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EFFECTS OF GAMMA RADIATION ON THE SEXUAL ATTRACTION OF THE MEDITERRANEAN FRUIT FLY *Ceratitis capitata Wied*

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ABSTRACT

The Mediterranean fruit fly, *Ceratitis capitata* Weid, was gamma irradiated as full grown pupae with 50, 70 and 90 gray. The produced adults were examined for their attractiveness to the non irradiated (normal) other sex. Well as the attractiveness of the latter to the irradiated other sex was also examined. The results obtained showed that all gamma doses tested had no clear effect on the attraction of normal females by irradiated males. At 50 and 70 gray, the irradiated females were less attracted by normal males, than the normal females, while at 90 gray the irradiated females were more attracted by normal males than normal females. A very low percentage of males were attracted by females whether they were irradiated or not.

INTRODUCTION

The damage caused by the Mediterranean fruit fly (Medfly), *Ceratitis capitata* Weid,to Egyptian agriculture is increasing mainly because farmers are finding it harder to choose suitable means of control in view of the difficulties frequently associated with the use of insecticides, such as undesirable residues and biological disequilibrum. Recently, the sterile insects technique has opened up new possibilities of this insects control in Egypt.

Many records have been obtained on the bad effects of gamma radiation on the vitality and consequently competitiveness of the males in the normal population. Mating in the medfly is influenced considerably that attracts mature females (Jacobson *et al.*, 1973).

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The present study was carried out in order to investigate the role of gamma radiation in reflecting the sex attraction whether through inhibition of sex pheromone production in irradiated males or the effect on the response of irradiated females towards males.

MATERIALS AND METHODS

The medfly was reared in the laboratories of Radiobiology Department, Nuclear Reseach Centre, Atomic Energy Authority of Egypt, as described by Wakid (1975). Irradiation was conducted using a ^{60}Co gamma cell unit giving a dose rate ranging from 8–14 rad/second throughout the present work. For attraction expirement the design suggested by Rössler (1977) was used after modifications. Twenty five males and an equal number of females were segregated within 24 hours after eclosion and held separately in plastic cage at the standard laboratory conditions (25 ± 2°C, 70% R.H.). Connection of the two cages by a plastic tube was performed after four days of separation. Males or females were irradiated at their pupal stage one day before eclosion. Five types of observations were made for the number of attracted sex to the other sex:–

1. Attraction of normal females to normal males (control).
2. Attraction of normal females to irradiated males.
3. Attraction of irradiated females to normal males.
4. Attraction of normal males to irradiated females.
5. Attraction of irradiated males to normal females.

Variables which may affect the assay including sexual maturity and stage of flies of both sexes, mated or unmated status of females, temperature, humidity and light, etc. were considered. Flies of different ages of both sexes were tested to ascertain whether the effect of treatment or selection on response to or production of phermone may become evident with age.

Three doses of gamma radiation, 50, 70 and 90 gray were used together with a normal control in six replicates each were used.

RESULTS AND DISCUSSION

The data obtained are shown in Figs. (1, 2 & 3). From Fig. 1, it is obvious that gamma radiation had no clear effect on the attraction of females by irradiated males or in other words, pheromone was not affected by irradiating the males with doses up to 90 gray of gamma radiation. The percentage of normal females attracted by irradiated males were, 49.2, 52.4 and 58.2 at 50, 70 and 90 gray, respectively, in comparison with 58.9 in the controls (normal females to normal males).

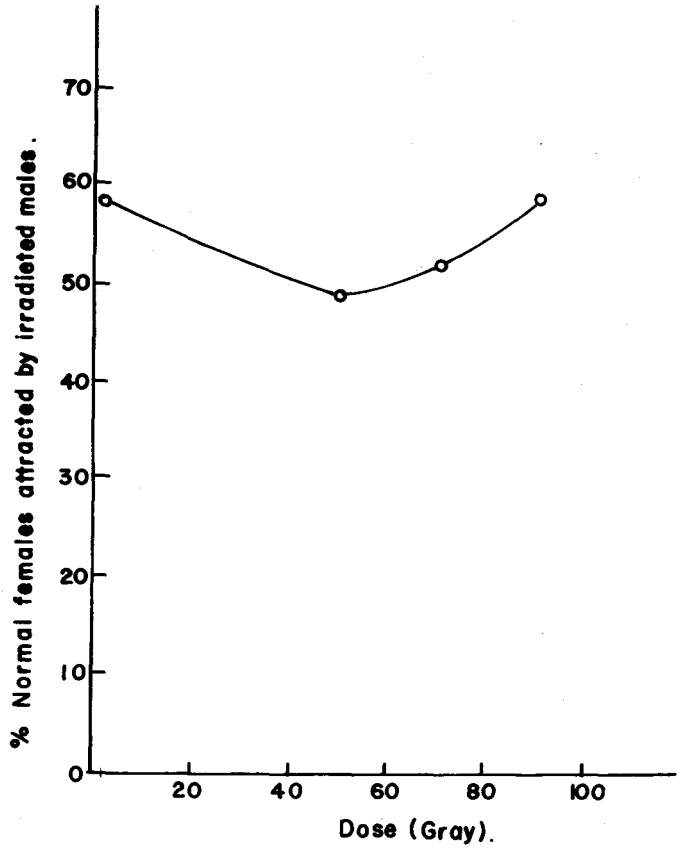

Fig. 1 : Effect of gamma radiation on the response of normal females towards irradiated males of *Ceratitis capitata*

The effect of gamma radiation on the attraction of irradiated females by normal males is illustrated in Fig. 2. The percentage of irradiated females attracted by nornal males were 49.1, 39.5 and 61.1 at 50, 70 and 90 gray, respectively, while it was 52.0 in the control group. This means that 50 and 70 gray of gamma radiation seem to have a slight (insignificant) effect on the chemoreceptors of the females that receive the chemical signals (phermone) produced by the males and consequently were slightly attracted towards them. However, at 90 gray the percentage of irradiated females attracted by normal males was raised again to a higher than the control, although insignificant. This increase in the percent of attracted females at high doses could not be explained.

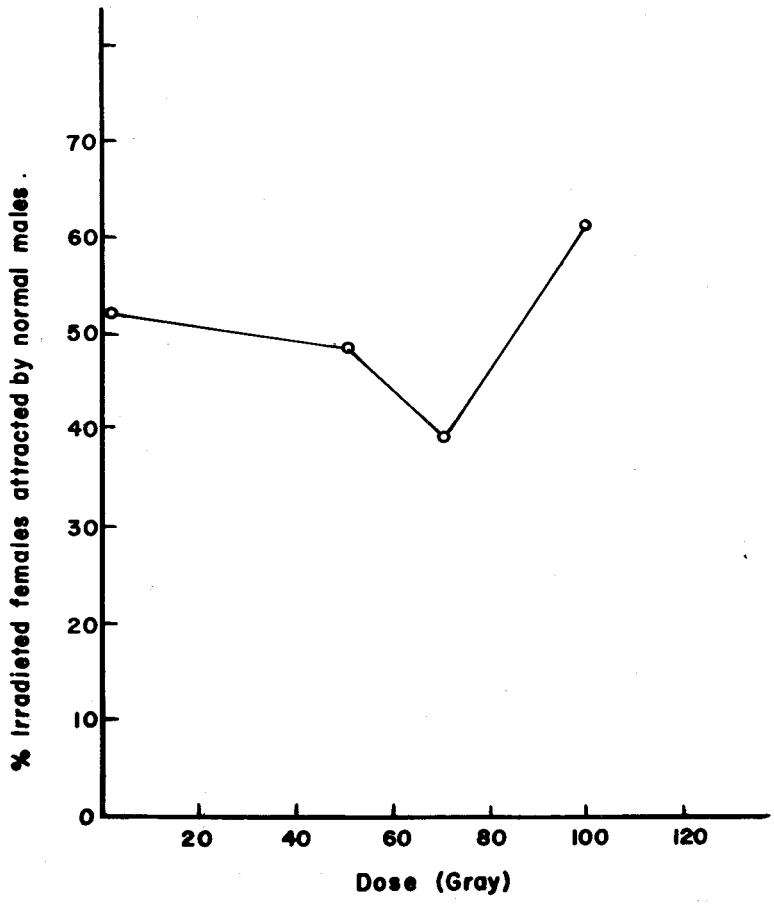

Fig. 2 : Effect of gamma radiation on the response of irradicated females towards normal males of *Ceratitis capitata*

From Fig. 3 it is clear that a very low percentage of males were attracted by females whether they were irradiated or not. At 50, 70 and 90 gray; 8.3, 8.4 and 10.6% of the irradiated males were attracted by normal females compared with 8.3% in the controls. Also, 11.6, 7.1 and 12.2% of the normal males were attracted by irradiated females, compared with 11.0% in the control group. This results ensures the fact reported by Jacobson *et al.*, (1973) and other workers that the male medfly attracts females and not the opposite.

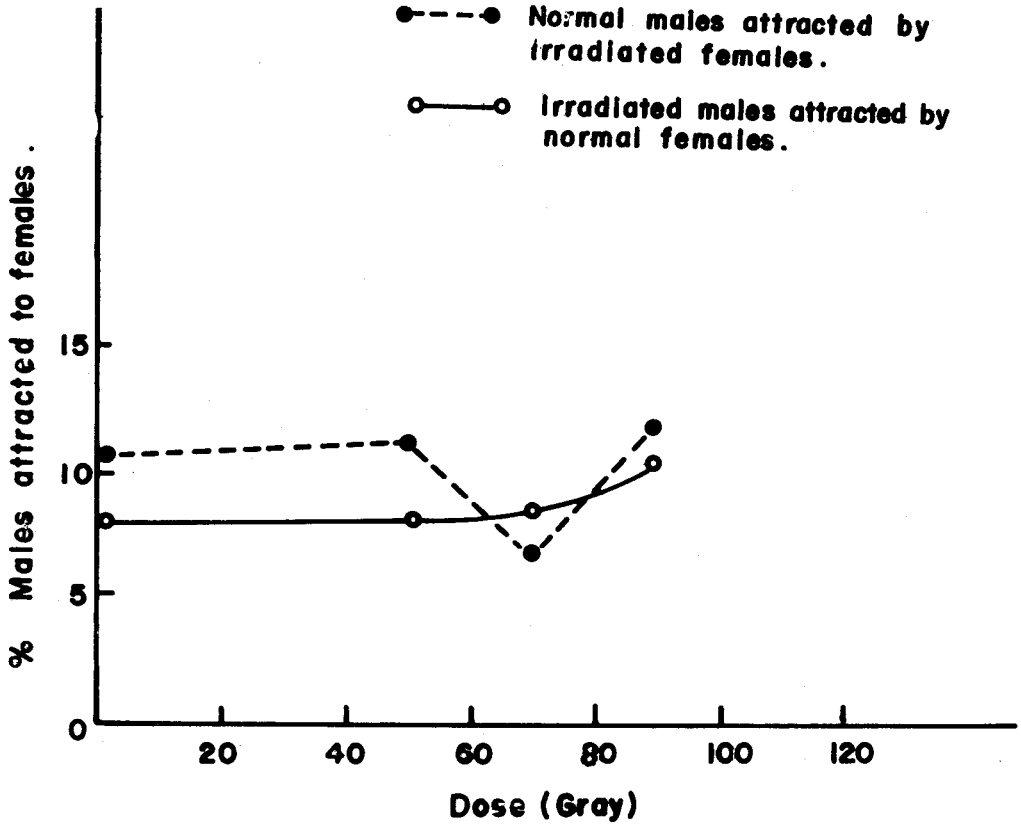

Fig. 3 : Effect of gamma radiation on the response of males towards females of *Ceratitis capitata*

Many reports have been obtained regarding the effects of radiation on the mating behaviour and mating of the medfly, *C. capitata.* For example, Katiyar and Valerio (1964) reported that irradiation decreased the mating vigour of the fly. Also, Katiyar and Ramirez (1969) concluded that normal males were more aggresive in mating than irradiated ones. In the same year (1969) Chambers *et al.*, reported that irradiated females, no matter what the dose, mated about 85–90% as normal females. Recently, Abdu *et al.*, (1985) showed that production of sex phermone by virgin females of *Tribolium castaneum* decreased with incresing the radiation doses from 4 to 10 krad, and a dose of 12 krad could inhibit phermone production. They also found that a dose of 8 krad could bring inhibition of male reponse.

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تأثير أشعة جاما على التجاذب الجنسي لذبابة فاكهة البحر الأبيض المتوسط

رضا محمد عبده - عبد الفتاح مجاهد واكد و إيمان الخولي

عند تشعيع العذارى الكاملة النضج لذبابة فاكهة البحر الأبيض المتوسط بالجرعات ٥٠ ، ٧٠ ، ٩٠ جراى من أشعة جاما واختبرت الجاذبية الجنسية للذباب الناتج للجنس الآخر غير المشعع وكذلك جاذبية هذا الأخير للجنس الآخر المشعع لم يلاحظ تأثر واضح على انجذاب الإناث المشععة إلى الذكور غير المشععة عند الجرعتين ٥٠ ، ٧٠ جراي بينما زاد عند الجرعة ٩٠ جراي . ولكن كانت نسبة إنجذاب الذكور للإناث قليلة جداً سواء في الحشرات المشععة أو غير المشععة .