SUMMARY

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The present investigation was suggested to study the possibility of developing radioresistance against chronic and acute irradiation by the house fly, Musca domestica L. exposed for successive generations to substerilizing doses of gamma radiation.

Also the present study aimed at investigating the effect of acute sterilizing doses of gamma radiation on the mating behaviour and competitiveness value of the house fly male and female populations resulting from previously exposed potential strain to substerilizing doses for several generations.

A- The effect of chronic irradiation on the biology of house fly through successive generations:

Four doses of irradiation namely 700, 900, 1100 and 1300 rad were applied to fourteen generations and observations were undertaken at generations number F_1, F_3, F_5, F_8, F_{11} and F_{14}.

1- Adult emergence and sex ratio:

* Emergence of adult flies was affected at all tested doses through successive generations. Generally a reduction in the percentage of adult emergence through successive generations was observed.

* No apparent effect on the sex ratio was observed when using chronic exposure of gamma radiation.

2- **Adult longevity:**

* Adult longevity was highly affected by chronic irradiation. It was evident that adult females derived from irradiated pupae of selected populations and reared in usual way died at significantly faster rate and have a shorter life span than females derived from non irradiated populations.
* There was a difference in mortality rates between irradiated and non irradiated populations, however; this difference was comparatively small.

3- **Fecundity:**

* Fecundity was affected by the exposure to gamma radiation.
* The effect of gamma irradiation was extended to different generations.
* There was a correlation between the radiation doses and their response of fecundity.

4- Fertility:

Results indicated a highly significant positive relationship between the applied dose of gamma irradiation and the hatchability. The higher dose has the lower percentage of hatchability. A slight gradual decrease in hatchability through successive generations was observed.

B- Measurements of ratio sensitivity of M. domestica L. exposed to substerilizing doses of gamma radiation for five and eleven generations:

F_6 and F_{12} populations were previously treated for five and eleven generations by chronic substerilizing doses and then offered an acute dose of 3000 or 4500 rad.

1- Effect of acute dose of 3000 or 4500 rad on F_6 population:

a- Adult emergence and sex ratio:

* **Adult emergence was** adversely affected by acute additional doses.
* Results indicated that irradiation of pupae derived from populations previously irradiated and exposed to an additional acute dose of 3000 or 4500 rad had no effect on sex ratio of all populations.

b- Adult longevity:

* Populations of M. domestica L. treated in ancestor generations and exposed to 3000 rad in F_6 as acute dose showed a clear shortening effect on the life span of the emerging adults.
* There was a correlation between the radiation substerilizing dose and their response of adult longevity.
* Data indicated that there might be a relationship between egg laying and female longevity. It is concluded that the higher longevity of females has the lower number of egg laid.

c- Fecundity and fertility:

* Fecundity was reduced by exposure to acute doses of gamma radiation.
* Acute dose (3000 rad) when applied to the control group stimulated the egg production.
* Populations which treated successively with chronic irradiation doses and then offered an acute dose showed a negative response of fecundity and fertility.

2- Effect of two additional acute doses of 3000 or 4500 rad on F_{12} population

a- Adult emergence and sex ratio:

* All populations indicated a highly significant reduction in adult emergence than their corresponding control.
* Exposure of F_{12} populations to an acute dose did not effect the sex ratio.

b- Adult longevity:

* Both male and female F_{12} populations exposed to an acute dose survived significantly longer than their corresponding control ones, i.e. males and females from the irradiated selected populations died at a significant slower rate than males and females of the non irradiated populations.

c- Fecundity and fertility:

* Acute exposure of gamma irradiation had a highly significant effect on the fecundity and fertility of F_{12} population.
* There was a highly reduction in egg number laid by irradiated females.
* Fertility was also reduced. This reduction was correlated with the dose received in ancestor

generation and on the other hand with the acute dose of 3000 or 4500 rad.

* The dose of 4500 rad being the sterilizing dose of M. domestica.

According to the obtained results, it may be concluded that exposure of F_6 or F_{12} populations to an acute dose of 3000 or 4500 rad did not increase the radioresistance of the irradiated selected populations of M. domestica L. .

c- The effect of acute dose of gamma irradiation on sexual competitiveness of M. domestica

I- Mating competitiveness of irradiated males mated with normal females

a- Mating competitiveness of F_7 and F_{13} males:

Mating competitiveness of males of the irradiated selected populations when assessed by the percentage of egg hatch showed that:

* In the combination of 20 irradiated males, 20 normal males and 20 normal females 1:1:1 combination, the egg hatch data obtained in the mating competitiveness experiments when compared with the expected egg-hatch data there was a reduction in competitiveness values.

* According to these results it may be assumed that competitiveness of male of M. doemestica L. was affected by irradiation. As the dose level was increased, the mating competitiveness was decreased.

II- Mating competitiveness of irradiated females mated with normal males:

* In all treatments the expected egg hatch was higher than the observed one.
* Egg production decreased by increasing the dose of exposure.
* Irradiation of females were more affective in reducing the percentage of egg hatch.
* In all treatments mating competitiveness of irradiated females were higher than that of normal ones.