EVALUATION OF REPLACEMENT OF SAWDUST BY DIFFERENT CROP RESIDUES AS SUBSTRATES FOR OYSTER MUSHROOM *Pleurotus ostreatus* (PO_2) PRODUCTION

A THESIS

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Dedicated

To

My Beloved Parents

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May, 2014 The Author

ABSTRACT

The prime objective of the study consisting of four experiments was to investigate the performance of different substrates of crop residue on growing of oyster mushroom *Pleurotus ostreatus* (PO_2). In all experiments one oyster mushroom variety *Pleurotus ostreatus* (PO_2) was grown on various percentage of saw dust with either rice straw or sugarcane bagasse or grass pea husk or green gram husk at different percentage (100, 80, 60, 40, 20 and 0%). All experiments were done using six treatments with three replications. In Experiment-1, 80% rice straw + 20% saw dust (T_4) performed better regarding number of primordia, number of effective fruiting body, pileus diameter, stalk length, stalk diameter, biological yield, economic yield and harvest index except highest pileus thickness which was found higher at 100% rice straw (T_5). In Experiment-2, 100% sugarcane bagasse (T_5) showed better performance in case of all parameters mentioned in Experiment-1. In Experiment-3, similar to Experiment-2, 100% grass pea husk (T_5) showed better performance except number of primordia which was observed highest at T_4 treatment where 80 % Grass pea husk was mixed with 20% saw dust. In Experiment 4, 100% green gram husk (T_5) showed the best performance except number of primordia which was observed the highest in T_3 treatment where 60% green gram husk was mixed with 40% saw dust. From the study it was evident that three substrates (sugarcane bagasse, grass pea husk and green gram husk) performed better as pure on growing *Pleurotus ostreatus* (PO_2). Among the four substrates green gram husk gave the maximum yield but sugarcane bagasse gave the minimum maintenance cost.

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CHAPTER ONE

INTRODUCTION

CHAPTER I

INTRODUCTION

In common terminology the term "Mushroom" is used for the entire fleshy, macroscopic Basidiocarpous and Ascocarpous spore bearing fungi but in its strict sense under mushroom science "the fruiting bodies of edible species of fungi are usually called 'mushroom' (Tripathi, 2005). Mushrooms are large reproductive structures of edible fungi belonging to genus *Pleurotus* under the order Agaricales, the family Tricholomataceae and the class Basidiomycetes.

Mushroom consists of two parts, the fruiting body and thread like structure. This thread like structure is known as mycelium which supplies nutrients from substrate to fruiting body. There are a lot of variations in fruiting bodies. About 2000 species of edible mushroom have been identified among them only about 80 species have grown experimentally and 4-5 produced on industrial scale throughout the world (Chang and Miles, 1988).

The cultivation of *Pleurotus* spp. started first by the beginning of the 19^{th} century on tree stumps. The first domesticated species under *Pleurotus* was *Pleurotus ostreatus*. The different species of *Pleurotus* grow within a temperature range from $15\text{-}30^0$ C and it can be grown on various agricultural waste materials as substrate (Block *et al.*, 1958).

Mushrooms are very nutritious food and are rich in protein, vitamins and minerals and poor in calorie and cholesterol (Pathak *et al.,* 1998; Chang and Miles, 1988 and Bano and Rajarathnam, 1986). Mushrooms are increasingly being recognized as important food products for their significant role in human health, nutrition and disease. Mushrooms display certain medicinal properties like anti-cancerous, anti-cholesterol and anti-tumor activities and are useful against diabetes, ulcer and lung diseases (Quimio, 1976). As a food item, the

nutritional values of mushrooms are considered in between meat and vegetables.

Bangladesh is a developing country. Here, protein deficiency is an existing reality. The present nutritional status of Bangladesh is a matter of concern. Most of our people have been suffering from malnutrition. Mushroom can substantiate the suffering from malnutrition to some extent because it produces large amount product in short time and provide more protein per unit area than any other crops (Gupta, 1986).

The spawn is equivalent to vegetative seed of higher plant. Quality of spawn is basic requirement for the successful mushroom cultivation (Tschierpe and Hartmann, 1977). Substrate is a growing medium of mushroom which supply nutrients for growth and development of fruiting body (Chang and Miles, 1988). The agricultural waste used as substrates and can be recycled into food and less endangered by pollution (Hayes, 1978).

In Bangladesh about 30 million tons agricultural waste like saw dust, paddy straw, wheat straw and sugarcane baggase are available (Ahmed, 2001), which can be used for mushroom cultivation. But the performance of these agro-wastes has not yet properly been investigated in the climatic conditions of Bangladesh for specific species of oyster mushroom. A limited works on substrate have been done. Ahmed (1998) studied the suitability of *P. sajor-caju* on saw dusts of mango, jackfruit, koroi, sugarcane bagasse, jute stick, rice straw, waste cotton and maize cobs. Only Nirod *et al.* (2007) studied the performance of *P. ostreatus* (Jacquin ex Fr.) Kummer on the agricultural and household by-products, grasses and weeds as substrates available in Bangladesh though Ruhul Amin (2002) found that the *Plerotus ostreatus* is the best performing oyster mushroom in Bangladesh.

The National Mushroom Development and Extension Centre (NAMDEC), Savar grows oyster mushroom using saw dust. But, saw dust in our country has becoming scarce due to its use in huge amount in developing poultry industries and its price is also increasing day by day (Sarker *et al.*, 2007). Therefore, it is necessary to identify the alternative suitable substrates for mushroom production that will be easily available, low in price and more yielding. Considering the facts the present study was undertaken to find out the effect of different crop residues substrates (rice straw, sugarcane bagasse, grass pea husk and green gram husk) on the growing of oyster mushroom variety *Pleurotus ostreatus* (PO_2).

CHAPTER TWO

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

Different literature were collected and reviewed before beginning of the work. The literature cited here, based on present information about the performance of different kinds of substrates on mushroom cultivation. These were collected from Internet, books, journals and articles from National Mushroom Development and Extension Center (NAMDEC), Mushroom Culture Center, Bangladesh Agricultural Research Council.

Performance of oyster mushrooms on different substrates

Hasan *et al.* (2010) studied the performance of oyster mushroom (*Pleurotus ostreatus*) on different pretreated substrates viz. rice straw, banana leaf mid rib, poultry litter, horse dung and cow dung. Twelve different treatments with lime were evaluated to find out the growth and yield of mushroom. The highest yield (119gm) and return (12.85Tk) were obtained from the treatment of rice straw + 10% poultry litter + 1% lime. The highest mycelium running rate was observed in the treatment of banana leaf mid ribs + 10% horse dung + 1% lime. The minimum duration of mushroom production found in banana leaf mid ribs + 10% cow dung + 1% lime. However, the rice straw + 10% poultry litter + 1% lime and rice straw + 10% horse dung + 1% lime were the best treatments for the growing of oyster (*Pleurotus ostreatus*) mushroom and they are economically viable.

Barai *et al.* (2009) investigated the cultivation and yield performance of different oyster mushroom (*Pleurotus ostreatus*) varities viz. FLO, PO_2 and HK-51 with six different solid substrates- coir, rice husk, rice straw, sawdust, sugarcane bagasse and water hyacinth. In terms of yield *Pleurotus ostreatus* (PO_2) and *P. ostreatus* (FLO) showed better performance in comparison to *P. ostreatus* (HK-51). Variety *P. ostreatus* (HK-51) did not give fruiting bodies

when it was grown on coir, rice husk and sugarcane bagasse. Among the varieties *P. ostreatus* (PO_2) and *P. ostreatus* (FLO) produced the highest yield, biological efficiency and number of fruiting bodies in case of rice straw substrates, recommended as the best substrate for oyster mushroom cultivation.

Amin *et al.* (2007) studied the effect of substrates on the growth and yield of five selected oyster mushroom varieties. Fivedifferent oyster mushroom varieties *Pleurotus ostreatus* (PO_2), *Pleurotus ostreatus* (Florida),*Pleurotus ostreatus* (HK51), *Pleurotus sajor-caju* (PSC) and *Pleurotus sajor-caju* (Grey) were grown on four different substrates. Sawdust: wheat bran: rice husk = 8:4:1 (S1), sugarcane bagasse: saw dust: wheat bran = 4:2:1 (S2), wheat straw: saw dust: wheat bran = 4:2:1 (S3) and rice straw: saw dust: wheat bran = 4:2:1 (S4). From the study he was stated that among the four substrates used in the study sugarcane bagasse: saw dust: wheat bran = 4:2:1 was most suitable for the growth and yield of oyster mushroom variety *Pleurotus ostreatus* (PO_2).

Sarker *et al.* (2007) reported that any amount of wheat bran added to the sawdust increased biological yield over the control. The low production on sawdust without wheat bran clearly showed the need for supplementation.

Mukherjee (2007) found that when weed plants were mixed with rice straw in the ratio 1:1, there is increased in the yield than when used individually.

Taurachand (2004) reported that sugarcane bagasse contains cellulose and sucrose which is easily degraded by oyster mushroom. It is also rich in nitrogen content.

Obodai *et al.* (2003) studied the seasonal effects on spawn run period, time for first appearance of fruiting bodies, number of flushes, morphological characteristics of the first flush and biological efficiency of 7 strains of oyster mushroom, (*Pleurotus ostreatus* and *P. sajor-caju* etc.) grown on composted

sawdust in Ghana, were studied. *P. eons* strain EM-1and *P. sajor-caju* strain ST-6 gave the best yield and biological efficiencies in the wet and dry seasons respectively. The spawn run period, mycelial growth density and the first appearance of fruiting bodies were not season dependent.

Royse (2002)., Panjabrao *et al.* (2007) and Onyango *et al.* (2011) reported that the variation in stipe length and mushroom cap diameter was observed in the nine substrates used in this study. Relatively smaller mushroom cap diameter and longer mushroom stipe length are undesirable characteristics as for marketable quality. Environmental conditions as well as supplementation of substrates with various additives including nitrogen sources have been reported to improve growth, yield and quality of mushrooms.

Kues and Liu (2000) stated that growing oyster mushrooms convert a high percentage of the lignocellulosic substrate to fruiting bodies increasing profitability. Of them, *Pleurotus ostreatus* demands few environmental controls, and their fruiting bodies are not often attacked by diseases and pests, and they can be cultivated in a simple and economic way.

Pani *et al.* (1997) reported that wheat bran, rice bran, sawdust, black gram (*vigna mungo*) husk, apple pomace, maize cobs and grains of wheat, maize and ragi were evaluated as supplements to improve the sporophore yield of three species of *Pleurotus*. Supplementing straw with cereal grains and bran significantly increased yield of all 3 species. The highest yields of *P. sajor-caju* (92.0% biological efficiency BE), *P. rlecbellatus* (75.0% BE) and *P. florida* (93.3% BE) were obtained in response to wheat grain supplementation. Apple pomace, sawdust, maize cobs and black gram husk appeared to be poor supplements.

Dhandha *et al.* (1996) studied the nutrition and yield performance of oyster mushroom (*Pleurotus* spp.). Four *Pleurotus* spp. namely *Pleurotus rlecbellatus,*

P. florida, P. sajor-caju and *P. ostreatus* were evaluated for their yield and nutriyional status. *P. ostreatus* was found to give maximum harvest on wheat straw substrate showing 64% biological efficiency.

Dhandha *et. al.* (1995) also observed no change in total mushroom yield in paddy straw mushrooms from the addition of oils of mustard, sunflower, ground nuts and cotton seed at 0.1 to 0.5. He concluded that *Pleurotus* spp. prefers unsupplemented and unfermented straw.

Bugarski *et al.* (1995) studied the yield and yield components of different strains of oyster mushroom. The strains of oyster mushrooms NS-16 and NS-11 were studied with a view to determine the best yielding strain, shortest incubation period and fast fructification. The hybrid H_7 was used for check. The strain NS-11 had the shortest incubation period (16-17 days), while the hybrid H_7 had the longest (18-19 days). First fruiting occured on H_7 (30^{th} -33^{rd} days, depending on substrate), they achieved it with the strain NS-16 (17.07 substrate use) and the lowest with NS-11 (12.25).

Jandiak and Goyal (1995) showed that Cultivation of oyster mushroom (*Pleurotus ostreatus*) has increased tremendously throughout the world because of their abilities to grow at a wide range of temperature and utilizing various agro-based residues. *Pleurotus* spp. is efficient lignin degraders, which can grow on different agricultural wastes with broad adaptability to varied agro-climatic conditions.

Badshah *et al.* (1994) stated that *Pleurotus ostreatus* and *Pleurotus florida* were grown on wheat straw, sugarcane bagasse, corncobs or sawdust by mixing 120-130 g of spawn with 2 kg of substrate and placing the mixture in sterilized polyethylene bags, which were kept in the dark at 25 ^{0}C for 2-3 weeks. Once the bags became full of mycelial growth, then they were removed. Watering was carried out 2-3 times a day. Fruiting bodies were harvested at maturity. *P.*

ostreatus and *P. florida* yields ranged from 249.8 and 277.7 g per 2 kg substrate respectively on sawdust and wheat straw. In *P. florida* contains higher fat but lower protein than *P. ostreatus*.

Poppe and Hofte (1995) tested 40 different types of organic waste, wild herbs and weeds for growing mushroom. More than 80% of them were directly used as substrates and about 20% are used additives to very poor substartes. Simply moistened or untreated, pasteurized, fermented or sterilized waste was used for mushroom cultivation. About 30 species of mushroom were tested on available 40 substrates. The highest yield was achieved with straw based substrates for oyster mushroom, sawdust for shii-take.

Khan *et al.* (1991) found the effects of different forest wastes on the radical growth of lentinus edodes (Berk) were studied. Three types of sawdust from Shishu (*Dalbergia sisso*) Babla (*Acacia nilotica*) and Jack fruit (*Artocarpus heterophyllus*) were amended with wheat bran and limes were used for spawn preparation. The sawdust was also used to prepare compost for spawn running amended with lime and different combinations of wheat bran, wheat chaff, paddy straw and cotton waste. Sawdust from *D. sisso* was the most suitable for spawn preparation and all types of sawdust amended with cotton waste were found to give optimum conditions for spawn running.

Khan *et al.* (1991) grew oyster mushroom on beds comprising 6.7 kg sugarcane bagasse alone or bagasse mixed with cotton waste and paddy straw. This substrate was shown high performance. The highest yield (3880 g) and biological efficiency (19.4%)were obtained with a substrate containing 50% sugarcane bagasse and 50% cotton waste. The first flush gave the highest yield.

Thangamuthu (1990) used sugarcane bagasse for growing *Pleurotus* spp. The two species gave similar yields at 500 g substrate, reaching maximum of 506-

508 g on pretreated bagasse, 407-411 g on paddy straw and 379-391 g on wheat straw alone.

Patil (1989) cultivated *Pleurotus ostreatus* on six different substrates, i.e. wheat straw, bajra., maize straw, sugarcane bagasse, jowar and cotton stick. The results indicated that all the substrates could be used for commercial cultivation of the oyster mushroom.

Rinker (1989) found 37 and 42.6% more total yield in *P. ostreatus* from supplementation with barley straw with brewer's grain and 17, 27, 65 and 118% more yield by addition of alfalfa hay at 5, 10, 20 and 40% (dry wt. basis). He also found that supplementation prior to pasteurization increased the total yield, but mushroom size was negatively affected with increased supplementation. In our studies we have not found any significant effect on mushroom size. Influence of supplementation is also species and strain-specific.

Suprapti (1987) found that wood waste like sawdust, leaves of legume plants such as dhaincha (*Sesbania grandiflora*) and ipil ipil (*Leucaena leucocephala*) used as substrates for oyster mushroom cultivation. The substrate consisted rubber wood, sawdust mixed with turi lamtoro gung leaves containing 5%, 10%, 15% and 20% by W/V with distilled water. The highest production was found from saw dust substrates mixed with 10% dhaincha leaf.

Losovoi (1981) reported that various strains of *Pleurotus ostreatus* and one of *Pleurotus cornucopiae* were grown successfully on sterile blocks of sawdust with added gypsum (1-2%), chalk (1-2%), urea (0.3-0.5%) and NPK (0.3-0.5%). Best yield was obtained with *P. ostreatus*. He also reported that *pleurotus* spp. cultivated on a sawdust-based medium produced 20-30% yield by volume on sawdust blocks in the glasshouse. Several strains of *P. ostreatus* were most promising for intensive cultivation.

The supplementation with organic materials such as oil seed meals, wheat bran, wheat flour, maize powder, rice bran etc. is used for mushroom production. These supplements are added to the basal substrate for enhancement of growth and yield of mushroom (Hadwan *et al.,* 1997). Amin *et al.* (2007) used wheat bran as supplement to saw dust for the production of oyster mushroom. Sarker (2004) reported that wheat bran and rice bran performed best at the rate of 40% and 50% level respectively when supplemented to waste paper as a substrate.

CHAPTER THREE

MATERIALS AND METHODS

CHAPTER III
MATERIALS AND METHODS

3.1 Location of the study

The experiment was conducted in the Plant Protection Laboratory of Agrotechnology Discipline, Khulna University during December, 2012- May, 2013.

3.2 Materials collection

The mushroom variety (*Pleurotus ostreatus*) PO_2 was collected from Horticulture Centre cum Mushroom Sub Centre, Department of Agricultural Extension (DAE) Khairtala, Jessore. Sugarcane bagasse, green gram husk, grass pea husk, saw dust, rice bran, $CaCO_3$ and other necessary materials such as poly propylene bags (size- 7cm × 10cm and 8cm× 12cm), plastic neck, brown paper, rubber band, absorbent cotton were collected from local market of Khulna. Rice straw was collected from Prof. Purnendu Gain Field Laboratory, Agrotechnology Discipline, Khulna University.

3.3 Pure culture in Potato Dextrose Agar (PDA) media

To obtain pure culture Potato Dextrose Agar (PDA) was used. A small piece of tissue from the fruiting body was used as explants. The explants were placed in the PDA media under aseptic condition.

3.3.1 Preparation of PDA medium

The PDA medium was prepared by using of 200g of peeled and sliced potato, 20 g dextrose and 15 g agar in one liter of water. At first 200 g of sliced potato was put in a saucepan. One-liter clean tap water was poured in the pot and boiled until the slice of the potato become soft. After that the potato extract was separated from the boiled potato slice by filtering. Subsequently the volume

was adjusted by adding distilled water to one liter in a volumetric flask. It was again heated in a beaker and stirred after adding 20 g dextrose and 15 g agar. About 5 ml of PDA mixture was poured in each test tube followed by plugging. The medium was sterilized in an autoclave for 15 minutes at 121 ^{0}C with 1.1 kg/cm^2 pressure. The sterilized PDA containing test tube was kept in a slanted position. These slants were used to inoculate explants and to purify it. The agar and tubes were allowed to cool in upright position for culture.

3.3.2 Preparation of PDA culture/tissue culture

To obtain pure culture, PDA culture or tissue culture method was used. The mushroom aged 24 to 48 hours were used for tissue culture. Random parts of the mushroom were used, although the cap, especially the lower portion where the gill plate joints and the stems were considered the best tissue for excision. The mushroom was thoroughly pre-washed in distilled water. A scalpel was then dipped in alcohol and flamed until it was red-hot. Then it was cooled for about 10 seconds. The cut was made length wise from the cap to down wards. Small piece of the internal tissue of the broken mushroom was cut and removed with a flamed needle. The needle, with the tissue attached was then immediately inserted into test tube slant and the tissue laid on the agar surface. The mouth of the test tube was before the needle was inserted. The mouth of the test tube was plugged with cotton plug and 25 ± 1 ^{0}C temperature preferably in dark condition for about 10 to 15 days. After 3 to 4 days, the tissue was covered with a white mycelium that was spread on the agar surface. White mycelia were originated from the excised tissue.

3.4 Preparation of mother culture

Mother culture was prepared by mixing sawdust and wheat bran at the ratio of 2:1. Calcium carbonate was used at the rate of 0.2% of the mixture. The moisture level of the mixture was maintained at 65% by adding tap water. Polypropylene bags of 18 X 25 cm size were filled with 200 g of the above

prepared mixture and packed tightly. Each of the bags was prepared by using heat resistant plastic neck. A hole of about 2/3 deep of the volume of the bag was made at the center with a sharp end stick for space to put inoculums. The neck was plugged with cotton and covered with brown paper and tied with a rubber band. The packets were sterilized in an autoclave for one hour at 121 ^{0}C under 1.1 kg/cm^2 pressure. After sterilization the packets were cooled for 24 hours and transferred into a clean bench. A piece of pure PDA culture medium containing mycelium of oyster mushroom was placed aseptically in the hole of mother culture packet and the packet was again plugged as mentioned before. Then the inoculated packets were placed on a wooden rack in the laboratory at 25 ± 1 ^{0}C temperature for incubation. The medium of the mother culture was colonized by the fungus as manifested by white colony growth of mycelium within 15-16 days of inoculation. The fully colonized packets were used for spawning.

3.5 Preparation of substrates and spawn packet

Four different substrates namely, rice straw, sugarcane bagasse, grass pea husk and green gram husk were tested in the experiment. Plant materials were cut into small pieces (0.5-1 cm) and grass pea husk and green gram husk were grinded finely. Sawdust was used with each substrate at different combination along with rice bran and $CaCO_3$. Polypropylene bags of 7cm × 10cm and 8cm× 12cm were filled with 500 g substrate mixture. The procedure of packet preparation, plugging, sterilization and incubation were the same as mentioned under the section describing preparation of mother culture. Each spawn packet was inoculated with the mother culture at the rate of two spoonfuls per packet. After inoculation, the packets were incubated in the laboratory at about 25 ^{0}C temperature. Growth of mycelium in the spawn packets were completed within about 28 to 39 days.

For the preparation of 500 g weighted spawn packet following ingredients were needed:

Table 1. Ingredients of spawn packet preparation in standard estimate

Ingredients	Amount
Saw dust*	170 g
Rice bran	80 g
$CaCO_3$	1 g
Water	250 ml

Source: National Mushroom Development and Extension Center (NAMDEC), Savar, Dhaka, Bangladesh

*Here, concentration of saw dust was replaced with each of the substrates (rice straw/ sugarcane bagasse/ grass pea husk/ green gram husk) in each treatment.

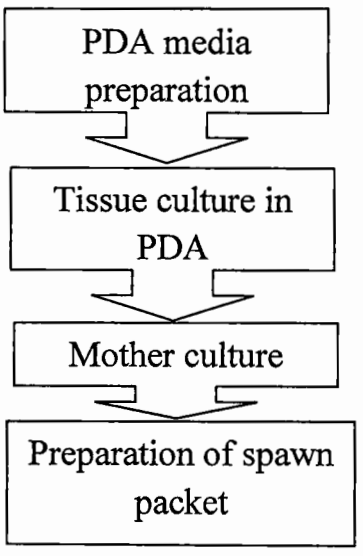

Fig. 1. Flow chart of spawn packet preparation

3.6 Culture of mushrooms

The brown paper and plastic neck with cotton plug were removed from the spawn packet and the mouth of spawn packet was wrapped tightly with rubber band.

done twice a day until the mushrooms were matured enough to harvest. In the room temperature (ranges 25-30^0), high relative humidity (80-85%) and proper ventilation for fruiting were maintained.

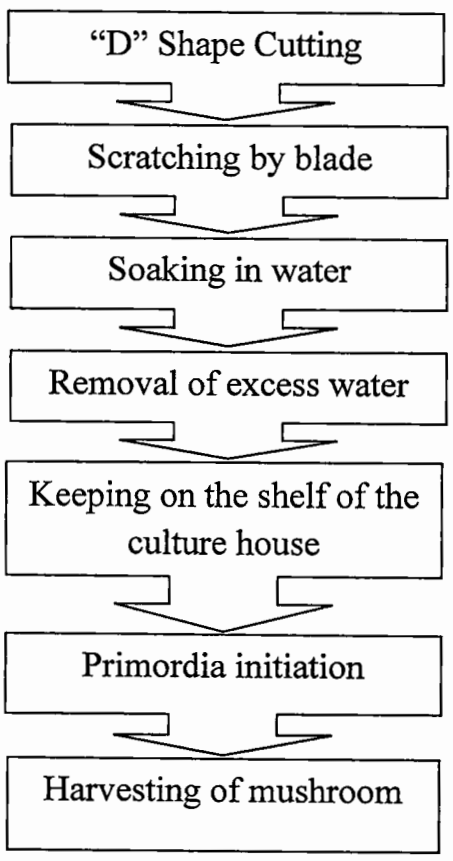

Fig.2. Flow chart of culture of spawn packet

3.7 Harvesting of mushrooms

The Oyster mushroom variety *Pleurotus ostreatus* (PO_2) matured within 3-6 days after the placing in culture room and maturity was identified by curl margin of the cap (Pal and Thapa, 1979) and before spores were released (Jandiak, *et al.* 1976). To harvest the mushrooms, they were grasped by the stalk and gently twisted and pulled by finger. No knife was used for this purpose.

3.8 Collection of data

Data were collected periodically during the growing period of mycelium and immediate after harvesting of fruiting body. The data were recorded on the following parameters:

1. Mycelium running time (days)
2. Number of primordia
3. Number of effective fruiting body
4. Length and diameter of the stalk (cm)
5. Thickness (mm) and diameter (cm) of pileus
6. Biological Yield (g)
7. Economic yield (g)
8. Harvest index (%)

3.8.1 Mycelium running time (days)

Days required from inoculation to completion of mycelium running were recorded.

3.8.2 Number of effective fruiting bodies

Well-developed, twisted and tiny fruiting body fruiting bodies were counted but not dry and pin pointed ones.

3.8.3 Length and diameter of stalk (cm)

Stalk length and diameter of two randomly selected fruiting bodies were measured by a measuring tape.

3.8.4 Thickness (mm) and diameter (cm) of pileus

Thickness of two arbitrarily selected fruiting bodies was measured by a digital slide calipers and diameter of pelius was measured by a measuring tape.

3.8.5 Biological Yield (g)

Biological yield in g per packet was recorded by weighing the whole cluster of fruiting body without removing the lower hard and dirty portion.

3.8.6 Economic yield

Economic yield in g per packet was recorded by weighing all the fruiting bodies in a packet after removing the lower hard and dirty portion.

3.8.7 Harvest index

It was calculated by using the following formula;

$$\text{Harvest index (\%)} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

3.11 Treatment combination of different experiments

Four experiments were conducted to satisfy the objective-

Experiment 1: Effect of different combination of saw dust and rice straw on the performance of variety *Pleurotus ostreatus* (PO_2)

Treatment combination

T_0 = Saw dust 100% + Rice straw 0%

T_1 = Saw dust 80% + Rice straw 20%

T_2 = Saw dust 60% + Rice straw 40%

T_3 = Saw dust 40% + Rice straw 60%

T_4 = Saw dust 20% + Rice straw 80%

T_5 = Saw dust 0% + Rice straw 100%

Experiment 2: Effect of different combination of saw dust and sugarcane bagasse on the performance of variety *Pleurotus ostreatus* (PO_2)

Treatment combination

T_0 = Saw dust 100% + Sugarcane bagasse 0%

T_1 = Saw dust 80% + Sugarcane bagasse 20%

T_2 = Saw dust 60% + Sugarcane bagasse 40%

T_3 = Saw dust 40% + Sugarcane bagasse 60%

T_4 = Saw dust 20% + Sugarcane bagasse 80%

T_5 = Saw dust 0% + Sugarcane bagasse 100%

Experiment 3: Effect of different combination of saw dust and grass pea husk on the performance of variety *Pleurotus ostreatus* (PO_2)

Treatment combination

T_0 = Saw dust 100% + Grass pea husk 0%

T_1 = Saw dust 80% + Grass pea husk 20%

T_2 = Saw dust 60% + Grass pea husk 40%

T_3 = Saw dust 40% + Grass pea husk 60%

T_4 = Saw dust 20% + Grass pea husk 80%

T_5 = Saw dust 0% + Grass pea husk 100%

Experiment 4: Effect of different combination of saw dust and green gram husk on the performance of variety *Pleurotus ostreatus* (PO_2)

Treatment combination

T_0 = Saw dust 100% + Green gram husk 0%

T_1 = Saw dust 80% + Green gram husk 20%

T_2 = Saw dust 60% + Green gram husk 40%

T_3 = Saw dust 40% + Green gram husk 60%

T_4 = Saw dust 20% + Green gram husk 80%

T_5 = Saw dust 0% + Green gram husk 100%

3.11 Design of experiment and data analysis

The experiments were laid out in Completely Randomized Design (CRD). Each of the experiments had six treatments (T_0-T_5) and three replications (R_1-R_3).

The data were collected and analyzed by computer operated MSTAT-C program. The treatment means if any were compared using Duncan's New Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

CHAPTER FOUR

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSIOIN

4.1 Experiment 1: Effect of different combination of saw dust and rice straw on the performance of variety *Pleurotus ostreatus* (PO_2)

4.1.1 Mycelium running time (days)

There were no significant differences in different treatments in respect of days required to complete mycelium running in a spawn packet in case of rice straw. But numerically the highest days required to complete mycelium running (39.00) was recorded in case of treatment T_5 and lowest (33.33) was found in case of treatment T_3 (Table 2).

The lowest days to complete mycelium running was recorded on waste paper which was statistically similar with saw dust, rice straw and ulu reported by Sarker *et al.* (2007).

4.1.2 Number of primordia

The effect of substrate on the number of primordia was varied significantly at 1% level of significance. The higher number of primordia (87.67) was obtained from treatment T_4 which was statistically similar with the treatment T_2 (85.00), T_3 (84.00), and T_5 (81.67). The lowest number of primordia (26.33) was obtained in case of treatment T_0 which was statistically similar with treatment T_1 (Table 2).

Amin *et al.* (2007) reported that *Pleurotus ostreatus* (PO_2) produced the highest number of primordia in all the substrates like saw dust, sugarcane bagasse, wheat straw and rice straw.

4.1.3 Number of effective fruiting body

The effect of substrate on the number of effective fruiting body was varied significantly at 1% level of significance. The higher Number of effective fruiting body (56.67) was obtained from treatment T_4 which was followed by T_2 (46.00), T_3 (50.67), and T_5 (49.00). The lowest number of effective fruiting body (7.33) was found in case of treatment T_0 which was followed by treatment T_1 (Table 2).

The lowest number of effective fruiting body was observed in rice straw with saw dust and wheat bran was reported by Amin *et al.* (2007).

4.1.4 Thickness of pileus (mm)

The effect of substrate on thickness of pileus was varied significantly at 1% level of significance. The highest thickness of pileus (9.67) was obtained from treatment T_5 which was statistically similar with the treatment T_4 (9.32). The lowest Thickness of pileus was found (4.01) in case of treatment T_0 (Table 2).

4.1.5 Diameter of pileus (cm)

The effect of substrate on diameter of pileus was varied significantly at 1% level of significance. The highest diameter of pileus (10.93) was obtained from treatment T_4. The lowest diameter of pileus (5.12) was found in case of treatment T_0 (Table 2).

4.1.6 Length of stalk (cm)

The effect of substrate on length of stalk was varied significantly at 1% level of significance. The highest length of stalk (4.87) was obtained from treatment T_4. The lowest Length of stalk was found (2.83) in case of treatment T_0 which was statistically similar with the treatment T_1 (3.33) (Table 2).

Table 2. Performance of oyster mushroom variety *Pleurotus ostreatus* (PO_2) of different combination of saw dust and rice straw substrate in different treatments

Treatments	Mycelium running time (days)	Number of primordia	Number of effective fruiting body	Thickness of pileus (mm)	Diameter of pileus (cm)	Length of stalk (cm)	Diameter of stalk (cm)	Biological yield (g)	Economic yield (g)	Harvest Index (%)
T_0	36.00	26.33b	7.33c	4.01e	5.12e	2.83c	2.91d	54.00c	50.33c	93.21b
T_1	34.33	59.33ab	29.33bc	5.77d	6.96d	3.33c	3.46c	117.00b	113.33b	96.8a
T_2	36.00	85.00a	46.00ab	7.22c	8.14c	3.87b	3.71c	178.33a	174.33a	97.74a
T_3	33.33	84.00a	50.67ab	8.17b	9.58b	4.25b	4.21b	180.33a	176.17a	97.16a
T_4	36.00	87.67a	56.67a	9.32a	10.93a	4.87a	5.01a	212.67a	208.67a	98.10a
T_5	39.00	81.67a	49.00ab	9.67a	9.25b	4.33b	4.50b	196.00a	192.00a	97.95a
Level of significance	NS	**	**	**	**	**	**	**	**	**

** Indicate 1% level of significance, * indicate 5% level of significance and NS indicate none significant

4.1.7 Diameter of stalk (cm)

The effect of substrate on the diameter of stalk was varied significantly at 1% level of significance. The best diameter (5.01) of stalk was obtained from treatment T_4. The lowest diameter of stalk (2.91) was found in case of T_0 (Table 2).

4.1.8 Biological yield (g)

The effect of substrate on biological yield was varied significantly at 1% level of significance. The Biological yield was varied significantly between the treatments. The highest number biological yield (212.67) was obtained from treatment T_4 which was statistically similar with the treatment T_2 (178.33), T_3 (180.33) and T_5 (196.00). The lowest biological yield (54.00) was found in case of treatment T_0 (Table 2).

4.1.9 Economical yield (g)

The effect of substrate on economical yield was varied significantly at 1% level of significance. The highest economical yield (208.67) was obtained from treatment T_4 which was statistically similar with the treatment T_2 (174.33), T_3 (176.17) and T_5 (192.00). The lowest economical yield (50.33) was found in case of T_0 (Table 2).

The lowest yield (both biological and economic yield) was found in rice straw with saw dust and wheat bran was reported by Amin *et al.* (2007).

4.1.10 Harvest index (%)

The effect of substrate on economical yield was varied significantly at 1% level of significance. The highest harvest index (98.10) of was obtained from treatment T_4 which was statistically similar with the treatment T_1 (96.80), T_2 (97.74), T_3 (97.16) and T_5 (97.95). The lowest harvest index (93.21) was found in case of treatment T_0 (Table 2).

4.1.11 Relationship between number of effective fruiting body and economic yield:

A positive linear relationship was observed between number of effective fruiting body and economic yield per packet (Fig.3). It was observed that the equation y= 3.214x+24.43 gave a good fit to the data and the value of co-efficient of determination (R^2=0.984) showed that the fitted regression line had a significant regression co-efficient. So, it indicated that economic yield per packet increased as the number of fruiting body increased.

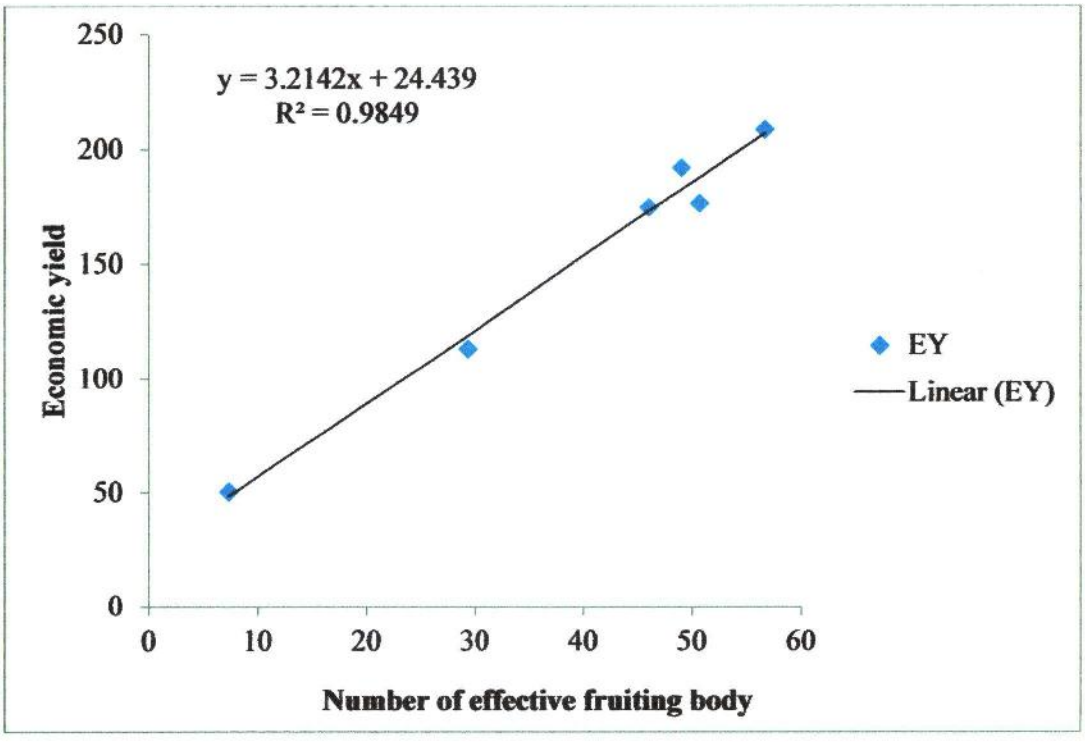

Fig.3. Functional relationships between number of effective fruiting body and economic yield of *Pleurotus ostreatus* (PO_2) influenced by rice straw substrate.

4.2 Experiment 2: Effect of different combination of saw dust and sugarcane bagasse on the performance of variety *Pleurotus ostreatus* (PO_2)

4.2.1 Mycelium running time (days)

The effect of substrate on days required for mycelium running was varied significantly at 1% level of significance. The highest time required for mycelium running (36.00) was obtained from treatment T_4 and treatment T_2 which was statistically similar to the treatment T_0 (33.33). The lowest time required for mycelium running (28.00) was found in case of treatment T_1, T_5 and treatment T_1 (Table 3).

Sarker *et al.* (2007) reported that the lowest days to complete mycelium running was recorded on waste paper, saw dust, rice straw and ulu but maximum days were required to complete mycelium running on nepier grass, para grass, water hyacinth, kash, wheat straw and sugarcane bagasse.

4.2.2 Number of primordia

The effect of substrate on number of primordia initiation was varied significantly at 1% level of significance. The highest number of primordia (95.67) was obtained from treatment T_5 which was followed by the treatment T_3 (59.33) and treatment T_4 (77.00). The lowest number of primordia (28.00) was found in case of treatment T_0 which was followed by the treatment T_1 (39.67) and T_2 (44.33) (Table 3).

Amin *et al.* (2007) reported that the highest number of primordia was observed in sugarcane bagasse with saw dust and wheat bran.

4.2.3 Number of effective fruiting body

The effect of substrate on number of effective fruiting body was varied significantly at 1% level of significance. The highest number of effective fruiting body (57.67) was obtained from treatment T_5 which was followed by treatment T_3 (34.67) and T_4 (46.67). The lowest number of effective fruiting body was found (15.00) in case of treatment T_0 which was followed by the treatment T_1 (25.00) and T_2 (28.00) (Table 3).

The highest number of effective fruiting body was produced by *Pleurotus ostreatus* (PO_2) in sugarcane bagasse with saw dust and wheat bran was reported by Amin *et al.* (2007).

4.2.4 Thickness of pileus (mm)

The effect of substrate on thickness of pileus was varied significantly at 1% level of significance. The highest thickness of pileus (11.06) was obtained from treatment T_5. The lowest thickness of pileus (3.70) was obtained in case of treatment T_0 (3.70) (Table 3).

4.2.5 Diameter of pileus (cm)

The effect of substrate on diameter of pileus was varied significantly at 1% level of significance. The best diameter of pileus (11.41) was obtained from treatment T_5. The lowest diameter of pileus (4.77) was obtained in case of treatment T_0 (Table 3).

Table 3. Performance of oyster mushroom variety *Pleurotus ostreatus* (PO_2) of different combination of saw dust and sugarcane bagasse substrate in different treatments

Treatments	Mycelium running time (days)	Number of primordia	Number of effective fruiting body	Thickness of pileus (mm)	Diameter of pileus (cm)	Length of stalk (cm)	Diameter of stalk (cm)	Biological yield (g)	Economic yield (g)	Harvest Index (%)
T_0	33.33a	28.00c	15.00c	3.70f	4.77f	3.04f	3.00e	71.67c	67.00c	93.96
T_1	28.00b	39.67bc	25.00bc	6.32e	6.69e	3.71e	3.91d	105.33bc	101.33bc	96.16
T_2	36.00a	44.33bc	28.00bc	7.80d	7.77d	4.29d	4.54c	135.33abc	131.33abc	96.87
T_3	28.00b	59.33abc	34.67abc	8.77c	8.58c	5.06c	5.12b	142.00abc	138.00abc	97.10
T_4	36.00a	77.00ab	46.67ab	9.73b	10.41b	5.50b	5.43ab	191.67ab	187.67ab	97.76
T_5	28.00b	95.67a	57.67a	11.06a	11.41a	5.96a	5.87a	217.67a	213.50a	98.08
Level of significance	**	**	**	**	**	**	**	**	**	NS

** Indicate 1% level of significance, * indicate 5% level of significance and NS indicate none significant

4.2.6 Length of stalk (cm)

The effect of substrate on length of stalk was varied significantly at 1% level of significance. The highest length of stalk (5.96) was obtained from treatment T_5. The lowest length of stalk (3.04) was obtained from treatment T_0 (Table 3). The quality of oyster mushroom (*Pleurotus ostreatus*) depends on the length of stalk, higher the length of stalk poor the quality of mushroom (Zadrazil, 1978).

4.2.7 Diameter of stalk (cm)

The effect of substrate on the diameter of stalk was varied significantly at 1% level of significance. The highest diameter of stalk (5.87) was obtained from treatment T_5 which was followed by treatment T_4 (5.43). The lowest diameter of stalk (3.00) was found in case of treatment T_0 (Table 3).

4.2.8 Biological yield (g)

The effect of substrate on biological yield was varied significantly at 1% level of significance. The highest biological yield (217.67) of stalk was obtained from treatment T_5 which was followed by the treatment T_4 (191.67). The lowest biological yield (71.67) was found in case of treatment T_0 followed by treatment T_1 (105.33) (Table 3).

4.2.9 Economic yield (g)

The effect of substrate on economical yield was varied significantly at 1% level of significance. The highest economical yield (213.50) of stalk was obtained from treatment T_5 which was followed by the treatment T_4, (187.67), T_2 (131.33) and T_3 (138.00). The lowest economical yield (67.00) was found in case of treatment T_0 which was followed by the treatment T_1 (101.33) (Table 3).

Both biological yield and economic yield were found higher in sugarcane bagasse with saw dust and wheat bran (Amin *et al.*, 2007).

4.2.10 Harvest index (%)

There were no significant differences among the treatments in respect of harvest index. But numerically the highest harvest index (98.08) was found in case of treatment T_5 and lowest (93.96) was found in case of treatment T_0 (Table 3).

4.2.11 Relationship between number of effective fruiting body and economic yield:

A positive linear relationship was observed between number of effective fruiting body and economic yield per packet (Fig.4). It was observed that the equation y = 3.448x+20.83 gave a good fit to the data and the value of co-efficient of determination (R^2 = 0.976) showed that the fitted regression line had a significant regression co-efficient. So, it indicated that economic yield per packet increased as the number of fruiting body increased.

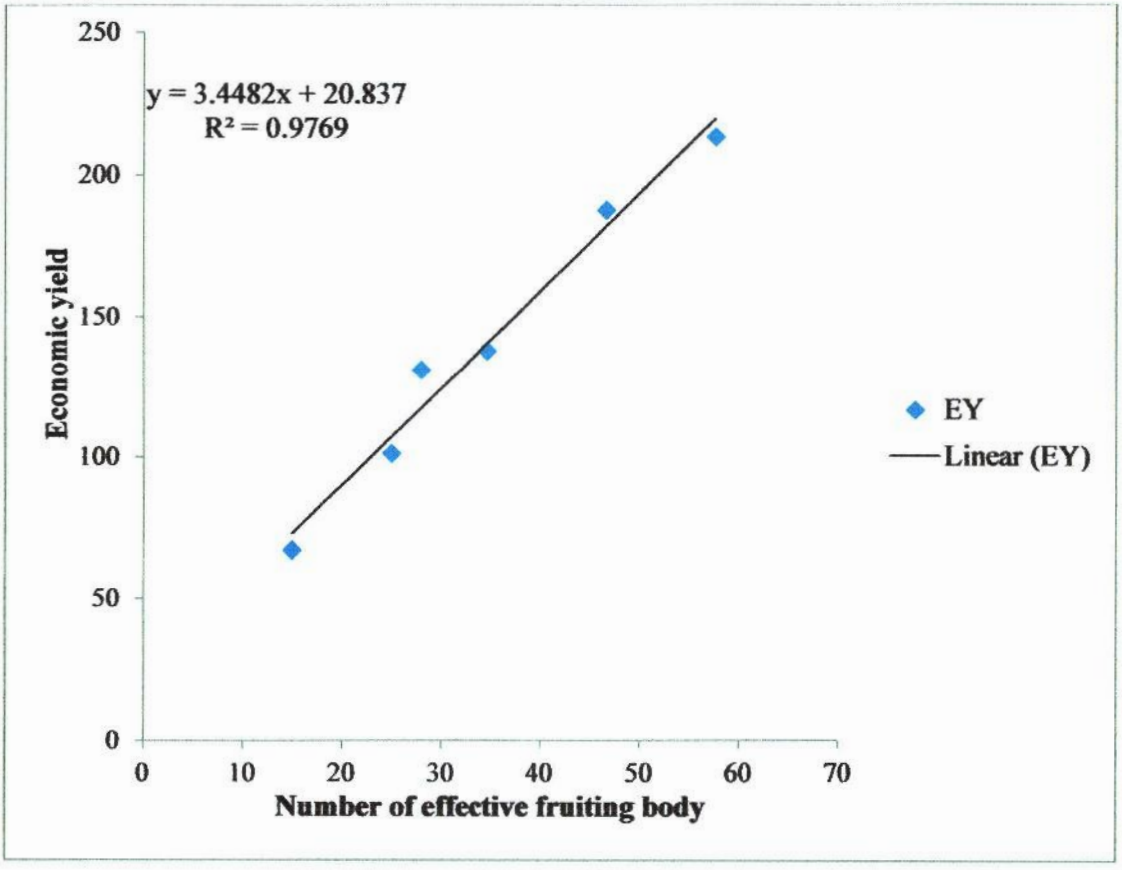

Fig.4. Functional relationships between number of effective fruiting body and economic yield of *Pleurotus ostreatus* (PO_2) influenced by sugarcane bagasse substrate.

4.3 Experiment 3: Effect of different combination of saw dust and grass pea husk on the performance of variety *Pleurotus ostreatus* (PO_2)

4.3.1 Mycelium running time (days)

The effect of substrate on days required for mycelium running was varied significantly at 1% level of significance. The highest days required for mycelium running (39.00) was obtained from treatment T_5 which was statistically similar to the treatment T_0 (39.00), T_1 (39.00), T_2 (39.00) and T_4 (39.00). The lowest time required for mycelium running (36.00) was found in case of treatment T_3 (Table 4).

4.3.2 Number of primordia

The effect of substrate on number of primordia was varied significantly at 1% level of significance.The highest number of primordia (105.00) was obtained from treatment T_4 which was followed by the treatment T_3 (83.33), T_2 (76.00), and T_5 (88.67). The lowest number of primordia (24.33) was found in case of treatment T_0 followed by T_1 (45.33) (Table 4).

4.3.3 Number of effective fruiting body

The effect of substrate on number of primordia was varied significantly at 1% level of significance. The highest number of effective fruiting body (72.67) was obtained from treatment T_5 which was statistically similar with treatment T_4 (67.33) and T_3 (56.67). The lowest number of effective fruiting body (11.00) was obtained in case of treatment T_0 followed by treatment T_1 (27.33) (Table 4).

4.3.4 Thickness of pileus (mm)

The effect of substrate on thickness of pileus was varied significantly at 1% level of significance. The highest thickness of pileus (10.97) was obtained from treatment T_5. The lowest thickness of pileus (4.18) was obtained in case of treatment T_0 (Table 4).

4.3.5 Diameter of pileus (cm)

The effect of substrate on diameter of pileus was varied significantly at 1% level of significance. The highest diameter of pileus (12.04) was obtained from treatment T_5. The lowest diameter of pileus (4.98) was obtained from treatment T_0 (Table 4).

4.3.6 Length of stalk (cm)

The effect of substrate on length of stalk was varied significantly at 1% level of significance. The highest length of stalk (6.10) was obtained from treatment T_5. The lowest Length of stalk (2.86) was found in case of treatment T_0 (Table 4).

4.3.7 Diameter of stalk (cm)

The effect of substrate on the diameter of stalk was varied significantly at 1% level of significance. The highest diameter (5.99) of stalk was obtained from treatment T_5. The lowest diameter of stalk (2.88) was found in case of treatment T_0 (Table 4).

4.3.8 Biological yield (g)

The effect of substrate on biological yield was varied significantly at 1% level of significance. The highest biological yield (243.33) was obtained from treatment T_5 which was statistically similar with the treatment T_2 (189.33), T_3 (199.33) and T_4 (229.67). The lowest biological yield (75.67) was found in case of T_0 which was statistically similar with treatment T_1 (106.00) (Table 4).

Table 4. Performance of oyster mushroom variety *Pleurotus ostreatus* (PO_2) of different combination of saw dust and grass pea husk substrate in different treatments

Treatments	Mycelium running time (days)	Number of primordia	Number of effective fruiting body	Thickness of pileus (mm)	Diameter of pileus (cm)	Length of stalk (cm)	Diameter of stalk (cm)	Biological yield (g)	Economic yield (g)	Harvest Index (%)
T_0	39.00a	24.33c	11.00c	4.18f	4.98f	2.86f	2.88f	75.67b	55.17b	72.74b
T_1	39.00a	45.33bc	27.33bc	5.58e	6.65e	3.39e	3.27e	106.00b	102.00b	96.16a
T_2	39.00a	76.00abc	49.33ab	6.88d	7.42d	4.02d	4.10d	189.33a	185.33a	97.84a
T_3	36.00b	83.33ab	56.67a	7.84c	8.60c	4.73c	4.99c	199.33a	195.33a	97.97a
T_4	39.00a	105.00a	67.33a	9.42b	10.48b	5.39b	5.39b	229.67a	225.67a	98.27a
T_5	39.00a	88.67ab	72.67a	10.97a	12.04a	6.10a	5.99a	243.33a	239.33a	98.33a
Level of significance	**	**	**	**	**	**	**	**	**	*

** Indicate 1% level of significance, * indicate 5% level of significance and NS indicate none significant

4.3.9 Economic yield (g)

The effect of substrate on economical yield was varied significantly at 1% level of significance. The highest economical yield (239.33) was obtained from treatment T_5 which was statistically similar with the treatment T_2 (185.33), T_3 (195.33) and T_4 (225.67). The lowest economical yield (55.17) was found in case of T_0 which was statistically similar to T_1 (102.00) (Table 4).

4.3.10 Harvest index (%)

The effect of substrate on harvest index was varied significantly at 5% level of significance. The highest harvest index (98.33) was obtained from treatment T_5 which was statistically similar with the treatment T_1 (96.16), T_2 (97.84), T_3 (97.97) and T_4 (98.27). The lowest harvest index (72.74) was found in case of treatment T_0 (Table 4).

4.3.11 Relationship between number of effective fruiting body and economic yield:

A positive linear relationship was observed between number of effective fruiting body and economic yield per packet (Fig.5). It was observed that the equation y = 3.017x+23.62 gave a good fit to the data and the value of co-efficient of determination (R^2 = 0.991) showed that the fitted regression line had a significant regression co-efficient. So, it indicated that economic yield per packet increased as the number of fruiting body increased.

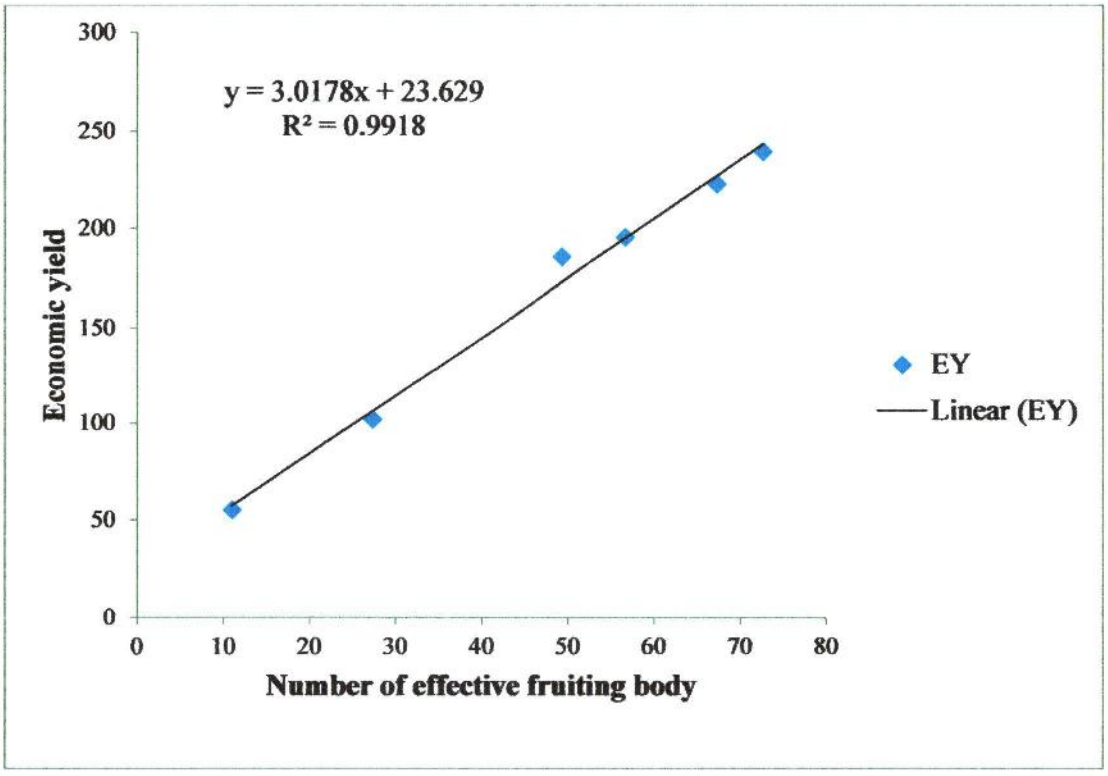

Fig.5. Functional relationships between number of effective fruiting body and economic yield of *Pleurotus ostreatus* (PO_2) influenced by grass pea husk substrate.

4.4 Experiment 4: Effect of different combination of saw dust and green gram husk on the performance of variety *Pleurotus ostreatus* (PO_2)

4.4.1 Mycelium running time (days)

There were no significant differences in different treatments in respect of time required for mycelium running. But numerically the highest time required for mycelium running (39.00) was found in case of treatment T_1, T_4 and T_5. Lowest time required for mycelium running (33.33) was found in case of treatment T_2 (Table 5).

4.4.2 Number of primordia

The effect of substrate on number of primordia was varied significantly at 1% level of significance. The highest number of primordia (106.67) was obtained from treatment T_3 which was followed by the treatment T_4 (85.33) and T_5 (84.00). The lowest number of primordia (28.00) was found in case of treatment T_0 which was followed by the treatment T_1 (56.67) and T_2 (61.33) (Table 5).

4.4.3 Number of effective fruiting body

The effect of substrate on number of effective fruiting body was varied significantly at 1% level of significance. The highest number of effective fruiting body (71.67) was obtained from treatment T_5 which was followed by the treatment T_4 (60.00) and T_3 (52.00) . The lowest number of effective fruiting body (14.00) was found in case of treatment T_0 which was followed by the treatment T_1 (31.00) and T_2 (36.67) (Table 5).

4.4.4 Thickness of pileus (mm)

The effect of substrate on thickness of pileus was varied significantly at 1% level of significance. The highest thickness of pileus (10.57) was obtained from

treatment T_5. The lowest thickness of pileus (3.86) was found in case of treatment T_0 (Table 5)

4.4.5 Diameter of pileus (cm)

The effect of substrate on diameter of pileus was varied significantly at 1% level of significance. The highest diameter of pileus (12.42) was obtained from treatment T_5. The lowest diameter of pileus (4.87) was obtained in case of treatment T_0 (Table 5).

4.4.6 Length of stalk (cm)

The effect of substrate on length of stalk was varied significantly at 1% level of significance. The highest length of stalk (5.79) was obtained from treatment T_5. The lowest length of stalk (2.71) was found in case of treatment T_0 (Table 5).

4.4.7 Diameter of stalk (cm)

The effect of substrate on the diameter of stalk was varied significantly at 1% level of significance. The highest diameter of stalk (5.99) was obtained from treatment T_5. The lowest diameter of stalk (2.96) was found in case of T_0 (Table 5).

4.4.8 Biological yield (g)

The effect of substrate on biological yield was varied significantly at 1% level of significance. The highest biological yield (249.00) was obtained from treatment T_5 which was followed by the treatment T_4 (221.33) and T_3 (194.00). The lowest biological yield (77.00) was found in case of treatment T_0 which was followed by treatment T_1 (Table 5).

Table 5. Performance of oyster mushroom variety *Pleurotus ostreatus* (PO_2) of different combination of saw dust and green gram husk substrate in different treatments

Treatments	Mycelium running time (days)	Number of primordia	Number of effective fruiting body	Thickness of pileus (mm)	Diameter of pileus (cm)	Length of stalk (cm)	Diameter of stalk (cm)	Biological yield (g)	Economic yield (g)	Harvest Index (%)
T_0	36.00	28.00c	14.00d	3.86f	4.87f	2.71f	2.96f	77.00d	73.17d	94.72b
T_1	39.00	56.67bc	31.00cd	5.93e	6.73e	3.33e	3.62e	138.67cd	134.83cd	97.00a
T_2	33.33	61.33bc	36.67bcd	7.21d	7.75d	4.12d	4.10d	169.33bc	165.33bc	97.55a
T_3	34.33	106.67a	52.00abc	8.31c	9.67c	4.79c	4.79c	194.00abc	189.67abc	97.72a
T_4	39.00	85.33ab	60.00ab	9.27b	11.16b	5.12b	5.37b	221.33ab	217.33ab	98.18a
T_5	39.00	84.00ab	71.67a	10.57a	12.42a	5.79a	5.99a	249.00a	245.00a	98.39a
Level of significance	NS	**	**	**	**	**	**	**	**	**

** Indicate 1% level of significance, * indicate 5% level of significance and NS indicate none significant

4.4.9 Economic yield (g)

The effect of different substrate on economic yield was varied significantly at 1% level of significance. The highest economic yield (245.00) was obtained from treatment T_5 which was followed by the treatment T_4 (217.33) and T_3 (189.67). The lowest economic yield (73.17) was found in case of treament T_0 which was followed by the treatment T_1 (134.83) (Table 5).

4.4.10 Harvest index (g)

The effect of different substrate on Economical yield was varied significantly at 1% level of significance. The highest harvest index (98.39) of stalk was obtained from treatment T_5 which was statistically similar with the treatment T_1 (97.00), T_2 (97.55), T_3 (97.72) and T_4 (98.18). The lowest Economical yield (94.72) was found in case of T_0 (Table 5).

In Experiment 3 and 4, using substrates has no available literature because these are new experiments.

4.4.11 Relationship between number of effective fruiting body and economic yield:

A positive linear relationship was observed between number of effective fruiting body and economic yield per packet (Fig.6). It was observed that the equation y = 2.891x+43.00 gave a good fit to the data and the value of co-efficient of determination (R^2 = 0.977) showed that the fitted regression line had a significant regression co-efficient. So, it indicated that economic yield per packet increased as the number of fruiting body increased.

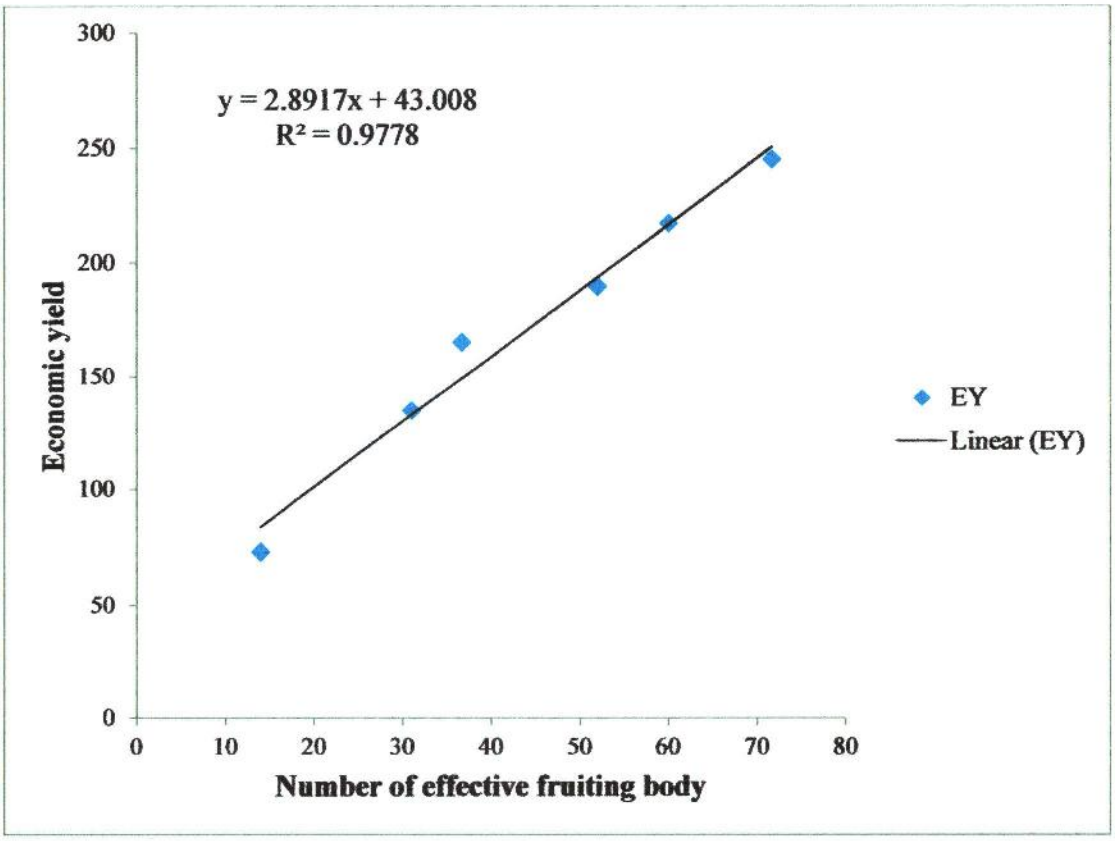

Fig.6. Functional relationships between number of effective fruiting body and economic yield of *Pleurotus ostreatus* (PO_2) influenced by green gram husk substrate.

CHAPTER FIVE

SUMMARY AND CONCLUSION

CHAPTER V

SUMMARY

The experiments on four different substrates were carried out to investigate the performance of oyster mushroom variety *Pleurotus ostreatus* (PO_2). For this purpose mushroom variety *Pleurotus ostreatus* (PO_2) was collected from Horticulture Center cum mushroom Sub Center, department of Agricultural Extension (DAE) Kairtala, Jessore and among four different substrates, sugarcane bagasse, grass pea husk and green gram husk were collected locally and rice straw was collected from Prof. Purnendu Gain Field Laboratory, Agrotechnology Discipline, Khulna University. Oyster mushroom *Pleurotus ostreatus* (PO_2) was cultivated on these four substrates with different proportion at 0%, 20%, 40%, 60%, 80% and 100% level. The effect of different levels on growth and yield of oyster mushroom was also examined. Result stated that days required for primordioa initiation were minimum at 60% level (T_3 treatment) in case of rice straw and grass pea husk and 40% level (T_2 treatment) in case of green gram husk but in case of sugarcane bagasse it was 20% (T_2 treatment), 60% (T_3 treatment) and 100% level (T_5 treatment). In case of rice straw substrate, number of primordia, number of effective fruiting body, pileus diameter, stalk length, stalk diameter, biological yield, economic yield and harvest index were highest at 80% level (T_4 treatment). But highest pileus thickness was found at 100% level (T_5 treatment). In case of substrate sugarcane bagasse, number of primordia, number of effective fruiting body, pileus thickness, pileus diameter, stalk length, stalk diameter, biological yield, economic yield and harvest index were highest at 100% level (T_5 treatment). On the other hand in case of grass pea husk and green gram husk substrates number of effective fruiting body, pileus thickness, pileus diameter, stalk length, stalk diameter, biological yield, economic yield and harvest index were highest at 100% level (T_5 treatment). But highest value of number of primordia

was observed at 80% level (T_4 treatment) in case of grass pea husk and 60% level (T_3 treatment) in case of green gram husk.

CONCLUSION

From the study it can be concluded that the performance of oyster mushroom *Pleurotus ostreatus* (PO_2) vary from substrate to substrate and different substrate composition. Among the four substrates, three substrates sugarcane bagasse, grass pea husk and green gram husk performed better when they were used as pure (T_5 treatment) for cultivation of oyster mushroom *Pleurotus ostreatus* (PO_2). But rice straw substrate performed better in T_4 treatment (80% rice straw + 20% saw dust). From the result, among the four substrates green gram husk gave the maximum yield but sugarcane bagasse gave the minimum maintenance cost.

CHAPTER SIX

REFERENCES

CHAPTER VI

REFERENCES

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Appendix I

Images of oyster mushroom *Pleurotus ostreatus* (PO_2) on rice straw substrate

Images of oyster mushroom *Pleurotus ostreatus* (PO_2) on sugarcane bagasse substrate

Images of oyster mushroom *Pleurotus ostreatus* (PO_2) on grass pea husk substrate

Images of oyster mushroom *Pleurotus ostreatus* (PO_2) on green gram husk substrate