1. INTRODUCTION

Storage of agricultural produce without or with minimum spoilage is problematical in most of the tropical countries. During storage a number of organisms viz., rodents, insects, fungi, mites and moisture etc., cause considerable losses. Insects occupy key position amongst these storage pests.

Rice is a most important food crop for more than half of the World's population. Losses to rice storage pose a threat to the very existence of an enormous number of people. Even though the increase in rice production has not kept pace with increase in demand, yet increasing quantities of rice produced is now becoming available for storage. Reliable estimates of overall national losses during rice storage are not available but these are much greater than generally appreciated.

Insects cause different types of losses in stored rice. These are quantitative, qualitative, grain viability loss and production of secretions toxic to man. Body fragments or dead bodies of insects left in stored grains cause health hazards. Insects also act as carriers of many toxigenic or pathogenic fungal spores and contaminate the healthy grains.

Use of synthetic contact insecticides, fumigants, plant products, bio-agents, radiant energy, physical methods
like sanitation, grain handling, use of entolettes, dryers, improved storage structures, non-conventional methods like use of sterilants, growth regulators, juvenile hormones and their analogues, sex pheromones, antifeedants, repellents and manipulation of storage atmosphere are the options investigated so far for insect pest management of stored rice (Prakash et al., 1981c). Some of these approaches, like use of physical methods, plant products, synthetic contact insecticides and fumigants are being currently used for minimising storage losses.

Plant products being indigenous resource, with insecticidal and insect repellent properties, are traditionally in use for over a century, to minimise losses in grain storage due to insects. In general the plant products, except natural pyrethrins do not possess quick knock-down effect unlike synthetic contact insecticides and fumigants, which are currently being recommended for the control of stored grain insect pests. Yet the plant products have many advantages over the synthetic insecticides. Plant products possess little or no mammalian toxicity when compared with their synthetic counterparts and thus constitute no health hazards. The surface persistence lasts for long period and no adverse effect on seed viability, cooking quality and milling has been reported. These are less expensive and are easily available.
Increasing awareness of hazards in use of synthetic pesticides, several reported cases of food poisoning and development of resistance by insects to the commonly used insecticides have created renewed interest in the use of plant products for storage pests. Research work on plant products was reviewed recently by Prakash et al. (1981b). Different parts of plants have been found to possess insecticidal, insect repellent, antifeedant or ovicidal properties against different insects attacking stored grains. Production of large quantities of such products for practical use in storage has yet to be attempted. The possibilities of encouraging large scale natural cultivation of concerned plant has to be explored so that the desired parts of the plant are available at the time of need particularly for small scale storage. However, for large scale storage use of plant parts pose the problem of space. In such cases use of suitable extracts of the plants could be feasible. Therefore the future lies in identifying the active principles involved in the plant products and make them available at a cost competitive with synthetic insecticides so as to discourage the latter’s use.

Certain plant products have been evaluated as paddy grain protectants under natural and controlled conditions of storage (Prakash, 1979, 1980, 1981; Prakash et al., 1979, 1980a,b; 1981e; 1982a,b; Prakash and Rao, 1983). Begunia
and bel leaves are most promising grain protectants. These possess insect repellent property against insects attacking stored paddy (Prakash, 1979, 1980, 1981; Ahmed and Sultana, 1980; Prakash et al., 1981a, 1982a,b). However, begunia and bel leaves are not available throughout the country in dry and wet seasons and inability to store the leaves in large quantities for long duration limits the practical applicability of this product. It is thus of much importance to identify the active principle in these leaves for its commercial use. Studies were therefore, carried out to isolate, characterize and identify the active components from the leaves of begunia, *Vitex negundo* Linn. (Verbenaceae) and evaluate the active components against the attack of selected major storage insect pests viz., angoumois grain moth, *Sitotroga cerealella* Oliv.; lesser grain borer, *Rhyzopertha dominica* Fabr. and rice weevil, *Sitophilus oryzae* Linn. (Prakash et al., 1984) in laboratory and natural conditions of paddy storage. Seed viability, cooking quality and mammalian toxicity of grains treated with active components were also studied. Studies conducted on leaves of bel, *Aegle marmelos* (Rutaceae) resulted in very low recovery of active component. In addition a very high cost was involved in obtaining required amount of active component for its identification and evaluation. Hence, these studies were suspended.