Utilization of Sugar Factory Waste as an Organic Fertilizer on Growth and Production of Baby Corn

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Abstract- The research purpose is to view and know the influence of giving blotong against growth and production of baby corn. This research was conducted in the village Borongloe Bontomarannu Gowa district. The research was arranged as a factorial experiment in completely randomized block design (RBD) with three replications. The first is fertilizer type: blotong (B1), blotong+EM4 (B2) and bokashi blotong (B3), while of the blotong dose assigned as the second factor: blotong 5 ton ha -1 (D1), blotong 10 ton ha-1 (D2) and blotong 15 ton ha-1 (D3). The research result indicated that bokashi blotong gives the best influence compare to blotong+EM4 against all parameters. Interaction between fertilizer dose 10 ton ha-1 to the bokashi. Blotong gives the best influence to the baby corn production 4.41 ton ha-1, bokasi blotong best anyway influence on baby corn vegetative growth, that is: plant height 113.00 cm, leaves number 8 (eight) pieces and stem diameter 6.02 cm. Results of analysis of variance showed that giving of bokashi blotong (B3) showed a better effect on the growth and production of baby corn and highly significant for plant height age of 60 days after planting, leaf number aged 60 days after planting, cob length cornhusk and without cornhusk, diameter stems and cobs, cob weight with cornhusk and without cornhusk and production are converted into ton ha-1. This is due to bokashi blotong has organic content of C, N, P, and K totaling more than the maximum treatment blotong (B1) and the blotong+EM4 (B2). Based on the research result, it can be summarised that sugar factory waste called blotong can be used to make bokashi as organic fertilzer, so the baby corn can growth and production better.

Index Terms- Bokashi, blotong, organic fertilizer, baby corn, sugar factory waste

I. INTRODUCTION

One form of corn production can be designed as an export commodity is baby corn. Baby corn is young cob corn is harvested, the vegetable material, which has a moisture content of nutrients such as 75.96 grams, 19.02 grams of carbohydrates, 1.18 grams of fat, 3.20 grams of protein, phosphorus 867 mg, 270 mg potassium, 28.00 mg calcium and vitamins A, B, and C. In addition, it also contains 5.43 mg/100 grams ascorbic acid and 670 mg/100 grams ß-carotene (Hooda and Kawatra, 2013).

Since baby corn is in great demand in international market and with its cultivation and exports foreign exchange could be earned by the country (Nandal *et al.*, 2010). Baby corn cuisine served in a special even baby corn Indonesia has begun to enter the international market with a relatively high number of requests compared to other vegetables (Palungkung, 2008).

Therefore, to create a system of sustainable agriculture business need to improve and maintain soil fertility, physical, chemical and biological soil, and organic amendments also enhanced the overall soil microbial activity (Hampton *et al.*, 2011). But until now the attention to improve soil fertility is merely chemical fertility only, while the physical and biological soil fertility is still less attention. Based on research of results Ranjan *et al.* (2013) stating that biological fertilizer significantly increased yield and yield attributing characters at baby corn.

Stating that organic materials such as crop residues, various industrial waste and manure natural produce compounds that can improve soil physical condition and nutrient availability (Jamil *et al.*, 2004). One of the industrial waste that is still under-utilized as a source of organic fertilizer is the *blotong*, which is the waste produced by the sugar mills. *Blotong* is used as organic material to add nutrients, improve soil pH, as well as improving growth of maize (Manoarfa, 1992).

Based on the above then the information on the filter cake as a source of organic fertilizer to the present still less that it is necessary carry out the assessment. This study aims to see and know the effect of *blotong* on the growth and production of crops especially baby corn.

II. MATERIALS AND METHODS

This study was conducted in two phases. The first stage *bokashi blotong* manufacturing and the second stage application to the crop. The second phase of the study was conducted in a factorial experiment, with a randomized block design (RBD), which consists of two factors. The first factor is the type of fertilizer (B), which consists of three types: *blotong* (B1), *blotong*+EM4 (B2) and *bokashi blotong* (B3). The second factor is the dose of fertilizer (D), which consists of three levels, namely: fertilizer dose 5 ton ha^{-1} (D1), fertilizer dose 10 ton ha^{-1} (D2) and fertilizer dose 15 ton ha^{-1} (D3). These two factors are combined so that there are nine of each treatment was repeated three times so that there are 27 experimental units.

The first phase of this research, conducted with three types of fertilizer variations are: *blotong* (B1), *blotong*+EM4 (B2) and the *bokashi blotong* (B3). The three types of fertilizer in

laboratory analysis, and applied to the field with the dose varies according to the treatment.

Materials used for the manufacture of *bokashi blotong* are: *blotong* 10 kg, chaff 5 kg, Bran 5 kg, EM4 150 cc, molasses 150 ml (or five tablespoons granulated sugar) and 20 liters of water. Making way is:

a. Mix evenly *blotong*, husk and bran → mix P
b. EM4 and Dissolve molasses in water → Solution Q
c. Q Pour the solution slowly into the dough mixture evenly while stirring until the moisture content reaches 35% (mixture of R). Water content can be checked by taking a handful of dough and kneaded R. If after the kneaded dough keep the dough together and when released will be destroyed again means the water level is good.
d. Mixed R piled on the cement floor as high as 15-30 cm, then covered with burlap sacks for 4-5 days. During the fermentation temperature is maintained 40-50°C. When the temperature is greater than 50°C and mixed open sack R behind and forth until the air in and the temperature drops. Checking the temperature otherwise performed every six hours. After four days of fermentation *bokashi* will ripe and ready to be used as organic fertilizer. Type is called aerobic *bokashi*.

The data collected covers the cob weight (kg) with and without the cob and the average production is measured at harvest, age 65 days after planting. Data processed by analysis of variance and the mean difference was tested by HSD at the level of 5%. Experimental plots were made measuring 2 m x 3 m total of 27 units. Spacing is between plots of 50 cm and 100 cm between groups. Planting is done with a drill spacing of 75 cm x 25 cm, each planting hole is left as many as three seed and one plant after the age of two weeks. *Blotong* fertilization application, given before planting by disseminated on irrigated land on the ground.

III. RESULTS AND DISCUSSION

The results of the analysis of the content of *blotong* management type C-organic, N-total, P and K are presented in Table 1.

Table 1: The results of the analysis used in the *blotong* management research

Management of type C-Organic *blotong*	C-Organic (%)	N Total (%)	Phosphorus (%)	Potassium (%)	C/N
Blotong	6.97	0.43	0.14	0.04	16.21
Blotong + EM4	5.82	0.38	0.15	0.02	22.96
Bokashi blotong	21.59	0.94	0.56	0.35	15.32

In Table 2, the higher dose of fertilizer applied to the soil, especially on the type of filter *bokashi blotong* fertilizer (B3), the vegetative growth of plants (plant height and leaves number) the better.

Table 2: Average Plant Height (cm) and leaves number (pieces) at Age 30 days after planting

Treatment:	Plant height	Leaves Number
Type of fertilizer:		
Blotong (B1)	96.71 a	7.56 a
Blotong+EM4 (B2)	96.69 a	8.00 a
Bokashi Blotong (B3)	113.04 b	8.33 b
	HSD 0.05 = 15.70	HSD 0.05 = 0.70
Doze of Fertilizer :		
5 ton ha^{-1} (D1)	95.67 a	7.78 a
10 ton ha^{-1} (D2)	103.64 a	8.00 a
15 ton ha^{-1} (D3)	107.13 a	8.00 a
	HSD 0.05 = 15.70	HSD 0.05 = 0.70

Description : The numbers in the same column followed by the same letter do not differ on the real level 0.05

Fertilizer 5 - 15 ton ha^{-1} did not cause changes in stem diameter and cob diameter, but the highest dose of 15 ton ha^{-1} (D3) causes a significant change in the cob diameter, in Table 3. Fertilizer types significantly affect long-cob, especially the type of filter *bokashi blotong* fertilizer (B3).

Table 3: The average diameter of stem and diameter of cob (cm) at harvest

Treatment:	stem diameter	cob diameter
Type of fertilizer:		
Blotong (B1)	5.55 ab	6.95 a
Blotong+EM4 (B2)	5.27 a	8.72 ab
Bokashi Blotong (B3)	6.02 b	11.28 b
	HSD 0.05 = 0.50	HSD 0.05 = 2.36
Doze of Fertilizer :		
5 ton ha^{-1} (D1)	5.56 a	7.86 a
10 ton ha^{-1} (D2)	5.75 a	9.26 a
15 ton ha^{-1} (D3)	5.52 a	9.83 a
	HSD 0.05 = 0.50	HSD 0.05 = 2.36

Description : The numbers in the same column followed by the same letter do not differ on the real level 0.05

Treatment with a dose of 15 ton ha^{-1} gives a good effect on plant height, leaves number and stem diameter (Tables 2 and 3). This situation suggests that the higher dose of fertilizer given the better growth. The increase in leaf number as well as size due to enough nutrition can be explained in terms of possible increase in nutrient absorption capacity of plant as a result of better root development and increased translocation of carbohydrates from source to growing points (Singh and Agarwal, 2001).

Test results HSD α0.05 indicates that treatment of the interaction between B3 and D2 generate cob with cornhusk heaviest weight. Thus, the *bokashi blotong* fertilizer dose 10 ton ha^{-1} produces cob with cornhusk heaviest weight at harvest in Table 4.

Table 4: The average weight of cobs with cornhusk (g) at harvest

Treatment:	Doze of Fertilizer : (ton ha^{-1})		
	5 (D1)	10 (D2)	15 (D3)
Type of fertilizer:			
Blotong (B1)	82.67 a	110.67 ab	140.67 bc
Blotong+EM4 (B2)	170.67 cd	198.67 de	226.67 ef
Bokashi Blotong (B3)	274.00 f	440.67 h	352.00 g
HSD 0.05 = 49.67			

Description: The numbers in the same column followed by the same letter do not differ on the real level 0.05

Test results HSD α0.05 indicates that treatment of the interaction between B3 and D2 generate cob without cornhusk heaviest weight. Thus, the *bokashi blotong* fertilizer dose 10 ton ha^{-1} produces cobs without cornhusk heaviest weight at harvest in Table 5.

Table 5: The average weight of cobs without cornhusk (g) at harvest

Treatment:	Doze of Fertilizer : (ton ha^{-1})		
	5 (D1)	10 (D2)	5 (D1)
Type of fertilizer:			
Blotong (B1)	34.00 a	46.00 ab	56.67 b
Blotong+EM4 (B2)	76.00 c	90.67 cd	102.00 de
Bokashi Blotong (B3)	118.00 ef	160.67 g	134.00 f
HSD 0.05 = 16.85			

Description: The numbers in the same column followed by the same letter do not differ on the real level 0.05

Based on the description it can be seen that the *bokashi blotong* have the ability to provide the optimal nutrients in the soil that is used as a food ingredient for growth and production. This is in line with Djanuar and Justika (1985), states that if the macro and micro nutrients available to the plants enough, the process of forming and running a reshuffle in plant cells rapidly in actively growing plants, resulting in the formation of cells and tissues also characterized by a rapid increase plant height, leaf number and flower and fruit formation.

Treatment *blotong*+EM4 (B2) showed different effects are not apparent with treatment *blotong* (B1). This is presumably due to the use of *blotong*+EM4 can meet nutrient requirements in sufficient quantity, and soil fertility incorporating organic inputs into the soil (Agyeman *et al.*, 2012), which organic fertilizers can also improve the physical and biological conditions of the soil as *blotong* contains EM4+ C/N is higher than with other treatments. This is presumably because the ingredients used are fresh. Organic materials that undergo the composting process and a good organic fertilizer has a ratio of stable C/N between 10/1 to 22/1, the ratio C/N is high on the final product showed microorganisms will actively utilize nitrogen to form proteins, when the ratio C/N is low then the nitrogen will be lost through volatilization ammonium (Sutanto, 2003).

Test results HSD α0.05 indicates that treatment of the interaction between B3 and D2 yield baby corn production the highest. Thus, the *blotong* with bokashi fertilizer dose of 10 ton ha^{-1} baby corn production were highest at the end of the study conducted in Table 6.

Table 6: Average Production (ton ha^{-1}) at harvest

Treatment:	Doze of Fertilizer : (ton ha^{-1})		
	5 (D1)	10 (D2)	5 (D1)
Type of fertilizer:			
Blotong (B1)	0.8 a	1.11 ab	1.42 bc
Blotong+EM4 (B2)	1.71 cd	1.99 de	2.27 fg
Bokashi Blotong (B3)	2.74 g	4.41 i	3.52 h
HSD 0.05 = 16.85			

Description: The numbers in the same column followed by the same letter do not differ on the real level 0.05

Optimal fertilization efficiency is the fertilizer should be given in sufficient quantities of plants, not too much and not too little. Giving too much will result in soil solution is too thick so it can cause toxicity in plants, if slightly; the effect is not visible (Rinsema, 1986).

Interaction treatment *bokashi blotong* (B3) with a dose of 10 ton ha^{-1} gives a significant influence on the production of plant, cob weight with cornhusk and without cornhusk and production are converted ton ha^{-1}. This is because the dose and *bokashi blotong* (B3) provide nutrients in optimal condition under conditions of high pH and low soil organic matter which can contribute to reduce the supply of micronutrients (Diaz and Mueller, 2011), so by giving *bokashi blotong* adding nutrients that contribute to metabolism in plants progressing well. While Gaswono (1983), states that the macro and micro nutrients can spur the growth and development of corn plants, which embodies the pattern of farming systems that have high productivity.

Results Analysis of variance showed that the interaction effect dose management *blotong* no significant effect on plant height, number of leaves, stem diameter and length of cobs and cobs. It is alleged that the management of *blotong*, dose should be influenced by biotic and a biotic factors. Interaction with less dose *blotong* management, significantly affect the cornhusk cob, cob weight without cornhusk and production are converted into ton ha^{-1}, this is because the growing media has a high nutrient content and can increase productivity at the plant.

IV. CONCLUSION

Based on data analysis and discussion of the main thrust of this research can be concluded. *Bokashi blotong* give the best effect compared with the *blotong* and the *blotong*+EM4 for all parameters observations. Dose of 15 ton ha^{-1}, the *bokashi blotong* give the best effect on the vegetative growth of baby corn is plant height 113.00 cm, number of leaves 8 pieces and stem diameter 6.2 cm. Interaction between *bokashi blotong* a dose of 10 ton ha^{-1} gives the best effect on the growth and production of baby corn that yields as much as 4.41 ton ha^{-1}. To cultivate baby corn suggested using *bokashi blotong* by 10 ton ha^{-1}, and need further research to determine the level of fertilization management *blotong* most optimal and efficient for growth and crop production in the achievement of sustainable organic agriculture.

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