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Cytogenetics of Vitis

IV: Backcross derivatives of V. vinifera L. × V. rotundifolia Michx.[1])

by

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Introduction

The work on hybridization of *Vitis vinifera* L. and *V. rotundifolia* Michx. has been reviewed in previous papers (Patel and Olmo, 1955; Jelenković and Olmo, 1968). The present review will be limited mainly to cytogenetics of the backcross hybrids of the two species.

Dunstan (1962) reported that fertile seedlings could be produced from the highly sterile F_1 diploid hybrids by backcrossing. Using the F_1 hybrid NC6-15, he obtained, by open pollination and controlled crossing with the pollen of *V.vinifera* and *V. rotundifolia* varieties, BC_1 and BC_2 progenies from which some fertile seedlings were selected. One of the first backcross-generation seedlings had complete pollen sterility, but a good berry set occurred after pollination with *V. vinifera* varieties. He interpreted this male sterility as cytoplasmic in nature.

Fry (1964) recently reported results obtained in crosses between *V. rotundifolia* varieties and BC_1 progeny of VR hybrids. The first backcross progeny was obtained by open pollination of the F_1 hybrid B5-50. From this, again by open pollination the progeny of BC_2 was secured. In both instances, the pollen parents were presumed to be *V. rotundifolia*. Fry made controlled pollinations of male sterile varieties of *V. rotundifolia* with the pollen of hybrid seedlings resulting from the second open pollination. This direction of crossing was successful and produced highly fertile progeny. Seedlings segregated for some *V. vinifera* phenotypes, including fruit quality.

Materials and Methods

The vines used in the present investigation were grown in the vineyard of the Department of Viticulture and Enology, University of California at Davis.

Diploid backcross derivatives are designated as BC_1. The population of BC_1 hybrids was obtained by controlled and open pollination of the F_1 VR hybrids, T6 series, as described by Jelenković and Olmo (1968) in a previous paper.

Measures for testing fertility, and cytological and related techniques were also the same as described by these authors.

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[1]) This paper is adapted from a portion of a thesis submitted by the senior author in partical fulfillment for the Ph. D. degree in Genetics, University of California, Davis, June, 1965.

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Experimental Results

1. Fertility studies of diploid BC_1 derivates

Ovule viability test

Results of ovule fertility studies of five BC_1 seedlings are summarized in Table 2. Seedlings Y14-15 and b56-17 are hermaphrodites; but, since they had very low set

Table 1

BC_1 VR hybrids used in the present investigation

BC_1 hybrids	Parentage	Flower type
Y14—14	T6—31 O. P.[1])	Female
Y14—15	T6—31 O. P.	Hermaphrodite
Y14—16	T6—32 O. P.	Hermaphrodite
Y14—22	T6—38 O. P.	Hermaphrodite
Y14—23	T6—38 O. P.	Female
Y14—26	T6—44 O. P.	Hermaphrodite
Y14—33	T6—63 O. P.	Female
b54—1	T6—44 O. P.	Female
b56—17	T6—42 × Scolokertek	Hermaphrodite

[1]) O. P. = open pollinated, presumed *V. vinifera* pollen.

Table 2

Fertility studies of some BC_1 types of VR hybrids

Parents	Pollinated Flowers (clusters)	Set (%) Berry	Set (%) Ovule	Seed Av./berry	Seed Total	Seed Floaters(%)
	Ovule fertility studies					
Y14—14 × Grenache	719 (7)	40.4	12.1	1.2	347	7.8
Y14—14 × Palomino	488 (5)	46.1	16.0	1.4	312	9.6
Y14—15 × Mission	698 (6)	12.2	3.2	1.1	91	40.6
Y14—23 × Grenache	941 (10)	18.3	6.4	1.4	243	11.5
Y14—23 × Cabernet-Sauvignon	686 (8)	10.2	3.5	1.4	97	7.2
Y14—23 × Red Malaga	593 (7)	31.0	10.1	1.3	240	7.5
Y14—23 × Xerez	357 (5)	0.0	0.0	0.0	0	0.0
b 56—17 × Thompson Seedless	623 (10)	29.8	7.7	1.0	193	27.4
b 54—1 × Grenache	97 (1)	35.0	9.0	1.0	135	2.8
Y14—4 × Trayshed	729 (7)	20.0	6.0	1.2	175	6.2
Y14—15 × Trayshed	597 (6)	13.6	3.2	1.0	77	37.7
Y14—23 × Trayshed	622 (6)	0.0	0.0	0.0	0	0.0
	Self-fertility studies					
Y14—15	3458 28)	2.4	0.6	1.0	83	37.1
Y14—16	803 (9)	0.0	0.0	0.0	0	0.0
Y14—33	1723 (14)	0.0[1])	0.0	0.0	0	0.0
Y14—26	310 (5)	0.0	0.0	0.0	0	0.0
b56—17 I	321 (4)	0.0	0.0	0.0	0	0.0
b56—17 II	711 (15)	1.7	0.4	1.0	12	58.0
b56—17 III	545 (9)	3.3	0.8	1.0	18	83.3

[1]) Set small parthenocarpic berries.

upon selfing, *V. vinifera* and *V. rotundifolia* pollens were applied without previous emasculation. The flowers were not emasculated since this procedure frequently injures the ovary. Any seedlings that result from selfing can be recognized, as they are very dwarfed. The berry set in Y14-15 with 'Mission' and 'Trayshed' was about 13 per cent and ovule set about 3 per cent. Seedling b56-17 pollinated with 'Thompson Seedless' had a berry set of nearly 30 per cent and ovule set of about 7 per cent. However, average number of seeds per berry was one.

The other seedlings, Y14-14, Y14-23, and b54-1, had relatively high berry and ovule sets as well as high average seed number per berry. Berry set varied from 10.2 to 46.1 per cent and ovule set between 3.5 and 16.0 per cent. The average seed number per berry ranged from 1.02 to 1.38.

The crosses of Y14-23 with 'Xerez' and 'Trayshed' failed to produce berries. The reason may be related to poor vigor of the shoots that bore the flower clusters.

Self-fertility test

The berry and ovule sets resulting from selfing of hermaphroditic BC_1 seedlings were very low (Table 2). Seedling Y14-15 produced only 83 seeds from 13,832 ovules pollinated during three seasons. Flowers of Y14-16 produced no set in two seasons of selfing, yet the pollen of this seedling had high viability. The plant is a poor grower and bears only about 7 to 8 small flower clusters per season. The same may be true for seedling Y14-26.

Flower clusters of seedling b56-17 were isolated and selfed at three different periods in the 1964 season. The first isolation failed to produce berry set. The flower clusters used in this isolation were borne on the basal part of the primary shoots. For the third attempt the flower clusters on secondary shoots were used, and the highest berry and seed sets were obtained (Table 2).

Table 3

Pollination of some *V. vinifera* and *V. rotundifolia* varieties with the pollen of BC_1 derivatives

Parents	Pollinated	Set (%)		Seed		
	Flowers (clusters)	Berry	Ovule	Av./berry	Total	Floaters (%)
	BC_1 to *V. vinifera*					
Hunisa × b56—17	622 (2)	18.3	5.4	1.2	142	7.7
Hunisa × Y14—33	160 (1)	0.0	0.0	0.0	0	0.0
Hunsia × Y14—16	225 (1)	8.4	2.1	1.0	19	0.0
Hunisa × Y14—15	461 (2)	0.0	0.0	0.0	0	0.0
L12—80 × Y14—15	522 (2)	0.2	0.4	1.0	1	0.0
F2—35 × Y14—15	792 (3)	2.3	0.6	1.1	20	0.0
F2—35 × Y14—16	815 (2)	36.3	10.8	1.2	351	2.8
Chasselas Napoleon × Y14—16	547 (3)	17.0	5.3	1.2	117	0.0
	BC_1 to *V. rotundifolia*					
Dulcet × Y14—15	395 (8)	0.0	0.0	0.0	0	0.0
Dulcet × b56—17	298 (7)	0.0	0.0	0.0	0	0.0
Dulcet × Y14—16	68 (2)	0.0	0.0	0.0	0	0.0
Dulcet × Y14—22	155 (5)	0.0	0.0	0.0	0	0.0
Higgins × Y14—16	117 (3)	0.0	0.0	0.0	0	0.0
November × Y14—16	92 (3)	0.0	0.0	0.0	0	0.0
November × Y14—22	72 (2)	0.0	0.0	0.0	0	0.0

Pollen viability test

The results of the pollen fertility tests of this group of seedlings are presented in Table 3. The pollen of seedling Y14-33 on 'Hunisa' failed to set fruit. The pollen of this seedling was meager and nonviable. The flower cap persisted on the flower and later, for a considerable time on the fruit. Emasculation of the calyptra was difficult and injured the ovary.

Seedling Y14-15 produced viable pollen and set fruit on F2-35 and L12-80. Berry and ovule set were very low, however. No set was obtained on 'Hunisa'. The best sets were obtained by using pollen of seedlings Y-14-16 and b56-17. From Table 3 it is evident that all pollinations of male sterile *V. rotundifolia* varieties with pollen of BC_1 seedlings failed to produce berry set.

Viability of the pollens of Y14-15, Y14-16, Y14-26, and b56-17 were determined also by staining and germination tests (Table 4). The highest germinability was in Y14-16 and the lowest in Y14-15.

Microscopic studies of the pollen grains revealed striking variations in stainability among seedlings. The pollen of seedling Y14-16, which had the highest germination rate among the seedlings in this group, was more than 50 per cent stainable (Fig. 1). In contrast, the pollen of seedling Y14-15, which was of low germination,

Table 4

Pollen appearance and germinability of BC_1 hybrids

Vine	Pollen grains total No.	Stained %	Nonstained %	Shriveled %	Germination %
Y14—15	1458	13.8	8.3	77.9	0.4
Y14—16	1474	58.5	3.6	38.0	2.5
Y14—26	1118	15.5	15.1	69.4	0.0
b56—17	1414	33.0	15.1	51.91	1.3

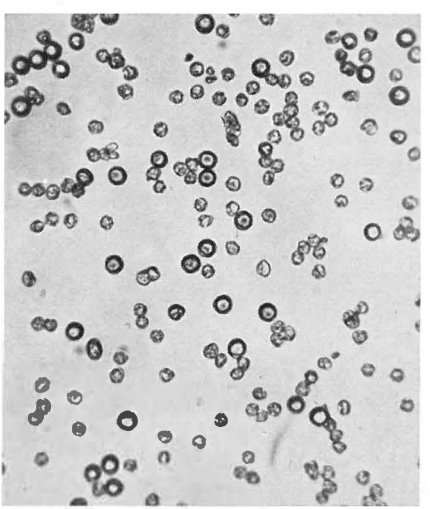

Fig. 1

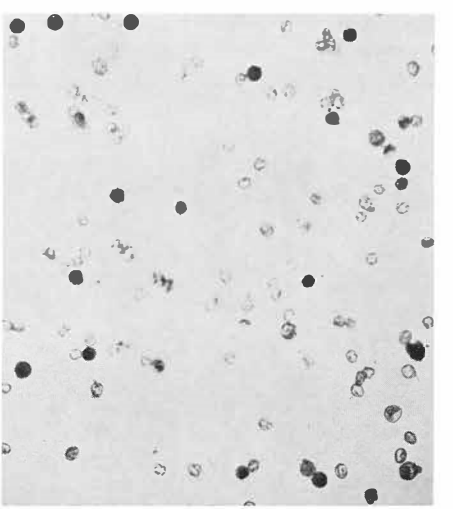

Fig. 2

Fig. 1: Pollen of Y14—16, about 50 percent stainable (mag. × 230).
Fig. 2: Pollen of Y14—15, about 14 percent stainable (mag. × 200).

Table 5
Chromosomal associations at MI of diploid BC_1 VR hybrids

Vine	PMC analyzed	I[3]	II	III	IV	V	VI	VII
Y14—14	54	0.85[1])	16.09	0.26	0.37	0	0.18	0
		0—6[2])	12—19	0—2	0—1	0	0—1	0
Y14—15	48	5.06	12.50	0.71	0.77	0.27	0.12	0.25
		0—14	7—17	0—3	0—2	0—1	0—1	0—1
Y14—16	36	2.00	15.11	0.94	0.39	0.08	0.05	0.03
		0—5	10—19	0—2	0—2	0—1	0—1	0—1
Y14—23	15	2.13	13.40	1.46	0.86	0.06	0.06	0.06
		1—3	10—15	0—3	0—2	0—1	0—1	0—1
Y14—33	24	3.20	7.87	0.58	0.91	0.20	0.91	0.33
		0—7	2—14	0—2	0—3	0—1	0—2	0—1
b56—17	21	1.61	8.62	2.09	1.04	0.38	0.52	0.38
		0—7	2—14	0—5	0—3	0—1	0—2	0—1

[1]) Mean; [2]) Range; [3]) = univalent, etc.

had only 13.7 per cent stainable grains (Fig. 2). The pollens of seedlings Y14-26 and b56-17 were in between these two extremes. The stainable pollens of all clones were quite uniform in size and shape.

2. Chromosomal analysis of diploid BC_1 hybrids

Of six BC_1 seedlings studied, five had 38 and one (Y14-33) had 39 chromosomes. Since the male parent was *V. vinifera,* gametes with 20 chromosomes likely came from T6-63. In the F_1 hybrid, gametes with 19 chromosomes are most often functional.

Results of meiotic studies of chromosomal behavior at MI are presented in Table 5. Chromosomal configurations ranged from univalents to multivalents of nine. Different clones again were highly variable. Y14-14 had the highest average bivalent association (16.09) and the lowest univalent and multivalent formation. Vine Y14-15 had the highest mean number of univalents at MI (5.06), and also relatively high multivalent association.

The lowest average bivalent formation, 7.87 and 8.62, was noted in clones Y14-33 and b56-17, respectively. Both seedlings produced multivalents.

Y14-16 and Y14-23 were similar in chromosomal pairing. Univalents averaged about 2 per cell, and bivalents 15.11 and 13.40, respectively. The mean number of trivalents was 1.46 in Y14-23 and 0.94 in Y14-16. All clones except b56-17 had lower mean number of trivalents.

The shape of the bivalents varied among clones. In Y14-15 the bivalents had one terminal chiasma and were rod-shaped. In vine Y14-14 the bivalents were frequently ring-shaped (Fig. 3). Most of the other clones had both forms at metaphase (Fig. 4). No attempt was made to determine the frequencies of ring and rod-shaped bivalents.

Univalents were randomly oriented. Their location indicated that they result from failure of pairing or chiasma formation between homologous chromosomes, but not to precocious separation at MI.

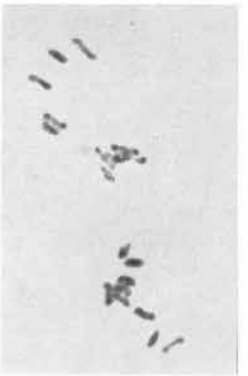

Fig. 3

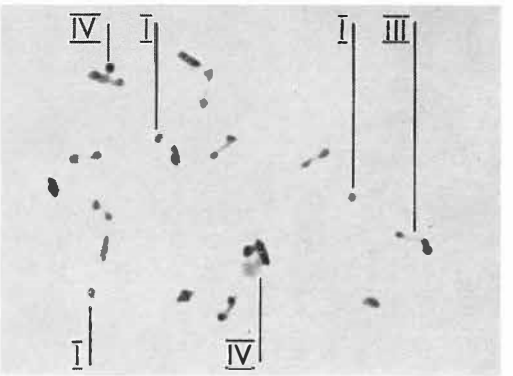

Fig. 4

Fig. 3: Metaphase I, vine Y14—14, 19_{II}. Bivalents mostly ring shaped (mag. × 1620).
Fig. 4: Metaphase I, vine Y14—23; $2_n = 38$. $12_{II} + 3_I + 1_{III} + 2_{IV}$ (mag. × 1620).

High multivalent associates at MI are exceptionally difficult to analyze. Estimation of the numbers of chromosomes involved was done by counting the univalents and bivalents, and ascribing the remainder to the multivalent configuration. Both trivalents and quadrivalents are relatively easy to identify at MI. Multivalents were most frequently oriented as chains, less often as rings.

The distribution of univalents and bivalents in PMC is recorded in Table 6. More than 60 per cent of the PMC of Y14-14 were without univalents at MI. In contrast, seedling Y14-15 had only about 2 per cent of the PMC without univalents. The highest percentages of PMC fell into classes with 3—4 or 5—6 univalents. Vine Y14-16 had 50 per cent of PMC in the class with 1 and 2 univalents. Only 16 per cent

Table 6

Distribution of PMC number of univalents and bivalents in BC_1 into classes based on hybrids at MI

Vine	Percentage of PMC with indicated number of univalents					
	0	1-2	3-4	5-6	7-8	over 9
Y14—14	66.6	22.2	5.5	5.5	0.0	0.0
Y14—15	2.1	16.7	27.2	27.1	16.7	10.4
Y14—16	16.6	49.9	19.4	13.8	0.0	0.0
Y14—23	0.0	59.9	40.1	0.0	0.0	0.0
Y14—33	4.2	29.1	41.6	16.6	8.3	0.0
b56—17	47.6	23.8	14.3	9.2	4.8	0.0

	Percentage of PMC with indicated number of bivalents										
	19	18	17	16	15	14	13	12	11	10	below 10
Y14—14	9.2	3.7	31.4	29.6	9.2	7.4	5.5	1.8	1.8	0.0	0.0
Y14—15	0.0	0.0	6.3	4.2	18.8	10.4	16.7	14.6	2.1	14.6	12.5
Y14—16	2.8	2.8	8.3	22.2	38.2	13.8	5.5	2.8	0.0	2.8	0.0
Y14—23	0.0	0.0	0.0	0.0	20.0	26.6	40.0	6.7	0.0	6.7	0.0
Y14—33	0.0	0.0	0.0	0.0	0.0	4.2	0.0	4.2	0.0	12.5	7.9
b56—17	0.0	0.0	0.0	0.0	0.0	4.8	4.8	4.8	17.0	9.2	57,1

Table 7

Laggards and bridges in PMC at AI and AII in diploid BC_1 VR hybrids

Vine	PMC studied	0		1		2		3		4		5		6		7	
		L[1]	B[2]	L	B	L	B	L	B	L	B	L	B	L	B	L	B
							AI										
Y14—14	32	22		4	0	2		1	0	3	0	0	0	0	0	0	0
Y14—15	33	4		4		3	1	8	0	5	0	3	2	2	1	0	0
Y14—16	24	16		3	0	4	0	0	1	0	0	0	0	0	0	0	0
Y14—33	20	0		3	0	4	2	6	7	0	0	2	1	1	0	2	1
							AII										
Y14—15	14	0	0	2	0	2	2	1	0	3	3	1	0				
Y14—33	21	0	0	3	0	10	2	4	0	2	0	0	0				

[1]) Laggards; [2]) Bridges.

were without univalents. Two classes of PMC were found in Y14-23. The highest class had 1—2 univalents, and included about 60 per cent of the PMC. The narrow range of univalents observed may have been due to the small numbers of cells analyzed. In clone Y14-33 only one cell of the 24 was without univalents. Most of the PMC had three or four univalents. In b56-16, about 48 per cent were without univalents at MI.

High bivalent frequencies were correlated with few or no univalents. Thus in Y14-14 most frequently the PMC's had 17 II, whereas in Y-14-15 and Y14-16 the peak class was 15 bivalents. In Y14-23 13 bivalents were most frequent and the highest degree of pairing is 15 II. In the last two clones of this group, namely Y14-33 and b56-17, most of the cells had less than 10 bivalents.

Chromosomal behavior at AI is summarized in Table 7. More than 50 per cent of the PMC in clones Y14-14 and Y14-16 were without laggards but in Y14-16 one cell had three bridge-like configuration. In clone Y14-15, laggards and chromatin bridges were common in the same cell. As many as 13 laggards and 12 bridge-like configurations were observed in a single cell. Of the 20 PMC from clone Y14-33 scored at AI, none were without irregularities. Cells in AII were scored only in clones Y14-15 and Y14-33. Some chromosomes were outside the spindle, also laggards and bridge-like configurations were noted. The presence of chromatin bridges in AII indicates that some of the attenuation in separation of bivalents at AI was a result of gross structural changes (inversions, translocations or both).

3. Morphology of the diploid BC_1 VR hybrids

The distinctive feature of the diploid backcross progeny was the remarkable variation in vigor among the seedlings. Clones Y14-15, Y14-33, and b56-17 were very vigorous. They produced a large number of primary shoots that continued to grow late in the season. Some of these shoots reached 3 meters in length and bore numerous flower clusters.

Clone b56-17, in addition, produced many secondary shoots that continued to bear flower clusters during a long period in summer. Clones Y14-16, Y14-22, and Y14-23 were very weak. The latter two seedlings did not flower until the fifth season in the seedling block. They produced no secondary shoots, and the number of primary shoots was small, (average of three or four). The primary shoots reached about 40 cm

Table 8
Morphological characteristics of the diploid BC_1 VR hybrids

Vine	Bark of trunk	Specific gravity	Cane			Pith	
			Striation	Lenticels	Tendrils	Diaphragm	Color
Y14—14	Fibrous	>1.0	Present	Absent	Bifid	Present	Yellow
Y14—15	Adherent	>1.0	Absent	Absent	Bifid	Present	Brown
Y14—16	Fibrous	>1.0	Present	Absent	Trifid	Present[1])	Yellow
Y14—22	Adherent	>1.0	—	Absent	Bifid	Absent	Green
Y14—23	Fibrous	>1.0	Absent	Absent	Bifid	Present	Brown
Y14—26	Fibrous	>1.0	Absent	Absent	Bifid	Present	Yellow
Y14—33	Fibrous	>1.0	Absent	Present	Bifid	Present[1])	Green
b 54—1	Fibrous	>1.0	Present	Absent	Bifid	Absent	Green
b 56—17	Fibrous	>1.0	Absent	Absent	Bifid	Absent	Green

[1]) Partially formed diaphragm.

in length and were very thin. During the winter, the canes died back perceptibly, so that only two or three basal buds survived. Seedlings Y14-14 and b54-1 were fairly vigorous. Morphological traits of the trunk and cane are summarized in Table 8. The specific gravity of the wood of all seedlings tested was higher than 1.0, the characteristic value of *V. rotundifolia* wood. The other trunk and cane characteristics were predominantly *V. vinifera* type. For example, only two of nine seedlings studied had nonfibrous bark, and only one (Y14-16) had trifid tendrils. Four of the seedlings formed diaphragms. Two had partially formed diaphragms, the clear separation of the yellow pith and green diaphragm being at the upper margin of the diaphragm only. All seedlings that form a diaphragm have yellow or brown pith; absence of a diaphragm is associated with green pith. There was no correlation between type of trunk bark and diaphragm formation.

The fruit clusters were conical in shape and resembled those of *V. vinifera* (Fig. 5). The smallest clusters were in Y14-16 and the largest in Y14-14. Since the male parents of these seedlings are unknown, and since the varieties of *V. vinifera* vary considerably in shape of the leaves, it is difficult to ascertain the mode of inheritance of leaf traits. With the exception of seedling Y14-15, all possessed *V. vinifera* type leaves. Some had both lateral sinuses (upper and lower), some only upper, and Y14-16 neither. Size and shape of a particular sinus varied among the seedlings.

The leaves were thick in texture ,and depression between secondary veins made the blade surface undulated and rough. All leaves had at least some hairs on the lower surface, a *V. vinifera* characteristic. In Y14-15, leaf blades were plane, smooth, and shiny.

Results of the berry and seed studies are presented in Table 9. In comparison with that of the parents, the skin of the seedlings was relatively thick. Two of them lacked the musky flavor of *V. rotundifolia*. Seedlings Y14-23 and Y14-33 had berries with a much-diluted musky flavor. The most pronounced flavor was in berries of b56-17. The seeds of Y14-14 and b54-1 were of the *V. vinifera* type; those of Y14-15 and b56-17 were of the *V. rotundifolia* type.

When the phenotypic traits of diploid BC_1 progeny are compared with those of F_1 diploid progeny, it is obvious that much greater variability exists in the BC_1 progeny.

Fig. 5: Fruit cluster of vine b54—1 (mag. × 0,75).

Discussion

Large variations in fertility were found among the diploid backcross derivates. For example, in seedlings Y14-14, b54-1, and b56-17, the percentages of berry and ovule set were in the range of berry and ovule set reported for *V. vinifera* varieties by RANDALL (1940) and ALLEY (1957). Hence, these seedlings can be considered as fertile as commercial varieties. In contrast, clone Y14-33 was completely sterile.

DUNSTAN (1962 a, 1964) described one backcross seedling with high ovule fertility but complete pollen sterility. He attributed this sterility to cytoplasmic male sterility. No such sterility was found in our backcross progeny. It is possible that DUNSTAN's "cytoplasmic male sterility" resulted from normal segregation of genes for flower type, since male sterile types would be expected to segregate.

Multivalents were frequent in the backcross hybrids. Bridge-like configurations and laggards were noted in seedlings Y14-15 and Y14-33, which had high degrees of

Table 9

Berry and seed characteristics of the diploid BC_1 VR hybrids

Vine	Berry				Seed				
	Color	Shape	Flavor	Skin	Clings to pulp	Fossette	Shape	Creases	Beak
Y14—14	White	Spherical	Nonmusky	Thick	No	Shallow	Pyriform	Present	Short
Y14—15	White	Oval	Musky	Thick	Yes	Very shallow	Oblong	Present	Very short
Y14—22	Black	Oval	Musky	Thick	No	Shallow	Oblong	Absent	Short
Y14—23	White	Oval	Slightly musky	Thick	No	Shallow	Pyriform	Absent	Short
Y14—33	White	Spherical	Slightly musky	Thick	—	—	—	—	—
b 54—1	Black	Spherical	Nonmusky	Thick	No	Shallow	Pyriform	Absent	Long
b 56—17	White	Oval	Strong musky	Thick	Yes	Very shallow	Oblong	Present	Very short

sterility. Thus, in this progeny there was a positive correlation between chromosomal pairing and fertility. In Y14-14, high fertility was associated with low frequency of univalents; in Y14-15, high sterility was related to a low frequency of bivalents. Seedlings in the diploid backcross progeny of the Y14-series had a higher average frequency of multivalents than did F_1 plants. The same relationship holds for the irregularities noted at AI and AII of seedlings Y14-15 and Y14-33. Maximum hybridity should be expected in the F_1 generation. However, exchange of chromosomal segments between V and R genomes in the F_1 generation further increased structural heterozygosity in certain chromosomes, which, if not detrimental in haplophase, caused chromosomal irregularities in backcross progeny. Because of segregation and recombination in the F_1, unbalanced genotypes were obtained in backcross progeny. This unbalance of genetical factors probably contributed to the increased chromosomal irregularities in these seedlings.

In regard to crossing behavior, the BC_1 seedlings crossed with *V. vinifera* as either female or male parents, but only as female with *V. rotundifolia*.

Summary

Diploid backcross progeny of (*V. vinifera* L. × *V. rotundifolia* Michx.) × *V. vinifera* L. were studied in the present investigation.

1. In the diploid backcross (BC_1) progeny a range from completely sterile seedlings to others as fertile as standard *V. vinifera* varieties was obtained.
2. Average bivalent formation at MI in the diploid BC_1 progeny varied from 7.9 to 16.1. There was a relation in BC_1 hybrids between chromosomal pairing at MI and fertility of the seedlings.
3. BC_1 seedlings segregated for some *V. rotundifolia* characters (fruit quality, flavor, type of bark, tendrils, diaphragm, size of flower clusters, shape of the leaves, etc.). Wood type was the only characteristic of *V. rotundifolia* which was found in all BC_1 seedlings.
4. Crossability pattern of the BC_1 progeny to *V. vinifera* and *V. rotundifolia* was the same as that of F_1 VR hybrids; namely, only as a female parent to *V. rotundifolia* and female or male to *V. vinifera*.

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