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STUDIES ON THE EFFECT OF MOTHER CULTURE AND SUCCESSIVE SUB-CULTURES ON THE YIELD OF STRAW MUSHROOM, *VOLVARIELLA VOLVACEA*

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ABSTRACT: Most of the spawn raised by tissue culture are often found to produce lower yield than the parent culture. Therefore, an experiment was conducted to evaluate the relative yield potential of the successive sub-cultures of initial mother culture of straw mushroom (*Volvariella volvacea*) which was raised by tissue culture. Starting from the mother culture, the subsequent cultures were examined thoroughly and the slow growing cultures, akin to sterile mycelia, were periodically rejected. Only the cultures showing apparent normal floppy growth were selected for spawn production. It was observed that there were great variations among the initial mother culture and subsequent sub-cultures in terms mycelia growth and mushroom productivity. The mother culture (G-1) showed maximum amount of abnormal growth and sterile mycelia (29.4 %), slowest radial growth (6.4 mm), longest period(18 days) for spawn production and induced the lowest yield (640.3g, 6.4 %BE). The 1st sub-culture (G-2) also performed poorly. However, the 2nd sub-culture (G-3) sustained highest mushroom yield (1255.1 g, 12.5 % BE) and purity (100 %), maximum radial growth (9.4 mm) and produced the spawn within the shortest time (12 days). The yields obtained from G-3 (1255.1 g), G-4 (1248.5 g), G-5 (1249.1g) and G-6 (1189.1 g) were statistically *at par*, but significantly higher than those obtained from G-1(640.3 g) and G-2 (712.4 g).Therefore, instead of using the mother cultures directly for spawn production, they should be purified further in subsequent generations and ideally the 3rd sub-culture (G-4) should be selected.
Key words: Mother culture, tissue culture, sub-culture, straw mushroom, yield

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INTRODUCTION

Paddy straw mushroom is one of the important edible species of South-East Asian countries including India. In Odisha, it is generally cultivated from March to October under natural climatic conditions with an estimated annual production of 9550 MT [1]. Healthy and productive microbial culture plays a crucial role in achieving high yield and quality mushroom crop. Strainal purity in mushrooms is maintained by tissue culture [2]. As frequent sub-culturing of fungal cultures tend to cause a loss in their vigour and yield potential [3], rejuvenation of strains is often attempted adopting tissue cultures from cultivated crop of sporophores [4]. However, it is observed that most of the tissue cultures produce lower yield compared to their parental culture. Moreover, there is wide variation among the mother cultures, raised by tissue culture from the same fruiting body, in terms of yield potential and sustainability. While it has been stated that tissues taken from the joint of stalk and pileus sustain higher yield of *V. volvacea* compared to other regions of sporophore [5], there is no report as to which generation supports optimum yield. Therefore, an attempt was made to study the relative efficacy of different spawn raised by mother culture and the successive sub-cultures on the production of straw mushroom, *Volvariella volvacea*.

MATERIALS AND METHODS

The largest mushroom at button stage from the first flush of a bed with maximum fruiting was selected for tissue culture. Method of tissue culture, as described previously [5, 6] was followed. The mother cultures generated by tissue culture were carefully examined daily and the cultures showing excessive slow and compact growth were rejected immediately. The cultures showing normal floppy growth were selected for further sub-cultures at periodic interval of 15 days and the successive sub-cultures were design ated as G- 1 to G-6 starting from the initial mother culture. At each stage, the screening and selection of cultures, as stated previously, were followed. The PDA petriplates (4" dia.) and spawn substrates inside glass bottles (375 ml capacity) were inoculated with 5 mm mycelia blocks from each pure culture separately and their growth rate was studied after 10 and 14 days of incubation, respectively. Spawn were also prepared from the mother culture and successive cultures (G-1 to G-6) following standard method [7] with slight modifications and were used separately for mushroom cultivation. Mushroom cultivation in square sized beds with layer spawning was followed [8]. Three replications were maintained for each treatment and the experiment was carried out in randomized block design. Mushrooms were harvested from a total of 2 flushes at button/ egg stage and fresh weights were immediately recorded. The data were subjected to statistical analysis.

RESULTS AND DISCUSSION

A perusal of data presented in Table-1 indicates that there were variations among the initial mother culture and subsequent sub-cultures in sustaining the growth and reproduction of *V. volvacea.* The mother culture (G-1) raised by tissue culture showed greater variations compared to other cultures. The amount of abnormal growth was the highest (29.4 %) and the radial growth of the mycelium in petriplate (6.4 mm) and complete colonization of spawn substrates (18 days) were the slowest. In G-3, the mycelium exhibited the highest radial growth (9.4 mm) and completely covered the spawn substrates within the shortest period (14 days). From G-3 onwards, the mycelia growth rate was almost similar.

Among the successive sub-cultures, the 2rd sub-culture (G-3) performed the best in terms of minimum days(14) required for complete colonization of the spawn substrates (14 days) and minimum period for primordial initiation (8days). It also sustained highest yield of fresh mushrooms (1255.1g, 12.5 % BE). The yields obtained from G-3 to G-6 were statistically *at par*, but significantly higher compared to G-1 and G-2.

Table-1: Effect of successive cultures of mother culture on the production of *Volvariella volvacea*

Treatments/Generation of culture	G-1	G-2	G-3	G-4	G-5	G-6	CD(0.05)
Growth characteristics							
Radial growth(mm)	6.4	7.1	9.4	9.3	9.0	8.7	-
Slow growth, compact growth (%)	29.4	17.3	0.1	0.0	0.0	0.0	-
Normal growth (%)	71.6	82.7	100	100	100	100	-
Yield attributes							
Complete mycelia growth in spawn bottle (days)	18	17	14	14	15	15	-
Primordial initiation(days)	10	10	8	8	9	9	-
Fruiting bodies(No)	68.8	72.6	112.1	109.8	112.1	110.1	-
Yield(g)	640.3	712.4	1255.1	1248.5	1249.1	1189.1	69.7
Avg weight of fruiting body(g)	9.3	9.8	11.1	11.3	11.1	10.8	-
Biological Efficiency (%)	6.4	7.1	12.5	12.4	12.0	11.8	-

a

b

Fig-1: a.Top pic- Mushroom production in G-3, b. Mushroom production in G-1

Though not much information is available on the present investigation, the scientific basis of such variations among successive cultures may be explained as per the behaviour of the basidiospores of the straw mushroom, akin to the genetic composition of the sporophores. Considerable variations in the biological efficiency (BE) and mycelia characters of the straw mushroom have been reported [9].Chang and Yau [10] observed a ratio of 3 self-fertile to 1 self-sterile progeny in their study. This indicates that the mushroom tissues also contain the same genetic composition as the basidiospores. After tissue culture, the developing mycelia are most likely to contain one-fourth of the sterility factor. It is known that, the sterile mycelia exhibit slower growth rate compared to the fertile mycelium. In removing the slow growing cultures by careful examination and subsequent rejection, greater proportion of fertile mycelium is allowed to build up in the culture, thereby minimizing the risk of sterile mycelia in successive generations. As a result, higher yield and stability of mushroom production could be achieved. Selection of single basioiospore isolates of *V. volvacea* in improving and stabilizing the spawn performance has also been advocated [11]. All these observations showed that the sterility factor in the genetic makeup of straw mushroom mycelia might have been largely determined the growth and reproduction of the edible fungus.

CONCLUSION AND RECOMMENDATION

It is inferred from the experiment that the initial mother culture raised from tissue culture should not be directly used for spawn production. They should ideally be purified few times in successive sub-cultures to ensure higher percentage of fertile mycelium leading to higher growth and yield of *Volvariella volvacea*.

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