

Media-Dependent Mycelial Growth Behaviour and Substrate Suitability for Spawn Production in Two *Auricularia* mushroom Species

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ABSTRACT

The mycelial growth performance and colony characteristics of *Auricularia auricula-judae* and *Auricularia polytricha* (Mont.) Sacc. Mushroom were evaluated on three culture media Potato Dextrose Agar (PDA), Malt Extract Agar (MEA) and Yeast Extract Agar (YEA) to assess the influence of nutrient composition on radial growth and morphology. Distinct media-dependent differences were recorded. *A. auricula-judae* showed maximum growth on MEA (7.20±0.20cm), followed by YEA (5.18±0.05cm) and PDA (4.78±0.05cm). *A. polytricha* (Mont.) Sacc. exhibited comparatively higher growth across all media, with MEA supporting the highest radial expansion (9.00±0.00cm). Colony morphology varied, with PDA yielding thick colonies, MEA producing compact smooth colonies and YEA forming thin, cottony colonies; both species remained white on all media. Low standard deviations reflected high measurement precision and differences were statistically significant ($p < 0.05$). Jowar supported the fastest mycelial colonization, completing the spawn run in 12.67±0.58 days in *A. auricula-judae* and 11.67±0.58 days in *A. polytricha*, followed by bajra (14.33±0.58 and 13.67±0.58 days, respectively). Wheat did not support mycelial growth in *A. auricula-judae*, while delayed colonization was observed in *A. polytricha* (18.67±0.58 days). Overall, MEA proved most effective for mycelial growth, and jowar was identified as the most efficient spawn substrate.

Introduction

The total number of mushroom species worldwide is estimated to be approximately 140,000, of which only about 10% have been scientifically described (Chang and Miles, 2004). Worldwide, mushrooms have long been utilized as a nutritious food, medicine and cosmetics. Both cultivated and wild edible mushrooms are now essential parts of diets due to their unique flavor, texture, scent and nutritional qualities (Turfan *et al.*, 2018).

Among edible mushrooms, species of the genus *Auricularia* have gained considerable attention owing to their high nutritional value, ecological adaptability and increasing economic significance. The genus *Auricularia* is taxonomically classified under the phylum *Basidiomycota*, class *Agaricomycetes*, order *Auriculariales*, and family *Auriculariaceae*. (Onyango *et al.*, 2011). This mushroom include two cultivated species viz. *Auricularia*

auricula-judae and *Auricularia polytricha* (Mont.) Sacc. collectively referred to as Judas's ear, wood ear or black wood ear mushroom, forms gelatinous, ear-shaped fruiting bodies. The top surface ranges from black to brown and the underside can be smooth, wrinkled or veined (Jo *et al.*, 2014, Vyshnavi & Pramod, 2022). These fungi typically colonize on decaying hardwood substrates throughout the year in temperate regions worldwide (Priya *et al.*, 2016).

Auricularia auricula-judae and *Auricularia polytricha* most valued species of traditional medicines. Mycelial growth depends largely on the growth medium, which supplies essential nutrients (Amin, 2008), and the quality of spawn, reduces contamination and enhances yield and consistency of fruiting and making it essential for successful large-scale cultivation and reliable research outcomes. Keeping these aspects in view, the present investigation was undertaken to study the effects of different culture media and the spawn production of using different grains of *Auricularia* spp.

Materials and Methods

Mycelial growth on different culture media

Pure cultures of *Auricularia auricula-judae* and *Auricularia polytricha* (Mont.) Sacc. were obtained from the Directorate of Mushroom Research (DMR),

Chambaghat, Solan, Himachal Pradesh. The growth characters of *Auricularia* spp. were studied on three solid media *viz.*, Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), Yeast Extract Agar (YEA).

20ml of each sterilized culture medium was aseptically poured into 90mm diameter sterile Petri plates under a laminar airflow chamber to maintain contamination-free conditions. Inoculation was carried out by excising a 9mm mycelial disc from the actively growing margin of a 10-day-old culture using a sterile cork borer. The disc was carefully transferred to the center of each freshly solidified agar plate with sterile forceps, ensuring proper contact with the medium. After inoculation, the plates were sealed with parafilm and labelled with species name, date, treatment and replicate number. Three replicates were prepared for each treatment to ensure reliability of observations. All inoculated plates were incubated at $28\pm 1^{\circ}\text{C}$ in an inverted position to prevent condensation from interfering with mycelial growth. Observations were recorded at two-day intervals until full colonization. In each plate, the colony diameter was measured in two opposite directions and the mean value was calculated. These mean measurements were used to plot a growth curve with time (days) on the x-axis and mycelial growth (cm) on the y-axis. Nature of colony growth and colour of colony were also recorded.

(Priya and Geetha, 2016; Zurbano, 2018; Jo *et al.*, 2014).

Spawn Production

In this study, three cereal grains *viz.* Jowar (*Sorghum bicolor* (L.) Moench), Bajra (*Pennisetum glaucum* (L.) R. Br.) and Wheat (*Triticum aestivum* (L.) Thell.) were used as substrates for spawn production based on their availability, affordability and nutrient composition. The grains were cleaned, washed and boiled in distilled water (1:2w/v) for 30 minutes until softened. Excess water was drained and the grains were cooled under aseptic conditions. Calcium carbonate (10 g/kg) was added to adjust pH and prevent clumping. Portions of 100g of the prepared grains were filled into sterilizable glass bottles, plugged with non-absorbent cotton, wrapped and autoclaved at 121°C (15 psi) for 30 minutes. After cooling overnight, the bottles were gently shaken to remove condensation. Before inoculation, the outer surface of each bottle was exposed to gamma radiation for 30 minutes inside a laminar airflow cabinet. Under aseptic conditions, actively growing mycelial bits from pure cultures were transferred into the bottles, ensuring direct contact with grains. The inoculated bottles were incubated at 28±1°C for 15–20 days. Mycelial run duration, the number of days required for complete colonization was recorded as the

key parameter to assess substrate suitability and spawn quality (Netam *et al.*, 2018; Onyango *et al.*, 2011; Belachew *et al.*, 2013).

Results

The mycelial growth behaviour and colony characteristics of *Auricularia auricula-judae* and *Auricularia polytricha* (Mont.) Sacc. were assessed on three culture media Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), and Yeast Extract Agar (YEA). Distinct variations in radial growth and colony morphology were recorded across the media. *A. auricula-judae* exhibited its highest radial extension on MEA (7.20±0.20cm), followed by YEA (5.18±0.05cm), while PDA supported the lowest growth (4.78±0.05cm). In contrast, *A. polytricha* (Mont.) Sacc. demonstrated substantially greater growth on all media, with maximum mycelial extension on MEA (9.00±0.00cm), followed by PDA (6.83 ± 0.06 cm) and YEA (6.67±0.231cm) (Table-1). Media composition also influenced colony morphology. On PDA, both species formed thick, fluffy colonies; however, *A. auricula-judae* showed irregular margins, whereas *A. polytricha* (Mont.) Sacc. produced smooth margins. On MEA, dense, fluffy colonies with smooth margins were observed for both species, reflecting enhanced nutrient utilization. On YEA, colonies appeared thin and cottony, with *A.*

polytricha (Mont.) Sacc. developing irregular margins and *A. auricula-judae* forming smooth margins. Colony colour remained uniformly white across all media for both species (Table- 2).

The mean mycelial growth values showed clear and consistent differences among the three media, supported by low standard deviation (SD) values, indicating high precision and reproducibility of measurements. *A. polytricha* (Mont.) Sacc.

consistently exhibited significantly greater radial growth than *A. auricula-judae*, with MEA providing the most favourable and uniform growth conditions (SD = 0.00). The distinct differences observed among PDA, MEA and YEA suggest a statistically significant influence of media composition on mycelial growth, which would likely be confirmed through ANOVA testing ($p < 0.05$).

Table-1 Effect of different media on growth of *Auricularia* spp. after 10 days.

Sr.x No.	Culture media	<i>Auricularia auricula-judae</i>	<i>Auricularia polytricha</i> Mont. (Sacc)
1.	PDA	4.78 ± 0.05	6.83 ± 0.06
2.	MEA	7.20±0.20	9.00 ± 0.00
3.	YEA	5.18 ± 0.05	6.67 ± 0.23

Table-2 Nature of colony growth of *Auricularia* spp. after 10 days.

Sr. No.	Different culture media	Nature of colony growth		Colour
		<i>Auricularia auricula-judae</i>	<i>Auricularia polytricha</i> (Mont.) Sacc.	
1.	Potato dextrose agar	Thick Fluffy growth with irregular margin	Thick, Cottony with smooth margin	White
2.	Malt extract agar	Thick, Fluffy growth and smooth margin	Thick, Fluffy growth and smooth margin	White
3.	Yeast extract agar	Thin and fluffy growth smooth margin	Thin and cottony growth smooth margin	White

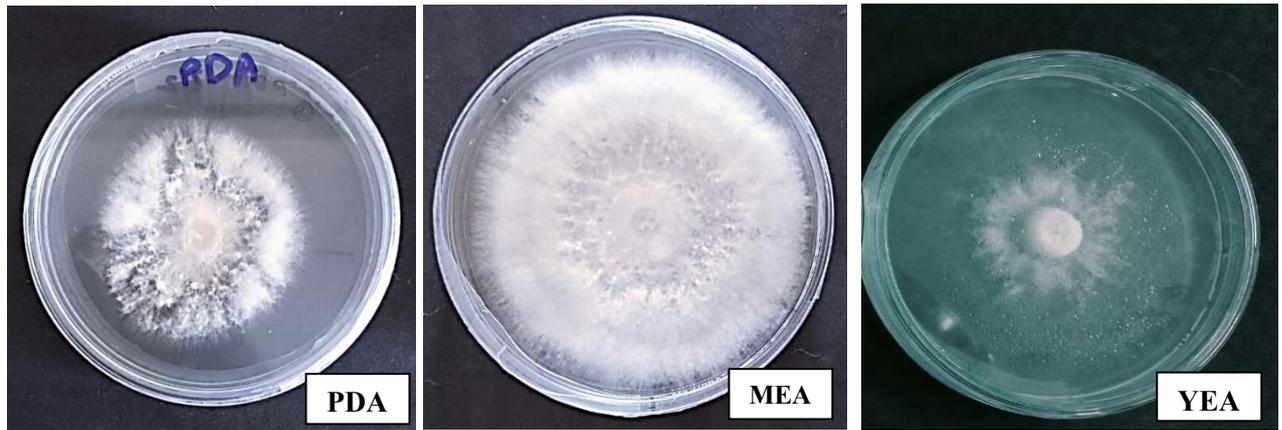


Plate-1: Mycelial growth of *A. auricula* on different culture media 10 days after inoculation.



Plate-2: Mycelial growth of *A. polytricha* on different culture media 10 days after inoculation.

Spawn production on different grain substrates

Spawn production performance differed significantly among grain substrates. In *Auricularia auricula-judae*, jowar supported the most rapid and uniform colonization, completing the spawn run in 12.67 ± 0.58 days, followed by bajra (14.33 ± 0.58 days). No mycelial ramification was observed on wheat grains, confirming their unsuitability for spawn production in this species (Plate 3). In

Auricularia polytricha (Mont.) Sacc., jowar again resulted in the fastest colonization (11.67 ± 0.58 days), while bajra required a longer duration (13.67 ± 0.58 days). Although *A. polytricha* was capable of colonizing wheat grains, the process was considerably delayed (18.67 ± 0.58 days), indicating poor substrate efficiency (Plate 4). Overall, jowar emerged as the most favourable and reliable grain substrate for

spawn production in both species, whereas wheat was unsuitable for *A. auricula-judae* and highly inefficient for *A. polytricha*.

Table-3: Mycelial run duration (Days)

Sr. No.	Treatment	<i>Auricularia auricula-judae</i>	<i>Auricularia polytricha</i> (Mont.) Sacc.
1.	Jowar	12.67 ± 0.58	11.67 ± 0.58
2.	Bajra	14.33 ± 0.58	13.67 ± 0.58
3.	Wheat	0.00 ± 0.00	18.67 ± 0.58



Plate 3: Mycelial growth of *A. auricula* on the different spawning materials viz, sorghum(A), bajra(B), wheat(C)

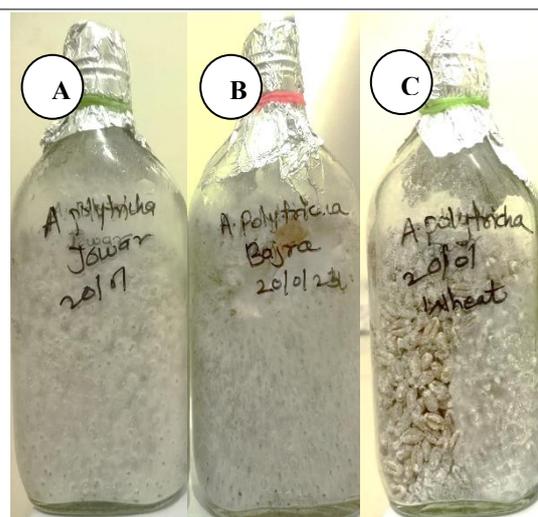


Plate 4: Mycelial growth of *A. polytricha* on the different spawning materials viz, sorghum(A), bajra(B), wheat(C)

Discussion

Several studies support the effectiveness of malt extract agar (MEA) as a favourable medium for mycelial growth, which is consistent with the positive results observed in the present study. Khan *et al.* (1991) identified MEA as the most suitable medium for mycelial growth of *Auricularia polytricha*, outperforming wheat extract agar and potato dextrose agar. Walker *et al.*

(2023) also reported strong mycelial performance on MEA, ranking it second only to Rice Bran Sucrose Agar for *Auricularia cornea*. While other media such as PDA have been reported to support satisfactory or maximum growth in different fungi (Amin *et al.*, 2008; Jo *et al.*, 2014; Devi *et al.*, 2015), and carrot extract agar has shown potential for *Auricularia*

species (Priya and Geetha, 2016), these findings collectively indicate that nutrient-rich media differ in effectiveness across species. The consistent performance of MEA across multiple studies highlights its reliability and supports its suitability for promoting vigorous mycelial growth of *Auricularia* species.

Several studies have highlighted the importance of substrate selection in promoting vigorous mycelial growth. Aguilar *et al.* (2024) reported that cracked corn was highly effective, supporting dense and robust mycelial development. Similarly, Zurbano *et al.* (2018) found that sweet sorghum enabled the fastest and densest growth of *Auricularia polytricha*, while Razak (2013) observed that, soaked crushed corn promoted rapid mycelial development compared to whole corn. Walker *et al.* (2023) further demonstrated that sorghum and paddy grains supported the most vigorous growth across multiple *Auricularia cornea* isolates. These findings collectively emphasize that cereal-based substrates, particularly sorghum, provide optimal nutritional support for efficient spawn production, aligning with the positive results obtained in the present study.

Conclusion:

MEA is the most effective medium for promoting uniform and vigorous

mycelial growth in both *Auricularia auricula-judae* and *A. polytricha*, with *A. polytricha* exhibiting relatively faster growth. Mycelial morphology is influenced by nutrient composition, while stable colony pigmentation is maintained across media. For spawn production, jowar grains are the most suitable substrate for both species, followed by bajra, whereas wheat grains are unsuitable or poorly supportive, particularly for *A. auricula*, highlighting the importance of selecting appropriate media and substrates for efficient *Auricularia* cultivation.

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References

- Aguilar, J. S., Dulay, R. M. R., Kalaw, S. P., & Reyes, R. G. (2024). Growth preferences of secondary mycelia, optimum spawning material, and fruiting body production of

- Auricularia polytricha* (mont.) sacc. utilizing a rice straw-based substrate formulation. *J. ISSAAS Vol. 30, No. 1:175-190*
- Amin, S. R., Alam, N., Tania, M., & Khan, M. A. (2008). Study of mycelial growth of *Cordyceps sinensis* in different media, at different PH level and temperature. *Bangladesh J Mushroom, 2*, 43-8.
- Belachew, K. Y., & Workie, M. A. (2013). Base substrate sorghum supplied with nitrogen additive enhanced the proliferation of oyster (*Pleurotus ostreatus* (Jacq.: Fr.) Kummer) mushroom spawn mycelium. *Int. J. Sci. Res, 4(3)*, 431-436.
- Chang, S.T., Miles, P.G. (2004). *Mushrooms: cultivation, nutritional value, medicinal effect, and environmental impact*. Second edition. CRC Press, Boca Raton–London–New York–Washington, p. 451.
- Devi, M. B., Singh, S. M., & Singh, N. I. (2015). Biomass production in *Auricularia* spp.(Jew's ear) collected from Manipur, India.
- Jo, W. S., Kim, D. G., Seok, S. J., Jung, H. Y., & Park, S. C. (2014). The culture conditions for the mycelial growth of *Auricularia auricula-judae*. *Journal of Mushroom, 12(2)*, 88-95.
- Khan S. M, Mirza J. H. and Khan M. A. (1991). Physiology and cultivation of woods ear mushroom (*Auricularia polytricha* (Mont.) Sacc.). *Science and Cultivation of Edible Fungi*, 90.
- Netam, R. S., Yadav, S. C., Mukherjee, S. C., & Kumari, P. (2018). Cultivation of button mushroom (*Agaricus bisporus*) under controlled condition: An initiative in Bastar Plateau of Chhattisgarh. *International Journal of Current Microbiology and Applied Sciences, 7(10)*, 782-787.
- Onyango B. O., Palapala V. A., Arama P. F., Wagai S. O. and Gichimu B. M. (2011). Morphological characterization of Kenyan native wood ear mushroom [*Auricularia auricula* (L. ex Hook.) Undrew.] and the effect of supplemented millet and sorghum grains in spawn production., *Agriculture and Biology Journal of North America 2(3)*: 407-414.
- Priya R. U. and Geetha D. (2016). Cultural and physiological studies on black ear mushrooms, *Auricularia polytricha* (Mont.) Sacc. and *Auricularia auricula* (L.)

Underw *Mushroom research*, 25
(2): 125-131.

Razak, D. L. A. (2013). Cultivation of *Auricularia polytricha* mont. sacc (Black jelly mushroom) using oil palm wastes (Master's thesis, University of Malaya (Malaysia).

Turfan, N., Pekşen, A., Kibar, B., & Ünal, S. (2018). Determination of nutritional and bioactive properties in some selected wild growing and cultivated mushrooms from Turkey. *Acta Scientiarum Hortorum Polonorum. Hortorum Cultus*, 17(3), 57-72.

Vyshnavi, A. S., & Pramod, R. (2022). Effect of supplements and growth regulators on the productivity of Jew's ear mushroom (*Auricularia auricula-judae*).

Walker, A., Wannasawang, N., Taliam, W., Keokanngun, L., Luangharn, T., & Thongklang, N. (2023). Optimal conditions for mycelial growth and nutritional values of the *Auricularia cornea*. *Studies in Fungi*, 8(1).

Zurbano, L. Y. (2018). Mycelial growth and fructification of earwood mushroom (*Auricularia polytricha*) on different substrates. *KnE Social Sciences*, 799-814.