Evaluation of some essential oils against seed-borne pathogen of rice

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Recent environmental constraints would restrict the use of many prevalent synthetic fungicides. As such there is a pressing need for pesticides of plant origin because of their ecofriendly nature (2). Higher plants have been recognised to release volatile substances which keep the air remarkably free from pathogenic micro-organisms (7). Essential oils are important in this connection because they entail special promise for use as fumigant fungicides even for deep-seated seed borne pathogens, as these being lipophilic can easily penetrate deeper through living tissue unbarred by the selective permeability of the cell membrane (6). In present communication, antifungal efficacy of essential oils of Acorus calamus and Hedychium spicatum against Helminthosporium oryzae and Fusarium moniliforme, seed borne pathogens of paddy, are reported.

The plant materials were surface sterilized by dipping in 2.5% sodium hypochlorite solution for 5 minutes and then repeatedly washed with sterilized water and subjected to hydro distillation in clevenger's apparatus. The essential oils thus obtained were tested for their toxicity against Helminthosporium oryzae and Fusarium moniliforme by technique of Bocher (3), the nature of toxicity, effect of temperature, storage and increased inoculum on fungitoxic efficacy of the oils by technique of Tripathi et al. (8), and percent inhibition of mycelial growth following Arora and Dwivedi (1).

Out of 16 essential oils, only oil of Hedychium spicatum and Acorus calamus completely inhibited the growth of both the test fungi at a lowest dose of $1.0 \times 10^3$ ml/l and $0.5 \times 10^3$ ml/l respectively. The oil of Acorus calamus up to $3.5 \times 10^3$ ml/l (v/v) exhibited fungistatic nature of toxicity but turned fungicidal @ $4.0 \times 10^3$ ml/l dose while oil of Hedychium spicatum remained fungistatic upto $4.5 \times 10^3$ ml/l and become fungicidal @ $5.0 \times 10^3$ ml/l.

Exposure of oils upto 160°C and storage upto 360 days at room temperature (27± 2°C) did not adversely effect the fungitoxic efficacy of the oils indicating thermostable and durable nature of antifungal factors. Both the oils at $0.5 \times 10^3$ ml/l and $1.0 \times 10^3$ ml/l were able to inhibit 12 discs, each of 5 mm diameter, and one mycelial disc of 20 mm diameter of both the test fungi indicating the oils capacity to sustain heavy inoculum. Besides the test fungi, the oil of Acorus calamus at $0.5 \times 10^3$ ul/l inhibited the growth of Aspergillus flavus Link, A. nidulans (Eidam), A. niger Van Tiegh, A. ruber Bremer, Thom & Raper, Cladosporium herbarum (Pers.) Link., Drechslera sativa, Fusarium oxysporum Schlecht, Macrophomina phaseolina (Maublano) Ashby, Rhizoctonia solani Kuehn, and Sclerotium rolfsii Saccardo and dose $5.0 \times 10^3$ ul/l inhibited the growth of Aspergillus flavus Link, A. nidulans (Eidam), A. niger Van Tiegh, A. ochraceus Withelm, A. ruber Bremer Thom and Raper, A. terreus Thom, Chaetomium indicum Cord, Cladosporium herbarum (Pers.) Link., Curvularia geniculata (Tracy & Earle.) (Boedijn), C. lunata (Walker) Boedijn. Drechslera hawaiiensis (Burg.) Subram. & Jain, D. sativa, Fusarium oxysporum Schlecht, Macrophomina phaseolina (Maublano) Ashby, Nigrospora oryzae (Sacc.) Manon, Rhizoctonia solani Kuehn, Sclerotium rolfsii Saccardo. However, the oil of Hedychium spicatum @ $1.0 \times 10^3$ ul/l inhibited the growth of Aspergillus.
Aspergillus flavus Link., A. nidulans Oudam., A. niger Van Tiegh., A. terreus Thom., Cladosporium herbarum (Peins.) Link., Drechslera sativa, Fusarium oxysporum Schlecht, Macrophomina phaseolina (Maublanc) Ashby, Rhizoctonia solani Kuehn, Sclerotium oryzae Catt, S. rolfsii Saccardo, and at 5.0 x 10^3 ml/l the oil inhibited the growth of Aspergillus flavus Link., A. nidulans (Oudam A. niger Van Tiegh., A. ochraceus Wilhelm, A. ruber Bremer, Thom & Raper, A. terreus Thom., Chaetomium indicum Corda, Cladosporium herbarum (Pers.) Link., Curvalaria geniculata (Tracy & Earle) (Boedijn), Drechslera hawaiiense (Bogn.) Subram. & Jain, D. sativa, Fusarium acuminatum Ellis & Everhart, F. oxysporum Schlecht, Macrophomina phaseolina (Maublan) Ashby, Nigrospora oryzae (Sacc.) Manon, Rhizoctonia solani Kuehn, Sclerotium oryzae Catt, S. rolfsii Saccardo.

During recent years, the antimicrobial principles of higher plants variously referred to as plant antibiotics, pseudoantibody, phytocide and their possible use in plant disease control has been advocated often and again (4, 5). The fungitoxic essential oils are especially important since their volatility can be exploited to control deep rooted seed-borne infections (7).

REFERENCES

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