

SOME FERTILE HYBRIDS OF BUNCH AND MUSCADINE GRAPES

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ALMOST 100 years ago the first recorded hybrids between *Euvitis* and *Vitis rotundifolia* were obtained by Dr. Peter Wylie¹³. Since his time the work of hybridizing bunch grapes with muscadines has been undertaken by various institutions, including the U. S. Department of Agriculture, and several private workers. All attempts prior to 1955 failed to produce results of practical horticultural value, the primary difficulties being a high degree of sterility in the F₁ and weakness in subsequent generations. Although investigation of this problem was begun in 1939 at Greensboro, North Carolina, little was accomplished for some years.

The work reported here is based on an old F₁ hybrid known as N.C. 6-15, presumably produced by Detjen⁴ at the North Carolina Experiment Station, Raleigh, from a cross of a Malaga seedling by a dark-fruited, hermaphrodite, *V. rotundifolia* selection. It was received from a private breeder, (R. L. Farrer, of Atlanta, Ga.), to whom cuttings had been sent after the *V. rotundifolia* hybrid work was discontinued at North Carolina in the early 1920's.

The vine is a typical F₁ hybrid with a chromosome number of $2n=39$, as established by Patel and Olmo⁹. Morphologically, it is more or less intermediate between the species, and its flowers are pistillate with strongly reflexed stamens.

N.C. 6-15 has been described as "absolument stérile tant par le pollen que par l'ovule,"⁸ "almost completely pollen and ovule sterile."⁹ Patel and Olmo⁹ report having obtained several seeds from it, two of which proved viable. It is like all such F₁ hybrids, largely sterile; but it is *unlike* all such hybrids pre-

cisely in the degree to which it has proved capable of producing, under certain conditions, fruit and viable seed, despite its chromosomal irregularities. Although the few clusters produced are generally very small, one to four berries being the rule, bunches of eight to 12 berries have been obtained, and in 1956 the vine produced, among other smaller clusters, two of 26 and 31 berries, respectively, averaging just under one sound seed (non-floaters) per berry. In 1960 about 100 sound seeds were harvested.

Wylie¹³ noted considerable variation in "compatibility" between individual *Euvitis* and *V. rotundifolia* vines. Dearing¹ and Detjen³ observed similar breeding behavior. In order to explore, in the light of their experience, the possibilities of further breeding, as well as to obtain at once as many seeds as possible, pollen from numerous *Euvitis* varieties, especially *V. vinifera* and Franco-American hybrids, was used on N.C. 6-15 in mixed-open and controlled pollinations, with the results stated above. In the controlled crosses, the variety Blackrose gave the best fruit set.

Germination of the seeds of N.C. 6-15 is normal, i.e., approximately 50 percent. However, behavior of its seedlings is at variance with that previously reported for backcross progeny of such hybrids. Although the majority of seedlings, regardless of the pollen parent, have been weak or very weak, not surviving to fruit, about five percent have ranged from somewhat under average vigor to marked heterosis. Among these backcrosses of N.C. 6-15 have been individuals ranging in fertility from well above that of the seed parent to normal. (The term "backcross" is used to indi-

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N.C. 6-15 AND FIVE SEEDLINGS

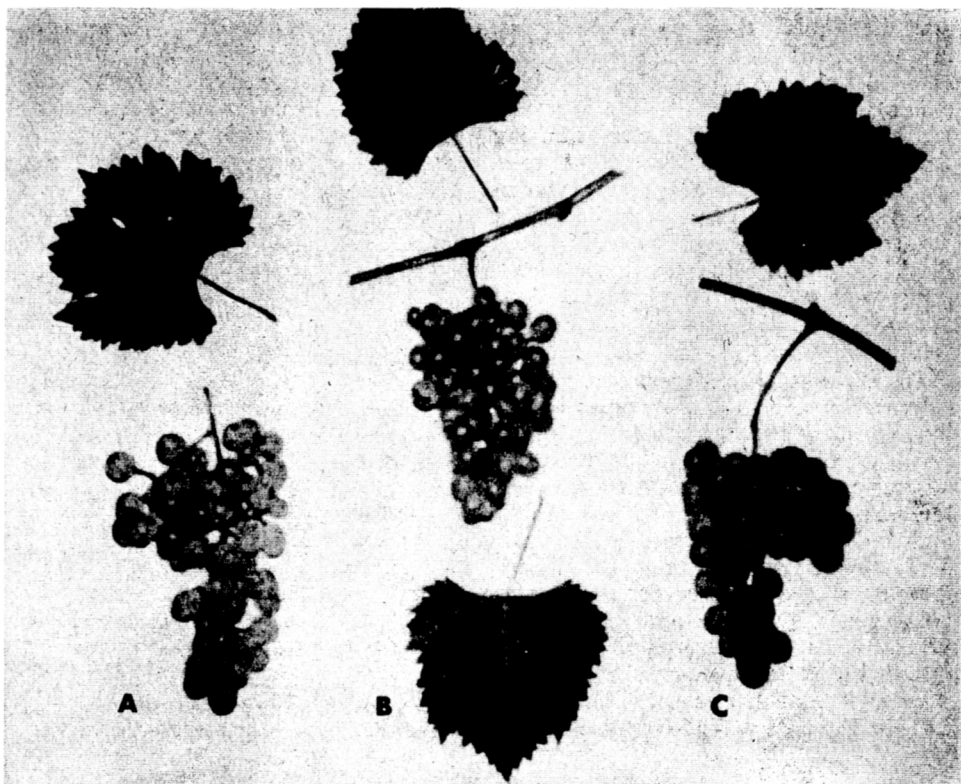
Figure 18

A—DRX 59-3 (× Blackrose); B—DRX 59-5 (× Dunstan 17); C—DRX 58-2 (× Blackrose); D—DRX 58-5 (× Dunstan); E—N.C. 6-15; F—DRX 57-5 (× Dunstan 56). The fruit of N.C. 6-15 (E) is just beginning to ripen; the others are mature.

cate the parental *species* of N.C. 6-15, its exact parental *varieties* presumably being no longer in existence.) These results are in accord with the well-established principle that fertile lines may be developed from partially sterile F_1 hybrids¹⁰. Eight such fertile selections have been made to date. Seven of them have been backcrossed with *Euvitis* and three by *V. rotundifolia* (Figure 18). Cytological analysis of four seedlings of N.C. 6-15 × *Euvitis* reveals the chromosome number of each to be $2n=38$.

The first of these four, designated DRX-55, resulted from an open-pollinated seed of N.C. 6-15, being the one

surviving plant from nine seeds produced in 1954. The vine is intermediate in certain characteristics, although somewhat more *Euvitis* in general appearance. Although its flowers appear morphologically perfect, its pollen is entirely sterile. Attempts at selfing, distributed through five seasons of flowering and involving 40 clusters, have failed to produce a berry, while clusters left open with adequate pollen have set normally. Microscopic examination of the pollen shows only abortive grains. This vine, therefore, presents a condition apparently rare in *Vitis*; normally it has fertile ovules in flowers whose pollen proves consistently sterile. (Stout ob-



DERIVATIVES OF N.C. 6-15

Figure 19

A—DRX 58-12 (DRX-55 \times Blackrose); B—DRX-55 (N.C. 6-15 open pollinated); C—DRX-17 (DRX-55 \times N. Y. Sta. 16829). All fruit mature.

served male-sterile individuals, all *Euvitis*, some having erect but "crinkled" stamens, others with normal, upright stamens¹¹. He attributed their sterility to intersexualism.) Furthermore, DRX-55 appears unique among *Euvitis* \times *V. rotundifolia* hybrids in that its fruit clusters are predominantly *Euvitis* in size and form.

In studying F_1 hybrids of *Euvitis* \times *V. rotundifolia*, Williams¹² observed that "the degree of expression of the intermediate condition was about uniform in any one vine; that is, a vine with more resemblance to one parent in one character had more resemblance to that parent in other characters." In the

majority of BC_1 progeny of N.C. 6-15, such consistent dominance by either parental species is not apparent.

It will be noted in Table I that four out of the five seedlings illustrated in Figure 18, as well as N.C. 6-15 itself, show the more or less intermediate condition in certain characters.

The BC_2 generation of N.C. 6-15, especially the backcrosses by multispecific *Euvitis* varieties, presents striking patterns of segregation and recombination, with the recurrent species more clearly in evidence. Among the BC_2 occur numerous vines manifesting in altogether novel combinations the anatomical and morphological characters

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