

## Use of Sunflower Meal (De-Oiled Cake) During Composting for Lower Cost Mushroom Production

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**ABSTRACT:** Considering the constraints due to unavailability of uniform quality chicken manure in the local market, three different combinations of wheat and sunflower meal (de-oiled cake) were tested for their ability to affect yield and cost of production of the button mushroom (*Agaricus bisporus*). Compost was prepared by mixing 18, 22 and 25% sunflower meal with wheat straw by short method of composting. Eighty % chicken manure with wheat straw served as the control. All ingredients were composted for 18 days of two phase composting using a tunnel for peak heating as advocated by Shandilya *et al.* 1976. Fresh grain spawn was obtained from Bharat Mushrooms, Delhi, India. Formaldehyde treated soil (2:1 mixture of 2 year old farm yard manure and garden soil) was used for casing of beds. Combination with 22% sunflower meal gave the maximum production of mushrooms (226 kg/ton of compost).

### 1 INTRODUCTION

*Agaricus* is a hetrotrophic organism that obtains all nutritive elements from the substrate—the compost. Therefore, compost plays a more comprehensive and important role in mushroom production than does soil in higher plants. Finished compost is the result of decomposition process governed by a number of micro-organisms that produce important chemical and biological reactions thereby making it selective for *Agaricus bisporus*.

Due to non availability of horse manure compost, formulation based on wheat straw plus other nutrients (organic and inorganic) has become a standard and is being adapted by all the commercial mushroom units in India. Various formulations have been developed by different workers mainly based on locally available materials (Schisler 1974, Shandilya 1976, 1980, Hayes and Shandilya 1977, Dhar *et al.* 1985).

Chicken manure which is being used most efficiently and economically to supplement the wheat straw is losing its potency due to certain scientific, social and environmental barriers. Generally, chicken manure is a mixture of bird droppings, poultry feed and sawdust and is never homogenous in nature. Under uncovered yards it is exposed to severe climatic changes like rain, wind and temperature that makes it unfit to be used as uniform biological entity. Chicken manure lying outside in open fields retains water in rainy seasons and breaks down its nitrogen vary rapidly. This causes a loss of its nutritional value. Wet chicken manure forms hard lumps that mix unevenly and become anaerobic lumps during phase I composting. This also causes odors in the yard and reduces compost quality. Even more demanding than compost quality has become the social issues of odor and air quality problems. Odor problems have already been addressed and therefore promoted much research and various changes in compost production methods. Air quality problems during phase I composting have forced the growers to change the operations significantly (Miller 1993). Hence the objectives of our studies were to determine the effects of sunflower meal as a potent alternative to chicken manure. The present investigation deals with the addition of easily available, cheap and nutritional organic source.

## 2 MATERIALS AND METHODS

Wheat straw and chicken manure were procured locally. Sunflower meal (De-Oiled Cake) having protein content (40-45% of dry wt) was obtained from Aarti Agro Industries, New Delhi. Fresh grain spawn of *Agaricus bisporus* (Lange) Sing., strain S11 was obtained from Bharat Mushrooms, Delhi, India. Formaldehyde-treated casing soil (2:1 mixture of 2 year old farm yard manure and garden soil) was used for casing of beds.

Wheat straw-based compost was prepared by the short method. All ingredients were composted for 18 days of two phases composting using a tunnel for peak heating as advocated by Shandilay *et al.* 1980. Pre-wetting was carried out for 2 to 3 days followed by 7 days of outdoor composting on a concrete floor.

Supplements such as chicken manure or different concentrations of sunflower meal were added on the first day of stacking. Gypsum was added on the seventh day. Initial nitrogen content of the compost pile was kept at about 1.70 to 1.75%.

Spawn was mixed with the compost at 0.6 % by through spawning method in all the twenty four trays each containing 80 kg of compost (72% moisture). Spawned trays were covered with polythene sheets. After spawn run, polythene sheets were removed and the trays were cased with formaldehyde (41%) treated casing soil to a thickness of 4.0 cm. Regular

watering and appropriate ventilation especially at the time of pinhead formation was provided in growing room. Mushrooms were picked for 60 days and the weight of mushrooms recorded daily for each tray to determine yield. Yield was determined as kilogram per square meter. The yield response indicated that a compost mixture with 22% sunflower meal produced the best yields.

## 3 RESULTS AND DISCUSSION

Total nitrogen contents of all composts were the same during stacking. Compost C-2 was maintained by adding 0.7 kg urea (Table 1).

The yield data of four (C<sub>1</sub>-C<sub>4</sub>) compost mixtures (Table 2) showed that composts with sunflower meal were statistically equal with maximum productivity at 22% sunflower meal. The reduced yield in the compost with 80% chicken manure is obvious due to uneven nutritional status of the substrate while the low yield in compost with 25% sunflower meal may be either due to the harboring of parasites and competitors or excess nitrogen in the form of ammonia interfered with spawn run. Yield beyond two months was not recorded, it might be possible that compost with 25% meal had provided more production beyond that period.

Table 1. Composition of four composts.

Ingredient (kg)	C-1	C-2	C-3	C-4
Wheat straw	300	300	300	300
Chicken manure	240	—	—	—
Sunflower meal	—	54	66	75
Gypsum	24	24	24	24
Urea	—	0.7	—	—
Nuvon (ml)	30	30	30	30

Table 2. Sixty days' yield\* from four composts.

Compost	Yield/m <sup>2</sup> (kg)	Yield/m <sup>2</sup> (kg)	Yield/m <sup>2</sup> (kg)	Yield/mt of (kg)
	(a) I month	(b) II month	(a+b)	compost
C-1	6.8	6.4	13.2	165
C-2	9.8	6.2	16.0	200
C-3	10.4	7.7	18.1	226
C-4	9.8	7.7	17.5	218

\* Mean of six trials

The changes in normal cultivation practices studied in this experiment were found to be significant not only as an alternative to chicken manure but on economic front also. The most significant effect was the emergence of an alternative to chicken manure. Not only sunflower meal (De-oiled cake) which proved its efficiency during the experiments other kind of meals from protein rich seeds like soybean, groundnut, sesame etc. can be considered for straw-based compost preparation.

Problems of odor, air pollution as well as anaerobic clumps which were always attached with chicken manure are supposed to be not related with these proteins rich meals. Unlike chicken manure these meals are found to be homogenous and with appropriate characteristics like protein content, fibers, fat and carbohydrates etc. On economic front these characterised well maintained and packed meals can be obtained from organised markets at a cheaper rate than chicken manure if costs of labor, loading, unloading, transport, etc. are considered.

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