原　著

Mating Competitiveness of Normal and Chemosterilized Males of Melon Fly, *Dacus cucurbitae* (Coquillett) Musharraf A. Ansari and Kaushilya M. Wadhwani (Department of Zoology, Aligarh Muslim University, Aligarh (U. P.) India) Received April 4, 1972, *Botyu-Kagaku* 37, 41, 1972.

6. Melon fly, *Dacus cucurbitae* (Coquillett) の正常雄と化学不妊化雄との間での交尾競争 Musharraf A. Ansari and Kaushilya M. Wadhwani (Aligarh Muslim 大学　動物学教室) 47. 4. 4　受理

Melon fly, *Dacus cucurbitae* の雄を hempa で不妊化し，正常の雄と各種の割合で混ぜて処女雌と交尾させて，不妊化により交尾能力が影響されるか否かを調べた．その結果，hempa による不妊化によって雄の交尾活性が衰えることはなかった．1例として，正常雄を不妊化雄の2倍とした実験区では，理論不妊率は33.3%となるが，実験結果は38.4%となった．

The success of sterile male release technique depends on the ability of sterilized males to find native females. Any deficiency in the mating potentiality of sterile males as compared to the normal ones is likely to foil the whole attempt. The factor, therefore, has been studied by several workers but the results obtained are quite conflicting. Steiner and Christenson (1956)[6] and Christenson (1958)[1] found that a high dose of gamma radiation adversely affected the mating competitiveness of the oriental fruit fly, *Dacus dorsalis* Hendel. Similar results were obtained by Rhode *et al.* (1961)[5] in case of Mexican fruit fly, *Anastrepha ludens* L. A significant loss in mating vigour was observed by Lindquist and his associates in 1964 when the males of boll weevil, *Anthonomusr gandis* were treated with apholate.[4] Recently Young *et al.* (1968)[7] also observed that males of fall armyworm moth *Spodoptera frugiperda* were not as vigorous as the normal ones when treated with tepa. On the contrary, Ladd (1970)[3] could not observe any reduction in mating potentialities of tepa sterilized males of Japanese beetle, *Popillia japonica.*

It seems that the effects of sterilizing agents are more or less specific and need a further study before larger programmes are undertaken in the field. With this aim in view, present studies were made to investigate the effects of hempa on the mating competitiveness of melon fruit fly, *Dacus cucurbitae* (C).

Materials and Methods

Test insect and chemical

Flies were obtained from the normal laboratory stock initially developed from larvae collected from infected fruits in and around Aligarh district. Larvae and adults were reared on pumpkin fruit *Cucurbit moschata* at a temperature of 28±1°C and 60 to 70 percent relative humidity. Small petri-dishes containing pumpkin pieces were placed in each cage. The flies readily oviposited in such pieces and observations were taken after every twenty four hours.

Hempa was obtained through the courtesy of Dr. A. B. Borkovec, In Charge, Chemosterilant Investigations, Pesticide Chemicals Research Branch, USDA, Beltsville, Maryland.

Experimental Procedure

On emergence males were isolated in two groups, one of them fed on sugar treated with 1.0 percent hempa while the other group was fed on untreated sugar. On fifth day the treated males were released in cages 8×8″ constructed of wire frames and covered over with meshed cloth and mosquito netting. The desired numbers of normal males and females of the same age were also released in these cages. As mating starts after 6 to 8 days of emergence and the females lay the first batch of eggs about 5 days thereafter, observations were made after every two, three or five days. Eggs obtained from

Table 1. Percent net sterility of untreated females caged with treated and untreated males of *Dacus cucurbitae.*

Days after start of experiments	Type of mating*						
	20:20:20	15:15:15	40:20:60	30:15:30	20:40:60	15:30:30	15:0:15
15	43.2	52.3	76.3	89.1	31.2	16.3	100.0
17	40.6	47.9	61.2	60.3	11.6	28.2	100.0
20	62.8	56.4	41.3	94.3	21.2	56.8	100.0
22	70.8	30.9	84.7	54.6	61.6	41.3	100.0
25	30.5	72.6	39.3	61.2	51.2	27.8	100.0
30	56.2	51.3	73.2	86.3	45.7	51.3	100.0
35	68.2	43.6	90.3	74.1	31.8	42.2	100.0
40	35.7	60.3	82.6	63.2	53.2	40.6	100.0
Average	50.1	51.9	68.6	72.8	38.4	38.06	100.0
Predicted	50.0	50.0	66.6	66.6	33.3	33.3	100.0

* The figures indicate the number of sterilized males, normal males and normal females in each mating.

females were counted on moist black cloth piece and the hatching of eggs was determined after twenty four hours. Percent sterility and net sterility was calculated from the formulae as described by Hair and Adkins (1964).[2] Presuming that the treated males were as competitive as the normal males the predicted sterility was calculated on the basis of proportion of sterilized and normal males and was compared to the net sterility obtained in tests.

Results

The results (Table 1) clearly show that sterilized males were no less vigorous and competitive than the normal ones. In other words the females received the sterilized and normal males with equal preference. This was evident when the predicted sterility was compared with the sterility actually obtained. Though there was a variation in infertility of eggs collected at different times but on average, the percent sterility was slightly higher than predicted levels. In a test where 20 females were caged with 20 normal and 20 sterilized males, the average percent net sterility was 50.1 as against 50.0 percent expected sterility. In other series of experiments where normal males were doubled in number than the treated ones and expected sterility was 33.3, the observed net sterility was 38.4 and 38.06 percent. When the ratio of treated and normal males were reversed, 68.6 and 72.8 percent net sterility was observed. This shows that the actual sterility levels in eggs obtained from normal females caged with sterilized and normal males were higher in comparison to the predicted sterility levels. This may be due to the fact that the sterilized males are more vigorous than the normal ones. It is therefore, safe to conclude that males of *Dacus cucurbitae* when treated with hempa did not lose their vigour and sexual competitiveness.

Summary

Mating competitiveness of males of *Dacus cucurbitae* sterilized by hempa was studied by allowing the treated males to mate with virgin females of the same age along with normal males in different ratios. There was no indication that mating vigour and sexual competitivenss was reduced by treatment with hempa. In a test where normal males were doubled in number than the treated ones, the average percent net sterility was 38.4 as against 33.3 percent expected sterility.

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Phenoloxidase in the Armyworm, *Leucania separata* Walker*. Hajime Ikemoto (Tokyo Prefectural Isotope Research Station, Setagaya, Tokyo) Received January 31, 1971. *Botyu-Kagaku*, 37, 43 (1972).

7. アワヨトウのフェノールオキシダーゼ

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アワヨトウ幼虫の体液フェノールオキシダーゼはモノフェノールオキシダーゼとしての基質特異性をしめし，5.6から8.0にかけて至適 pH がみられた．銅酵素の阻害剤で活性が抑制されるので銅蛋白質とおもわれる．淡色型幼虫（単独飼育）の体液を酵素液に用いるとチロシンを酸化するとき lag 期をしめしたが，黒色型幼虫（高密度飼育）では lag 期はみられなかった．原因の一つとして黒色型幼虫の体液は淡色型幼虫の体液に比較してドーパ量が多いことが考えられる．

黒色型幼虫は淡色型幼虫よりも体液，皮膚ともにつよいフェノールオキシダーゼ活性をしめした．つよいフェノールオキシダーゼ活性がアワヨトウの相変異にともなう黒化現象に関与しているとおもわれる．なお，体液フェノールオキシダーゼは蛹化のとき，いちじるしくつよい活性をしめしたが，これは蛹化のタンニング反応に関与しているとおもわれる．蛹化直後の皮膚フェノールオキシダーゼ活性はほとんどみられなかったが，皮膚では不溶性フェノールオキシダーゼがタンニング反応に関与しているものと推定される．

The larvae of the armyworm, *Leucania separata* show a greenish yellow or brown colour when reared in isolation. But those reared in high density show a fine velvety black in their dorsal region[6]. The black pigment of the larval integument is reported to be a kind of indole melanins[3].

It is well known that the phenoloxidase catalizes the production of quinones which are responsible for the hardening and darkening of the integument of insects after their molting and pupation.

In the present report, substrate specificity and some other characteristics of the armyworm phenoloxidase were investigated by using the haemolymph of the gregarious black larvae. Furthermore, phenoloxidase activities were compared between the isolated type and the high density type of the armyworm over several stages.

* This work was read at the meeting of the Tokai branch, Japanese society of applied entomology and zoology in Gifu, July, 1967.

Material and Methods

Insects

The larvae used in this study were reared in the laboratory on the leaves of cornplants by the method of Ikemoto[2].

Preparation of enzyme solution

Enzyme preparations were made as follows: Haemolymph was collected in cold tube to protect haemolymph from melanization. Samples collected from 15 to 30 individuals were mixed in order to obtain at least 0.8m*l* of haemolymph for each experiment, and 0.6m*l* of haemolymph was diluted to 4m*l* with M/15 phosphate buffer (pH 7.0). The diluted haemolymph was used as an enzyme solution.

Dorsal region of the abdominal integument was dissected out from the remainder of the body, and washed with distilled water. The integuments of about seven animals were pooled together, and homogenized with 15 volume of M/15 phosphate buffer (pH 7.0), and then after centrifuging, supernatant liquid of the homogena-