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Efficacy of potential biocontrol agent and fungicides in management of chilli twig blight disease caused by *Choanephora cucurbitarum*

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Abstract

Management of *Choanephora* twig blight disease of chilli was carried out in year 2014 for screening potential biocontrol agent and effective fungicide under greenhouse conditions with different combinations. In the present study the treatment, T₂ (captan @ 0.15%) recorded was found to most effective in reducing the disease incidence by 66.47% followed by T₇ (*Trichoderma viride* + captan + Neem oil) 28.9% when compared to control (13.95%).

Keywords: chilli, biocontrol agent, *Choanephora cucurbitarum*, green house, captan, neem oil

Introduction

Chilli is one of the important spice crop known for its fascinating natural colour throughout the world and it is originated from South Central America. The area under Chilli was estimated at 792.1 thousand hectare during 2010-11 with the production of 1223.4 thousand tones green chilli. During this year production of green chilli was recorded 1.5 MT per hectare (Anonymous, 2011) [2].

The genus *Choanephora* was first described by Currey (1873) [4] from fructifications on flowers of *Hibiscus rosaesinensis* furnished by D. D. Cunningham from Calcutta, India. Currey described fungus as *Cunninghamia* but later changed the generic name to *Choanephora* since the name *Cunninghamia* had already been used. *Choanephora cucurbitarum* is a plant pathogenic fungus causing fruit rots, flower rot and leaf blights on a variety of plants including squash, pumpkin, pepper, pea and bean. This fungus is known to attack several other crops which include cereals such as millet, rice and sorghum. The fungus also causes pod blight known as wet rot, blossom blight and whisker rot (Kacharek *et al.*, 2003) [5]. This disease is also common on squash and southern pea but occurs on the floral parts of many types of plants (Afolabi, 1994) [1]. It causes blossom blight, die back, wet rot and soft rot of stems or side shoots of chilli plants (Maeda *et al.*, 2010) [6].

The crop is suffering from various diseases of which the fungal disease, *Choanephora* blight in chilli caused by *Choanephora cucurbitarum* has become one of the constraints in chilli growing areas resulting in poor yields, besides reducing quality.

Material and Methods

The present investigation was carried out in the Department of Plant Pathology, College of Agriculture, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Ranga Reddy District, Telangana.

Pot culture experiment was laid out in randomized complete block design (RCBD) under green house conditions to test the efficacy of fungicides and biocontrol agent. The pots were arranged in randomized complete block design with three replications for each treatment. T₁ treatment was sprayed with spore suspension (10⁷ conidia ml⁻¹) of *Trichoderma* spp. and inoculum (5 x 10⁵ spores/ml) of *C. cucurbitarum* was sprayed 1week after pathogen inoculation. Chilli plants sprayed with water alone and chilli plants inoculated with spore suspension (5 x 10⁵ spores/ml) of *C. cucurbitarum* alone served as healthy and inoculated controls. Treated plants were transferred to polythene humid chamber with fogging devices in which temperature and humidity were maintained at 22 ± 2°C. Similarly based on poisoned food technique studies effective fungicides which made cent per cent mycelial inhibition were selected and sprayed on the chilli plants. In T₃ treatment Neem oil was sprayed at the rate of 3 ml/l and combinations of the above treatments were taken. The treatment details were as follows.

Different treatments with combinations in details are given in the following table

| S. No. | Treatments | Combinations |
|--------|----------------|--|
| 1 | T ₁ | Effective bio agent/ antagonist |
| 2 | T ₂ | Effective Fungicide |
| 3 | T ₃ | Neem oil (3 ml/l) |
| 4 | T ₄ | T ₁ + T ₃ (Effective bio agent/ antagonist + Neem oil) |
| 5 | T ₅ | T ₂ + T ₃ (Effective Fungicide + Neem oil) |
| 6 | T ₆ | T ₁ + T ₂ (Effective bio agent/ antagonist + Effective Fungicide) |
| 7 | T ₇ | T ₁ +T ₂ + T ₃ (Effective bio agent/ antagonist + Effective Fungicide + Neem oil) |
| 8 | T ₈ | Control |

Results and Discussion

In the present study the effective fungicide captan (2 gm/lit), spore suspension (10^7 conidia ml⁻¹) of *Trichoderma* spp. and inoculum (5×10^5 spores/ml) of *C. cucurbitarum* was sprayed 1 week after pathogen inoculation.

Treated plants were transferred to polythene humid chamber with fogging devices in which temperature and humidity were maintained at $22 \pm 2^\circ\text{C}$ and relative humidity at 90%. Disease severity index was calculated for each treatment and indicator of the effectiveness of the fungicide and potential biocontrol agent and data on disease index was recorded and presented in Table 1 and Fig 1.

Among the individual treatments all were significant in reducing the per cent disease index over control. Treatment T₂ (Effective fungicide captan @ 0.15%) was highly significant in reducing the disease incidence by 66.47 per cent disease over control (85.3) while least at T₃ i.e. Neem oil with a 13.5 per cent disease over control.

Table 1: Management of twig blight of chilli caused by *Choanephora cucurbitarum* by using effective fungicide, potential biocontrol agent and neem oil.

| S. No. | Treatment | Combinations | Per cent disease index | Per cent disease control |
|--------|----------------|--|------------------------|--------------------------|
| 1 | T ₁ | <i>Trichoderma viride</i> isolate 1 | 39.7 | 53.45 |
| 2 | T ₂ | Captan | 28.6 | 66.47 |
| 3 | T ₃ | Neem oil | 73.4 | 13.95 |
| 4 | T ₄ | T ₁ +T ₃ (<i>Trichoderma viride</i> isolate 1+ Neem oil) | 62.9 | 26.26 |
| 5 | T ₅ | T ₂ +T ₃ (Captan + Neem oil) | 30.1 | 64.71 |
| 6 | T ₆ | T ₁ + T ₂ (<i>Trichoderma viride</i> isolate 1+ captan) | 29.1 | 65.88 |
| 7 | T ₇ | T ₁ +T ₂ + T ₃ (<i>Trichoderma viride</i> isolate 1 + captan + Neem oil) | 28.9 | 66.11 |
| 8 | T ₈ | Control | 85.3 | 0 |
| | | CD (P=0.05) | 3.27 | |
| | | SE (m) | 1.28 | |

DAI: Days after inoculation

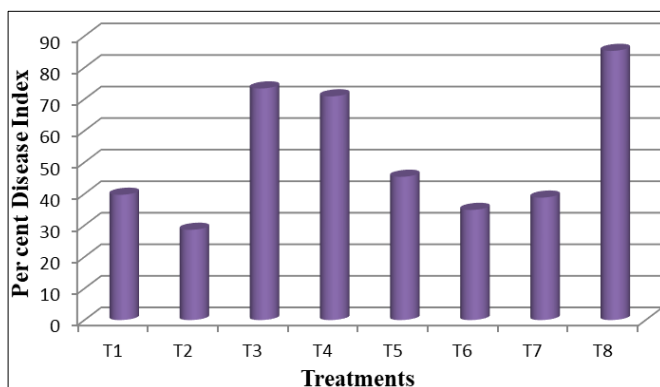


Fig 1: Evaluation of effective fungicide and potential biocontrol agent in reducing twig blight of chilli caused by *Choanephora cucurbitarum*

T₁ - *Trichoderma viride* isolate 1

T₂ - Captan

T₃ - Neem oil

T₄ - T₁ +T₃ (*Trichoderma viride* isolate 1+ Neem oil)

T₅ - T₂+T₃ (Captan + Neem oil)

T₆ - T₁+ T₂ (*Trichoderma viride* isolate 1+ captan)

T₇ - T₁ +T₂ + T₃ (*Trichoderma viride* isolate 1+ captan + Neem oil)

T₈ - Control (Madhuri)

Results clearly indicated that captan was effective when compared to control (85.3%). Among the integrated Treatments, T₇ (*T. viride* isolate 1+ captan + Neem oil) recorded low disease severity index of 28.9 followed by T₆ (*T. viride* isolate 1+ captan) and T₅ (captan + Neem oil) with 28.9, 29.1 and 30.1 respectively (Plate 1).

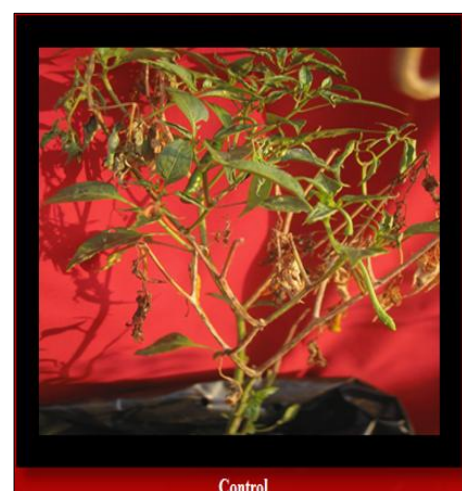
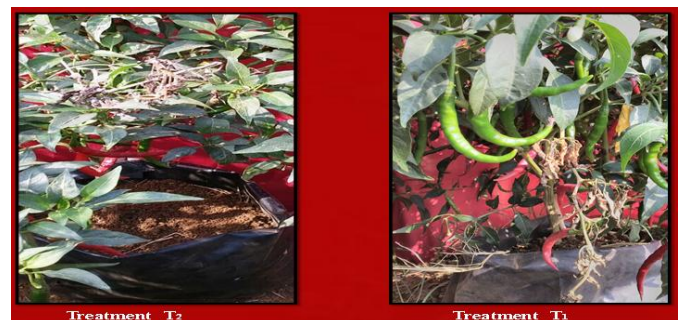


Plate 1: Screening of effective fungicide and biocontrol agent against *Choanephora cucurbitarum*

Trichoderma viride isolate 1 recorded the disease index of 39.7 at per cent disease over control of 53.45 while other integrated treatments (T₄, T₆ and T₇) recorded per cent disease of control 26.26, 65.88 and 66.11 respectively. It was observed that, captan alone or integrated with other treatments viz., *Trichoderma viride* isolate 1 and neem oil was found effective. Raju *et al.* (1982)^[8] found that captan was highly effective against *C. cucurbitarum*. Panja (1999)^[7] also reported that captan (2.0 gm/lit) was most effective in inhibiting the twig blight pathogen in chilli. Field evaluation of effective plant extract antagonists and fungicide revealed that spraying with *T. viride* (2%) showed a maximum disease reduction of 61.41% followed by *P. fluorescens* (58.10%). However, the fungicide ziram (0.25%) with 80.84% disease reduction ranked first reported by Balogun and Babatola (1999)^[3].

In the present study, fungal biocontrol agents was not effective when compared to captan. The *Trichoderma* isolate 1 recorded low (39.7%) per cent disease when compared to fungicide. This may be due to variation in isolate.

Conclusion

The most effective fungicide (captan) and potential biocontrol agent (*Trichoderma viride* isolate 1) were evaluated against twig blight incidence of chilli caused by *Choanephora cucurbitarum* under glass house conditions along with neem oil. These treatments were used alone and in various combinations. Among the various treatments the application of captan (T₂) was recorded maximum (66.47%) per cent disease control while least was recorded in T₃ (Neem oil) 13.95%. The fungicide captan alone and their combination were proved effective in the disease management.

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