I. TOXICITY TESTS AGAINST INSECTS

1. Bioassay:

It is the combination of two words: Bios–life; assay–determination. Thus bioassay stands for determination of relative toxicity of insecticides by studying and examining their effects on living organisms. In broad sense, the term "bioassay" or "biological assay" refers to the procedures for determination of relation between a physiologically active agent and the effect which it produces in the living organism. According to Finney (1952) "the term biological assay should be understood to mean the measurement of the potency of any stimulus physical, chemical or biological, physiological or psychological by means of the reactions which it produces in living matter".

i. Principle of bioassay:

The principle of bioassay is to compare the response of insects from treated samples to those from a series of standards under the same conditions. The response may be based on knock down, mortality, photomigration etc. In bioassay, the extracts or prepared insecticidal concentrations are deposited on a proper surface or dispersed in water. The test insects are then released which come in contact with the toxicant. Vineger fly (*Drosophila melanogaster*).housefly (*Musca domestica*) and mosquito larvae are highly susceptible to insecticides and are generally used for microbioassays. No doubt that any test organism,

which is susceptible, can be used but to obtain a sensitivity from 0.1 ppm to 1.0 ppm concentrations only the above mentioned insects are found more suitable. Moreover, these organisms are easy to handle and easy to rear so as to provide a uniform population of known age and stage.

The words 'symptoms' and 'effect' have been used several times without a precise indication of their meaning. Symptom signifies any particular change in behaviour visible to an observer whereas the effect includes any abnormal condition, generally leading to death.

ii. Factors affecting bioassay:

(a) Biological: It is true that the selection of test insect for bioassay depends on their susceptibility to toxicant yet factors such as stage of the insect, sex, age, size etc. also play an important role. For instance male houseflies are more susceptible than female flies. Likewise mosquito larvae show great variation in their response to toxicants.

(b) Physical and Chemical: Contamination with toxic or non–toxic material may interfere with the process of bioassay. Some insecticides are more volatile (viz. phosdrin, aldrin, lindane etc.) and get vaporised readily. Evidently, to reduce such losses other materials are required to be added. Such physical and chemical factors may affect the responses of insects, modify the nature of deposit of the toxicant and may change their availability and uptake. Hence proper care and cleanup steps are very necessary.

iii. General Criteria for Bioassay:

An effect is a measure of the dose over a range of stimulli. Since a dose is a controllable variable, measurement with precision becomes a basic requirement for bioassay. The effect must be determined qualitatively. The mortality counts be based on the counting of dead as well as moribund insects. All the tests must be sensitive and the results obtained must have reproducibility.

iv. Basic Criteria for Test Insect in Bioassay:

(a) Availability: It is extremely difficult to have bioassay programme on the basis of insect trapped from field. Rearing of test insect is, therefore, an essential pre-requisite for any bioassay programme. For bioassay laboratory adapted strains are required. There is no doubt that "gene pool" of the stock changes during adaptation from wild to laboratory condition but due to "inbreeding depression" the number of test insects are not available in sufficient quantity.

This happens in 4th or 5th generation. If this stage is successfully passed then a laboratory adapted strain is obtained.

(b) Food: On plant food limited number of test insect is obtained round the year. Artificial diet has overcome this difficulty.

(c) Behaviour: Mating, oviposition, cannabalism.

(d) Fecundity: It is desirable to conlonize species with high innate capacity for increase.

(e) Sensitivity: The test insect should be sensitive enough to the insectical response e.g. *Drosophila,* houselly, mosquto larvae.

(f) Easy handling: The test insect must be such which could be handled easily.