HEAVY METALS ANALYSIS OF MUSHROOM *pluerotus florida* on two different substrates *sesamum indicum* and *oryza sativa*

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ABSTRACT

The present work carried out on cultivation of mushroom *pluerotus florida*on *sessam indicm*and *oryza sativa* and estimation of heavy metals.Oyster mushrooms grow in wild logs and stumps. Being the edible mushroom, it was also sold in markets. Among the 70 species of pluerotus and other newly detected species, they are similar to each other. Oyster mushroom rich in vitamin B,B2,B12,C,D,E and used for anti-cancer, pernicious anemia, anti-tumor,immune mandatory, anti-nmalaria,anti-viral,etc… It can be converted to vitamin by human body, through cholesterol is absent in mushroom. Metal toxicity is a vital medical problem.Heavy metals are naturally occurring earth’s crust. They have density five times as heavy as water .some , heavy metals are mandatory nutrients. The metal mercury , which was discovered in Egyptian tombs was used to cure the widespreas syphilis in 15th century. The present study carried out on cultivation of mushroom in two different substrate , the fruit body formation appears on 30th day in paddy straw and 18th day in *sesamumindicum.* The weight gain of the substrate used obtain in *sesamumindicum*straw 810gm and 790gm. Obtain in substrate of paddy straw.The maximum level of copper 2.67 ppm estimated on *pluerotusflorida*grown on substrate by using paddy straw. For, analysis of heavy metal the maximum level of Lead 12.5ppm estimated in *sesamundicum*substrate as 8.10ppm Lead analysed in paddy straw substrate.

INTRODUCTION

The intake of wild edible mushroom is alarming due to their protein as well as trace minerals **(arahar-murugkar,et al..,2005)** . mshrooms are loaded with sugars, fiber, and minerals **(senator,1990 and Adewusi et al, 1993)**. 4-5 species of industrial significance all over the world.

**( Lelley et al.,1987)** decribed mushroom as a weapon against famine. Agricultural waste that contains lignin are metabolized by these mushrooms. Mushroom proteins are considered to be intermediate between that of animals and vegetables **(Kurtz man 1976,Martinez-carrera).** Mercury vapour is soluble in lipid, through lungs and oral mucosa it enters into the blood. In human food, sesame is considered as the most consumed oil seed in all over the world. It can be used for the preparation of foods. Cookies, cakes and so on. This study was also applied for the determination of lead, cadmium and arsenic in 80 samples of sesame purchased from supermarkets in khorasan province, iran **(Niloofarkhobakhtfahim etal.,2013).** The various analytical tools like SEM-EDX, FTIR and LC-MS deduced the stress tolerance mechanism **(Dilnadamodaran etal.,2013).**

*Pleurotus florida* (mont) singer cultivated on soyabean straw , paddy straw, wheat straw in 1:1 proportion to find the effect of these agro waste on yield, moistre content, crude protein, total carbohydrate, fat, crude fiber,ash and minerals. Soyabean straw showed highest yield (with 87.56% BE) with maximum moisture (92.45%) and crude fiber content (8.10%) in the fruiting body was showed on paddy straw cultivation the combination of soyabean straw paddy straw showed highest fat (2.60%) , calcium (310mg /100gm) and iron (13.06mg /100mg) of mushroom **(syedabrarahmed et al.,2009).**

Pleurotusspp have anti-cholestrol emic, anti-oxidant properties **(anandhi et al.,2013),** blood lipid lowering effects , anti-hematoma, anti-sarcoma activities **(wang and gao,2000).** Mushroom was reported to have the medicinal value for Diabetics & cancer therapy (**Sivrikaya etal.,2002).**the quality of waste product is increased by degradation of cellulose & hemicellulose due to mushroom enzymes and it is digestible. Mushroom yields an extra income with limited acreage **(Muller and cantner,1990).** Rice straw produced about 10% more mushroom than wheat straw under the similar cultivation condition **(zhang et al., 2002).** Mushroom substrate is a type of lingo cellulose material that aids the growth, development and fruiting of mushroom. The Aim of the study was to detect the concentration of heavy metals in soil and leafy vegetables grown in surrounding of industrial areas. This study was conducted from October 2014 to june 2015. Swiss chard samples showed cr and zn levels higher than FAO/WHO limits. The level of Cd, Pb, and Cu. However , were at their safe limits **(ermiasmisganaw etal.,2017).**

MATERIALS AND METHODS

### *Sesamum indicum straw* is taken in an amount of 4kg and *oryza sativa* was taken in an amount of 4kg. Spawn collection

*Pleurotus florida spawn* collected from Tamil Nadu Rice Research Institute Manganallur**,** Aduthurai, Thanjavur district.

### Substrate preparation

**A**ll the three substrate of *oryza sativa* straw, *Sesamumindicum*straw. They were pasteurized by hot water treatment. Boiling water was added to the substrate and substrates were allowed to remain in this water for 12 hours. After 12 hours of soaking period excess of water was drained off. The wet substrate had a moisture content of 75-78%. The substrate were spread a pre –sterilized polythene sheet and thoroughly spawned at 2% of the wet substrate.

### Cultivation in polythene bags

Mushroom blocks /beds were prepared in 45×55 cm sized polythene bags. Bags were filled with spawned substrate and closed to maintain high humidityduring spawn run. 8-10 holes were made in the polybags arbitrarily for exchange of gases. No water was given during spawn run period. When mycelium completely covered the substrate in bags, making a compact mass polythene cover was removed from mycelia block of the substrate to provide sufficient aeration to encourage cropping. Room temperature varied from 25 to 300c.

Variation in the relative humidity was 80-90%. Humidity was maintained by wetting the walls and floor. Diffused light and fresh air was provided by opening the door for 2-3 hours every day. Blocks were kept moist by watering twice a day and watering was withhelda day beforeharvesting.

### Harvesting

The mature fruit bodies of *pleurotus florida.* Were picked when the edges of pelei started curl up. Fresh weight of mushrooms was recorded immediately after harvesting .Biological efficiency was calculated using the following relationship.

RESULT

Table 1 shows the days for completion of spawn running, pinhead formation and fruiting body formation of *Pleurotus florida* grown on substrate *Sesamum indicum*.

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **GROWTH** | **NO.OF DAYS** | **NO.OF DAYS** |
| ***Sesamum indicum*** | **PADDY**  **STRAW**  **(*Oryza sativa*)** |
| 1 | S.PAWN RUNNIG DAYS | 16 | 19 |
| 2 | PINHEAD FORMATION DAYS | 13 | 25 |
| 3 | FRUITING BODY FORMULA | 17 | 29 |
| 4 | WEIGHT | 810.00 gm. | 790.00 gm. |

**Table 1** showing days for completion of spawn running, pinhead formation, and fruiting body production of *Pleurotus florida* on the different substrate paddy straw and straw of *Sesamum indicum*. The maximum of spawn running days (20) observed in substratum of paddy straw substrate and minimum (17) days observed in *Sesamum indicum.* The maximum days for pinhead formation(26 )days observed in *Oryza sativa* and minimum (14) days observed in *Sesamum indicum.*

The fruit body formation appears on 30th day in paddy straw and 18th day in *Sesamum indicum*. The weight gain of substrate used obtain in *Sesamum indicum* straw 810 gm and 790 gm. obtain in substrate of paddy straw.

### TABLE-2

Estimation of heavy metals (zinc, mercury) of *Pleurotus florida*on two different substrates.

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **SUBSTRATE** | **DESCRIPTION** | **LEVEL** |
| 1 | Paddy straw | Zinc | 1.25 ppm |
| Mercury | 8.10 ppm |
| 2 | *Sesamum indicum* straw | Zinc | 2.67 ppm |
| Mercury | 12.5 ppm |

**Table -2** shows the heavy metal analysis of *Pleurotus florida* which grown in two different substrate *Sesamum indicum* and paddy straws (*Oryza sativa)*. The heavy metals are zinc and mercury analysed for the present investigation.

The maximum level of zinc 2.67 ppm estimated on *Pleurotus florida* grown on substrate used by *Sesamum indicum* straw as 1.25 ppm zinc level observed in *Pleurotus florida* grown in substrate by using paddy straw. For, analysis of heavy metal the maximum level of mercury 12.5ppm estimated in *Sesamum indicum* substrate as 8.10 ppm mercury analysed in paddy straw substrate.

### Fig:1Growth, Pinhead formation and fruiting body formation of *Sesamum Indicum* dried stalk and leave



***Sesamum indicum straw;***



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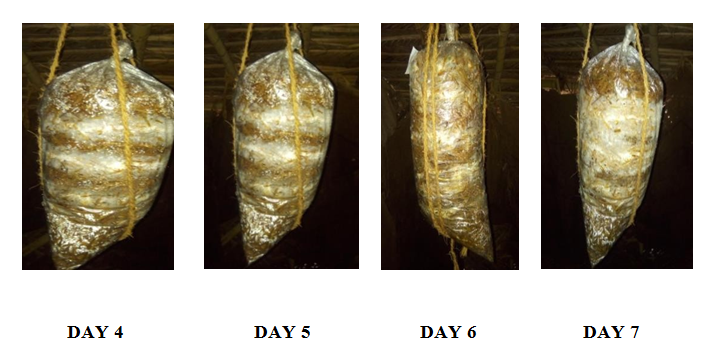


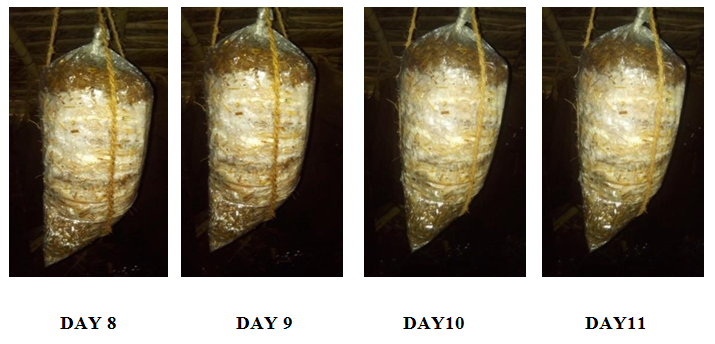
### Fig:2 Growth, pinhead formation and fruiting body formation of *Oryza sativa* straw

### PADDY STRAW;

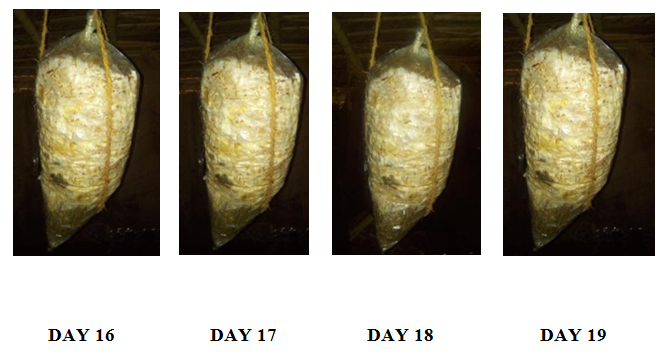
### Description: C:\Users\ELCOT\Desktop\day 1.jpg

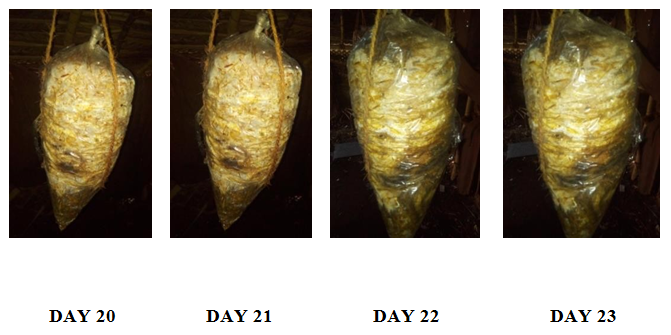












### Pinhead Formation



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**DAY 28 Initial Fruiting DAY 29 Initial Fruiting DAY30 Fruiting body Formation**

DISCUSSION

The present work carried out cultivation of *Pleurotus florida* mushroom in Idhaya College For Women Kumbakonam, Thanjavur. Oyster mushroom *Pleurotusflorida*cultivated in two different substrates *Sesamum indicum* straw and *Oryza sativa* straw. The present investigation growth of two different substrates the spawn running days, pinhead formation, Fruiting body, weight was compared. The longest time required for Pinhead formation (26) days recorded in straw of *Oryza sativa* and minimum pinhead formation (14) days observed in straw of *Sesamum indicum* The maximum our findings the present experiment almost similar to the findings of Oyster mushroom 16 to 25 days The maximum spawn running days (20) in noticed straw of *Oryza sativa* and minimum spawn running (17) days’ straw of *Sesamum indicum.* Our findings related to findings **Zhang et al., 2000.** Oyster mushroom cultivation of rice, wheat. The total yield of *Pleurotus florida*on maximum of 810gm observed in substrates straw of*Sesamum indicum* straw. The minimum 790gm observed in substrates straw of *Oryza sativa.* Heavy metals for essential nutrient difficulty Iron, cobalt, zinc, copper Lead is an essential trace mineral necessary for survival. It is found in all body tissue and plays a role in making red blood cells and maintaining nerves cells and immune system.

It also helps the body form collagen and observed Iron and plays a role in energy production. The species of plants which are of the fungal lineage include mushrooms, rusts, smuts, puffballs, truffles, morels and yeasts (**Blackwell et al., 2011).** They belong to the family of plants called Basidiomycetes. More than 700, 000 species of these fungi have been described, although some estimates have suggested that the total number of about 1.5 million species may exist **(James et al., 2006**). They are used as dietary supplements and complementary medicine where they are employed as anticancer, antiviral, immune potentiating, hypocholesterolenic and hepato protective agents. In fact, it has been asserted that the constant intake of either mushrooms or mushroom nutriceuticals makes people fitter and healthier.

In addition, the cultivation of this class of plants also helps in the conversion of agricultural and forest wastes into useful matter thus reducing environmental pollution (**Osemwegie et al., 2006**). Mushrooms have been used for dyeing wood and other natural fibres (**Abulude, 2013)** and it has been asserted that their use for this purpose, dated back to the prehistoric time of synthetic dyes **(Oghenekaro et al.,2008).** The presence of heavy metals in the environment has been a major public health concern, their removal from the environment is deemed important to the protection of environmental health. According to **Quarcoo and Adotey (2013**), mushrooms absorb heavy metals from a substrate via spacious mycelium.

Age and the size of the fruiting body are of less importance. The proportion of the metal content originating from the atmospheric depositions seems to be also of less importance due to the short lifetime of a fruiting body, which is usually 10-14 days. Mushrooms are also known to be capable of bio-accumulating more heavy metals in their fruit bodies since some of these heavy metals are natural components of the earth’s crust. **Stihi et al., (2009**), determined the heavy metal content of the fruiting bodies of substrate collected at various distances from a metal smelter in Dambovita County, Romania. The concentrations of Mn, Fe, Cu, and Zn in the samples were determined by Energy Dispersive X-Ray Fluorescence (EDXRF) spectrometry and the concentrations of Cr, Ni, Se, Cd and Pb were determined by Atomic Absorption (AA) spectrometry. They reported that a highest accumulation of Fe, Cu and Zn from substrate was observed for all the analyzed mushrooms samples and a high accumulation of Pb was observed in mushrooms growing in the vicinity of the metal smelter. Eight heavy metals (Cu, Zn, Fe, Mn, Cd, Cr, Ni, and Pb) in 14 different wild-growing edible mushroom species was studied by **Fangkun et al., (2010).** Their report show that iron content was higher than other metals in all mushroom species. The levels of zinc, cadmium, and lead in some edible mushroom samples were found to be higher than legal limits. The relative standard deviations were found below 10%.

## SUMMARY AND CONCLUSION

Cultivation of mushroom in two different substrates paddy straw (*oryza sativa)* and substrate of *Sesamum indicum.* Growth and yield performance of *Pleurotus florida* on two substrates *Oryza sativa, Sesamum indicum*. Analyzing of heavy metals Lead, Copper present in *Pleurotus florida* on two different substrates.

The present work carried out cultivation of *Pleurotus florida* mushroom in Idhaya College For Women Kumbakonam, Thanjavur. Oyster mushroom *Pleurotus florida* cultivated in two different substrates *Sesamum indicum* straw and *Oryza sativa* straw.

The present investigation growth of two different substrates the spawn running days, pinhead formation, Fruiting body, weight was compared.

The longest time required for Pinhead formation (26) days recorded in straw of *Oryza sativa* and minimum pinhead formation (14) days observed in straw of *Sesamum indicum.* The maximum our findings the present experiment almost similar to the findings of Oyster mushroom 16 to 25 days**.** On different agro waste. The maximum spawn running days (20) in noticed straw of *Oryza sativa* and minimum spawn running (17) days’ straw of *Sesamum indicum.*

The total yield of *Pleurotus florida* on maximum of 810gm observed in substrates straw of *Sesamum indicum* straw. The minimum 790gm observed in substrates straw of *Oryza sativa.* Heavy metals for essential nutrient difficulty Iron, cobalt, zinc, copper Lead is an essential trace mineral necessary for survival. It is found in all body tissue and plays a role in making red blood cells and maintaining nerves cells and immune system. The maximum of spawn running days (20) observed in substratum of paddy straw substrate and minimum (17) days observed in *Sesamum indicum.* The maximum days for pinhead formation (26 ) days observed in *Oryza sativa* and minimum (14) days observed in *Sesamum indicum*.

REFERENCES

* **Abulude (2007),Adewusi et al, 1993.** Assessment of the content of Pb, Cd, Ni and Cr in soaps and detergents from Akure, Nigeria. Res. J. Environ. Toxicol. 1 (2): 102 – 104, their morphology and uses. Global Journal of Pure and Applied Science, 12 (2),149-157.
* **Agrahar-Murugkar D, Subbuakshmi G**. Nutritional value of edible wild mushrooms collected from the **Khasi Hills of Meghalaya**. **Food Chem. 2005;89:599–603.**
* **Blackwell, M., Vilgalys, R., James, T. Y., & Taylor, J. W. (2011**). Fungi Eumycota: mushrooms, safe, fungi, yeast, molds, rusts, snuts, etc. version 10, April, 2009.http:// tolweb.org/fungi/2377/2009.04.10 in the tree of life web project **Chang, S.T., Miles, P.G. 1988.** Edible Mushroom and their cultivation. CRC press, Inc. Bocsa Raton, Florida U. S. A.27;83-88.
* **DilnaDamodaran,Raj Mohan Balakrishnan, and vidya k. Shetty**. The uptake mechanism of cd, cr, cu, pb, and zn by mycelia and fruiting bodies of *Galerinavittiformis*.biomad research international volume 2013,articleID149120,11pages
* **Ermiasmisganaw and TigistNardos.** Heavy metal concentrationin soil and swiss chard grown in the vicinity of Addis Ababa, Ethiopia. American –Eurasian J.Agric and environ .sci.,17(1):58-62,2017.
* **Jamesfankun, Kurtzman,R.H.Jr., 1976, “** Nutrion of Pleurotussapidus effects of lipids. Mycologia,”68,268-295.
* **Lalley, J**. Edible mushrooms as a weapon against starvation. Mush. J. Tropics. 7, 1987. 135-140.
* **Martinez-Carrera, D., 2000,** “Mushroom biotechnology in tropical America.”Int. J. Mushroom Sci.,3,9-20.
* **Muller, M. and cantner, E.W. 1990**. Mushroom cultivation for feed and food. Entwicklung-und-leandlicher-Raum (Germany, F.R.).22(2)15-17.
* **NilofarkhoshbakhtFahim, Hamid Reza Beheshti, SomayehSadatFakoorJanati and JavadFeizy.** Survey of cadmium, Lead, and arsenic in Sesame from olleted from shiraro town, northwest Tigray, Ethiopia**.ISSN**:1011-3924 .2019(**2),** 191- 2002.
* **Oghenekaro, O. A., Okhwoya, A. J.,andAkpaja, E. O. (2008).** Growth of Pleurotus tuber- regium (fr) singer on some heavy metal-supplemented substrates. African Journal of Microbiology Research, 12,268-271.
* **Osemwegie, O. O., Eriyaremu, E.G.,andAbdulmahik, J. (2006**) A survey of macrofungiinEdo/DeltaregionofNigeriaAbuludeF.O,OgunkoyaM.O.,Ogunleye
* **Quarcoo and Adotey.** Determination of heavy metal in pleurotusostreatus (oyster mushroom) and termitomycesclypeatus (termite mushroom) sold on selected markets in Accra, Ghana.mycosphere 4(5):960-967(2013).
* **Senator, F.,1990,** “Free fatty acid and free amino acid content of some mushrooms of Science and Agriculture”,51,91-96.
* **Sivrikaya, H., Bacak, L., Saracbasi, A., Toroglu, I. and Eroglu, H. 2002.** Trace elements in *Pleurotussajorcaju* cultivated on chemithermo mechanical pulp for bio- bleaching. Food chem. 79:173-176.
* **Stihi, C., Radulescu C., Busuioc G.,Popescui I.V, Gheboianu A., &Ene A. (2009).** Studies on Accumulation of heavy metals from substrate to edible wild mushrooms *Rom. Journ. Phys*.,. 56, 1–2,257–264.
* **Syed Abrar Ahmed, J.A.Kadam V.P. Mane, S.S. Patil and M.M.V.Baig**. Biological Efficiency and nutritional contents of *Pleurotus Florida (*Mont) Singer cultivated on different Agro-wastes. Nature and science, 2009,7(1**) ISSN** 1545-0740 http:[www.](http://www/) Science pub.Net.
* **Wang H, Gao J, Ng TB. 2000 –** A new lectin with highly potent anti hepatoma and anti sarcoma activities from the oyster mushroom *Pleurotusostreatus*. BiochemBiophys Res Commun. Sep 7;275(3),810**–**816.
* **Zhang, R., Li, X. and Fadel, J.G. 2002**. Oyster mushroom cultivation with rice and wheat straw. *Bioresearch Technology* 82: 277-284. 11, *Volvariella Volvacea* cultivation pp 100-109 274.38: 457-4655461-5467.