

STUDIES ON THE CULTIVATION OF *PLEUROTUS SAJOR-CAJU* (OYSTER MUSHROOM) ON SELECTED AGRICULTURAL WASTES

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ABSTRACT

The present study the studies on the cultivation of *Pleurotus sajor-caju* on the selected agricultural wastes. The *Pleurotus sajor-caju* is an edible mushroom. The paddy grain spawn on *Pleurotus sajor-caju* was obtained from Kerala, Agricultural College, Vellayani Selection of suitable substrate for their cultivation among paddy straw, coconut mesocarp, plantain dry leaves. The spawn running, pinhead formation, maturity of fruiting bodies, yield, growth characteristics of basidiocarp from pinhead stage to maturity were analysed. In paddy straw, the spawn running was on 5th day after the incubation of the spawn. In coconut mesocarp, the spawn running was on 7th day after the incubation of the spawn. The maximum number of *Pleurotus sajor-caju* mushroom pinheads were formed in paddy straw (19) followed in coconut mesocarp (22) and no bud formation in coconut leaf in the 15-25 days interval. The maximum number of *Pleurotus sajor-caju* mushroom pinheads were matured at 18 to 21 days interval in paddy straw, followed coconut mesocarp were matured. However, no buds produce plantain leaf. The maximum yield was obtained on paddy straw. The lowest yield was obtained on coconut mesocarp. There was no growth in plantain leaf.

KEYWORDS: Fungi, Oyster mushroom, Incubation, Basidiocarp

INTRODUCTION

Mushrooms are rich in proteins, vitamins and minerals and popularly called as the vegetarian's meat. Mushrooms proteins are considered to be intermediate between that of animals and vegetables (Kurtzman, 1976) as it contains all the nine essential amino acids required for the human body (Hayes & Haddad, 1976). Mushroom has high plan all over the world (Florczak et al., Rajeswska & Balasinka, 2004; Khan et al., 2012). Mushrooms contain about 1.5-6.7% Carbohydrates, 1.5-3% protein, 0.3-0.4% fats and vitamins (Bernas et al., 2006 ; Haq et al., 2010) mushrooms are useful against diabetes, ulcer, lung disease, and an excellent antitumor agent (Jose & Janardhanan, 2000).

Pleurotus species are popular and widely cultivated throughout the world mostly in Asia and Europe owing to their simple and low-cost production technology and higher biological efficiency (Mane et al., 2007). *Pleurotus* species are efficient lignin degraders that can grow on a wide variety of agricultural wastes with broad adaptability to agro-climatic conditions (Jandaik & Goyal, 1995).

Pleurotus sajor caju is a typical edible fleshy fungus. It has fruiting bodies shape like an oyster that contains high nutrient carbohydrate, protein, fats, minerals and multivitamins. "*Pleurotus*" means beside the ear and "*Ostreatus*" means oyster shaped and in Nepal it is oftencalled

“Kanyachayu” due to the ear like appearance *Pleurotus* species are rich source of proteins, minerals and vitamins C and B Complex (Caglanrmark, 2007; FAOSTAT, 2019). They can be used to over-come nutrient deficiency in the developing countries where the diet lacks quality proteins and minerals (Kumar *et al.*, 2020). Integrated Rural Development Program (IRDP) mushroom farming has become a very important cottage industrial activity. Eating mushrooms not only fills the nutritional void in India, but it also provides a source of income for small farmers and small businesses. (Karthick and Hamsalakshmi.2020).

Pleurotus sajor-caju has already cultivated on different substrates such as paddy straw, wheat straw, cotton wastes and hulled maize, sugarcane bagasse and sorghum stalks and leaves .

Oyster mushrooms are rich in vitamin C, B complex and minerals salts required by the human body (Randive,2012) The submerged culture of the genus *pleurotus* has been studied by several authors with the most varied objectives including the production of liquid inoculumns, extra cellular enzymes, flavoring agents, beta glycosidase (Marosis *et al.*, 2002), antimicrobials vitamins and extracellular polysaccharides(Adebayo *et al.*,2012)

MATERIALS AND METHODS

Collection of spawn

The experiment was conducted on cultivation of *Pleurotus sajor-caju* using various substratescollected from Nagercoil. The pure culture (Spawn) was obtained from Kerala, Agriculture college, Department of plant pathology, Vellayani.

Systematic Position of Pleurotus sajor-caju

Sub-division	:	Basidiomycotina	Class	:	Hymenomycetes
Sub class	:	Holobasidiomycetidae	Order	:	Agaricales
Family	:	Trichlomataceae			
Genus	:	<i>Pleurotus</i>			
Species	:	<i>sajor-caju</i>			

Biology of Pleurotus sajor-caju

Pleurotus sajor-caju is a basidiomycete in which the basidiocarp is edible and nutritious. It comes under the order Agaricales and family Trichoiomataceae. The sporophores of *Pleurotus sajor-caju* usually grown in groups. Food-grade mushrooms are the most efficient bioremediation method for the large amount of lignocellulosic waste generated annually by agriculture and related activities (Stamets, 2000). The cultivation technology is very simple, involves little cost, and does not require special compost is needed for the cultivation.

Substrate Preparation

The material on which the mycelium of mushrooms grows is called substrates. Agricultural wastes are used as substrate for cultivation of oyster mushroom. Three different substrates are selected viz Paddy straw, coconut mesocarp, coconut leaf.

Cropping and Watering

After the spawning process is complete, the temperature in the growing room is maintained between 16 and 25°C. The fruit body was started as soon as the substrate was fully impregnated with mycelium. Humidity in the growing room was maintained at 80-90 percent by sprinkling water on the floor, while the bags were kept moist with sprinkler water applied three times daily. During the cropping process and after the previous step was completed, the moisture content of the substrate was visually checked daily. Water was sprinkled on the bags twice a day during the cropping period.

Cultivation

Pleurotus species were known to grow relatively well on cellulosic, Carbohydrate materials. They require sugars protein etc. for their growth. Furthermore, they grow at a PH of 5 - 7 and 65 - 80% substrate moisture content. This is a protein rich material. The cultivation of this mushroom also needs only agricultural waste as saw material.

Spawn

The cereal kernels overgrown by mushroom mycelium is called spawn. The spawn prepared from paddy grains is used for the present study. The spawn *Pleurotus sajor-caju* was obtained from Agriculture college, Vellayani, Thiruvananthapuram.

Substrate

Substratum is the material on which the mycelium of mushrooms grows. Agricultural wastes and easily available plant leaves can be used as substrate for cultivation to oyster mushroom species were selected and three different substrates selected Paddy straw, coconut mesocarp waste, coconut leaf.

Paddy straw

Paddy is normally grown as an annual plant. According to the variety and soil fertility, rice plants can grow up to 1-1.8 m (3.3- 5.9 ft) tall. It has long, slender leaves that range in length from 20 to 39 inches and are 2 to 2.5 inches wide. A branched inflorescence 30 - 50cm (12 - 20 in) long produces the small wind-pollinated flowers. Paddy straw is cheaply available in Kanyakumari District.

Coconut mesocarp

India is the third coconut cultivation country in the world. Coconut and coir are valuable raw materials and the pith are treated as waste. In India, the production of coconut is high in Kerala and in Tamilnadu. In Tamilnadu, Tanjavoor and Kanyakumari districts are the maximum producers of coconut and coir products.

Coconut leaf

The coconut palm (*Cocos nucifera*) is a member of the palm family (Arecaceae).

Coconut leaves are found in mat form. The leaf sheaths collected from the trees were soaked in water for a week, washed thoroughly with tap water, then distilled water, and dried in the sun for a week. For 24 hours at 105-110 c, the leaf sheath was divided into inner and outer layers and placed in a hot air oven to remove moisture.

Polythene Bags

Polythene bags are used as a container for mushroom cultivation. Polythene bags with 60 x 30 cm size and 80to100 gauge thickness were obtained from Trivandrum

Preparation of culture substrates

Three different substrates viz paddy straw, coconut mesocarp, coconut leaf separately was prepared following the method described by Bhaskaran *et al.*, (1978) in the case study.

The three substrates are separately cut into small bits (3 to 5 cm) and are soaked in addwater for 12 hours to soften the tissues. Then they are boiled in separate contains for 30 minutes, water is drained and the boiled substrates should contain around percentage moisture.

Mushroom house/mushroom shed.

Mushroom shed should be preferably thatched. It should have a door the thatched portions can be covered with chicken mesh to squirrels. The floor of the shed can be filled with sand to a height of 15 cm and watered. The mushroom beds will be placed on racks inside the mushroom house. The inner side of the mushroom shed can be lined with gunny bags and sprayed with water twice daily to keep the shed cool. The shed may be laid in east west to avoid direct effects of sun and to reduces the temperature inside the cropping room.

Preparation of mushroom beds

Polythene bag of 60 x 30 cm size is taken and 2 holes of km diameter made in the center to ensure ration. The bottom of the polythene bags is tied a threat to provide a flat circular bottom to the mushroom beds. The mushroom spawn in dug out and places on a clean plastic tray. The spawn is divided into 2 halves and can be used for preparing two mushroom beds. The substrates paddy straw, were uniformly placed in the bottom of polythene bags separately to a height of about 5 cm. One portion of the spawn in sprinkled over the entire surface of the substratum. Similarly, four such layers are fills with the subtraction. Every time before spawning, press the leaf with hand for making it compact. Finally, the bag in closed tightly with twine. The prepared cylindrical running under semi dark condition in a clean room, spawn run at 30 to 35°C.

Incubation

After spawn running the polythene cover was removed and the bed was kept length wise. From the second day onwards, clean water was sprayed thrice a day. An elation and light were allowed for 20 minutes in the morning and evening by opening windows of the growing room. After 3 to 5 days the basidiocarps grow 5 to 8 cm and we're readily for harvest.

Spawn running

Growth of mycelium is called spawn running. Spawn running took 2 - 3 weeks afterinoculation. The inoculation of all substrates took place on the same day.

Pinhead formation

The pinheads formation is the second stage of mycelial growth during cultivation of mushroom, small pinheads like structure were observed.

Harvesting

The harvest was done after the maturation of 22 days. The basidiocarps are matured the collection can be made by hand picking.

RESULT AND DISCUSSION

Various agricultural wastes were utilized to produce *Pleurotus sajor – caju*. The production of food from wastes is not restricted to the use of food crop residues. However, a variety of wastes from farms, industries and even animal sources can represent potential substrate for conversion into food.

Spawn running

After inoculation, spawns began to appear 2 to 3 weeks later. The inoculation of all substrates took place on the same day. Tan (1981) reported that the spawning process took three weeks, and fruiting bodies appeared after 2-3 days. The present study showed the spawn running was on the 5 day.

Pinhead formation

Pinhead formation is the second stage of mycelial growth in mushroom cultivation. These pinhead-like structures appeared 6-7 days after the spawning event. Ahmad (1986) reported that the *Pleurotus sajor-caju* completed spawning in 17-20 days on different substrates, and that pinhead formation took 23-27 days. The present work also showed the pinhead formation on 18th day. This work correlate with the findings of Ahmad (1986).

Harvesting the fruiting body

This is the third and final stage in the mushroom-growing process. Fruiting bodies appeared 3-6 weeks after pinhead formation, and 27-34 days after spawn inoculation. Quimio (1976, 1978), who reported that fruiting bodies formation takes place in 3-4 weeks after inoculation of spawn. In the present work paddy straw showed 18-22 day after inoculation. The work correlate with the findings of Quimio (1976, 1978).

Yield of oyster mushroom

Paddy straw showed high amount among different substrates such as coconut leaves, coconut mesocarp. First the maximum yield was obtained in paddy straw. Second the minimum yield was obtained in coconut mesocarp. So, paddy straw is best substrate for the cultivation of oyster mushroom.

Substrate used

The substrates used for the cultivation of edible *Pleurotus sajor-caju* was Paddy straw, Coconut mesocarp, Plantain leaf.

Table 1: Substrates used for the cultivation of mushroom *Pleurotus sajor-caju*

S.No	Substrates
1	Paddy straw
2	Coconut mesocarp
3	Plantain leaf

Table 2: Spawn running of *Pleurotus sajor-caju* in different substrates

S.No	Substrates	Spawn running
1	Paddy straw	6
2	Coconut mesocarp	8
3	Plantain leaf	Nil

Result on the spawn running of *Pleurotus sajor-caju* in different substrates were present in Table 2. In paddy straw the spawn running was on 6th day after the incubation of the spawn. In Coconut mesocarp waste the spawn running was 8th after the incubation of the spawn. Spawn running was absent in Plantain leaf.

Table 3: Pin head formation after casing in *Pleurotus sajor-caju* cultivation on different substrates

S.No	Substrate	Pin head formation (in days)
1	Paddy Straw	18
2	Coconut mesocarp	20
3	Coconut leaf	Nil

The number of pinhead formation in *Pleurotus sajor-caju* present in table 3.

The number of pinhead formation of *Pleurotus sajor-caju* mushroom from the date of spawning exhibited significant difference between different substrate (Table 2). The pinheads first appeared between 15 to 25 days by using all the experimental wastes. The physical characteristics of the bed varied depending on the selected organic wastes when used for the preparations of bed for the cultivation of mushroom.

The maximum number *Pleurotus sajor-caju* mushroom pinheads we're formed in paddy straw (19) followed in Coconut mesocarp (22) and no bud formation in Plantain leaf nthe 15-25 days interval.

Table 4: Maturation of *Pleurotus sajor-caju* cultivated on different substrates

S.No	Substrates	Maturation (in days)
1	Paddy straw	18-22
2	Coconut mesocarp	20-25
3	Plantain leaf	Nil

The number of buds matured in *Pleurotus sajor-caju* present in Table 4. The maximum number *Pleurotus sajor-caju* mushroom pinheads were matured at 18 to 21 days interval in Paddy straw (10), followed Coconut mesocarp waste were matured. However, no buds in plantain leaves.

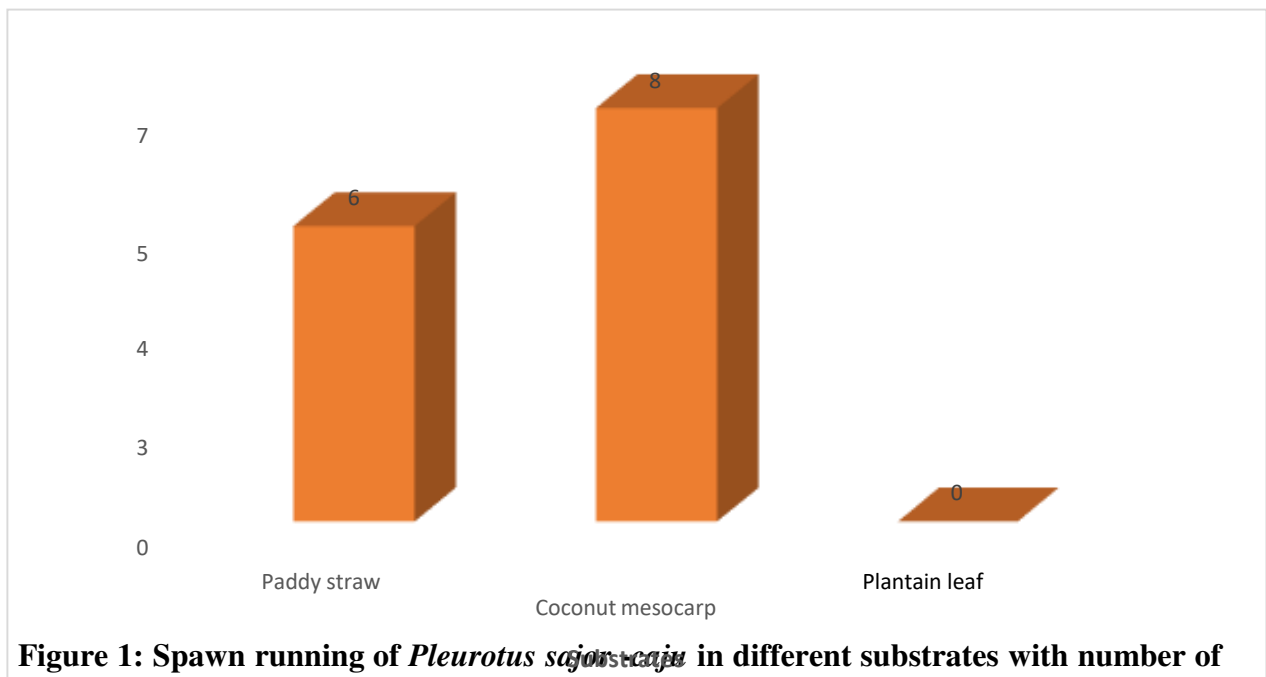


Figure 1: Spawn running of *Pleurotus sajor-caju* in different substrates with number of days

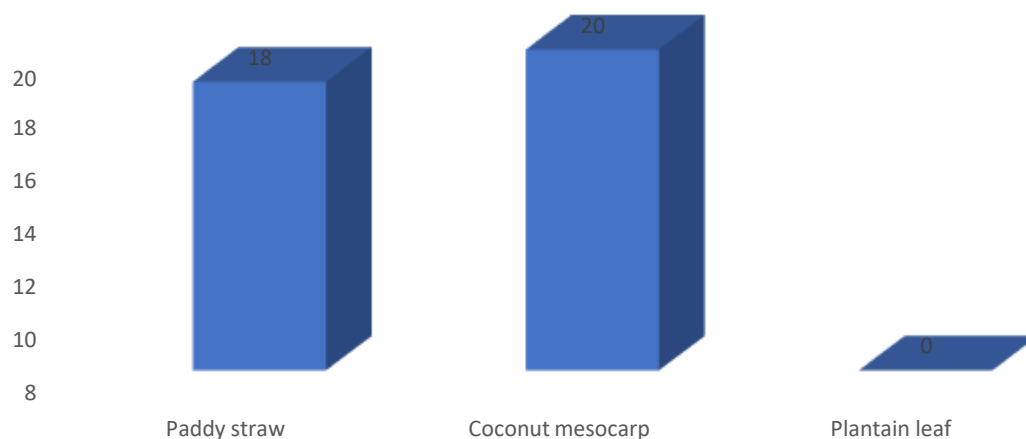


Figure 2. Pin head formation after casing in *Pleurotus sajor-caju* cultivated different substrates.

■ Pinhead formation (in days)

CONCLUSION

The present study established the significance of *Pleurotus sajor-caju* is an edible oyster mushroom develop in large numbers as a group was cultivated under local condition sink the available lingo cellulosic waste paddy straw as growing substrate. The paddy straw was not very rough but aerated firm and it favors the growth of the mushroom mycelium. The development of the basidiocarp is the most important factor in the yield. The normal basidiocarp with maximum weight fine texture and pleasing shades with more food value and without toxic material may have a good market.

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