CULTIVATION OF EDIBLE MUSHROOM ON PADDY STRAW AND BANANA LEAVES SUBSTRATES

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Abstract

Volvariella volvacea (rice straw mushrooms) is one of the best edible mushrooms which can be grown at warmer climates of the tropical regions. Tissue culture for rice straw mushrooms were cultured on potato dextrose agar (PDA) media. After one week, the mycelia were sub-cultured on (PDA) media with bottles. Spawn of *V. volvacea* were produced using sorghum grains with bottles. Bags spawn of *V. volvacea* were produced using paddy straw and banana leaves. Finally, the mushrooms were cultured on bed culture with two different substrates paddy straw and banana leaves respectively. In this study the paddy straw substrates were shown the highest growth of fruit length 7.36 cm, diameter 4.36 cm, number of fruits 45 and production of fruiting weight 795.5 g. The banana leaves substrates were shown fruit length 7.28 cm, diameter 3.7 cm, number of fruits 37 and production of fruiting weight 548.2 g. Among the two different substrates, paddy straw substrates are the best for cultivation of paddy straw mushroom.

Keywords- Edible mushrooms

INTRODUCTION

Edible mushrooms like *Volvariella volvacea* have attracted much attention as source of food and medicine over the years. The paddy straw mushroom is a preferred type of mushroom by most consumers because of its aroma and taste.

Mushroom which is a fleshy saprophyte fungus are found growing on damp rotten log of wood trunk of trees, decaying organic matter and in damp soil rich in organic substances. Edible mushrooms are highly nutritious and can be compared with eggs, milk and meat. The content of essential amino acids in mushroom is high and close to the need of the human body. Mushroom is easily digestible and it has no cholesterol content.

Mushroom is known to mankind since time immemorial. During the centuries that followed and throughout the middle ages, the Greeks and the Romans, most especially, considered mushrooms as special food. In fact, mushrooms have existed even long before man appeared on earth i.e., about 130 million years ago (Verma, 2002).

Large quantities of renewable lignocellulosic residues are generated every year as a result of extensive agricultural practices. Mushrooms, on the other hand, have the ability to transform nutritionally useless waste into highly acceptable nutritious food. Thus, cultivation of edible mushroom could be an economically viable proposition for the bio-conversion of lignocellulosic wastes. (Chang, 1978).

In the developing countries like India, most of the people do not meet the balanced diet. This may be mainly because of uncontrolled population, poverty and inadequate food for humans. To overcome this problem, low cost with highly nutritive food is needed. Today mushrooms like *Volvariella volvacea* fulfill all this need. Generally, it is rich in protein, vitamins, fibre and minerals, which is easily digested and it has no cholesterol content. (Jonathan *et al*., 2010).

The aims of this study are to produce commercial spawn of *Volvariella volvacea* (Bull. Singer) by tissue culture, to produce chemical free edible mushrooms

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and to know the growth and yield of *Volvariella volvacea* (Bull.Singer) on paddy straw and banana leaves substrates.

MATERIALS AND METHODS

Selection of mushrooms for culture

Volvariella volvacea was selected for study because it is particularly common in our country. It is also mostly preferred by many consumers because of its aroma and taste.

Culture media preparation (Bram 2007)

Potato Dextrose Agar is the most commonly used medium for growing paddy straw mushroom. Two hundred grams peeled and sliced potato was boiled in one liter of distilled water till the tissues were softened. Potatoes were removed and the broths were kept as clear as possible. Water was boiled and dextrose and agar were added. Before sterilization, 10 ml of the medium were taken in culture tubes of 20 ml capacity for preparation of agar slants. The culture tubes were plugged with non-absorbent cotton and autoclaved at 121^{o}C for 20-30 minutes.

Procedure of mushroom tissue culture

A button stage young fruit body was freshly harvested and brought to the laboratory for tissue culture. The adhered dust particles were removed with the help of a cotton swab. The fruit body was held with a sterilized forceps and dipped in 70 % ethanol for 30 seconds to eliminate the microbes present on its surface. The fruit body was then cut longitudinally with a sterilized scalpel and tissue bits of approximately 3-5 mm were separated from the pileus-stipe junction (collar region). The bits were aseptically transferred on to pre-sterilized agar slants containing potato dextrose agar culture medium with the help of sterilized forceps. Test tubes were incubated in an incubator at 30-32°C for 6-7 days.

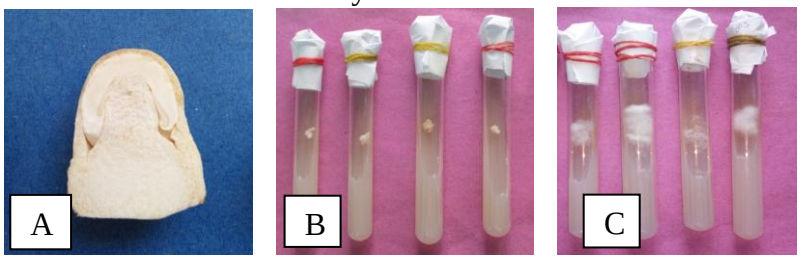

Figure 1. Tissue culture preparation for *Volvariella volvacea* (Bull.) Singer

A. Cross section of *Volvariella volvacea* (Bull.) Singer.
B. A starter tissue culture from a fresh mushroom is transferred on PDA slant
C. Growing mycelium on five days culture

Preparation of Mother spawn

Sorghum grains were used as the base material for multiplying the mycelium in the spawn bottles. Healthy and pesticide free grains were chosen for substrate purpose.

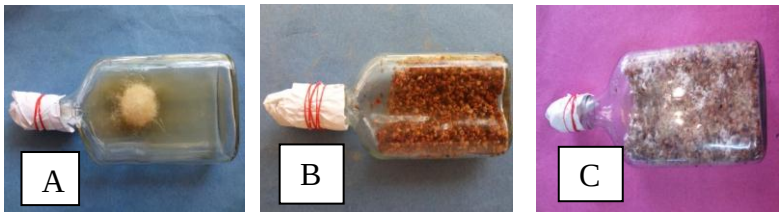

Figure 2. Mother spawn preparation for *Volvariella volvacea* (Bull.) Singer.

A. Mother cultures on PDA media
B. The mother cultures serve to inoculate the grain spawn cultures
C. Growth of mycelium in the grain spawn cultures

Preparation of commercial spawn with bags

The straw and banana leaves were chopped manually and soaked in water for 24 hours. The soaked materials were rinsed in pure water twice and drained with a sieve. Excess water was drained off. Five hundred gram each of the materials, chick pea bran and soft-wood sawdust were mixed up properly. The mixture substrates were prepared in equal proportions by weight. The two prepared substrates were separately packed into polythene bags (30x20 cm). The bags were sterilized by autoclave at 15 lb for 20 minutes. The bags were allowed to cool overnight. Using needle, about 5 g of *V. volvacea* mycelium were inoculated into the bags.

Figure 3. Preparation of commercial spawn with bags

A. The mother cultures serve to inoculate the spawn cultures in bags

B. Growth of mycelium in the bags spawn cultures

Preparation for bed culture and cultivation

Paddy straws and banana leaves were collected from Shaw-pin Village for the experiment. Thirty bundles of substrate about 50 kg dry weight were utilized in each bed of 90 cm x 55 cm x 15 cm (length x width x height). The tied bundles were soaked in clean and cold water for 3-4 hours. Two soaked bundles with their button ends on one side were placed length wise close to each other on the platform. This was the first layer were placed in east-west direction. Similarly in second layer, the first two bundles were placed in opposite north-south direction. The third layer was prepared over the second layer in east-west direction**.**

Two hundred grams spawn of *Volvariella volvacea* was used in each bed in the experiments. Fifty days old spawn bags were broken and the spawn cakes were split into number of spawn bits of thumb size each. After the first layer was prepared, spawn bits of thumb size were put on the four sides of the layer.

RESULTS

Growth parameter for paddy straw and banana leaves substrates.

Table 1. Growth characters of mushroom on paddy straw substrates

Harvesting days	Fruit length (cm)	diameter (cm)	Number of Fruit	Weight (g)
13	7.36	4.36	13	274.8
14	3.94	2.66	7	124.7
15	5.83	2.35	8	135.3
16	5.16	2.7	6	94.3
24	2.88	2.5	6	86.9
25	2.88	2.0	5	79.5
		Total	45	795.5

Table 2. Growth characters of mushroom on banana leaves substrates

Harvesting days	Fruit length (cm)	Diameter (cm)	Number of Fruit	Weight (g)
11	4.80	2.5	7	93.9
12	7.28	3.7	19	291.2
15	6.17	2.6	5	77.7
19	4.80	2.5	6	85.4
		Total	37	548.2

Figure 4. Growth character of mushroom from paddy straw substrates

A. Growing mushroom in paddy straw substrates
B. Harvesting mushroom from paddy straw substrates (First day)

Figure 5. Growth character of mushroom from banana leaves substrates

A. Growing mushroom in banana leaves substrates
B. Harvesting mushroom from banana leaves substrates (First day)

DISCUSSION AND CONCLUSION

Cultivation of mushroom using paddy straw substrates showed the best result on the number of fruiting body 45 and weight of fruiting body 795.5 g. Cultivation of mushroom using banana leaves substrates showed the number of fruiting body 37 and weight of fruiting body 548.2 g.

In the present investigation, the largest number of fruiting were found in paddy straw substrates at 13 days and in banana leaves substrates at 12 days but the earliest fruiting time was found in banana leaves substrates at 11 days.

Moreover, time duration for banana leaves substrates was 9 days. The largest time duration was found in paddy straw substrates at 13 days.

The two substrates were screened and all supported the growth of the mushroom through varying degrees. To confirm the report of (Tricita, 2005), the paddy straw was the traditional substrate for the cultivation of the mushroom and banana leaves substrate was equally good.

According to (Ukoima *et al.*, 2009) straw mushroom was cultivated on various farm wastes and reported that the highest yield of 345 g was recorded from palm fibre followed by 231 g from rice husk and 146 g from saw dust. Palm fibre was considered as the most suitable farm waste for growing *V. volvacea.*

Edible mushrooms have been cultivated for many years and it is expected that their production will increase further in the future, due to market demand. Edible fungi are primary agents of decomposition which are important in cycling a variety of elements such as carbon, nitrogen and oxygen.

The banana leave substrates as an agro-waste, could be used to produce the mushroom as much as the paddy straw could produce. It might be a way of reducing agro-waste in the environment first as reported by (Kuyper *et.al*., 2002) that the cultivation of *Volvariella volvacea* on local agricultural creates a way of reducing environmental pollution.

ACKNOWLEDGEMENTS

I would like to express my heartfelt thanks to Dr Mya Mya Ku, Professor and Head, Department of Botany, Banmaw University for allowing me to undertake this research work and for providing me the necessary facilities. Finally, I would like to express my heartfelt gratitude to my beloved parents for their financial support and continual encouragement throughout my life.

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