Preliminary Report on Grape Breeding in Maryland

By E. C. AUCHTER, AND W. E. WHITEHOUSE, *University of Maryland, College Park, Md.*

INTRODUCTION

GRAPE breeding studies have been carried on at the Maryland Agricultural Experiment Station over a period of 11 years. These investigations were started and conducted by Mr. W. R. Ballard from 1912 until 1918, from which time they have been under the direction of the present authors. At the time this work was started it was hoped that other desirable varieties of grapes, in addition to those varieties available at that time, might be produced. For instance, Moore Early, one of the earliest of our commercial grapes, is not especially productive in Maryland. As a consequence the production of a new variety, which in addition to being as early or earlier, and also as productive, would be a great help to the grape growing industry of the state. Certain of our other standard varieties also have some weak points under Maryland conditions.

OUTLINE OF THE WORK

At the beginning of this work a number of crosses were made between Vitis labrusca and Vitis vinifera. Later, many of the Roger's Hybrids and Vitis labrusca, and in addition those varieties containing Vitis riparia blood, notably Clinton, were used in many of the crosses. Crosses were also made between many of the common sorts such as Winchell, Diana, Worden, Campbell Early and Eclipse. Due to the pressure of other work, it has been impossible to devote the time and energy necessary to carrying this type of work out on an extensive scale. About 1200 seedlings have been raised to date and this paper is in the nature of a preliminary report of the behavior of these seedlings. The following list is an outline of the crosses and of the varieties used in open pollination work, with the number of seedlings secured in each case.

TABLE 1

Varieties Used

Number	Open Pollinated	Number	Crosses
2	Bailey	6	Agawam x Clinton
2	Brilliant	62	Brighton x Winchell
8	Creveling	23	Campbell x Winchell
5	Goethe	146	Clinton x Black Hamburg
14	Lucile	48	Delicious x Winchell
86	Lindley	56	Diana x Clinton
196	Mericadel	61	Diamond x Clinton
4	Red Giant	34	Eclipse x Brilliant
12	Salem	35	Lindley x Clinton
80	Wilder	16	Lindley x Campbell
7	Woodruff	6	Lindley x Winchell
2	Wyoming	22	Moore Early x Winchell
9	Worden	14	Salem x Clinton
...	———	83	Winchell x Clinton
...	———	56	Winchell x Brilliant
...	———	39	Winchell x Worden
...	———	121	Worden x Winchell
...	———	54	Worden x Clinton

RESULTS OBTAINED

Although very few promising or desirable seedlings have been obtained up to date, still the seedlings from certain variety crosses have stood out in the work, and in a further study of this nature these varieties would be used in preference to many of the others. From the open pollinated varieties used, very few desirable seedlings have resulted. Five of the Lindley, one of the Lucile, and one of the Mericadel, appear at this time to have some promise. In the crossing work, Diamond, Brighton, Clinton, and Winchell, gave the most promise as parents, while Worden, Brilliant, Delicious, and Moore Early, have proved of secondary importance. Palmer (1), Wellington (3), and Hedrich and Anthony (2), found that certain of these same varieties gave desirable seedlings. Of the Diamond X Clinton crosses which have fruited, one, a green grape is promising, having vigor and good quality. Of the Brighton X Winchell crosses, one, a red grape, has exceptionally good quality and berries which hold well to the cluster. Winchell X Worden has given one seedling of promise, a purple grape of good quality. In addition, seedlings have been obtained from Moore Early X Winchell and Winchell X Brilliant which merit further observation before discarding them.

A study of the following table on fruit color inheritance is interesting.

TABLE 2

Inheritance of Fruit Color in Grapes

Cross	Parent Colors	No. Vines Fruited	Per cent Blue	Per cent Red	Per cent White
Agawam x Clinton	R x B	3	66.6	....	33.3
Brighton x Winchell	R x W	6	....	16.6	83.4
Campbell x Winchell	B x W	4	75.0	....	25.0
Clinton x Black Hamburg	B x B	40	92.5	....	7.5
Delicious x Winchell	B x W	13	15.3	....	84.7
Diana x Clinton	R x B	14	50.0	....	50.0
Diamond x Clinton	W x B	22	54.5	4.6	40.9
Eclipse x Brilliant	B x R	9	66.6	....	33.3
Winchell x Clinton	W x B	25	52.0	....	48.0
Lindley x Clinton	R x B	4	75.0	25.0	.....
Lindley x Campbell	R x B	2	50.0	....	50.0
Lindley x Winchell	R x W	3	....	....	100.0
Moore Early x Winchell	B x W	8	25.0	....	75.0
Salem x Clinton	R x B	4	25.0	....	75.0
Winchell x Brilliant	W x R	17	....	....	100.0
Winchell x Worden	W x B	54	33.3	7.5	59.2
Worden x Winchell	B x W	44	25.0	....	75.0
Worden x Clinton	B x B	7	85.8	....	14.2

Blue and black are classed as one color and all gradations of red as one color. In our work the number of crosses made is small compared to the numbers made by other investigators. Blue appears to be dominant over red. The white color in the majority of the crosses was furnished by Winchell, and apparently the factor or factors carrying the white of this variety, except when used with Campbell, exert a strong dominance.

Palmer (1) found the blue color of Campbell dominant in his Campbell X Winchell crosses, and Hedrick and Anthony (2) and Palmer (1) all found white recessive to blue. In all probability the same results would have been obtained in our work had we used a larger number of white varieties. Apparently, Winchell must be used with discretion in working for a better blue or red colored grape.

Conclusions

From the comparatively small number of seedlings fruited up to date, we have obtained a few which give promise in one or two respects. However, it is questionable if these seedlings have all the qualities necessary to make them better than our present varieties. Our work so far has failed to produce a variety in which earliness, blue color, and good quality, are all present.

Literature Cited

1. Palmer, E. F. Solving the Fruit Grower's Problems by Plant Breeding. Proc. Amer. Soc. Hort. Sci. 1920, p. 123.
2. Hedrick, U. P. and Anthony, R. D. 1915. Inheritance of Certain Characters in Grapes. N. Y. Agr. Exp. Sta. Tech. Bul. 45, pp. 10-13.
3. Wellington, R. Grape Varieties that Produce Seedlings of Superior Merit. Proc. Amer. Soc. Hort. Sci. 1920, pp. 37-40.

Growth Studies of the Concord Grape

By A. L. Schrader, *University of Maryland, College Park, Md.*

Introduction

WHEN one reviews the literature on the pruning of the grape, it is surprising to not that relatively little experimental work has been done except to test out the various practices which have developed. Although our pruning practices have been largely governed by an apparent relation between the growth and the fruitfulness of the vine, practically nothing has been done experimentally to determine what this relation is. The pruning practice recognizes this relation when the vines are pruned to a limited number of buds so that the vine will not "overbear," and that sufficient growth will be made to furnish fruiting wood in the following year. The aim of the pruner is to maintain a balance between the vegetative growth of the vine and its fruiting capacity. When vines are too strongly vegetative, more buds are left at pruning time with a consequent increase in fruiting and a reduction of the growth. Keffer (1) in Tennessee has found that unpruned canes will bear more fruit than pruned canes, but the shoot growth on the unpruned cane is much reduced with a consequent reduction of the yield in the following season. Since pruning apparently maintains a good individual cane growth which insures annual fruiting of the vine, there must be a relation between the length of the individual cane and the fruitfulness of its buds. Partridge

(3) in Michigan reported data to show that the diameter of the individual cane and its fruitfulness are related. The largest yields were obtained by Partridge from canes of one-quarter of an inch in diameter, or "pencil size." Thus it is suggested at this time that the growth of the individual cane and the fruiting of its buds are related. This suggestion appears to be borne out by our pruning practice which removes about 90 per cent of the new growth of the vine and retains only a few selected canes which are also pruned back severely.

Relation Between the Original Length of the Cane and Its Fruiting

In order to get some measure of the above relation, some studies were made in one of the College vineyards at College Park. Fifty canes were measured at pruning time to get the original length of the cane before pruning. Canes of various lengths were used ranging from three to 12 feet. The diameter of the canes was approximately "pencil size," such as a grower would select. All of the canes were then pruned to 12 buds each. Table I shows the average yields per cane that were obtained from the canes arranged according to the original length of the cane.

It can be seen from Table I that the canes which had three to four feet or original length produced a comparatively low average yield. Canes which had an original length of four to seven feet bore the largest yields. The canes of the longer original length show a decreasing of yield with greater length of cane. Despite the small number of canes used in this test, the results on average yields per cane appear significant as shown by the probable errors given in the table. The large yield of the four to five foot class is due especially to the greater number of bunches per cane, as shown in Table I, together with a fairly good size bunch. The greater number of bunches on the canes of this class is probably a chance variation in the material of the test, since the number of bunches per cane appears to be nearly constant for the other classes. The eight to 12 foot class shows a slight drop in number of bunches per cane which can be ascribed to the large percentage of buds which did not start on this type of cane. The low average yield of these long canes is likewise due especially to the large percentage of buds which did not start, and also to a lower weight of bunch than the high yielding canes of the five to six and six to seven foot classes. It might be thought that the *fruiting buds* of these long canes would show a larger average yield than the fruiting buds of the high yielding canes, due to the fewer number of buds which produced the yield on the long canes, but Table I shows that this is not the case. The average yield per *fruiting bud* on the long canes is relatively low as compared to those of the high yielding canes. This is due largely to the relatively low average weight of bunch on these long canes, since the number of bunches per shoot was about the same as the number on the high yielding canes. On the basis of greater weight of bunch and large total yield, it is evident that the five to six foot class of canes represents the most desirable length of canes used in this experiment.