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MORPHOLOGICAL DISTINCTION BETWEEN FEMALE *DROSOPHILA MELANOGASTER* AND FEMALE *D. SIMULANS*

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CANELURAS MODERADAS

Laranjas: Barão Folha Comprida, Coco, Doppio, sangüínea, Hall, Mediterrânea, Navelência, Verna, Westin.

Limas: da Pérsia Pindamonhangaba, Galego, Kagsi lime híbrido, Selva.

Azedas: Palestina.

Citranges: Savage.

Miscelâneas: Camargo (limão?), Citrangequat, do Pará (tangerina?), Rio Claro (limão?), Uruguaio (limão?).

CANELURAS FORTES

Laranjas: Brogna, Lamb Summer, Mortera, Ovale sangüínea, Pera comprida, Sangüínea Consafacio.

Limas: Abacaxi, Kagsi, Seda.

Pomelos: Mac Carty, Pernambuco, Viçosa.

Tangelos: Swannee, Webber.

Miscelâneas: Ácido (limão?), Americano (limão?), Calamondin, Campeona (tangerina?), Citrus hystrix, Finike yerli, Inglês (limão?), Ponderosa (limão?).

CANELURAS SEVERAS

Limas: Cristal, Galego sem espinho, Galego, Marfim.

Laranjas: Pera Ôvo.

Pomelos: Duncan, Foster, Hart's, Imperial, Marsh Seedless, Red Arananyan, Red Blush, Royal, Triumph, Thompson Pink.

Miscelâneas: Gigante (limão?), Limonime Perrine.

Discussão dos resultados

A maioria dos cultivares examinados mostrou boa tolerância à Tristeza, principalmente aqueles de tangerinas e limões verdadeiros. Confirmando estudos anteriores (2) (3), foi observado que entre as laranjas houve uma larga variação, situando-se as mesmas em todas as categorias, havendo algumas do tipo Baía que não apresentaram caneluras, enquanto outras deste mesmo tipo se mostraram levemente intolerantes. Vale ressaltar a presença da laranja Westin no grupo das moderadamente intolerantes, pois ela é de interesse para a citricultura paulista. Nos grupos forte e severamente afetados pela Tristeza estão incluídos alguns cultivares de laranja Pera e outros, cujos frutos assemelham-se aos deste tipo.

Os pomelos, limas doces e ácidas mostraram-se em sua maioria muito afetados pela Tristeza, com exceção de algumas limas doces. As cidras foram incluídas no grupo de boa tolerância à Tristeza. Notou-se que as plantas desta espécie apenas mostraram caneluras leves, mesmo quando fortemente afetadas pela moléstia.

Os híbridos e miscelâneas foram distribuídos em todas as categorias de tolerância.

A presença de caneluras em plantas de limão Cravo, alguns tipos de laranjas agro-doces e algumas do grupo miscelâneas, como tangerinas e limões, sugere uma possível origem híbrida dos mesmos, pois os cultivares típicos das referidas espécies apresentam ótima tolerância à Tristeza.

Conclusões

Pode-se concluir com o levantamento efetuado que:

1) A maioria das laranjas doces, limões verdadeiros e tangerinas apresenta ótima tolerância à Tristeza, enquanto a maior parte das limas ácidas e pomelos é fortemente afetada.

2) Há uma variação de tolerância entre plantas do mesmo cultivar.

3) Há necessidade de se efetuar a premunização em cultivares incluídos nos grupos com caneluras moderadas, fortes ou severas, no caso de se estabelecerem pomares comerciais dos mesmos.

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MORPHOLOGICAL DISTINCTION BETWEEN FEMALE *DROSOPHILA MELANOGASTER* AND FEMALE *D. SIMULANS*

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Abstract. Two morphological characteristics were selected to permit the distinction between *D. melanogaster* and *D. simulans* females. The two characteristics — I. Width of a region of the cheek and II. Pigmented distribution of the sixth abdominal tergite — are shown to be sufficiently favorable and reliable for the purpose.

Resumo. *Distinção morfológica entre fêmeas de* Drosophila melanogaster *e fêmeas de* D. simulans. Duas características morfológicas foram selecionadas para permitir a distinção entre fêmeas de *D. melanogaster* e fêmeas de *D. simulans* — I — Largura de uma região da faceta. II — Distribuição de pigmentos do sexto tergito abdominal — parecem ser suficientemente favoráveis para este propósito.

Introduction

IT IS DIFFICULT TO MAKE A DISTINCTION BETWEEN *Drosophila melanogaster* and *D. simulans*, regarded as sibling species, because they are morphologically very similar. The morphological similarity is so remarkable that in the papers on fluctuations the females frequencies of both species are registered together as, for example, in Patterson (1943) and Pavan (1959).

The males can be identified by means of an examination of the external genitalia, for in *D. simulans* there is a larger salience of the posterior process of the genital arch, absent in *D. melanogaster* (Sturtevant, 1919 and Salles, 1947).

In this paper is presented a technique for the distinction between females of both species. The technique is based on two characteristics: I. Width of a region of the cheek and II. Pigment distribution of the sixth abdominal tergite.

Materials and methods

The flies were collected in his natural habitat: one sample from São José do Rio Preto, State of São Paulo, and the other from Porto Alegre, State of Rio Grande do Sul, Brazil.

The two samples, totalizing 1312 flies, were studied for the two characteristics mentioned above, and the results were always checked with the classical male genitalia method.

I. Width of a region of the cheek.

The region concerned is limited by the segment of a straight line, which passes through the basis of the vertical anterior bristle which goes along with the lower border of the cheek. This bristle is located near two other stronger ones in the lower posterior region. The distance between the basis of this bristle and the border of the eye is the character in question (figs. 1. A and B).

The measurements presented in Table II were obtained by means of stereoscopical microscope Wild M5 with a 75 times magnification.

II. Pigment distribution of the sixth abdominal tergite.

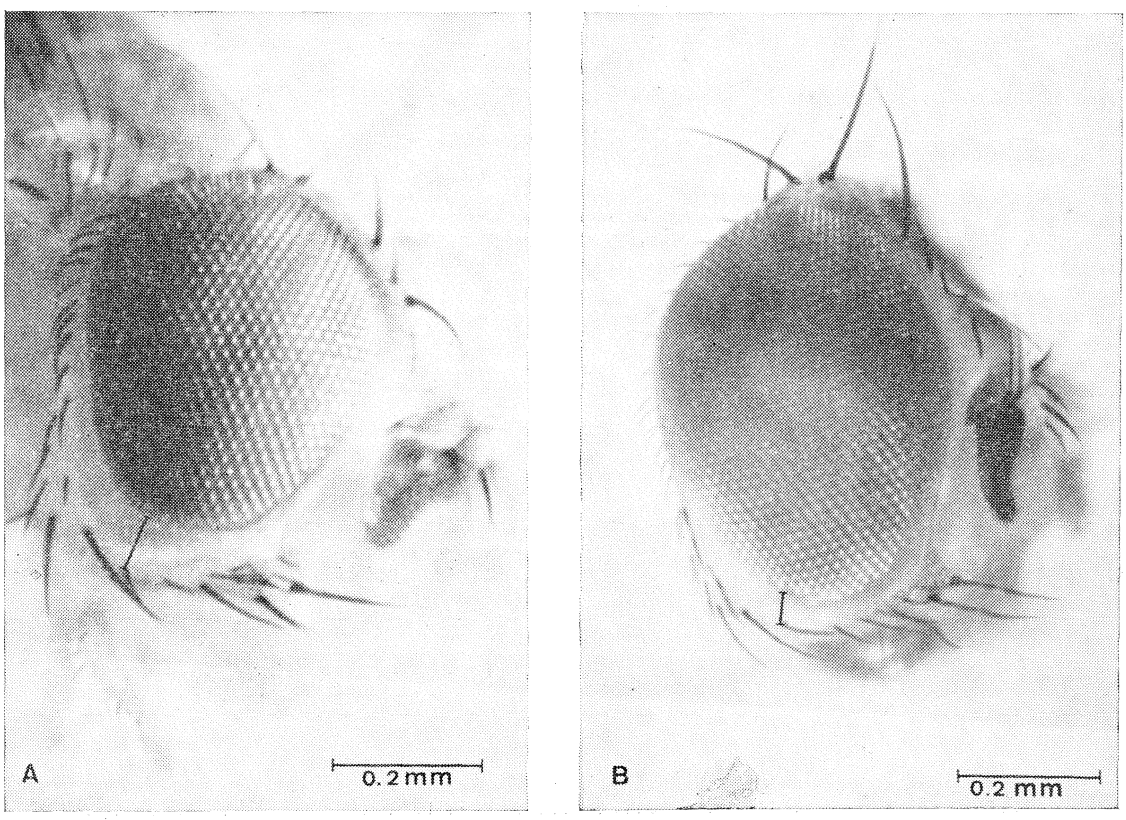

Fig. 1. Head of *D. melanogaster* (A) and *D. simulans* (B) showing the width of a region of the cheek.

The presence or absence of pigmentation in the sixth abdominal tergite, at the lateral borders as well as the area they form, were taken into consideration (figs. 2. A and B).

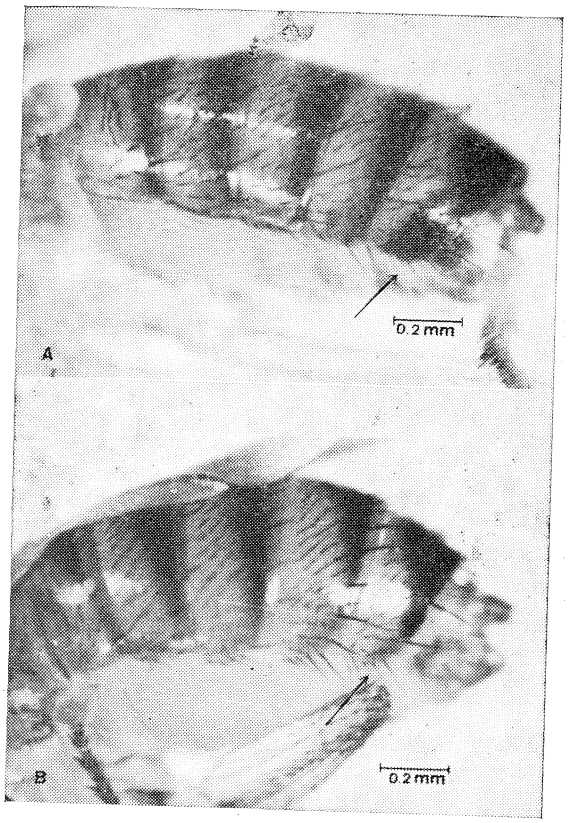

Fig. 2. Abdomen of *D. melanogaster* (A) and *D. simulans* (B) showing the sixth tergite.

Results

Two hundred and sixty females from nature were classified according to the width of the cheek and were separated in vials with culture medium. The males of the first generation of each one of these females were classified as *D. melanogaster* or *D. simulans* according to the external structure of their genitalia. Thus it was possible to classify the females by the classical method and compare the results obtained by the width of the cheek, which allowed us to verify the precision of the technique here presented.

Table I shows the results obtained by the proposed method, compared with those obtained by the classical method. Out of the 260 females, 113 were classified as *D. melanogaster* and 147 as *D. simulans*, by our method. A comparison of these figures with those obtained by the examen of the F_1 males gave us a total correctness of 111 for *D. melanogaster* (1.7% of error) and 138 for *D. simulans* (6.1% of error).

TABLE I

Comparative results of the classification of 260 females of *D. melanogaster* — *D. simulans* by the character width of the cheek and by the F_1 male genitalia

Species	Number of the classified by width of the cheek	Concordance by F_1 male genitalia	% of error
D. melanogaster	113	111	1.7
D. simulans	147	138	6.1

Measurements of a sample of 531 females from nature, classified by the males genitalia, gave the results shown in Table II. Out of these females, 237 were *D. melanogaster* and 294, *D. simulans*.

TABLE II

Measurements of the width of the cheek of 531 *D. melanogaster* and *D. simulans* females classified by the F_1 male genitalia

Rule division	Value in μ	*D. melanogaster*		*D. simulans*	
		N.° of females	%	N.° of females	%
2	26.80	—	—	27	9.18
3	40.20	2	0.84	228	77.55
4	53.60	90	37.97	38	12.92
5	67.00	132	55.69	1	0.34
6	80.40	13	5.48	—	—

The diagram in Fig. 3, which illustrates the results of Table II, shows a coincidence in the width of the cheek measurements at the 40.20, 53.60 and 67.00 μ values, which corresponds to the overlapping areas of both species; there is a predominance at the 53.60 μ value.

A comparison of the results presented in Tables I and II, (fig. 3), shows a larger error, whenever *D. simulans* is classified in terms of the cheek width; this can be explained by the existence of a greater number of *D. melanogaster* females invading the *D. simulans* domain than the opposite, as shown in Table II.

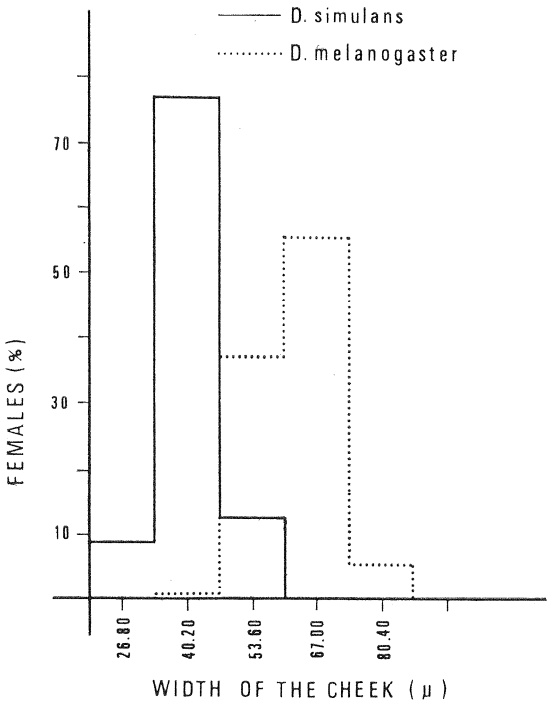

Fig. 3. Diagram of the results of Table II.

The discrimination between females of both species is done by taking into consideration the pigmented area of the sixth tergite, as well as the shape it takes at the lateral border of the tergite. Thus, in *D. melanogaster,* the pigmented area is trapezoidal reaching the lateral border of the tergite (figs. 2. A and B). In *D. simulans* the pigment is distributed in a smaller area, seldom reaching the lateral margin of the tergite, and ending in a acute angle. Sometimes the pigmented area becomes diluted as it approaches the lateral margin of the tergite, producing a lighter shaded area.

Table III shows the results of the comparison between the data obtained from 113 females classified by means of the sixth tergite and the data obtained by means of F_1 male genitalia analysis.

The cheek width does not seem to be affected by the aging of the flies; on the other hand, the sixth tergite is not suitable for identifying newly hatched flies since they are not pigmented at all. As they grow old, the pigmented area increases, as well as the pigmentation intensity. In most of the flies collected in their natural environment, this character is quite evident, which makes the identification easy.

TABLE III

Results of 113 females classified through the sixth tergite

Species	Number of females classified by		% of error
	the 6 th. tergite	the F_1 male genitalia	
D. melanogaster	32	32	—
D. simulans	81	80	1.2

Finally, 408 females from one single collection were identified according to both traits and the results were again checked by the male genitalia method. The percents of error are near 1.5 (Table IV).

TABLE IV

Comparative results of 408 females classified according to the cheek and the sixth tergite, and the F_1 male genitalia

Species	Females classified by the cheek and sixth tergite	Concordance by the analysis of F_1 male genitalia	error % of
D. melanogaster	165	163	1.22
D. simulans	243	239	1.65

Discussion and conclusions

Sturtevant (1919), in his description of *D. simulans,* mentions the character *larger width of the cheek* as not being a discriminating factor between the two species: "the eyes are a little narrower than in that species; but these differences are not sufficiently well marked to serve as diagnostic characters."

Mayr (1942) defines sibling species as being morphologically similar and indistinguishable, but presenting specific biological characteristics and being reproductively isolated.

Although the *D. melanogaster* and *D. simulans* females are very similar morphologically, they can be discriminated by means of a more detailed inspection. As we have shown, differences in their morphology, some of taxonomic significance, can be detected.

The results, based on the width of the cheek, obtained according to the technique described in the present paper, show the possibility of discrimination among females, with a very small error. As the pigmented area of the sixth tergite is another discriminating actor, particularly in old flies, it is possible to associate both characteristics, obtaining then a even smaller error.

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EFFECTS OF HYCANTHONE ON *BIOMPHALARIA GLABRATA* *

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Abstract. *B. glabrata* adult snails exposed, for 24 hours, to 50 and 100 ppm hycanthone concentrations presented a mortality rate of 30 and 90%, respectively. Snails exposed to different concentrations of the drug and, afterwards, placed in dechlorinated water, for a repair period, presented normal oviposition, their egg-masses also giving origin to normal embryos.

Egg masses submitted to hycanthone concentrations of 2 to 8 ppm, however, presented, 7 days after exposition, a mortality rate of 26 to 100%. The remaining eggs gave origin to malformated embryos which sometimes survived for about 20 days without hatching.

Resumo. *Efeitos do hycanthone sobre a* Biomphalaria glabrata. Caramujos adultos (*B. glabrata*) expostos, durante 24 horas, a concentrações de 50 e 100 ppm de hycanthone, apresentaram uma mortalidade de 30 e 90%, respectivamente. Os caramujos expostos a diferentes concentrações da droga, e colocados em recuperação em água desclorada, apresentaram oviposição normal, com desovas dando origem a embriões também normais. Por outro lado, nas desovas de *B. glabrata*, concentrações de 2 a 8 ppm de hycanthone causaram mortalidade de 26 a 100%, sete dias após a exposição. Foram também observadas, nas desovas sobreviventes, diversas malformações embrionárias. Estes embriões cresceram até durante 20 dias após a exposição, sem todavia eclodirem.

Introduction

HYCANTHONE HAS BEEN REPORTED TO DISPLAY MOLluscicidal and molluscan antischitosomal properties (Yarinsky & Freele, 1970). These authors also claimed that, at nonlethal concentrations, the drug did not significantly interfere with the snail's reproductive function.

After Hartman's paper showing the mutagenic effects of hycanthone on *Salmonela* and on *E. coli* T_4 bacteriophage, many others have reported mutations and cytogenetic aberrations in mammalian somatic cells (*in vitro*), in rat's bone marrow (*in vivo*), in onion roots, in chicks and in arachnidan eggs (Hartman et al., 1971; Hirschberg & Weinstein, 1971; Sieber et al., 1972; Medina et al., 1972; Rocha & Katz, 1972).

Our scope has been to confirm the molluscicidal activity of hycanthone and investigate its action in the embryonary stage of *Biomphalaria glabrata*.

Materials and methods

Groups of 5 and 10 laboratory-reared *Biomphalaria glabrata snails* (12 — 17 mm) were placed in 30, 50 and 100 ppm (parts per million) water solution of hycanthone (methanosulphonate) for 24 hours and, afterwards, put in fresh water, where, for a period of four days, they were daily examined for mortality.

Other groups displaying similar features were placed in sodium pentachlorophenate solution (0.2, 0.4 and 0.8 ppm), as controls.

Surviving groups of snails were transferred to glasses with fresh water to find out whether exposure

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