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Original Research Article

In-vitro Evaluation of Chemical and Non-chemicals against Diseases of *Pleurotus* sp. and Yield

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A B S T R A C T

The combination Wheat straw + Neem water extracted (15%) showed excellent response towards the growth of mushroom mycelia and complete spawn run within 14 days and also reduced incidence of common moulds (2.40%), while Wheat straw + Jivamrut (05%) has taken 18 days for complete spawn run. The maximum incidence of disease 5.00% recorded in Wheat straw + Jivamrut (10%). The fastest pinning was observed in combination Wheat straw + Bavistin (0.10%) i.e. 20 days while slowest pinning was recorded in Wheat straw + Neem water extract (10%) i.e. 28 days followed by Wheat straw + Bavistin 0.15%, Wheat straw + Bavistin 0.05%, Wheat straw + Jivamrut 10%, and Wheat straw + Jivamrut 15% i.e. 22, 23, 23 and 24 days respectively and these were at par with each other. The average weight of fruiting body among all the combination ranges from 6.00g to 7.40g. The minimum average weight of fruiting body was observed in combination Wheat straw + Jivamrut (05%), i.e. 6.00g, whereas maximum average weight of fruiting body recorded in Wheat straw + Bavistin (0.15%), i.e. 7.40g followed by Wheat straw + Bavistin 0.5%, Wheat straw + Jivamrut 15% and Wheat straw + Neem water 10% i.e. 7.20, 6.85 and 6.80 g. These treatments were at par with each other. The combination of wheat straw with chemical and non-chemical in *Pleurotus* sp. gives highest yield of fruiting body treated with 0.15% of bavistin 500g/kg of compost followed by 495g/kg against bavistin 0.10% and 490g/kg against bavistin 0.05% whereas among non-chemical the highest yield was observed in compost treated with Wheat straw + Neem water extract (10%) 478g/kg of compost followed by 470g/kg in 15% of Neem water extract and 10% of Jivamrut 473g/kg indicates and 470g/kg fruiting was recorded in combination.

Keywords

Pleurotus sp., Wheat straw, Bavistin, Jivamrut

Introduction

The first mushroom was cultivated in China around 600 A.D. This was *Auricularia auricula*. *Agaricus* is the only one that was not first cultivated in China. The mushroom belongs to Basidiomycota division (Randive, 2012). The mushroom is a saprophytic fungus that grows on dead and decaying organic matter. Due to the absence of chlorophyll, it is unable to synthesize its own food and hence is dependent upon the organic substrate for food. As mushrooms are primitive organisms. The term mushroom applies mostly to those fungi that have stem (stipe), cap (pileus), hymenium (lamellae) and spores on the underside of the cap (Masarirambi *et*

al., 2011). *Agaricus* is the major genus, contributing about 85% in India and 30% in the world of the total cultivated mushrooms. *Pleurotus,* is a close 2nd and contributes about 27% of the world's output while *Lentinula edodes* (shiitake) contributes approximately 17% (Kaur *et al*., 2019).

World mushroom production has gradually increased from 0.30 million tons to 3.41 million tons over a period of last 50 years from 1965 to 2015 (Singh *et al.,* 2017). Resultantly, the world trade trend shows that the mushroom export/import has also continuously increased during the period. On the export front, till 1993, Indian contribution to the world trade was almost negligible, but it was heartening to note that for the first time, during 1994, India not only figured in the US imports, but emerged as the second largest exporter of canned mushrooms replacing Taiwan. In the year 2016-2017, the total exports of white button mushroom from India in canned and frozen form stood at 1054 quintals and generated an income of Rs. 7282.26 lakhs (DGCIS export data. 2017). The current production of mushrooms in India has approximately more than one lakh ton mark with the annual growth rate of more than 15% (Kaur *et al.,* 2019). China is the leading producer of mushrooms worldwide, producing about 65% of global mushrooms and 85% of Oyster mushroom worldwide (Royse, 2003). Africa produces only 1% of the total world output of Oyster mushroom (Onyango *et al*., 2010). The mushrooms can be grown on various substrates including paddy straw, maize stalks/cobs, vegetable plant residues, sugarcane bagasse (Mendez *et al*., 2005; Hassan *et al*., 2011). The preferred method of cultivation is dependent on the mushroom variety, market demand, farmer's preferences, and availability of growing media (Atikpo *et al*., 2008). The reuse of agricultural wastes for mushroom cultivation serves a dual purpose by eliminating wastes and giving it an added value through production of nutritious low-cost food (Villas Boas *et al.,* 2002).

Materials and Methods

Quality chemicals, fungicides etc. required for the experiment were obtained from the Mushroom Laboratory, Department of Plant Pathology, ANDUA&T Kumarganj, Ayodhya.

Days required for mycelial growth and pin head formation of mushroom

This was recorded by counting days from bag filling to completion of mycelial growth/spawn run in individual bags of every treatment. Pinhead formation was observed by recording the time taken in days from the filling date of bags to pinhead formation of each individual treatment.

Days required for appearance of disease on mushroom

Disease appearance to be recorded by counting of days from filling the bags, appearance of disease symptoms on compost and mushroom.

Crop management

After spawning, the bags were placed in dark room with optimum temperature 26^0C in mushroom house. During spawn run no light and cross ventilation allowed. substrate fully covered with mycelium, the polythene bags were removed to expose the substrate surface for initiation of pinhead formation and kept on iron racks with 40cm gap between two shelve in cropping room of the mushroom house for fruiting. The water was sprayed regularly on the compact mass of substrate to keep it wet. The temperature of mushroom house was maintained between 21 to 26^0C

during the experimental period. The humidity of the cropping room was maintained at 85 to 90% by humidifier during the cropping period light was provided 2-3 hours by 40 watts bulbs and 3-4 hours cross ventilation by opening doors and windows. The open beds were observed carefully still harvesting.

Harvesting of Total yield of mushroom

The watering was stopped a day before harvesting and harvesting of mushroom was done at optimum size and growth and fresh weight of mushroom was recorded immediately harvesting and the small portion of the substrate all over the surface of the bed will be scrapped in order to obtain next crop. Three harvesting were taken. This was calculated by weighing of fresh fruiting body of total harvested fruiting body of each individual treatment during cropping season.

Results and Discussions

Evaluation of chemical & non-chemical against common moulds

The response of chemicals and non-chemicals against moulds during the cultivation of *Pleurotus* sp. are presented in (Table 1). The data indicated the supremacy of chemical treatment over the non-chemicals.

Spawn runs (d) / Incidence of disease (%)

The substrate treated with a common dose (70ppm) of chemical (Bavistin), where spawn run significantly varies depicted and the Wheat straw + Bavistin (0.05%) has taken minimum period 13 days for completing the spawn run and moulds attack was 1.20% followed by the combination Wheat straw + Bavistin (0.15%) taken 14 days and no moulds attack was noticed. A common dose of (4%) non-chemicals shows the different time in complete spawn run (Table 1). The combination Wheat straw + Neem water extracted (15%) showed excellent response towards the growth of mushroom mycelia and complete spawn run within 14 days and also reduced incidence of common moulds (2.40%), while Wheat straw + Jivamrut (05%) has taken 18 days for complete spawn run. The maximum incidence of disease 5.00% recorded in Wheat straw + Jivamrut (10%).

Pin head formation (d) / Average weight of fruiting body (g)

The pinhead formation ranges from 20 to 28 days. The fastest pinning was observed in combination Wheat straw + Bavistin (0.10%) i.e. 20 days while slowest pinning was recorded in Wheat straw + Neem water extract (10%) i.e. 28 days followed by Wheat straw + Bavistin 0.15%, Wheat straw + Bavistin 0.05%, Wheat straw + Jivamrut 10%, and Wheat straw + Jivamrut 15% i.e. 22, 23, 23 and 24 days respectively and these were at par with each other. The average weight of fruiting body among all the combination ranges from 6.00g to 7.40g. The minimum average weight of fruiting body was observed in combination Wheat straw + Jivamrut (05%), i.e. 6.00g, whereas maximum average weight of fruiting body recorded in Wheat straw + Bavistin (0.15%), i.e. 7.40g followed by Wheat straw + Bavistin 0.5%, Wheat straw + Jivamrut 15% and Wheat straw + Neem water 10% i.e. 7.20, 6.85 and 6.80 g. These treatments were at par with each other.

Yield (g/kg)

The overall cropping period after spawn run, pinning and maturity of the fruiting body resulted into final yield ranging among different combinations of chemical and non-chemicals 450gm/kg to 500gm/kg.

Table.1 Evaluation of Non-chemical and chemical against common moulds of *Pleurotus* sp.

Treatments	Dose	Spawn run (d)	Pinning (d)	Average Weight of fruiting body (g)	Yield gm/kg	% Incidence of disease
Wheat straw + Jivamrut 5%	4.00%	18.00	23	6.00	470	4.10
Wheat straw + Jivamrut 10%	4.00%	15.00	23	6.50	473	5.00
Wheat straw + Jivamrut 15%	4.00%	16.00	24	6.85	461	4.30
Wheat straw + Neem water 5%	4.00%	17.00	24	6.70	450	3.00
Wheat straw + Neem water 10%	4.00%	16.00	28	6.80	478	2.90
Wheat straw + Neem water 15%	4.00%	14.00	26	6.75	470	2.40
Wheat straw + Bavistin 0.5%	70 ppm	13.00	23	7.00	490	1.20
Wheat straw + Bavistin 0.10%	70 ppm	14.00	20	7.20	495	1.00
Wheat straw + Bavistin 0.15%	70 ppm	14.00	22	7.40	500	00
Control		16.00	23	5.70	396	2.1
C.D.		1.829	3.281	0.446	43.044	0.473
C.V.		6.969	8.105	3.778	5.359	10.603
SE±(m)		0.616	1.104	0.150	14.489	0.159
SE(d)		0.871	1.562	0.213	20.491	0.225

The combination of wheat straw with chemical and non-chemical in *Pleurotus* sp. gives highest yield of fruiting body treated with 0.15% of bavistin 500g/kg of compost followed by 495g/kg against bavistin 0.10% and 490g/kg against bavistin 0.05% whereas among non-chemical the highest yield was observed in compost treated with Wheat straw + Neem water extract (10%) 478g/kg of compost followed by 470g/kg in 15% of Neem water extract and 10% of Jivamrut 473g/kg indicates and 470g/kg fruiting was recorded in combination Wheat straw + Jivamrut (05%). All the three combination of Wheat straw + Bavistin given highest yield over non-chemicals.

The similar findings obtained during the course of studies and spawn run among all the combinations ranges from 13 to 18 days and pinning ranges from 20 to 28 days, whereas the longest spawn run was observed in (Wheat straw + Jivamrut 05%). The variation in spawn run might due to the varied chemical constitution which hamper or enhance the spawn run. The results of spawn run are quite similar to the finding of Shah *et al*., (2004), Tan (1981). The fastest pinning was observed in (Wheat straw + Bavistin 0.10%,), i.e. 20 days, while slowest pinning was recorded in (Wheat straw + Neem water extract 10%), i.e. 28 days which are similar to the studies carried out elsewhere Ahmed (1998) pinhead formation (23 to 27 days), Fan *et al*., (2000) pinhead formation in (20 to 23 days). The overall cropping period after spawn run, pinning the maturity of the fruiting body resulted into final yield ranging among different combinations of chemical and non-chemicals ranges from 450gm/kg to 500gm/kg. The combinations of wheat straw with chemical and non-chemicals in *Pleurotus* sp. gives highest yield of fruiting body treated with 0.15% of bavistin 500g/kg of compost followed by 495g/kg against bavistin 0.10% and 490g/kg against bavistin 0.05% whereas among non-chemical the highest yield was observed in compost treated with Wheat straw + Neem water extract (10%) 478g/kg of compost followed by 470g/kg in 15% of neem water extract and 10% of Jivamrut 473g/kg indicates that the chemical (Bavistin 0.15%) superior over non-chemicals. The results obtained from different concentration of bavistin and non-chemicals are similar with studies conducted by (Upadhyay *et al.,* (1987) Vijay and Sohi (1987) Allameh *et al.,* (2002) and Vijaykumar *et al.,* (2013).

In conclusion, the variation in spawn run might due to the varied chemical constitution which hamper or enhance the spawn run. The fastest pinning was observed in (Wheat straw + Bavistin 0.10%,), i.e. 20 days, while slowest pinning was recorded in (Wheat straw + Neem water extract 10%), i.e. 28 days which are similar to the studies carried out elsewhere. The overall cropping period after spawn run, pinning the maturity of the fruiting body resulted into final yield ranging among different combinations of chemical and non-chemicals ranges from 450gm/kg to 500gm/kg, while in control 396gm/kg. The combination of wheat straw with chemical and non-chemical in *Pleurotus* sp. gives highest yield of fruiting body treated with 0.15% of Bavistin 500g/kg of compost followed by 495g/kg against Bavistin 0.10% and 490g/kg against bavistin 0.05% whereas among non-chemicals the highest yield was observed in compost treated with Wheat straw + Neem water extract (10%) 478g/kg of compost followed by 470g/kg in 15% of Neem water extract and 10% of Jivamrut 473g/kg indicates that the chemical (Bavistin 0.15%) superior over non-chemicals. All the three combination of Wheat straw + Bavistin gave highest yield over non-chemicals. Whereas all the six non chemical combinations yield

ranges from 450gm/kg to 478gm/kg slightly lesser yield but keeping in view the hazards of chemical fungicides, the lesser yield combination of non-chemicals was preferred over chemical combination to avoid the ill effects of chemicals on consumers.

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