not only contain microbes such as microbes and microbial nitrogen fastening system solvent phosphate. Therefore the resulting bokashi has greater benefits for the plant [11].

The application of bokashi technology should apply in the land which still has the content of low soil organic matter or very low. The content of Organic material of agricultural soils in Indonesia the majority in low conditions to very low. Due to deployment of the technology is highly recommended to support the bokashi growth and development of plants, especially in the form of hybrid seeds that require high energy[9]. Therefore the growth of *Zea mays* L., is best on the grant of 50% and the land of bokashi 50%.

The results showed that bokashi 50% level, very good for plant growth of corn *Zea mays* L.. Research results are aligned by [12]–[14] that various doses and concentration of organic Bokashiliquid kirinyuh has effect on plant height of maize cultivars pioneer at the age of 42 HST. This is due to the corn plant belongs to the plant that is easy to grow and cultivation has been popular among farmers as plant cost effective with limited fertilizer [15]. But to be able to live and blossom, *Z. mays* L. requires high nutrients, mainly nitrogen (N), phosphorus (P) and potassium (K)

In addition, the growths of *Z. mays* L. also need micro-substances and micro nutrients molybdenum, which depends on the type of soil, it is also important to nourish the plant to prevent the symptoms of deficiency[17].

The seeds of *Z. mays* L. can grow well in the available fertilizer which serves as the starter for a minimum of 5 cm to the side of the seed during the sown[18]. Bokashi as rich organic materials in biological resources capable of acting as a "starter" that activates the dormant compounds contained in the seeds of *Z. mays* L., so the seeds are planted at 50% bokashi can grow very well. This is in accordance with the opinion of the [19] that *Z. mays* L. that grow on acidic soil plant growth has been hampered by the toxicity of aluminum and lead to dwarfing root growth as a result of the plant is unable to pick up moisture from the soil.

4. Conclusion

Mixing of Bokashi 50% with 50% of the land is the best media plant for growth of corn *Zea mays* L. in Ke-bon Agung Jember regency. Suggestion to research more in depth is about to test the compounds in the bokashi and harvest produced *Z. mays* L. with the planting of mixed media bokashi 50% and 50% ground media.

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