J Plant Physiol Pathol 2015, 2:5
http://dx.doi.org/10.4172/2329-955X.C1.003

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Global Summit on
Plant Science

September 21-23, 2015 San Antonio, USA

Efficiency of medicinal plant essential oils against insect pests of stored wheat

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The aim of this investigation was to evaluate pest management potential of some medicinal plants, against different strains of *Tribolium castaneum, Trogoderma granarium* and *Cryptolestes ferrugineus*, the most common and major insect pests of stored grain. Essential oils extracted from *Datura stramonium, Eucalyptus camaldulensis*, *Moringa oleifera* and *Nigella sativa* with concentrations of 5, 10, 15 and 20% were applied on filter papers to make physical contact or to repel the insects under a constant temperature of 30 ± 2 °C and 65 ± 5% relative humidity. All essential oils exhibited considerable insecticidal and repellent activities against test insects. Among the essential oils, *D. stramonium* showed the highest toxicity, i.e. 32.26, 23.83 and 56.41% mortality and repellency 74.1, 73.9 and 80.2% against *T. castaneum, T. granarium* and *C. ferrugineus*, respectively. Concentration and exposure time significantly affected the mortality and repellency. Overall repellency in all treatments was found higher after 48hr as compared to 24 and 72hr. Bioactivities were observed in the order of *D. stramonium*>*E. camaldulensis* >*N. sativa* > *M. oleifera*. The results clearly advocate the use of essential oils as integrated pest management technique to protect grain during storage.

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Overexpression of sterol methyl transferase1 gene, MuSMT1 from *Macrotyloma uniflorum* improves abiotic and biotic stress tolerance in *Arabidopsis thaliana*

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Sterol Methyl Transferase 1 (SMT1) enzyme catalyzes the production of 24-ethyl sterols. A gene MuSMT1encoding sterol methyl transferase 1 was isolated from *Macrotyloma uniflorum* and was overexpressed in transgenic *Arabidopsis* for functional characterization. MuSMT1 was found to impart tolerance against multiple abiotic stresses such as high and low temperature, drought, salinity and oxidative stresses in transgenic *Arabidopsis.* During stress conditions, transgenics were observed to retain their RWC, chlorophyll content and reduced MDA level compared to control plants. Transgenic plants also showed significant resistance to the necrotrophic fungus *Botrytis cinerea.* To further elucidate the mechanism, transgenic Arabidopsis overexpressing MuSMT1were found to accumulate 24-ethyl sterols. Paclobutrazol, a synthetic plant growth retardant severely impaired plant growth by inhibiting sterol-14-α-demethylation and thereby reducing 24-ethyl sterols production. Exogenous stigmasterol application could rescue the growth of paclobutrazol treatment wild type plants suggested the importance of specific sterol for growth and development in plants. While MuSMT1 transgenic *Arabidopsis* were able to maintain 24-ethyl sterols content and the growth and development even upon paclobutrazol treatment. Taken together, this study has for the first time documented the importance of MuSMT1 in biotic and abiotic stress tolerance of plants by maintaining the levels of 24-ethyl sterols.

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