

# Recycling of farm waste straw

## for paddy straw mushroom cultivation

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*Paddy straw mushroom production can be a better opportunity to fetch more price to the rice cultivator. Increasing popularization of threshers has made difficult to find out uncrumbled straws for paddy straw mushroom cultivation. On the other side, threshed straws are seen kept underutilized and also wasted in the farmyard. KVK, Keonjhar has standardized the technique to use the wasted threshed straw for production of paddy straw mushroom for the farmers of Odisha. It will directly benefit lakhs of rice farmers of the nation and lead them for prosperity through rice farming and self employment through mushroom production.*

**Key words:** Agri-waste, Home-stead, Mushroom, Paddy straw, Threshing

Mushroom cultivation was started in India during 1961. It is now a part of diet of most of Indians, especially the vegetarian. A nutritious food item, mushroom, can be produced from agriculture, forestry, industrial as well as household waste. Its cultivation requires minimum space, minimum resource with maximum output delivery in terms nutrition and money. It can be a homestead vocation and commercial enterprise as well giving employment and income to the grower. The per capita consumption of mushroom is 40-50 gm in India in comparison to more than one kg in western developed country. India produces 600 million tonnes of agri-waste per annum of which if 1% is diverted to mushroom production. Button and oyster mushrooms are mostly cultivated in India. Tropical mushrooms like Paddy straw mushroom (*Volvariella volvacea*) are more preferred in eastern Indian states like Odisha though having less nutritive value than oyster mushroom. Odisha alone produce more than 80% of total production of paddy straw mushroom of the nation.

Paddy straw mushroom (*Volvariella volvacea*) is a very popular diet of Odisha. Its taste and flavour is better than the other cultivated mushroom. It is usually produced from the heaped straws in backyard with a little decomposition during rainy season. Some farmers sprinkle butter milk, salt as a traditional practice to initiate mushroom production in the heaped straws. During post 1980 period, paddy straw mushroom was cultivated scientifically, using stifed uncrumbled straws. Later on, increasing popularity of mechanization in threshing, and concrete roofs instead of thatched house due to various social security schemes have led to leave the major

bi-product of rice cultivation, straws, as a waste product. Seeing the dominance of paddy as the major crop and large scale of its bi-product straws remain underutilized, a research was carried out during 2016-17 to standardize the mushroom production from threshed straws by Krishi Vigyan Kendra, Keonjhar, Odisha with the sponsorship of ICAR. The objective of project was to standardize the farmers' practice scientifically and upscale it. Among the nine treatments based on the soaking period of the straws and using of pulse powder as supplementary food, the best treatment that gave the highest yield was 5 hours of soaking

**Table 1.** Production comparison among different trials

| Parameter             | Farmers' practice        | On-station trial         | On-farm trial            |
|-----------------------|--------------------------|--------------------------|--------------------------|
| Substrate             | Unthreshed straw (8 kg)  | Threshed straw (5 kg)    | Threshed straw (5 kg)    |
| Feeding material      | 200 gm pulse powder (4%) | 150 gm pulse powder (3%) | 150 gm pulse powder (3%) |
| Soaking period        | 12 hrs                   | 5 hrs                    | 5 hrs                    |
| Pin head appearance   | 8-10 days                | 8-10 days                | 8-10 days                |
| Frequency of plucking | 3 times                  | 3 times                  | 3 times                  |
| Maximum yield/bed     | 1.2kg                    | 0.85 kg                  | 1.15 kg                  |
| Average yield/ bed    | 1.0 kg                   | 0.76 kg                  | 0.81 kg                  |
| Biological efficiency | 12.5%                    | 15.2%                    | 16.2%                    |

period and 3% of pulse powder (150 gram) per bed. The rest of whole production procedure of paddy straw mushroom production as mentioned in the flow chart below was taken with care. Special attention was given on few critical steps, e.g. preparation of bed, maintaining of humidity (80-85%), temperature (30-32°C), covering of white polythene till the bud initiation stage (8-10 days).

#### Method standardized for paddy straw mushroom production using threshed straw

- Selection of threshed straw which is not damaged by rain water.
- 5 kg such straw is ideal for preparation of a bed
- Soaking in fresh water for 5hrs in a tank
- Strain the straw and maintain the moisture level at 65% such that water does not come out even after pressing
- 50 grams of chalk powder may be added to the straw
- Collect the spawn from the bottle and non-infected pulse (Bengal gram) powder (3% of dry substrate)
- Divide both the spawns and pulse powder into 4 equal parts.
- A closed space with proper ventilation of air and light be selected for mushroom production
- Prepare a round base with 10" radius and 5" thickness of straw
- Put one part mushroom spawn on its sides (leaving 2" from side)
- Sprinkle one part of gram flour on the spawned surface.
- Put 5" straw on the prepared layer.
- Continue the same procedure of spawn and pulse powder application in the layer.
- Similar procedure to continue for the next two layers
- entire surface of fourth layer with sprinkling of pulse powder and spawn

**Table 2.** Economics of different trials

| Parameter                  | Farmers' practice | On-station trial | On-Farm trial |
|----------------------------|-------------------|------------------|---------------|
| Yield/bed                  | 1.0 kg            | 0.76 kg          | 0.81 kg       |
| Cost of Production (₹)/bed | 62                | 35               | 33            |
| Gross return (₹)/bed       | 120               | 91               | 97            |
| Net return (₹)/bed         | 58                | 56               | 64            |
| BC ratio                   | 1.94              | 2.6              | 2.93          |

- 2" of straw to be spread uniformly on top most layer
- Press the bed from the top and cover with clean polythene sheet
- Maintain optimum humidity (80-85%) and temperature (30-32°C)
- Mycelium starts spreading within 4-5 days
- Remove the polythene sheet after 8-10 days (bud initiation stage)
- Pluck the mushroom at bud stage (after about 10days)
- Maintain the temperature of 28-32°C with 70% humidity of the bed; sprinkle water if necessary
- Pluck the mushrooms continuously for 2-3 days as per the size demanded by market (up to 15 days from the date of inoculation of spawn)
- Harvest till new heads come up / other unwanted fungal growth is seen

The average production in farmers' field was 0.81 kg of fresh mushroom per bed. The net income from 10 beds was ₹ 640. In a rice dominated cropping district like Keonjhar, from the 175,000 ha of cultivated area giving about 54,000 MT of loose threshed straw can approximately produce 3,200 MT of paddy straw mushroom per annum. It can enrich the rural district income by adding more than ₹ 3 crore which will directly go to the resource poor farm families. This practice is now getting popularised in the district among the women SHGs that will benefit the rural economy as well as considered as a step towards women empowerment. It also add to the

nutritional security of the poor farmers, farmwomen and tribal communities of the district by adding most of the important elements to their diet.

#### Benefits of the innovation

- Utilization of threshed straws
- Preparation of a nutritious food item from threshed straw
- Giving value to a no-value product
- Adding extra return to rice cultivation
- With the least utilisation of resources, a homestead entrepreneurship develops
- With the simplest technology involved, any person can take the advantage and get self-employed

#### SUMMARY

Farmers' traditional practice of paddy straw mushroom cultivation from threshed straw was redefined scientifically by KVK, Keonjhar, Odisha. This technology is simple and easy for farmers, and the waste bi-product of rice farming, if converted to mushroom can be a good source for nutritional security and additional income generation. It will also increase the net return from rice farming substantially. This technology has started spreading in Keonjhar and neighbouring district of Deogarh within a short span of time.

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