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Cultivation and Production of Selected *Oyster* Mushroom *(Pleurotus Sajor Caju)*

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ABSTRACT

P. sajor-caju is recognized as an excellent mushroom. It can be cultivated within a wide range of temperatures on different natural resources and agricultural wastes. Pleurotus sajor-caju can be grown on wheat straw, paddy straw, Rice husk, stalks and leaves of sorghum, pearl, millet and maize for commercial cultivation. The present research work aim is to find medicinal values and quantity of Pleurotus Sajor Caju. The span of oyster mushroom were cultivated in the sterile rice husk as cultured medium and cultivated mushroom were identified bared on morphological & microscopically. Results showed that 8kg of yield was produced by using 1kg of culture. Secondary metabolites like Alkaloids, Flavonoids, Steroids, Saponins, determine and antioxidants like SOD, Catalase, GPX, Lipids, Vitamins K, C levels were also identified and results concluded that mushrooms are rich source of metabolites.

Keywords: Oyster mushroom, Agricultural wastes, Cultivation, Yield, Medicine.

INTRODUCTION

Mushrooms are edible fungi rich source of secondary metabolites, antioxidants, non-starchy carbohydrates, dietary fiber, minerals, less fat, vitamin B and are quite low in fat value [1]. Oyster mushrooms (*Pleurotus spp., viz., P. ostreatus, P.flabellatus, P. sajor-caju, P. florida* etc.)

are a good choice for beginning mushroom cultivators because they are easier to grow than many of the other species and they can be grown on a small scale with a moderate initial investment. *Pleurotus* species have been used by human cultures all over the world for their medicinal properties and other beneficial effects. Oyster mushrooms are a good source of dietary fiber and other valuable nutrients. They also contain a number of biologically active compounds with therapeutic activities. Oyster mushrooms modulate the immune system, inhibit tumor growth and inflammation, have hypoglycemic and antithrombotic activities, lower blood lipid concentrations, prevent high blood pressure and atherosclerosis, and have antimicrobial and other activities.

Oyster mushroom can be cultivated in any type of ligno cellulose material like straw, sawdust and rice hull [2]. Mushrooms have a variety of accumulated secondary metabolites such as phenolic compounds, polypeptides, terpenes, and steroids. Mushrooms also have lectins, polysaccharides, polysaccharide-peptides, and polysaccharide-protein complexes which are known to have immune modulatory and anticancer activities [3]. Mushrooms with their flavor, texture, nutritional value and high productivity per unit area have been identified as an excellent food source to alleviate malnutrition in developing countries[4]. Among the reasons for the quick acceptance of mushroom is its nutritive content. Mushrooms are eaten as meat substitutes and flavoring. In general edible mushrooms are low in fat and calories, rich in vitamin B and C, contain more protein than any other food of plant origin and are also a good source of mineral nutrients[5]. The main research is to determine the suitability of locally available substrates for oyster mushroom production.

MATERIALS AND METHODS

Selection of oyster mushrooms: *P. sajor-caju* were selected for the study and it was authenticated by the Prof. Z. Vishnuvardha, Head, Department of Botany, Acharya Nagarjuna University, Guntur and it was used for the production.

Cultivation : Identified mushroom were cultivated in the sterile rice husk because it is easily available and cheap, it is widely used.

Chemical sterilization technique: Take 90 liters of water in a drum of 200 liter capacity. Slowly steep 10 kg of Rice husk in the water. Mix 125ml of formaldehyde (37-40 percent) and 7 g of Bavistin dissolved in 10 liters of water in another container and pour the solution slowly into the drum. Rice husk should be pressed and drum should be covered with a polythene sheet. Take out the Rice husk after 12 hrs. Spread the pasteurized or chemically sterilized Husk on neat and clean cement flooring or on raised wire mesh frame, inside the chamber where bag filling and Spawning are to be done.

Spawning: When the pasteurized substrate has cooled down to room temperature, it is ready for filling and spawning. At this stage, substrate moisture content should be about 70%. Polythene bags (35 x 50 cm, 150 gauge) or polypropylene bags (35 x 50 cm, 80 gauge) used for its cultivation. One 500 ml bottle spawn (200-250 g) can be used for 10-12 kg wet husk (3 bags). Spawning can be done in layer spawning or through spawning. In case of layer spawning, fill the substrate in bag, press it to a depth of 8-10 cm and broadcast a handful of spawn above it.

Similarly, 2nd and 3rd layers of substrate should be put and simultaneously after spawning, the bags should be closed. In through spawning, pasteurized straw is mixed with 2% spawn and filled in bags. After gently pressing, close the bags for spawn running (development). Spawned bags should be stacked in racks in neat and clean place, in closed position. Temperature at 25±5 °C and humidity at 70-85% should be maintained by spraying water twice a day on walls and floor. It takes 20-22 days when bags will be fully covered with white mycelium.

Cropping and harvest: After 20-22 days, when bags are fully impregnated with white mycelium, transfer the bags into cropping room and remove polythene/ polypropylene covers. The open blocks should be kept in racks about 20cm apart. Rack should be 60 cm wide with gap of 50-60 cm between two shelves. Mushrooms grow in a temperature range of 20-33^{0}C.

Relative humidity is maintained by spraying water twice a day on the walls and floor of the room. Spraying of blocks should be avoided for the first 2-3 days. A light moist spray of water is given on blocks as soon as the small pin heads appear. Once pinheads are 2-3 cm big a little heavier watering is to be done on blocks and further watering of blocks is to be stopped to allow them to grow. Mushrooms should be plucked before they shed spores to maintain quality. After 1st flush of harvest, 0.5 to I cm outer layer of the block should be scrapped. This helps to initiate 2nd flush which appears after about 10 days. After harvest, the lower portion of the stalk must be cleaned with dry cloth. They should be packed in perforated (5-6 small holes) polythene bags to keep them fresh. It loses freshness after about 6 hours, which can be enhanced by keeping them in refrigerator. Oyster mushroom can be sun dried for 2 days and dried product marketed in polythene bags. Dried mushrooms should be soaked in water for 10 minutes before use.

RESULTS AND DISCUSSION

The genus Pleurotus (Pleurotaceae, higher Basidiomycetes) comprises a group of edible mushrooms with medicinal properties and important biotechnological and environmental applications. The evolutionary connection among species in the genus Pleurotus is still not clear and many taxonomic issues remain controversial. The cultivation of Pleurotus spp is an economically important food industry worldwide which has expanded in the past few years. P. sajor caju is the third most important cultivated mushroom for food purposes. Nutritionally, it has unique flavor and aromatic properties; and it is considered to be rich in protein, fiber, carbohydrates, vitamins and minerals. P. sajor caju is the third most important cultivated mushroom for food purposes. Nutritionally, it has unique flavor and aromatic properties; and it is considered to be rich in protein, fiber, carbohydrates, vitamins and minerals. Pleurotus spp are promising as medicinal mushrooms, exhibiting hematological, antiviral, antitumor, antibiotic, antibacterial, hypocholesterolic and immune modulation activities. The bioactive molecules isolated from the different fungi are polysaccharides. One of the most important aspects of Pleurotus spp is related to the use of their ligninolytic system for a variety of applications, such as the bioconversion of agricultural wastes into valuable products for animal feed and other food products and the use of their ligninolytic enzymes for the biodegradation of organo pollutants, xenobiotics and industrial contaminants.

Table 1: Biochemical and Antioxidant analysis of *Pleurotus sajor caju*

Protein	Carbohydrate	Lipid	SOD	Catalase	GPX	Vitamin C	Vitamin k
1.30 ± 0.25	2 ± 0.15	1.08 ± 0.13	1.17 ± 0.15	0.83 ± 0.06	1.04 ± 0.28	0.85 ± 0.04	0.58 ± 0.03

Nutritional & enzymatic information on SOD, protein, Catalase, GPX, Vitamin C, Vitamin k lipid and carbohydrate were analyzed as shown in table 1.

Protein is an important constituent of dry matter of mushrooms [6-12],reported the digestibility of mushroom protein to be as high as 72 to 83%. The proximate analysis of mushroom mycelia has been reported by a number of Workers [13-15] and that of *Morchella* species by[16].Protein content of mushrooms depends on the composition of the substratum, size of pileus, harvest time and species of mushrooms[17]. On dry matter basis, the protein content of mushrooms varies between 19/100 and 39/100 g [18-19]. Protein was determined according to the method of Lowry *et al*. In terms of the amount of crude protein, present in the *Pleurotus sajor caju* in 1.30 ± 0.25 .

The carbohydrate content of mushrooms represents the bulk of fruiting bodies accounting for 50 to 65% on dry weight basis. Free sugars amounts to about 11%. Florezak et al. [20] reported that *Coprinus atramentarius* (Bull.: Fr.) Fr. contain 24% of carbohydrate on dry weight basis. The content of carbohydrate present in the *p. sajor- caju* in 2 ± 0.15.In terms of the amount of lipid content present in the *p. sajor- caju* in 1.08 ± 0.13.Superoxide dismutase (SOD) activity was measured according to the slight modified method previously described by Marklund and Marklund. The activity of SOD was in terms of the amount in 1.17 ± 0.15. Catalase activity was measured according to slight modified method of Sinha [21]. in their terms of present *p. sajor- caju* in 0.83 ± 0.06.

The activity of Glutathione peroxidase (GPx) was determined according to slight modified method [22] and present is 1.04 ± 0.28 in p. sajor- caju. Mushrooms are one of the best sources of vitamins. Vitamin content of edible mushrooms has been reported [23-25]. Manning [26] gave a comprehensive data of vitamin content of mushrooms and some vegetable. Mushrooms also contain vitamin C in small amounts [27,28]. The vitamin C content will be present 0.85 ± 0.04 , in *p. sajor- caju* .Mushrooms also contain vitamin k. It also present in the *p. sajor- caju* is 0.58 ± 0.03.

Table 2: Secondary metabolites in *PLEUROTUS SAJOR CAJU* extracts in different solvents

Secondary metabolites	Ethyl acetate	Chloroform	Petroleum ether
Alkaloids	+	-	-
Flavonoids	++	++	+
Steroids	+++	++	+++
Saponins	+	-	+
Tannins	-	+	-
Glycosides	++	+	++
Resins	++	-	+

Metabolites in low levels +, in moderate levels ++, in high levels+++ and absent- .

Secondary metabolites alkaloids, flavonoids, steroids, saponins, tannins ,glycosides and resins extracted from *Pleurotus sajor caju* are presented in Table 2 . Alkaloids extracted in ethyl acetate were significantly low but were absent in other solvents. Flavonoids were moderate levels in ethyl acetate and Chloroform but were low in Petroleum ether. Steroids were moderately high in ethyl acetate and Petroleum ether but were moderate level in chloroform. Saponins were low levels ethyl acetate and Petroleum ether but absent in other solvent. Tannins were absent in ethyl acetate and Petroleum ether .Glycosides and Resins extracted in ethyl acetate were significantly in moderate levels then in their resins are absent in chloroform. glycosides will be present in moderate level in petroleum ether and compared to all secondary metabolites high amounts of steroids present in their as well as our solvents.

APPLICATIONS

P. sajor caju is the third most important cultivated mushroom for food purposes. Nutritionally, it has unique flavor and aromatic properties; and it is considered to be rich in protein, fiber, carbohydrates, vitamins and minerals. Pleurotus spp are promising as medicinal mushrooms, exhibiting hematological, antiviral, antitumor, antibiotic, antibacterial, hypocholesterolic and immune modulation activities. The bioactive molecules isolated from the different fungi are polysaccharides. One of the most important aspects of Pleurotus spp is related to the use of their ligninolytic system for a variety of applications, such as the bioconversion of agricultural wastes into valuable products for animal feed and other food products and the use of their ligninolytic enzymes for the biodegradation of organo pollutants, xenobiotics and industrial contaminants. *p. sajor. caju.* Mushrooms also contain vitamin c and k.

CONCLUSION

During the growth of mushroom mycelia and the development to mature fruit bodies in oyster mushroom were cultivated in the sterile rice husk substrate have low sugar and fat contents and high content of good quality protein ,carbohydrates , SOD, Catalase, GPX, Lipids, Vitamins K,C levels . This study showed that the secondary metabolites from different extracts present in the metabolites high levels is called steroids then on their low levels in metabolites are present in Alkaloids & Tannins. These results also indicate that the studied mushrooms have good nutritive value for humans. Additionally, the agricultural ligno cellulosic wastes that are usually burned or left in the field to rot in our region can effectively be used for oyster mushroom production and this will provide an economical gain to this region if cultivation of oyster mushroom is made a profession by producers.

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