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***In vivo* evaluation of bio agents botanical and
fungicides against *Fusarium oxysporum* f. sp.
*basilica***

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Abstract

The Holy Basil (*Ocimum sanctum* Linn.) commonly known as Tulsi, is an aromatic perennial plant, belongs to the family Liliaceae. It is native to Indian subcontinent and wide spread as a cultivated plant throughout the south-east Asian tropics. Holy Basil is widely grown in India for medicinal as well as religious purposes. For the management of wilt disease of Holy Basil (*Ocimum sanctum*) the experimental finding depicted in Table no.3 reveal that among 6 treatment which include three bio-agent T₁ *Trichoderma viride*, T₂ *Trichoderma harzianum* and T₃ *Pseudomonas fluorescence* and one botanicals T₄ Neem leaves and two chemicals T₅ Tebuconazole and T₆ Mancozeb. The most effective was Tebuconazole 250 EC @ 0.1% with percent disease control and percent disease intensité, (68.20) and (19.67) respectively. And Mancozeb 75WP @ 0.1%. With PDC and PDI (62.54) and (23.17), respectively where as the bio-agent *Trichoderma viride* Talc based formulation was prepared.cfu-1×10⁹/gm and dissolved @ 10gm in 1.0 lit. Distilled water) with PDC and PDI (45.41) and (33.75), respectively. *Trichoderma harzianum* (Talc based formulation was prepared.cfu-1×10⁹/gm and dissolved @ 10gm in 1.0 lit. distilled water) with PDC and PDI (37.02) and (38.94) respectively and *Pseudomonas fluorescence* @ 4 gm/kg seed with PDC and PDI (27.76) and (44.62) respectively. and Neem leaves @ 5% with PDC and PDI (16.98) and (51.53).The used fongicide and bio pesticide significantly reduce the wilt of *Ocimum sanctum*.

Keywords: Tulsi, *Pseudomonas fluorescence*, Tebuconazole

Introduction

The Holy Basil (*Ocimum sanctum* Linn.) commonly known as Tulsi, is an aromatic perennial plant, belongs to the family Liliaceae. It is native to Indian subcontinent and wide spread as a cultivated plant throughout the south-east Asian tropics. Holy Basil is widely grown in India for medicinal as well as religious purposes. There are many species of Basil such as *Ocimum sanctum* L.(Tulsi), *Ocimum gratissimum* (Ram Tulsi), *Ocimum canum* Sims (Dulal Tulsi), *Ocimum basilicum* (Ban Tulsi), *Ocimum kilimandscharicum* Gureke (Camphor Basil) and *Ocimum americanum* Linn (Hoary Basil) among them holy Basil (*Ocimum sanctum*) has been well known for its therapeutic potential (Prakash and Gupta, 2005) [2].The chemical constituents present in *Ocimum sanctum* are Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool and β-caryophyllene, β-elemene (Kothari *et al.*2004) [1] In several ancient system of medicine including Ayurveda, Greek Roman, Siddha and Unanni, *Ocimum sanctum* has vast number of therapeutic applications such as in cardiopathy,

homeopathy, leucoderma, asthma, bronchitis, catarrhal fever, otalgia, hepatopathy, vomiting, lumbago, hiccups, ophthalmia, gastropathy, genitourinary disorders, ringworm, verminosis and skin diseases etc. It is commonly used in cough, cold and mild indigestion. Despite its therapeutic potential, holy Basil is susceptible to various disease including *Fusarium* wilt, Bacterial leaf spot, Damping off, and Downy mildew, among them wilt caused by *Fusarium oxysporum* f. sp. *baisilici*, is most common and destructive disease of holy Basil. It becomes a serious problem in commercial production of holy Basil worldwide thus management of disease is very important.

Materials and Methods

In vivo evaluation of bio-agents, botanical and fungicide against wilt pathogen

The experimental site is located at Main Experiment Station of Department of Medicinal and Aromatic plants of Narandra Deva University of Agriculture & Technology, Kumarganj, Faizabad (Uttar Pradesh). Geographically experimental site is situated at 26.27 °N latitude, 82.12 °E longitude and altitude of 113 meters from sea level.

Table 1: Plants used as botanicals with their common name, English name, family and their part used.

Common Name	English Name	Botanical Name	Family	Part used	Active compound	Activity	Class
Neem	Neem	<i>Azadirachta indica</i> (A. Juss.)	Meliaceae	Crude extracts	Azadirachtin	Fungi	Terpenoides

Efficacy of the fungicide against the wilt of Holy Basil

Two fungicides namely Tebuconazole 250 EC @ 0.1% and Mancozeb 75 WP @ (0.1%) were used.

Table 2: List of fungicides, trade name, chemical name and supply source

S. No.	Common name	Trade name	Chemical name	Source
1.	Tebuconazole 250 EC	Folicur	1-(Chlorophenyl)-4, 4dimethyl3-(1h, 1, 1, 2, 4-triazol-1-yl methyl.) pentan-3-ol.	Bayer-private Ltd.
2.	Mancozeb 75 WP	Indofil M-45	Manganese ethylene bisdithio-carbamate	Indofil Chemicals, Ltd.

Results and Discussion

For the management of wilt disease of Holy Basil (*Ocimum sanctum*) the experimental finding depicted in Table no.3 reveal that among 6 treatment which include three bio-agent T₁ *Trichoderma viride*, T₂ *Trichoderma harzianum* and T₃ *Pseudomonas fluorescence* and one botanicals T₄ Neem leaves and two chemicals T₅ Tebuconazole and T₆ Mancozeb. The most effective was Tebuconazole 250 EC @ 0.1% with percent disease control and percent disease intensity, (68.20) and (19.67) respectively. And Mancozeb 75WP @ 0.1%. With PDC and PDI (62.54) and (23.17), respectively where as the bio-agent *Trichoderma viride* Talc based formulation was prepared.cfu-1×10⁹/gm and dissolved @ 10gm in 1.0 lit. distilled water) with PDC and PDI (45.41) and (33.75), respectively. *Trichoderma harzianum* (Talc based formulation was prepared.cfu-1×10⁹/gm and dissolved @ 10gm in 1.0 lit. distilled water) with PDC and PDI (37.02) and (38.94) respectively and *Pseudomonas fluorescence* @ 4 gm/kg seed with PDC and PDI (27.76) and (44.62) respectively. And Neem leaves @ 5% with PDC and PDI (16.98) and

Efficacy of the bio-agents against the wilt of Holy Basil

The soil application of bio-agent use in the field like that *Trichoderma viridae* Talc based formulation was prepared. CfU-1×10⁹/ gm and dissolve @ 10gm in 1.0 litre Distilled water, *Trichoderma harzianum* Talc based formulation was prepared. CfU-1×10⁹/gm and dissolve @10gm in 1.0 litre Distilled water and *Pseudomonas fluorescence* @4gm/kg seed.

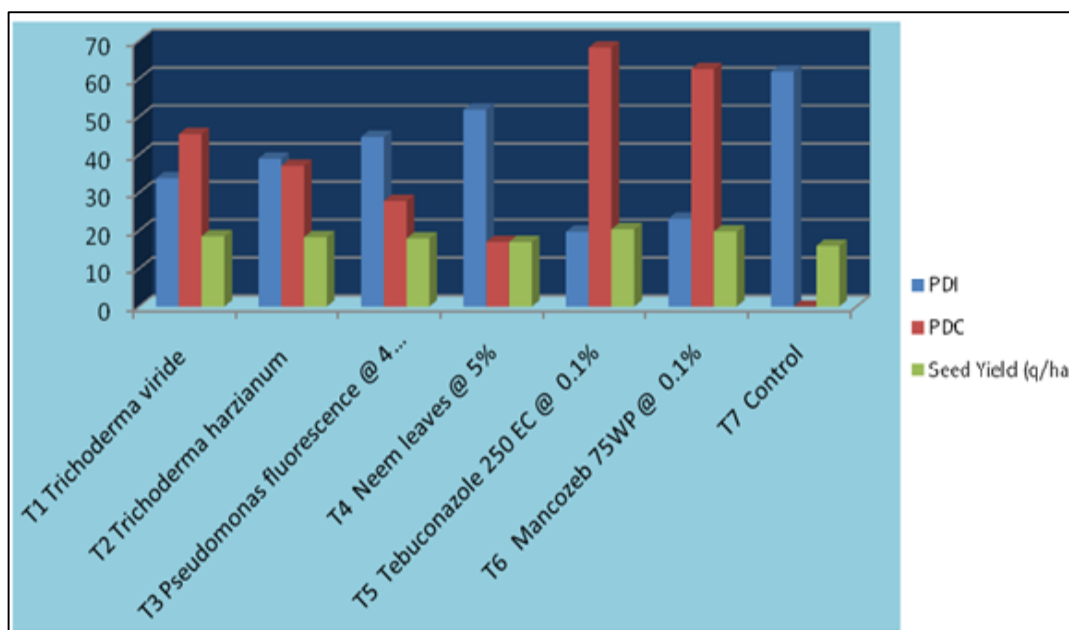
Efficacy of the botanical extract against the wilt of Holy Basil

Fresh neem leaves, were collected and wash thoroughly in clean water. Then the washed neem leaves were taken in 100 ml of sterilized water and heated at 80°C for 10 minutes. The material was filtered through double layered muslin cloth. The appropriate volume of plant extract was mixed in sterilized distilled water to make the desired concentration for experiments. For bioassay, double strength concentrations of botanicals were prepared by dissolving 5 ml of plant extract in 95 ml of sterilized distilled water, respectively to get the final concentration of 5 percent.

(51.53).The used fungicide and bio pesticide significantly reduce the wilt of *Ocimum sanctus*. The result with consistent with studies by Afzal *et al.* (2010)^[3] and Buchvorova *et al.* (1989)^[4] found that vita vax 200 hp so best control *In vivo* but *In vitro* condition. The best where vita vax 200-NP, omai-80WP against *Fusarium oxysporum* f. sp. *Baisilici*. The experimental result are endurance with Rayes *et al.* (2016)^[5] to suggested that seed treatments with essential oils from savory and thyme and bio control agents *Pseudomonas fluorescence*. and *Fusarium oxysporum* have been evaluated. *In vivo* after dry hot air treatments against *Fusarium oxysporum* f. sp. *baisilici* on Basil seeds. The savory and thyme essential oils showed a significant pathogen control activity because of their innate antifungal activity and because of the seed application method, but the dry hot pre-treatment did not show any obvious effect on the performance of the essential oil treatments. The dry heat treatment improved the *Pseudomonas* seed dressing effect against *Fusarium oxysporum* f. sp. *baisilici*.

Table 3: Effect of bio agents, botanical and fungicides on wilt disease of Holy Basil (*Ocimum sanctum*) *in vivo*

Treatments	PDI	PDC	Seed Yield (q/ha)
T ₁ <i>Trichoderma viride</i> (Talc based formulation was prepared.cfu-1×10 ⁹ /gm and dissolved @ 10gm in 1lit. distilled water)	33.75	45.41 (42.35)	18.50
T ₂ <i>Trichoderma harzianum</i> (Talc based formulation was prepared.cfu-1×10 ⁹ /gm and dissolved @ 10gm in 1lit. distilled water)	38.94	37.02 (37.47)	18.27
T ₃ <i>Pseudomonas fluorescence</i> @ 4 gm/kg seed	44.62	27.76 (31.81)	17.92
T ₄ Neem leaves @ 5%	51.83	16.98 (24.30)	17.00
T ₅ Tebuconazole 250 EC @ 0.1%	19.67	68.20 (55.70)	20.35
T ₆ Mancozeb 75WP @ 0.1%	23.17	62.54 (52.27)	19.75
T ₇ Control	61.83	0.00 (0.28)	16.00
C.V. (%)	5.36		1.30
SEm±	1.21		0.14
CD (P=0.05)	3.73		0.42

**Fig 3:** Effect of bio agents, botanical and fungicides on wilt disease of Holy Basil (*Ocimum sanctum*) *in vivo*

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