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University of Calcutta, Kolkata 700 019, India

Effect of different media on the growth, sporulation and chlamydospore formation of four spp. of *Fusarium*

A. K. SINGH* AND D. N. SHUKLA
Department of Botany, University of Allahabad, Allahabad 211002
**Regional Agricultural Research Station, SKUAST-J, Rajouri 185131*

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Nine culture media viz., Peptone Dextrose-Rose Bengal Agar Medium, Potato Dextrose Agar (PDA) Medium, Oatmeal Agar Medium, PCNB Agar Modified, Czapek dox Agar Medium, Asthana and Hawker's Medium, modified Asthana and Hawker's Medium 'A', Richard's Agar Medium and Glucose Asparagine medium were used to find out the most suitable one for the mycelial growth of the *Fusarium*. Out of them Rechard's medium supported best growth of the present species of *Fusarium*. It was followed by Czapek's medium in case of *F. acuminatum* and *F. solani* whereas PCNB Agar modified was second best in case of *F. oxysporum* and *F. equiseti*. Asthana and Hawker's medium 'A' supported poor growth of all *Fusarium* sp. Sporulation was excellent on modified Asthana and Hawker's medium 'A', followed by Potato Dextrose-Agar and Richard's medium. Chlamydospore were also observed in a few cases and were produced in fair degree on Oat meal medium in each case. On Peptone Dextrose Rose Bengal medium only microspores were observed. The final pH of different media increased. However, a decrease in pH was recorded in case of Czepak's Dox-Agar medium and Oat meal media in every case.

Key words: Media, chlamydospore, sporulation, *Fusarium* sp., pH

INTRODUCTION

Fungi are dependent on the medium or the substrate for all the elements. Nutritional requirements of various fungi differ and there is no medium or substrate which can be universally suited to all the fungi. The choice of the media and environmental condition depend on the purpose of the investigation. The use of such substrate for the artificial culture of fungi continued till Pasture (1860). Roulin (1869), who has first devised a synthetic medium for the nutritional studies of some common fungi. Lilly and Barnett (1951) have found that all media are not equally suited for a particular fungus. Bilgrami (1956) working with *Phyllosticta cycadina, P. artocarpina* and *Pestalotia mangiferae*, has observed that the best growth of *Phyllosticta cycadina* on Richard's medium followed by Oatmeal medium, whereas *P. artocarpina* and *Pestalotia mangiferae* have showed best results on Richard's medium followed by Potato Dextrose Agar medium. The population of all of them is best on Asthana and Hawker's medium 'A' while it is good on Potato Dextrose Agar and Oatmeal Agar media and is poor on Richard's medium.

The aim of this study has to identify an effective and cheaper medium for rapid growth of *Fusarium*.

MATERIALS AND METHODS

In the present investigation, cultural studies on *F. oxysporum, F. acuminatum, F. solani* and *F. equiseti* were studied under *in vitro* conditions. Following nine culture media were used to find out the most suitable one for the mycelial growth of the fungus. Each culture medium was prepared as per standard procedure in 1 liter of water and autoclaved at 120°C for 20 min. Media were inoculated with five mm disc cut from the periphery of actively growing mycelial culture and incubated at 27±1°C. Each treatment was replicated thrice. Observations were taken when the fungus covered complete Petriplate in any one of the media. The mycelium was harvested by centrifugation for 20 min at 6000 rpm and dry mycelial weight was obtained by filtering the sample cultures through a pre-weighed filter paper (Whatman no.42) and drying in an oven for 24 hrs. at 50°C (Wang and

*E-mail : ashoks286@gmail.com

Rakshit 1999). The average dry weight, degree of sporulation, chlamydospore formation and change in the pH were recorded.

RESULTS AND DISCUSSION

Results are presented in Tables 1, 2, 3 and 4. Rechard's medium supported best growth of the present species of *Fusarium*. It was followed by Czapek's medium in case of *F. acuminatum* and *F. solani* where PCNB Agar modified was second best in case of *F. oxysporum* and *F. equiseti*. Asthana and Hawker's medium 'A' supported poor growth of all *Fusarium* spp.

Sporulation of the organisms was excellent on modified Asthana and Hawker's medium 'A', Potato Dextrose-Agar and Richard's medium. It was poor

Table. 1: Showing the average dry weight, sporulation change in pH and chlamydospore formation of *F. acuminatum* on different media

Media	Dry wt. in gm	Sporulation	Chlamydospore Formation	pH	
				Initial	Final
Asthana & Hawker's medium'A'	62.5	Excellent	Poor	5.2	6.5
Modified Asthana & Hawker's medium'A'	74.8	Excellent	Poor	5.2	7.5
Czapek Dox Agar medium	143.1	Good	--	7.0	6.4
Glucose Asparagine medium	97.0	Poor	Poor	5.1	5.5
Oatmeal Agar medium	128.9	Poor	Fair	6.2	5.5
Peptone Dextrose Rose Bengal Agar medium	65.3	Poor	Poor	5.5	6.1
PCNB Agar modified medium	99.7	Poor	--	5.4	7.4
Potato Dextrose Agar medium	112.1	Good	--	6.1	6.1
Rechard's medium	253.2	Excellent	--	6.4	6.2

CD= 9.83at 5% level of significant

Table. 2: Showing the average dry weight, sporulation change in pH and chlamydospore formation of *F. oxysporum* on different media

Media	Dry wt. in gm	Sporulation	Chlamydospore Formation	pH	
				Initial	Final
Asthana & Hawker's medium'A'	43.7	Good	--	5.1	6.2
Modified Asthana & Hawker's medium'A'	56.6	Excellent	Poor	5.0	6.8
Czapek Dox Agar medium	132.6	Good	--	7.5	6.8
Glucose Asparagine medium	57.0	Poor	Poor	5.0	5.2
Oatmeal Agar medium	124.9	Poor	Fair	6.5	5.5
Peptone Dextrose Rose Bengal Agar medium	57.7	Poor	Poor	5.5	6.0
PCNB Agar modified medium	156.0	Fair	--	5.5	8.8
Potato Dextrose Agar medium	150.0	Excellent	--	6.2	6.5
Rechard's medium	248.3	Excellent	--	5.0	6.5

CD= 2.78 at 5% level of significant

Table. 3: Showing the average dry weight, sporulation change in pH and chlamydospore formation of *F. solani* on different media

Media	Dry wt. in gm	Sporulation	Chlamydospore Formation	pH	
				Initial	Final
Asthana & Hawker's medium'A'	47.1	Good	Poor	5.1	7.0
Modified Asthana & Hawker's medium'A'	60.5	Excellent	Poor	5.0	7.9
Czapek Dox Agar medium	160.1	Excellent	--	7.2	6.8
Glucose Asparagine medium	85.2	Poor	Poor	5.5	6.2
Oatmeal Agar medium	119.8	Poor	Fair	6.5	6.0
Peptone Dextrose Rose Bengal Agar medium	65.2	Poor	Poor	6.0	6.5
PCNB Agar modified medium	130.0	Fair	--	6.0	8.5
Potato Dextrose Agar medium	142.3	Excellent	--	6.5	6.5
Rechard's medium	247.2	Excellent	--	5.0	6.5

CD= 2.5 at 5% level of significant

Table. 4: Showing the average dry weight, sporulation change in pH and chlamydospore formation of *F. equseti* on different media

Media	Dry wt. in gm	Sporulation	Chlamydospore Formation	pH	
				Initial	Final
Asthana & Hawker's medium'A'	40.1	Good	--	5.5	6.5
Modified Asthana & Hawker's medium'A'	53.6	Excellent	Poor	5.1	6.7
Czapek Dox Agar medium	130.0	Poor	--	7.5	6.5
Glucose Asparagine medium	55.2	Poor	--	5.2	5.5
Oatmeal Agar medium	120.3	Poor	--	6.5	5.5
Peptone Dextrose Rose Bengal Agar medium	55.8	Poor	Poor	5.3	5.8
PCNB Agar modified medium	153.1	Fair	--	6.0	6.3
Potato Dextrose Agar medium	143.0	Excellent	--	6.5	6.0
Rechard's medium	245.5	Excellent	--	5.4	6.9

CD= 3.03 at 5% level of significant

on Glucose Asparagine, Oat meal and Pepton-Dextrose Rose Bengal Agar were medium. Sporulation of *Fusarium* ranged from fair to good on other media, (chlamydospore were also observed in few cases and were produced in fair degree on Oat meal medium. In Peptone Dextrose Rose Bengal medium only microspores were observed. The final pH of different media increased. However, a decrease in pH was recorded in case of Czepak's Dox-Agar medium and Oat meal media in every case. Martin, (1950) found that counting of soil fungi were higher in the media containing rose Bengal; than other media. Wu *et al.*, (2009) observed that Gallic acid when added in media, inhibited the growth of *F. oxysporum* f.sp.*niveum*. The colony diameter, the conidia germinating rate and the conidia yield were reduced by 5.7-22.9%, 35.8-55.6% and 38.9-62.2 per cent respectively. Chittem and Kulkarni (2008) reported that the maximum dry mycelial weight of *F. oxysporum f.* sp. *gerberae* on Oat meal broth (450 mg) which was significantly superior over all the media tested. This was followed by Richards's broth (340 mg) and Potato dextrose broth (310 mg). Sharma *et al.* (2005) found that *Fusarium oxysporum* f. sp. *lini* grew well on linseed and maize meal media. Nareah *et al.* (2009) reported that the Richard media

supported best growth of the pathogen *Bipolaris sorokiniana*. Kim and Xiao (2005) reported that Oatmeal agar (OMA) was most suitable for production of pycnidia and conidia of *Sphaeropsis pyriputrescens,* the causal agent of Sphaeropsis rot of pears and apples, but Cornmeal agar was not suitable for either mycelial growth or pycnidial production. Castella *et al.* (1997) found that Malachite Green Agar 2.5 ppm (MGA 2.5) is a potent selective medium for isolation and enumeration of *Fusarium* spp. Farooq *et al.,* (2005) found that the Czapeck Dox agar and Chickpea Seed meal Extract Agar media were the best for the radial growth of *F. oxysporum* as this fungus gave maximum growth of 85 and 80 mm, respectively, followed by Cornmeal agar and Malt extract agar media which showed growth of 70 and 65 mm, respectively. Vladimir *et al.*, (2002) observed that the myclobutanil-based medium showed the highest selectivity to growth of *Fusarium* spp. but required a slightly longer incubation time (>5 d) than peptone–pentachloronitrobenzene-based agar (PPA) (< 5 d). PPA allowed a faster fusarial growth but also permitted the growth of other moulds.

Among the nine media used, modified Asthana and Hawker's medium 'A' was selected as basal medium for the present four species of *Fusarium* as it provided fair growth and excellent sporulation.

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