

# Mushroom, a best companion crop for coconut

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Mushrooms are healthy foods and promising nutraceuticals. Odisha has tremendous potential for mushroom cultivation due to availability of abundant agricultural biomass, manpower and suitable climate.

Indian agriculture is now facing the challenges of nutritional security for the ever increasing population. In future, the depleting agricultural land, climate change, water shortage and need for quality food products at competitive rates are going to be the vital issues. Hence, it is imperative to divert our agricultural activities in areas like horticulture to meet these challenges and to provide food and nutritional security to our people. Mushroom cultivation is one such component that not only uses vertical space but also helps in addressing the issues of quality food, health and environmental sustainability. Fortunately, mushroom has gained importance in recent years possibly for the global shift towards vegetarian food and recognition of mushroom as a functional food. Mushroom cultivation also offers scope to recycle agro-wastes as carbon pool into good quality protein, much of which are otherwise wasted in the field. This unique horticultural

venture has tremendous scope to meet the challenge of food shortage without undue pressure on land.

## Mushroom as an intercrop in coconut garden

Coconut (*Cocos nucifera* L.) palm is an important perennial palm that survives more than 70 years. It is mostly grown under mono cropping system, as a result of which the total farm productivity is much lower than the actual potential. Further, frequent price fluctuation in coconut and high production cost lead to monocropping of coconut as not a sustainable and more economical proposition. Coconut garden provides excellent opportunities to exploit the interspace potential for maximizing returns per unit area by raising different intercrops. The most possible intercrops in coconut gardens include perennial, biennial and seasonal including medicinal and aromatic crops. Intervention of other agricultural practices including

raising of other crops become indispensable for augmenting the income of the coconut farmers through efficient utilization of available land, microclimate and labour.

### Scope of mushroom cultivation in coconut garden

Coconut is being grown in an area of 54,291 hectares with an annual production of 3805 lakh nuts (2012-13). The productivity level of coconut in the state is gradually increasing and has reached to 7500 nuts/ha (2012-13). Unlike other intercrops, mushroom cultivation inside coconut garden is now gaining momentum among the farmers of Odisha. Among different types of mushrooms, straw mushroom (*Volvariella volvacea*) is the obvious choice for the farmers. Straw mushroom is well suited for cultivation in the tropics because of its requirement for comparatively higher temperature for production. In addition, the mushroom grows on non-pasteurized substrate, more desirable for low input agricultural practices. It is cultivated predominantly in outdoor as an intercrop in the shade of coconut plantations in the hot and steamy coastal situation during summer and rainy seasons. Odisha is the only state where paddy straw mushroom is grown commercially for eight

months a year. Odisha produces about 3.05 million tones of paddy straw per annum and a major part of it is left out to decompose naturally or burnt in situ. Outdoor cultivation of straw mushroom is increasingly popular owing to low capital investment particularly for availability of straw at a cheaper rate throughout the year. This system accounts for over 60% production of straw mushroom in the state. Straw mushroom has become an economic and nutritional main stay in the agricultural economy of coastal belt of the state. Mr Trinath Pradhan of Siara village of Brahmagiri, Puri Dist. is growing paddy straw mushroom in an area of 2.0 ha of coconut garden.

### Cultivation of paddy straw mushroom in coconut garden

The microclimate of the coconut plantations offers a favorable place for successful cultivation of straw mushroom. The available temperature and humidity varies within 25-38°C and 70-96% respectively, which is favourable for cultivation of straw mushroom. Further the winter is mild and therefore, the crop is raised profitably from the month of February to November. Straw mushroom being a low duration crop (15 days), the farmers are able to raise 12-15 crops on a span of 10 months in the coconut system.



Good quality paddy straw bundles are collected, made to 45cm long by trimming both the ends and soaked in 2% solution of calcium carbonate for six hours. Bundles are taken out, excess water is drained off to 65% substrate moisture and beds are raised with dimension of 1.5' x 1.5' x 1.5' (length x breadth x height). Requirement of spawn and organic additive have been standardized at 3% each of the dry weight of the substrate. Three layered raised beds are prepared for spawning and organic supplementation at 1:1:2 proportions. Beds are topped with a thin layer of straw followed by covering with polythene sheet that maintains appropriate temperature for mycelia ramification (28-30°C) and fruit body formation (28-30°C). Polythene sheet is removed after emergence of pin heads, watering done as and when required and the fruits of the first flush are harvested at 14-15 days followed by providing the polythene cover once again. The second harvest from the second flush is harvested at 21-22 days. One bed thus prepared, may yield approximately one kilogram of fruits with a biological efficiency of 15% with appropriate aftercare.



## Cultivation of oyster mushroom

Oyster mushroom, *Pleurotus* species can be successfully grown during winter months during November to February in the coconut garden. Oyster mushroom prefers a temperature of 20-30°C and 80-85% humidity which is available inside a coconut orchard. The oyster mushroom can be cultivated employing most cellulosic farm wastes using a variety of containers such as polythene bags, nylon nets, baskets, shelves, trays etc. The spawn run is rapid and the first crop of mushroom can be harvested in about three weeks' time. Gray oyster mushroom (*Pleurotus sajor-caju*), white oyster (*P. florida*), pink oyster mushroom (*P. eous*) and blue oyster mushroom (*Hypsizygous ulmarius*) are the ruling species of the state. Pink oyster is gaining popularity owing to its attractive colour along with its good taste and flavour for small scale semi-urban and urban units.

The straw bundles are cut into 1.5-2.0" size and soaked in clean and cold water for 12-16 hrs. depending upon the stiffness of the straw. The cut pieces are sterilized in steam for an hour and are spread to drain out excess water maintaining 65% moisture in the substrate. The spawn from the bottle is removed and divided into four parts, likewise the boiled wheat is divided into four parts. The straw pieces are filled in

the bag upto 6" thickness to make it compact. The spawn and boiled wheat (one part each) put towards the periphery only to facilitate the emergence of fruit bodies, and top of the polythene bag is then tied up. For gas exchange, 10-20 holes are made around the bag by a clean nail. The bag is incubated in darkness for 15 days for mycelia growth. After that the mycelia mat is removed from the polythene bag and hanged in the racks. From the second day onwards the bags are watered to maintain substrate humidity. 20-25 days after spawning small buds develop and 3-4 days after they attain harvestable stage. Mushrooms are harvested in 3-4 flushes at 7-10 days interval. Total yield obtained from a single bag is 1.5kg-2kg. Bio-efficiency is more than 100%. The biological efficiency of oyster mushroom is very high (100 %) and the shelf life is better (24 h) than straw mushroom. Production cost is low with little longer cropping cycle (45 days). Further, it is suitable for post-harvest processing, however the consumer demand is limited in the state.

### Economics of mushroom cultivation in coconut garden

Mushroom cultivation is a profitable enterprise, and the cost involvement in raising one bed of paddy straw mushroom of 1.5' x 1.5' x 1.5' size is around Rs.50/- and if the minimum yield of mushroom

is 800g per bed, the net profit per bed will be Rs.14/- (if it is sold at minimum price Rs.80/- per kg). In a monocropping coconut garden of one hectare area where 50% land area is available for intercropping, about 5000 straw mushroom beds can be raised easily. This will give a net profit of Rs. 70,000/- in a crop cycle of maximum one month. If minimum six crops are raised during March to October, then the net profit will be Rs. 3,50,000/-. Likewise, by raising at least two crops of oyster mushroom during November to February a net profit of Rs.1,20,000/- can be obtained from 12000 oyster mushroom bags if minimum yield per bag is 1000g and sale price of Rs.40/- per kg with the expenditure of Rs.30/- per bag.

Mr. Trinath Pradhan, a farmer of Siara Village, who is growing paddy straw mushroom in 2.0 ha coconut garden could earn additional net income of Rs. 4.5 lakhs annually from five thousand straw mushroom beds by raising mushroom thrice a year. The AICRP on Mushroom & Palms functioning at Bhubaneswar support the farmers by providing technical know-how for growing mushroom in coconut garden.

Mushrooms are healthy foods and promising nutraceuticals. Odisha has tremendous potential for mushroom cultivation due to availability of abundant agricultural biomass, manpower and suitable climate. Mushroom production can be further increased by exploring scope of cultivation in the coconut gardens in coastal districts of the state. There is also increasing demand for quality products both in domestic and export markets. Further it is important to commercially utilize the spent mushroom substrate left after cultivation for making manures or vermicompost for getting additional income and proper recycling of agro-waste at the production site. ■

