INSECTICIDES (incl. Fungicides, Herbicides, Nematicides, Larvicides, etc.)

NPARR, 6(1 & 2), 2015-49 Antimicrobial and antioxidative activity of extracts and essential oils of Myrtus communis L.

Since synthetic antimicrobial agents and food additives can cause a number of adverse effects, there is a growing interest from consumers in ingredients from natural sources. Medicinal plants, such as Myrtus communis L. are a source of new compounds which can be used in both the food industry and for medical purposes, primarily as antimicrobial agents. In this review, the characteristics of myrtle essential oils and extracts are summarized, with particular attention to their chemical composition, biological activities and potential applications [Verica Aleksic and Petar Knezevic* (Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad, Trg Dositeja Obradovica 2, Novi Sad, Vojvodina, Serbia), Microbiological Research, 2014, 169(4), 240-254].

NPARR, 6(1 & 2), 2015-50 Antifungal activity of natural compounds against Candida species isolated from HIV-positive patients

To evaluate the antifungal effect of Cinnamomum zeylanicum (C. zeylanicum) and Melaleuca alternifolia essential oils and honey against strains of Candida sp. from HIV-positive patients in order to subsidize new therapeutic strategies for candidiasis. The study evaluated the antifungal effect of natural antimicrobials against 30 strains of Candida sp. isolated from oral cavities in HIV-infected patients. Then, they were compared to the action of fluconazole and amphotericin B. Antifungal susceptibility was evaluated by the broth macrodilution technique and the minimum inhibitory concentration and the minimum fungicidal concentration were determined. Among all antifungals evaluated in this study, amphotericin B was the one showing the best results; however, all compounds studied here showed inhibitory activities against isolates of Candida sp. Honey (0.0313–64 µg/mL) demonstrated fungistatic activity inhibiting 70% of the isolates. C. zeylanicum essential oil (0.0313–64 µg/mL) inhibited 93.3% of the Candida strains and Melaleuca alternifolia essential oil (0.0313–64 µg/mL) was able to inhibit 73.3% of them. Therefore, all natural compounds evaluated in this study, especially C. zeylanicum essential oil, may become promising agents for oral candidiasis therapy including in HIV-positive patients [Débora Oro, Andréia Heissler, Eliandra Mirlei Rossi, Diane Scapin, Patrícia da Silva Malheiros* and Everton Boff (Hygiene and Food Microbiology Laboratory, Department of Food Sciences, Food Science and Technology Institute, Federal University of Rio Grande do Sul, ICTA/UFRGS, Porto Alegre, RS, Brazil) Asian Pacific Journal of Tropical Biomedicine, 2015, 5(9), 781-784].

NPARR, 6(1 & 2), 2015-51 Non-pathogenic Fusarium oxysporum endophytes provide field control of nematodes, improving yield of banana (Musa sp.)

Endophytic colonization by the fungus Fusarium oxysporum can result in increased host resistance to pests and diseases, and greater biomass production. However, few studies have assessed the field performance of this fungus for biological control of pests and diseases in banana. Further to greenhouse assessment, studies were carried out to evaluate the performance of F. oxysporum strains against plant-parasitic nematodes on banana (Musa sp., cv. Giant Cavendish and cv. Grand Nain) in the field using tissue-cultured plants. Plants were inoculated separately with one of three strains (V5W2, Eny 7.11o and Emb 2.4o) before being inoculated with Pratylenchus goodeyi and Helicotylenchus multicinctus in an on-station trial and in an on-farm trial planted in a field naturally infested with the same nematodes. All three endophytic strains significantly suppressed P. goodeyi and H. multicinctus densities and damage in the field.
On-station, nematode population densities were reduced by >45% in endophyte-inoculated plants compared to non-inoculated plants, while percentage root necrosis was reduced by >20%. Similarly, on-farm, nematode damage to roots and densities were also significantly lower in endophyte-inoculated plants compared with control plants. Significantly improved yields were observed for plants inoculated with endophytes when compared to the control plants, with inoculation with strains Emb 2.4o and V5W2 resulting in up to 35% and 36% increased banana yields, respectively, for the on-station trial. For the on-farm trial, up to 20% increase in yields were observed for strain Eny 7.11o compared to control plants. This study provides the first report from the field in Africa on the reduction of nematode populations and damage, and the increase in banana production by fungal endophytes. The study shows that endophytes have potential to enhance yields of tissue-cultured banana plants and protect them against pests [Bancy Waweru, Losenge Turoop, Esther Kahangi, Daniel Coyne, and Thomas Dubois (International Institute of Tropical Agriculture, P.O. Box 7878, Kampala, Uganda), *Biological Control*, 2014, 74, 82-88].

*N P A R R, 6(1 & 2), 2015-52 Aflatoxin contamination of corn under different agro-environmental conditions and biocontrol applications*

Biological control of the fungus *Aspergillus flavus* has been shown to be effective in reducing aflatoxin contamination in corn. This study compared field application of a bioplastic-based formulation for delivering atoxigenic *A. flavus* isolates in Northern Italy and the Mississippi Delta.

Due to an extremely hot and dry summer at the Italy site in 2012, aflatoxin contamination was approximately seven times higher than in 2011. In 2011, and 2012, application of bioplastic granules inoculated with the atoxigenic isolate *A. flavus* NRRL 30797 at 15 and 30 kg ha\(^{-1}\) resulted in a reduction of aflatoxin contamination by 67.2 ± 4.1% and 94.8 ± 5.3%, respectively. The higher application rate was also effective when soil abundance of *A. flavus* was artificially increased by applying contaminated corn residues. At the Mississippi site, summer 2012 was also hot and dry, with high levels of aflatoxin contamination. In fields planted with non-Bt or Bt hybrids, application of biocontrol granules inoculated with *A. flavus* NRRL 30797 or NRRL 21882 at 30 kg ha\(^{-1}\) reduced aflatoxin contamination to up to 89.6%. Field experiments on two continents showed that bioplastic-based *A. flavus* formulations markedly reduced aflatoxin contamination under different agro-environmental conditions and infestation intensities [Cesare Accinelli*, Hamed K. Abbas, Alberto Vicari and W. Thomas Shier (Department of Agricultural Sciences, University of Bologna, Bologna 40127, Italy), *Crop Protection*, 2014, 63, 9-14].

*N P A R R, 6(1 & 2), 2015-53 Integration of soil-applied herbicides at the reduced rates with physical control for weed management in fennel (Foeniculum vulgare Mill.)*

Fennel has been widely used in traditional medicine for their antimicrobial effects. Since fennel is a long duration crop and have slow initial growth, it protection from weed is essential. Experiments were conducted for two consecutive seasons to evaluate the efficacy of soil-applied herbicides at the reduced rates in combination with physical control for weed management and optimizing the yield of fennel. Treatments were type of herbicide (trifluralin and pendimethalin), application dose (recommend dose (R), 75% R, 50% R, and 0% R) and physical weed control (none, one hand-weeding at 50 day after planting (DAP), wheat straw mulch). Weed-free control treatment was also included in each year. The results showed that the use of soil-applied herbicides resulted in reduced weed biomass but did not provide season long weed control without an additional physical control. In both seasons,
pendimethalin provided better weeds control than trifluralin. Reduced herbicide rates were found to be more effective when herbicides application followed by hand-weeding than when were used alone or combined with mulch. Experimental results also showed that one time increasing in herbicide rates increased seed yield by 17.5 and 7.5% in 2012 and 16.5 and 6.3% in 2013, when one hand-weeding and mulching were used as supplemental control, respectively. Overall, the 75% of the labeled recommended rate of herbicides followed by one hand-weeding at 50 DAP produced consistently high yields and less weed biomass, reflecting both superior weed control and crop safety [Ali Reza Yousefi and Mohammad Reza Rahimi (Department of Agronomy and Plant Breeding, College of Agriculture, University of Zanjan, Zanjan, Iran), Crop Protection, 2014, 63, 107-112].

NPARR, 6(1 & 2), 2015-54 Biorational versus conventional insecticides – Comparative field study for managing red spider mite and fruit borer on tomato

Tomato, Lycopersicum esculentum L. (Solanaceae) is an important crop worldwide that is grown both outdoors and under protected structures, for fresh market consumption and for processing. In the Mariana Islands, tomato is grown as an outdoor crop throughout the year. Tomatoes are attacked by a variety of pests, including the tomato fruitworm, Helicoverpa armigera (Hübner) (Lepidoptera: Noctuidae), and, in Pacific islands, the red spider mite Tetranychus marianae McGregor. These pests cause scarring, tissue damage, and aberrations in fruit shape or color, making the tomatoes undesirable for fresh market. Also, insect bodies, excreta or parts in fruits reduce their market suitability. Field trials aimed at improving management of these pests were undertaken at two locations in Guam (Yigo and Inarajan), USA in 2012 and 2013, assessing the efficacy of different biorational and conventional insecticides against T. marianae and H. armigera on tomato. At both locations, the mean percentage of mite-infested leaves and the population density of T. marianae were higher in control than in treated plots. An integrated pest management (IPM) program comprising sprays of selective insecticides (Petroleum spray oil, Beauveria bassiana, azadirachtin and Bacillus thuringiensis), evaluated at 15, 30, 45 and 60 days after transplantation of tomato seedlings, significantly reduced the number of T. marianae-infested leaves and the density of T. marianae over plots treated with carbaryl, malathion, six applications of B. bassiana or B. thuringiensis and over both controls at both locations. Similarly, significantly lower fruit damage by H. armigera was recorded in the plots treated with the IPM program than in plots treated with carbaryl, malathion, or the control treatments at both locations. Marketable tomato yields from the plots which received with the IPM program were significantly greater at both locations than were those in the other treatments [Gadi V.P. Reddy* and Ross H. Miller (Western Triangle Agricultural Research Center, Montana State University, 9546 Old Shelby Rd., P.O Box 656, Conrad, MT, 59425, USA), Crop Protection, 2014, 64, 88- 92].