

No Segregation Distortion in Intersubspecific Crosses in *Cucurbita pepo*

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A number of loci affecting fruit and stem coloration have been identified in *Cucurbita pepo* L. (2). Two cases of segregation distortion were reported recently. One involved a cross between a gourd of *C. pepo* subsp. *texana* (Scheele) Filov and a zucchini-type cultigen (*C. pepo* subsp. *pepo*) (6). The other was reported for the *D* gene in reciprocal backcross progenies involving a bush inbred of 'Vegetable Spaghetti' (*C. pepo* subsp. *pepo* Vegetable Marrow Group, *d/d*), as the recurrent parent, and 'Early Prolific Straightneck' (*C. pepo* subsp. *texana* Straightneck Group, *D^s/D^s*), as the donor parent (3). In this case, adherence to the expected 1:1 backcross ratio was observed when the F₁ was the female parent and 'Vegetable Spaghetti' was the male. However, in the reciprocal cross, that is when the F₁ was used as the male and 'Vegetable Spaghetti' as the female, a highly significant deviation from the expected 1:1 ratio was observed. For both cases of segregation distortion, it was thought that distortion might occur through microgametophyte competition rooted in the distance of the parents (belonging to different subspecies) and/or fruit shape (belonging to different cultivar-groups), and might reflect a more widespread phenomenon in *C. pepo*.

To further test this idea, reciprocal crosses were made between 'Table Queen' (*C. pepo* subsp. *texana* Acorn Group) with 'Verte non-coureuse d'Italie' (*C. pepo* subsp. *pepo* Cocozelle Group). The former cultivar has vine growth habit (*bu/bu*), dark stems (*D/D*), and non-striped (*l-1/l-1*), light-colored (*Qi/Qi*) young fruits and the latter cultivar has bush growth habit (*Bu/Bu*), light stems (*d/d*), and striped (*l-1St/l-1St*), intense-colored (*qi/qi*) young fruits (1,2,4,5). The F₁s, as expected, had bush growth habit, dark stems, and striped, light-colored young fruits (*Bu/bu D/d l-1St/l-1 Qi/qi*). Four F₁ plants, derived from using 'Table Queen' as the female parent, were reciprocally crossed with four plants of that cultivar, plant-for-plant. Similarly, five F₁ plants, derived from using 'Verte non-coureuse d'Italie' as the female parent, were

reciprocally crossed with five plants of that cultivar, plant-for-plant. Thirty-two seeds of each of the progenies of each backcross (18 progenies in all), were planted in 128-cell styrofoam trays on 5 March 2001 and transplanted to the field 21 days later. Each plant was scored for growth habit, stem color, fruit striping, and young fruit color when the first well-formed fruit was from 3 to 5 days past anthesis.

Almost every one of the results for individual plants segregated in accordance with the expected 1:1 ratio in the backcross (Table 1). There were two exceptions, one involving *Qi* with 'Table Queen' as the donor and the other involving *l-1St* with 'Verte non-coureuse d'Italie' as the donor. In both cases, the excess was for the dominant allele of the donor. The totals for 1165, 1165R, 1166, and 1166R conformed well to the expected 1:1 backcross ratios for all four segregating loci. The *Bu* and *l-1* loci, and the *D* and *qi* loci, appear to be inherited independently (Table 2).

Segregation for the four loci was entirely in accordance with expected 1:1 backcross ratios. Segregation distortion was not observed in either set of reciprocal backcrosses. Wide crossing within *C. pepo*, that is, across subspecies and/or cultivar-groups, cannot alone be responsible for the segregation distortions heretofore observed.

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Table 1. Segregation for stem color, growth habit, fruit striping, and young fruit color in backcrosses involving ‘Table Queen’ (TQE, *C. pepo* subsp. *Texana* Acoprn Group, genotype *bu.bu D/D l-l-l Qi/Qi*) and ‘Verte non-coureuse d’Italie’ (VNI, *C. pepo* subsp. *Pepo* cocozelle Group, genotype *bu/Bu d/d l-lSt-/l-lSt qi/qi*).

	<u>Number of plants</u>				<u>Number of plants</u>			
<u>Line*</u>	<u>D/d</u>	<u>d/d</u>	<u>X²</u>	<u>P</u>	<u>Qi/qi</u>	<u>qi/qi</u>	<u>X²</u>	<u>P</u>
1165	19	11	2.133	0.15	13	17	0.533	0.46
1165a	15	17	0.125	0.72	19	13	1.125	0.28
1165b	17	15	0.125	0.72	19	13	1.125	0.04
1165c	13	18	0.806	0.37	21	10	6.903	0.08
Total	64	61	0.036	0.85	72	53	2.888	
1165R	19	10	2.793	0.09	17	12	0.431	0.50
1165Ra	15	15	0.000	1.00	16	14	0.133	0.71
1165Rb	14	18	0.500	0.47	16	16	0.000	1.00
1165Rc	14	15	0.034	0.85	14	15	0.034	0.85
Total	62	5	0.133	0.71	63	57	0.300	0.58
<u>Line*</u>	<u>Bu/Bu</u>	<u>bu/bu</u>	<u>X²</u>	<u>P</u>	<u>l-lSt/l-l</u>	<u>l-l/l-l</u>	<u>X²</u>	<u>P</u>
1166	16	15	0.032	0.85	13	18	0.806	0.37
1166a	17	14	0.290	0.58	19	12	1.581	0.21
1166b	19	12	1.581	0.21	14	17	0.290	0.58
1166c	17	14	0.290	0.58	13	18	0.806	0.37
1166d	16	16	0.000	1.00	18	14	0.500	0.47
Total	85	71	1.256	0.26	77	79	0.026	0.86
1166R	17	14	0.290	0.58	14	17	0.290	0.58
1166Ra	13	17	0.533	0.46	13	17	0.533	0.46
1166Rb	18	13	0.806	0.37	15	16	0.032	0.85
1166Re	14	18	0.500	0.47	16	16	0.000	1.00
1166Rd	13	14	0.037	0.85	19	8	4.481	0.03
Total	75	76	0.007	0.93	77	74	0.060	0.80

*The 1165 lines employed TQE as donor parent and VNI as recurrent parent. The 1166 lines employed VNI as donor parent as TQE as recurrent parent. Lines designated R were derived using the F₁ as female and recurrent parent as male; lines not designated R were derived using the F₁ as male and recurrent parent as female.

Table 2. Breakdown into four genotypes in the mutual, reciprocal backcrosses of Table Queenm (TQE, *C. pepo* subsp. *Texana* Acorn Group, genotype *bu/bu D/D l-1 Qi/Qi*) and Verte non-coureuse d'Italie (VNI, *C. pepo* subsp. *Pepo* Cocozelle Grop, genotype *Bu/Bu d/d l-1St/l-1St qi/qi*).

<u>Female Parent</u>	<u>Male Parent</u>	<u>Number of plants</u>					<u>X²</u>	<u>P</u>
		<u>Total</u>	<u>D/d Qi/qi</u>	<u>D/d Qi/qi</u>	<u>d/d Qi/qi</u>	<u>d/d qi/qi</u>		
VNI	F ₁	125	34	30	38	23	3.928	0.26
F ₁	VNI	120	35	27	28	30	1.267	0.73
Total	Total	245	69	57	66	53	2.755	0.44

<u>Female Parent</u>	<u>Male Parent</u>	<u>Number of plants</u>					<u>X²</u>	<u>P</u>
		<u>Total</u>	<u>Bu/bu l-1St/l-1</u>	<u>Bu/bu l-1/l-1</u>	<u>bu/bu l-1St/l-1</u>	<u>bu/bu l-1/l-1</u>		
TQE	F ₁	156	38	47	39	32	2.923	0.42
F ₁	TQE	151	38	47	39	37	0.065	0.99
Total	Total	307	76	84	78	69	1.495	0.68

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