

Integrated Disease Management of Foot Rot Complex in Betelvine

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ABSTRACT

The experiment was carried out during 2015-17 to study the foot rot disease incidence and yield of betelvine by incorporating the different treatments under field condition at Mamatageri, Badami Taluk of Bagalkot district. The application of enriched FYM with *Trichoderma harzianum* (@ 2 kg / vine) + *Pseudomonas fluorescens* (@ 10 g/vine) or enriched FYM with *Trichoderma harzianum* (@ 2 kg / vine) + *Pseudomonas fluorescens* (@ 10 g/vine) + neemcake (@ 1 kg/vine) or Bordeaux mixture (1%) @ 2 l/vine or metalaxyl + mancozeb 78 WP (3 g/l @ 2 l/vine) recorded highest reduction of the disease with maximum yield.

Key words: Betelvine, Horticulture, *Trichoderma harzianum*, Tebuconazole

INTRODUCTION

Betelvine is one of the important and sustainable income earning horticulture crop brought by the austrics. In Indian subcontinent it is known as Pan in Hindi, Tambula in Sanskrit, Villayadela in Kannada, Vettillakkoti in Malayalam, Vettilai in Tamil, Tamalapaku in Telugu, Videch-pan in Marathi, Nagarbel in Gujrati and pan in Bangala which belongs to family Piperaceae having a chromosome number $2n=78^4$. It is an ancient plantation crop grown initially in shaded habitats of forest ecosystem along the sea coast. Inland spread of this crop led to development of shade structures known as barejas which made use of different indigenous materials available that varies from region to region. The conditions in which the crop is grown is very conducive to

disease development. Among the different diseases, wilt or foot rot complex is a major that causes economic yield loss ranging from 30 – 100 per cent whereas 20-40 per cent loss due to leaf rot, leading to almost total crop failure³. This disease was observed at Mamatageri, Badami Taluka, Bagalkot district with high degree of severity, that needed a rigorous investigation into various aspects of the organisms. A perusal of the accumulated literature revealed that, many aspects of the foot rot complex disease and its pathogen have remained unexplored. With the above background, the present investigation was undertaken at College of Horticulture, Bagalkot.

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MATERIAL AND METHODS

An experiment was conducted in a farmer field at Mamatageri, Badami Taluk of Bagalkot district. There were ten treatments (selected 5 vines per treatment), replicated three times

with Randomized Block Design (RBD). Treatments imposed at the time of lowering of vine. Treatment details are as follows

Sl. No.	Treatment	Treatment details
1	T ₁	Drenching the vine with metalaxyl (8 %) + mancozeb (64 %) 78 WP @ 3 g/l (2 l/vine)
2	T ₂	Drenching the vine with tebuconazole @ 2 ml/l (2 l/vine)
3	T ₃	Application of enriched FYM with <i>Trichoderma harzianum</i> (6×10^8 cfu 2.5 Kg of <i>Trichoderma</i> in 500 Kg of FYM) @ 2 kg / vine.
4	T ₄	Soil application of <i>Pseudomonas fluorescens</i> 4×10^8 cfu @ 10 g/vine
5	T ₅	T ₃ +T ₄
6	T ₆	Application of neemcake @ 1 kg/vine
7	T ₇	T ₅ +T ₆
8	T ₈	Drenching of Bordeaux mixture (1%) @ 2 l/vine
9	T ₉	Drenching of validamycine 2 ml/l (2 l / vine)
10	T ₁₀	Untreated control

Observations

Per cent disease incidence and number of lesions were recorded at every 30 days interval after the treatment imposition. Yield parameters like number of sprouts per vine and number of leaves ha⁻¹ were also recorded and the data was analysed statistically.

Statistical analysis

The design adopted was randomized block design (RBD). The data on growth of the pathogens, per cent disease incidence and yield parameters were tabulated and subjected to statistical analysis using method of analysis of variance for randomized complete block design by Fisher and Yates. Whenever 'F' test was found significant for comparing the means of two treatments, critical difference (CD) 0.05 for field and 0.01 for lab studies was worked.

RESULT

Pathogens involved in the cause of foot rot complex disease were identified as *Phytophthora parasitica* and *Sclerotium rolfsii* by using cultural, morphological and molecular tools and the field treatments were formulated. The efficacy of different fungicides and bioagents against foot rot

complex in betelvine was evaluated under field conditions during *kharif /Rabi*, 2016 as described in "Material and Methods".

The treatment imposition was done during the month of August at the time of lowering of vines and the observations were taken at monthly intervals. Per cent disease incidence was calculated using the formula given by Vernell and Hecloud⁶.

Per cent foot rot complex disease incidence was nil in the treatments T₁ (drenching with metalaxyl + mancozeb 78 WP @ 3 g/l at 2 l/vine), T₅ (application of enriched FYM with *Trichoderma harzianum* (2.5 kg of *Trichoderma* in 500 kg of FYM) @ 2 kg / vine) + soil application of *Pseudomonas fluorescens* @ 10 g/vine), T₇ (Application of enriched FYM with *T. harzianum* (2.5 Kg of *Trichoderma* in 500 Kg of FYM) @ 2 kg / vine + Soil application of *P. fluorescens* @ 10 g/vine + application of neemcake @ 1 kg/vine) and T₈ (drenching of Bordeaux mixture @ 1 % at 2/vine). Which were statistically at par with T₉ (7.33 %) (drenching of validamycine @ 2 ml/l at 2 l/vine) and significantly least over all other treatments. Highest per cent disease

incidence was recorded in control (80.00 %) (Table 1 and Figure 1).

One month after treatment imposition, observations on number of sprouts per vine and number of lesions on newly emerging vines were recorded. Among different treatments, application of enriched FYM with *T. harzianum* @ 2 kg / vine + soil application of *P. fluorescens* @ 10 g/vine + application of neemcake @ 1 kg/vine recorded maximum number of sprouts (9.2) and not showed any lesions on stems, followed by drenching with metalaxyl + mancozeb 78 WP @ 3 g/l at 2 l/vine which recorded average of 7.3 sprouts per vine and also not showed any lesions on the stems. Similarly, the application of enriched FYM with *T. harzianum* @ 2 kg / vine + soil application of *P. fluorescens* @ 10 g/vine also recorded more number of sprouts (7.2) and did not showed any lesions development. With respect to yield, all the treatments were at par with each other, maximum yield (38.55 lakh leaves/ha) was recorded in the treatment application of

enriched FYM with *T. harzianum* @ 2 kg / vine + soil application of *P. fluorescens* @ 10 g/vine + application of neemcake @ 1 kg/vine followed by drenching with metalaxyl + mancozeb 78 WP @ 3 g/l at 2 l/vine (38.22 lakh leaves/ha). Least number of leaves harvested in control (18.95 lakh leaves/ha) (Table 1 and Figure 1).

Cost: benefit ratio

Highest cost : benefit ratio was recorded where Application of enriched FYM with *Trichoderma harzianum* (6×10^8 cfu 2.5 Kg of *Trichoderma* in 500 Kg of FYM) @ 2 kg / vine + Soil application of *Pseudomonas fluorescens* 4×10^8 cfu @ 10 g/vine whereas, lowest cost : benefit was recorded where the application of neemcake @ 1 kg/vine alone. These results also revealed that although biological control approach was statistically at par to chemical control in terms of yield, PDI but when we consider cost: benefit ratio, biological control with *T. harzianum* and *Pseudomonas fluorescens* were superior to chemical control.

Table 1: Effect of different chemicals and bio agents on foot rot complex disease management

Treatment	Percent disease incidence (Mean)	No. of lesions	No. of sprouts	No. of leaves (Lakhs) ha ⁻¹	B:C
T ₁	0.00 (5.74)	0.00	7.3	38.22	1.76
T ₂	20.00 (26.57)	0.46	4.4	31.52	1.60
T ₃	26.67 (30.79)	0.66	4.6	31.20	2.07
T ₄	33.33 (35.01)	1.13	4.2	29.89	1.92
T ₅	0.00 (5.74)	0.00	7.2	35.28	2.25
T ₆	26.67 (30.79)	0.73	4.7	33.16	1.20
T ₇	0.00 (5.74)	0.00	9.2	38.55	1.34
T ₈	0.00 (5.74)	0.00	5.8	30.87	1.83
T ₉	7.33 (12.69)	0.13	5.0	32.18	2.13
T ₁₀	80.00 (68.07)	4.44	2.7	18.95	1.29
S. Em±	4.34				
CD (0.05)	12.68				

The values in the parenthesis are arc sine transformed values



T₁= Metalaxyl (8 %) + mancozeb (64 %) 78 WP @ 3 g/l (2 l/vine)



T₇= Enriched FYM with *T. harzianum* @ 2 kg / vine + *P. fluorescens* @ 10 g/vine + neemcake @ 1 kg/vine



T₁₀= Untreated control



T₅= Enriched FYM with *Trichoderma harzianum* @ 2 kg / vine + *Pseudomonas fluorescens* @ 10 g/vine



T₈= Drenching of Bordeaux mixture (1%) @ 2 l/vine

Figure 1: Performance of promising treatments in management of foot rot complex of betelvine

DISCUSSION AND CONCLUSIONS

The results with respect to the control of the wilt complex disease under field condition were in agreement with the findings of Mohanty and Dasgupta⁵ who stated that application of Bordeaux mixture at monthly interval led to the lowest foot rot (8.19 %) and leaf rot (10.74%) incidence. Dasgupta *et al.*², revealed that biological control approach was at par to chemical control in terms of per cent

disease control. Similarly when we consider the yield, these results were in confirmation with the findings of Dasgupta, *et al.*¹, who observed that application of Bordeaux mixture at pre-monsoon, monsoon and post-monsoon showed highest leaf yield (36.45 lakh ha⁻¹) and it was statistically at par with application of *Trichoderma* sp. at premonsoon, monsoon and post-monsoon. Therefore, use of biological control agents are recommended for the

management of *Phytophthora* foot rot of betelvine looking at the long term prospects and to avoid the possibility of health hazards due to consumption of betel leaf contaminated with the fungicides.

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