Impact Of Aspergillus Fungi On Germination Of Chilli Seeds And Its Control

Tharsika Ratnarajah, Gunasingham Mikunthan

Abstract: Chilli fruits are commonly contaminated by Eurotymycetes fungus, Aspergillus sp. (Eurotiales: Trichomaceae). This fungus produced white to lime green mycelium; yellowish to green conidia, which size is around 34x0.8μ. This study was carried out to investigate the effect of Aspergillus sp. on chilli seed germination. The seeds of the chilli variety MI green were obtained from DATC, Jaffna for using this experiment. Chilli seeds were treated with Aspergillus sp., Trichoderma viride, Aspergillus sp. + Trichoderma viride, Aspergillus sp. + Neem extract and distilled water as control. Highest germination percentage were observed in T5 (suspension of T.viride) as 73% followed by 65% germination from T1 (distilled water), 44% from T3 (suspension of Aspergillus sp. and T.viride), then T4 (suspension of Aspergillus sp. and neem leaf extract) and T2 (suspension of Aspergillus sp.) showed the germination as 30% and 20%, respectively. The growth inhibition percentage of Aspergillus sp. in presence of T. viride and T. harzianum were calculated by dual culture over control. The percent inhibition of radial growth of Aspergillus sp. was 55.35% by T. viride and 50.25% by T. harzianum in seven days after inoculation. Results show that T.viride was superior to T.harzianum in restricting the growth of Aspergillus sp. on dual culture in PDA.

Keywords: Red chilli, Aspergillus sp, Trichoderma sp, chilli seeds.

1 Introduction

Chilli (Capsicum frutescens L.) is one of the economically important cash crops cultivated in Sri Lanka. Both dry and fresh pods of chilli are considered as most important commercial spices with high nutritional values and use as spice in food and beverages as whole form or powdered form. Moulds are widely distributed as environmental contaminants. Chillies contaminated before processing anywhere in the food chain. Chillies are produced in countries with tropical climates that have high range of temperature, humidity and rain fall. Usually the red chillies are spread out on the ground to dry in the open air where the climatic conditions are ideal for growth of moulds and production of mycotoxins. Aspergillus sp. is commonly found on chilli fruits stored in humid region. Aspergillus flavus is a predominant component of the mycflora of red chilli [5]. The occurrence of moulds and mycotoxins can be alleviated by the application of a variety of preventive measures both before and after harvest including appropriate pest and disease control measures and good harvesting drying and storage practices.

2 Materials and methods

2.1 Effect of Aspergillus sp. on germination of chilli seeds

The seeds of the chilli variety MI green were obtained from Department of Agriculture, Jaffna for using this experiment. Seeds were selected without any deformities by visual examination. Chilli seeds were treated with Aspergillus sp., Trichoderma viride, Aspergillus sp. + Trichoderma viride, Aspergillus sp. + Neem extract and distilled water (Table 1).

2.3 Preparation of suspension of Aspergillus sp., Trichoderma sp and neem leaf extract

Five petri plates of Aspergillus sp., three petri plates (90cm diameter) of Trichoderma viride were obtained from seven days old culture. They were dissolved in 450ml and 300ml distilled water, respectively and shaken manually. Then the content was filtered through sterile muslin cloth. Neem leaf extract was prepared from ground the 20g neem leaves in 50ml distilled water. The supernatant was filtered through sterile muslin cloth and used for the experiment.

2.4 Seed treatment of chilli

Twenty-five chilli seeds were taken and dipped into prepared different treatment suspension for ten minutes. Then the treated seeds were placed in petri plates contain whatman filter paper and cotton wool as bed.

Table 1. Combination of seed treatment of chilli

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Combinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50ml suspension of Aspergillus sp.</td>
</tr>
<tr>
<td>2</td>
<td>50ml suspension of Trichoderma viride</td>
</tr>
<tr>
<td>3</td>
<td>50ml suspension of Aspergillus sp. and 50ml suspension of Trichoderma viride</td>
</tr>
<tr>
<td>4</td>
<td>50ml suspension of Aspergillus sp. and 50ml Neem leaf extract</td>
</tr>
<tr>
<td>5</td>
<td>50ml distilled water.</td>
</tr>
</tbody>
</table>

Three replicates were done in each treatment. Watering was done daily and allowed the seeds for germination. Germination percentage was estimated according to following equation (Atallah, 1983).

\[ G\% = \frac{(TNS)-(NNGS)}{TNS} \times 100 \]  

TNS
Whereas:
TNS: Total number of seeds
NNGS: Number of non-germinated seeds

2.5 Bio control of Aspergillus sp. under in vitro condition

Aspergillus sp.p. T. viride and T.harzianum were inoculated and cultured separately in to PDA medium. Seven days
after the incubation, 4mm agar slugs of Aspergillus sp. and T. viridae were placed opposite to each other. Three replicates for each set were maintained. Controls were set in single and dual culture of Aspergillus sp. and same method was used for T. harzianum. The growth inhibition was calculated by using the formula.

\[
\frac{(C-T) \times 100}{C}
\]

Whereas:
C - Growth in control
T - Growth in treatment.

Assessments were made when fungi achieved an equilibrium after which there was no further alteration in the growth. The radial growths of tested pathogens were measured after seven days of incubation period [8], [9], [6].

3 Results and discussion

3.1 Effect of Aspergillus sp. on chilli seeds germination

Germination percentage of chilli seeds were examined in different treatment suspension.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Mean germination percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁ - 50ml distilled water</td>
<td>65.33 (^a)</td>
</tr>
<tr>
<td>T₂ - 50ml suspension of Aspergillus sp.</td>
<td>20.00 (^d)</td>
</tr>
<tr>
<td>T₃ - 50ml suspension of Aspergillus sp. and 50ml suspension of Trichoderma viride</td>
<td>44.00 (^b)</td>
</tr>
<tr>
<td>T₄ - 50ml suspension of Aspergillus sp. and 50ml Neem leaf extract</td>
<td>30.66 (^c)</td>
</tr>
<tr>
<td>T₅ - 50ml suspension of Trichoderma viride</td>
<td>73.33 (^a)</td>
</tr>
</tbody>
</table>

Values having same letter are not significantly different according to the Duncan mean separation at 95% confidence interval.

Highest germination percentage of chilli seeds were observed in T₅ as 73% followed by 65% germination from T₁, 44% from T₃, then T₄ and T₂ showed the germination as 30% and 20%, respectively. Treatment comparison of T₅, T₁, and T₃ with T₂ had significance difference in their mean germination percentage, exhibited antagonistic effect with T₂ (Aspergillus sp.). Trichoderma viride could restrict growth of post-harvest pathogens namely Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Fusarium sp. and Pencillium sp [7]. Azadiracta indica is known to has antifungal, antibacterial, antiviral, insecticidal, and insect repellent properties [1], [4]. Aqueous extracts of leaves and seeds of A. indica inhibit aflatoxin production by Aspergillus flavus [10].

3.2 Bio control of Aspergillus sp. by Trichoderma sp under in vitro condition

The growth inhibition percentage of Aspergillus sp. in presence of T. viride and T. harzianum were calculated by dual culture over control. The percent inhibition of radial growth of Aspergillus sp. was 55.35% by T. viride and 50.25% by T harzianum in seven day after inoculation. Result showed that T. viride was superior to T. harzianum in restricting the growth of Aspergillus sp. on dual culture with PDA. The inhibitions of radial growth of A. niger (55%), A. flavus (51%), and A. fumigatus (52%) on par with T. viride were present results [7].

![Figure 1](image1.png)

Figure 1. Colony interaction between the Aspergillus sp. with Trichoderma viride (A) and Trichoderma harzianum(B).

4. Conclusion

Germination percentage of chilli seeds were increased by Trichoderma viride (73%) followed by distilled water (65). 44%,30%,20% germination of chilli seeds were observed in Aspergillus sp. + Trichoderma viride, Aspergillus sp. + Neem and Aspergillus sp. treatment suspension, respectively. Aspergillus sp. infected seeds had less germination percentage. T. viride (55.35%) was superior to T. harzianum (50.25%) in restricting the growth of Aspergillus sp. on dual culture PDA medium under in-vitro condition. Contamination of Aspergillus sp. on chilli seeds will drastically reduce the seed germination. Before sowing, seed will treat with Trichoderma sp is better method for get more germination percentage.

5. Acknowledgement:
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6. References


