



Evaluation of media and substrates for spawn production of paddy straw mushroom (*Volvariella volvacea*)

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Abstract: The quality and cheap spawn is the basic needs for higher with quality mushroom production. Present studies have been carried out to find out the most suitable media for mycelial growth and the substrate for spawn production of *Volvariella volvacea*. Among eight media tested, potato dextrose agar medium supported the maximum mycelial growth and was found significantly superior over rest of the media followed by malt extract agar medium, carrot root extract agar medium and rice bran decoction agar medium. Out of nine locally available substrates evaluated for spawn production, sorghum, pearl millet and wheat grain gave significantly maximum growth and were statistically at par with one another and proved as best substrates for spawn production.

Key words: Media, mycelial growth, spawn, substrates, *Volvariella volvacea*

Introduction

Paddy straw mushroom (*Volvariella volvacea*) is the most popular for its nutrition, taste and flavor in South-east Asian countries. In India, climatic conditions in plains and south are best suited for its cultivation. It can grow on wide range of agricultural waste substrates, having shorter cropping duration and ability to grow on wide range of temperature and humidity compared to other cultivated mushroom. This mushroom contains good amount of protein, crude fibers and ash along with superior composition of various elements and essential amino acids; all make it health diet (Ahlawat, 2011).

Spawn is the seed of mushroom, comparable to the vegetative seed in crop plants. It is merely the vegetative mycelium from a selected mushroom grown in a convenient medium or grains. Thus spawn comprises of mycelium of the mushroom and a supporting substrate medium that provides nutrition to the fungus during its growth. It can be prepared on any kind of cereal grains and also on agricultural wastes. The process of making grain spawn was first introduced by Sinden (1932) at the Pennsylvania State University. Terrier (1945) used wheat grain as the basal medium for spawn production. The grain spawn was further perfected by Stoller (1962), he advised the use of 6 g gypsum and 1.5 g Chalk, per pound of grain to avoid clamping of grains. The success of mushroom production and higher yield of quality mushroom depends upon proper maintenance of pure culture as well as purity and quality of the spawn used. Thus, cheap and quality spawn is the basic needs for mushroom growers. Keeping in view the importance of suitable medium and the substrate in the preparation of quality spawn, the present study has been carried out with eight different media and nine substrates for evaluation to find out the best media and substrates for mycelial growth in spawn production.

Materials and Methods

Preparation of media: The medium is used as a substrate for isolation, multiplication, maintenance and preservation of mushroom cultures. To find out the best culture medium for mycelial growth of the *V. Volvacea*, eight different culture media viz., potato dextrose agar, malt extract, carrot root extract agar, rice bran decoction, wheat grain extract agar, corn meal agar, Richard's medium, Astana and Hawker's medium were prepared by standard methods. The different constituents of these media were included as- potato dextrose agar (peeled potato 200.0 g, dextrose 20.0 g, Agar-agar 20.0 g, water 1000 ml), carrot root extract agar medium (carrot root 200 g, Agar-agar 20 g, dextrose 20 g, water-1000 ml), malt extract agar (malt extract 25 g, peptone 5.0 g, Agar-agar 18 g, water 1000.0 ml), rice bran decoction medium (rice bran 200g, Agar-agar 20g, dextrose 20g, water 1000 ml), wheat grain extract agar (wheat grain 32 g, dextrose 20 g, Agar-agar 20 g, water 1000 ml), corn meal agar (corn meal 20 g, dextrose 20 g, Agar-agar 15 g, water 1000 ml), Richard's Medium (Potassium nitrate-10.00 g, Potassium dihydrogen phosphate 5.00 g, Magnesium sulphate 2.50 g, Ferric chloride 0.02 g, sucrose 50.00 g, Agar-agar 5.00 g, water 1000 ml), Asthana and Hawker's medium (Potassium nitrate (KNO_3) 3.50 g, Potassium monobasic phosphate (KH_2PO_4) 1.75 g, Magnesium sulphate ($MgSO_4 \cdot 7H_2O$)-0.75 g, Glucose 5.00 g, Agar-agar 20.00 g).

The different constituents of media were dissolved in water separately. In case of potato dextrose agar, carrot root extract agar, rice bran decoction medium and wheat grain extract, extraction was taken after boiling them on a water bath. All the media were sterilized in the autoclave at 121 °C for 20 minutes. The pH of the medium adjusted by adding N/10 NaOH or N/10 HCl drop by drop to raise it to 7 or brought down to be adjusted to 7.0, respectively

before sterilization. After sterilization the tubes containing hot medium were put in slanting position for slant preparation or pouring of medium in sterilized Petri-dishes followed by cooling at room temperature. The glass-wares were cleaned with chromic acids and distilled water was used during entire media study. All the Petri plates and other glass wares were sterilized in hot air oven at 160°C for 120 minutes before pouring the medium. A set of three Petri dishes of 9.0 cm diameter was maintained for each treatment. About 20 ml. sterilized, melted but cooled medium was aseptically poured in each Petri dish. The Petri dishes were handled aseptically in a sterilized inoculation chamber using a spirit lamp flame in the chamber. The medium in the plates was allowed to solidify before inoculation with mushroom culture.

Preparation of spawn- In order to find out the best substrate for spawn preparation, nine substrates, viz., wheat grain, sorghum grain, maize grain, pearl millet grain, rice grain, wheat bran, chickpea grain, soybean cake and pea grain were used for spawn production. Spawn of all tested substrates were prepared by following Upadhyay *et al.* (2004). The experiment was conducted in CRD with 3 replications.

All the substrates were cleaned and boiled in water till they soften and then spread over a polythene sheet under shade for draining excess water from grain surface, then after in each substrate was mixed with calcium carbonate @ 0.5% and calcium sulphate @ 2%. The mixed grain was filled in 20 cm long test tubes up to 12 cm volume and plugged with non absorbent cotton and autoclaved at 15 psi for 1.5 hours. After cooling these autoclaved test tubes were left in the room temperature for 24 hours, so that they are cooled to ambient temperature. A bit of mushroom mycelium was aseptically transferred in to these test tubes and inoculated at 32±1°C temperature. The down ward linear growth of the mycelium of each substrate was noted after 7 days of incubation.

Results and Discussion

The result of mycelial growth on different solid media presented in table-1 revealed that potato dextrose agar medium supported the maximum mycelial growth of *V. volvacea* and was found significantly superior over rest of the media tested. Good growth was recorded on malt extract agar medium. Fair mycelial growth was recorded on carrot root extract agar, rice bran decoction agar and wheat grain extract agar, whereas all other tested media supported poor mycelial growth. The mycelial growth of all the tested media was significantly different from one another. The mycelial growth of *V. volvacea* grew faster and at par in Malt extract agar and Potato dextrose agar culture media than other media tested in the studies of Khan *et al.* (1991) and Singh *et al.* (2000). Rukhsana *et al.* (2013) also reported that malt extract agar medium supported the better mycelial growth followed by corn meal agar. Kalra *et al.* (1997) found maximum mycelial growth on Rechar's medium. However, in the study of Ukoima *et al.* (2009) minimum mycelia growth of *Volvariella volvacea* was recorded on potato dextrose agar in tested media. These results are corroborated the present findings.

The data depicted in table-2 revealed that sorghum, pearl millet and wheat grain substrates gave significantly maximum

Table-1: Effect of different solid media on the mycelial growth of *Volvariella volvacea*

Media	Mycelial Growth (mm)
Potato dextrose agar	88.66
Malt extract agar	85.33
Carrot root extract agar	65.33
Rice bran decoction agar	61.66
Wheat grain extract agar	53.33
Corn meal agar	43.66
Richard's medium	40.66
Asthana & Hawker's medium	36.33
C. D. at 5%	2.52

Table-2: Evaluation of different substrate for spawn production of *Volvariella volvacea*

Substrates	Average linear mycelial growth (cm)
Sorghum	12.00
Pearl millet	11.43
Wheat grain	11.20
Wheat bran	8.96
Rice grain	8.26
Maize grain	8.10
Chickpea grain	7.66
Soybean cake	7.16
Pea grain	6.06
C.D. at 5%	0.90

growth, which were statistically at par with one another and proved as best substrates for spawn production. Wheat bran, rice grain and maize grain gave good vegetative growth and statistically at par with one another, while poor mycelial growth was recorded on chick-pea, soybean cake and pea grain, respectively. Kumar *et al.* (1975) reported that jowar grain gave better growth of mycelium after mixing 2% gypsum and 6% calcium carbonate in boiled grain by weight. Wheat grain and rice (1:1 w/w) supported good growth and produced at par mushroom yield with wheat grain spawn (Suman *et al.*, 1988). Mahanta *et al.* (1994) observed that yields of *Volvariella volvacea*, *V. diplasia*, *Pleurotus sajor-caju*, *P. citrinopileatus* and *P. sapidus* and found 5-10% higher yield on sterilized cashew refuse than on wheat grains spawn. The present results are in consistency with the available literature of varied spawn substrates used by earlier workers.

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