

### Breeding for Seedless *Vinifera* Grapes

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A PRELIMINARY report on the breeding of grape varieties of *Vitis vinifera* was made in 1931 (1). Attention at that time was called to the fact that seedless grape varieties were obtained in the F<sub>1</sub> generation seedlings by using a seedless variety as the male parent. Since the issue of the preliminary report more seedlings have fruited giving additional data and some promising seedlings. In the continuation of the *Vinifera* grape breeding studies, the main object has been the production of more varieties having the seedless character and also to produce a seedless grape with a muscat flavor. To indicate leads for future breeding it seems desirable to give a brief discussion of some of the crosses where seedless *Vinifera* varieties were used as the male parent.

*Muscat of Alexandria crosses*.—The Muscat of Alexandria, a white grape, is the variety used for Muscat raisin manufacture. The normal berries are large, oval, and although the stamens are upright, many small, round, seedless berries occur. This variety was crossed with the seedless Corinthe Blanc, Corinthe Rose, Panariti (black Corinthe), Sultanina, Sultanina Rosea, and Black Monukka, all having upright stamens.

Nineteen seedlings were obtained from the Alexandria x Corinthe Blanc cross, 17 of which have fruited. Four of these had reflexed stamens while the remainder were upright. All seedlings were white in color, small in size, not definitely muscat flavor, and none were seedless. This cross did not yield any seedling of apparent value.

Thirty-five seedlings were obtained from the Alexandria x Corinthe Rose cross, 28 of which have fruited. Three vines had reflexed stamens, the remainder upright. Fourteen seedlings were white in color, and 14 varied from light to dark red. The berries were small in size, not definitely muscat in flavor, and none were seedless. While this cross did not yield any seedling of apparent value, one red-fruited seedling has been selfed in an attempt to segregate the muscat flavor and the seedless character.

Twenty-four seedlings were grown from the Alexandria x Panariti cross, 23 of which have fruited. Six vines had reflexed stamens, the remainder upright. Twelve seedlings were white in color and 11 varied from dark red to purple black. The berries varied in size from small to medium large, one seedling had a definite muscat flavor while nine others had a slight muscat flavor. No seedless seedlings were obtained in this cross. Selfed seedlings of two of the more promising vines of this cross have been grown to study segregation of characters.

Six seedlings were obtained from the Alexandria x Sultanina cross, four of which have fruited. One vine had reflexed stamens while three were upright. All seedlings were white in color, small to medium large in size, and not definitely muscat flavor. One vine had seedless fruit while one other vine bore fruit with only hollow rudi-

mentary seeds. Two seedlings have been considered of sufficient value to propagate for production tests. Selfed seedlings have been grown and back crosses made with the male parent.

Eleven seedlings were obtained from the Alexandria x Sultanina Rosea cross, nine of which have fruited. One seedling had reflexed stamens, eight had upright. Five seedlings were white in color while four varied from light pink to red. Three seedlings had a slight muscat flavor, two seedlings were seedless and one near-seedless. One seedling has been propagated for further trial and selfed seedlings have been grown of two vines of this cross.

Fifty-four seedlings were derived from the Alexandria x Black Monukka cross, 43 of which have fruited. Ten vines produced reflexed stamens while 33 were upright. Twenty seedlings were white in color with the remainder varying from white mottled red to pink, and from dark red to purple black. The berries varied from medium to large. Ten seedlings had a slight muscat flavor, six seedlings were practically seedless, one of which had the combined characters of muscat flavor and seedlessness. Six seedlings of this cross have been propagated for further trials while eight seedlings have been selfed and two have been used in backcrosses. The most interesting and valuable seedlings have been obtained from this cross of Alexandria x Black Monukka.

*Muscat Hamburg crosses:*—Muscat Hamburg is a black variety. The normal berries are above medium in size, oval to roundish oval, and although the stamens are upright, frequently small, round, seedless berries occur in the normal clusters. The Muscat Hamburg has a distinct muscat flavor but is decidedly different in aroma from the Muscat of Alexandria. Black Monukka and Panariti were used as male seedless parents in crosses with Muscat Hamburg.

Twenty-nine seedlings were obtained from the Muscat Hamburg x Black Monukka cross, 22 of which have fruited. All vines had upright stamens. Four seedlings were white and 18 varied from dark red to purple black in color. The berries ranged in size from very small to medium large. While the fruit from all the vines was distinctly rich in flavor, the decided muscat flavor was apparent in only three of the seedlings. One very small fruited seedless seedling with a muscat flavor was obtained from this cross. Three other seedlings produced only rudimentary seeds. Two of the seedlings have been propagated for production records while eight seedlings have been selfed. Three of the seedlings have been used in backcrosses. The outstanding result of this cross was the production of a very small seedless, muscat flavored seedling. This seedling has been propagated for production trials and if production records are favorable it should have value as a commercial currant type raisin.

Nineteen seedlings were grown from the Muscat Hamburg x Panariti cross, all of which have fruited. All vines had upright stamens. Two seedlings were white while 17 varied from purple black to black. All the seedlings were small in size, 16 varied from slight to decided muscat flavor, and none were seedless. This cross did not yield any seedling of apparent value. Two seedlings were selfed however in order to study segregation of characters.

*Black Monukka crosses:*—In addition to the use of Black Monukka as a male parent in crosses with muscat flavored grape varieties, crosses have also been made between other varieties and Black Monukka for the production of seedless varieties. In some of the first crosses made in 1923, Gros Guillaume x Black Monukka produced one seedless seedling from nine plants grown. Rodites x Black Monukka produced one seedless seedling from one plant grown. From these indications of the value of Black Monukka as a male parent in seedless production, other crosses were made.

Twenty-four seedlings were grown from the Pizzutello (white) x Black Monukka cross, 19 of which have fruited. All seedlings had upright stamens. Three seedlings were white in color while 16 varied from light red to purple black. In size the seedlings varied from small to large. Three seedlings were seedless and three others had only rudimentary seeds. Pizzutello bears distinctly falcoid shaped berries. The seedlings varied from falcoid to pointed fusiform in shape. The three seedless seedlings have been propagated for production tests while some have been selfed and others used in backcrosses.

Forty-four seedlings were grown from the Damas rose x Black Monukka cross, 40 of which have fruited. The type of stamens in this cross was not ascertained. Nine seedlings were white in color while 35 varied from light red to purple black. Two seedlings were seedless while four others produced only rudimentary seeds. One seedling has been propagated for production records while three others have been used in backcrosses.

Two hundred seventy-five seedlings have been grown from the various crosses with the male parent a seedless variety, 85 per cent of these have fruited. Reflexed stamens occurred in 13.2 per cent of the seedlings fruiting although all parents had upright stamens. In the transmission of color white has been a pure color but recessive to black. In most cases black has been heterozygous. The red color has varied from light red to dark red in intensity. Twenty-nine seedless or practically seedless grapes have been produced, representing 12.4 per cent of the fruiting vines. The production of seedlessness in the  $F_1$  generation has proven the practical value of using male seedless parents. The ratio of seedless or near seedless plants produced to seeded plants in the first generation would indicate that seedlessness is not a simple inheritable dominant factor. It is an interesting fact that no seedless plants were derived from crosses of the true seedless currant-type grapes, namely, Corinthe blanc, Corinthe Rose, and Panariti. While muscat flavor occurred in some seedlings Muscat Hamburg appeared to transmit the factor for muscat flavor to a greater degree than Muscat of Alexandria. In two seedlings however the muscat flavor and seedlessness have been produced. The seedless plants of intrinsic value as well as the seeded plants possessing commercial promise have been propagated for production records.

#### LITERATURE CITED

1. SNYDER, ELMER. A preliminary report on the breeding of Vinifera grape varieties. Proc. Am. Soc. Hort. Sci. 28: 125. 1931.