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Effect of different nutrient media on mycelial growth of isolates of *Pyricularia oryzae* causing rice blast disease

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Abstract
Effect of different nutrient media on growth of thirty rice blast isolates (*Pyricularia oryzae*) collected from different locations of Jammu division was studied. All the isolates were grown on five different nutrient media viz., oat meal agar (OMA), potato dextrose agar (PDA), potato carrot agar (PCA), malt extract agar (MEA) and Czapeks Dox agar CDA) to compare the efficiency of various media in the growth promotion of fungus. The mycelial growth of *P. oryzae* isolates on different nutrient media after 14 days of incubation varied from 2.42 to 90.00 mm. The maximum mean mycelial growth (49.95 mm) was observed in the isolate Po3 and minimum mean mycelial growth (11.23 mm) was observed in the isolate Po20. All the isolates showed excellent growth on OMA, while good growth observed in PDA and PCA, however, fair and poor growth observed in MEA and CDA, respectively.

Keywords: mycelial growth, *Pyricularia oryzae*, rice blast

Introduction
Rice (*Oryza sativa* L.) is one of the most important cereal crops grown all over the world. Rice crop is attacked by many diseases including fungal, bacterial, viral, nematodal including physiological disorders (Hollier *et al.*, 1993; Webster and Gunnell, 1992; Jabeen *et al*., 2012) [2, 8, 3]. Among fungal diseases, blast disease is the one of the most important and destructive disease of rice caused by the ascomycetous fungus, *Pyricularia oryzae* (Teleomorph *Magnaporthe oryzae* (Couch and Kohn, 2002) [1]. The causal organism, *P. oryzea*, is known for its genetic instability, allowing it to overcome the genetic resistance of host plants (Shull and Hamer, 1994) [7]. Rice blast disease is considered as one of the major recurrent constrain in all rice growing areas of the world accounting yield losses to 14-18% (Mew and Gonzales, 2002) [5]. Losses may range up to 90 per cent depending upon the component of the plant infected. P. *oryzae* infects above ground parts of the plant, but neck blast and the panicle blast are the most damaging phases of the disease and have been shown to significantly reduce yield, grain weight and milling quality. The pathogen may infect all the above ground parts of a rice plant at different growth stages viz., leaf, collar, node, internodes, base or neck and other parts of the panicle and sometimes the leaf sheath. A typical blast lesion on a rice leaf is grey at the centre, has a dark border and it is spindle-shaped.

Material and Methods
Mycelial growth of *P. oryzae* isolates on different nutrient media
The five culture media *viz*., Oat meal agar, Potato dextrose agar, Potato carrot agar, Malt extract agar and Czapek's Dox agar were tested for obtaining growth of *P. oryzae* under laboratory conditions. All the media were properly sterilized in an autoclave at 1.05 kg/cm^2 pressure for 20 minutes before use. Twenty ml of each medium was poured into the sterilized Petri plates under aseptic conditions in a laminar air flow chamber. The Petri plates were inoculated with 5 mm mycelial discs of each isolate taken from the periphery of seven day old culture with the help of sterilized cork-borer. The experiment was replicated thrice. The inoculated Petri plates were kept in BOD incubator maintained at 25±1 ºC temperature. The observations on radial growth of the pathogen were recorded after 14 days of inoculation. The variations in the mycelial growth of all isolates in each medium were recorded.

Results

Mycelial growth of *P. oryzae* isolates on different nutrient media

The isolates of *P. oryzae* were grown on five different nutrient media to compare the mycelial growth of different isolates on different media. The mycelial growth of *P. oryzae* isolates on different nutrient media after 14 days of incubation varied from 2.42 to 90.00 mm (Table 1).

On OMA (Oat Meal Agar) medium isolate Po1, Po2, Po3, Po5, Po6, Po8, Po10, Po13, Po15, Po17, Po18, Po23, Po25, Po26, Po27, Po28 and Po30 showed maximum mycelial growth (90.00 mm) and they do not differ significantly from each other, followed by isolates Po12 (87.43 mm), Po14 (84.67 mm), Po7 (83.67 mm), Po11 (82.10 mm), Po4 (76.17 mm), Po22 (69.07 mm), Po19 (66.60 mm), Po29 (52.13 mm), Po21 (51.13 mm), Po9 (47.60 mm), Po16 (43.23 mm), Po24 (38.80 mm) and least mycelial growth was observed in isolate Po20 (25.40 mm) and these isolates were significantly different from each other.

On PDA (Potato Dextrose Agar) medium isolate Po3 showed maximum mycelial growth (79.70 mm), while minimum (12.60 mm) was recorded in isolate Po20. Isolate Po7 and Po11 showed 42.80 mm and 42.81 mm mycelial growth, respectively and do not differ significantly. All other isolates were significantly different from each other.

On PCA (Potato Carrot Agar) medium, maximum mycelial growth was observed in isolate Po3 (49.41 mm) and least by Po20 (10.22 mm). Isolate Po2 and Po17 showed 44.81 mm and 44.83 mm mycelial growth, respectively and do not differ significantly. Isolate Po9 and Po14 were significantly at par with each other and showed 22.73 mm and 22.92 mm mycelial growth, respectively. Similarly isolate Po18 and Po26 were at par with each other and showed 48.23 mm and 48.42 mm mycelial growth, respectively. Isolate Po20 and Po29 do not differ significantly as they both showed 20.92 mm mycelial growth. All other isolates were significantly different from each other.

On Malt Extract Agar (MEA) medium isolate Po3 exhibited maximum mycelial growth (20.93 mm) and minimum was recorded in Po20 (5.52 mm). Isolate Po1 and Po22 showed 10.22 mm and 10.12 mm mycelial growth, respectively and do not differ significantly. Similarly, isolate Po2, Po14 and Po29 do not differ significantly and showed 18.72 mm, 18.62 and 18.63 mm mycelial growth, respectively. Isolate Po6 and Po11 showed 11.22 mm and 11.33 mm mycelial growth, respectively and they also do not differ significantly. Isolate Po12 and Po25 do not differ significantly and showed 16.22 mm and 16.32 mm mycelial growth respectively. Similarly, isolate Po15 and Po28 do not differ significantly and showed 17.21 mm and 17.22 mm mycelial growth respectively. All other isolates were significantly different from each other.

On CDA (Czapek's Dox Agar) isolate Po3 show maximum mycelial growth (9.71 mm) while minimum was observed in Po20 (2.42 mm). Isolate Po3 was significantly different from all other isolates. However, all other isolates do not differ significantly with one or another isolate.

The maximum mean mycelial growth (49.95 mm) was observed in the isolate Po3 and minimum mean mycelial growth (11.23 mm) was observed in the isolate Po20. It can be concluded that isolate Po3 is the fast growing isolate as compared to others and isolate Po20 is the slowest among all the isolates. All the isolates showed excellent growth on OMA, while good growth observed in PDA and PCA, however, fair and poor growth observed in MEA and CDA, respectively.

Table 1: Mycelial growth (dia mm) of *Pyricularia oryzae* isolates on different nutrient media

Isolate	Mycelial growth (dia mm) after 14 days of inoculation					Mean
	Oat Meal Agar	Potato Dextrose Agar	Potato Carrot Agar	Malt Extract Agar	Czapek's Dox Agar	
Po1	90.00	75.85	42.21	10.22	4.19	44.49
Po2	90.00	62.93	44.81	18.72	4.00	44.09
Po3	90.00	79.70	49.41	20.93	9.71	49.95
Po4	76.17	49.82	30.72	14.91	7.19	35.76
Po5	90.00	58.13	27.32	19.53	5.10	40.02
Po6	90.00	65.20	33.32	11.22	8.08	41.56
Po7	83.67	42.80	26.52	8.13	4.32	33.09
Po8	90.00	45.12	29.23	9.73	3.41	35.50
Po9	47.60	32.96	22.73	16.00	7.18	25.29
Po10	90.00	59.52	38.11	11.92	5.52	41.01
Po11	82.10	42.81	33.94	11.33	5.81	35.20
Po12	87.43	66.71	30.17	16.22	4.13	40.93
Po13	90.00	56.23	38.62	19.82	8.19	42.57
Po14	84.67	47.51	22.92	18.62	4.20	35.58
Po15	90.00	50.40	33.32	17.21	6.61	39.51
Po16	43.23	34.23	26.27	20.51	6.92	26.23
Po17	90.00	70.51	44.83	15.72	3.91	44.99
Po18	90.00	60.72	48.23	12.53	3.61	43.02
Po19	66.60	39.80	27.21	13.17	5.92	30.54
Po20	25.40	12.60	10.22	5.52	2.42	11.23
Po21	51.13	30.10	27.92	16.82	2.82	25.76
Po22	69.07	44.90	37.13	10.12	3.92	33.03
Po23	90.00	58.42	39.43	13.52	6.22	41.52
Po24	38.80	20.50	12.63	7.22	6.60	17.15
Po25	90.00	51.11	20.92	16.32	4.15	36.50
Po26	90.00	43.41	48.42	19.22	8.12	41.83
Po27	90.00	31.82	29.62	15.52	5.32	34.46
Po28	90.00	62.10	37.23	17.22	6.82	42.67

Po29	52.13	66.50	20.92	18.63	7.12	33.06
Po30	90.00	72.00	46.11	8.60	2.47	43.84
CD (P=0.05)	0.89	0.14	0.20	0.19	0.26	

Discussion

Thirty isolates of *P. oryzae* were grown on five different nutrient media *viz*., oat meal agar (OMA), potato dextrose agar (PDA), potato carrot agar (PCA), malt extract agar (MEA) and Czapeks Dox agar CDA) to compare the efficiency of various media in the growth promotion of fungus. The mycelial growth of *P. oryzae* isolates on different nutrient media after 14 days of incubation varied from 2.42 to 90.00 mm. The maximum mean mycelial growth (49.95 mm) was observed in the isolate Po3 and minimum mean mycelial growth (11.23 mm) was observed in the isolate Po20. All the isolates showed excellent growth on OMA, while good growth observed in PDA and PCA, however, fair and poor growth observed in MEA and CDA, respectively. The different colony characters (growth, sporulation, colour, appearance, margin and zonation) varied on different media. This might be due to the variation in the nutritional requirement of the fungus. Our results are complete agreement with Patridge and Chandra (2011) [6] who reported that mycelial growth of *P. grisea* was highest using PDA and OMA media. Kulmitra *et al.* (2017) [4] studied the cultural characteristics such as colour and texture of the leaf blast pathogen *P. oryzae* on different solid media. Among all the solid media studied, the highest mean mycelial growth of the fungus *P. oryzae* was recorded on oat meal agar (77.6 mm) followed by rice leaf extract (75.9 mm).

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