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Effects of granular organic fertilizers on the growth and yield of pak choi and rice cv. Phitsanulok 60-2

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Abstract

This study was conducted to determine the effect of granular organic fertilizers on growth and yield of pak choi and rice cv. Phitsanulok 60-2. The study was divided into two experiments. The first experiment was to investigate the type of organic fertilizers on yield of pak choi. Manure, bioextract water, granular organic fertilizer and granular organic fertilizer mixed with bioextract water were applied to pak choi every four days. Pak choi that received granular organic fertilizer mixed with bioextract water showed the highest growth and yield. The second experiment was to compare granular organic fertilizer and the agent acted as soil amendment (VD 100[®]) on the growth and yield of rice cv. Phitsanulok 60-2. Treatments consisted of chemical fertilizer, granular organic fertilizer and chemical fertilizer, VD 100[®] and chemical fertilizer and no fertilizer as control. Results revealed that the application of VD 100[®] did not increase growth of rice. Rice grown with granular organic fertilizer plus chemical fertilizer showed the highest growth and yield.

Keywords: granular organic fertilizer; pak choi; rice

Introduction

Organic fertilizer is an effective agent for improving soil quality in the long term. In addition, organic fertilizers from waste product reduce the cost of agricultural production (Havlin et al., 2005). There are many types of organic fertilizer in Thailand such as manure, compost, bioextract water, granular organic fertilizer. Each type has a different form and convenience in usage. Granular organic fertilizer mostly compost from manure, compost and soil pressed into pellets. In addition, farmers may add an agent used as a soil amendment to rice field. Producers claim that the agent can enhance the fertilizer use efficiency by adsorbing fertilizer and then slow releasing to plant. The objective of this study was to compare the effect of granular organic fertilizers on growth and yield of pak choi and rice var. Phitsanulok 60-2 to different types of organic fertilizer and to agent acted as soil amendment.

Materials and Methods

The study comprised two experiments. The first experiment was to investigate the type of organic fertilizer on yield of pak choi. A completely randomized design with four treatments and four replications was employed. Manure (buffalo dung), bioextract water from fish meal (1.25 mL/L), granular organic fertilizer (80 g/pot) and granular organic fertilizer mixed with bioextract water were applied to pak choi every four days after 15 days of sowing. Plant height and weight (5 plants) were recorded at 30 and 45 days after sowing.

The second experiment was to compare granular organic fertilizer and agent acted as soil amendment (VD 100[®]) on growth and yield of rice cv. Phitsanulok 60-2. The design of experiment was completely randomized with four treatments and four replications. Treatments consisted of chemical fertilizer at the rate recommended by the Department of Agriculture, 135 kg/rai of granular organic fertilizer and chemical fertilizer, 19 kg/rai of VD 100[®] and chemical fertilizer and no fertilizer as control. Twenty seedling of rice were transplanted in 50 cm diameter pot filled with paddy soil. Plant height, yield and yield components were recorded.

Results and Discussion

Pak choi that received granular organic fertilizer (GOF) with and without bioextract water showed the highest height at 30 and 45 days after sowing. The GOF application gave the highest fresh weight of pak choi at 30 and 45 days after sowing while manure and bioextract water showed low weight of pak choi (Table 1) because the quantity of plant nutrient in GOF are highest than bioextract water and manure. Bioextract water from fish meal had total N, P and K at 1.07, 0.006 and 0.67 % respectively (Kaewtubtim, 2008) while the buffalo dung contained N, P and K at 1.27, 0.23 and 0.22 % respectively (Department of Agriculture, 2005). The GOF had the highest level of N, P and K (1.57, 2.09 and 1.28 %). The growth rate of pak choi was low due to the fertility of soil. It can be inferred that plant obtained the nutrient from the fertilizer. We did the same experiment with high soil fertility. The results showed the similarity trend with higher height and weight but no significant difference.

Table 1: Effect of type of organic fertilizer on height and fresh weight of Pak choi at 30 and 45 days after sowing

Fertilizer	Height (cm)		Fresh weight (g.)	
	30 days	45 days	30 days	45 days
Manure (buffalo dung)	10.12 c ¹	19.95 b	18.50 b	77.25 c
bioextract fertilizer	12.02 b	21.22 b	19.75 b	88.00 c
Granular organic fertilizer	15.75 a	25.27 a	23.50 b	135.25 b
Granular organic fertilizer with bioextract water	16.76 a	25.56 a	35.25 a	176.25 a
F-test	**	**	**	**

¹ Means with the same letter within column are not significantly different at $P \leq 0.05$ by DMRT

The application of agent acted as soil amendment showed no significant effect on the growth of rice. Plant height in all treatments was not different at 15 days after transplanting. Rice with GOF plus chemical fertilizer showed the highest height until harvest (Table 2). The height was significant lower in the unfertilized treatment. The application of VD 100[®] showed lower plant height than that of the chemical fertilizer but had the higher yield and yield component than chemical fertilizer (Table 3). The GOF plus chemical fertilizer gave the highest yield and yield component. Jogloy et al. (2006) reported that the application of animal manure plus chemical fertilizer gave the highest chlorophyll in *Helianthus tuberosus* L. Xu et al. (2008) found that the organic manure application with chemical fertilizers increased the yield more than chemical fertilizers because it increased nitrogen use efficiency of rice. The application of VD 100[®] had no effect on growth and yield of rice. Jothityangkoon et al. (2003) found that the application of enhancing agent for fertilizer use efficiency (socon f-1[®]) did not affect growth and yield of soybean.

Table 2: Effect of fertilizer on height of rice cv. Phitsanulok 60-2

Fertilizer	Height (cm)		
	15 days	60 days	110 days
Control	9.23	45.53 c ¹	74.64 d
Chemical fertilizer	9.24	50.57 b	88.19 b
GOF with chemical fertilizer	9.24	51.82 a	89.91 a
VD 100 with chemical fertilizer	9.23	50.69 b	87.74 c
F-test	ns	**	**

¹ Means with the same letter within column are not significantly different at $P \leq 0.05$ by DMRT

Table 3: Effect of fertilizer on yield and yield component of rice cv. Phitsanulok 60-2

Fertilizer	No. of tillers/plant	No. of panicles/plant	Seed weight/pot	1,000 grains weight (g.)
Control	5.77 d ¹	5.61 d	392.03 d	23.40 c
Chemical fertilizer	7.10 c	7.01 c	400.46 c	24.56 b
GOF with chemical fertilizer	8.88 a	8.60 a	538.23 a	25.76 a
VD 100 with chemical fertilizer	7.63 b	7.53 b	452.23 b	25.56 a
F-test	**	**	**	**

¹ Means with the same letter within column are not significantly different at $P \leq 0.05$ by DMRT

Conclusions

Granular organic fertilizers with bioextract water gave pak choi the highest growth and yield. Granular organic fertilizer with chemical fertilizer increased the yield and yield component of rice. The application of VD 100[®] had no effect on the growth and yield of rice.

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