

Botanicals: Sources for Eco-Friendly Biopesticides

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Editorial

To develop eco-friendly pest control technologies are the need of day and challenging tasks for developing countries to improve agricultural productivity in a sustainable manner. Of the total world's food production, one third was destroyed annually by more 20,000 species of pests in the field and during storage. Globally, crop production was increased by successful implementation of green revolution technology through the application of synthetic chemical pesticides in pest control program. Because of their indiscriminate use, more 500 species of insect pests, 270 species of weeds and 150 plant pathogens have developed resistance and even some of the pest species developed multiple resistances to more than one or/class pesticide. Rachel Carson in 1962 emphasized the importance of biotic approach to pest control in her closing remark in "Silent Spring". According to WHO estimation, 3 million cases of pesticide poisoning and 220,000 deaths are confirmed each year in developing countries. In the last two decades, US Environmental Protection Agency has banned/restricted the use of many hazardous pesticides associated with high toxicity and residual problems. In this pathetic situation and also increased "green consumerism" eco-friendly alternative methods are given importance to develop eco-products for pest control program.

Botanical pesticides are considered as one of the eco-safe alternatives due to their biodegradation in nature, multiple mode of action on target pests and may not leave toxic residues. Historically, many plant species have been explored well for human welfare by studying their insecticidal, repellent and antifeedant properties. In 400BC, dried and powdered pyrethrum flowers were practiced for delousing. In 17th century, first botanical insecticide nicotine was isolated from tobacco leaves and used to kill plum beetles. One Arab scholar listed 584 natural materials, mostly plants with pharmacological and poisonous properties in 970AD. Prehistorically, Derris, Nicotiana and Rytania were used to compact agricultural pests and their utilization extended till 1940's. These age old technologies practiced by the people in many parts of the world were replaced by modern pest control technologies. Recently more emphasis is being given for exploration of higher plants and their products, as novel chemotherapeutants for plants to replace deadly poisonous chemical pesticides in order to restore sustainable agricultural production and environmental health.

Unquestionably, plant kingdom is the storage centre for diversified secondary metabolites which are synthesized by the plants itself and used as defensive weapons against pest attack. In general, many plants contain wide spectrum of secondary metabolites such as phenols, flavonoids, terpenoids, quinones, tannins, alkaloids, saponins, coumarins and sterols which show vary in their efficacies against pest species. Recent study has listed 43 repellent plant species, 21 feeding

deterrent plant species, 47 toxic plants, 37 grain protectant plants, 27 reproduction inhibitor plants and 7 plants with insect growth and development inhibitors properties. However, documented plant species on the globe exceeds 400,000 which offer potential source for future exploitation. Therefore, exploration of rich floral diversity using modern technologies may provide the road to discover many more novel bio-pesticide compounds.

Recent time many research reports highlight bio-potential properties of several plant species. However, these plant species were studied and evaluated for anti-pest compounds only at laboratory level. Even though, several plant species proved to have anti-pest properties only a few are commercialized for various reasons. The well-known example is *Azadirachta indica* contributes for the development of more than 100 commercial products. Of late different botanical pesticide formulations are being identified for large scale field application that would be made available in industrialized and developing countries in near future for organic food production.

In addition, many aromatic plants essential oil and their derivatives are also given importance for pest control program. The essential oils may protect the plants against pest attack by producing strong odour to repel the insect and also with their insecticidal properties. Reports highlight that many essential oils were obtained from the plants belongs to the family Myrtaceae, Lauraceae, Rutaceae, Lamiaceae, Asteraceae, Apiaceae, Cupressaceae, Poaceae, Zingiberaceae and Piperaceae. The worldwide essential oil production was estimated to be 45,000 tons with the value of US\$700 million. Many private and multinational companies are showing great interest to produce essential oil for multipurpose including insecticides production for agricultural, domestic and veterinary pest control program. The Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) has also recognized that essential oil based commercial products are safe. Currently, Nanotechnology has pivotal role in development of plant based pesticides that may revolutionize pest control in near future.

Botanicals are future potential sources for development of eco-friendly products for crop protection. The botanical bio-pesticides would achieve the target of evergreen revolution if these bio-molecules can be characterized for their potency using available modern biotechnological tools, to develop low cost technology for compound isolation, formulation and commercial scale establishment of plant resource. The role of journal of biopesticides and biofertilizers in contributing and playing a vital role in dissemination of up-to-date developments in this field of research to the scientific world is greatly appreciated.