

Substrates Evaluation for the Quality Production of *Pleurotus sajor-caju*

Reena

Govt. Mh College of Home Science And Science for Women Autonomous
Jabalpur (M.P.)

Abstract- The present investigation was carried out to evaluate the effect of different agricultural substrates on the quality production of oyster mushroom (*Pleurotus sajor-caju* #392). The study was conducted using four agricultural waste substrates, namely wheat straw, rice straw, sugarcane bagasse, and maize straw for mushroom cultivation. The experiment focused on spawn running, pinhead appearance, maturity, flush-wise yield, biological efficiency, and nutritional composition of cultivated mushrooms. Results revealed that wheat straw showed the fastest spawn running and pinhead formation with maximum total yield and biological efficiency. Wheat straw recorded 1360 g total yield and 136% biological efficiency, while sugarcane bagasse showed the lowest yield performance. Nutritional analysis indicated that sugarcane bagasse had the highest protein content (8.75%), whereas maize straw recorded maximum crude fat content (10%). Wheat straw exhibited superior fiber and ash content. The findings conclude that wheat straw is the most suitable substrate for commercial cultivation of *Pleurotus sajor-caju*, whereas sugarcane bagasse can be used for improving mushroom nutritional quality. This study highlights the importance of selecting appropriate substrates for achieving better mushroom production and quality.

Keywords— *Pleurotus sajor-caju*, substrate, oyster mushroom, wheat straw, biological efficiency, nutritional quality..

I. INTRODUCTION

Mushrooms are macrofungi having distinct fruiting bodies and are considered highly nutritious and medicinally important food sources. Unlike green plants, mushrooms lack chlorophyll and therefore depend upon organic substrates for obtaining nutrients. They play an important role in converting lignocellulosic agricultural waste into nutritious food products. Oyster mushroom (*Pleurotus sajor-caju*) is one of the most cultivated edible mushrooms due to its high protein content, easy cultivation, adaptability, and medicinal value.

The cultivation of oyster mushroom requires suitable substrates for better mycelial growth, fruiting body formation, and yield. Agricultural wastes such as wheat straw, rice straw, maize straw, and sugarcane bagasse are widely used as substrates because they are inexpensive and readily available. The quality and productivity of mushrooms greatly depend on substrate composition, moisture retention, aeration, and nutrient availability. Therefore, evaluation of substrates is necessary to identify the most effective material for high-quality mushroom production.

Mushrooms are rich in proteins, vitamins, minerals, dietary fiber, and essential amino acids while low in fat and calories. Due to these nutritional benefits, mushroom cultivation is becoming an important agricultural practice worldwide.

Moreover, mushroom farming contributes to waste management, environmental sustainability, and income generation for rural communities.

The present study was conducted to evaluate the effect of different substrates on the growth, yield, biological efficiency, and nutritional quality of *Pleurotus sajor-caju* #392 cultivated under controlled conditions.

II. MATERIALS AND METHODS

Collection of Spawn Culture

Fresh spawn of *Pleurotus sajor-caju* #392 was collected from the Biodiversity Conservation and Rural Biotechnology Centre, Jabalpur, for cultivation and experimental evaluation.

Preparation and Chemical Treatment of Substrates

Four agricultural substrates namely wheat straw, rice straw, sugarcane bagasse, and maize straw were selected for cultivation of oyster mushroom. The substrates were chopped into small pieces (3–5 cm) and chemically treated to reduce microbial contamination. Straw was soaked in water containing 15 ml formaldehyde per 10 liters of water and 0.5 g bavistin per kg of substrate for 12–18 hours at room temperature. After soaking, excess water was drained and moisture content was maintained at approximately 65–70% before spawning.

Spawning and Incubation

Spawn was inoculated into substrates at the rate of 2% (w/v). Spawning was performed by layering the substrate with spawn after every 3–4 cm thickness. Polybags containing inoculated substrates were incubated at 25°C until complete mycelial colonization. After complete spawn running, polythene bags were removed and substrates were transferred to a mushroom cultivation hut where temperature and humidity were maintained for fruiting. Regular watering was done to ensure proper growth and development of fruiting bodies. □

Data Recording

Data were recorded on different growth and yield parameters including spawn running, appearance of pinheads, maturity period, flush-wise yield, total yield, and biological efficiency.

Spawn Running

The number of days required for 25%, 50%, 75%, and 100% mycelial growth was recorded for each substrate.

Pinhead Appearance and Maturity

The time required for pinhead formation and maturation of fruiting bodies after spawning was recorded in days.

Yield Measurement

Mushroom yield was recorded in three successive flushes and total yield was calculated by summing all flushes. □

Biological Efficiency (BE)

Biological efficiency was calculated using the formula:

Nutritional Analysis

Mushrooms harvested from different substrates were analyzed for moisture, ash, crude protein, crude fat, and crude fiber content using standard biochemical methods including oven drying, furnace ash determination, Kjeldahl method, and Soxhlet extraction.

III. RESULTS AND DISCUSSION

The results demonstrated that substrate type significantly influenced the growth, yield, and nutritional composition of *Pleurotus sajor-caju* #392.

Spawn Running

Among all substrates, wheat straw supported the fastest spawn running, requiring 13, 18, 22, and 26 days for 25%, 50%, 75%, and 100% colonization, respectively.

Sugarcane bagasse required the maximum time for complete colonization. The favorable aeration and nutrient composition of wheat straw may have enhanced mycelial growth. □

Pinhead Appearance and Maturity

Wheat straw showed the earliest pinhead appearance (27 days) and maturity (30 days), whereas maize straw and sugarcane bagasse required longer durations.

This indicates that wheat straw provides a suitable environment for rapid fruiting body development.

Flush-wise and Total Yield

The highest mushroom yield was obtained from wheat straw with a total yield of 1360 g followed by rice straw (1230 g). Sugarcane bagasse recorded the lowest yield (756 g). Yield decreased progressively from first flush to third flush in all substrates due to nutrient depletion.

Biological Efficiency

Maximum biological efficiency was observed in wheat straw (136%), followed by rice straw (123%), maize straw (96%), and sugarcane bagasse (75.6%). Higher biological efficiency in wheat straw may be due to its favorable lignocellulosic composition and moisture-holding capacity.

Nutritional Composition

Nutritional analysis revealed variations among substrates. Sugarcane bagasse recorded the highest protein content (8.75%), while maize straw had maximum fat content (10%). Wheat straw showed higher crude fiber (3.5%) and ash content (0.863%), indicating superior mineral and dietary value. These differences may result from substrate composition and nutrient availability.

IV. CONCLUSION

The present investigation concluded that substrate selection significantly affects the growth, yield, biological efficiency, and nutritional quality of *Pleurotus sajor-caju* #392. Wheat straw proved to be the most suitable substrate for mushroom cultivation as it showed the fastest spawn running, earliest pinhead formation, maximum yield (1360 g), and highest biological efficiency (136%). However, sugarcane bagasse produced mushrooms with higher protein content, suggesting its importance for improving nutritional quality. Therefore, wheat straw is recommended for commercial cultivation of *Pleurotus sajor-caju*, while sugarcane bagasse may be preferred for nutritionally enriched mushroom production.

Mushroom cultivation on agricultural waste materials also provides an eco-friendly method for waste utilization and sustainable food production.

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