Conventional Botanicals
Nicotine, Rotenones, Sabadilla, and *Pyrethrum*

Besides traditional use of botanicals, their commercial use began in the nineteenth century with the introduction of nicotine from *Nicotiana tabacum*, rotenone from *Lonchocarpus* sp., derris dust from *Derris elliptica*, and pyrethrum from *Chrysanthemum cinerariaefolium*. Nicotine, an alkaloid obtained from *Nicotiana tabacum*, *N. rustica*, and *N. glutinosa*, is another well- established botanical insecticide. Nicotine analogues like nor-nicotine and anabasine also possess insecticidal properties. Nicotine is active against piercing-sucking insects such as aphids,leafhoppers, whiteflies, thrips, and mites .However, due to high mammalian toxicity and detrimental effect on human health, its use as an insecticide has decreased considerably.Rotenones, the first-generation botanical pesticides, have been extensively used in the past to control household and agricultural pests. Its use, however, had to be dispensed with due to high fish and/or mammalian toxicity. Rotenone is a naturally occurring chemical with insecticidal, acaricidal, and piscicidal properties. It is obtained from the roots of *Lonchocarpus* or *Derris*. Although rotenone is the primary constituent in insecticides containing these preparations, a second isoflavone, deguelin, also possesses similar biological properties. The use of *Derris* root powder was first patented in 1912. It is a selective, nonspecific insecticide, used in home gardens for insect control, for lice and tick control on pets, and for fish eradications as part of water body management. Rotenone is not very soluble in water and is used either as a dust or in an oil or kerosene solution. It exerts its toxic action by acting as a general inhibitor of cellular respiration.*Sabadilla alkaloid* derived from sabadilla(*Schoenocaulon officinale* A. Gray) and a number of *Veratrum* species generally referred to as *Veratrum* alkaloids are also known for their insect control properties. The insecticidal activity of sabadilla comes from the alkaloid fraction, which constitutes 3–6 % of the extract. Two most important lipophilic alkaloids in

the extract have been identified as veratridine and cevadine, the former being more insecticidal. The major effects of sabadilla poisoning include muscle rigor in mammals and paralysis in insects. Its mode of action is similar to that of the pyrethroids and acts through disruption of nerve cell membranes causing loss of nerve function, an increase in the duration of the action potential, repetitive firing, and a depolarization of the nerve membrane potential due to effects on the sodium channel. Sabadilla alkaloids are labile and break down rapidly in sunlight. These are less toxic to mammals than most other insecticides and are therefore safe to use.

Pyrethrum, the most widely used botanical insecticide is extracted from the flowers of *Chrysanthemum cinerariaefolium* (pyrethrum). It is highly effective against houseflies, mosquitoes, fleas, lice, and many other indoor arthropod pests. The toxins, namely, pyrethrins, cinerins, and jasmolins, have some unusual insecticidal properties, most striking being the immediate knockdown or paralysis on contact which causes most flying insects to drop almost immediately upon exposure .These compounds act both on the central nervous sys- tem and in the peripheral nervous system causing repetitive discharges, followed by convulsions. Pyrethrins have low toxicity to vertebrates and have wide acceptance worldwide. Like most other natural pesticides, pyrethrins are labile, have limited stability under field conditions, and are rapidly degraded by sunlight and heat. These are generally formulated with synergists such as piperonyl butoxide (PBO) to inhibit detoxifica- tion and improve insect mortality. Natural pyrethrins are considered as the best example of products manipulated in the laboratory to discover highly effective synthetic pyrethroid group of insecticides.Thus, successful use of traditional botanical has aroused further interest on exploring plant biodiversity for new bioactive phytochemicals and extractives as possible source of pest control agents. Some of the recent developments are described as under.