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 Tmpetature, 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 Alternaria alternata.

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

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 compared to bacteria and actinomycetes, fungi were relatively tolerant to acidic ion than basic ion (Cochrane, 1958; Biligrami 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* (Sumuel Govindswami, 1972; Gholve et al., 2015).

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

<table>
<thead>
<tr>
<th>Days</th>
<th>% PH</th>
<th>Control</th>
<th>3.5</th>
<th>4.5</th>
<th>5.5</th>
<th>6.5</th>
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<tbody>
<tr>
<td>0 days</td>
<td>12.0mm</td>
<td>05.0mm</td>
<td>05.0mm</td>
<td>05.0mm</td>
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<td></td>
</tr>
<tr>
<td>2 days</td>
<td>24.0mm</td>
<td>05.0mm</td>
<td>05.0mm</td>
<td>11.5mm</td>
<td>18.0mm</td>
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<td>10.0mm</td>
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<tr>
<td>4 days</td>
<td>45.0mm</td>
<td>05.5mm</td>
<td>07.5mm</td>
<td>23.2mm</td>
<td>40.2mm</td>
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<tr>
<td>6 days</td>
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<td>07.0mm</td>
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<td>48.0mm</td>
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</tr>
<tr>
<td>8 days</td>
<td>80.0mm</td>
<td>09.0mm</td>
<td>16.3mm</td>
<td>45.2mm</td>
<td>80.2mm</td>
<td>52.0mm</td>
<td>41.0mm</td>
<td></td>
</tr>
</tbody>
</table>

**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) Petriplate showing growth at 35°C and 4.5 pH. (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 physiological factors for the growth of *Alternaria alternata*. 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**


Sharma AM, 2014. IPM package for soyabean, NCIPM Govt. of India.


How to cite this article