MYCELIAL GROWTH AND FRUIT BODY PRODUCTION OF NEW HYBRID CULTURES OF DIFFERENT *PLEUROTUS SPECIES*

Rajesh Kumar Meena[1] and Anila Dhoshi [2]

Department of Plant Pathology, Rajasthan College of Agriculture Maharana Pratap University of Agriculture and Technology, Udaipur-313001 (Raj.) India
[1]Department of Plant Pathology, RCA, MPUAT, Udaipur-313001 (Rajasthan)
[2]Department of Plant Pathology, RCA, MPUAT, Udaipur-313001 (Rajasthan)
Email: rajeshpatho@gmail.com

Abstract: *Pleurotus ostreatus* or oyster mushroom is an edible mushroom was cultivated from agricultural wastes. In present investigation, new hybrid cultures of different *Pleurotus* species obtained through inter species hybridization on malt extract medium and it was observed that the different hybrid cultures of P_2, P_3, P_5, P_6, P_7, P_8, P_{10}, P_{11}, P_{12}, P_{14}, P_{16} and P_{21} had given higher mycelial growth in diameter as compared to their Parent- I and Parent-II. Further, it was recorded that the fruit body production were observed in all newly developed hybrid strains except 12 strains

Keywords: *Pleurotus* spp., oyster mushroom, mycelial growth, and hybrid cultures

INTRODUCTION

Pleurotus or Oyster mushroom is a basidiomycetous fungus belonging to the order Aphyllophorales, and family tricholomataceae. Total mushroom production of world is 2.4 million tonnes in 2009. In world, mushroom production chart, *Pleurotus* stands second next to *Agaricus bisporus*. Unlike other mushrooms *Pleurotus* spp. has much diversity in their adaptation to the varying agro climatic conditions as well as to the lignocelluloses substrates. According to James (1995) edible mushroom (dry) contain about 19-40% protein i.e. its protein content is twice that of vegetable and four times that of oranges, and they are rich with vitamins, and minerals, less percent of unsaturated fatty acid and carbohydrate which makes it so ideal for diabetic and the obesity patient. Most mushroom has exceptional medicinal potentials and properties, curative and prophylactic especially in diseases such as high blood pressure, asthma, respiratory tracts infection, anaemia, hepatitis, cancer, tumour etc.

The mushrooms are richer in protein as compared to cereals, pulses, fruits or vegetables on dry weight basis. They also provide minerals, vitamins and many essential amino acids. Due to its flexible nature, mycelial growth, high saprophytic colonizing ability. Edible mushrooms are macromycetes. They can offer us an important opportunity for a cheap and nutritious food for human beings on a large scale, mycoforage for animal foods and some pharmacological values. Genetic improvement in edible mushrooms, like any other branch of science, requires systematic investigation to establish facts and principles for further development. The mushroom industry/farmers would subsequently receive benefit by applying the new development technology in genetics.

MATERIAL AND METHOD

Cultures

Different cultural of *Pleurotus* species i.e. *Pleurotus citrnopileatus* (P_2), *Pleurotus florida* (s) (P_3), *Pleurotus sajor-caju* 503 (P_5), *Pleurotus sajor-caju* (B) (P_6), *Pleurotus salmeno straminus* (P_7), *Pleurotus florida* (P) (P_8), *Pleurotus* winter (P_{10}), *Pleurotus* W-9 (P_{11}), *Pleurotus* (H) (P_{12}), *Pleurotus* W-10(P_{14}), *Pleurotus* (W)-1(P_{16}), and *Pleurotus* B white (P_{21}), were obtained from All India Coordinated Mushroom Improvement Project ICAR of Rajasthan College of Agriculture, MPUAT, Udaipur.

Multiplication of pure cultures of oyster mushrooms

Pure cultures of oyster mushrooms were multiplied and maintained in test tubes having malt extract agar (1.0 %) medium or plain agar medium by inoculating tubes with mycelial bit from pure culture tubes. The newly inoculated slants were incubated at 28 ± 1 ºC.

Composition of malt extract agar medium (1 %).

Malt extract	=	10 g
Agar-agar	=	20 g
Distilled water	=	1000 ml
pH	=	7.0

Composition of plain agar medium

Agar-agar	=	20 g
Succinic acid	=	0.25 g
Distilled water	=	1000 ml
pH	=	7.0

Mean diameter (cm) of mycelial growth and fruit body production of new hybrid cultures of different *Pleurotus species*

The 20 ml sterilized plain agar medium poured in Petri plates and inoculated with 2 mm disc from one week old slants of different hybrid culture than these Petri plates were incubated at 28 ± 1ºC. Observations on mycelial growth of new hybrid culture and fruit body production were recorded after 7thdays of inoculation. Each treatment was replicated three times.

RESULT AND DISCUSSION

Mycelial growth and fruit body production of hybrid cultures of *Pleurotus* P_2 and P_3

The mean diameter (cm) of different hybrid culture of P_2 and P_3 were given in Table 1. It was observed that hybrid cultures i.e. P_2 x P_{20} – 6.22 cm, P_2 xP_{14} – 6.38 cm and P_3 x P_{16} – 6.43 cm were shown significantly lower diameter growth as compared to all other hybrid cultures of P_2 and P_3. Secondly, it was also observed that the hybrid P_3xP_{11} had given significantly higher (8.24 cm) diameter growth as compared to all hybrid cultures. Fruit body production was observed in all new hybrid strains except P_2 x P_{14} and P_2 x P_{20}. Further, it was also observed that the mycelial growth of hybrid cultures was found fast growing as compared to their parents. Similar studies was carried out by Sawashe and Sawant (2009) isolated 120 single spores of *P. florida* and 85 single spores of *P. eous* and concluded that mycelial growth obtained through inter species hybridization of *Pleurotus* species. On various media i.e. solid medium (PDA), liquid media (PD broth) and on wheat grains solid medium. it was observed that the hybrid culture Pe-1 x Pf-1, Pe-1 x Pf-2, Pe-1 x Pf-56, Pe-1 x Pf-16 and Pe-1 x Pf-29 had given maximum mycelial growth as compared to its parents and original parents.

Mycelial growth and fruit body production of hybrid cultures of *Pleurotus* P_5 and P_6

In Table 2 results show's that the mycelial growth on malt extract medium indicted that the hybrid strain P_6 x P_8 (7.58 cm) given significantly higher mycelial growth as compared to both parents and all other hybrid cultures and it was also noticed that the hybrid P_6 x P_{11} – 5.22 cm, P_6 x P_{14} – 5.44, and P_5 x P_{16} – 5.50 cm were given significantly lower mycelial growth as compared to other hybrid cultures. Fruit body production was recorded in all new hybrid strains except P_6 x P_{11} and P_6 x P_{14}. Thus, in general these results indicated that all the hybrids had given higher mycelial growth as compared to their parents. (Sawashe and Sawant, 2009; Wang and Aderson, 1972).

Mycelial growth and fruit body production of hybrid cultures of *Pleurotus* P_7, P_8 and P_{10}

The results regarding the mycelial growth of hybrid cultures of P_7, P_8 and P_{10} were given in Table 3. It was indicated that the hybrid strain P_8 x P_{21} (7.98 cm) had given significantly higher mycelial growth as compared to both parents and all other hybrid strains and it was followed by the hybrid P_{10} x P_{14} – 7.58 cm. Whereas, hybrid strains of P_7 x P_{21} (5.50 cm) and P_7 x P_{20} (5.70 cm) were given significantly lower diameter growth as compared to all other hybrid strains. It was also observed that fruit body production was recorded in all new hybrid strains except P_7 x P_{21}. Further, it was observed that hybrid cultures grew fast as compared to their parents. The present investigations are in close conformity with the results of Fritsche, (1978) and Anonymous, 2004-05).

Mycelial growth and fruit body production of hybrid cultures of *Pleurotus* P_{10}, P_{11}, P_{12}, P_{14}, P_{16}, P_{20} and P_{21}

In Table 4 results show's that the mycelial growth on medium indicated that the hybrid strain of P_{12} x P_{21} (6.99 cm) had given significantly higher mycelial growth as compared to both parents and all other hybrid strains. Whereas, hybrid strain P_{14} x P_{20} (5.15 cm), P_{11} x P_{20} (5.16 cm) and P_{11} x P_{16} (5.24 cm) were given significantly lower diameter growth as compared to all other hybrid strains. It was also observed that fruit body production were recorded in all hybrid strains except P_{11} x P_{16}, P_{11} x P_{20}, P_{12} x P_{16}, P_{14} x P_{20}, P_{14} x P_{21}, P_{16} x P_{20}, and P_{16} x P_{21} strains. Further, it was observed that hybrid cultures grew fast as compared to their parents. Similar studies were carried out by Bahukhandi and Munjal (1989), Thakur and Bhandal (1993) and Ghosh and Chakravarti (1999).

SUMMARY

The present investigation were under taken to mycelial growth and fruit body production of new hybrid cultures of different *Pleurotus species* were carried out and the results thus obtained are summarized that mycelial growth and fruit body production of new hybrid strains were also recorded. In general it was observed that the hybrid cultures were given higher mycelial growth in diameter as compared to the parent-I and parent-II. Further, it was recorded that the fruit body production were observed on malt extract medium in all newly developed hybrid strains except 12 strains. The present studies helpful in improvement in quality characters govern fast colonizing ability by compatible reactions of different cultivated as well as wild *Pleurotus* species of different geographical locations and hosts leading to development of new cultures which can be utilized for commercial growing after evaluations on yield, size, shape, colour and protein content of the fruit bodies.

Table 1 Mean diameter (cm) of mycelial growth and fruit body production of hybrid Cultures of *Pleurotus* P_2 and P_3

S.no.	Hybrid cultures	Parent-I (cm)	Parent- II (cm)	Mycelial growth of hybrid culture (cm)	Fruit body production of hybrid cultures
1.	P_2 x P_3	5.66	6.28	6.60	+ (5)
2.	P_2 x P_5	5.66	3.12	6.78	+ (2)
3.	P_2 x P_6	5.66	3.21	6.94	+ (1)
4.	P_2 x P_7	5.66	5.24	7.14	+ (6)
5.	P_2 x P_{11}	5.66	3.94	6.54	+ (1)
6.	P_2 x P_{14}	5.66	3.19	6.38	-
7.	P_2 x P_{20}	5.66	4.82	6.22	-
8.	P_3 x P_6	6.28	3.21	7.32	+ (5)
9.	P_3 x P_8	6.28	6.42	7.39	+ (4)
10.	P_3 x P_{10}	6.28	5.62	7.74	+ (2)
11.	P_3 x P_{11}	6.28	3.94	8.24	+ (7)
12.	P_3 x P_{12}	6.28	5.26	7.81	+ (4)
13.	P_3 x P_{14}	6.28	3.19	6.54	+ (2)
14.	P_3 x P_{16}	6.28	4.22	6.43	+ (3)
16.	P_3 x P_{20}	6.28	4.82	7.86	+ (3)
17.	P_3 x P_{21}	6.28	5.52	7.80	+ (4)
SEm ±				0.099	
CD at 5 %				0.288	
CV %				2.555	

+ Fruit body production
- No fruit body production

Table 2 Mean diameter (cm) of mycelial growth and fruit body production of hybrid Cultures of *Pleurotus* P_5 and P_6.

S.no.	Hybrid cultures	Parent-I (cm)	Parent- II (cm)	Mycelial growth of hybrid culture (cm)	Fruit body production of hybrid cultures
1.	P_5 x P_7	3.12	5.24	7.13	+ (7)
2.	P_5 x P_{12}	3.12	5.26	7.27	+ (10)
3.	P_5 x P_{16}	3.12	4.22	5.50	+ (1)
4.	P_5 x P_{20}	3.12	4.82	6.66	+ (5)
5.	P_5 x P_{21}	3.12	5.52	6.76	+ (6)
6.	P_6 x P_7	3.21	5.24	6.62	+ (5)
7.	P_6 x P_8	3.21	6.42	7.58	+ (11)
8.	P_6 x P_{11}	3.21	3.94	5.22	-
9.	P_6 x P_{12}	3.21	5.26	5.68	+ (1)
10.	P_6 x P_{14}	3.21	3.19	5.44	-
11.	P_6 x P_{16}	3.21	4.22	6.64	+ (2)
12.	P_6 x P_{20}	3.21	4.82	6.69	+ (1)
13.	P_6 x P_{21}	3.21	5.52	6.84	+ (5)
SEm ±				0.85	
CD at 5 %				0.249	
CV %				2.247	

+ Fruit body production
- No fruit body production

Table 3 Mean diameter (cm) of mycelial growth and fruit body production of hybrid Cultures of *Pleurotus* P_7, P_8 and P_{10}.

S.no.	Hybrid cultures	Parent-I (cm)	Parent- II (cm)	Mycelial growth of hybrid culture (cm)	Fruit body production of hybrid cultures
1.	P_7 x P_8	5.24	6.42	6.98	+ (4)
2.	P_7 x P_{10}	5.24	5.62	7.04	+ (2)

3.	P_7 x P_{11}	5.24	3.94	6.79	+ (2)
4.	P_7 x P_{12}	5.24	5.26	6.83	+ (3)
5.	P_7 x P_{14}	5.24	3.19	6.08	+ (3)
6.	P_7 x P_{16}	5.24	4.22	7.41	+ (5)
7.	P_7 x P_{20}	5.24	4.82	5.70	+ (1)
8.	P_7 x P_{21}	5.24	5.52	5.50	-
9.	P_8 x P_{10}	6.42	5.62	7.34	+ (5)
10.	P_8 x P_{11}	6.42	3.94	6.92	+ (3)
11.	P_8 x P_{12}	6.42	5.26	6.74	+ (2)
12.	P_8x P_{14}	6.42	3.19	7.32	+ (3)
13.	P_8 x P_{16}	6.42	4.22	7.41	+ (6)
14.	P_8 x P_{20}	6.42	4.86	7.16	+ (6)
15.	P_8 x P_{21}	6.42	5.52	7.98	+ (10)
16.	P_{10} x P_{11}	5.62	3.94	6.96	+ (2)
17.	P_{10}x P_{12}	5.62	5.26	6.44	+ (3)
18.	P_{10} x P_{14}	5.62	3.19	7.58	+ (8)
19.	P_{10} x P_{16}	5.62	4.22	7.42	+ (6)
20.	P_{10}x P_{20}	5.62	4.82	6.98	+ (4)
21.	P_{10} x P_{21}	5.62	5.52	6.18	+ (2)
SEm ±			0.110		
CD at 5 %			0.321		
CV %			2.686		

. + Fruit body production
- No fruit body production

Table 4 Mean diameter (cm) of mycelial growth and fruit body production of hybrid Cultures of *Pleurotus* $P_{11,}$ $P_{12,}$ $P_{14,}$ $P_{16,}$ and P_{21}

S.no.	Hybrid cultures	Parent-I (cm)	Parent- II (cm)	Mycelial growth of hybrid culture (cm)	Fruit body production of hybrid cultures
1.	P_{11} x P_{12}	3.94	5.26	6.58	+ (4)
2.	P_{11} x P_{14}	3.94	3.19	5.82	+ (1)
3.	P_{11} x P_{16}	3.94	4.22	5.24	-
4.	P_{11} x P_{20}	3.94	4.82	5.16	-
5.	P_{11} x P_{21}	3.94	5.52	6.54	+ (1)
6.	P_{12} x P_{14}	5.26	3.19	6.78	+ (5)
7.	P_{12} x P_{16}	5.26	4.22	5.66	-
8.	P_{12} x P_{20}	5.26	4.82	5.70	+ (1)
9.	P_{12} x P_{21}	5.26	5.52	6.99	+ (6)
10.	P_{14} x P_{16}	3.19	4.22	5.68	+ (1)
11.	P_{14} x P_{20}	3.19	4.82	5.15	-
12.	P_{14} x P_{21}	3.19	5.52	5.99	-
13.	P_{16} x P_{20}	4.22	4.82	6.76	-
14.	P_{16} x P_{21}	4.22	5.52	6.31	-
SEm ±			0.135		
CD at 5 %			0.390		
CV %			3.821		

+ Fruit body production
- No fruit body production

ACKNOWLEDGMENT

The authors are grateful to ICAR, NRCM, Chambaghat, H.P., Professor & Head, Department of Plant Pathology, RCA, Udaipur and authorities of MPUAT, Udaipur (Raj.) for providing necessary facilities to carry out present investigation.

REFERENCES

Anonymous (2004-05). Proceeding of IX Workshop of All India Co-ordinated Mushroom Improvement Project held at Chambaghat, Solan on 24-25th Oct., 2004.

Bahukhandi, D. and Munjal, R.L. (1989). Effect of chemical mutagens on colony development and crop

yield of *Pleurotus sajar-caju. Indian Phytopath*. **42** : 459-462.

Fritsche, G. (1978). Breeding work of Agaricus bisporus. In "The Biology and cultivation of Edible Mushrooms" (Chang, S.T. and W.A. Hayes, eds.) pp. 239-250. Academic Press, New York and London.

Ghosh, N. and Chakravarty, D.K. (1991). Studies on evolving new strains of *Pleurotus sajor-caju* by selective dikaryotization. *Indian Mushroom*. **3** : 69-72.

James, C.S. (1995). *Analytical Chemistry of Foods* 1st edn, Chapman and Hall, New York

Sawashe, S. G. and Sawant, D. M. (2009). Performance of hybrid strains of *Pleurotus* species. *Journal of Maharashtra Agriculture Universities*. **34:** 119-120.

Thakur, K. and Bhandal, M.S. (1993). Monosporous isolates and their intermating in *Pleurotus sapidus* and *P. sajar-caju. Mushroom Res*. **2** (1): 41-44.

Wang, S.S. and Anderson, N.A. (1972). A genetic analysis of sporocarp production in *Pleurotus sapidus. Mycologia*. **64** : 521-528.