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Effect of plant extracts on the fungal pathogen causing wilt of sugarcane in *in vitro*

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SUMMARY

Fungi are an important group of microorganisms responsible for various diseases of plants and cause a considerable loss in yield. Plants are the richest source of organic chemicals, which can be used as defensive weapons. Number of plants has been found to possess antifungal properties, which are able to control certain fungal diseases of crops. Effect of *Boswellia serrata* Roxb ex. Coleb., *Gnidia glauca* (Fresen.) Gilg., *Ocimum americanum* L., *Mundulea sericea* (Wild.) A. Chev., and *Woodfordia fruticosa* (L.) Kurz. extracts were tested in *in vitro* by poisoned food technique to know there inhibitory effect on the growth of *Fusarium moniliforme* Sheldon. Extracts of *Boswellia serrata* leaves were found significantly superior in inhibiting the mycelial growth 24.51 %, 30.42 % and 47.89 % of *F. moniliforme* at 5 per cent, 10 per cent and 15 per cent, respectively. Extract of *Woodfordia fruticosa* and *Ocimum americanum* were found second best after *Boswellia serrata*, while extracts of *Gnidia glauca* and *Mundulea sericea* were least effective in growth inhibition as compared to other plant extracts at all the three concentrations tried.

Key words : Antifungal, *Fusarium moniliforme*, Plant extracts and inhibition

Fungi are an important group of microorganisms responsible for various diseases of plants and cause a considerable loss in yield. A number of chemical fungicides are available in market for the crop protection. Some of them are excellent in terms of efficacy and cost benefit. However, their indiscriminate use has created the problems of air, soil and water pollution, development of resistance in target organisms and serious health hazards due to the toxicity of their residues. Efforts are being done for finding alternatives to chemical fungicides to overcome these problems. Plants are the richest source of organic chemicals on the earth and produce a wide variety of secondary metabolites, which can be used as defensive weapons. Plant extracts can be the potential alternatives to chemical agents that are hazardous to human and animal health. Number of plants has been found to possess antifungal properties, which are able to control certain fungal diseases of crops instead of spraying chemical fungicides.

Fusarium moniliforme Sheldon is an important pathogen causing wilt of sugarcane and mango malformation. McRae (1932) for the first time from Bihar, India identified and reported *F. moniliforme* as a causal agent of sugarcane wilt. Joffe *et al.* (1973) reported *F. moniliforme* pathogenic to onion and all dicotyledonous plants in Israel. Mauto *et al.* (1976) isolated *F. moniliforme* from rice, soyabean, maize and sorghum.

Danej (1980) reported that phenolic compounds are good inhibitors of fungal pathogens and useful in controlling fungal diseases. Garg (1974) studied the antifungal activity of essential oil of *Boswellia serrata* against seventeen pathogenic fungi. From the above reports it was clear that plants containing natural phenols could be used as biofungicides against the *Fusarium moniliforme*. Therefore, leaves of *Boswellia serrata* and *Woodfordia fruticosa* were tested for their antifungal properties against the important pathogen *Fusarium moniliforme* as they contain natural phenols. In addition *Mundulea sericea*, *Gnidia glauca* and *Ocimum americanum* were also tested for their fungicidal properties.

MATERIALS AND METHODS

Healthy leaves of *Boswellia serrata, Ocimum americanum, Mundulea sericea, Woodfordia fruticosa* and *Gnidia glauca* collected from the Harishchandragad-Kalsubai Wild Life Sanctuary were tested in *in vitro* by poisoned food technique to know there inhibitory effect on the growth of *F. moniliforme.* Pathogen was isolated from wilted sugarcane. Surface sterilized pieces were placed on potato dextrose agar medium in Petriplates. Petriplates were then incubated at 28^0 C to 30^0 C temperatures. Repeated sub culturing was practiced to obtain pure fungal culture. During all these operations

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Table 1 : Effect of various plant extracts on the growth of *Fusarium moniliforme* in *in vitro* at various concentrations

Name of plant extracts used	Various concentrations					
	5 % conc.		10 % conc.		15 % conc.	
	Av. colony diameter (mm)	Growth inhibition (%)	Av. colony diameter (mm)	Growth inhibition (%)	Av. colony diameter (mm)	Growth inhibition (%)
Boswellia serrata	67.75	24.51	61.75	30.42	46.50	47.89
Gnidia glauca	77.00	14.20	74.00	16.61	67.25	24.64
Mundulea sericea	81.25	9.47	77.00	13.23	68.50	23.24
Ocimum americanum	76.00	15.32	69.00	22.25	64.75	27.45
Woodfordia fruticosa	71.75	20.05	68.50	22.81	57.75	35.29
Control	89.75	-	88.75	-	89.25	-
S.E. $\pm$	0.48		0.47		0.56	
C.D. (P=0.05)	1.44		1.42		1.67	
CV	1.26		1.31		1.72	

perfect aseptic conditions were maintained.

Fifty grams of plant leaves of each plant were cut into small pieces and minced with the help of grinder by adding 50 ml sterilized distilled water. These phyto-extracts were filtered through double-layered muslin cloth in 150 ml conical flasks and plugged with non-absorbent cotton. These filtered extracts were autoclaved at 1.2 kg cm^{-2} pressure for 20 minutes. Autoclaved extract was individually added into previously sterilized PDA @ 5 per cent (*i.e.* 1 ml extract +19 ml PDA), 10 per cent (*i.e.* 2 ml extract +18 ml PDA) and 15 per cent (*i.e.* 3 ml extract + 17 ml PDA) and mixed thoroughly at the time of pouring in the previously sterilized Petriplates. Petriplates were then inoculated aseptically after solidification by placing 5 mm disc at the center, cut aseptically with cork borer from 10 days old culture of test pathogen *i.e. F.moniliforme*, separately. Four repetitions of each treatment for the test pathogen were maintained. The plates without phyto-extracts served as control. Petriplates were then incubated at room temperature (Sharma and Bohra, 2003). Observations on colony diameter for the test pathogen were recorded and statistically analyzed and per cent growth inhibition was also worked out by using the following formula suggested by Vincent (1947).

$$\text{Per cent growth inhibition } Z \frac{C - T}{C} \times 100$$

where, C= Growth of pathogen in control after incubation

T= Growth of pathogen in treatment after incubation

RESULTS AND DISCUSSION

Extracts of *Boswellia serrata, Gnidia glauca, Mundulea sericea, Ocimum americanum* and *Woodfordia fruticosa* with three concentrations *viz.*, 5 per cent, 10 per cent and 15 per cent were evaluated in *in vitro* by poisoned food technique for their efficacy against *Fusarium moniliforme*. Extracts of *Boswellia serrata* leaves significantly inhibited the mycelial growth, *i.e.* 24.51 %, 30.42 % and 47.89 % of *F. moniliforme* at 5 per cent, 10 per cent and 15 per cent, respectively (Table 1). Extract of *Woodfordia fruticosa* and *Ocimum americanum* were found second best after *Boswellia serrata*, while extracts of *Gnidia glauca* and *Mundulea sericea* were least effective in growth inhibition as compared to other plant extracts at all the three concentrations tried.

Conclusion:

Leaf extracts of *Boswellia serrata* and *Woodfordia fruticosa* can be used as biofungicides without any adverse effect on the environment to control the *F. moniliforme*.

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