EFFECT OF PADDY STRAW SUBSTRATES ON THE GROWTH AND YIELD OF *PLEUROTUS OSTREATUS* (JACQ. EX. FR.) KUMMER (NGWE-HNIN-HMO)*

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Abstract

Mushroom is a crop which is cultivated in many countries using different agricultural wastes. This study was carried out to investigate the effects of paddy straw substrates on growth of *Pleurotus ostreatus* (Jacq. ex. Fr.) Kummer. The oyster mushroom, *P. ostreatus* (Jacq. ex. Fr.) Kummer was cultivated on paddy straw in polythene bags (containing 500 g paddy straw on dry weight basis per bag) using sorghum grain spawn. In this investigation, the substrate paddy straw yields a product average of 416g per bag. Therefore, it can be concluded that paddy straw is most suitable substrate for yield of oyster mushroom (Ngwe-Hnin-Hmo).

Keywords; Oyster mushroom *P. ostreatus*, paddy straw substrates

Introduction

Mushrooms are one kind of edible fungi belonging to the genus *Pleurotus* under the class Basidiomycetes. *Pleurotus ostreatus* mushroom have excellent flavor and taste. *Pleurotus* species are very popular and widely cultivated throughout the world mostly in Asia, Africa and Europe owing to their simple and low cost production technology and higher biological efficiency (Mane *et al.*, 2007).

Oyster mushroom cultivation has increased tremendously throughout the world because of their abilities to grow at a wide range of temperature and harvested all over the year (Amin *et al.*, 2007).

Oyster mushroom have the ability to excrete hydrolyzing and oxidizing enzymes which have capable of utilizing complex organic compounds that occurred agricultural wastes and industrial by-products with broad adaptability varied agro-climatic conditions (Jandaik *et al.*, 1995).

Oyster mushrooms are rich in proteins (30.5%), fat (2.3%), carbohydrates (57.7%), fiber (8.8%) and ash (9.7%) with 346 K (cal) energy value on 100 g dry weight basis; while vitamins such as thiamin (4.9 mg), riboflavin (4.8 mg) and niacin (108.6 mg), minerals like calcium (97 mg), phosphorus (475 mg), ferrous (8.6 mg) and sodium (60 mg) on 100 g dry weight basis, are also found present (Pandey and Ghosh, 1996).

The aim of the present study is to investigate the growth performance of edible mushroom on paddy straw substrates, to produce chemical free edible mushrooms and to know the importance of edible mushroom for human being.

Materials and Methods

The experiment was carried out at the Department of Botany, Yadanabon University. Specimen were collected from P.M.K Mushroom house, for tissue culture. Oyster mushrooms (*Pleurotus ostreatus*) are characterized by the rapidity of the mycelial growth and high saprophytic colonization activity on cellulosic substrates.

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* Third Prize (2023)

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Sterilization Procedure

In the laboratory, all of the apparatuses, equipment, metallic instruments, glassware and culture media were sterilized in the autoclave at 121°C about 1 hour at 1.5 kg/cm^2 pressure strictly for maintaining sterility. The culture room of the laboratory was cleaned by gently washing with detergent followed by 70% ethyl alcohol regularly. Before inoculation, laminar airflow cabinet was sterilized using ultra violet light for 30 minute keeping blower active. All inoculation measures were carried out in the laminar airflow cabinet to avoid contamination. The cabinet was exposed on the UV light for 30 minutes before use. All the instruments and equipment used were sterilized with alcohol before use.

Production of Oyster Mushroom (*Pleurotus ostreatus*)

Preparation of PDA Media

At first, 250 g potatoes were washed, peeled and sliced to prepare 1000 mL PDA media. Then peeled and sliced potatoes were boiled in water to make them soft and also filtered through a cheese cloth and further water was added to get 1000 mL media. After adding 18 g agar and 20 g dextrose, it was heated and stirred for about 45 minutes. Then 10 mL media was taken into each of test tube and mouths of the test tubes were plugged with cotton and brown paper. After that all the test tubes were sterilized in an autoclave for 20 minutes at 121°C and 1.5 kg/cm^2 and kept in slanting position for having maximum space for the organism in pure culture to proliferate.

Tissue Culture

To obtain pure culture, a small piece of tissue was collected from the fruiting body of mushroom, *Pleurotus ostreatus* and placed on the sterilized PDA medium under aseptic condition in a laminar air flow cabinet. It was then kept for 7-10 days in an incubator under 25°C for sufficient mycelial growth. These pure cultures were used for the entire experiment.

Preparation of Mother Spawn

Mother culture substrate was prepared by using sorghum grain. Sorghum grain were sieved and sun dried. The mother culture substrate was prepared by sorghum grain and wheat bran in 2:1 ratio with 0.1% calcium carbonate. Then it was mixed thoroughly with hands and maintained 55% moisture content by adding sufficient water. Then 200 g of mixture were placed into flat bottle. The neck of the bottles were plugged with cotton and covered with brown paper placing rubber band to hold it tightly in place. The flat bottles were sterilized for 1 hour at 121°C with 1.5 kg/cm^2 pressures in an autoclave and kept them for cooling. Then inoculums from pure culture were placed aseptically to the mother spawn packets. The packets (flat bottle) after inoculation were again plugged with cotton and were kept at 20-22°C for spawn run. The whole packet containing substrate became white due to fungal mycelia proliferation within 15-20 days and thus ready for spawning the substrate.

Preparation of Spawn Packets

Spawn packets using paddy straw, wheat bran and $CaCO_3$ were in ratio 69:30:1 respectively. The mixed substrates were filled into 10×12 inch polypropylene bag. The spawn packets preparation, sterilization, inoculation and incubation were done using the method described by Sarker *et al*., 2007. The weight of each spawn packet was 500 g. Moisture was measured by using the moisture meter and adjusted the moisture content at 65%. Therefore, the packets were sterilized about 1h and then these were kept for cooling. After cooling, 5 g mother spawn were

inoculated into the packets in the laminar airflow cabinet and were kept at 20-22°C temperature until the packets become white with the mushroom mycelium. After completion of the mycelium running the rubber band, brown paper, cotton plug and the mouth of spawn packet were removed and the mouth was wrapped tightly with rubber band. Then this spawn packets were transferred to the culture house.

Cultivation of Spawn Packet

Two ends, opposite to each other of the upper position of plastic bag were cut in "D" shape with a blade and opened by removing the plastic sheet after which the opened surface of substrate was scraped slightly with a tea spoon for removing the thin whitish mycelial layer. Then the spawn packets were soaked in water for 15 minutes and invested to remove excess water for another 15 minutes. The packets of each type were placed separately on the floor of culture room and covered with newspaper. The moisture of the culture room was maintained 80-85% relative humidity by spraying water 3 times a day. The light and ventilation of culture house was maintained uniformly. The temperature of culture house was maintained 22- 25°C.

Harvesting of Mushroom

Oyster mushrooms matured within 2-3 days after primordia initiation. The matured fruiting body was identified by curl margin of the cap, as described by Ruhul Amin, 2002. Mushrooms were harvested by twisting to uproot from the base. Mushrooms were harvested 2 times from a packet. After completing the first harvest again the packets were scraped at the place where the 'D' shaped cut had been done and were soaked in a bucket for five minutes and then placed in the culture house and water was sprayed regularly. The primordia appeared within 9-10 days after first harvest and 7-8 days after second harvest. Water spraying was continued until the mushrooms were ready to be harvested.

Results

Morphological features

According to the research *Pleurotus ostreatus* (Jacq. ex. Fr.) Kummer, Oyster mushroom can be divided into two parts; mycelium and fruit body. The fruit body, which is made up of pileus and stipe, is for eating. Pileus convex at first, expending to broadly convex, eventually flat and even upturned in age, 5.0-20.0 cm in diameter, white, grayish white to gray-brown. The entire pileus margin undulates like oyster shell. Color varies according to the strain, lighting and temperature conditions. Stipes are typically eccentrically attached to the pileus.

Table 1. Yield of Oyster mushroom on paddy straw substrates

Yield	Replicates	Weight of mushroom on first harvested	Weight of mushroom on second harvested	Total
Yield Obtained	Replicate 1	210 g	205 g	415 g
	Replicate 2	200 g	198 g	398 g
	Replicate 3	220 g	207 g	427 g
	Replicate 4	208 g	200 g	408 g
	Replicate 5	220 g	213 g	433 g
Average				**416 g**

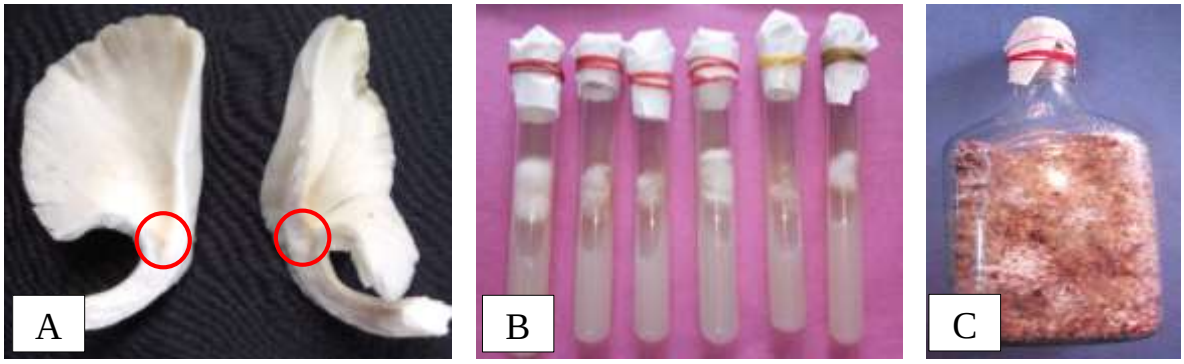

Figure. 1. Cultivation of oyster mushroom (*Pleurotus ostreatus*)

A. Small piece of specimen was taken for Tissue culture
B. Tissue were cultured in test tubes with PDA medium
C. Commercial spawn with sorghum grain

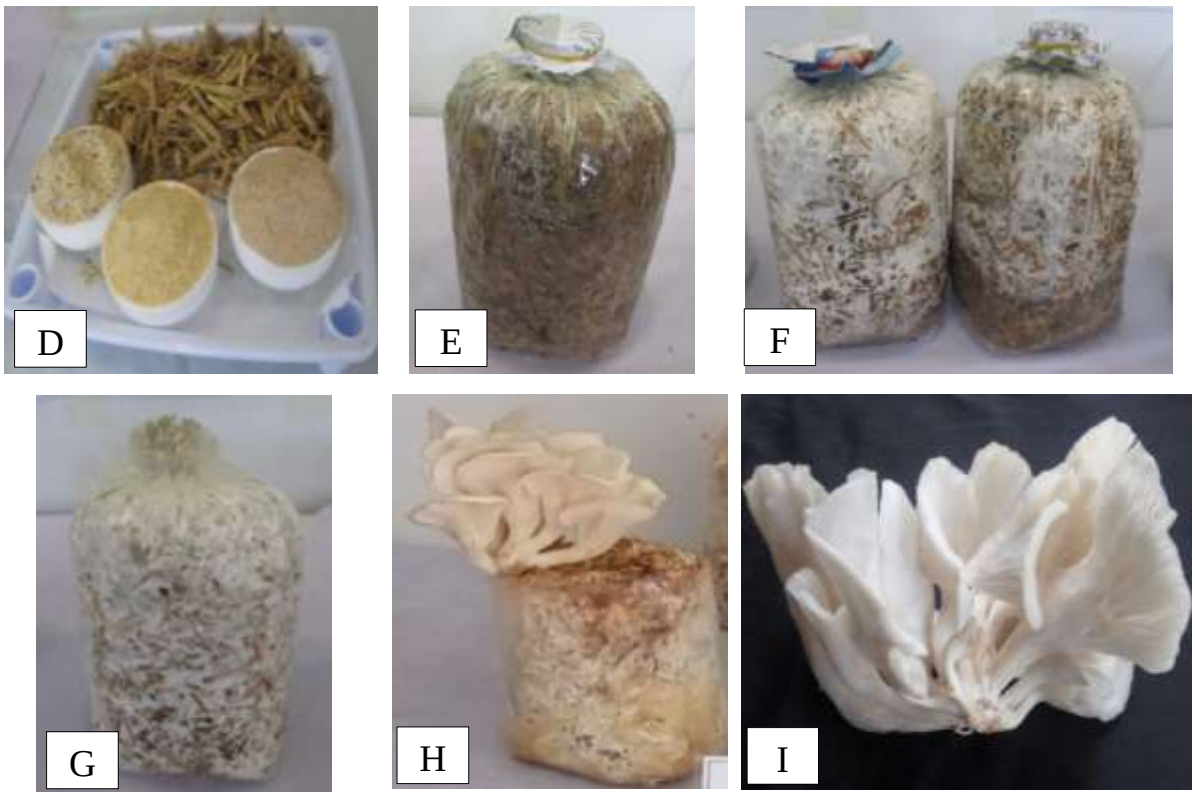

Figure. 2. Cultivation of oyster mushroom (*Pleurotus ostreatus*)

D. Material for cultivation
E. Preparation of cultivation bag with paddy straw materials
F. Cultivation bags with growing mycelium
G. Early maturing phase of growing mushroom
H. Growing mushroom before harvesting
I. After harvesting

Discussion and Conclusion

Pleurotus ostreatus is an edible mushroom which is prepared by the various agro-based products such as sawdust, cotton waste, wheat straw, etc. (Dinesh Babu, 2010). In this study, paddy straw has been used as a substrate. Oyster mushroom is grown on sterilized substrate bag cultivation.

In this study, the growth and yield of mushroom were better on paddy straw substrate. In this investigation, oyster mushroom yields a product average of 416g per bag from 500 g paddy straw substrates bags. According to Paul *et. al.*, 2014, cultivation of *Pleurotus ostreatus* on saw dust substrates were found average of 373.4 g per bag from 500 g. It may also offer economic incentives for agribusiness to examine these residues as valuable resources and develop new enterprises to use them to produce nutritious mushroom products.

Therefore, the mushroom cultivation may become one of the most profitable agribusiness that could produce food products from paddy straw substrates and help to dispose them in an environment friendly manner.

From the findings of this study, it is evident that treatment paddy straw substrates gave maximum yield of the *Pleurotus ostreatus*.

Acknowledgements

I wish to express my heartfelt thanks to Dr Tint Moe Thuzar, Rector of Yadanabon University for permitting to undertake this research work. I would like to express my profound gratitude to All Prorector of Yadanabon University for permitting and encouragement on this work. I am greatly indebted to Dr Khin Pale', Professor and Head, Department of Botany for providing all the necessary facilities in this department for this research. I wish to express my gratitude to Dr Khin Myo Win, Professor, Department of Botany for her critical reading of manuscript.

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