

Bio-fertilizer from Agricultural residue to Pathum Thani 1 Rice Production

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Abstract

The objective of this research was to study the Pathum Thani 1 Rice production using prepared bio-fertilizers. Two bio-fertilizers, formula 1 and formula 2 were prepared from local agricultural residues; leaves and twigs of *Sananea saman Merr*, leaves and twigs of *Sesbania aculeate*, rice straw, husk and duck's feces, *Eichhornia crassipes* (Mart.) Solms, mixed leaves from mango, *Morinda citrifolia* Linn, *Erythrina indica*, grass and hen's feces. The production of Pathum Thani 1 rice was monitored by the comparison of the total weight of 1,000 grain rice, total average production per treatment and total average production per 1 rai. The production of Pathum Thani 1 rice results found that the total weight of 1,000 grain rice was investigated that the third treatment (derived from the mixture of the formula 1 of the bio-fertilizer and one-fourth of chemical fertilizer) has the highest weight average, then following by the first and second treatment. Moreover, The total average production per treatment, the sixth treatment (derived from the mixture of the formula 2 of the bio-fertilizer and three-fourth of chemical fertilizer) gave the highest amount of the production, then following by the fifth and third treatment. In addition, the total average production per 1 rai, the sixth treatment (derived from the mixture of the formula 2 of the bio-fertilizer and three-fourth of chemical fertilizer) gave the highest amount of the production, then following by the fifth and third treatment.

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Introduction

Rice is the main source of food for Thai people as well as other neighbor countries namely Laos, Cambodia, Vietnam, Myanmar and China. Farmers in the past often fertilized rice sprouts with natural or organic fertilizer. After the replacement of chemical fertilizer which contained more nutrients for rice in following periods, the growth and the products had increased. However, the use of chemical fertilizer can cause bad effects to environment for example, the lack of natural nutrients in the soil which damages the soil quality. Farmers often solve the problem by adding more chemical fertilizer which produced more expenses in farming. Moreover, in chemical fertilizers also contain heavy metals which are going to be stored in the soil and water and spoil the quality of it. Therefore, researcher is interested in using the left-over of farming materials and plants in the local area to develop bio-fertilizer which can provide enough nutrients for Pathum Thani 1 Rice. (*Oryza sativa* L.; GRAMINEAE)



Pathum Thani 1 Rice is very popular in Singburi Province. It is fragrant rice, withstands light and its height is about 104-133 centimeters, smooth and almost sticky when cooked. The rice seeds look similar to Jasmine Rice and can withstand brown plant louses and leaf blight disease. As a result, researcher wants to observe the products of this rice which are fertilized by the developed bio-fertilizer.

Objective

- 1.To develop bio-fertilizer from local agricultural residues for Pathum-Thani 1 Rice.
- 2.To study the increasement of Pathum Thani 1 Rice after fertilized by the bio-fertilized.

Materials and Methods

There are two formulas. Both are made from various parts of local plants.

1. Bio-Fertilizer Formula 1

Materials

1. Leaves and twigs of *Sananea saman* Merr 14 Kilograms
2. Leaves and twigs of *Sesbamia aculeate* 14 Kilograms
3. Rice straw 16 Kilograms
4. Paddy husks 16 Kilograms
5. Duck's feces 16 Kilograms
6. Urea Fertilizer 120 grams
7. p.d.1 Suggested rate based
8. p.d.12 Suggested rate based
9. Pure Water 1.2 liters

Methods

1. Mix animal feces and other plants from number 1-5 together.
2. Dissolve 1 in 1.2 liters of water. Stir for 10 minutes then pour into the mixing materials from number 1) until the percentage of moisture reaches 60. (Testing by gripping the mix ingredients, it will merge together into a ball but not sticky. When it is dropped from the height about 1 meter, the ball will break but still has the fingerprint on its surface.)
3. Set the fertilizer at the height about 15-30 centimeters. Cover it with canvas or other material that is capable. Hays and piles of leaves can be used in order to keep fertilizer damp.
4. Flip the pile back and forth and water it every 10 days until the materials decompose into natural fertilizer.
5. Add p.d.12 when the materials are fully decomposed into fertilizer.

2. Bio-Fertilizer Formula 2

Materials

1. *Eichhornia crassipes*(Mart.)Solm leaves 8 Kilograms
2. Mango leaves, *Sananea saman* Merr leaves, *Morinda Critifolia* Linn. and *Erythrina indica* leaves 16 Kilograms
3. Grass 8 Kilograms
4. Rice straw 8 Kilograms
5. Fresh husks 8 Kilograms
6. Paddy husks 8 Kilograms
7. Hen's feces 8 Kilograms
8. Brans 8 Kilograms
9. Biofermentation 3 tables with molasses 3 tables dissolve in water 20 liters
10. p.d.12 Suggested rate based

Methods

1. Mix materials number 1-8 together.
2. Water the biofermentation into the mix until the percentage of moisture reaches 60. Set the fertilizer at the height about 15-30 centimeters. Cover it with canvas or other materials e.g. hays or leaves in order to keep the fertilizer damp.
3. Flip the pile back and forth and water it every 10 days until all materials are decompose into natural fertilizer.
4. When materials are decompose into fertilizer, add p.d.12

3. The Experiment of the Bio-fertilizer in the rice fields.

We did the experiment with 10 treatment, 3 times each

1. 1st treatment with bio-fertilizer formula 1
2. 2nd treatment with bio-fertilizer formula 2
3. 3rd treatment with bio-fertilizer formula 1 and $\frac{1}{4}$ of chemical-fertilizer
4. 4th treatment with bio-fertilizer formula 2 and $\frac{1}{4}$ of chemical-fertilizer
5. 5th treatment with bio-fertilizer formula 1 and $\frac{3}{4}$ of chemical-fertilizer
6. 6th treatment with bio-fertilizer formula 2 and $\frac{3}{4}$ of chemical-fertilizer
7. 7th treatment with bio-fertilizer formula 1 and $\frac{1}{2}$ of chemical-fertilizer
8. 8th treatment with bio-fertilizer formula 2 and $\frac{1}{2}$ of chemical-fertilizer
9. 9th treatment with chemical-fertilizer
10. 10th treatment with no fertilizer

Results

treatment	Weight of Rice 1,000 seeds (grams)	Average of products/ treatment (grams)	Average of products/Plantation (1 rai; kilograms)
bio-fertilizer formula 1	28.2351	4274.1400	341.9310
bio-fertilizer formula 2	27.8885	4255.6667	340.4530
Bio-fertilizer formula 1+ Chemical-fertilizer $\frac{1}{4}$	29.9280	4438.5100	355.0810
Bio-fertilizer formula 2 + chemical-fertilizer $\frac{1}{4}$	27.5009	4025.0770	322.0060
Bio-fertilizer formula 1 + chemical-fertilizer $\frac{3}{4}$	27.0264	5770.4970	461.4000
Bio-fertilizer formula 2 + chemical-fertilizer $\frac{3}{4}$	27.8279	5875.6800	470.0540
Bio-fertilizer formula 1+ Chemical- fertilizer $\frac{1}{2}$	26.6646	3858.6100	308.6890
Bio-fertilizer formula 2 + chemical- fertilizer $\frac{1}{2}$	26.7475	4356.8030	348.5440
Chemical-fertilizer	25.8885	4056.6500	324.5320
No fertilizer	27.2472	3658.8770	292.7100

Conclusion and Discussion

1. In scale of 1,000 rice seeds; third treatment (Bio-fertilizer formula 1 + $\frac{1}{4}$ of chemical-fertilizer) weighs the most, first treatment (Bio-fertilizer formula 1) weighs secondly and second treatment (Bio-fertilizer formula 2) weighs thirdly.
2. Average of products/ treatment ; Sixth treatment (Bio-fertilizer formula 2 + $\frac{3}{4}$ of chemical-fertilizer) gives the largest amount of average products while fifth treatment (bio-fertilizer formula 1 + $\frac{3}{4}$ of chemical-fertilizer) and third treatment (bio-fertilizer formula 1 + $\frac{1}{4}$ of chemical fertilizer) gives lesser product in orderly.
3. Average of products/Plantation(1 rai) ;Sixth treatment (Bio-fertilizer formula 2 + $\frac{3}{4}$ of chemical-fertilizer) gives the largest amount of products per plantation while fifth treatment (bio-fertilizer formula 1 + $\frac{3}{4}$ of chemical-fertilizer) and third treatment

(bio-fertilizer formula 1 + $\frac{1}{4}$ of chemical fertilizer) gives lesser products per plantation in orderly.

From the research's result, we found that bio-fertilizer in both formula have enough required nutrients for Pathum Thani 1 rice. They are high in Nitrogen because the materials that are used are also high in Nitrogen. Moreover, with the help of p.d.12, it numbers the bacteria that can also help increasing Nitrogen. This Nitrogen is good for making hormone that can speed up the growth of root and body of the plants. It is also help increasing the quality of dissolving nutrient in plants. As we used both formulas of fertilizer in rice paddles, the products and the weight of 1,000 rice seeds are higher than the treatment that used only chemical-fertilizer. However, according to this research, in order to increase the amount of products per plantation we should add $\frac{1}{4}$ - $\frac{3}{4}$ of chemical-fertilizer since the experiment plantations had long been used with chemical-fertilizer. So it is better to add chemical-fertilizer together with bio-fertilizer at first then gradually decrease chemical-fertilizer until we can eventually use only bio-fertilizer.

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References

- Boussiba, S. 1995. *Anabaena azollae* as a Nitrogen Biofertilizer. Microalgae biotechnology laboratory, Jacob Blaustein institute for Desert Research Ben Gurion University, Sede Boker, Israel.
- Fu, F. X. and P. R. Bell. 2003. Factor affecting N₂-fixation by the cyanobacterium *Trichodesmium* SP. Microbiology ecology. 45:203-209.
- Irisarri, P, S. Gonnet. and J. Monza. 2001. Cyanobacteria in Uruguayan rice fields : diversity ,nitrogen fixing ability and tolerance to hericides and combined nitrogen. J. Biotech. 91:95-103.
- Padhi, H, B. Rath and S. P. Adhikary. 1998. Tolerance of N₂-fixing cyanobacteria to NaCl. Biologia-Plantarum. Czech Republic.