

TIMING AND PRODUCTION OF GRAPE POLLEN BY GRAFTING

JOSEPH L. FENNELL

*Horticulturist, Inter-American Institute of Agricultural Sciences,
Turrialba, Costa Rica*

IN plant breeding the availability of the proper pollen at exactly the time required is of paramount importance. Often the normal flowering period of a staminate parent may be months too early or too late to pollinate the proposed seed parent. Breeders of many plants are fortunate in that pollen can be preserved in viable condition for considerable time, if properly dried and stored in a cool and dark location. With other genera, the grape for example, pollen retains its potency even under the best conditions for a very short time. Hence one of the greatest problems of the plant breeder is to assure a supply of fresh, viable pollen on the date that the seed-parent is in flower.

The grape breeder sometimes finds this problem especially acute. When working under environments that are alien to most cultivated varieties, as for instance in the humid tropics, the procurement of the necessary pollen is often a major difficulty. In many instances it is found practically impossible to grow to flowering size certain varieties of North American and European grapes most desirable for breeding. Also, the prolonged dormancy resulting from insufficient chill in the warmer climates often retards the flowering of most varieties of the *labrusca* and *vitifera* species until a date much too late to be of value. In all events, the control of pollen production with regard to the required date and varieties must be mastered before any real degree of success can reward the breeder's efforts.

A relatively simple technique has been developed which when properly carried out has proven to be a major factor in solving the problem of pollen control in grape breeding. This method, though based primarily upon the simple process

of grafting, does require, nevertheless, considerable practice and a knowledge of varietal differences before good results are assured. Accordingly, best results should not be expected until after a few seasons practice.

Materials and Methods

The timing of pollen production by the graft method depends, primarily, upon a careful timing of certain procedures. Considerable accurate data relative to the growth and flowering habits of both proposed parent vines are a prerequisite to satisfactory results. First, we must know the approximate flowering date of the intended seed parent. Second, we must know the time interval which intervenes between first growth, or budding-out, and flowering of the prospective pollen parent. There is often considerable varietal variation in the length of this interval. The time required from date of grafting until growth begins is about the same for all varieties studied, under proper conditions. Generally speaking, this latter period will be about four weeks if the precautions here listed are taken.

Selection of Varieties

The careful selection of stock vines, especially in regard to whether they are early, medium or late in budding-out, is of considerable importance. If successful grafts are to be assured, the date at which the stock naturally starts to grow should coincide with or somewhat precede that of the scion. Growth date of the scion is determined by date of grafting. Most species or varieties of the *Euvitis*, or bunch grapes can be used successfully as graft stocks, although those kinds that root well from cuttings generally give the best results.

As an example let us take as our proposed seed parent the wild *Vitis shuttleworthii*, which in Southern Florida usually begins flowering about March 20. We wish to cross this early species with pollen of the cultivated variety Marguerite, which normally blossoms much too late to be of use in pollinating our chosen pistillate vine. Previously we have obtained dependable data relative to time interval elapsing between budding-out and flowering of our proposed pollen vine. This period let us say is 35 days. We then count back 35 days from March 20, the blossoming date of our seed parent and arrive at the date of February 13. From this latter date we then subtract the time required between grafting and initial growth, or budding-out, known to be approximately 25 days. This gives us the basic grafting date: January 19 or 20. Since unforeseen factors may somewhat modify these growth and flowering periods it is a good precaution to make three sets of grafts with one six days ahead of our basic date and one six days after it.

Preparations Prior to Grafting

Certain important preliminaries should be carefully attended to before arrival of the designated grafting dates. Since vine pruning is usually done in January, scion material of chosen pollen varieties should be obtained slightly prior to this time. The scions should be taken from dormant, well ripened, one-year wood from a quarter to a half inch in diameter, depending on variety. Each scion should have from three to five well developed dormant buds and is best taken from between the fourth and twelfth leaf nodes. Grape scions can easily be held for two months or more without serious deterioration if they are carefully covered with slightly moist sphagnum moss or sand, wrapped in waxed paper and stored in a temperature of about 40° Fahrenheit.

Grape scion material, whether from the cold north or from the Tropics, that has been subjected to its natural environmental conditions until removed

from the vine and treated as described until grafted will show little or no dormancy influence affecting the date of initial growth. If thus handled, all varieties will have received sufficient chill or other growth stimulus for their individual needs and will be ready to begin luxuriant growth as soon as other conditions are favorable. In warm climates the real problem is to prevent this growth action until the graft union is sufficiently developed to support it.

In warm regions it is important to select the vines to be used as stock for grafts several weeks in advance and to do all necessary pruning or cutting at that time. If this expedient is carefully observed there should be little or no "bleeding" induced by the grafting process, provided that only straight, with-the-grain splits are made in the stock. Otherwise an unexpected rain just before or soon after grafting may induce prolonged "bleeding" from the fresh wounds at the graft union and may endanger the success of the experiment.

In warm climates the bleeding of the stock causes two difficulties. It affords the moisture which the scion, already passed its dormant period, utilizes to force its buds prematurely into growth. It also encourages the development or various harmful cryptogamic organisms in and near the spliced areas which may prevent a successful graft union.

In the selection of stock vines to support scions of the pollen varieties, only those should be used whose normal growth dates approximate or preferably slightly precede the desired budding date of the particular scion variety. Grafts may be placed high on the stock vine and a single plant may be made to support numerous scions, depending, of course, on the size of the stock and the number of branches of the proper size.

Grafting Process

The actual grafting employed in this work follows the well known cleft-graft method. Considerable care is advisable to make sure that straight, with-the-grain splits are made and that the cambiums of both stock and scion make

good contact. No wax nor covering of any kind should be used. Grafts should be securely tied, but care must be taken that the tying material does not in any way cover up the spliced areas. Air and thorough drainage are necessary for the knitting together and growth of the cambiums.

Care of Grafts

After all grafts are in place and securely tied the stock vine may be bent over to the ground and the grafts arranged so as to lie as nearly flat as possible. The scions should be thoroughly covered with several inches of slightly moist soil and it is imperative to make certain that actual regions of the grafts are well covered. A burlap bag, split open and spread immediately over the grafts and under the soil covering, will often allow a more ready inspection from time to time. It is also important that the soil around and under the grafts be well drained, yet it should never completely dry out. If the soil covering should become too dry it may be very slightly moistened.

It is well to place as a final covering over the entire soil mound a sheet of tar paper or other waterproof material which will serve as a protection against rain. If this precaution is neglected an unexpected shower may saturate the soil around the scions and prematurely force out all flowering buds. These will soon wither and leave only secondary buds, mostly non-flowering, for later growth. Normal growth of properly inserted and cared for scions will usually begin in about four weeks after grafting.

As soon as true growth begins, as indicated by the healthy swelling of the dormant buds, the vine may be raised to the trellis and securely tied. For at least a month after the vine is attached to the trellis, care should be taken to prevent strong winds from breaking the graft union. As soon as the scion becomes flushed with vigorous growth the strain on the newly formed union may prove too great unless both scion and stock are securely supported.

Discussion

There is no wish to leave the impres-

sion that this method of pollen control is infallible. Results depend in a large measure on the care and skill with which the work is performed, and upon proper choice of the material and timing. Over a period of several years between 40 and 80 per cent of the writer's grafts have come through to produce pollen at the time desired. Success has been dependent on weather conditions, stock vines employed and other influences. A careful consideration of the possible speed-ups or delays that may result from abnormal weather conditions is often quite important.

The graft method of pollen production has proven an invaluable aid in the author's grape breeding efforts in tropical and sub-tropical climates. It has rendered easily possible the crossing of any desired combination of bunch grape, irrespective of the great divergence in normal flowering periods or of their inability through alien climatic influences to reach the flowering stage in the normal way. Properly handled grafts will produce vigorous shoots and the pollen produced is quite comparable in quantity and viability to that produced naturally. If stock vines are given reasonable care they may be employed year after year.

It is well understood, of course, that only those flowers which are of the same season as the grafting, or more specifically, only those which develop from dormant floriferous buds on the previously chilled scions, are controlled by the grafting date.

The extent to which this method might be successfully applied to other plants has not been tested.

Summary

The control of pollen production in grapes by timed grafts of the desired pollen variety is described. By this means pollen can also be obtained from kinds which, due to alien climatic conditions, cannot be brought to flowering in the normal way. The writer's experience with the method has been most favorable, making possible crosses that could not have been achieved by other means.