decay in the number of different fruits. When Sharples (12) treated Cox's Orange Pippin with 45° water to reduce decay from *Gloeosporium* sp. he concluded that the procedure increased breakdown and coreflush. More recently it was demonstrated that when calcium chloride was added to the hot water, breakdown was controlled as well as decay (13). In our experiments, heating fruit to a considerably lower temp than Sharples used but for a much longer period was highly effective in controlling decay generally, and *Corticium* sp. in particular.

Reduction in titratable acidity in fruit during 6 days at 38°C was equivalent to that which occurred during 4 months at −1° (Table 1). Acid loss during the cold storage period, however, was generally similar regardless of pre-treatment.

Although the effects of heat treatment on fruit softening and disorders may have some practical implications, the accelerated reduction of acid in low acid cultivars such as 'Golden Delicious' and 'Spartan' is a highly undesirable feature of the treatment. Experience in this laboratory has shown that a minimum acid level of 300-350 mg/100 ml is a desirable objective for these cultivars which can be achieved even with extended CA storage.

Literature Cited

1. Brooks, C. and Harley, C. P. 1934. Soft scald and soggy breakdown of apples. *J. Agr. Res.* 49:55-69.
2. Burg, S. P. 1962. The physiology of ethylene formation. *Annu. Rev. Plant Physiol.* 13:265-302.
3. Couey, H. M. and Olsen, K. L. 1975. Storage response of 'Golden Delicious' apples after high carbon dioxide treatment. *J. Amer. Soc. Hort. Sci.* 100:148-150.
4. Eckert, J. W. and Sommer, N. F. 1967. Control of diseases of fruits and vegetables by postharvest treatment. *Annu. Rev. Phytopath.* 5:391-432.
5. Hansen, E. 1942. Quantitative study of ethylene production in relation to respiration of pears. *Bot. Gaz.* 103:543-558.
6. Hardenburg, R.E. and Anderson, R. E. 1965. Postharvest chemical, hot water and packaging treatment to control apple scald. *Proc. Amer. Soc. Hort. Sci.* 87:93-99.
7. Maxie, E. C., Mitchell, C. G. and Sommer, N. F. 1974. Effect of elevated temperature on ripening of 'Bartlett' pear, *Pyrus communis* L. *J. Amer. Soc. Hort. Sci.* 99:344-349.
8. Overholser, E. L. and Taylor, R. H. 1920. Ripening of pears and apples as modified by extreme temperatures. *Bot. Gaz.* 29:273-296.
9. Porritt, S. W. and Meheriuk, M. 1970. Chemical control of scald on waxed apples. *Can. J. Plant Sci.* 50:313-317.
10. ―――― and ――――. 1975. Postharvest factors associated with the occurrence of breakdown in Spartan apple. *Can. J. Plant Sci.* 55:743-747.
11. Ruck, J. A. 1963. Chemical methods of analysis of fruits and vegetables products. Canada Dept. of Agric. Publ. 1154.
12. Sharples, R. O. 1967. The effect of a postharvest heat-treatment on the storage behavior of Cox's Orange Pippin apple fruits. *Ann. Appl. Biol.* 59:401-46.
13. ―――― and Johnson, D. S. 1976. Postharvest chemical treatments for control of storage disorders of apples. *Ann. Apple. Biol.* 83:157-167.

J. Amer. Soc. Hort. Sci. 103(5):587–591. 1978.

Flower Production of *Freesia hybrida* Seedlings under Night Interruption Lighting and Short Day Influence[1]

Terry L. Gilbertson-Ferriss and H. F. Wilkins[2,3]

Department of Horticultural Science, University of Minnesota, St. Paul, MN 55108

Additional index words. photoperiod, cool-season crop, freesia

Abstract. **Flowering dates of freesias (*Freesia hybrida* Bailey) sown at monthly intervals varied according to monthly temperature fluctuations over a 2-year period. Seeds germinated from April to June reached anthesis from December to March. April through June seeding dates were acceptable for obtaining optimal flower production and quality in Minnesota, but these plants were slower to flower than those seeded from July through November. Night interruptions by incandescent light hastened flowering, but flower quality was poorer than from plants grown under natural days. Short days and night interruptions using BCJ-Ruby incandescent lamps had no influence on flowering date.**

Freesia hybridia, Iridaceae, is native to South Africa (2) and an important cut flower crop in Europe and Japan. The lack of information on freesia culture in the U.S. may account for the limited commercial production. Commercial potential exists as a cool season crop (10° – 15.5°C) but European cultural practices must be modified for the American grower because of light and temperature differences. European cultural practices have been modified for Israeli production (6).

The freesia inflorescence is a cymose spike (personal communication, E. C. Abbe, Univ. of Minnesota). Flowers are borne sessile along the apical end of the scape which terminates in a flower. On a normal floral spike, flowers are closely spaced. The portion of the scape bearing the flowers will be perpendicular to the remaining scape. Low temp (6-9 weeks at 12° – 15°C when 7 leaves are visible) stimulates floral induction and initiation (7, 14). Interruption of floral initiation by high temp (above 15.5°) causes abnormal flower development. This is characterized by the formation of a "gladiolus-like" or "thumbed" inflorescence where the lowest flower is placed some distance below the other flowers (3, 7, 11).

Several studies have indicated that photoperiod or phytochrome responses are involved in flowering of freesia (4, 7, 8, 10, 11, 13). Flowering was delayed in plants grown under florescent lights, which are rich in red (R) light (11).

Floral initiation (8, 11) and vigor of flowering (4) were stimulated by short days (SD). Short days were suggested to

[1]Received for publication January 4, 1978. Scientific Journal Series Paper No. 9824. Minnesota Agricultural Experiment Station.
The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper must therefore be hereby marked *advertisement* solely to indicate this fact.

[2]Graduate Research Assistant and Professor, respectively.

[3]We acknowledge Kay Sargent, Lab Technician, for her assistance in acquiring data.

be more promotive in high summer temp than in winter temp (11). However, Heide (7) found very little daylength influence in high temp, these data suggested that SD cannot substitute for low temp.

Responses to long day (LD) treatments have been inconsistant. Reduced flower quality (13) and no advantages (10) with use of LD have been reported, on the other hand, data have shown LD stimulated and accelerated flower development 6-14 days over SD (3, 8, 11). The promotive influence however decreased with increasing temp (3) which supported the results that daylength had little effect in hot weather (7).

An interaction between flower color and photoperiod has been reported (7, 9). Short days stimulated floral initiation in yellow and white cultivars. These results suggest that the SD responsive white and yellow cultivars originated from *F. refracta* while the blue and red LD responsive cultivars originated from *F. armstrongii.* It is possible that there are 2 separate species with 2 distinct photoperiodic responses.

The objective of this study was to compare the influence of different light treatments on the flowering response of seeded freesia grown at a constant 13°C.

Materials and Methods

Seed propagation was used to avoid uncertainties of past corm temp treatments in commercial sources.

Expt. 1. Freesia hybridia 'Super Emerald Mixture' seeds were leached in flowing 5°C tap water for 3 days prior to each monthly seeding from April 10, 1975 to Dec. 10, 1975 in plastic cell packs containing 3 soil: 2 sphagnum peat: 2 sand (by vol), and covered with 0.6 cm of medium grade vermiculite. Germination occurred in 3 to 5 weeks in an 18° greenhouse. Seedlings, 5 to 8 cm tall were randomly divided into 3 groups, each transplanted into 1 of 3 raised greenhouse benches. Light treatments (measured by ISCO Spectroradiometer, spectrum defined from 380 to 750 nm) were 1) natural days (ND), 2) night interruption from 2200-0200 with incandescent light (I-NI) (Sylvania lamp – direct light, 120 volt, 100 watt, 394 $\mu w/cm^2$ at plant ht), and 3) night interruption of light from 2200-0200 with BCJ Ruby incandescent lamps (BCJ-NI) (30.2 $\mu w/cm^2$ at plant ht). Light sources were 92 cm above the soil line and were spaced at 1 m intervals over the 1 m wide benches. A constant 13° greenhouse temp was maintained when possible. During the summer, temp were kept as close as possible to 13° by evaporative cooling but occasionally reached 17-30°C. The greenhouse glass was coated with 50% white shading from May to Sept. Standard cultural procedures were followed (5, 15) and plants were uniformly fertilized according to need based on weekly soil tests.

Lateral floral spikes may be borne along the scape of the primary floral spike. Primary and lateral floral spikes were independently harvested as the basal flower began to open. Measurements were taken for floral scape length, no of lateral floral spikes, no. of flowers per inflorescence, date of flowering, corm and cormel fresh wt and no. of cormels per corm. Treatment means were calculated for each of the above and significant trends were determined using Friedman's Rank Test (16, 17).

Expt. 2. The same cultural procedures were used in 1976-1977 as in Expt. 1., but *Freesia hybrida* 'Royal Crown' seeds were used and light treatments were ND and 8 hr (0800-1600) SD. Monthly seedlings were made from May through Nov. Additional data were taken on the no. of leaves per plant at flowering. Significant treatment differences were determined by analysis of variance and least significant differences (LSD) statistical tests (16, 17).

Results

Expt. 1. Freesias grown under I-NI reached anthesis 10 days earlier for all seeding dates than those grown under ND and flowered in 267, 205 or 166 days when seeded in April, August or Oct. as compared to 287, 215 or 172 days respectively for ND plants (Table 1). Night interruptions with BCJ lamps had no consistent effect on flowering when compared to ND (Table 1).

Plants within a treatment flowered over an extended period of time. Frequently the first flower was cut 1 month earlier than the calculated average flowering date. The Dec. 1975 seeding did not flower under any treatment.

Light treatments had no effect on the no. of lateral floral spikes produced irrespective of seeding date (Table 1). The no. of lateral spikes decreased from April to Nov. seeding dates. More lateral spikes formed on plants that were seeded during the warm period of the year (April through August) and grown under ND with high light intensity.

Light treatments had no effect on the no. of flowers per inflorescence produced (Table 1). Progressively fewer flowers per inflorescence were formed from April to Nov. seeding dates. The no. of flowers per inflorescence for ND was 8.1 for April seeding date, 6.7 for July and 5.9 for Nov. Average flower scape lengths were not influenced by light treatments (Table 1). Floral scape lengths were shorter with each month's delay in seeding from 30 cm in ND for April seeding to 25 cm for July to 16 cm for Nov.

Total floral spike yields were altered by both light treatments and seeding dates with the highest under ND followed by BCJ-NI and then the I-NI (Table 1). Plants under I-NI had less than half as many flower spikes as plants under ND. Plants seeded in July produced the largest yield followed closely by those seeded in June and August. Plants seeded in April and May were not as productive as those sown in summer, but they had higher yields than plants seeded from Sept. to Nov.

Plants were allowed to mature and naturally senesce before harvest and produced corms equal to or larger than commercial 1.6 cm to 1.9 cm diam forcing stock. Corm fresh wt was progressively lower from the BCJ-NI to ND to I-NI light treatments (Table 2). Subjective observations at harvest indicated that the root systems on ND corms were larger than on either the I-NI or BCJ-NI corms. Root systems on I-NI grown corms were the smallest. Corm fresh wt of the April to August seedlings averaged 5.5–8.5 g, (Table 2).

Small cormels formed from lateral buds on the developing freesia corm. The no. of cormels per corm progressively decreased from ND to BCJ-NI to I-NI treatments (Table 2). Spring and summer sowing generally produced more cormels than fall and winter sowings under all light treatments. Average cormel fresh wt was lower from April to Nov. plantings under all light treatments, but the differences were not significant (Table 2). Light treatments did not influence cormel fresh wt.

Expt. 2. Plants from the monthly seedings and grown under ND or SD reached anthesis at the same date (Table 3). The days to anthesis decreased from 269 to 185 from May to Nov. seedings. Lateral floral spikes were favored by SD compared to ND (Table 3). The no. of lateral spikes per primary floral spike decreased from the May to Nov. seeding under both photoperiods. Number of flowers per spike was usually greater under SD than under ND (Table 3), but fewer flowers per spike were produced from May to Nov.

Natural day and SD treatments had no consistent effect on the scape length of cut flower spikes. For example, under ND freesias seeded in June produced the longest scapes, while under SD freesias seeded in Oct. and Nov. produced the longest scapes; however, in most cases, there were no significant differences in plant response between ND and SD treatments (Table 3). Flower scapes decreased in length from 24.4 cm in May to 20.0 cm in Sept. to 14.3 cm in Nov. Total no. of cut floral spikes was greater under SD than under ND and decreased from May to Nov. under both light treatments. Frequently the May, June and July seedlings had 2 or more growing points and pro-

Table 1. Crop timing, flower production and flower qualities of *Freesia hybrida* sown at monthly intervals and grown under natural daylengths (ND) or night interruptions by BCJ-Ruby (BCJ-NI) or incandescent (I-NI) lamps (Expt. 1, 1975-1976).

Seeding dates and light treatments	Days to flower[z]	No. of lateral floral spikes[y]	No. of flowers/ floral spike[x]	Cut floral scape length[w] (cm)	No. of floral spikes/m^{2}[v]
April					
BCJ-NI	288	1.4	7.8	29.8	330.0
ND	287	1.8	8.1	30.3	587.5
I-NI	267	1.3	8.2	29.2	180.0
May					
BCJ-NI	272	1.6	7.3	27.9	477.4
ND	267	1.4	7.2	27.6	302.0
I-NI	256	1.2	7.6	27.5	140.0
June					
BCJ-NI	260	1.3	7.5	25.5	554.3
ND	254	1.4	6.9	27.1	691.4
I-NI	249	1.0	6.8	27.7	257.1
July					
BCJ-NI	236	1.2	6.9	25.5	616.0
ND	242	1.1	6.7	24.7	688.0
I-NI	229	1.1	7.3	27.7	264.0
August					
BCJ-NI	209	1.0	6.5	25.3	596.7
ND	215	1.2	6.2	24.7	673.3
I-NI	205	0.9	7.1	26.9	412.0
September					
BCJ-NI	193	0.4	6.3	20.7	169.2
ND	200	0.7	6.4	20.7	381.9
I-NI	193	0.4	6.6	24.0	122.1
October					
BCJ-NI	181	0.4	6.8	17.8	135.9
ND	172	0.4	5.5	18.0	158.6
I-NI	166	1.8	3.5	12.8	42.0
November					
BCJ-NI	155	0.3	6.4	15.8	48.0
ND	143	0.3	5.9	15.6	114.0
I-NI	149	0.2	4.8	15.4	53.4

[z]Trend of decreasing no. of days to flowering from April to Oct. seedings is significant at the 99% level, by Friedman's Rank Test. Trend of BCJ-NI, ND, I-NI for most to fewest no. of days to flowering is significant at the 99% level, by Friedman's Rank Test.

[y]Trend of fewer laterals from April to Nov. seedings is significant at the 99% level, by Friedman's Rank Test. Light treatments had no significant effect.

[x]Combined avg. of primary and lateral inflorescences. Trend of decreasing no. of flowers from April to Nov. is significant at the 95% level, by Friedman's Rank Test. Light treatments had no significant effect.

[w]Combined avg. of primary and lateral inflorescences. Trend of shorter scape lengths from April to Nov. seedings is significant at the 99% level, by Friedman's Rank Test. Light treatments had no significant effect.

[v]Production of primary and lateral inflorescences is highest in the June, July, and August seedings, fewer spikes in April and May and even fewer in Sept., Oct., and Nov. seedings. Trend significant at 95% level by Friedman's Rank Test. Trend of decreasing production nos. from ND to BCJ-NI to I-NI is significant at the 99% level by Friedman's Rank Test.

duced 2 or more primary floral spikes (visual observation).

May, June, July and Nov. sowings grown under SD had more leaves at the time of flowering than those grown under ND. Under both photoperiods the no. of leaves present at anthesis decreased the May (10.3 – 8.9) to Nov. seedings (6.7 – 7.5). Corm wt was unaffected by photoperiod but decreased fairly uniformly from May to Nov. seedings (Table 3). More cormels per corm were formed under SD than ND. Progressively fewer cormels per corm were formed from the May to Nov. sowings. Cormels from SD were lighter than from ND conditions and wt progressively decreased from the May to Nov. seedings.

Discussion

The NI treatments with the BCJ lamps, which are rich in far-red (FR) light energy (18), or SD did not alter time of flowering compared to ND, however, I-NI hastened flowering. In nature, the amount of FR present during the day peaks at sunrise and sunset (12). Therefore, a FR light treatment prior to sunup or at sundown may have had a very different effect on flowering than our BCJ-NI or I-NI treatments. We did not observe flowering differences under the various light treatments based on flower colors (no data given) as reported by Heide (7) and Klougart and Jørgesen (9).

Heide (7) did not find a daylength effect on the no. of flowers per spike, however, in our study SD increased the no. of flowers per spike while I-NI and BCJ-NI had no effect. Mansour (11) showed that a 9 hr SD increased the no. of lateral spikes. Natural days in Minnesota are 11 hr 01 min by Oct

Table 2. Corm fresh wt, no. of cormels per developing corm, and cormel fresh wt from *Freesia hybrida* seeded at monthly intervals and grown under natural daylengths (ND) or night interruptions by BCJ-Ruby (BCJ-NI) or incandescent lamps (1-NI) (Expt. 1, 1975-1976).

Seedling dates and light treatments	Corm fresh wt[z] (g/corm)	No. of cormels/corm[y]	Cormel fresh wt[x] (g/cormel)
April			
BCJ-NI	13.1	3.2	1.6
ND	12.9	6.8	1.8
I-NI	15.2	5.2	1.7
May			
BCJ-NI	12.6	4.1	1.7
ND	16.0	9.6	1.6
I-NI	14.5	5.3	1.4
June			
BCJ-NI	13.8	6.3	1.3
ND	13.4	7.7	1.3
I-NI	15.2	5.6	1.6
July			
BCJ-NI	14.6	6.4	1.4
ND	14.3	7.1	1.3
I-NI	14.2	4.0	1.5
August			
BCJ-NI	13.8	8.9	1.2
ND	14.8	6.7	1.3
I-NI	16.1	5.1	1.6
September			
BCJ-NI	6.8	6.3	0.7
ND	8.9	9.6	0.5
I-NI	9.7	4.2	1.2
October			
BCJ-NI	9.3	4.7	0.9
ND	6.8	4.4	1.1
I-NI	3.2	2.1	0.5
November			
BCJ-NI	6.6	3.0	0.9
ND	6.8	3.7	1.0
I-NI	3.2	1.5	0.6

[z]Corm wt of April through August seedings were similar while corm wt from Sept., Oct. and Nov. seedings were lower. Trend significant at 95% level by Friedman's Rank Test. Trend of highest wt in the BCJ-NI and lowest in the I-NI is significant at the 99% level by Friedman's Rank Test.

[y]Trend of May and June, August and Sept., April and July then Oct. and Nov. for producing the most to fewest cormels per corm respectively is significant at the 90% level, by Friedman's Rank Test. Natural day had the grestest no. of cormels and I-NI the fewest, trend is significant at the 95% level by Friedman's Rank Test.

[x]Seeding dates and light treatments had no significant effects.

15, 8 hr 46 min by Dec. 21, and 11 hr 53 min by March 15. SD in this study increased no. of lateral floral spikes as reported by Mansour (11).

Under all light treatments the floral scape length, no. of flowers per spike, no. of lateral floral spikes, yield per bench area, fresh wt of corms and cormels, no. of newly developed corms and the no. of days from seedings to flowering progressively decreased from the April to Nov. seedings. A possible explanation for this trend is that high summer temp (above 15.5°C) favored vegetative growth; therefore, the plants were larger when favorable floral initiation temp (12° – 15.5°) occurred. Older plants tend to produce higher quality inflorescences and according to Heide (7) are more receptive to floral inducing daylengths and temp. Thus, plants from Sept. to Nov. sowings in Expt. 2 had fewer leaves at flowering than the May to August seedings because they were exposed to floral inducing temp at an earlier stage of growth and rapidly initiated floral meristems. However, limited plant development prior to floral initiation resulted in lower floral spike yield and grade, less corm development (fresh wt), and fewer cormels. Plants seeded from Sept. through Nov. may have had higher floral yields and grade if they had been grown above 15.5° to develop more leaves prior to floral initiation by low temps (12° – 15.5°). Transplanting directly into a continuous 13° greenhouse is not advisable because in order to produce saleable quality flowers, the plants should develop 7 visible leaves before they are grown below 16° (7).

Short days increased the no. of flowers per spike, the scape length and no. of spikes cut per m^2. Whether these increases commercially warrant the use of SD by pulling shade cloth requires further study.

April-August seedlings produce high flower yields and good quality, but dependable quality and accurate timing is dependent upon controlled greenhouse temp. Sept.-Dec. seedings grown at 13°C did not produce saleable quality flowers or large yields. However, those seeding dates may produce acceptable quality flowers if the plants are grown above 16°C until 7 visible leaves are present when the temp would then be lowered

Table 3. Crop timing, flower production, flower qualities, corm wt and cormel no. and wt of *Freesia hybrida* when sown at monthly intervals and grown under natural (ND) or short days (SD) (Expt. 2, 1976-1977).

	May		June		July		August		Sept.		Oct.		Nov.		
	ND	SD	ND	SD	ND	SD	ND	SD	ND	SD	ND	SD	ND	SD	LSD
Days to flower	269	267	249	251	246	241	214	216	195	220	193	198	185	189	7.5
No. of primary and lateral flower spikes/plant	4.3	4.7	3.7	4.7	2.1	2.3	2.3	2.9	0.9	2.4	1.9	2.0	1.3	3.7	–[z]
No. of lateral floral spikes	2.2	3.2	1.7	3.0	1.1	1.4	1.5	1.6	0.7	1.0	0.3	1.1	0.4	0.9	0.46
No. of flowers/ floral spike	7.1	8.0	5.7	6.6	5.2	6.0	5.2	5.2	4.1	5.1	4.1	4.7	4.6	5.5	0.8
Cut floral scape length (cm)	24.4	26.1	29.9	25.9	24.0	25.3	25.4	22.2	20.0	18.8	13.5	20.5	14.3	19.3	3.3
No. of primary and lateral spikes/m^2	430	467	367	473	209	231	233	285	90	240	195	204	146	367	–[z]
No. of leaves/ plant at flowering	8.9	10.3	8.4	9.6	6.8	7.6	7.3	7.6	6.6	6.9	6.5	6.8	6.7	7.5	0.6
Corm fresh wt (g)	18.5	14.8	12.2	11.1	6.6	5.5	7.3	7.2	3.5	3.6	2.4	3.7	4.5	3.4	1.8
No. of cormels/ corm	11.9	15.8	11.3	12.3	6.5	7.7	6.5	8.5	3.8	6.6	3.2	4.2	2.8	2.5	2.7
Cormel fresh wt	1.9	1.4	1.5	1.2	1.1	1.2	1.3	1.2	0.8	0.7	0.7	0.6	0.6	0.3	0.3

[z]LSD not available as this statistic was not replicated.

to 12^o-15.5^o for floral initiation and eventual flowering.

Literature Cited

1. Ball, Victor. 1972. Freesia. p. 330. *In* Victor Ball, Ball red book, 12th ed., Geo. Ball Co., West Chicago.
2. Brown, N. E. 1934. Freesia, Klatt and its history. *J. S. Afr. Bot.* 1:1-31.
3. deLint, P. J. A. L. 1969. Flowering in freesia: temperature and corms. *Acta Hort.* 14:125-131.
4. Garner, W. W. and H. A. Allard. 1920. Effects of relative length of day and night and other factors of the environment on growth and reproduction in plants. *J. Agr. Res.* 18:553-606.
5. Goemans, Bob. Culture guide on growing freesias from seed. Parigo Hort. Co. Ltd., Spalding, Lincolnshire.
6. Halevy, A. H. and Y. Mor. 1969. Promotion of flowering in freesia plants var. Princess Marizke. *Acta Hort.* 15:133-137.
7. Heide, O. M. 1965. Factors controlling flowering in seed-raised freesia plants. *J. Hort. Sci.* 40:267-284.
8. Kawata, Joichi. 1973. Year-round production of Freesia in Japan. *Jap. Agr. Res. Quart.* 7:257-262.
9. Klougart, A. and E. Jǿrgensen. 1962. Flower formation in freesia. *Horticultura* 16:215-225.
10. Laurie, A. and G. H. Poesch. 1932. Photoperiodism. The value of supplementary illumination and reduction of light on flowering plants in the greenhouse. *Ohio Agr. Exp. Sta. Bul.* 512.
11. Mansour, B. M. M. 1968. Effects of temperature and light on growth, flowering and corm formation in freesia. Lab of Hort., Agr. Univ., Wageningen, Netherlands. Pub. 304.
12. McKenzie, J. S., C. J. Weiser and M. J. Burke. 1974. Effects of red and far red light on the initiation of cold acclimation in *Cornus stolonifera* Michx., *Plant Physiol.* 53:783-789.
13. Post, K. 1952. Florist crop production and marketing. New York, Orange Judd Pub. Co.
14. Rees, A. R. 1967. Effect of shade on the flowering of seed-grown freesias. *Expt. Hort.* 17:15-20.
15. Sennels, N. J. 1951. Freesia. J. E. Ohlsens Enke, Publ. Copenhagen. 64 p.
16. Snedecor, George W. and William G. Cochran. 1967. Two-way classifications. p. 229-338. *In* George W. Snedecor and William G. Cochran, Statistical methods. The Iowa State Univ. Press. Ames, Iowa.
17. Steel, Robert G. D. and James H. Torrie. 1960. Two tests for two-way classifications. p. 403-404. *In* Robert G. D. Steel and James H. Torrie, Principles and procedures of statistics. McGraw-Hill, New York.
18. Roh, S. M. and H. F. Wilkins. 1977. The effects of bulb vernalization and shoot photoperiod treatments on growth and flowering of *Lilium longiflorum* Thunb. cv. Nellie White. *J. Amer. Soc. Hort. Sci.* 102:229-235.