THE ALTERED RATE OF GROWTH OF FREESIA CORMS

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The present paper represents a preliminary report on a more-or-less heterogeneous series of experiments. Most of these have been planned for the purpose of determining their effect on the rate of growth of the Freesia plants from the time the corms were planted to the production of blossoms. Due to the fact that these tests cover a period of less than two years the results are quite fragmentary, however, we feel that sufficient data have been gathered to warrant mentioning them at this time.

It is common knowledge that bulbous plants require a rest period of varying length interposed between seasons of growth. It has not been the purpose of the present authors to inquire into the mechanism which maintains this dormancy but to impose environmental conditions that, for one reason or another, gave promise of stimulating the plant into immediate growth with the production of blossoms before the usual blooming season. Since it is often equally desirable to prolong the usual season of a given variety it was thought important to note those conditions which tended to retard the blooming date. The fact that this report is being made a few weeks before the usual blooming season of greenhouse grown Freesias it has been necessary, in most instances, to record only relative growth instead of the blooming date. Since ample material in the form of select corms of a standard commercial Freesia was available and facilities at hand for following through the complete cycle of growth our attention has been limited to this one variety.

The experiments may be listed under: first, temperature effects; second, chemical treatments and; third, X-ray dosage.

Low temperatures for the storage of Freesia corms were obtained by the use of a commercial cold storage plant and a General Electric household refrigerator. In the first lot, which had been held during the month of August at a temperature of 38-40 degrees F., it was found that the germination of the corms and subsequent growth was slightly retarded so that the blossoms, although of splendid quality, appeared after those on the control plants. The second lot of corms was, accidentally, carried at a temperature of 33 degrees F. for more than two weeks during the first part of September. When planted these corms equalled the controls in rate of growth and give evidence of equalling their blooming date. In each case the control plants were from corms that had been stored in an open warehouse with temperature similar to that of the outside air. It was probable that the last lot was not retarded due to the fact that they were placed in cold sotrage near the end of their dormant stage while the first lot was placed in cold storage in the early part of the rest period. The foregoing seems to indicate that the Freesia corm can withstand low temperatures for several weeks provided other factors of their environment (increased humidity, presence of noxious gases, etc.) are not materially altered. It also suggests that the subsequent rate of growth may be in part dependent upon the relative time, within the dormant period, when the corms are subjected to the low temperatures.

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The chemical treatments include items that have given favorable results with other plants, substances reported as having a stimulating effect on the growth of animal tissues, and materials normally used as fungicides in the control diseases on Freesia corms. This last group was added due to the fact that questions had been raised concerning their possible effect on growth. With few exceptions the preparation of the materials and treatments were made by Dr. Michael. Variation in length of treatment and concentration of dosage was made in most instances that did not suggest high toxicity in the first test. The substances employed were: ether, ethyl chloride, ethylene chlorhydrin, ethyl bromide, ethylene gas, acetylene, chloroform, thio urea, potassium thiocyanate, thio cresol, cystine, thio glycollic acid, formalin, mercuric chloride, powdered sulphur, hydroxymercurichlorophenol (Bayer's Semesan), carbon dioxide, and oxygen. From one to several pots containing five or seven corms were used for each test. In each case the dormant corms were treated and immediately planted while the control plants were from corms of the same size and planted at the same time. Each lot was checked with the controls as to their time of germination (appearance above the surface of the soil), subsequent growth at regular intervals, and number of "shoots" per corm.

Of the above treatments chloroform, ethylene bromide and ethyl chloride were found to be toxic, causing the corm to die before germination. Ether gave conflicting results possibly due to its toxic effect when the concentration was high. In this connection it is interesting to note that most of the halogen derivatives used were toxic. No effort was made to determine the critical point at which their concentration was sufficiently toxic to cause the death of the corm.

The following list of substances produced a retarding action on early growth: concentrated formalin, potassium thiocyanate, ethylene gas under some conditions, thio cresol and glycollic acid. The above treatments varied in the amount of retarding but in most cases the later growth equalled that of the controls. Later check showed these plants to be entirely normal with prospects of a blooming date nearly equal, or equal to the plants from untreated corms.

Ethylene gas under optimum conditions, acetylene, cystine in very dilute solution, ethylene chlorhydrin and thio urea gave results slightly ahead of the controls in the early stages of growth. This early stimulus was either lost entirely or its effects only slightly discernible in the later stages indicating that the rate had not been permanently altered. The Freesia corms were more tolerant to prolonged exposure to acetylene than to ethylene.

The other treatments, except powdered sulfur, did not materially alter the rate of growth in either the early or later stages. Sulfur treated corms germinated and matured with the controls but their appearance suggested a loss of vigor that was interpreted as being due to disturbed nutrition resulting from the excess sulfur about the roots of the plants.

Of the above items ethylene gas offered the most interesting results although its effect was that of retarding the rate of growth under some conditions while under other methods of application (concentration and relative time in the dormant period when treatment was made) it quite definitely accelerated growth. Several concentrations and lengths of exposure were tried in an effort to determine the critical point at which the stimulating effect of the gas was the highest. In this as in other treatments not only the primary bud (located near the scar of the stem of the preceding season) but the lateral buds, which are usually abortive, are subject to stimulation. Should these abortive buds be induced to grow a re-

tarding action might result since the corm would be made to support from two to six "shoots" instead of the usual one or two. This stimulating effect was obtained with one series of ethylene treatments which resulted in an increased number of "shoots" to from two to six instead of the one shoot per corm as developed on the controls. This series was retarded nearly three weeks in germination and its later growth was not as rapid as the controls. Regardless of the planting date the primary bud of the Freesia corm begins its growth at the end of the dormant period. This growth may result in the formation of a new corm without the appearance of the characteristic plant structures. Observations bore out the expected unsatisfactory results when treatments were made near the end of the dormant period. It is doubtful if a method of increasing the number of stalks produced by a single corm is of any practical value to the commercial florist since the resulting blossoms would probably be of inferior quality.

Very little information has been gathered as to the increase in corms and cormlets from treated Freesias, although it is quite possible that this item might be of considerable importance in the production of off-sets from a new variety. This and several other items need rechecking. One of these is to extend the series of chemical treatments to the first part of the dormant period while the corms are undergoing their so-called "curing."

If any conclusion could be drawn from the observations on the above series of experiments it would probably be that chemical treatment of Freesia corms gives only a temporary stimulus to growth. Once growth is established the plant is controlled by other factors in its reaction with its environment.

In addition to the above experiments dormant corms were subjected to X-ray dosage. This phase of work was undertaken as part of the breeding program which was reported last year, however it is giving an opportunity to follow its effect on the rate of growth. The exposures were at distances of fifteen and twenty inches from the target and at regular intervals from two to twenty-one minutes with a current of 105 K.V. and 30 M.A. A one mm. aluminum screen was placed between the target and the corms in half of the lots so treated. Due to the fact that it has been necessary to repeat these experiments the data concerning the effect of X-rays on the rate of growth is quite incomplete at this time. Indications are that the lower dosages are of a stimulating effect while higher dosages retard and, if sufficiently high, may be fatal. No information is at hand concerning the effect of X-rays on the later growth and blooming time.

The above report is mainly of work in progress and much data will be added during the present winter and spring.

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