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## Studies on nutrition supplementation for production of oyster mushroom (*Pleurotus florida*)

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**Abstract**

The present experiment entitled “Studies on nutrition supplementation for production of oyster mushroom (*Pleurotus florida*)” was under taken with the aim to determine the growth and yield of mushroom. There are different organic substrates *i.e.* wheat straw, Soybean straw, moong bean straw, urd bean straw, Sorghum stem (chopped), Maize stem (chopped), Pigeon pea stalk, Cotton stalk and Safflower straw and different supplementation; Wheat bran, Rice bran, Maize bran, Neem cake, Oil cake, Glucose, Dextrose, Ammonium sulphate, Ammonium nitrate Urea, and Poultry manure were used for production. The minimum days of spawn run (18.75) was recorded with moong bean straw substrate. While, the maximum number of primordial (177), number of pin heads (164.75), number of fruiting body (68.50), diameter of fruiting body (8.25 cm), stripe length (3.43 cm) and Yield (579.75 g) were recorded with wheat straw substrate. On the effect of carbon, nitrogen and cakes supplementation on wheat straw, the minimum days of spawn run was recorded with oil cake 5%. While, the different quantity parameters were recorded number of maximum primordial and pin head on maize bran 5%, maximum number of fruiting body and diameter of fruiting body on dextrose 5%, stripe length maximum on maize bran 5% and maximum yield significant on dextrose 5%.

**Keywords:** Oyster mushroom, organic substrates, organic supplementation, growth, Yield.

**Introduction**

A mushroom is the fleshy, spore-bearing fruiting body of a fungus, typically produced above ground on soil or on its food source. Mushrooms is known as macro fungi with distinctive fruiting bodies, which can be either epigenous or hypogenous. Edible mushroom known as food of gods. It is also used eaten routinely as in human diet generally known as healthy food. Mushrooms are excellent source of minerals and protein and also known as vegetarian's meat (Khan *et al.*, 1981) [14]. The oyster mushrooms (*Pleurotus spp.*) also called as Dhingri or 'Abalone' now ranks second among the important cultivated mushrooms in the world the tongue shaped pileus with an eccentric lateral stipe, this mushroom has been named as oyster mushroom. The flexible nature of the genus are mostly cultivated species, than any other mushrooms. Oyster mushroom (*Pleurotus florida*) is grown in moisten areas organic matter decomposing, they are highly valuable for nutrient cycling.

The attention of man has been attracted by the mushrooms from the ancient times and it is used as food item from the time of human civilization. Mushrooms are rich in nutrients and they have very good chemical composition, therefore they are very useful from the medicinal point of view for instance, they are effective against cancer, hypertension and diabetes. Mushrooms are large reproductive structures of edible fungi belonging to order Agaricales, Phylum Basidiomycotina. *Pleurotus spp.* has been reported to have anticancer, antimicrobial, antihypertensive, anti hyperlipidemic and antiallergic properties (Khan and Tania 2012). The *P. florida* produces metabolites of medicinal and pharmacological interest, and antitumorals (Elmastas *et al.*, 2007) [9].

Mushroom is not grown directly on soil as other crops but on organic substrate either raw or composted. These substrates are mostly materials from farm, plantations or factories. Oyster mushroom (*Pleurotus florida*) is grown in moisten areas organic matter decomposing; they are highly valuable for nutrient cycling. In India, 15-20 percent losses due to spawn spoilage have been reported. Spawn, *i.e.* seed required for growing mushroom, is the vegetative mycelium from a selected mushroom cultured on a convenient medium like wheat grains, pearl millet,

sorghum grains, etc. Grain spawn had an advantage over manure spawn because it could be mixed easily and provided many inoculum points.

### Review of Literature

Badshah *et al.* (1992) [3] grown *Pleurotus* spp. on different substrates like wheat straw, sugarcane baggase, corn cobs and saw dust. Yield of different substrates varied 18.50-432.8 g/2 kg substrates. Higher yield was obtained from wheat straw followed by sugarcane baggase, corn cobs and saw dust.

Khan *et al.* (2001) [15] cultivated oyster mushroom on cotton wastes, wheat straw, paper waste and paper waste + wheat straw (1:1) under laboratory condition. Among substrates, cotton waste gave highest yield (198.67 g) where as, paper based produce no fruiting body. The biological efficiency of oyster mushroom on four different substrate varied, with oyster mushroom cultivated in cotton waste recording the highest biological efficiency (19.87%).

Jain and Vyas (2002) [12] used different combinations of wheat straw with other substrates for enhancing the yield of *P. florida*. Out of nine combinations of wheat straw (WS) tested such (wheat straw: groundnut shells, wheat straw: bamboo leaves, wheat straw: paddy straw, wheat straw: soybean straw, wheat straw: pinus needles, wheat straw: saw dust, wheat straw: used tea leaves: wheat straw: ashoka leaves), only two combinations showed biological efficiency of *Pleurotus florida* eighter superior are equal to 93 and 89 per cent, respectively, in comparison to WS gave 87 per cent.

*Pleurotus* species are popular and widely cultivated throughout the world mostly in Asia, America, Europe. Oyster mushroom includes important commercial species that are widely cultivated throughout the world for their flavour, high nutritive value, medicinal properties and to upgrade the nutritional quality of lignocellulosic wastes for their use as animal feed (Cohen *et al.*, 2002) [5].

Mushrooms are fleshy, spore-bearing fruiting body of fungi belonging to the subdivision of Basidiomycotina of the class Hymenomycetes. Basidiomycetes include many of the familiar fleshy mushrooms. They are promising resource of physiologically functional food and as material for the development of medicines, pharmaceutical product, such as drugs, dietary supplements and healthy cosmetic products. Mushrooms have very high nutritional value being rich in proteins, vitamins and minerals. Mushroom's body stores nutrients and other essential compounds, and when enough material is stored and the conditions are favorable they start to fruit - produce mushrooms (Zhong and Tang, 2004) [27].

Mushroom is an eco-friendly cash crop. It is cultivated on agricultural residues to provide an ample opportunity for employment and extra-income to farmers. An integrated farming system-incorporating mushroom cultivation as the key activity for rural farmers has a potential to solve the problems which the farmers of India are currently facing. World is looking towards mushroom as one of the rich nutritious vegetarian food. More than 2000 species of mushrooms are known to be edible and the cultivation technology has been standardized for about 20 species (Dhoke *et al.*, 2007) [6]. Increase in population, reduction in per capita land, rise in temperature, increase in cost of production all put together marginal farmers and young unemployed youth on crossroad.

Dey *et al.* (2008) [7] reported that different substrates significantly affected the number of primordial and fruiting bodies, and the amount of fresh weight or yield of oyster

mushroom in cylindrical block system. The maximum number of primordia and fruiting bodies, and the amount of fresh weight was obtained with sugarcane bagasse in all flushes whereas, the minimum with mustard straw.

Ahmed *et al.* (2009) [2] cultivated *Pleurotus florida* on different substrate viz., soybean straw, paddy straw, wheat straw and their combination in 1:1 proportion to determine the effect of these substrates on yield, moisture content, crude fiber, crude protein, total carbohydrates, fat, ash and minerals like P, Fe, Ca content. Soybean straw showed significantly highest yield (with 87.56% biological efficiency) with maximum crude protein (23.50%) and maximum phosphorus (920 mg/100 mg of dry mushroom) content. Highest moisture (92.45%) and crude fiber content (8.10%) in the fruiting bodies was recorded on paddy straw cultivation. The combination of soybean straw + paddy straw showed significantly highest fat (2.60%), calcium (310 mg/100g) and iron (13.06 mg/100g of dry mushroom) content.

Ebibila *et al.* (2009) screened some agro-waste materials, like paddy straw, oil palm fiber and sawdust for the cultivation of the straw mushroom *Volvariella volvacea* and observed that the straw naturally supported the mycelia growth and production of fruiting bodies. Growth and production of fruiting bodies on oil palm fiber was similar to that of paddy straw. The production of fruiting bodies on the mixture of oil palm fiber and sawdust was scanty. Sawdust alone as a substrate produced few fruiting bodies that were comparatively small in size.

Dinesh *et al.* (2010) [8] reported that two species of oyster mushroom were grown on different substrates like paddy straw, sorghum stem, varagu straw and sugarcane trash. The biochemical analysis confirms that the protein, carbohydrates, lipids and amino acids in *Pleurotus* spp. were found to be altered by the substrates, the protein, carbohydrate, lipid and amino acid contents were maximum in *Pleurotus* spp. when the paddy straw was used as a substrate.

Ashraf *et al.* (2013) [1] conducted an experiment to compare the effect of different agricultural wastes on growth and yield of mushroom production, three species of *Pleurotus* viz. *P. sajor-caju* (V1), *P. ostreatus* (V2) and *P. djamor* (V3) were grown on three different substrates cotton waste (T1), wheat straw (T2) and paddy straw (T3).

Eslaminezhad *et al.* (2015) [10] reported that Improving yield, biological efficiency (BE) and number of pinhead formation in *Pleurotus florida* where achieved by nutritional supplement addition and use of casing overlay to substrate. In the present study utilization of soybean meal at two levels (2.5% - 5% dry substrate weight) and Hogland solution (Hogland, 1/2 Hogland) without the use or with avail of casing overlay to substrate and with control substrate were analysed. The results indicated that the addition of nutritional supplement and use of casing overlay to substrate had significant effect on yield and pinhead formation of oyster mushroom

Patel and Trivedi (2015) [17] mentioned that different species of *Pleurotus* grown within a temperature range of 20°C to 30°C, hence is becoming popular in both tropical and sub-tropical countries. In India, the cultivation is picking up at an alarmingly high rate due to ease of its cultivation. The most important step in the cultivation of *Pleurotus* mushroom is the pasteurization of large quantities of raw material without which the competing moulds during spawn run could not be removed.

Siddhant *et al.* (2015) [23] evaluated different brans wheat barley rice maize (cereal bran) sorghum (millet bran) pea,

gram and pigeon pea (legume gram) as supplement @ 10% on dry weight basis substrate for enhancing yield and biological efficiency of (*Pleurotus flabellatus*) among the bran used wheat, rice, pea, pigeon pea and sorghum bran produced significantly higher yield and biological efficiency of mushroom than the control. Maximum yield was recorded rice bran (655 gm) followed by wheat bran (615 gm) higher weight sporocarp was obtained from the barley (12.50 gm), pea (13.63) and pigeon pea bran (15.42gm).

Tesfaw *et al.* (2015) [25] evaluated the techniques to grow oyster mushrooms from culture to harvest using locally available materials. Oyster mushroom was successfully grown in potato dextrose agar (PDA). Effects of temperature, relative humidity and pore size, on growth of mushrooms were evaluated. High temperature (25°C), high relative humidity and pin hole size were optimal for oyster mushroom growth.

Iqbal *et al.* (2016) [11] studied the effect of different agricultural wastes (wheat straw, rice straw, sugarcane bagasse, maize straw and sorghum straw) on growth, production and quality of oyster mushroom (*Pleurotus florida*). Spawn running took less time i.e. 20 days on wheat straw than other substrates. The appearance of pinhead took 29 days on wheat straw and maturity of pin head also took less time i.e. 30 days on wheat straw. Maximum yield i.e. 1360 gm was recorded on wheat straw.

Pokhrel (2016) [20] reported that substrates such as corn cob, vegetable residue and waste paper were examined with the supplementation of rice bran and chicken manure separately. While studying mycelial growth, spawn run, pin head formation, yield and biological efficiency were observed. Best mycelial growth, early pin head formation and better yield were observed. Among the substrates used, corn cob showed the highest yield with range from 99.08 to 109.50% biological efficiency, rice bran was the best supplement for the promotion of growth and development of oyster mushroom.

Mensah, E.O. (2017) [16] reported that coconut coir and beans straw could blend well for mushroom production. The project was executed to evaluate the mycelial growth rate, yield and cost benefit analysis of oyster mushroom (*Pleurotus ostreatus*) cultivation on sole coconut coir, sole bean straw and a 2:3 ratio mixture of sole bean straw and sole coconut coir as substrates. Recording highest yields in the range of 43.2 - 47.4 g/kg substrate. The results indicated that beans straw could be a productive supplement to coconut coir and other highly lignified substrates for mushroom production

Pathania *et al.* (2017) [18] studied the cultivation of oyster mushroom on horticultural waste i.e. wheat straw and apple pomace mixed in the different ratio. It was found that the best yield of mushroom was observed when 0.50 kg of apple pomace mixed with 1.50 kg of wheat straw maximum fruiting body i.e. 28 were observed with approximate weight of 110gm with highest biological efficiency of 54.23% which is higher than the yield obtained from wheat straw recommending it blending with wheat straw. There was a significant increase in yield of mushroom in apple pomace + straw as compared to control i.e. wheat straw.

Paul *et al.* (2017) [19] reported the members of the genus *Pleurotus* generally known as oyster mushroom positioned second among the commercially cultivated edible mushrooms. Different *Pleurotus species* contained a large amount of polysaccharides, proteins, vitamins as well as but also flavonoids, glycosides, tannins, phenolics, steroids, terpenoids, alkaloids, glucans and other anti-oxidants. Presence of these nutraceuticals enable them to show different therapeutic activities such as

antitumor, immunomodulatory, anti-inflammatory, anti-hypertensive, hypo-cholesterolaemic, genoprotective, anti-platelets, anti-hyperglycaemic, anti-microbial and anti-viral activities.

Salami *et al.* (2017) [21] cultivated *Pleurotus florida* on the four lignocellulosic substrates: sawdust, corn cobs, oil palm spadix and corn straw. The result showed that *Pleurotus florida* contained 26.28-29.91% protein, 86.90-89.60% moisture, 0.48-0.91% fat, 19.64-22.82% fiber, 31.37-38.17% carbohydrate and 5.18-6.39% ash. The mineral contents ranged from 17-21 mg/100 g iron, 277-359 mg/100 g sodium, 2088-2281 mg/100 g potassium, 342-410 mg/100 g calcium and 1009-1133 mg/100 g phosphorus.

Singh *et al.* (2017) [24] conducted an experiment using wheat straw, paddy straw and chickpea straw alone and also in a combination of each other with 1:1 ratio (w/w) for the cultivation of *Pleurotus djamor*. The results obtained during the present experiment, maximum yield (440.00g/kg of dry substrate), minimum days for spawn run (23.00 days), minimum days for first harvesting (30.00 days), highest pileus length and width (9.0 cm and 9.67cm) were observed at wheat straw while highest number of fruiting body.

Shnyreva *et al.* (2017) [22] mentioned that *Pleurotus* are well known as valuable edible mushrooms which are broadly cultivated in the world as well as widely propagated in forests of the temperate climate zones including Russia. The best species *P. sajor-caju* 74%, *P. pulmonarius* 61% and *P. ostreatus* 72% fruit body yields by dry substrate weight in the first flushing cycle. "Spawn run" stage was finished within 17 to 24 days, the highest colonization stage (26 days) being for the pink oyster, *Pleurotus djamor* *Pleurotus species* of different origin.

## Material and Method

### Experimental Location and Design

This study was carried out in the laboratory of the Department of Plant Pathology, College of Agriculture, RVSKVV, Indore. The experiment was laid out in Complete Randomized Design (CRD).

### Source of material

All the substrates and supplementation were obtained from the farm, College of Agriculture, Indore. The polythene bags, spawn and other chemicals viz., fungicide, insecticides, formaldehyde, distilled water, were procured from the Plant Pathology Section, College of Agriculture, Indore.

### Preparation of substrate:

Two hundred liters of tap water filled in a plastic drum of 400 liters capacity. A stock solution with 125 ml formaldehyde and 14g Bavistin in water was prepared which finally added to drum containing 200 liters of water. This solution was stirred properly with a stick for its mixing. 20 liters of solution poured into the 40 liters capacity plastic drum for each substrate viz., wheat straw, soybean straw, moong bean straw, urd bean straw sorghum stem (chopped), maize stem (chopped), pigeon pea stalk, cotton stalk and safflower straw. Now, two kg dry straw substrate was steeped completely in this chemical solution. The mouth of the container was closed with the lid and kept as such for 18 hours. After 18 hours the straw agro wastes were taken out from the chemical solution and put on a wire sieve for the removal of extra solution. It was then spread thin layers over a clean cemented floor for further removal of excess moisture under aseptic conditions.

## Spawning

The mushroom were grown on different substrate on wheat straw, soybean straw, moong bean straw, urd bean straw sorghum stem (chopped), maize stem(chopped), pigeon pea stalk, cotton stalk and safflower straw in surface sterilized polythene bags measuring 60 X 45 cm in size. These surface sterilized polythene bags were taken and two small vents were made on both corners of the bottom side for leaching the excess water of the chemically treated substrate. The two layered spawning was done by using the 50 g of spawn/ kg wet straw substrate in a bag. One third quantity (approximate 3 kg wet straw) of 1 kg dry substrate of above prepare substrate was filled in these bags and gently pushed down. The fully grown spawn was broadcasted over the upper surface of the substrate.

**Supplementation:** The organic supplementation of carbon nitrogen sources and cakes on quantity and quality of oyster production.sources were added separately @ 50 g/ kg weight basis in different substrates to assess the biological efficiency of *P. florida*.

**Parameters:** The data was collected and observations were made on the following parameters: Days of spawn run, number of primordia, number of pin heads, number of fruiting body, diameter of fruiting body, stripe length and yield (g) per bag of the mushrooms were calculated after the completion of cropping period.

## Results and Discussion

### 1.1 Comparative study of oyster mushroom cultivation on different substrates.

#### Days of spawn run

The data have been presented in Table 1 showed that the minimum and significantly superior days of spawn run was recorded on the substrate of moong bean straw substrate (18.75). The maximum days of spawn run was recorded on

sorghum stem (chopped) (22.50).

#### Number of primordia

The data showed that the number of primordial was maximum and significantly superior on the substrate of wheat straw substrate (177.00). Minimum number of primordial have been reported on moong bean straw (160.50).

#### Number of pin heads

The data on the number of pin heads showed that the maximum pin heads developed on substrate of wheat straw (164.75) which was statistically superior to other substrate. Minimum number of pin heads have been reported on moong bean (149).

#### Number of fruiting body

The data on the number of fruiting body showed that the maximum fruiting body developed on substrate of wheat straw (68.50). Minimum number of fruiting body have been reported on moong bean (41.25).

#### Diameter of fruiting body

Observation on diameter of fruiting body showed that Wheat straw produced largest fruiting body (8.25), which was statistically larger than other substrates. The lowest diameter of fruiting body on the substrate of moong bean straw (6.35).

#### Stripe length

Data in stripe length showed that the length was maximum on substrate of wheat straw (3.43). The minimum stripe length was observed with mungbean straw.

#### Yield

The statistical analysis of the yield data on different substrates showed that the highest yield (g) was recorded on substrate of wheat straw (579.75) which was significantly superior to all other substrates.

**Table 1:** Characteristics of fruiting body and yield of oyster mushroom on different substrates

S. No.	Substrates	Duration of spawn run (days)	Number of Primordia	Number of Pin heads	Number of fruiting body	Diameter of fruiting body (cm)	Stripe length (cm)	Yield (g)
1	Wheat straw	20.00	177.00	164.75	68.50	8.25	3.43	579.75
2	Soybean straw	20.50	167.00	155.25	48.50	6.83	2.68	477.25
3	Moong bean straw	18.75	160.50	149.00	41.25	6.35	2.20	403.50
4	Urd bean straw	19.25	161.25	152.25	44.25	6.55	2.38	433.25
5	Sorghum stem (chopped)	22.50	168.50	157.75	52.25	6.93	2.98	509.50
6	Maize stem (chopped)	19.50	171.25	162.00	58.75	7.18	3.20	568.75
7	Pigeon pea stalk	20.00	169.00	159.50	57.00	6.95	3.08	556.75
8	Cotton stalk	21.25	174.25	163.75	62.00	7.28	3.28	572.50
9	Safflower straw	21.50	164.75	153.00	46.75	6.68	2.45	456.50
	SEm±	0.91	2.20	4.55	1.79	0.18	0.13	15.33
	CD at 5%	2.65	6.40	13.20	5.21	0.53	0.38	44.49

### 1.2 Effect supplementation of carbon nitrogen sources and cakes on quantity and quality of oyster production

#### Days of spawn run

The data have been presented in Table 1 showed that the minimum days of spawn run on wheat straw was recorded with supplementation of oil cake 5% (19.50). The maximum days of spawn run was recorded on supplementation of Urea 5% (23.25).

#### Number of primordial

The data showed that the maximum number of primordial on wheat straw was recorded with supplementation of Maize bran 5% (194.75). The minimum number of primordial was recorded on supplementation of Poultry manure 5% (179).

#### Number of pin heads

The data showed that the maximum number of pin heads on wheat straw was recorded with supplementation of maize bran 5% (183.50) which was statistically superior to other substrate. Minimum number of pin heads have been reported on supplementation of poultry manure 5% (167.75).

#### Number of fruiting body

The data showed that the maximum number of fruiting body on wheat straw was recorded with supplementation of dextrose 5% (72). The minimum number of fruiting body was recorded on supplementation of poultry manure 5% (64).

### Diameter of fruiting body

The data showed that the maximum diameter of fruiting body on wheat straw was recorded with supplementation of dextrose 5% (9.65). The minimum diameter of fruiting body was recorded on supplementation of poultry manure 5% (8.63).

### Stripe length

The data showed that the maximum stripe length on wheat

straw was recorded with supplementation of dextrose 5% (4.65). The minimum stripe length was recorded on supplementation of poultry manure 5% (3.73).

### Yield

The data showed that the maximum yield on wheat straw was recorded with supplementation of dextrose 5% (792.50). The minimum yield was recorded on supplementation of poultry manure 5% (696.75).

**Table 2:** Effect of supplementation of carbon nitrogen, sources and cakes on quantity and quality of oyster production

S. No.	Supplementation @ 5% per kg substrate	Duration of spawn run (days)	Number of primordia	Number of Pin heads	Number of fruiting body	Diameter of fruiting body (cm)	Stipe length (cm)	Yield (g)
1	Wheat bran 5%	21.50	186.50	175.25	65.50	8.75	4.00	743.25
2	Rice bran 5%	22.00	184.25	173.50	64.50	8.70	3.88	723.00
3	Maize bran 5%	20.75	194.75	183.50	70.00	9.35	4.45	776.50
4	Neem cake 5%	21.25	190.50	179.25	68.25	8.88	4.25	757.75
5	Oil cake 5%	19.50	182.00	171.00	64.25	8.65	3.78	707.00
6	Poultry manure 5%	20.00	179.00	167.75	64.00	8.63	3.73	696.75
7	Urea 5%	23.25	188.25	176.75	67.50	8.80	4.10	748.25
8	Ammonium nitrate 5%	20.25	191.50	180.00	68.75	8.90	4.35	765.25
9	Dextrose 5%	20.75	199.25	188.25	72.00	9.65	4.65	792.50
10	Glucose 5%	22.00	192.50	181.00	69.25	9.25	4.45	771.00
11	Ammonium sulphate 5%	22.25	197.75	186.75	71.25	9.40	4.50	783.25
12	Control	21.00	177.50	164.75	63.25	8.35	3.48	575.25
	SEM±	0.99	2.46	3.27	1.28	0.24	0.29	9.13
	CD at 5%	2.83	7.07	9.37	3.68	0.68	0.84	26.18

### Discussion

The Various crop residues can be used in producing Oyster mushrooms either as main substrates or in combinations with supplements. The mycelial growth in wet composts was improved when packed less density, possibly because of improved aeration. Most rapid colonization occurs within the temperature range 22-27°C. A wide range of organic waste materials have been proposed for mushroom cultivation. Wheat straw is one example and its 25% supplementation with olive mill effluent gives economic mushroom yield (E. Kalmis *et al.* 2008) [13].

Baysal *et al.* (2003) [14] investigated paper waste supplemented with rice husk, chicken manure and peat for *Pleurotus ostreatus* cultivation. Highest yield for fresh weight was recorded as 350.2 grams in the substrate containing 20% rice husk

Badshah *et al.* (1992) [3] similarly used different substrate for grown of *pleurotus* spp. On different substrates like wheat straw, sugarcane bagasse, corn cobs, saw dust and in soil. Yield of different substrates from varied 18.50-432.8 g/2 kg substrates. He noticed higher yield was obtained from wheat straw followed, sugarcane bagasse, corn cobs and saw dust, respectively over.

Jain and Vyas (2002) [12] evaluated the effect of the wheat straw supplementation with wheat bran, rice bran or neem cake the yield of *P. florida* was evaluated under laboratory conditions (26°C and 80-85% R.H.). Wheat straw supplemented with rice bran was most favourable substrate for *P. florida* resulting in the highest yield (910 g. basidiocarps).

Vyas *et al.* (2003) [26] carried out a laboratory experiment to evaluate the potential use of locally available plant materials, i.e. sorghum stalk, bajra straw, moth bean stalk, rice straw, mung bean stalk, sewan + dhamangeasses and wheat straw for *P. florida* cultivation. Wheat straw gave the earliest spawn run (17 days), first harvest (27 days) and highest total yield (985 g/ bag) and bio efficiency (98.5%).

### Summary

The results of present investigation are being summarized as below:

Among the different agro wastes tested, Wheat straw was found to be the best substrate for mushroom production followed by cotton stalk and maize stem (Chopped). It proved better on the basis of duration of spawn run, number of primordia, number of pinheads, number of fruiting bodies, diameter of fruiting body, stipe length and yield.

Among the supplementation of carbon and nitrogen source on quantity and quality Oyster production was found to gave best result of maximum yield of Oyster mushroom production. Among supplementation of dextrose was found to the best supplementation of carbon and nitrogen source followed by ammonium sulphate and maize bran.

### Conclusion

Mushroom are very rich source of protein and minerals and more effective in decreasing protein deficiency as well as malnutrition problem in rural areas. Self-employment opportunities in rural areas and better way of income generation. The study revealed that Moong bean straw substrate fastest spawn run and wheat straw superior primordia, pin head, fruiting body, diameter of fruiting body, stripe length and better yield among all the treatments including substrate. Wheat straw supplemented with oil cake better for spawn run, superior primordial and pin head with maize bran supplemented. Maximum number of Fruiting body and diameter of fruiting body on wheat straw with dextrose supplementation. Stripe length and maximum yield on wheat straw was recorded with supplementation of dextrose.

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