I N T R O D U C T I O N

Approximately 700,000 species of insects have been described in the world. According to Imms (1948) insects comprise about 70% of the known species of all kind of animals. Many of the insects are responsible for incalculable harm to human beings in several ways. Only about 1% of the insects are harmful in all sphere of life. It would not be an exaggeration to say that insects have been directly or indirectly responsible for more loss of life and destruction of food products than that caused by wars, floods, earthquakes, fires, and famines in the history of man. Every year they have been destroying our agricultural products as well as stored commodities in different ways; cost of which runs into billions of rupees. The cigarette beetle, Lasioderma serricorne F., is one of the serious pests of stored commodities which infests mainly cured tobacco leaves, but may also be found in spices, rice, atta, maida and other valuable stored products. Work has already been done on large number of harmful insects including L. serricorne F., in respect of bionomics and physiological activities. Nevertheless, continued research work is desireable to take effective defence measures against these pests and enemies of social as well as economic progress, so as to substantially reduce the enormous wastage and to facilitate national development.

In old days, mankind had tried to control the insects pest by simple means like nets, fire, swatters etc. On the other hand, since long back, farmers in India have practiced mixing of ash and other non-toxic materials to protect the stored grains against insect infestation. Work on insect control with inert dusts has been reported by Hockenyos (1933), Chiw (1939), Alexander, et al., (1944), Wigglesworth, (1944), and La - Hue (1965). In recent past, Golob et al., (1982) reported on the use of locally available materials such as powders of dolomite, wood ash, tobacco dust, saw dust and sand as protectants of maize against insect infestation under storage conditions.

Earlier, it was generally not realized as to how harmful are the effects of indiscriminate use of pesticides themselves and then the residual activity, if such were employed to control the house hold pests as well as those of stored products. Increasing realization of the magnitude of hazards caused by indiscriminate use of chemical insecticides has of compelling necesscity intensified the search for compounds possessing least toxicity and easy biodegradability. The available information on pyrethrins, rotenone and nicotine showes that these insecticides of plant origin are comparatively safer to mammals and higher animals (Feinstein, 1952). Invention and use of many highly potent organic chemicals for the control of insect pests such as B.H.C., D.D.T. and malathion was

resorted to during the early part of the current century. Use of these chemical insecticides in improper proportions and at inappropriate times resulted in the destruction of predators and parasites of insect pests themselves, thereby disturbing the whole ecological balance on one hand and on the other leading to development of resistant pest populations. Thus man created a "disasterous phase" for agriculturists, who were compelled to use more potent varieties of chemical insecticides and that too, in higher doses to control the pests; resulting in increase in the production costs ultimately affecting the profit. Hence, it became necessary to find out alternative methods of pest control having least of such hazards. In this context, scientists are of opinion that instead of chemical pesticides biological compounds possessing pesticidal properties would be safer, as they degrade in the nature sooner or later. More attention is therefore, being paid towards the pesticides of plant origin. There are many plants in naturally growing or cultivated, which have been found to be good sources of such insecticidal compounds and too, with no polution hazards.

Most of the chemical insecticides, at the present, are being imported from foreign countries and are expensive. So far as the insecticides from the plant kingdom are concerned not much is known in the country. We have to mostly depend on those available from other countries. Some of

these, such as pyrethrum, have been introduced to India and have established themselves fairly well. The larger the number of effective insecticides we discover from among the Indian plants greater will be the chances of their being brought into extensive use by the people, and thereby reducing cost and increasing profitability of agriculture practice and minimizing wastage of variety of stored products.

To date, approximately 2000 species of plants have been reported to possess potential insecticidal properties (Caius, 1986). Plant substances such as alkaloids, salanine, saponins, phospholipids, carboxylic acid, glycosides, essential oils, resins, nicotine, tannins, rotenone, non-protein amino acids, bitter fractions etc, have been tested for such insecticidal properties (Joshi and Usher, 1986).

Another commendable area of insects pest control relates to use deterrents and arrestants. These terms are employed here to connote following meanings:-

Deterrents : Chemicals that repel the insects and thereby inhibit feeding or oviposition.

Arrestants : Chemicals that cause insects to stop moving and thereby elicite feeding or oviposition.

The importance of insect deterrents and arrestants in pest management occupies a prominent place. Here again, cheaper and larger number of effective insect deterrants and arrestants that could be used from amongst plants growing in the country, the greater is the likelyhood of wide spread use.

In this context several researchers have been working all over the world on attractants since last 50 years.

The leaves of neem (Azadirachta indica A. Juss.) and of patchouli (Pogostemon heyneanus Benth,) and the roots of costus (Saussurea lappa C.B.Clarke.) were used to protect woolen fabrics from insect attacks. Articles placed in boxes made of sandalwood (Santalum album L.) were immune to attacks of insects pest. Some essential oils such as the eucalyptus oil from Eucalyptus globulus Labill. and citronella oil from Cymbopogon nardus L. when applied to the body, give relief from the bites of mosquitoes so long as the odour lasts. Hemp (Cannabis sativa L.) if spread under a bedsheet, affords ample protection against the fleas which disturb the sleep at night. The simple device of mixing the leaves of Trigonella foenum-graecum L. and of Vitex negundo L. etc. with grains before storage, especially in rainy season, as practiced by the agriculturalists in some parts of the country, saves the produce from the ravages of insects (Chopra, et al., 1958). Jillani and Malik (1973) demonstrated repellency of water and ethanolic extracts of neem (Azadirachta indica A. Juss.) leaves and seeds against adult and larvae of the red flour beetle, Tribolium castaneum Herbst., larvae of khapra beetle, Trogoderma granarium Everts. and adults of the lesser grain borer, Rhizopertha dominica F. Several insects deterrents have been isolated from neem seeds viz.—

meliantriol, a locust phagorepellent (Lavie, et al., 1967), azadirachtin, a feeding inhibitor for locusts (Butterworth and Morgan, 1968 & 1971) and a salannin, house fly feeding deterrent (Warthen, 1979). Warthen, et al., (1978) reported that azadirachtin isolated from ethanolic extracts of neem seeds inhibited the feeding of the fall army worm, S. frugiperda. Tan and Sudderuddin (1978) reported a similar effect on the dimondback moth, Plutella xylostella L. Crude extracts of neem seeds were shown by Jacobson et al., (1978) to be promising antifeedants against cucumber beetles. Mclachlan, et al., (1982) reported about the antifeedant activity of polyacetyline and phenylheptatriyne obtained from the plant family Asteraceae; with respect to Euxoa messoria (Lepidoptera : Noctuidae). Koul (1983) isolated two limonoids from the two plant species, Cedrela toona and Citrus paradesi and found these to be feeding inhibitors for the larvae of Spodoptera litura. Petroleum ether extracts of seeds of 50 plant species were tested by Khan et al., (1983) for their repellent or antifeedant activity against stored grain insect, Tribolium castaneum H. Ambika and Mohandas (1982) studied the relative efficacy of some antifeedants amd deterrents obtained from neem, coconut, rice, punnai, gingelly, groundnut and rubber seeds against insect pests of stored paddy. Streibl et al., (1983) isolated alantolactone, isoalantolactone and ent-isoalantolactone from the plant Locophola heterophylla and tested for feeding deterrent

activities on 3 storage pests, Sitophilus granarius, Tribolium confusum, and Trogoderma granarium.

In the light of above cited literature, it could be clearly seen that no work worth its mention has been reported so far in respect of deterrent and arrestant properties of locally available plant species against the destructive pest-cigarette beetle, Lasioderma serricorne F. The present project was, therefore, undertaken to screen locally available plants with a view to identify the effective plants and their components, to devise suitable simple methods of extraction, dosimetric studies and chemical analysis of deterrent and/or arrestant constituents against the pest, L. serricorne F.