PREFACE
Coupea (*Vigna unguiculata* (L.) Walp. *Syn. V. sinensis* (L.)) is one of the most important tropical and subtropical legume crops. Apparently native to Central Africa, it is cultivated on nearly 0.85 million hectares in India. It is well adapted to a great range in climatic, soil and cultural conditions especially in comparison with other leguminous crops (Ligon, 1956). Coupea pulse beetle, *Callosobruchus* spp. is one of the most destructive pests of seed during storage and often results in enormous losses. The annual loss caused by this pest was estimated to be 55,000 tonnes, out of an annual production of one million tonnes in Nigeria (Caswell, 1973). In different parts of the Indian Union, leguminous seeds were comparatively more damaged and a loss of some 33 percent was attributed to bruchidae alone (Mokherjee *et al.*, 1970).

The indiscriminate use of pesticides is causing alarm all over the world. The danger of air pollution, water pollution, stored food pollution and hazards to operators and wild animals should be minimised. Toxicological and residue problems are rapidly increasing in some areas e.g. the control of stored product pests, now that modern pesticides, often organic chemicals of a complex nature are being used on a large scale. The indiscriminate use of pesticides by traders, farmers and other agencies has become a serious health hazard.

Recognition of the limitations on the one hand, and the damage caused to the biosphere on the other, by continued extensive and sometimes indiscriminate use of conventional synthetic organic insecticides has led to a radical revision of insect control strategies in the past decade.
Isolation, identification and procurement of insect control agents of various categories from plants constitute an important part of this revised overall strategy to fight the insect menace. Botanical sources can yield chemicals which are outright repellents, antifeedants or even insecticides e.g. pyrethroids, rotenoids etc. Competent professionalism and close harmony between chemists and biologists is essential to progress the meaningful tapping of plant resources for insect control. These resources should provide an effective, cheap, readily available and non-hazardous means of preventing the damage caused by insect pests.

The present investigation on intrinsic rate of increase and an evaluation of some indigenous plant products for repellents, antifeedants and insecticides for the control of pulse beetle, *Callosobruchus maculatus* (Fabr.) infesting copea seed was undertaken in the different physical conditions prevailing during the storage period in godowns particularly in Northern India.

Section-I gives a brief account of the history of intrinsic rate of natural increase of insect, history of indigenous plant products for repellents, antifeedants and insecticides for the control of insect pests, realization of usefulness of indigenous plant products. The importance of the present study and a brief review of literature on species of pulse beetle, damaging the leguminous seeds in India and in other countries is given. The distribution, biology including fecundity, incubation period, life cycle, effect of temperature and humidity on the biology etc. of pulse beetle and the damage and losses caused by pulse beetle is reviewed. The intrinsic rate of natural increase of insect and indigenous plant products as repellents, antifeedants and insecticides are also reviewed.
Section-II reports on studies on the intrinsic rate of increase of pulse beetle, *C. maculatus* at different temperatures (27 ± 1°C, 30 ± 1°C and 35 ± 1°C) in cowpea seed.

The optimum temperature for the development of egg, larva and pupa was observed to be 30 ± 1°C while for adult stage it was 27 ± 1°C. Unmated adults lived longer than mated ones. As temperature rises, the age specific fecundity (fertility), net reproductive rate and mean length of a generation were found to decrease. A positive correlation was observed between innate capacity for increase in numbers, finite rate of increase, instantaneous birth rate and instantaneous death rate and increase in temperature.

Section III - In this section, the effect of various oils, viz., Karanjee, Mahua, Castor, Mustard, Neem, Lemongrass, Coconut, Citronella and Groundnut at three dosages (0.2, 0.4 and 0.6 parts/100 parts of seed w/w) on the ovipositional behaviour, population of one pair of pulse beetles and percent damaged cowpea seeds at three different temperatures viz., 27 ± 1°C, 30 ± 1°C and 35 ± 1°C have been reported.

Oviposition was completely inhibited by each dosage of Karanjee oil just after treatment followed by Citronella and Lemongrass. Development of the adult population of pulse beetle was retarded by at least for four months by all the oils. Karanjee and Mahua oils proved to be superior to Lemongrass, Citronella and Castor in reducing the population of pulse beetle. All the oils protected cowpea seeds from pulse beetle damage for up to four months after treatment. Karanjee oil proved to be the most effective treatment followed by Mahua, Lemongrass, Citronella and Castor oils. The germination or viability of treated seeds was not impaired except in the case of high dosage with Lemongrass oil.
Section-IV gives the results of the evaluation of some plant extracts (Ipomoea, Adhatoda, Parthenium, Tridax and Embelia) prepared in petroleum ether, benzene and alcohol for use as repellents, antifeedants or insecticides. The fecundity of pulse beetle was inhibited when coupea seed was treated with various indigenous plant materials extracted in different solvents. The plant material of Tridax extracted in petroleum ether was found to be effective in checking the oviposition of pulse beetle. The development of pulse beetle was prevented by all the plant products extracted in different solvents. The extracts of Tridax in petroleum ether was found to be most toxic. All the plant materials extracted in different solvents significantly protected the coupea seed from damage by pulse beetle for up to 60 days after treatment. The extract of Tridax in petroleum ether proved to be best protective.

The main features narrated in the previous pages indicate the extent to which these investigations have contributed to the knowledge of intrinsic rate of increase of pulse beetle during storage under different physical conditions prevailing in the godowns of Northern India and evaluation of different indigenous plant products for repellents, antifeedants and insecticides for the control of pulse beetle, C. maculatus. It is hoped that the information thus gained would be useful in developing practical methods of protecting of coupea seed during storage.