

## Management of important fungal diseases of medicinal plants through fungicides

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*Clerodendrum*, *Smilax* and *Acorus* are some of the common genera of medicinal plants, with most of the species occurring in tropical Africa and southern Asia. They are herbaceous flowering plants possessing medicinal properties to alleviate different health related problems. However, despite the inherent medicinal properties these plants are also attacked by several plant pathogens where, leaf spot caused by *Cercospora* and rust by *Uromyces acori* are the main fungal diseases causing severe damages to plants. An initiative has been taken to identify a suitable fungicide to minimize these diseases with a view to reduce the initial inoculum of the pathogens as these two pathogens (*Cercospora* and *Uromyces*) causing huge damage to field crops like cereals, pulses, oilseeds and vegetables. Several potential fungicides like Propiconazole (Tilt @ 1.0 ml L<sup>-1</sup>), Hexaconazole (Contaf @ 1.0 ml L<sup>-1</sup>), Difenoconazole (Score @ 0.5 ml L<sup>-1</sup>), Mancozeb (Indofil M-45 @ 2.5 g L<sup>-1</sup>), Chlorothalonil (Kavach @ 2.0 g L<sup>-1</sup>) and Carbendazim (Bavistin @ 1.0 g L<sup>-1</sup>) were evaluated against the diseases. Hexaconazole was found to be superior for management of leaf spot disease on both *Clerodendrum* and *Smilax* host; while, triazole fungicides were found to be most effective for the management of rust disease (66.04%) of *Acorus*.

**Keywords** : *Cercospora*, *Clerodendrum*, leaf spot, medicinal plants, Rust of *Acorus*

### INTRODUCTION

*Clerodendrum* L., a genus belonging to the family Lamiaceae (Verbenaceae), can be found in numerous tropical and subtropical regions across the globe. This diverse genus includes a variety of plant species, ranging from herbs, shrubs and small trees, making it a versatile and adaptable addition to any ecosystem (Shrivastava and Patel, 2007). The leaf aqueous extract of *Clerodendrum* is traditionally used by people of North-East India to alleviate symptoms of diabetes, obesity and hypertension. Various plant species such as *C. indicum*, *C. phlomidis*, *C. serratum*, *C. trichotomum*, *C. chinense*, and *C. petasites* have been historically used for the treatment of inflammatory ailments like rheumatism and asthma (Hazekamp *et al.* 2001; Kang *et al.* 2003;

Panthong *et al.* 2003; Choi *et al.* 2004; Kanchanapoom *et al.* 2005). Plants like *C. indicum* and *C. inerme* have been used for treating a variety of health problems including coughs, venereal infections, skin diseases, and Beriberi disease. They were also used as a vermifuge, febrifuge, and to treat buboes problems and serofulous infection (Kanchanapoom *et al.* 2001). The powder of roots of *Smilax* is known as Rad. Sarzae. Jam. in pharmacy and are used as a traditional medicine for gout. *Smilax zeylanica*, family Liliaceae has been found to be the therapeutic hub showing its efficiency as antidiabetic, anthelmintic, antioxidant, pesticidal, antiepileptic and many other ailments. While the extract of *Acorus* has been used medicinally for a wide variety of ailments, such as gastrointestinal diseases and treating pain, and its aroma makes calamus essential oil valued in the perfume industry. *Acorus calamus* (sweet flag) is a wetland perennial

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**Table 1:** Effect of chemical management for controlling *Cercospora* leaf spot of *Clerodendrum*

Treatments	PDI	% of disease control
Propiconazole (Tilt @ 1.0 ml L <sup>-1</sup> )	19.63 (26.29)	55.05
Hexaconazole (Contaf @ 1.0 ml L <sup>-1</sup> )	13.56 (21.60)	68.95
Difenconazole (Score @ 0.5 ml L <sup>-1</sup> )	16.00 (23.57)	63.36
Mancozeb (Indofil M-45 @ 2.5 g L <sup>-1</sup> )	30.36 (33.43)	30.49
Chlorothalonil (Kavach @ 2.0 g L <sup>-1</sup> )	24.46 (29.62)	44.00
Carbendazim (Bavistin @ 1.0 g L <sup>-1</sup> )	25.80 (30.52)	40.93
Control	43.68 (41.36)	-
SEM (±)	0.58	-
CD <sub>(P=0.05)</sub>	1.80	-

Data in parentheses indicates angular transformed value.

**Table 2 :** Effect of chemical management for controlling *Cercospora* leaf spot of *Smilax*

Treatments	PDI	% of disease control
Propiconazole (Tilt @ 1.0 l L <sup>-1</sup> )	13.16 (21.26)	66.04
Hexaconazole (Contaf @ 1.0 l L <sup>-1</sup> )	12.00 (20.26)	69.04
Difenconazole (Score @ 0.5 ml L <sup>-1</sup> )	14.53 (22.31)	62.51
Mancozeb (Indofil M-45 @ 2.5 g L <sup>-1</sup> )	27.30 (31.49)	29.56
Chlorothalonil (Kavach @ 2.0 g L <sup>-1</sup> )	22.50 (28.31)	41.95
Carbendazim (Bavistin @ 1.0 g L <sup>-1</sup> )	23.33 (28.88)	39.80
Control	38.76 (38.50)	-
SEM (±)	0.69	-
CD <sub>(P=0.05)</sub>	2.14	-

Data in parentheses indicates angular transformed value.

monocot plant, wherein the scented leaves and rhizomes had been historically used medicinally towards one of a kind ailments like, fever, asthma, bronchitis, cough and especially for digestive issues, which include gas, bloating, colic and poor digestive characteristic. Range of energetic parts and critical oil had been identified and characterized from the leaves and rhizomes of candy flag. Rust disease (*Uromyces*) was noticed during the cultivation period. This study was done for control of *Cercospora* spot disease leaf rust of *Acorus* by fungicidal management.

## MATERIALS AND METHODS

Attempt was made for the fungicidal management of *Cercospora* leaf spot disease of *Clerodendron* and *Smilax* plant, at Central herbal garden Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar. The experiment was carried out with seven fungicides including three triazoles viz., propiconazole (Tilt@1.0ml L<sup>-1</sup>), difenconazole (Score@0.5ml L<sup>-1</sup>), hexaconazole (Contaf@1.0ml L<sup>-1</sup>), carbendazim (Bavistin@1.0g L<sup>-1</sup>), chlorothalonil (kavach@2.0g L<sup>-1</sup>) and mancozeb (Indofil M-45@2.5g L<sup>-1</sup>) along with water sprayed control. A similar experiment with all the above treatments was also conducted in case of rust of *Acorus*.

The treatments were applied as foliar sprays with high volume sprayer twice at the interval of 15 days, first spray being given at the time of emergence of disease. Observations on leaf spot.

were recorded 15 days after second spray and disease intensity was rated on 0-9 scale. Percentage disease index (PDI) was worked out using following formula:

$$\text{PDI} = \frac{\sum \text{of total rating}}{\text{Total plants observed} \times 9} \times 100$$

The PDI values were transformed by arc sign transformation, and analyzed statistically.

## RESULTS AND DISCUSSION

### Management of Leaf Spot Diseases

The perusal of the data presented in Tables 1 and 2, indicated that all the triazoles fungicides

significantly reduce leaf spot as compared to other fungicides under field level fungicidal evaluation studies. Among triazoles, Hexaconazole was found to be superior for management of leaf spot disease on both *Clerodendron* and *Smilax* host. Mancozeb was found to be least effective for the management of leaf spot disease. Nearly 70% disease inhibition was observed when plants were sprayed with Hexaconazole as compared to water treated control. This observation was in accordance with the findings of earlier workers who observed that Difenconazole was found to be the most effective fungicide for the management of *Cercospora* leaf spot disease of mungbean. Similar observation was also recorded by Vyavhare *et al.* (2020) who observed that Triazole fungicide was found to be better for management of leaf spot disease of groundnut. Thus from the present investigation it can be concluded that *Cercospora* induced leaf spot disease of *Clerodendron* and *Smilax* can be managed effectively with Hexaconazole fungicide.

### Management of Rust Disease

The perusal of the data presented in Table 3, indicated that all fungicides tested significantly reduced the diseases compared to untreated check. The minimum disease intensity (21.7%) and maximum disease control (66.97%) was recorded in the foliar application of Propiconazole. However mancozeb and chlorothalonil were found to be moderately effective against the disease. The present findings suggest that triazole fungicides are the most effective for the management of rust disease of *Acorus*. Similar results were obtained by Khan *et al.* (2005) while working with rust disease of groundnut and mung-bean, respectively.

## CONCLUSION

From this study it may be concluded that *Cercospora* induced leaf spot disease of *Clerodendron* and *Smilax* plants can be effectively managed with Hexaconazole fungicide; whereas, the triazole fungicides were found to be the most effective for the management of rust disease of *Acorus*.

**Table 3 :** Effect of chemical management for controlling rust disease of *Acorus*

Treatments	PDI	% of disease control
Propiconazole (Tilt @ 1.0 ml L <sup>-1</sup> )	27.70 (27.75)	66.97
Hexaconazole (Contaf @ 1.0 ml L <sup>-1</sup> )	23.10 (28.70)	64.84
Difenconazole (Score @ 0.5 ml L <sup>-1</sup> )	25.20 (30.12)	61.64
Mancozeb (Indofil M-45 @ 2.5 g L <sup>-1</sup> )	44.00 (41.52)	33.03
Chlorothalonil (Kavach @ 2.0 g L <sup>-1</sup> )	35.30 (36.76)	46.27
Carbendazim (Bavistin @ 1.0 g L <sup>-1</sup> )	40.90 (39.76)	37.74
Control	65.70 (54.20)	-
SEM (±)	1.35	-
CD <sub>(P=0.05)</sub>	4.18	-

Data in parentheses indicates angular transformed value.

## DECLARATIONS

Conflict of interest. Authors declare no conflict of interest.

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