MATERIALS AND METHODS

Test Insects:— The melon fly, Dacsa cucurbitae belongs to the family Tephritidae of the order Diptera. It is a pale white insect with small tegulae. The wings are conspicuously marbled with dark markings and thorax bears yellow stripes. Vibrissae are wanting and the antennae are short. The eyes are small and do not meet above in either sex. (Metcalf and Flint, 1967).

During the present studies a laboratory colony of D. cucurbitae was developed by collecting the larvae from infested fruits of Luffa aegyptiaca, Citrullus vulgaris and Momordica charantia from fields in and around Aligarh. The damaged fruits were kept in glass jars 8'' x 4'' in size and containing a four inch layer of sand. When about to pupate the larvae came up to the surface of the infested fruits and entered the sand for pupation. Newly formed pupae were separated from the sand and kept in petridishes in 1-foot square wire meshed wooden cages, on emergence the adults were fed on sucrose, Protinex (10:1) and pieces of spanish gourd.

Rearing technique:— The flies were reared at a temperature of 28 ± 1°C and 70.0 to 80.0 percent relative humidity on a diet of sucrose and protinex, containing protein hydrolysate with
vitamins, carbohydrates and minerals. Fresh pieces of Spanish gourd *Cucurbita maxima* and pieces of sponge soaked in water were also kept in the rearing cages. The Spanish gourd pieces containing the eggs were removed from the cages at twenty four hours intervals and were transferred to glass jars, 8" x 4" in size and containing four inches thick layer of sand. Sodium benzoate was sprinkled in each jar to prevent fungal growth. The jars were covered with muslin cloth in order to prevent the larvae from escaping out. On hatching the larvae were fed on the pulp of the fruits. Fresh pieces of the fruit were added when required. Pupation occurred in the sand and the newly formed pupae were picked up by filling the jars with water and gently stirring it. They were later placed in petridishes in 8 inch square cloth cages after being dried on a blotting paper.

**Test Methods:** The susceptibility level of the adult flies to different formulation of DDT, 
HCH, dieldrin, trichlorfon, fenthion and DDVP was determined by applying measured drops of the desired insecticide solution on the dorsum of the individual flies by means of a hypodermic syringe. The flies were anesthetized by carbondioxide to facilitate handling during the testing operations. Each fly was held by its wing with fine forceps and brought to the tip of the needle. By rotating the screw head on the circular scale of the micrometer the desired quantity of the insecticide solution was applied on the dorsum of
each fly. The size of drop was kept constant throughout the tests. The treated flies were kept in 4" x 2" cages made of rice paper and card board. A few crystals of sugar were added to each cage through a circular hole which was cut in its top. The hole was plugged with moist cotton to provide suitable moisture conditions. A cage was used only once to avoid any possible contamination. Mortality counts were made after 24 hours of the treatments and LC$_{50}$ values were derived from the dosage mortality regression lines as fitted by eye (Hoskins and Gordin, 1956).

The susceptibility of $D_{.}$ cucurbitae to toxic baits was evaluated by allowing the adults to feed on the treated diet. Different solution of insecticides were mixed with equal quantities of sucrose in a paste mortar; dried at room temperature and grinded thoroughly to make a thin powder. Arsenical compounds were dissolved in distilled water whereas dieldrin, malathion and sevin were dissolved in acetone. The treated diet was then fed to the newly emerged flies for three consecutive days. Mortality counts were made on the fourth day and base line data on the susceptibility of melon fly was obtained. LC$_{50}$ values were derived from dosage mortality regression lines as fitted by eye.

The effects of different toxicants on the reproductive potential of the species were also studied. The adults were
fed on diet treated with the desired insecticide, sodium arsenite, sodium arsenate, dieldrin, malathion or sevin. Sublethal doses which killed 50.0 to 80.0 percent of the flies were given to the flies for three days after emergence. The survivors were paired in 3" x 3" cages constructed of wireframes covered with mosquito netting and were fed on normal diet. Pieces of Cucurbita maxima were kept in petridishes to serve as oviposition sites. The flies readily oviposited in such pieces and the eggs so collected were placed on moist black cloth and their rate of hatching was determined. Preoviposition, oviposition and post-oviposition period of the treated flies was also determined and compared with that of the normal ones. Survivals of the dieldrin and sevin treated flies were bred to the next generation which was again subjected to insecticide pressure and in this way selection was carried out for three generations.

The sterility effects of chemosterilants on flies of different age groups were also investigated. Different concentrations of metepa, thiotepa and apholate were prepared in acetone and were mixed with equal quantities of sucrose in a paste mortar and grinded. Such a treated diet was fed to 1 day old, 20 day old and 40 day old flies for three consecutive days. The flies were given normal diet before and after their exposure to the chemosterilant treated diet. Reciprocal crosses were made between the treated and the untreated flies as also between the treated
males and the treated females. Eggs collected on moist black
cloth were observed for their rate of hatching and percent net
sterility was calculated after the manner described by Hair and
Adkins (1964).

The effects of chemosterilants on the bionomics of D.
cucurbitae were studied with respect to the incubation period,
the larval and the pupal duration. Percentage hatching, pupation
and emergence were also recorded. The adults were fed on a diet
treated with the desired chemosterilant for three days after
emergence. The chemosterilants used were apholate, metepa and
thiotepa. The males and the females after being treated were
kept in 3" x 3" cages and the eggs obtained from such crosses
were collected and placed in moist black cloth. The duration
of the incubation period was determined and the newly hatched
larvae were placed on pieces of Cucurbita maxima in glass jars
containing sand for rearing purposes. Larval duration was also
determined and the pupae thus obtained were kept in petridishes
in cloth cages for the adults to emerge.

The effects of the arsenical compounds sodium arsenate
and sodium arsenite and the chemosterilant metepa on the repro-
ductive tissues of D. cucurbitae were also studied. Newly
emerged flies were fed on diet treated with 0.03125 percent
sodium arsenate or sodium arsenite or with 0.25 percent metepa
for three days. Ovaries as also the testes were then removed from 16 day old flies which were dissected in normal saline. They were kept in alcoholic bouins for 24 hours, washed in several changes of 70.0 percent alcohol and dehydrated through a graded series of alcohol. These specimens were embedded in wax and the section were cut at 5 μ. These were stained in Heidenhein's Iron haemotoxylin and counterstained with eosin. In the same way the ovaries and the testes of the normal flies were also sectioned and stained.

The geotactic behaviour of D. cucurbitae was studied by releasing the flies in a 6 feet long cylindrical cage of 1 foot diameter and consisting of a wooden stand and nylon georzette cover with outlets at different levels (figure 19). Flies were released into the cage from the middle outlet and were left as such for three hours. They were then separated in two groups - those found sitting in upper and the lower halves of the cage. Each group of flies was then reared to produce the next generation for further experimentation.

Chemicals:- The chemicals used during the present investigations were obtained from different sources. P, P' DDT was obtained through the courtesy of Mr. J.W. Wright of WHO, gamma-HCH from Diamond Alkali Company and dieldrin from the Shell Chemical Company.
The organophosphate compounds trichlorfon, fenthion, DDVP and malathion were obtained from Bayer (India) Ltd., whereas Sevin, and arsenical compounds sodium arsenite and sodium arsenate were obtained from Union Carbide India Limited, and Riedel-de Haen A.G., Seelze b. Hannover respectively. The chemosterilants thiotepa, metepa and apholate were obtained through the courtesy of Dr. A.B. Borkovec, USDA, Entomology Research Division Beltsville, Maryland 20705.