Research Paper :

In vitro antifungal effect of crop root exudates against *Sclerotium rolfsii* Sacc. causing stem rot in groundnut

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SUMMARY

Crop root exudates of 20 crops like groundnut, soybean, pigeonpea, green gram, black gram, chickpea, pea, cowpea, mustard, cotton, castor, sunflower, safflower, sesamum, sorghum, pearl millet, maize, wheat, onion, and garlic were used in this study. Large variations of inhibitory effect of root exudates on *S. rolfsii* were observed. Low concentrations of root exudates (5% and 10%) had no effect on inhibition of mycelial growth and germination of sclerotia while, at high concentration (20%) inhibited the mycelial growth and germination of sclerotia. Mycelial growth, dry mycelium weight and sclerotial germination were recorded lowest in root exudates of sunflower, maize, pearl millet, sorghum, safflower, garlic, and onion. Mycelial growth, dry mycelium weight and sclerotial germination was recorded highest in root exudates of soybean, groundnut, green gram, black gram, pigeonpea, chickpea, pea and cowpea. It was observed that the root exudates of maize, sunflower and pearl millet showed a highest percentage of inhibition of mycelial growth and sclerotial germination. Another interesting of thing was observed that root exudates of groundnut, soybean and pea stimulate the mycelial growth and germination of sclerotia as compared to control. The results of this study suggested that the intercropping or crop rotation of safflower, maize, pearl millet, sorghum, sunflower, garlic, and onion with groundnut may be useful for the management of stem rot of groundnut and also for reduction of soil population of *S. rolfsii* in groundnut field. Similarly intercropping or crop rotation of soybean, green gram, black gram, chickpea, pea and cowpea with groundnut should be avoided. Based on these findings, it is hypothesized that root exudates of some crops contain antifungal compounds, while other stimulate the growth of fungal pathogens. Cultivation of safflower, maize, pearl millet and sorghum with groundnut could lead to a reduction in the occurrence of stem rot disease, especially when chemical control is not effective and economically costly. However, further investigation is necessary for isolation and identification of antifungal compounds in root exudates related to host-pathogen interaction.

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In Saurashtra region of Gujarat, farmers have a tendency to grow identical crop in the same field for several years. Continuous cropping of the same crop results in the accumulation of soil populations of specific plant pathogens, and leads to a decline in crop quantity and quality. Farmers therefore are recommended crop rotation with specific crop species to minimize the accumulation of soil populations of soil borne plant pathogens. The relation between crop exudates and soil-borne fungal diseases is a challenging problem in the field of Plant Pathology. Direct monitoring of antifungal compounds at the site of interest, the rhizosphere, remains a difficult task (Bonsall *et al.,* 1997, Keel *et al.,* 1992, Maurhofer, 1995, Notz *et al.,* 2001). Over the past decade, enormous steps have been taken toward understanding these different types of interactions (Hirsch *et al.,*2003.) and recently the field of plant biology has recognized the importance of root exudates in mediating these biological interactions (Bais *et al.,* 2003, Walker *et al.,* 2003, Weir *et al.,* 2004). The rhizosphere represents a highly dynamic front for interactions between roots and pathogenic and beneficial soil microbes, invertebrates, and root systems of competitors (Hirsch *et al.,* 2003). Although the functions of most root exudates have not been determined, several compounds present in root exudates play important roles in biological processes (Bais *et al.,* 2003, Bais *et al.,*2002, Kneer *et al.,* 1999). The plant defenses induced by root exudates simply reduce susceptibility to pathogen infection, whereas in other cases these defenses initiate production and release of leafy volatiles that attract predators of plant enemies.

Up to now, no control strategies are field effective against stem rot and the only way to