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REPRODUCTIVE POTENTIAL OF *TROGODERMA GRANARIUM* EVERTS DURING DIAPAUSE

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Food reserves in larvae enhanced the fecundity in *Trogoderma granarium*¹. Its larvae in diapause which weigh double the normal last instar²⁻³ showed profound increase in fecundity when the adults derived from such population were allowed to mate⁴⁻⁶. However, the larvae in diapause without food for 390 days, when allowed to become adults, laid about 59% less number of eggs than the adults derived from normal diapause larvae⁶. On the other hand, a decrease in fecundity has been recorded as a result of larval diapause in some insects⁷. It is possible that factors other than food are also involved. Further, it is also not clear if only one sex or both the sexes are affected.

In view of this the effect of diapause on the reproductive potential in *T. granarium* was studied.

The larvae of *T. granarium*, normal and in diapause were allowed to become adults. The larvae in diapause utilized in the present studies were either obtained by exposing 15-day old normal larvae to diapause inducing conditions without food for 20 days or 15-day old larvae kept in diapause inducing conditions with food for three months. The conditions for inducing diapause have been described earlier⁸. The purpose of getting larvae in diapause without food was to prevent the accumulation of food reserves in their body. Hence adults derived from such larvae were somewhat smaller in size compared to adults derived from non-diapause larvae. Sex was determined by the criteria utilized by several authors^{4,9,10}. The crosses used in the present studies are given in Table I. In each cross ten males and ten females were used. All the crosses were maintained at $35^{\circ} \pm 1^{\circ} \text{C}$ till the death of both the males and females. All the crosses were examined daily under the binocular microscope to remove the eggs laid, if any. Eggs laid per female was taken as fecundity. The eggs from each cross were incubated at $35 \pm 1^{\circ} \text{C}$ in petri dishes for hatching. The influence of diapause on reproductive potential was evaluated from fecundity and per cent hatchability observed from each cross. Three replicates were used in each case.

Mating of *T. granarium* adults derived from normal larvae produced 42 eggs per female. There was an increase in fecundity from 42 to 91 eggs per female when adults derived from larvae previously kept under diapause for three months in presence of food, were allowed to mate (Table I). Similar increase in fecundity has also been observed by Karnavar⁴⁻⁶. However, when adults obtained from larvae under

TABLE I

*Fecundity and hatchability of T. granarium adults obtained from normal larvae and larvae in diapause**

Nature of cross	Fresh body weight of larva in mg		Total eggs laid	Eggs laid per ♀	% hatchability
	♂	♀			
N ¹ ♂ × N ♀	1.08 ± 0.03	1.89 ± 0.02	417	41.7	94.5
D ² ♂ × D ♀	2.19 ± 0.03	4.25 ± 0.02	912	91.2	96.4
d ³ ♂ × d ♀	0.89 ± 0.002	1.30 ± 0.002	747	74.7	94.0
D ♂ × N ♀	2.19 ± 0.03	1.89 ± 0.02	561	56.1	96.3
N ♂ × D ♀	1.08 ± 0.03	4.25 ± 0.02	790	79.0	95.5
N ♂ × d ♀	1.08 ± 0.03	1.30 ± 0.002	700	70.0	96.7
d ♂ × N ♀	0.89 ± 0.002	1.89 ± 0.02	550	55.0	95.0

* Ten pairs of adults were used in each case.

¹ From normal larvae. ² 15 day old larvae kept in diapause inducing conditions with food for 3 months.

³ 15 day old larvae kept in diapause inducing conditions without food for 20 days.

diapause for 20 days without food were mated, 75 eggs were obtained per female (Table I). It is interesting to note that the larvae utilized for obtaining such adults weighed much less than the normal ones. It appears from the foregoing account that accumulated food in adults derived from larvae in diapause is not the main factor involved in the observed enhanced fecundity. However, according to an earlier observation, the fecundity recorded from the adults derived from extremely starved larvae in diapause was less than the normal adults but Karnavar⁶ accounted the occurrence of this fecundity to be due to involvement of factors other than the food in the enhanced fecundity due to diapause. Thus the weight of the adults is not apparently very important for the increased fecundity. Obviously, it is the development with or without food, which is responsible for this increase. This is supported by the fact that larvae spending more time in diapause need much less exposure to diapause terminating conditions for coming out of diapause¹¹.

Fecundity was above 70 eggs per female when the female adults developed from either types of larvae in diapause were crossed with normal males, whereas, 55 to 56 eggs per female were laid when the adult males developed from either types of larvae in diapause were allowed to mate with normal females (Table I). These results show that the female is relatively more involved in the enhanced fecundity. There was not much effect of diapause on per cent hatchability as more than 94% of eggs laid hatched in all crosses (Table I).

The enhancement of the reproductive potential in *T. granarium* as a result of diapause not only protects the pest from the adverse environmental conditions, but also adds extra potential for multiplication of its population under favourable conditions.

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CLASTOGENICITY OF ESTRONE IN THE RAT BONE-MARROW CELLS

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It has been known for some time that the removal of the ovaries in mice at an early age prevents the onset of mammary tumours in the susceptible inbred strains. The estrogenic hormones have been demonstrated to be carcinogenic¹. One such hormone is estrone which controls the uterine cycle. It was first isolated from the urine of pregnant women. This steroid hormone, responsible for inhibition or stimulation of the specific tissue growth, has also been found to be teratogenic. The present studies were undertaken to study its clastogenic effect on the bone-marrow chromosomes of the white rat—*Rattus norvegicus*.

Different series of rats were injected intraperitoneally with multiple doses of 10 mg/kg body weight of estrone every 24 hours. All the doses were less than LD50. With each series was a control which was injected only with distilled water. The animals were sacrificed after 24, 48 and 72 hours. Chromosomal preparations from the bone-marrow were made according to the air-drying technique. In addition, the DNA content of the liver and spleen was estimated according to the colorimetric method, using the diphenylamine reaction.

The frequency of aberrations in the control animals did not exceed 3% and the aberrations were mainly the hypodiploid cells, but sometimes gaps were also encountered. On examining the chromosomal preparations of the treated animals, aberrations of both the numerical and structural types were observed. A number of polyploid cells were observed and the structural aberrations consisted of gaps, breaks (chromatid and multiple types), translocation and pulverization. A dicentric and three ring chromosomes were also observed with the highest dose. The total number of aberrations increased with an increase in the dose. The mitotic index in all the cases was quite high and it also showed an increase with an