In vitro antifungal activity of selected medicinal plant extracts against selected postharvest pathogens in fruits and vegetables

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Introduction

Fungal diseases are a major problem occurred in fruit and vegetable cultivations and during post-harvest life of fruits and vegetables. Application of systemic fungicides is the most common practice for commercial control of most of the post-harvest pathogens. Although synthetic fungicides have provided effective control of major postharvest diseases, their application may be harmful to human health and the environment and they become ineffective after prolonged use (Awoit*et al*, 2013).There are some natural plant products with antifungal activity against various fungal groups. Those natural compounds can be used to control the post-harvest fruit and vegetable pathogens in environmental friendly manner(Paster*et al*., 1995).

Methodology

The current study was conducted to determine the antifungal activity of the leaves of *Azadirachtaindica*(Neem) and *Calendula officinalis*Linn(Marigold) and the peel of the fruit of *Myristicafragrans*(Nutmeg) against post-harvest disease causing fungal species such as*Colletrotrichumgloeosporioides, Fusariumoxysporum,Rhizoctonia solani* and *Trichoderma*spp. This experiment was conducted at the laboratories of Natural Products Chemistry division of the Institute of Fundamental Studies (IFS), Kandy.

The selected plant materialswere collected from the home gardens in Kandy. Plant materials were cleaned well under running tap water and air dried. The dried plant materials were crushed. Each plant powder (50 g) was extracted with hexane,ethyl acetate, methanol and distilled water respectively in a sequential process and the evaporation of solvent using rotary evaporator finished 12 extracts.The fungal cultures were obtained from Pathology Division of Horticultural Crops Research and Development Institute (HORDI), Gannoruwa, which were isolated from fruits and vegetables. The antifungal assay was conducted in 9cm diameter petri dishes. The extracts were dissolved in 10% Dimethyl sulfoxide (DMSO) to prepare 5000 ppm concentration of each extractand the 10% DMSO without plant extracts was used as the negative control.

The poisoned food technique (Chutia*et al*., 2009) was used to test for the antifungal activity. Plant extracts were mixed with the Potato Dextrose Agar (PDA) medium and poured to the petri dishes. The test fungal groups were inoculated with 8 mm diameter mycelial disc from 7- 10 daysold cultures. The plates were incubated at room temperature and colony diameter was measured after three days. This experiment was conducted by using Two Factor Factorial in Complete Randomized Design and data analysis was done by using Analysis of Variance (ANOVA) in General Linear Model. The mean comparison was done by using Tucky pairwise

comparison method at significance level of 5% ($\alpha = 0.05$) in Minitab 17 software.

Results and Discussion

Average colony diameter of each fungal species relevant to each plant extract is given in the table 1.

Table 1: Effect of the plant extracts on the growth of each fungal species

(H- Hexane,EA- Ethyl acetate,M- Methanol, DW- Distilled water, NC- Negative control)

Plant	Solvent	Colony diameter (mm)			
		R. solani	*C. gloeosporioides*	*F. oxysporum*	*Trichoderma*spp
A. indica	H	42.00^{bc}	15.67^{bc}	17.33^{ab}	47.67^{bc}
	EA	35.00^{bcd}	18.00^{bc}	17.33^{ab}	46.33^{bcde}
	M	40.33^{bc}	16.67^{bc}	11.67^{b}	40.00^{de}
	DW	40.00^{bc}	16.33^{bc}	15.33^{ab}	39.67^{ef}
C. officinalis	H	39.33^{bc}	23.67^{abc}	19.67^{ab}	46.33^{bcde}
	EA	41.33^{bc}	21.33^{abc}	17.33^{ab}	48.00^{bc}
	M	42.00^{bc}	23.33^{abc}	19.67^{ab}	49.33^{abc}
	DW	36.67^{bcd}	22.67^{abc}	22.33^{ab}	51.67^{ab}
M. fragrans	H	29.33^{cd}	13.33^{bc}	14.00^{b}	43.00^{cde}
	EA	31.00^{bcd}	12.33^{c}	14.33^{ab}	32.33^{f}
	M	26.00^{d}	13.00^{bc}	14.67^{ab}	39.00^{ef}
	DW	43.00^{b}	26.33^{ab}	23.67^{ab}	47.33^{bcd}
	NC	57.33^{a}	31.67^{a}	26.33^{a}	56.67^{a}

* Values followed by the same letter are not significantly difference at $p \leq 0.05$ when subjected to Tukey pairwise comparison.

According to the results of this experiment, the lowest growth diameter against *R. solani* was given by the methanol extract of the fruit peel of *M. fragrans* (26 mm). The growth of the *C. gloesporioides* was highly controlled from ethyl acetate extract of the fruit peel of *M. fragrans*(12.33 mm). The lowest growth diameter against *F. oxysporum*was given by the methanol extract of the *A. indica* leaves(14 mm) and the growth of the *Trichoderma*spp was highly controlled from ethyl acetate extract of the fruit peel of *M. fragrans* (32.33 mm). With these results the *M. fragrans* shows higher antifungal activity for *C. gloesporioides, R.solani* and *Trichoderma*spp than other extracts while*A. indica* shows higher antifungal activity against *F. oxysporum*.

Conclusions

The best antifungal extract against *R. solani* is methanol extract of fruit peel of*M. fragrans* and the best antifungal extract against *C. gloeosporioides* and *Trichoderma*spp is ethyl acetate extract of fruit peel of *M. fragrans* plant. The best antifungal extract against *F. oxysporum* is methanol extract of *A. indica* plant.

References

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