Antifungal Essential Oils: An Eco-friendly Approach for Salvaging Germplasm

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Key Words: Antifungal, Essential Oils

About one third of crop losses worldwide is attributed to plant pathogenic micro-organisms including fungi, bacteria and viruses. A number of economically important diseases are seed-borne and seed-transmitted. Seed-borne fungi also play an interfering role in the exchange of plant genetic resources (PGR) as there is always an inadvertent risk of introducing new or exotic pathogens through international movement of seeds and planting material.

During quarantine processing of introduced germplasm, a large number of pathogenic fungi belonging to species of *Fusarium, Drechslera, Colletotrichum, Phoma, Curvularia* etc. were intercepted from time to time (Khetarpal *et al.*, 2001). Use of chemical fungicides in the control of fungal diseases though effective, is accompanied by plethora of problems such as environmental pollution, health hazards and development of resistance by the target pathogens. The increasing toll on environment and human health thus calls for a "back to nature" approach in crop protection. Hence efforts are being made to explore safe and eco-friendly alternatives for salvaging infected exotic germplasm.

Five fungal pathogens having wide host range viz., *Drechslera sorokiniana* (Sacc.) Subram. & Jain (isolated from wheat cultivar Arnig), *Colletotrichum graminicola* Ces. (from sorghum cultivar MSSR001047), *Macrophomina phaseolina* (Tassi) Goid. (from local cultivar of sesame) and *Fusarium solani* (Mart.) Sacc., (from soybean cultivar FT 50211) and *Phomopsis sojae* Leh. (from soybean cultivar FT 50211) which cause heavy crop losses were detected in the seeds through blotter test. Pure cultures were isolated and maintained on potato dextrose agar (PDA) for inhibition studies.

In vitro screening of fifteen essential oils viz., *Anethum sowa* (dill oil), *Artemissia vulgaris* (mugwort), *Cymbopogon flexosuss* (lemongrass), C. *martinii* var. *motia* (palmarosa), *C. winterianus* (citronella), *Eucalyptus globulus* (eucalyptus), Jam rosa (hybrid between *Cymbopogon nardus* x *C. jwarancusa*), *Mentha arvensis* (Japanese mint), *M. piperita* (peppermint), *M. spicata* (spearmint), *Ocimum basilicum* (basil), *Pimpinella anisum* (anise), oils of citrus peel (*Citrus limon*) and orange peel (*Citrus reticulata*) and dementholated oil of *Mentha* (DMO) was undertaken for all the five fungal cultures using poisoned food technique (Nene and Thapliyal, 1979).

Oils were subjected to gas chromatographic analysis using Hewlett- Packard GC Model 58308 fitted with stainless steel column (6' X ¼") packed with carbowax (10%), FID and recorder.

Minimum inhibitory concentration (MIC) i.e. the minimum dose required to cause cent percent inhibition of mycelial growth was computed for each oil using regression equation and FORECAST tool available with Microsoft Excel. ANOVA was carried out to derive least square difference at 5 and 1% probability levels and Duncan's multiple range test of means (Gomez and Gomez, 1984). MIC values in ppm were rounded to first decimal which ranged from 439.8-2200.

Oil of palmarosa was found to be the most effective followed by oils of lemongrass, jamrosa and citronella against these test fungi. A careful perusal of the chemical compositions of the oils reveals that the differences in antifungal activity may be due to the geraneol and citral contents. The oil of palmarosa (0.1% by wt) as seed treatment of wheat artificially inoculated with *D. sorokiniana* gave complete control of the seed-infection.

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