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Evaluation of Various Organic Substrates for the Cultivation of *Pleurotus sajor-caju*

The cultivation of the oyster mushroom, *Pleurotus sajor-caju* (Fr.) Singer is gaining popularity in many parts of the world. It can be grown on wide varieties of agricultural by-products such as straw (Bano and Srivastava, 1962), corn cobs (Rajarathnam and Bano, 1987), saw dust (Singh, 1981), cotton screenings (Khan and Ali, 1981), banana pseudo-stems (Jandaik, 1976) and many other cellulolytic plant materials (Kandaswamy and Sivaprakasam, 1980). *P. sajor-caju* is mainly cultivated on pasteurized wheat and paddy straw. The substrates used in different regions depend on the availability and cost Area under paddy cultivation in many parts of India has been dwindling mainly due to the cost of cultivation and labour shortage. Paddy straw is widely used as fodder and is costly. Hence, there is a necessity to select alternate and cheaper substrates for cultivation of oyster mushroom. Arecanut *(Areca catechu* L.) husk and areca leaves are available abundantly in Kerala, Karnataka and Assam. Fallen, dried acacia leaf is another material which could be available in large quantity in the coming years due to widespread

planting of *Acacia auriculaeformis* A cunn. in aforestation programmes. The present work is an attempt to evaluate the locally available cheap materials, such as dried areca leaf sheath and husk and acacia leaves as substrates for the cultivation of oyster mushroom.

The method of cultivation followed was a modification of the method described by Moorthy (1981). The stock spawn of *P. sajor-caju* was grown on sorghum grains.

Arecanut leaf sheath, areca husk, acacia leaves, areca leaf sheath+paddy straw (1:1–W/W), areca husk+paddy straw and acacia leaves+paddy straw (1:1) were used as substrate in comparison with paddy straw alone as control. Paddy straw was chopped to a length of 6 to 8cm and soaked in water for 10min. Dried areca leaf sheath was chopped to a size of 5×8 cm and acacia leaves to a size of 5 to 8 cm and soaked in water for 3 and 36 hr. respectively. The final moisture content of the substrates was about 70%. The moistened substrates were pasteurized with steam for 20 min. at 15 lb pressure, allowed to cool and sprayed with carbendazim (Bavistin WP) and formalin (35% formaldehyde) solution so as to achieve a concentration of 75 ppm and 500 ppm respectively in the substrate (Vijaya and Sohi, 1987).

High density high molecular polythene (HMHDP) bags of size 55×40cm and 100 gauge thickness were used as containers. The bags were filled separately with the different substrates @ 1.2 kg dry substrate per bag. For each substrate three bags were maintained. Multilayered spawning technique was used to inoculate the substrate with the spawn @ 150 g per bag. After inoculation the polythene bags were tied at their open end, and kept on racks inside a closed room, where the temperature was maintained at 23 ± 2°C. The size of the room was $3.7 \times 3.7 \times 2.4$m. The bags were incubated for a spawn-run period of 18 days. After a spawn-run period of 10 days, the mycelial spread was recorded by visual observation. At the end of spawn-run, the polythene bags were cut open and stripped off exposing the entire substrate. After the spawn-run period the room was illuminated with three electric bulbs (60 W each), daily for 8 hr. The substrates were sprayed daily once with tap water. During the cropping period, the relative humidity in the room was above 90%.

Yield was recorded for three flushes. The biological efficiency (B.E) was calculated as a percentage of the yield of fresh mushrooms to the dry weight of substrate at spawning.

The yield of mushroom and the B. E. of different substrates used are presented in table I. Among the substrates used, areca leaf sheath supported the highest yield of mushroom and was best as far as substrate utilization was concerned. The average yield of fresh mushroom in the case of areca leaf sheath alone was 474 g per bag, followed by 341 g in the case of 1:1(W/W) mixture of areca leaf sheath and paddy straw. In this trial, paddy straw alone as a substrate yielded only 276 g fresh mushroom per bag. The B. E. of areca leaf sheath was 12 per cent more than paddy straw. Addition of areca leaf sheath to paddy straw increased

Table 1. *Yield of* Pleurotus sajor-caju *(g/bag) grown on different substrates*

Substrate *	1st flush		2nd flush		3rd flush		Total yield (g)	B. E. (%)
	Qty.	Days	Qty.	Days	Qty.	Days		
Paddy straw	58	28	183	50	91	60	332	27.6
Arecanut husk	15	36	—	—	—	—	15	—
Arecanut leaf sheath	358	64	116	72	—	—	474	39.5
Acacia leaves	37	54	—	—	—	—	37	—
Arecanut husk + Paddy straw	91	30	33	40	91	46	215	17.9
Arecanut leaf sheath + Paddy straw	50	28	216	64	75	73	341	28.4
Acacia leaves + Paddy straw	62	38	25	57	—	—	87	7.3

* Dry weight of the substrate per bag – 1200 g

yield over that of paddy straw alone. Yield was the lowest and negligible when arecanut husk alone was used as substrate. But when mixed with paddy straw it exhibited a B. E. of 17.9 per cent. The mycelial spread was also poor in areca husk. Yield was very poor when acacia leaves were used as substrate (B.E. 7.3%).

Though the mycelial growth was fast in acacia leaves, yield was second lowest. The visual observation on the mycelial spread after a spawn-run period of 10 days indicated that there was full spread in all the treatments except in arecanut husk (alone) where it was 90 per cent. Fast mycelial spread need not necessarily lead to high yield.

Paddy straw and other substrates which have paddy straw as a component yielded upto three flushes except in the case of acacia leaves + paddy straw. Though areca leaf sheath alone as a substrate yielded only two flushes, the highest yield was obtained with this substrate. There was considerable increase in yield in the first flush itself. However, one drawback in arecanut leaf sheath is the marked delay in mushroom production. The first flush was obtained 64 days after spawning on arecanut leaf sheath as against 28 days on paddy straw. The on-going experiments, where no temperature control measures were adopted, showed variations in the number of flushes. The number of flushes may vary in different seasons depending upon temperature change. This needs further investigations.

The present study indicates that areca leaf sheath is a promising substrate

Fig. 1. Oyster mushroom *Pleurotus sajor-caju* (Fr.) Singer grown on areca leaf sheath

for the cultivation of *P. sajor-caju* on a commercial scale and or for home cultivation by areca growers. Currently the area under areca cultivation in India is 1,84,300 ha. Areca leaf sheath is available throughout the year. The average number of leaves shed per areca palm per year varies from 6.5 to 8.0 depending on the spacing. The average number of leaves shed is around seven in 2.7 × 2.7m spacing (Bhat and Khader, 1982). It is estimated that about 3800 kg of leaf sheath per ha per year are available. Therefore, the mushroom cultivation can be an important component of an integrated biological system for a better and more beneficial use of areca leaf sheath in the areca growing tracts of the country.

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