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Evaluation of Supplementation of *Daucus carota* on growth parameter and yield of *Pleurotus sajor-caju*

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Abstract

Six substrates viz. Soybean straw, wheat straw, paddy straw, domestic waste, fruit waste and used tea leaves was taken for the purpose. For the improvement of yield supplementation of *Daucus carota* was done at 1%, 2% and 3% of wet weight basis of the substrate. It was observed from the data that different concentrations of *Daucus carota* was proved good for the enhancement of yield but 3% concentration was give maximum yield in all the substrates. Among all substrates, Soybean straw and domestic waste was give maximum yield viz.960.0gm/Kg and 760.0gm/Kg on dry weigh basis of the substrates.

Keywords: Supplementation, Yield, Growth, *Daucus carota.*

INTRODUCTION

According to systematic position, mushroom belongs to Basidiomycota, order Agaricales and family Pleurotaceae (Kirk, *et al*., 2001). Unlike other cultivated species of mushroom, *Pleurotus* exhibits much diversity in the adaptability to varying climates, and this flexible nature makes it a more cultivated species than any other cultivated mushroom. Out of 28 species reported from India, more than a dozen are under cultivation in different part of the country (Balakrishnan and Nair, 1995; Verma, 1998).

Mushroom supplementation is understood as a farming method based on the physical addition of nutritional amendments to compost, during the process of composting, the mixture of raw materials, at spawning or during casing (Estrada *et al*. 2009; Pardo-Giménez *et al*. 2012; 2016) Supplements are commonly manufactured products containing defatted vegetable meal, such as soybean meal, and other organic protein sources, among them cereal bran, enriched with minerals or vitamins, which are

frequently used for the cultivation of *Agaricus* and *Pleurotus* species (Zied *et al*. 2011; Burton *et al*. 2015).

A particular growing media or substrate is not suitable in all the season or all states. Different species of mushrooms can grow well in variable temperature conditions; hence they are ideally suited for cultivation throughout the year in various regions of tropical country like India (Jain, 2005; Dehariya and Vyas, 2020). Environmental factors include temperature, relative humidity, light, carbon dioxide and acidity of substrate, affected the productivity and morphology of the species (Chaubey 2010). The large amount of agricultural wastes and congenial climatic conditions provide tremendous scope for oyster mushroom cultivation in Sagar, M.P. (Vyas 2009; Dehariya and Vyas 2013; Dehariya and Vyas,2020).

There is a need for alternative source for necessary requirements of food. In present scenario mushrooms are emerging as good nutraceutical, nutriceutical and pharmaceutical point of view. The production of nutraceuticals from mushroom (*Pleurotus sajor-caju* (Fr.) Singer) grown on different substrates enhance these nutraceuticals by supplementation of *Daucus carota* (Dehariya and Vyas, 2014) and by supplementation of *Embelica officinelis* (Dehariya and Vyas,2013). The main purpose was the study to enhance not only the yield but also the nutritional quality of mushroom. Not very much significant yield was recorded but some increase in growth parameters was recorded.

MATERIAL AND METHODS

In the present study *Pleurotus sajor-caju* was used for the purpose. *Pleurotus sajor-caju* was cultivated on different conventional substrates viz. Soybean straw, wheat straw, paddy straw and non conventional substrates viz. Domestic waste, Fruit waste and Used tea leaves. For supplementation, powder of *Daucus carota* was used. Supplementation was done at the time of cultivation. The supplementary was properly treated with 25 ppm bavistin (half gram thoroughly mixed with pretreated substrates while spawning).

Spawn preparation: Clean whole grains were taken for the purpose. The grains were pre-wetted by boiling in water for 20-30 min (Jain, 2005). After boiling, excess water was drained off by spreading the grains on a wire mesh. Grains were now mixed with gypsum (calcium sulphate) and chalk powder (calcium carbonate) at the rate of 2% and 0.5%, respectively on dry weight basis. The grains were filled in flasks, and plugged then sterilized in autoclave at 22 Lb pressure for 1.5-2 hours. The grains were allowed to cool in room temperature for overnight. Next day flasks were inoculated with two bits of agar medium colonized with the mycelium of pure cultures. About 7-10 days after inoculation, flasks were shaken vigorously. Three weeks after incubation, the stock culture becomes ready for further multiplication of spawn.

Inoculated flasks were incubated at 26±2°C.

Cultivation: A medium was prepared using soybean straw (SS), wheat straw (WS), paddy straw (PS), domestic wastes (DW), Fruit waste (FW), used tea leaves (UTL), All substrates were washed in fresh water. The chopped straw substrates were steeped in water containing 75 ppm bavistin + 500 ppm formaldehyde for 18 hours (Jain, 2005) for preventing mould infestation due to various other competiting fungi. In the present investigation *Daucus carota* supplementation was used as 1, 2, 3 percent concentration on the dry weight basis of substrate respectively. Supplements were sterilized with 25 ppm bavistin for 12-18 hrs. Excess water was drained and was dried in shed to retain 65-70% moisture content by squeezing with hands and then allowed to cool down for a certain period (1hr.). Spawning was done @ 2% wet weight basis of substrate by thoroughly mixing. Spawned substrate was filled up in perforated polythene bags (60 × 40 cm) and polythene mouth was closed with rubber band. These bags were transferred to crop room for spawn run. Three replications were maintained for each substrate. For spawn run, temperature and relative humidity were maintained between 25-30°C and 65-90%, respectively. Polythene bags were cut open when the mycelial run was completed. The substrate beds were moistened by sprinkling of water thrice a day which was stopped a day before harvesting. Average values of observation with respect to duration of spawn run, time taken for first harvest yield and total yield was recorded. Biological efficiency of mushroom on fresh weight basis was calculated by using formula given by Chang and Miles (1989).

$$\text{Biological efficiency (\%)} = \frac{\text{Yield of fruiting body (gm)}}{\text{Total weight of substrate used (gm)}} \times 100$$

RESULT

The data presented in table (1) shows the impact of supplementation of *Daucus carota* on the growth and yield of *P. sajor-caju* cultivated on three conventional substrates viz soybean straw, wheat straw and paddy straw. It was observed that supplementation of 1% powder of *Daucus carota* improve growth parameter as well yield but significant change was recorded with 3% supplementation. As soybean straw was give 941.7 gm/Kg, 958.4 gm/Kg, and 960.0 gm/ Kg at 1%, 2% and 3% supplementation respectively. Paddy straw was give comparatively lower yield viz 756.7 gm/Kg, 763.4 gm/Kg and 786.7 gm/Kg at 1%, 2% and 3% supplementation respectively. The data presented in table (2) shows the impact of supplementation of *Daucus carota* on the growth and yield of *P. sajor-caju* cultivated on three non conventional substrates viz. Domestic waste, Fruit waste and Used tea leaves. It was observed that among all the test three non conventional substrates domestic waste was give maximum yield at 1%, 2% and 3% supplementation 725.0gm/Kg, 745.0gm/Kg, 760.0 gm/Kg respectively. Used tea leaves shows comparatively lower yield which was 660.0 gm/kg, 675.0 gm/Kg and 791.7 gm/Kg respectively at 1%, 2% and 3%

supplementation. Interesting trend of increasing yield was similar in conventional and non conventional test substrates.

Table 1: Effect of supplementation of different concentration of *Daucus carota* on growth parameter and yield of *P. sajor- caju* in selected conventional substrates.

Substrates	Supplementation concentration (%)	Spawn run (days)	Pin head appearance (days)	Stipe length (cm)	Cap diameter (cm)	Total yield (gm./kg.)	BE (%)
Soybean straw	Control	17.7	21.7	2.8	7.7	933.4	93.4
	1%	17.7	21.7	2.9	7.8	941.7	94.1
	2%	17.0	21.0	3.0	8.1	958.4	95.8
	3%	16.7	20.7	3.0	8.2	960.0	96.0
Wheat straw	Control	19.0	23.0	2.6	8.0	800.0	80.0
	1%	19.0	23.0	2.7	8.5	820.0	82.0
	2%	18.0	22.0	2.8	8.9	825.0	82.5
	3%	17.7	21.7	2.8	9.0	853.4	85.3
Paddy straw	Control	21.4	26.0	2.7	7.9	743.4	74.3
	1%	21.4	25.7	2.7	8.1	756.7	75.6
	2%	21.0	25.0	2.8	8.2	763.4	76.3
	3%	20.0	24.0	2.8	8.3	786.7	78.6

Values are given in average of three replicates

Table 2: Effect of supplementation of different concentration of *Daucus carota* on growth parameter and yield of *P. sajor- caju* in selected non conventional substrates.

Substrates	Supplementation concentration (%)	Spawn run (days)	Pin head appearance (days)	Stipe length (cm)	Cap diameter (cm)	Total yield (gm./kg.)	BE (%)
Domestic waste	Control	24.6	29.0	2.4	6.2	718.4	71.8
	1%	24.0	28.7	2.5	6.3	725.0	72.5
	2%	24.0	28.0	2.6	6.4	745.0	74.5
	3%	22.7	26.4	2.7	6.7	760.0	76.0
Fruit waste	Control	30.4	35.0	2.5	5.2	635.0	63.5
	1%	30.0	34.0	2.6	5.3	641.7	64.1
	2%	29.0	33.7	2.7	5.6	660.0	66.0
	3%	28.7	33.0	2.8	5.8	668.4	66.8
Used tea leaves	Control	25.7	31.7	2.3	5.6	655.0	65.5
	1%	25.7	31.0	2.3	5.7	660.0	66.0
	2%	25.0	29.7	2.4	5.8	675.0	67.5
	3%	24.7	30.0	2.5	5.9	791.7	79.1

Values are given in average of three replicates

DISCUSSION

Growing medium of the mushroom is generally known as substrate. The substrates used for cultivation of oyster mushroom are normally nitrogen deficient. An addition of organic and inorganic supplements to the substrate from outside to improve the yield of mushroom have therefore been recommended by many workers (Royse and Schisler, 1987a, 1987b; Madhusudhanan and Chandra Mohan, 2002; Jain and Vyas, 2002; Jain and Vyas, 2005; Chaubey *et al.,* 2010). Different workers was used various supplements for the growth of *Pleurotus sajor caju* mushroom viz. oil seed meals and cakes, powdered pulses, wheat and rice bran etc**.** (Bahukhandi, 1990), oil seed cake and meals, powdered pulses, sterilized chicken manure (Vijay and Upadhyay,1989; Baysal, *et al*., 2003; Naraian *et al*.,2009), addition of oat meal (Jandaik, 1974), rice bran (Gunashekharan and Graham,1987). Singh and Prasad (2012) evaluated the effect of wheat bran, soybean flour and cow dung supplementation on the yield of *Pleurotus sajor caju.* Banik and Nandi (2004) used biogas residual slurry manure as supplement with rice straw in 1:1 ratio. Sharma (2007) used different chemical supplements viz. Lactose, Peptone, MgSO4, EDTA in different concentrations to enhance the yield of *Pleurotus sajor caju*. Arsia *et al.,* (2018) evaluate nine different brans and flours *viz.*, Gram flour, gram chokar, bajra flour, jawar flour, wheat bran, rice bran, and maize bran were used with wheat straw for supplementation at the rate of 5 per cent on the dry weight basis on the biological efficiency of *Pleurotus sajor caju.* Dehariya, *et al.,* (2011) used soybean choker and groundnut bran for enhancement the protein contents in *Pleurotus sajor caju*. Singh and Prasad (2012) used wheat bran, soybean flour, cow dung as supplements to enhance the yield of *Pleurotus sajor caju.* Facoya *et al*.,2014 cultivated *Pleurotus sajor-caju* on *Pycnanthus angolensis* sawdust supplemented with 0, 5, 10, 15, and 20% palmkernel cake, oil palm fibre, rice bran, wheat chaff, and corn cobs. Moda *et al*., (2005) cultivated the *Pleurotus sajor-caju* on sugarcane bagasses with supplementation with corn grits and mineral solution. Gupta *et al* (2016) were used residual biogas slurries of mahua cake and cow dung for supplementation in *Pleurotus sajor caju* for enhancement of nutritional contents. Sao and Deshmukh (2018) done the comparative study of natural (wheat flour, rice flour, soya flour, maize flour with Cotton seed cake) and chemical supplements (Lactose, ZnSO4, MgSO4, FeSO4 with Peptone) for yield and biological efficiency of *Pleurotus sajor caju*.

CONCLUSION

In order to select cheaper and better amendment of bio efficiency of *P. sajor caju* an experiment was conducted in completely randomize design. As it is clearly evident from the result that supplement of *Daucus carota* not only reduced the spawn run time but also increases yield of *Pleurotus sajor-caju* in all three test lignocelluloses conventional substrate (wheat straw, paddy straw and soybean straw) and non conventional substrates (domestic waste, fruit waste and used tea leaves). Supplementation of 3% concentration of *Daucus carota* gave best result in all three conventional and non conventional substrate tested. These supplements were selected

purposely because it has some nutritional values, easily available and their application can be exploited in production of potential food for men. So they have used with positive hope of effectiveness.

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