DOI: https://doi.org/10.36036/MR.29.1.2020.145873 **Short Communication**
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Optimization of physical parameters of a wild *Macrocybe gigantea* strain

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ABSTRACT

A wild edible mushroom, characterised by robust fruiting bodies growing in large caespitose clusters under *Tectona grandis* was collected from a local park in Patiala. Based on morpho-anatomical characterization and ITS1, ITS4 and LSU sequences, this collection was identified as *Macrocybe gigantea*. In order to domesticate this mushroom, physical parameters for its growth was evaluated. This paper delves into the specific physical parameters most conducive to the vegetative growth of this wild agaric.

Keywords: Wild agaric, *Macrocybe gigantea*, physiological studies, pure culture

Germplasm collection and characterization is one of the most important part to diversify the mushroom types in the country. Indigenous strains growing in specific set of condition in wild can be easily grown with good yield. For the present study the fruiting bodies of a wild edible agaric were collected and identified as *Macrocybe gigantea* (Massee) Pegler & Lodge. The genus *Macrocybe* has other known edible species such as *M. titans* (Kimbrough, 2000). Dutta and Acharya (2014) discussed the traditional ethno-medicinal mushrooms of West Bengal have listed *M. gigantea* as prime edible agaric. As per Verma *et al.* (2017), *M. crassa* and *M. lobayensis*, too are potentially good edible mushrooms.

For *Macrocybe gigantea*, the physical parameters for the solid and liquid culture media, temperature and pH along with the incubation period and effect of dark and light conditions on the vegetative growth of the mushroom were evaluated and are discussed in this paper.

Based on morpho-anatomical characterization and ITS1, ITS4 and LSU sequences, this collection was identified as *Macrocybe gigantea*. To domesticate this edible fungus physiological studies were conducted to standardize the physical parameters for the optimal mycelial growth.

Effect of media on mycelial growth of *M. gigantea*

A total of 15 different solid media and 16 liquid media were evaluated with an aim to get best mycelial growth of *M. gigantea*. The 15 solid media tested were Yeast Extract Agar (YEA), Wheat Grain Agar (WGA), Coriander Agar (CA), Potato Dextrose Agar (PDA), Malt Extract Agar (MEA), Yeast Glucose Agar (YGA), Czapek Dox Agar (CDA), Maize Extract Agar (Maize EA), Dimmick Medium (DM), Pea Extract Agar (PEA), Yeast Potato Dextrose Agar (YPD), Glucose Peptone Yeast Extract Agar (GPYEA), Potato Malt Agar (PMA), Elliott Agar (EA) and Glucose Peptone Agar (GPA). The 16 liquid media tried were Richard's solution (RS), Glucose Asparagine Medium (GAM), Maltose Peptone Broth (MPB), Glucose Peptone Medium (GPM), Peptone Water (PW), Asthana and Hawker Medium (AHM),

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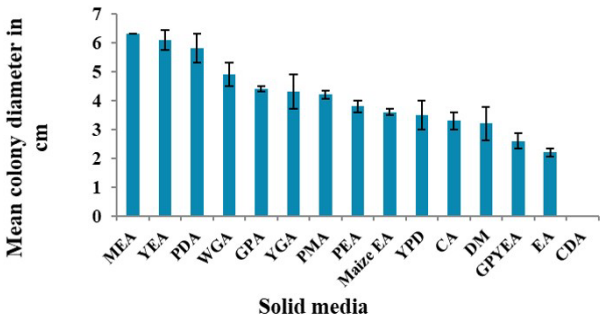

Fig. 1. Histogram showing effect of different solid media on mycelial growth of *M. gigantea*

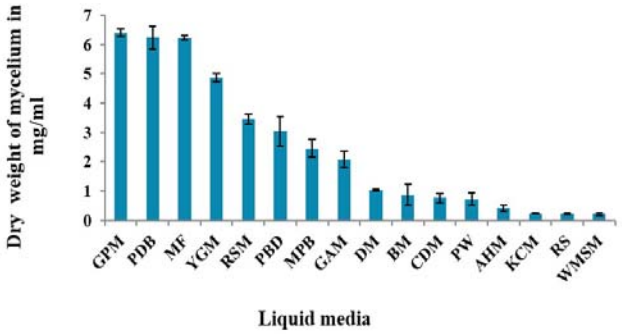

Fig. 2. Histogram showing effect of different liquid media on mycelial growth of *M. gigantea*

Koser Citrate Medium (KCM), Dimmick Medium (DM), Czapek Dox Medium (CDM), Yeast Glucose Medium (YGM), Potato Dextrose Broth (PDB), Pea Broth Dried (PBD), Rye Seed Medium (RSM), Will Mineral Salts Medium (WMSM), Mehrlich Formula (MF) and Bilai Medium (BM).

Radial growth on solid media was interpreted as the rate of increase in the colony diameter. The maximum mean colony diameter of 6.3 cm was observed on MEA with very thick and white mycelial mat (Fig 1). Thus on the basis of results, Malt Extract Agar (MEA) medium was selected for further studies. In contrary to this, Suman et al. (2018) and Ghafoor et al. (2022) reported Potato Dextrose Agar (PDA) as best suited for the vegetative growth in case of *M. gigantea*. In liquid media, maximum mycelial biomass was observed in GPM (6.41 mg/mL), PDB (6.25 mg/mL) and MF (6.23 mg/mL). Among these, very thick mycelial mat was found in GPM. Minimum growth was reported in AHM, KCM, RS and WMSM. So, for further studies Glucose Peptone Medium (GPM) was taken as the base liquid medium (Fig 2).

Effect of temperature on mycelial growth of *M. gigantea*

Selected solid and liquid medium inoculated with mycelial discs were exposed to various temperatures ranging between 15-40° (±2°C). Maximum vegetative growth of 6.3 cm on solid media and 6.43 mg/ml was observed at temperature 30±2°C (Table 1). The current results also coincide with the findings of Suman *et al*. (2018) and Ghafoor *et al*. (2022) who also found the best vegetative growth of *M. gigantea* at 30°C followed by 35°C.

Effect of pH on mycelial growth of *M. gigantea*

The selected solid and liquid media were used to evaluate optimum to pH for mycelial growth of

Table 1. Effect of different temperatures on mycelial growth of *M. gigantea*

S. No.	Temperature	Mean colony diameter (cm) ± SD on Solid Medium	Mean Dry Weight of Mycelium (mg/ml) ± SD in Liquid Medium
1	15° ± 2ºC	-	-
2	20° ± 2ºC	2.97 ± 0.49	-
3	25° ± 2ºC	3.9 ± 0.1	0.35 ± 0.11
4	**30° ± 2ºC**	**6.3 ± 0**	**6.43 ± 0.08**
5	35° ± 2ºC	5.4 ± 0.1	4.83 ± 0.55
6	40° ± 2ºC	1.13 ± 0.06	-

Macrocybe gigantea. Maximum mycelial growth on both solid (6.27 cm) and liquid media (9.74 mg/ml) was recorded at pH 5.0. It was concluded that alkaline pH supports no mycelial growth on both Malt Extract Agar and Glucose Peptone Medium (Tables 2). Suman *et al.* (2018) reported pH 7.0 and 8.0 for the best vegetative growth of most of strains of *M. gigantea*. The variation in the pH requirement of the test strain may be due to strainal variation.

Table 2. Effect of different pH on the mycelial growth of *M. gigantea* on Malt Extract Agar Medium

pH	Mean colony diameter (cm) ± SD	Mean dry weight of mycelium (in mg/mL) ± SD
3.0	0 ± 0	0 ± 0
3.5	1.17 ± 0.12	4.7 ± 0.21
4.0	3.0 ± 0.2	6.77 ± 0.11
4.5	3.77 ± 0.15	7.98 ± 0.34
5.0	6.27 ± 0.06	9.74 ± 0.21
5.5	4.5 ± 0.1	6.17 ± 0.03
6.0	3.33 ± 0.12	5.92 ± 0.28
6.5	2.13 ± 0.15	3.97 ± 0.41
7.0	1.9 ± 0.1	0 ± 0
7.5	0 ± 0	0 ± 0
8.0	0 ± 0	0 ± 0
8.5	0 ± 0	0 ± 0
9.0	0 ± 0	0 ± 0
9.5	0 ± 0	0 ± 0
10.0	0 ± 0	0 ± 0

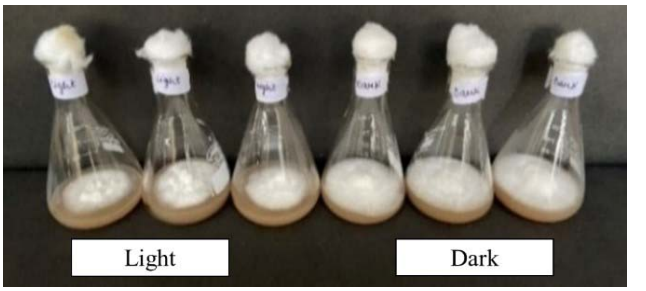

Fig. 3. Effect of light on mycelial growth of *M. gigantean* on Malt Extract Agar

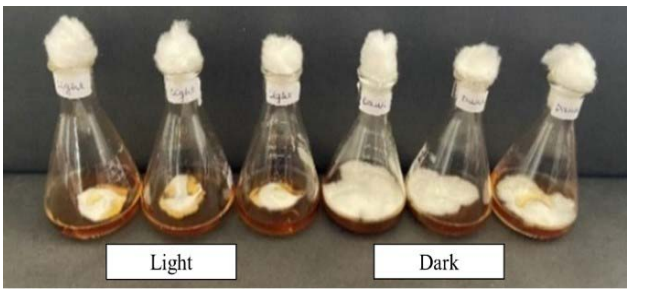

Fig. 4. Effect of light on mycelial growth of *M. gigantean* in Glucose Peptone medium

Effect of light on mycelial growth of *M. gigantea*

Effect of light and dark conditioned were evaluated for the mycelial growth of the test fungus. The results showed that the dark conditions supported the best mycelial growth as compared to light condition on both solid and liquid media (Fig 3 & 4, Table 3). On solid media, dark conditions supported the 6.27cm mycelial growth as compared to light (4.23cm) whereas in liquid media also, better mycelial growth was observed in in dark (8.04 mg/ml) as compared to light (5.91mg/ml).

Table 3. Effect of light on the mycelial growth of *M. gigantea* in Glucose Peptone Medium

Condition	Colony diameter in cm ± S.D.	Mycelial growth rate/day in cm	Mean dry weight of mycelium in mg/mL
Dark	6.27 ± 0.06	0.49	8.04 ± 0.25
Light	4.23 ± 0.12	0.31	5.91 ± 0.33

CONCLUSION

From the present study, it is concluded that Malt Extract Agar among solid media and Glucose Peptone Medium among liquid media are best suited for the vegetative growth of *M. gigantea* at temperature 30±2°C and pH 5.0 under dark conditions. The above conclusion is further recommended for any domestication studies of *M. gigantea*.

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