A Recessive Gene for Light Immature Exterior Color of Melon

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Introduction: Exterior appearance is an important aspect of fruit quality and consumer acceptance of cucurbits. However, as compared with *Cucurbita pepo* L., little is known concerning the mode of inheritance of various exterior fruit colors of *Cucumis melo* L. Thirteen loci affecting fruit color have been identified in *Cucurbita pepo* (2) and although eight are listed for *Cucumis melo* (3), it has not been possible to determine whether the duplicate factors listed for fruit mottling, *Mt* and *Mt-2*, and fruit striping, *st* and *st-2*, are one and the same gene. Information on possible gene interactions is scant, too, with a gene for yellow exterior color, *Y*, and a gene for fruit striping, *st*, considered to be epistatic to *Mt*, but mottling has higher contrast on a dark green background than on a light green or yellow background, and it is entirely possible that the mottling is visible on the two latter colors if the fruits are examined more carefully. Moreover, as shown in *Cucurbita pepo* (2), in order to obtain a clearer understanding of gene interactions, it is necessary to study fruit color as a function of fruit development. And melons do undergo changes in exterior color during their development.

Nonetheless, only two genes have been identified so far as affecting immature fruit color in melons (3). One, designated *Wi*, is a dominant factor for *white* color of the immature fruit (3). The other, designated *st-2*, is a recessive factor for striped immature fruit color. This gene was identified in the cross of 'Dulce' (striped) with PI 414723, an accession having intense (dark) green immature fruit color (1). We made a cross between 'Dulce' and an accession having light immature color, 'TAM-Dew'. We also crossed 'Krymka' which has dark-colored fruits, with 'Eshkolit Ha'Amaqim', which has light-colored fruits. Our objective is to describe and consider the results of these crosses.

Materials and Methods: The American muskmelon, *Cucumis melo* subsp. *melo* Reticulatus Group 'Dulce', which has striped, dark and light, immature fruit color was crossed with the American honeydew-type melon, *C. melo* subsp. *melo* Inodorous Group 'TAM-Dew', which has light immature fruit color. 'Krymka', a local cultivar from Crimea (Reticulatus Group) that has dark (intense) colored fruits throughout their development, was crossed with 'Eshkolit Ha'Amaqim.' The latter was derived in part from genetic material related to 'Ha'Ogen' (*C. melo* subsp. *melo* Cantalupensis Group) but the fruits of 'Eshkolit Ha'Amaqim' are light-colored throughout their development. Some F_1 plants from each cross were self-pollinated and/or backcrossed to their respective parents to obtain F_2 and BC_1 progenies. Seeds of the parental, familial, and backcross progenies were sown in the field in early August at Newe Ya'ar (Yizre'el Valley, northern Israel). Fruits were observed between 12 and 24 days after flowering, at which time they were scored for external color intensity.

Results and Discussion: 'Dulce' and 'TAM-Dew' bred true for exterior immature fruit color and all of the F_1 plants examined had striped exterior color, closely resembling that of the striped parent, 'Dulce' (Table 1). The F_2 segregated in accordance with a 3:1 ratio of striped to light and the backcross to 'TAM-Dew' segregated in accordance with a 1:1 ratio of striped to light. These results indicate that there is a single gene determining striped

young fruit exterior color, and that it is dominant to light fruit color.

'Krymka' and 'Eshkolit Ha'Amaqim' bred true for exterior immature fruit color and all of the F_1 plants examined had dark exterior color, closely resembling that of the dark parent, 'Krymka' (Table 2). The F_2 segregated in accordance with a 3:1 ratio of dark to light and the backcross to 'Eshkolit Ha'Amaqim' segregated in accordance with a 1:1 ratio of dark to light. These results indicate that there is a single gene determining dark young fruit exterior color, and that it is dominant to light fruit color.

The results of both crosses are compatible with the idea that there exists a recessive gene for light exterior immature fruit color in *Cucumis melo*. This gene for light fruit color apparently is not at the same locus as the heretofore reported dominant gene for light fruit color, *Wi*. However, it is not known what the genetic relationship is between the dominant gene for striped fruit, as in 'Dulce', and the dominant gene for dark fruit, as in 'Krymka'. To determine whether these two genes are at separate loci or in an allelic series, such as occurs in *Cucurbita pepo* (2), a testcross for allelism will need to be conducted.

Literature Cited:

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Table 1. Results of crossing 'Dulce' (striped fruit) with 'TAM-Dew' (light fruit).

Accession	Total	Striped rind	Light rind	Expected ratio	χ^2	*P*
P_1, Dulce	15	15	0			
P_2, TAM-Dew	15	0	15			
F_1, $P_2 \times P_1$	15	15	0			
F_2, $(P_2 \times P_1) \otimes$	244	188	56	3:1	0.546	0.46
BC_1, $P_2 \times (P_2 \times P_1)$	88	43	45	1:1	0.045	0.83

Table 2. Results of crossing 'Krymka' (dark fruit) with 'Eshkolit Ha'Amaqim' (light fruit).

Accession	Total	Dark rind	Light rind	Expected ratio	χ^2	*P*
P_1, Krymka	15	15	0			
P_2, Eshkolit Ha'Amaqim	15	0	15			
F_1, $P_2 \times P_1$	15	15	0			
F_2, $(P_2 \times P_1) \otimes$	203	148	55	3:1	0.475	0.48
BC_1, $P_2 \times (P_2 \times P_1)$	45	25	20	1:1	0.556	0.45
BC_1, $P_1 \times (P_2 \times P_1)$	40	40	0			