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RESEARCH ARTICLE

Management of Sclerotium wilt of *Stevia rebaudiana* through biorationals

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ABSTRACT

In vitro evaluation of biorationals against *Sclerotium rolfsii* causing wilt of *Stevia rebaudiana* indicated that cow urine and Panchagya inhibited the mycelial growth of the pathogen completely. Among different bioagents, botanicals and biorationals tested in pot experiment, have given good results. *Trichoderma harzianum, T. viride, Duranta repens* and *Eupatorium odoratum* were very effective and completely inhibited the disease incidence up to 30 days after planting. Maximum plant height was recorded in *T. harzianum* at 30 DAP.

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INTRODUCTION

Stevia rebaudiana is commonly known as sweetest plant of the world. It is widely grown for its sweet leaves which contains stevioside and rebaudioside. Stevia has garnered attention with the rise in demand for low carbohydrate low sugar food alternatives. Demand for natural sweeteners have driven the farmers in India for large scale cultivation of stevia. Wilt caused by a soil borne pathogen, *Sclerotium rolfsii* is becoming serious problem in the commercial cultivation of this crop (Hegde *et al*.,2010). Management of disease through biorationals is eco-nomical, eco-friendly and gaining ample importance in recent years. Hence, an attempt was made to find out the effective biorational for management of wilt of stevia.

MATERIALS AND METHODS

The efficacy of six organic products were tested against *S. rolfsii* for radial growth inhibition on Potato dextrose agar medium using poison food technique under *in vitro* condition. The biorationals used in this study were obtained from bio-farming unit, UAS, Dharwad. The following biorationals were used against *S. rolfsii* :

– Biodigester slurry @ 10 and 20 per cent
– Cow urine @ 10 and 20 per cent
– Panchagavya @ 10 and 20 per cent
– Vermiwash @ 10 and 20 per cent
– Raw neem oil @ 10 and 20 per cent
– Jeevamrutha @ 10 and 20 per cent

Required quantity of individual organic products was added separately into sterilized molten and cooled Potato dextrose agar so as to get the desired concentration of the organic products. Later, 20 ml of the poisoned medium was poured into sterilised Petriplate. Mycelial disc of five mm size from actively growing zone of seven days old culture was cut by a sterile cork borer and one such disc was placed at the centre of each agar plate. Control treatment was maintained without adding any organic products to the medium. Three replications were maintained for each treatment. Then such plates were incubated at room temperature and radial growth was measured when fungus attained the maximum growth in control plates. Per cent inhibition of mycelial growth over control was calculated by using the formula given by Vincent (1947) :

$$I = \frac{C - T}{C} x100$$

where,

I = Per cent inhibition

C = Growth in control
T = Growth in treatment

***In vivo* evaluation of bio agents, botanicals and biorationals against *S. rolfsii* :**

A pot experiment was conducted in the glass house of Dept. of Plant Pathology, University of Agricultural Sciences, Dharwad to find out best treatment for control of wilt of stevia. Stevia were grown in pots. The effective bioagent evaluated under *in vitro* studies were further evaluated in pot culture. Each treatment was replicated thrice. The giant culture was inoculated to each pot at the rate of 20 g per pot. Two days after application of inoculum the bio agents, botanicals and organic products listed below were applied individually to soil of respective sets of pots at the rate of 100 ml per pot. Pot without biorationals served as control. The treatments were as follows:

T_1 - *Trichoderma harzianum* (2 g), T_2 -*Trichoderma viride* (2 g), T_3 - Cow urine @ 10%, T_4 - Panchagavya@ 10%, T_5 - Jeevamrutha @ 10%, T_6 - Raw neem oil @ 10%, T_7 - *Eupatorium* @ 10%, T_8 - *Duranta repens* @ 10%, T_9 - *Azadirachta indica* @ 10%, T_{10} - *Lantana camera* @ 10%,T_{11} - *Datura stramonium* @ 10% and T_{12} - Control

Observations were recorded on plant height and disease incidence at 15 and 30 days after planting(DAP) and the per cent disease incidence (PDI) was calculated by the following formula:

$$PDI = \frac{\text{Number of plants affected}}{\text{Total number of plants observed}} x100$$

RESULTS AND DISCUSSION

The results depicted in Table 1 reveal that the effect of biorationals on fungal growth was significant. Among biorationals, cow urine (75.00%) was found effective in inhibiting mycelial growth followed by Panchagavya (72.37%). Least inhibition was observed with Jeevamrutha (49.26%) followed by raw neem oil (54.81%). Vermiwash and biodigester slurry did not show any inhibition of mycelial growth at both concentrations tested. The biorationals at 20 per cent were significantly superior in inhibiting mycelial growth compared to 10 per cent. Cow urine (100%) and Panchagavya (100%) at 20 per cent were the best treatments with 100 per cent inhibition of mycelial growth and were significantly superior to all other treatments.

In the present study, raw neem oil, Panchagavya and cow urine were highly effective against *S. rolfsii* at 10 per cent and 20 per cent. Where as vermiwash and bio-digester slurry didn't show inhibition of mycelial growth at all the concentration tested. The findings are in confirmation with Sugha (2005), Sapre and Varma (2006) and Praveen Kumar (2009).

***In vivo* evaluation of biorationals against *S. rolfsii* :**

Observations on disease incidence and plant height are depicted in Table 2 and Fig. 1.

Plant height :

All the treatments increased plant height significantly at 15DAP and 30 DAP compared to untreated control (11.50 cm and 13.00 cm). Maximum plant height was recorded in *Trichoderma harzianum* (30.50 cm and 36.30 cm) which was significantly superior to all other treatments. This was followed by *Trichoderma viride* (28.30 cm and 33.30 cm), Jeevamruta (27.10 cm and 32.40 cm), *Duranta repens* (24.70 cm and 30.00 cm) and Panchagavya (22.00 cm and 26.70 cm). Next best were *Eupatorium odoratum* (21.50 cm and 27.50 cm), *Datura stramonium* (18.50 cm and 21.00 cm), neem oil (18.00 cm and 20.00 cm), cow urine (17.00 cm and 20.40 cm), *Azadirachta*

Table 1: Effect of different biorationals on mycelial growth of *Sclerotium rolfsii*

Biorationals	Per cent inhibition of mycelial growth at concentrations		Mean
	10%	20%	
Biodigester slurry	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)*
Cow urine	50.00 (45.02)	100.00 (90.05)	75.00 (67.53)
Jeevamrutha	22.96 (28.64)	75.55 (60.40)	49.26 (44.52)
Panchagavya	50.74 (45.45)	100.00 (90.05)	72.37 (67.75)
Raw neem oil	51.85 (46.08)	57.77 (49.50)	54.81 (47.79)
Vermiwash	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Mean	22.31 (27.53)	55.55 (48.33)	
	S.E.m±		C.D. at 1%
Organic product (P)	0.12		0.47
Concentration(C)	0.07		0.27
P×C	0.169		0.67

*Figure in parentheses indicates angular transformed values

Table 2: Biological management of *Sclerotium* wilt of stevia in pot experiment

Treatments	Height (cm)		Per cent wilt	
	15DAP	30 DAP	15DAP	30 DAP
Control	11.50	13	100.00 (10.24)	100.00 (10.24)*
Cow urine	17.00	20.40	20.27 (4.56)	40.43 (6.39)
Panchagavya	22.00	26.70	16.19 (4.09)	20.72 (4.60)
Jeevamruta	27.10	32.40	83.11 (9.14)	100.00 (10.24)
Neem oil	18.00	20.00	100.00 (10.24)	100.00 (10.24)
Trichoderma harzianum	30.50	36.30	0.00 (0.71)	0.00 (0.71)
Trichoderma viride	28.30	33.30	0.00 (0.71)	0.00 (0.71)
Eupatorium odoratum	21.50	27.50	0.00 (0.71)	0.00 (0.71)
Duranta repens	24.70	30.00	0.00 (0.71)	0.00 (0.71)
Azadirachta indica	14.70	16.50	100.00 (10.24)	100.00 (10.24)
Datura stramonium	18.50	21.00	100.00 (10.24)	100.00 (10.24)
Lantana camera	13.00	15.00	33.59 (5.84)	62.63 (7.95)
S.E.m±	0.49	0.51	0.02	0.01
C.D. at 5%	1.44	1.49	0.07	0.04
C.V.	4.15	3.62	1.77	0.86

*Figure in parentheses indicates √X+0.5 transformed values

Fig. 1 : Biological management of Sclerotium wilt of stevia in pot experiment

indica (14.70 cm and 16.50 cm) and *Lantana camera* (13.00 cm and 15.00 cm).

Wilt incidence :

Wilt incidence was less at 15 DAP compared to 30 DAP. *Trichoderma harzianum, Trichoderma viride, Eupatorium odoratum* and *Duranta repens* were highly effective with complete control of the disease up to 30 DAP. Next best treatment was Panchagavya (16.19% and 20.72%), cow urine (20.27% and 40.43%) and *Lantana camera* (33.59% and 62.63%) at 15 DAP and 30 DAP, respectively. Neem oil, *Azadirachta indica, Datura stramonium* and Jeevamruta were least effective in managing disease.

Among different bioagents, botanicals and biorationals tested, bioagents have given good results. They were significantly superior to all other treatments tested. *Trichoderma harzianum, T. viride, Duranta repens* and *Eupatorium odoratum* were very effective and completely inhibited the disease. Maximum plant height at 30 DAP was observed in *T. harzianum.* These results are comparable with the findings of Hanumanthe Gouda (1999), Anahosur (2001), Sapre and Varma (2006) and Praveen Kumar (2009).

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