JOURNAL OF PURE AND APPLIED MICROBIOLOGY, Sept. 2015. Vol. **9**(3), p. 2101-2104

# Response of *Rhizoctonia solani* Growth on Different Abiotic Factors

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(Received: 17 June 2015; accepted: 11 August 2015)

**The aim of this investigation was to evaluate the effect of different abiotic factors on growth parameters of *Rhizoctonia solani* under laboratory condition. Among seven different media studied, the causal organism of sheath blight of rice grew well on Carrot Agar (CA) and Potato Dextrose Agar (PDA) media. It required optimum temperature of 26 ± 2 °C and pH 7 for the growth and sclerotia formation. The maximum radial growth of tested pathogen was noticed after 168 h of incubation period by producing 36.70 mm on Carrot Agar (CA) medium. The maximum sclerotia formation of pathogen was recorded at pH 7 after 144 hrs. of incubation period.**

**Key words:** Different media, Growth parameters, pH, Optimum temperature, Sclerotia formation.

Rice (*Oryza sativa*) is an important cereal in the world. It's also the staple food crop supplying nearly 23 per cent of the per capita energy for six billion people worldwide[1-3]. Like many other crops, rice suffers due to occurrence of sheath blight disease and causes considerable yield losses because of conducive microclimate in the endemic rice growing areas under rained and irrigated ecosystem. An understanding of the role of abiotic factors and its effect on infection and survival of the pathogen is necessary to develop cultural disease management practices. Beside, fungal physiology refers to nutrition, metabolism, growth, reproduction and death of fungal cell. It also generally relates to interaction of fungi with their biotic and abiotic environment, including cellular responses to stress. Fungal metabolism is also responsible for detoxification of organic pollutants and for bioremediation of environment[4-5]. For this reason, *in vitro* studies of growth parameters and sclerotia formation of *Rhizoctonia solani* at different media and varying pH levels was investigated to understand growth parameters and sclerotia formation, so as to better control as well as using it in future integrated disease management programme.

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## MATERIALS AND METHODS

### Seven media namely

Asthana and Hawker's (A & H), Carrot Agar (CA), Corn Meal Agar (CMA), Czapek Dox Agar (ZDA), Kodo Meal Agar (KMA), Potato Dextrose Agar (PDA) and Rice Polished Agar (RPA) were used. Isolation of pathogen was done from infected parts of rice, maintained in slant containing PDA medium and subsequently kept at 4 $^{O}$C until used. Twenty ml medium was poured in each Petri plate and was inoculated with 5 mm disc of ten day old culture grown on PDA, incubated at 26 ± 2 $^{O}$C

for different period of incubation, mycelial growth and sclerotia formation was measured. Levels of pH were maintained on CA medium at 4 to 9 for studying the influence of pH on growth parameters of test fungus. The pH of the medium was adjusted before autoclaving with the help of HCL (0.1 N) and NaOH (0.1 N) using digital pH meter. After autoclaving the medium was poured in the Petri plate and after solidifying, the medium inoculated with tested pathogen and subsequently incubated at 26 ± 2 $^{O}$C. The experiment was laid out in randomize complete block design with five replicates.

## RESULTS AND DISCUSSION

The radial growth of the tested pathogen at different time intervals was found to vary significantly with respect to different media. The growth of the tested fungus was significantly higher after 120hrs. of incubation time in RPA (21.30 mm) followed by CA (20.10 mm) and PDA (19.70 mm) media. However, there was no any growth recorded after 120 and 144 hrs. of incubation period except in case of 168 hrs. with only 8.20 mm (Table 1).

When the pathogen exposed to the different media after 6 days of inoculation the maximum growth parameter was documented by 27.80 mm in CA followed by 26.40 mm in CMA medium. Beside of no growth in CDA medium, the least growth also noticed in A & H medium by 24.80 mm. The maximum growth parameter tested in this investigation recorded in different media culture after 168 hrs. of incubation period as compared to other times of inoculation. However, the highest of radial growth was seen 36.70 mm in CA medium. In case of sclerotia formation which is

**Table 1:** Influence of different culture media on growth and sclerotia formation [a]

| Media name | Incubation Period (hrs.) | | | |
|---|---|---|---|---|
| | 120 | 144 | 168 | Sclerotia formation |
| Czapek-Dox-Agar | 0.0 [b] | 0.0 | 8.20 | None |
| Potato- Dextrose-Agar | 19.70 | 25.10 | 35.10 | Traces |
| Corn-Meal-Agar | 17.60 | 26.40 | 30.00 | None |
| Rice-Polished-Agar | 21.30 | 26.10 | 31.20 | Traces |
| Carrot-Agar | 20.10 | 27.80 | 36.70 | Traces |
| Asthana and hawker's | 16.70 | 24.80 | 32.50 | None |
| Kodo-Meal-Agar | 18.90 | 25.90 | 32.70 | Traces |
| S.Em ± | 0.31 | 0.32 | 0.51 | - |
| CD (P=0.05) | 2.28 | 1.48 | 1.98 | - |

a = Values are represented an average of five replicates, b=Radial growth (mm)

**Table 2.** Influence of pH on mycelial growth and sclerotia formation of tested fungus[a]

| pH levels | Incubation Period (hrs.) | | | |
|---|---|---|---|---|
| | 120 | 144 | 168 | Sclerotia formation |
| 4 | 0.0 b | 0.0 | 3.20 | None |
| 5 | 15.70 | 23.53 | 28.50 | None |
| 6 | 21.77 | 27.60 | 30.07 | Traces |
| 7 | 34.10 | 35.08 | 38.70 | Traces |
| 8 | 14.19 | 19.90 | 31.80 | Traces |
| 9 | 25.88 | 28.80 | 26.20 | None |
| S.Em ± | 0.19 | 0.98 | 0.08 | - |
| CD (P=0.05) | 0.11 | 0.47 | 0.34 | - |

a = Values are represented an average of five replicates, b=Radial growth (mm)

very important to disease dissemination or infection in the next season only there was recorded in PDA, RPA and CA media (Table 1).

Even the growth of tested pathogen was varied from different pH levels and incubation period ranging from zero to 38.70 mm. However, the highest growth parameter was recorded after 6 days of incubation time in pH 7 followed by pH 8 and 6 (Table 2). After 4 days of inoculation, there was 34.10 mm growth recorded in pH 7 which is significant to other tested levels. There was no growth recorded at pH 4 after 96 and 120 hrs. of inoculation. But, at this level of pH only after 144 hrs. there was 3.20 mm growth recorded. Growth of the pathogen was not statically significant at 6 and 9 pH level after 120 hrs. of incubation period on CA medium. When the pathogen inoculated at 4, 5 and 9 pH levels, there was no nay sclerotia formation after 6 days. However, the maximum sclerotia formation was documented at pH 7 level. The mycelial growth was recorded maximum (37.07 mm) in pH 7 after 144 hrs. of incubation and poor at pH 4 (3.20 mm). There were no sclerotia (Table 2). These finding is almost correlated to the other workers on effectiveness of abiotic factors on different growth parameters of phytopathogenic fungi[5-10].

Growth rate and sporulation of *Fusarium oxysporum* was reported to be influenced by different intensities of abiotic factors[11-12]. Results of the experiment indicated that the growth of *Alternaria alternata* was maximum in pH range of 6 to 6.5 and temperature range of 25 to 30 °C. Among the different media tested, host leaf extract medium supported significantly the maximum growth of all the fifteen isolates of *A. alternata* followed by PDA medium[13]. In the other study, the fungi tested showed variation in their growth and development when grown on various nutrient media. Further, they have also documented that role of pH change in the growth and development of the fungi tested[5]. Investigation was carried out to evaluate the *in vitro* use of pH factor in the control of *Aspergillus parasiticus* which is a notable causative agent of food rot and plant mycotoxins. There was no significant difference at 95 per cent confidence limit between the mycelial dry weight means except at pH 10. The spores formed at pH of 5 and the lowest at pH of 10. Also they have noticed that higher alkaline medium is not suitable for development of *A. parasiticus*[14]. The most suitable medium for the better growth of *Sclerotium rolfsii* was PDA and Malt-Extract-Agar medium. It was also found that PDA and Peptone-Sucrose-Agar medium were suitable for the sclerotia formation of the tested fungus. Further, rapid mycelial growth at 30 °C and maximum sclerotia production has been recorded at 25 °C. The highest radial growth of said pathogen was observed at pH 6.5 followed by 6 and 7[15]. The results showed that Yeast-Extract-Sucrose medium was the best medium for fusaristain A production and that the optimum pH was 7.5 and temperature 25 to 30 °C. Furthermore, production of fusaristain A was more than four times higher in stationary cultures than in agitated culture when *F. graminearum* was grown in liquid Yeast-Extract-Sucrose medium[16].

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