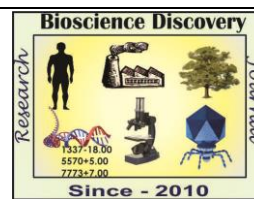


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Research Article



Effect of Temperature and pH on growth of *Alternaria alternata*, leaf spot pathogen of soyabean

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Abstract

Soyabean is widely cultivated oil seed crop in Marathwada and rest of Maharashtra region. The leaf spot of soyabean is caused by *Alternaria alternata* is becoming a common disease on soyabean crop. The fungal pathogen are greatly influenced by environmental factor therefore the present work undertaken to study the effect of temperature and pH on growth of *Alternaria alternata*. The effect of temperature and pH were determined by colony diameter method by using Martins rose Bengal streptomycin agar medium. It is clearly evident from the result that all the temperature pH tested showed variation in the diameter of colony. The temperature 35°C encouraged better growth of *Alternaria alternata* as compared to 30°C and 40°C. The result also revealed that pH 6.5 encouraged better growth of *Alternaria alternata* to the pH 7.5 and 5.5. It is concluded from the result that temperature 35°C and pH 6.5 is optimum temperature and pH for the growth *Alternaria alternata*.

INTRODUCTION

In India soyabean (*Glycine max (L) Merrill*) has been no.1 oil seed crop in terms of both area and production since 2005. It has shown unparallel growth over the last four decades from an area of only 30000 ha and production of 14000 ton in 1970, the area reached 9.95 million ha with total production of 12.57 million ton in 2011, with an average National yield of 1264 kg /ha. Soyabean occupied 42% of India's total oil seed and 25% of edible oil production. The feasibility of growing soyabean crop with minimum input / management lead to the rapid expansion in area production with the result that India now rank 4th in term and global soyabean area sown and 5th in term of soybean production. In India soyabean is mainly grown in the state of Madhyapradesh, Maharashtra, Rajasthan, Karnataka, Telangana, Chhattisgarh, Nagaland and Gujrat as a rain fed crop during the rainy (kharif) season. The crop has potential of

mitigating rampant protein energy malnutrition as well as becoming ideal food of the country and account of a number of nutraceutical and functional compound. Currently soyabean is severely attacked about half a dozen major diseases, a dozen insect pest and several major weeds. Yield loss due to individual diseases, insect, weeds species ranges from 22 to 100% (Sharma, 2014).

The phyllosphere of plants is a dynamic ecosystem inhabited by specific bacteria, yeasts and fungi. Their activity is related to various interactions between the biotic and abiotic factors of the environment (Thakur and Harsh, 2014). Abiotic factors includes Temperature, pH, Humidity, Light intensity etc. whereas biotic factors include pest and other microorganisms, these microorganisms will compete with pathogenic species this phenomenon called antagonistic activity and it has been studied by many researcher (Kumar, 2008; Panwar *et al.*, 2013).

S.oleracea is attacked by *Alternaria alternata* causing leaf spot disease resulting into failure of crop (Bhandari, 2008; Bhandari et al., 2014). *Alternaria alternata* causes leaf spot and blight on a large variety of Agricultural crop such as soyabean tomato, potato, carrot which causes heavy losses (Nelson, 2001). The effect of pH, incubation temperature, light regime and type of culture media on the mycelial growth of *A. alternata* causing leaf blight of noni has been studied *in vitro* in agar plates and it is found to be sensitive to nutritional and environmental factor and their growth and sporulation are therefore greatly influenced by the composition of the temperature and pH (Hubballi et al., 2010). The present work has therefore undertaken to study effect of these factors on the growth of *Alternaria alternata* causing leaf spot of soyabean.

MATERIAL AND METHODS

Alternaria alternata was isolated from the infected leaves of soyabean. After performing their pathogen city test their culture was maintained on Martin Rose Bengal streptomycin agar medium at 25 ± 1 C.

Effect of temperature:- Petri plates containing 20ml of Martin Rose Bengal streptomycin agar medium were inoculated with 5mm mycelial disc

from ten days old culture of *Alternaria alternata* . The inoculated plates were incubated at different temperature range 20°C, 30°C, 35°C, 40° C, 45°C and 50°C the colony diameter was measured 8 days after inoculation.

Effect of Hydrogen ion concentration (pH):-The effect of pH on growth of the pathogen was studied, followed the method (Kiryu1939) using Martin rose Bengal streptomycin agar medium the pH of the medium adjusted to 3.5, 4.5 ,5.5 , 6.5 , 7.5, 8.5 . With the help of digital pH meter using 0.1N Hydrochloric acid and 0.1 N sodium Hydroxide. The sterilized Petri plates are poured with 20ml agar medium and allowed to solidify. 5 mm disc from the actively growing ten days old culture of *Alternaria alternata* were placed on the solidified medium and plate were incubated at 28 ± 1 .C for 8 days then the mycelial growth diameter was measured.

RESULTS AND DISCUSSION

Effect of temperature on mycelial growth

All the sixth isolates grew well at temperature of 35°C (61.00mm) followed by 40°C (41.00mm) and 30°C (35.00mm).The least growth was observed at 20°C (07.00mm). It is clear that the temperature ranging from 35°C to 40°C is better for the growth of *Alternaria alternata*.

Table no. 1:Effect of temperature on the growth of *Alternatiaalternata*.

Temp Days	Control	20°C	30°C	35°C	40°C	45°C	50°C
0 days	05.00mm	05.00mm	05.00mm	05.00mm	05.00mm	05.00mm	05.00mm
2 days	12.00mm	05.00mm	10.00mm	15.00mm	11.00mm	08.00mm	05.00mm
4 days	40.00mm	06.00mm	20.00mm	35.00mm	19.00mm	14.00mm	05.50mm
6 days	53.00mm	06.00mm	28.00mm	48.00mm	30.00mm	20.00mm	06.50mm
8 days	65.00mm	07.00mm	35.00mm	61.00mm	41.00mm	28.00mm	07.50mm

Effect of hydrogen ion concentration of the mycelia growth

Fungi generally utilize substrate in the form of solution only if the reaction of the solution conductive the fungal growth and metabolism (Kiryu, 1939). This bring important of hydrogen ion concentration for better fungal growth of all the sixth pH level, pH 6.5 was found to be ideal and

produced the maximum mean mycelial growth (80.2mm) followed by pH 7.5 (52.0mm) and pH 5.5 (45.2mm). The mean mycelia growth was lowest at pH 3.5 which recorded (09.0mm) the pH below 6.0 and more than 7.0 was noticed to be inhibitory to the growth. The result of experiment indicated that *Alternaria alternata* prefers pH range of 6.00 to 7.00.

This showed that the fungus prefers acidic pH for growth this conclusion is similar to recorded conclusion that as compare to bacteria and actinomycetes, fungi were relatively tolerant to acidic ion than basic ion (Cochrane, 1958; Bililgrami and Verma, 1978). The result obtained in

the present study are in accordance with the result reported that pH 6.3 was best for the growth of *Alternaria solani* (Arunkumar, 2006; Gemawat and Ghosh, 1980) and that pH 6 was better for *Alternatia carthami* (Sumueland Govindswami, 1972; Gholve *et al.*, 2015).

Table no.2: Effect of different pH on growth of *Alternaria alternata*.

% PH \ Days	Control	3.5	4.5	5.5	6.5	7.5	8.5
0 days	12.0mm	05.0mm	05.0mm	05.0mm	05.0mm	05.0mm	05.0mm
2 days	24.0mm	05.0mm	05.0mm	11.5mm	18.0mm	13.0mm	10.0mm
4 days	45.0mm	05.5mm	07.5mm	23.2mm	40.2mm	30.0mm	22.2mm
6 days	62.0mm	07.0mm	14.4mm	32.5mm	65.5mm	48.0mm	32.5mm
8 days	80.0mm	09.0mm	16.3mm	45.2mm	80.2mm	52.0mm	41.0mm

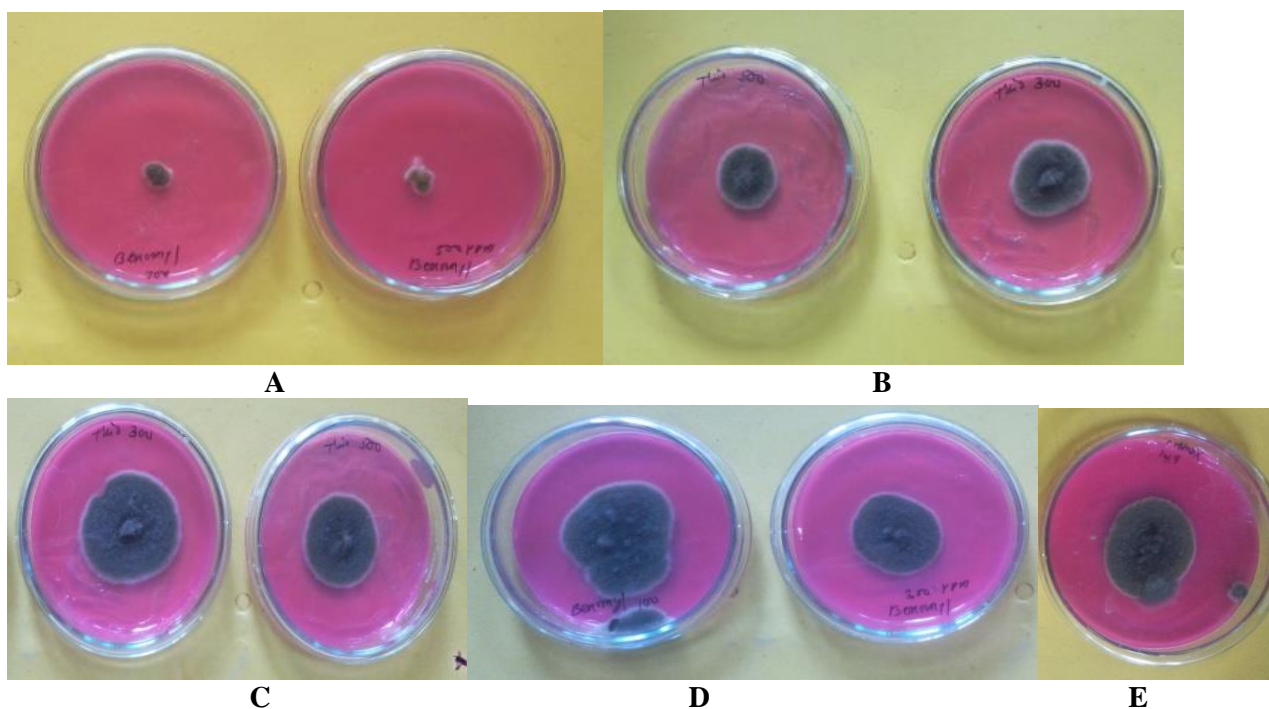


Figure 1: Petriplates showing mycelia growth on different temperature and pH range -(A) Petriplate showing growth at 20°C and 3.5 pH. (B) Petriplate showing growth at 30°C and 4.5 pH. (C) Petriplates showing growth at 35°C and 4.5pH. (D) Petriplate showing growth at 40°C and 6.5 pH. (E) Petriplate showing growth for control pH and Temperature.

Temperature and pH are most important physiochemical factors for the growth of *alternariaalternata*. The optimum temperature for the growth of *Alternaria alternata* found to be 35°C. The optimum pH for the growth of *Alternaria alternata* found to be pH 6.5.

REFERENCES

Arunkumar K, 2006. *Studies on Alternaria solani the Causal agent of early blight of tomato.* M.Sc(Ag.) Thesis, University of Agri. Science. Dharwad, India. Pp 45.

- Bhandari S, 2008.** *Development of strategy for diseases management of some important medicinal plants by using selected antagonistic fungi.* Thesis submitted for the degree of Doctor of Philosophy in Forest Pathology. Forest Research Institute, Dehradun, India. pp. 97-112.
- Bhandari S, Harsh NSK, Sharma AK, Puni ML and Thakur S, 2014.** A database of diseases of medicinal plants in Uttarakhand. *Ind. Forester*, **140**(5): 518-527.
- Biligrami KS and Verma RN, 1978.** *Physiology of fungi.* Vikas Publishing House, New Delhi.
- Cochrane VW, 1958,** *Physiology of fungi.* John Wiley and sons inc., New York. Pp 67.
- Gemawat PD and Ghosh SK, 1980.** Studies on physiology of *Alternaria solani*. *Indi. J. of Mycology & Pl. Pathology*, **9**(1):138-139.
- Gholve VM, Taware MR and Wagh SS, 2015.** Effect of different culture media, temperature and pH on growth and sporulation of *Alternaria carthami*. *Inter J of Pl. sci.*, **10** (2): 163-167.
- Hubballi M, Sevugapperumal N, Raguchander T, Anand T and Ramasamy S, 2010.** Effect of Environmental Conditions on Growth of *Alternaria alternata* Causing Leaf Blight of Noni. *World J of Agri. Sci.*, **6** (2): 171-177.
- Kiryu T, 1939.** *Studies on physiological properties of ceratostomea paradoxa.* Jaiwan province, sugarcane experiment station report **6**:21-27.
- Kumar Arun GS, 2008.** Studies on leaf blight of chrysanthemum Caused by *Alternaria alternata* (Fr.) Keissler. Master of Science (agriculture) in plant pathology. Department of plant pathology college of agriculture, Dharwad University of Agricultural Sciences.
- Nelson SC, 2001.** Noni cultivation in Hawaii. *Fruit and Nuts*, **4**: 1-4.
- Panwar V, Gangwar RK, Javeria S and Yadav RS, 2013.** Antifungal efficacy of fungicides and bio-control agents against leaf spot pathogen, *Alternaria alternata*. *Current Discovery*, **2**:128-133.
- Samual GS and Govindaswamy CV, 1972.** Effect of vitamin and level of pH on the growth and sporulation of *Alternaria solani*, the causal agent of the leaf blight disease of sesame. *Ind. J of Mycology & Pl. Pathology*, **2**: 185-186.
- Sharma AM, 2014.** IPM package for soyabean, NCIPM Govt. of India.
- Thakur S and Harsh NSK, 2014.** Phylloplane fungi as biocontrol agent against *Alternaria* leaf spot disease of (Akarkara) *Spilanthes oleracea*. *Biosci. Disc.*, **5**(2): 139-144.

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