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Effect of Different Media on Mycelial Growth of *Lentinula edodes*

Amoghavarsha Chittaragi*, Ashwani Kumar and Surjeet Singh

Department of Plant Pathology, College Of Agriculture, Chaudhary Charan Singh Haryana
Agricultural University, Hisar – 125004, Haryana, India

*Corresponding author

ABSTRACT

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Mushroom cultivation is an old age practice and recent advancements in the production technology has made them to cultivate under commercial scale. Among various mushrooms cultivated the shiitake mushroom (*Lentinula edodes*) is very well known for its medicinal values and hence its requirement in large scale production is in need. Current evaluation was done to study the mycelial growth of shiitake on different media derived from agro-residues. The study revealed that highest growth rate after 6 days of incubation was seen in the sorghum meal agar (SMA) with strain OE-388S (69.9 mm) whereas lowest growth rate was observed with strain LE-16-02 on PDA (39.5 mm).

Introduction

Mushroom cultivation is an eco-friendly method of solid waste management. It is evident that mushroom cultivation helps in the biological degradation of natural resources and are eco-friendly, protein rich food and the recent developments in the scientific understanding of mushroom cultivation has aided in improvement of its cultivation technology (Puri, 2011).

Shiitake mushroom species are the edible mushroom which have originated from East Asia and cultivated and consumed in numerous Asian nations. Shiitake mushroom is cultivated throughout the world and

contributes around 25 percent of aggregate yearly generation of mushrooms. Shiitakes give good amounts of protein (18%), potassium, niacin and B vitamins, calcium, magnesium and phosphorus. They have normal antiviral and resistance boosting properties

Lentinula edodes is a white rot fungus that secretes a class of ligno-cellulolytic enzymes, which permit it to grow on ligno-cellulosic substrates rich in lignin (Leatham, 1986). Shiitake mushroom is routinely cultivated on wooden logs. Inaccessibility of tree logs requires a look for optional substrates for shiitake and general mushroom cultivation. The availability of the agro-residues after crop

harvest like straws of various crops as that of wheat, sorghum, bajra, rice has been used as a basal substrate for the cultivation of shiitake in recent times. The use of locally available agro-residues provide a way to minimise the cost of cultivation and also helps to reduce the environmental pollution that occurs due to burning of various agro-residues in the field after the harvest. The growth of Shiitake was found faster on agro-residues compared to the natural log cultivation (Puri, 2011). Much systemic work has been not done in India with regard to this mushroom and hence there is need to carry out a research using the ligno-cellulosic agro-residual waste generated in agricultural fields every year. With this background the present study is undertaken to evaluate the effect of different media on growth of shiitake mushroom.

Materials and Methods

The present investigation was carried out at the Mushroom Technology Laboratory under department of Plant Pathology, CCSHAU, Hisar during 2016-17. The pure culture of *L. edodes* was used for the present investigation were obtained from Directorate of Mushroom Research (DMR), Solan and from Punjab Agricultural University (PAU), Ludhiana and were subsequently evaluated for the growth and development parameters.

Preparation of Potato Dextrose Agar (PDA) media

Potato dextrose agar (PDA) medium was prepared by using 200 g peeled potato, 20 g dextrose and 20 g agar in a litre of water. The medium was left to cool in the room before 10 ml of the PDA preparation was dispensed into test tubes, corked and then sterilized at 121 °C and 1.5 kg/cm² pressure.

The test tube containing the 10 ml sterilised PDA was kept in a slanted position. These

slants were further maintained to inoculate fungus. To obtain the pure culture, potato dextrose agar (PDA) culture was used. A small bit/disc of tissue was collected from the pure culture of shiitake mushroom and transferred on the sterilized PDA medium under aseptic conditions. This was incubated at 25±2°C for 7-10 days for sufficient mycelial growth. Pure cultures were obtained by sub culturing.

Preparation of different media

Four semi synthetic media were used to record their influence on radial mycelial growth of *L. edodes*. The media used for study were potato dextrose agar (PDA), wheat meal agar, Pearl millet meal agar, sorghum meal agar.

The following media were prepared by grinding the 200g grains of respective media and then adding the grain powder to 500 ml water for 20-25 min.

The contents are stained through muslin cloth and then volume made to 1 litre and mixed with 12g agar and 60g dextrose and boiled for few minutes.

Different grain meal agar used

Sorghum meal agar
Pearl millet meal agar
Wheat meal agar
Potato dextrose agar

The various grain meal agar media prepared were evaluated for radial growth of *L. edodes* strains by transferring a 10 mm bit of mycelium from pure culture maintained and incubated at 25±2°C.

The observations were recorded after one week to analyse the effect of media on radial growth using CRD design with 3 replications under standard laboratory conditions.

Strains used

The following strains were used during the research on different media prepared.

- LE-16-01
- LE-16-02
- LE-16-04
- OE 388 S
- DMRO 27

Results and Discussion

The results are depicted in the table 1 which showed that the highest growth rate after 6 days of incubation was seen in the sorghum meal agar (SMA) with strain OE-388S (69.9mm) whereas lowest growth rate was observed with strain LE-16-02 on PDA (39.5mm).

The effect of media on the radial growth of the fungus was influenced greatly by the kind of media used. Sorghum meal agar was most favoured by the different strains followed by wheat meal agar, potato dextrose agar and Pearl millet meal agar in the order of preference. The strain OE-388 S showed the fastest growth rate in comparison to other strains which was followed on an average by the LE-16-04, DMRO-27, LE-16-01 and LE-16-02 strains respectively.

The growth of strains on SMA (sorghum meal agar) and WMA (wheat meal agar) showed significant difference but the strains LE-16-01 and DMRO-27 were at par with each other. The strains on BMA showed the significant difference except for the LE-16-01, LE-16-04 and DMRO-27 which were at par with each other. Significant difference of growth on PDA was observed with different strains but the strains LE-16-01 and LE-16-04 showed at par growth. Similar pattern has been observed with strains DMRO-27 and OE-388S on PDA.

The strain LE-16-01 exhibited the significant difference in growth on all the four media used but the strains LE-16-02 and LE-16-04 were at par with each other on SMA and WMA. DMRO-27 showed at par growth on WMA and PDA. Other than these, all remaining values varied significantly with each other (Table 1).

The highest growth on sorghum meal agar was exhibited by OE-388S (69.5mm) and lowest growth rate was exhibited by strain LE-16-02 (46.25mm) whereas the similar trend has been observed with wheat, PDA and Pearl millet meal agar also where highest growth rate was shown by OE-388S (66.5mm, 59mm and 56.5mm respectively) and lowest by LE-16-02 (with 39.5mm, 46.5mm and 49.25mm respectively on PDA, WMA and BMA).

Table.1 Growth rate of *L. edodes* strains on different media

Strain Substrate	LE-16-01	LE-16-02	LE-16-04	DMRO 27	OE-388S	Mean
SMA*	60.5	46.2	63.2	61.8	69.5	60.2
PMA	51.5	49.2	52.0	52.3	56.5	52.3
WMA	59.0	46.5	63.8	58.2	66.5	58.8
PDA	53.3	39.5	54.3	58.8	59.0	52.9
Mean	56.0	45.3	58.3	57.8	62.9	
CD (p = 0.05)	Strains = 1.8		Substrates = 1.6		Intereaction = 3.6	
SE(m) ±	Strains = 0.6		Substrates =0.5		Intereaction = 1.3	

**SMA =Sorghum meal agar, WMA= Wheat meal agar, PMA =Pearl millet meal agar, PDA = Potato dextrose agar

Growth of *L. edodes* strains on different media

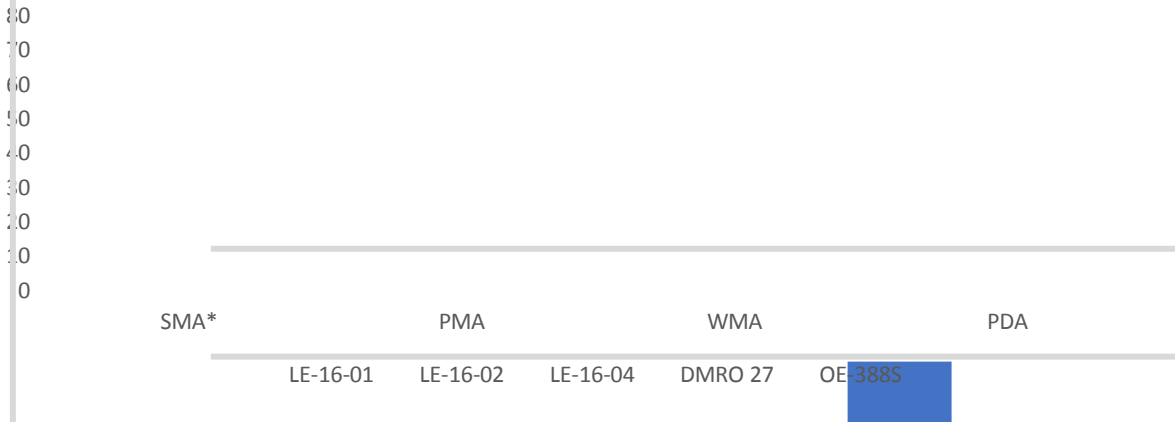


Fig. 1 Growth of Shiitake mycelia on sorghum meal agar media



Fig. 2 Growth of Shiitake mycelia on PDA

The radial growth was found almost similar for different strains on both sorghum meal agar and wheat meal agar and showed no significant difference but there was a significant difference in radial growth of Pearl millet meal agar and potato dextrose agar with other substrates but strains showed at par growth on both of those media.

Sorghum meal agar was most favoured by the different strains followed by wheat meal agar (WMA), potato dextrose agar (PDA) and bajra meal agar (BMA) in the order of preference. This is in accordance with the results obtained by Furlan *et al.*, (1997) where they evaluated the growth of mycelia (mm/day) of *L. edodes* at pH 6.4 in the absence of light and at 30°C using the malt soya peptone agar (MPA), wheat dextrose agar (WDA) and potato dextrose agar (PDA) with the highest growth being observed in WDA and MPA.

PDA found next best to the sorghum meal agar for the strain DMRO-27 which exhibited the growth of 58.7 and 61.7 on PDA and SMA (sorghum meal agar) which are at par with each other without showing significant difference. Similar results were obtained by Bilay *et al.*, (2000)) after evaluating the mycelial growth by using four commercially available media (malt extract agar, yeast malt extract agar, wart agar and experimental agar medium) and found potato dextrose agar medium as the most suitable medium for the growth of edible fungi. Even Kapoor *et al.*, (1997) found potato dextrose agar (PDA) and malt extract agar media as good source for growth of *P. fossulatus*.

Best mycelia growths were observed on the PDA and Yellow Corn Agar (YCA) with 92.7mm and 92.0mm respectively (Gbolagade *et al.*, 2005). Even in the current study the PDA exhibited the good performance but after SMA and WMA.

Glucose and ammonium chloride acts as the good carbon and nitrogen source for optimal mycelial growth (Song *et al.*, 1987). Kaur and Lakhanpal (1995) found maximum mycelial growth on media where dextrose was used as carbon source. Similarly, good biomass of mycelium (*Lentinula edodes*) found on a medium containing glucose as the carbon source (Sakamoto *et al.*, 1978). Hence, it could be assumed that media containing dextrose or glucose supported maximum mycelial growth.

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