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A Study and Development of Local Materials to Improve Quality of Oyster Mushroom Culture Materials, Panom Samran Sub-district, Khu Mueang District, Buriram Province

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This study aimed to investigate: 1) growth performance of Oyster Mushroom culture by different specific materials; 2) an amount of yields based on a number of cropping; and 3) to transfer the body of knowledge on oyster mushroom culture to the community. Completely Randomize Design (CRD) was used for the experimental plan. It comprised A treatments and 50 replications each i.e. 100% Para rubber saw dust (T1); Para rubber saw dust plus raw hush, 50:50% (T2); Para rubber saw dust plus sugarcane pulse, 50:50% (T3); and Para rubber sawdust plus rice straw, 50:50% (T4). Data were recorded by fresh weight measuring (gram), dry weight measuring (gram), width (cm.), and a number of flowers. Time span for flower giving was one month or 30 days. At the end of the experiment, analyzed variance and compared and average mean score of the treatments by Duncan's New Multiple Range Test (DMRT) and analyzed by the Statistical Package Program. Results of the four experiments showed that there was statistically significant difference ($P \leq 0.05$) in terms of fresh weight of treatment 1 (3.29^{a} grams), followed by treatment 3 (2.31^{b} grams). A highest value of dry weight was in treatment 1 (0.37^{a} grams), followed by treatment 3 (0.31^{ab} grams). A highest width of a flower cab was found in treatment 2 (10.85^{a} cm), followed by treatment 3 (10.47a cm). A highest number of flowers was found in treatment 1 (7.93^{a}), followed by treatment 3 (7.55^{a}). This denoted that using a specific material of chopped sugar cane pulse could well replace a specific material of 100% Para rubber saw dust. This was because sugar cane pulse had a chemical property of cellulose tissue beneficial to mushroom culture (Na Phuket, 2017). Thus, using sugar cane pulse as by-product material tends to be an alternative for interested farmers in sustainable mushroom culture in accordance with the philosophy of sufficiency economy.
Regarding results of the experiment on the basis of fresh weight, dry weight, width, and a number of oyster mushrooms (flowers) within a flower giving period (1 month), it was found that a highest fresh weight was in treatment 1 (3.29^{a} grams), followed by treatment 3 (2.31^{b} grams), treatment 4 (1.92^{bc} grams) and treatment 2 (1.74^{c} grams), respectively. Based on a highest dry weight, it was found in treatment 1 (0.37a gram), followed by treatment 3 (0.31ab gram), treatment 4 (0.07^{b} gram), and treatment 2 (0.26^{b} gram), respectively.
In terms of a highest width of flown cap, it was found in treatment 2 (10.85^{a} cm.), followed by treatment 3 (10.47^{a} cm.), treatment 1 (8.36a cm.), and treatment 4 (7.72b cm.), respectively. On the basis of a highest number of flowers (oyster mushrooms), it was found in treatment 1

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(7.93[a]), followed by treatment 3 97.55[a]), treatment 2 97.11[ab]), and treatment 4 (5.88[b]), respectively.

Keywords: investigation, oyster mushroom, a specific material

Introduction

Mushroom is a cheap an tasty food with high nutritive value, particularly on protein (2-5%) and 30-40 percent when dried (Srisa-ard, 2013). It is a food group which is important to the body. Infact, protein helps enhance body growth and important protein sources are from animal meat and animal meat products such as milk, cheese, and egg which are inexpensive while mushroom price is lower than this. Protein is mainly found in dry-seed bean or nut (80-90% water, 1% food refuse, and minerals essential to the body such as iron, phosphorus, and calcium and its mineral salt is higher than that of in vegetables twice. It can be considered that mushroom is valuable in nutrition which can replace animal meat but it has no cholesterol dangerous to the blood circulation system. Thus, mushroom is appropriate with liver, kidney, heart, and high blood pressure disease patients (Srisa-art, 2013). Oyster mushroom is a local mushroom having a high amount of protein and it is beneficial to the body. Oyster mushroom can be cultured in every region and season in Thailand. It has medicinal properties assisting consumers to have a strong body. Besides, it can ward-off cold fever and help the blood circulation system as well as gastropathy (Wongkriangkrai, 2000).

Nowadays Para rubber saw dust is popular to be used as a mushroom culture material but it is scarce and expensive making high production cost and decreased profits. Thailand has a lot of agricultural by-products having nutritive value e.g. tamarind saw dust, rice straw, sugar cane pulse, mungbean husk, water hyacinth, banana tree, various husks, materials from every part of maize, and an old mushroom culture lump which has been used. Baan Samrong, Pornsamran sub-district, Khu Mueand district, Buriram province. Most people there were engaged in rice and sugar cane growing. There are agricultural by-products in the field such as rice straw and sugar cane pulse after harvest. These agricultural by-products can be utilized as mushroom culture materials and help decrease production costs.

Therefore, the researcher had an idea to conduct a study and development of local material to improve quality of oyster mushroom culture materials at Baan Samran. Khu Mueang district, Buriram province. This could be done by using local materials to replace Para rubber sawdust which was expensive. These local materials included sugar cane pulse, rice straw, and raw husk used to replace Para rubber saw dust. It was expected to increase agricultural yields

to farmers. Besides, it could help decrease raw material cost but increase incomes top-up and elevate a level of quality of mushroom culture standards.

Objectives: Specifically this study aimed to:

1. Explore growth performance of oyster mushroom cultured by different culture materials;
2. Investigate an amount of yields from a cropping number of oyster mushroom; and
3. Transfer the body of knowledge on oyster mushroom culture to the community.

Materials and Methods

Experimental planning

Completely Randomized Design (CRD) was employed. There were 4 experiments with 50 replications each (200 experimental units). (T1) = 100% Para rubber saw dust, (T2) = para rubber saw dust + raw husk (50:50%), (T3) = Para rubber saw dust + sugar cane (50:50%), and (T4) = Para rubber saw dust + rice straw (50:50%).

Experimental step

Produce mushroom lumps based on the formula as mentioned. After that it was steamed and later on, mushroom picking, mushroom spawn the mushroom lumps. Recorded data on yields i.e. fresh weight, dry weight, width, and a number of flowers (mushrooms). Recorded growth performance every days throughout the time, since the flowers opened for 1 month. Collected mushroom yields every day 4 weeks after the flowers opened. Every parts of the oyster mushroom were weighed for finding fresh weight. Before weighing it, materials attached to the oyster mushroom must be taken out. The records were kept for 4 weeks.

Data analysis

Variance was analyzed by using ANOVA based on fresh weight, dry weight, width, and a number of flowers. Compared the difference between treatments or an average mean score by using DMRT method.

Results

Table 1. Oyster mushroom yields based on fresh weight for the period of 30 days

Experimental methods	Fresh weight (Gram)
T1 : 100% Para rubber saw dust	3.29^{a}
T2 : Para rubber saw dust + raw hush	1.74^{c}
T3 : Para rubber saw dust + sugar cane pulse	2.31^{b}
T4 : Para rubber saw dust + rice straw	1.92^{bc}
F - Test	2.13
% CV	41.52

According to table 1, it was found that a highest fresh weight was found in Treatment 1 (3.29^{a} rams), followed by Treatment 3 (2.31^{b} grams), Treatment 4 (1.92^{bc} grams), and Treatment 4 (1.74^{c} grams), respectively.

Table 2. Oyster mushroom yields based on dry weight in the period of 31 days

Experimental methods	Dry weight (Gram)
T1 : Para rubber saw dust	0.37^{a}
T2 : Para rubber saw dust + raw hush	0.26^{b}
T3 : Para rubber saw dust + sugar cane pulse	0.31^{ab}
T4 : Para rubber saw dust + rice straw	0.27^{b}
F - Test	4.43
% CV	41.93

According to Table 2, it was found that a highest dry weight was found in Treatment 1 (0.37^{a} gram), followed by Treatment 3 (0.31^{ab} gram), Treatment 4 (0.27^{b} gram), and Treatment 2 (0.26^{b} gram), respectively.

Table 3. Oyster mushroom yields based on width of the flower cap in the period of 31 days

Experimental methods	Dry weight (Gram)
T1 : Para rubber saw dust	8.36^{b}
T2 : Para rubber saw dust + raw hush	10.85^{a}
T3 : Para rubber saw dust + sugar cane pulse	10.47^{a}
T4 : Para rubber saw dust + rice straw	7.72^{b}
F - Test	4.71
% CV	22.16

According to Table 3, a highest with of the flower cap was found in Treatment 2 (10.85^{a} cm), followed by Treatment 3 (10.47^{a} cm), Treatment 1 (8.36^{a} cm), and Treatment 4 (7.72b cm).

Table 4. Oyster mushroom yields based on a number of flowers

Experimental methods	Dry weight (Gram)
T1 : Para rubber saw dust	7.93^{a}
T2 : Para rubber saw dust + raw hush	7.11^{ab}
T3 : Para rubber saw dust + sugar cane pulse	7.55^{a}
T4 : Para rubber saw dust + rice straw	5.88^{b}
F - Test	2.83
% CV	39.52

According to Table 4, a highest number of flowers was found in Treatment 1 (7.93^{a} flowers), followed by Treatment 3 (7.55^{a} flowers), Treatment 2 (7.11^{ab} flowers), and (5.88^{b} flowers).

Discussion

According the experiment on fresh weight, it was found that a highest fresh weight of oyster mushroom was found in Treatment 1 (3.29^{a} grams), followed by Treatment 3 (2.31^{b} grams). This conformed to a study of Sri-on *et al.,* 2000) which reported that nitrogen is important to protein synthesis to absorb in the organic form; meanwhile, carbon is used for growth performance particularly on the construction of cells which are structures of mushroom and it is food of the mushroom. This carbon element can be found in coconut fine bits, rice straw, and Para rubber saw dust. For rice straw, 1 lump of mushroom spawn can produce oyster mushroom for 200 grams on average whereas, for Para rubber saw dust, 1 lump of mushroom spawn can produce oyster mushroom for 300 grams.

Regarding dry weight, a highest dry weight of oyster mushroom was found in Treatment 1 (0.37^{a} gram), followed by Treatment 3 (0.31^{ab} gram). This conformed to Sudkaeo and Hutapat (2009) who revealed in a mushroom culture book that important nutrient need for growth performance of mushroom are carbon, nitrogen, and vitamins. Each of these is essential is each growth interval. Importance of these nutrients directly concern with the selection of materials to be used in mushroom culture. Mushroom culture materials mostly found art rice straw, Para rubber saw dust, sugar cane pulse, corn stubble, mung bean husk, hay, etc. All of these have an effect on fresh and dry weight of oyster mushroom.

On the basis of the flower cab, a highest flower cab value was found in Treatment 2 (10.88[a] grams) and followed by Treatment 39 10.47[a] grams). This conformed to a study of Pongthornpruek and Kraiwuttinan (2016) which found that a number of flowers, flower width, and length of flower-stalk are different. That is, a few flower and length of flower-stalk. For culture materials, saw dust mixed with chopped rice straw has an effect on a highest number of flowers (11.75 flowers on average). Meanwhile, saw dust mixed with husk has an effect on a highest weight of mushroom (118.89 grams) and husk mixed with coconut fine bits has an effect on a longest flower-stalk (7.9 cm).

Conclusion

This study comprised 4 treatments with 50 replications each: (T1) = 100% Para rubber saw dust, (T2) = Para rubber saw dust + raw husk, (T3) = Para rubber saw dust + sugar cane pulse, (T4) = Para rubber saw dust + rice straw. It was found that there was statically significant difference in terms of fresh weight, dry weight, width of flower cap, and a number of flowers (mushrooms). For result of the experiment 1, it was found that (T1) gave a highest yield based on fresh weight, dry weight, width of flower cap and a number of flowers (mushrooms) and this was followed by (T3). This implied that the farmers were able to create a formula (Para rubber saw dust + sugar cane pulse (50:50%) which give a highest oyster mushroom yields in terms of fresh weight, dry weight, width of a flower cap, and a number of flowers (mushrooms). This formula could replace the 100% Para rubber saw dust formula and reduce production costs.

Suggestions

1. According to results of the study, it can be topped-up by changing other local raw materials such as various kinds of beans, cassava peel, rain tree bark, mango tree, lead tree, giant sensitive plant, etc.
2. It can be topped-up by investigating duration of mushroom lump culture from using raw materials in different culture, etc.

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