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SHORT COMMUNICATION

A Rust-Eyed Mutant of the Melon Fly

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Eight males and six females of the melon fly, *Dacus cucurbitae* Coquillett, showing the rust eye color were found in the laboratory culture in November 1976 at Yokohama, Japan. The laboratory culture was derived from flies collected in November 1971 in Ishigaki Is., Okinawa. The rust-eyed males had been crossed with the rust-eyed females for five generations to reproduce the stock, and then a pure rust-eyed strain was established. The compound eye color of the rust-eyed flies was red at emergence and intensified to reddish brown or rust color lacking the bluish fluorescence. The rust-eyed flies had simultaneously white markings on the thorax instead of yellow markings of the wild-type flies (Fig. 1). Therefore, the rust-eyed flies were easily distinguishable from the wild-type.

So that the genetics of the rust-eyed character could be evaluated, single pairs (replicated 5 times) of newly emerged rust-eyed females and males were crossed with newly emerged normal males and females (i.e. wild-type flies with bluish eyes and yellow markings on the thorax) from the laboratory culture, respectively. Each mated pair was held in an $18\times10\times12$-cm plastic cage at a constant temperature of 26 ± 1°C, 70% RH with 14 hr daylight and provided continuously a standard laboratory diet of sugar, protein hydrolysate, and water.

Fourteen days later, eggs were deposited in cucumbers by the gravid female, and the stung cucumbers were placed in larval-rearing plastic dishes. Subsequently, the full-

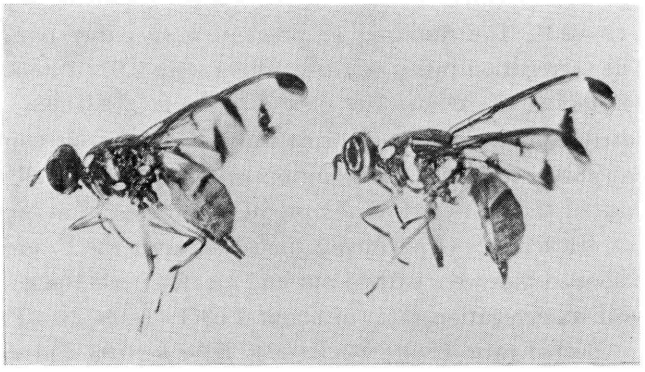

Fig. 1. Melon fly adults.
Left: lateral view of wild-type fly.
Right: lateral view of rust-eyed mutant.

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Table 1. Results of single-pair crosses between normal and rust-eyed melon flies[a].

Generation	Crosses[b] ♂×♀	No. pupae	No. adults (phenotypes of progeny) N ♂	N ♀	R ♂	R ♀	Ratio (normal: rust)	χ^2 (3:1 ratio in the F_1)
P	N×R	171	81-86		0-0		167: 0	—
F_1	[N]×[N]	1650	579-563		187-197		1142:384	0.0218
P	R×N	175	75-93		0-0		168: 0	—
F_1	[N]×[N]	1704	609-576		192-209		1185:401	0.0681
P	N×N	285	138-142		0-0		280: 0	—
F_1	N×N	999	457-438		0-0		895: 0	—
P	R×R	309	0-0		139-151		0:290	—
F_1	R×R	864	0-0		407-380		0:787	—

a) Total of 5 replicates of each cross.
b) N denotes normal flies from laboratory culture, R denotes rust-eyed flies, [N] denotes F_1 from N×R parents (phenotype similar to N).

Table 2. Results of backcrosses between F_1 progeny and rust-eyed melon flies[a].

Crosses[b] ♂×♀	No. pupae	No. adults (phenotypes of progeny)[c] N ♂	N ♀	R ♂	R ♀	Ratio (normal: rust)	χ^2 (1:1 ratio)
[N]×R	471	107-107		108-104		214:212	0.0094
R×[N]	428	104- 99		92-100		203:192	0.3063

a) Total of 2 replicates of each cross.
b), c) N denotes normal flies, R denotes rust-eyed flies, [N] denotes F_1 from N×R parents (phenotype similar to N).

grown larvae were transferred into moist sand and pupated, the pupae were held for adult emergence.

The F_1 progeny resulting from the single-pair crosses were all of normal phenotype. Therefore, single pairs (replicated 5 times) of the normal-appearing F_1 females and the same males were crossed. The resulting F_2 progeny were either normal phenotype or rust-eyed flies. The segregation ratios of these adults were 2.97: 1 and 2.96:1 (Table 1). According to the χ^2 test (1 df; $\chi^2=0.0218$, $0.8<p<0.9$ and $\chi^2=0.0681$, $0.7<p<0.8$), the observed ratios clearly conformed to the theoretical ratios for each control of eye color. On the other hand, paired matings of the normal adults produced all normal progeny, while paired matings of the rust-eyed adults produced progeny that were all rust-eyed.

In another test, backcrosses (replicated 2 times) between the F_1 progeny from N×R parents and the rust-eyed flies were carried out and yielded both the normal flies and the rust-eyed progeny at a segregation ratio of about 1.03:1 (Table 2). The results clearly conformed to the expected ratio (1 df; $\chi^2=0.0094$, $0.9<p<0.95$ and $x^2=0.3063$, $0.5<p<0.7$).

The results obtained thus indicate that the rust-eyed character is controlled by an autosomal recessive gene and the gene for rust eyes is probably not sex linked. Futhermore, the results suggest that the rust-eyed individuals have not lower survival value than

wild-type flies. These are also supported by the fact that we could establish a pure rust-eyed strain in a short period of several generations.

In addition, the dried specimens of rust-eyed flies retained the rust eye color and the white markings on the thorax, so even the dead flies were also distinguishable from the dead normal flies. As another eye color mutation in the melon fly, a yellow-eyed mutant was reported by Kobayashi *et al.* (1973). It was also controlled by an autosomal recessive gene.

The rust-eyed mutant reported in this paper should be useful for many investigations of melon fly biology, especially as a valuable genetic marker for laboratory and field studies. However, additional studies will be necessary to determine whether innate weaknesses exist in the behavior or physiology of this mutant strain. Thus, longevity, fecundity and sexual competitiveness are being tested.

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Reference

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