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Effect of Botanical Regime on Mycelial Growth in Pink Oyster Mushroom (*Pleurotus Djamor* Rumph.)

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Abstract

The present study was investigated to study the mycelial growth of *Pleurotus djamor* under three different botanicals *viz*., *Allium cepa, Allium sativum* and *Coriandrum sativum* with two different concentrations (2.5% and 3.0% respectively) with seven treatments and three replications. All the six plant extract significantly affected the mycelial growth. The *pleurotus djamor* were inoculated in PDA media Petri plates and incubated at 23±2°C for 7 days and observations were recorded at 3, 5 and 7 DAI. Maximum radial growth (90.00 mm) was observed in coriander leaf extract @ 3% followed by coriander leaf extract @ 2.5% (88.00 mm). Minimum radial growth (32.00 mm) was observed in garlic leaf extract @ 3%.

Keywords: *mycelial growth, botanicals, pleurotus djamor, radial growth, growth rate*

Introduction

The name *Pleurotus* has its origin from Greek word, 'Pleuro' that means 'formed laterally or lateral position of the stalk or stem'. Worldwide production of cultivated, edible mushrooms has increased more than 30-fold since 1978–2013. Eighty five per cent of the world production results from cultivation of only five genera: *Lentinula* (22%), *Pleurotus* (19%), *Auricularia* (17%), *Agaricus* (15%) and *Flammulina* (11%) (Royse *et al*., 2017 ; Chadha, 1994) Among the cultivated species, oyster mushroom (*Pleurotus* spp.) had ranks 2nd in the world. *Pleurotus*, with five or six cultivated species, is the genus with the highest diversity of any other cultivated genera of agarics (Singh and Kamal, 2017). In India, mushroom farming is hardly four decade old and with initial lag phase, it has started showing upward trend. Pink oyster (*Pleurotus djamor*) is a very fast growing mushroom that fruits easily on a wide range of lignocellulosic substrates.

Various *Pleurotus* species have been shown to possess a number of medicinal properties, such as anti-tumour, immunomodulatory, antigenotoxic, antioxidant, antihyperglycaemic, antimicrobial and antiviral activities. These therapeutic activities are exhibited by extracts or isolated compounds from *Pleurotus* spp. fermentation broth, mycelia and fruiting bodies (Gregori, 2007). Mainly Phyto-extract used against inhibition of competitor moulds was due to the presence of antifungal and antibacterial molecules azadirachtin, limonoid and terpinoids (Nathan *et al*., 2005 and Jarvis and Morgan, 2000). Leaf extracts of *A. Indica* having antifungal properties against *Aspergillus parasiticus* an aflatoxin producer (Allameh *et al*., 2002), it's azadirachtin and meliantrioletc. These plant extracts offer a viable choice which are non persistent in the environment and safer to use.

Considering the above, an attempt was made to develop a suitable management practice against the competitor moulds of *Pleurotus ostreatus* in an eco-friendly manner under the agro-ecological condition. In earlier experimental studies, *P. djamor* has been found to possess strong analgesic, anti-inflammatory and antipyretic activity. Crude extracts of the macro-fungus has also exhibited significant *in-vitro* free radical scavenging property, antimicrobial and anti-platelet potentiality. Thus these plant extracts will help in preventing diseases like moulds caused by *Trichoderma* spp., *Verticillium fungicola*, *Aspergillus* spp. etc and also promoting the growth of mycelium of *Pleurotus djamor* and thus resulting in increased productivity of mushroom Suseem and Saral (2013).

Materials and methods

The present study was done to study the mycelial growth of *Pleurotus djamor* against three different botanicals (*Allium cepa, Allium sativum* and *Coriandrum sativum*) with two different concentration (2.5% and 3.0% respectively) in laboratory. The study was conducted at laboratory of Plant Pathology, School of Agriculture, Uttaranchal University, Dehradun, India. During the study, culture of *Pleurotus djamor* was obtained from Directorate of Mushroom Research, Solan, Himachal Pradesh. The culture was isolated and maintained on Potato Dextrose Agar medium by regular sub culturing.

Maintenance of pure culture

The culture of *Pleurotus djamor* was isolated and maintained on Potato Dextrose Agar medium by regular sub culturing. The cultures of *Pleurotus* species was grown in sterilized Petri plates on potato dextrose agar (PDA) medium for 8 days. Single branched hyphae from the periphery of the growing colony was marked under low power (10x) of compound microscope and transferred to PDA slants for maintenance. These culture tubes was incubated at 24±1^{0}C for about a week and again sub-cultured on PDA medium before storing in a refrigerator at 05^0±1C for further use.

Preparation of plant extract media

For preparation of extract, the fresh leaves of *Allium cepa, Allium sativum* and *Coriandrum sativum* were thoroughly washed in ordinary tap water and air dried at room temperature for four consecutive days. After drying, the leaves turned brittle and easily crushed by electric grinder. These crushed leaves were sieved (52 mesh) and stored in the airtight containers. The powder (2.5 g and 3 g) was incorporated into 50 ml of distilled water then kept for 24 hours separately in two different beakers. Thereafter, it was filtered into a measuring cylinder and 50 ml volume of the extract was maintained by adding the water and finally it was incorporated into the PDA flask containing concentrated Potato dextrose agar media (50 ml was prepared from the ingredients required for 100 ml). Thus, after incorporation of 50 ml extract (5 %) in 50 ml PDA the final concentration of the powdered extract into the PDA remained 2.5 % and 3.0 % respectively. Plant extract evaluation was done using poisoned food technique by Grover and Moore (1962).

Statistical analysis

Data was analysed by using complete randomized design (CRD) with the help of analysis of variance table (ANOVA) wherever required. The F value will be calculated and critical difference (CD) was tested at five per cent level of significance for comparing treatment means (Steel, 1997).

Result and discussion

The result obtained on radial growth and radial growth rate of *Pleurotus djamor* in poison food technique is presented in Table 1. All the six plant extract had a significant radial growth of mycelium. The *Pleurotus djamor* were inoculated in botanicals extract media petri plates and incubated at 23±2°C for 7 days and observations were recorded at 3, 5 and 7 DAI. Maximum radial growth was observed in coriander leaf extract @ 3% (90.00 mm) followed by coriander leaf extract @ 2.5% (88.33 mm) and 82.00 in control (without any plant extract). Minimum radial growth was observed in garlic leaf extract @ 3% (31.67 mm) followed by garlic leaf extract @ 2.5% (52.33 mm).

Three days after inoculation (DAI) maximum radial growth was observed in T_6 (29.00 mm) with radial growth rate of 9.66 mm/day followed by T_5 (27.33 mm) with radial growth rate of 9.11 mm/day. Radial growth of T_2 (24.33 mm) and T_1 (17.67 mm) was observed with radial growth rate of 8.11 mm/day and 5.89 mm/day respectively. Minimum radial growth was observed in T_4 (3.50 mm) with radial growth rate of 1.16 mm/day followed by T_3 (11.33 mm) with radial growth rate of 3.77 mm/day.

Five days after inoculation (DAI) maximum radial growth was observed in T_6 (65.00 mm) and radial growth rate of 13.00 mm/day followed by T_5 (58.67 mm) and radial growth rate of 11.73 mm/day were recorded. Radial growth of T_2 and T_1 was observed to be (50.33 mm) and (46.33 mm) respectively with radial growth rate of 10.06 mm/day and 9.26 mm/day respectively. Minimum radial

growth after five days was observed in T_4 (12.67 mm) and radial growth rate of 2.53 mm/day followed by T_3 (26.33 mm) and radial growth rate of 5.26 mm/day.

Seven days after inoculation (DAI) maximum radial growth was observed in T_6 (90.00 mm) and radial growth rate of 12.85 mm/day followed by T_5 (88.33 mm) and radial growth rate of 12.61 mm/day were recorded. Radial growth of T_2 and T_1 was observed to be 81.33 mm and 80.00 mm respectively with radial growth rate of 11.64 mm/day and 11.42 mm/day respectively. Minimum radial growth after seven days was observed in T_4 (31.67 mm) and radial growth rate of 4.52 mm/day followed by T_3 (52.33 mm) and radial growth rate of 7.74 mm/day.

Mainly Phyto-extract used against inhibition of competitor moulds was due to the presence of antifungal and antibacterial molecules azadirachtin, limonoid and terpinoids (Nathan *et al*., 2005 and Jarvis and Morgan, 2000). Leaf extracts of *A. Indica* having antifungal properties against *Aspergillus parasiticus* an aflatoxin producer (Allameh *et al*., 2002), it's azadirachtin and meliantrioletc. Many workers phyto-extract was used against *Pleurotus* in higher concentration and find all phytoextract inhibit the growth of mycelium so in my research the use of phyto-extract in low concentration and found some extract inhibin and promote the groth of mycelium of *Pleurotus* spp. Pervez *et al*. (2012) were similarly observed mycelial growth in lantana extract 51.25% and neem extract (47.75%) in 5 and 10% concentration. Among the botanicals, *A. indica* (neem) showed found less effective against the mycelium growth of *P. ostreatus* (4.4%). The extent of inhibition of mycelium growth of *P. Ostreatus* and different competitor moulds varied considerably with different botanicals used. Among the botanicals, *A. indica* (neem) showed maximum inhibitory effect (54.1 to 71.6 %) against the growth of four competitor moulds fungi i.e. *Aspergillus niger*, *Trichoderma viride*, *Coprinus* spp. and *Penicillium* sp., and found less effective against the mycelium growth of *P. ostreatus* (4.4%). This was followed by extracts of *Pongamia pinnata* (karanja) 42.4 to 61.3% (mould fungi) and 6.7 % (*P. ostreatus*) and *Clerodendron indicum* (clerodendron) which inhibited 40.0 to 53.8 % and 8.9 % mycelium growth of mould fungi and *P. ostreatus* respectively Biswas (2015). Kumar *et al.* (2019) similarly evaluated different botanicals against *Pleurotus sapidus* in *in-vitro* condition for the growth *viz*. Neem leaf extract, Lantana leaf extract and Eucalyptus leaf extract in two different concentrations 2% and 4% respectively. The maximum mycelia growth was observed at 9 DAI *i.e.* 88.25 mm in lantana leaf extract @ 4% which is followed by 87.25 mm in lantana leaf extract @ 2%. The least mycelial growth was observed in Eucalyptus *i.e.* 15.75mm and 46.00 mm @ 4% and 2% respectively.

Table 1. Effect of different botanicals leaf extract on the radial growth of *P. djamor*

Treatment	Dose (%)	3 DAI		5 DAI		7 DAI	
		Radial growth (mm)	Radial growth rate (mm/day)	Radial growth (mm)	Radial growth rate (mm/day)	Radial growth (mm)	Radial growth rate (mm/day)
Onion leaf extract	2.50	17.67	5.89	46.33	9.26	80.00	11.42
Onion leaf extract	3.00	24.33	8.11	50.33	10.06	81.33	11.64
Garlic leaf extract	2.50	11.33	3.77	26.33	5.26	52.33	7.74
Garlic leaf extract	3.00	3.50	1.16	12.67	2.53	31.67	4.52
Coriander leaf extract	2.50	27.33	9.11	58.67	11.73	88.33	12.61
Coriander leaf extract	3.00	29.00	9.66	65.00	13.00	90.00	12.85
Control (PDA)	-	16.67	5.55	47.67	9.53	82.00	11.71
CD at 5%	-	**1.99**	-	**1.76**	-	**2.14**	-
SE (m)	-	**0.65**	-	**0.57**	-	**0.70**	-

DAI= Days after inoculation

Conclusion

From the result this can concluded that maximum radial growth of mycelium and growth rate of mycelium per day of *P. djamor* can be obtained from coriander leaf extract @ 3% concentration followed by 2.5% concentration. Minimum radial growth of mycelium and growth rate of mycelium per day was found in garlic leaf extract @ 3% concentration followed by 2.5% concentration. Thus it was found that garlic leaf extract showed the toxicity to *Pleurotus djamor* and inhibited the mycelial growth of mushroom.

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