DISCUSSION

Formation of hyphal pellets in shake culture reveals that interruption or continuous rotation results in active growth of the culture of *Pleurotus*. Kurtzman (1978) observed the formation of fruit bodies of *P.sapidus* in flasks kept stationary after shaking for 30 days. Solomon (1981) also remarked that fermentation used for mushroom culture have employed slow speed agitation, a feature which in itself tends to favour pellet formation. Camici et al.(1952), Galbraith & Smith (1969) observed that the formation of pellets is a balance between inoculum type and levels, culture medium and culture conditions.

It has been shown by Philips (1966) that *Penicillium chrysogenum* pellets above 0.2 mm in diameter are anaerobic at the centre due to diffusion resistance to oxygen. Pirt (1966) also considered that oxygen is the rate limiting nutrient in pellet growth.

Agitation transfers oxygen from the supplied air stream into the medium besides suspending particles in the medium. Biomass production is only interested in growing cells and therefore continuous culture is not only feasible but from an economic stand point, essential.

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Utilization of Areca Leaf as a substrate for cultivation of *Pleurotus sajor-caju*

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To produce mushrooms at a low cost, a very simple mushroom shed was built with areca stem and areca leaf, inside an arecanut (*Areca catechu* L.) garden. Freshly fallen areca leaf and leaf sheath alone were evaluated for the cultivation of oyster mushroom (*Pleurotus sajor-caju* (Fr.) Singer). The yield and biological efficiency varied between these two substrates. The average yield of fresh mushroom per bag containing 4 kg wet weight of substrate was 468 g and 344 g in leaf sheath alone and areca leaf with sheath respectively.

Different substrates have been tried for the cultivation of several species of *Pleurotus* in India and abroad. *Pleurotus sajor-caju* (Fr.) Singer can be grown on various agricultural by- products such as straw (Zadrazil, 1980; Rajarathnam & Bano, 1987; Vijay & Sohi 1987). Corn cobs (Rajarathnam & Bano, 1987), saw dust (Singh, 1981), cotton screenings (Cho *et al.*, 1981, Khan & Ali, 1981) and such other cellulolytic plant materials (Jandaik, 1976,; Kandaswamy & Sivaprakasam, 1980; Rajarathnam & Bano, 1987). The oyster mushroom *P. sajor-caju* is mainly cultivated on pasteurized wheat or paddy straw.

Fallen areca (*Areca catechu* L.) leaf is one of the main by products of areca cultivation. Thus areca leaves as well as leaf sheaths are not put to any proper use presently. Hence, the present work was undertaken to evaluate areca leaf along with sheath and leaf sheath alone as substrates for the cultivation of

oyster mushroom in a low cost mushroom shed built inside the arecanut garden.

MATERIALS AND METHODS

Freshly fallen areca leaves were collected from arecanut garden and used the same day of collection. Areca leaf along with leaf sheath (whole leaf) and leaf sheath alone (Sheath) were evaluated as substrates for the cultivation of *Pleurotus sajor-caju*. Since freshly fallen areca leaves were used they were not soaked in water. The areca leaves were chopped to a length of 5 cm and leaf sheath to a size of 3 cm x 6 cm. Both the substrates viz., whole leaf and sheath were pasteurized with steam for 30 min. at 15 lbs pressure and then 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 (Vijay & Sohi, 1987). The chopped and pasteurized whole leaf and sheath were separately used as substrates without any additives. The final moisture content of the substrate was about 70%.

Spawn was prepared on jowar (*Sorghum vulgare*) grains. Jowar grains were boiled in water. As soon as the grains started opening, the water was drained out and the grains mixed with 2% calcium carbonate. They were filled in bottles, sterilized at 121°C for $1^1/_2$ h. and inoculated with *P. sajor-caju*. The spawn was ready to use after about 15-20 days incubation at room temperature.

High density high molecular polythene bags of size 55 cm x 40 cm (100 guage) were used as container. The bags were filled with the substrate @ 4 kg wet substrate per bag. Multilayered spawning technique was used to inoculate the substrate with jowar grain spawn @ 150 g per bag. The bags were tied at their opened end and transferred to a low cost mushroom shed of L 5.4 m x B 2.7 m x H 2.7 m size.

The mushroom shed was built, inside areca garden with areca stem and leaves. Inside the shed there was a frame work of areca stem with five pairs of shelves, which could accommodate 80 bags filled with substrate. Such two sheds were constructed in the centre of an 11 year old areca garden. The mushroom was cultivated during Sept.-November. The maximum and minimum temperatures inside the mushroom shed were recorded daily during the period of cultivation.

After a spawn run period of 30 days, when the mycelium fully covered the substrate, the bags were cut and the substrate was sprayed with water daily once.

The mature fruiting bodies were harvested separately from each bag and the fresh weight of mushrooms was recorded. The minimum and maximum yield per bag and average yield of 40 bags of each substrate were worked out. The biological efficiency was determined by expressing in percentage the yield of fresh mushrooms in relation to the dry weight of the substrate.

RESULTS AND DISCUSSION

The average yield of fresh mushrooms produced on each substrate and biological efficiency are given in Table 1. The average yield of fresh mushroom in the case of areca leaf sheath alone as a substrate was 468 g per bag containing 4 kg wet weight of substrate, reaching a biological efficiency of 37.7 per cent. Where as the average yield was only 344 g in whole leaf substrate (B.E. 22.1%). The highest yield in leaf sheath was 875 g/bag whereas it was 480 g in whole leaf. The minimum yield obtained 233 g in leaf sheath and 120 g in whole leaf. The number of flushes also varied from bag to bag as well as with the substrate. The number of flushes per bag ranged from 2-4 (av.3) and 2-6 (av.4) in the case of sheath and whole leaf respectively. The time taken to produce first flush after spawning also varied with the substrate as well as from bag to bag (Table 2). The maximum and minimum temperatures recorded inside the mushroom shed during September-November were 29°C and 22°C respectively.

Paddy straw is considered as the best substrate for cultivating *P. sajor-caju*, in terms of yield. As the cost of paddy straw is increasing day by day, it is advantageous to find out a cheap and alternate substrate for mushroom cultivation. The present study reveals that fallen areca leaf is a promising substrate for the cultivation of *P. sajor-caju*. Though leaf sheath supported the highest yield, considering the availability whole leaf may be preferred as a substrate for oyster mushroom cultivation when more quantity of substrate is required for large scale cultivation. But it is advisable to use leaf sheath alone for home cultivation by areca growers as about 3800 kg of leaf sheath are available from one ha areca plantation per year. Currently the area under areca cultivation in India is 1,84,300 ha. The average number of leaves

shed is around seven in 2.7 m x 2.7 m spacing (Bhat & Khader, 1982). It is estimated that about 8500 kg areca leaf per ha per year are available. Looking to the availability of areca leaf throughout the year, it can safely be said that areca growing tracts of India has vast potential for the cultivation of *P. sajor-caju* in low cost sheds constructed inside the arecanut garden.

Table 1. Yield of fresh fruting bodies of *Pleurotus sajor-caju* grown on areca leaf

Substrate	Dry weight of substrate (kg)	Yield* (g)	Biological efficiency (%)
Areca leaf with leaf sheath	1.560	344 (120-480)	22.1
Leaf sheath alone	1.240	468 (233-875)	37.7

*Average of 40 bags
wet weight of substrate/bag = 4 kg

Table 2. Time taken after spawning to produce the first flush by *P. sajor-caju* and number of flushes on areca leaf

Substrate	Days from inoculum to Ist flush		No. of flushes	
	*Average	Range	*Average	Range
Areca leaf with leaf sheath	48	39-52	4	2-6
Leaf sheath alone	44	37-51	3	2-4

*Average of 40 bags.

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