Growth Dynamics and Decorative Value of ‘Easy Pot’ Potted Freesia Depending on the Growing Conditions

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Abstract
Comparative studies on four cultivars of potted freesia: ‘Pinokkio’, ‘Popey’, ‘Smarty’ and ‘Suzy’ were conducted in the years 1997-98. From January to June freesias were grown in a greenhouse and after the harvest the corms were stored from 5 to 11 months at the temperatures: 0.5-3º C, 14-18º C and 28-30º C. Five corms were planted in a pot into neutralised sphagnum peat. The following fertilization methods were applied:
1. slow-release fertilizer Osmocote Plus 5-6 – before planting;
2. popular, traditional fertilizer, Azofoska – before planting;
3. liquid fertilizer Multivit Plus – top-dressing;
4. no fertilizer.

Corm preparation before planting was found to have the greatest effect on the growth and development of the plants. The best results were obtained when the corms were stored 12-14 weeks before planting at the temperature of 28-30º C. The plants fertilised with Osmocote Plus at the dose of 5g /dm³ had the most abundant flowering ‘Popey’ and ‘Suzy’ turned out to be the most effective cultivars.

INTRODUCTION

In Poland freesia as a cut flower is one of the most popular and appreciated decorative plants whereas potted freesia is a new plant and has not been grown commercially. The aim of the present studies was to evaluate the effects of the storage temperature of the corms on the further freesia development as well as the effects of corm size and fertilization on the quality and decorative value of potted freesia.

MATERIALS AND METHODS
In the years 1997-98 the experiment on four cultivars of potted freesia ‘Pinokkio’ ‘Popey’ ‘Smarty’ ‘Suzy’ was conducted. Freesia corms with easily felt apical buds were obtained from the Van Staaveren firm at the beginning of January 1997. They were planted in 13-cm pots, 5 corms per pot and cultivated following the breeder’s instructions. The plants flowered at the end of March and the beginning of April and at the end of May the leaves started yellowing and drying out. In the middle of June the corms with foliage were lifted and left at the temperature of 20 to 25ºC to dry for 4 weeks. After that they were cleaned and sorted out for further studies according to their size: to 3.5 cm in circumference and over 3.5 cm. Since the middle of July 40 corms of each cultivar in two...
sizes (altogether 320) were stored in a storeroom at the temperature 14-18°C and remaining corms (1280) in a coolhouse at the temperature 0.5-3°C. In December the first experiment was set up on 320 corms stored at the temperature 0.5-3°C and on 320 corms stored at the temperature 14-18°C. At the end of January the remaining corms were divided into three groups: 640 corms were placed at the temperature 28-30°C, 160 at 14-18°C and the other 160 were left in a coolhouse.

At the beginning of May when the corms stored for 14 weeks at the temperature 28-30°C had easily felt buds and roots, they were taken to the storeroom with the temperature 14-18°C for 10 days and then experiment II was set up.

Both the experiments had a similar design. Each object consisted of 20 corms and each replication of 5 corms planted in 13-cm pots (vol. 0.75 dm³).

Experiment I

Two kinds of potting media were used: A – sphagnum peat, neutralised (to pH 6.5) with limestone and dolomite at the ratio 2:1; B – sphagnum peat neutralised in the same way but enriched with 5g of Osmocote Plus 5-6 months per dm³ applied at planting. In experiment I 32 objects were compared, 16 each time for two kinds of corm storage. The effects of 3 factors: cultivar (4), corm size (2), the potting medium (2) on the emergence and plant development were examined.

Experiment II

For the corms stored at 0.5-3°C and 14-18°C, only one potting medium was used: neutralised sphagnum peat with 5g Osmocote Plus 5-6. The effects of two factors: cultivar (4) and the corm size (2) were studied.

The corms stored at the temperature 28-30°C were planted in neutralised (pH 6.5) sphagnum peat and four fertilization treatments were applied:

A – no fertilization,
B – 5g Osmocote Plus 5-6 months per dm³ at planting,
C – Azofoska 2g/dm³ two days before planting;
D – Multivit Plus – top dressing, at the concentration 0.5%, 50 ml a week per pot.

Chemical composition of peat and fertilizer was as follows:

Sphagnum peat (mg/dm³): N (NO₃) – 15; P – 54; K – 10; Ca – 127; Mg - 44; Cl – 52.
Osmocote Plus 5-6 months (%): N – 15; P₂O₅ – 10; K₂O – 12; MgO – 2; Fe – 0.4; Mn – 0.06; Cu – 0.05; B – 0.02; Mo – 0.02; Zn – 0.015.
Azofoska (%): N – 13.6; P₂O₅ – 6.4; K₂O – 19.1; MgO – 4.5; Fe – 0.27; Mn – 0.045; Cu – 0.18; B – 0.045; Mo – 0.082; Zn – 0.045.
Multivit Plus (g/dm³): N – 45; P₂O₅ – 30; K₂O – 78; MgO – 20; (mg/dm³): Fe – 1500; Mn – 240; Cu – 120; B – 180; Mo – 20; Zn – 120.

In experiment I the temperatures ranged from 10-20°C, in experiment II from 16-30°C. There was no artificial lighting in winter and cooling in summer. All the protective measures followed the recommendations for freesia grown as cut flowers. Throughout the experiments there were neither any symptoms of leaf necrosis, deformation nor inflorescence discoloration. The evaluation of morphological characteristics of the plants from experiment I is demonstrated in Table 1. and from experiment II in Table 2. The results of the measurements of the length and shoot number at full vegetative stage; and the length and the number of inflorescences as well as the number of flowers at full generative stage were verified statistically by analysis of variance for factorial experiments and evaluated by the Tukey test at £ 0.05.

RESULTS AND DISCUSSION

Experiment I

Freesia corms, placed after harvest at the temperature 14-18°C, after 5 months of storage had well formed, felt buds and roots. Some of them, ‘Smarty’ cultivar in particular, had 1.5-cm long shoots at planting. After planting into the pots, in the greenhouse, at the temperature 12-16°C freesias emerged soon in 2-7 days. ‘Smarty’ cultivar emerged first, then in turn ‘Suzy’ ‘Popey’ and ‘Pinokkio’. During vegetation the
plants differed in the growth rate but the differences were within 20% and the sequence of cultivars according to the value of that feature was changing. Bigger corms emerged sooner and more evenly whereas the plants from smaller corms had later vegetation and longer shoots (Table 1). Irrespective of the cultivar and corm size the freesias from the medium with Osmocote Plus 5-6 had wider and greener leaves and more upright conformation and 1-2 weeks later started yellowing and dying out. However, the freesia plants obtained in this experiment had no decorative value because they did not flower, produced vegetative parts only.

Freesia corms stored at the temperature 0.5-3°C looked the same after being taken from the cool-house as just after lifting and planted in pots in the greenhouse did not emerge irrespective of potting media and did not produce any roots. In the course of the experiment i.e. in half a year, they only transformed. One to three corms developed from mother corm and the total corm weight decreased by c.a. 15-20%.

Experiment II

Freesia corms stored 6 months at the temperature 0.5-3°C, 3.5 months at the temperature 28-30°C, and then 10 days at temperature 14-18°C emerged very soon, after 2-3 days and irrespective of the cultivar and the size of corms – developed dynamically. All the cultivars began flowering 9 weeks after planting. Flowering lasted on the average three weeks. The plants looked very attractive thanks to flowers in all the shades of yellow from cream in ‘Suzy’ to intensive orange in ‘Popey’ and luscious green leaves. All varieties had a very nice scent. ‘Popey’ produced most buds, inflorescences and flowers.

Differentiated fertilization affected morphological features (Table 2). The best results were obtained in the combinations with Osmocote Plus and in turn with Azofoska, Multivit Plus and the poorest without any fertilization. In all the cultivars the kind of fertilization affected most the number of flowers and inflorescences: on the average in combinations with Osmocote Plus the plants had twice as many flowers than the plants without fertilization. ‘Popey’ turned out to have the weakest response to fertilization and ‘Pinokkio’ the strongest (Table 2). ‘Suzy was found to have relatively fewest inflorescences but the greatest number of flowers). When it was fertilised with Osmocote Plus 5-6 its inflorescences were the longest and consisted of 7 flowers whereas in other cultivars of only 3-6 flowers. In all the cultivars larger corms produced the plants with more abundant flowering (by 40% more flowers on the average) and greater number of flowers than smaller corms. The size of corms was not proved to have any effect on the plant height and length of inflorescences (Table 2).

The corms stored for 6 months at the temperature 0.5-3°C and 3.5 months at the temperature 14-18°C emerged 14 weeks after planting and first flowers appeared 11 weeks later i.e. 25 weeks after planting. There were about 2.5 times fewer flowers than on the plants from prepared corms and they had low decorative value because of deformities and discoloration. Therefore, the number of flowers and inflorescences were not submitted to statistical analysis. The plants of all the cultivars formed by 24-40% fewer shoots and had poorer foliage in comparison with plants obtained from the corms stored at the temperature 28-30°C. Temperature had no effect on the height of plants and the length of inflorescences.

The corms stored 9.5 months at the temperature 0.5-3°C transformed after planting as in experiment I and the first uneven emergence was observed after 4-5 months.

DISCUSSION

Temperature and fertilization are very important factors in production of bulbous and tuberous plants. The results of the studies on freesia as a cut flower prove that the temperatures at the preparation period of corms for further cultivation to a great extent determine the plant development.

The results obtained in both the experiments for freesia corms stored at the temperature 0.5-3°C prove that such temperatures caused very deep corn dormancy which was interrupted by treating the corms with high temperatures, 28-30°C. This
treatment is recommended as an effective method of stopping dormancy and accelerating
the growth and flowering of freesia grown as a cut flower (Berghoef et al. 1986a; Berghoef et al. 1986b; Berghoef and Zevenbergen. 1990b; De Hertogh and Le Nard 1993; Lee- et al 1998). Easy Pot freesias appeared to respond to the storage of corms at the
temperature 28-30°C similarly to the freesia grown as a cut flower, and storing their corms
for 7-14 days after preparation at the temperature of approximately 16°C accelerates their
flowering. Our results show (Startek et al. in print) that the corms of the same cultivars of
Easy Pot freesia prepared simultaneously under the same conditions, emerged 2-4 days
longer and flowered a week later when they had been planted directly after preparation.

The corms treated with the temperature 14-18°C after the harvest produced sprouts
4.5 months later and could no longer be stored. The plants from these corms in
experiment I – conducted in winter did not flower at all. In experiment II carried out in
spring and summer, the corms, stored at the beginning at 0.5-3°C and then 14-18°C
emerged 14 weeks after planting, flowered 15 weeks later than the plants from the
temperature 28-30°C, they had few flowers of bad quality.

Van Staaveren (Anonymous 1999) Easy Pot freesia breeder recommends
maintaining relatively low temperature, day 10-12°C, night 6-8°C. Although in
experiment II May – July, the temperatures were within 18-30°C the plants produced
flowers after 9 weeks and had very abundant flowering, especially those fertilised with
Osmocote Plus 5-6. Thus, it can be supposed that Easy Pot freesias are resistant to high
temperature of the medium and are similar to the Rapid cultivars of freesia, of the same
breeder, cultivated as cut flowers. It seems likely that low temperatures, recommended by
the breeder aim at maintaining compact plant conformation.

However, fertilization turned out to affect the quality of flowering more than the
corm size. Irrespective of the cultivar and the size of mother corms the freesias without
fertilization had the poorest flowering whereas those fertilised either with Osmocote Plus
5-6, Azofoska or Multivit Plus had by 160-30% more flowers. Statistical verification of
the results concerning the effects of fertilization on morphological characteristics and
flowering confirmed that the best quality flowers were obtained using Osmocote Plus 5-6,
- a slow-release fertilizer. One dose of 5g fertilizer per dm³ of neutralised peat applied at
planting was sufficient for abundant flowering and good plant condition during the whole
vegetation period. The breeder also recommends a slow-release fertilizer Osmocote 14-
14-14. In Our experiment the effects of differentiated doses of Osmocote Plus 5-6 were
not examined. It may be possible that a higher dose would be more favourable for the
plant quality. Thomas et al. (1998) also think that freesia cultivated in containers has
relatively high nutritional requirements.

CONCLUSION
1. Easy Pot potted freesias show a strong response to the temperature during the storage
of corms. As in the case of freesia cultivated as cut flowers the temperatures at which
the corms are stored between harvest and planting have significant effect on
emergence, further development and flowering of potted freesia.
appropriate time when their corms are stored at the temperature 28-30°C for 14 weeks
and also when they are cultivated at higher temperatures than recommended by the
breeder.
3. The size of mother corms affects morphological characteristics of plants. Larger corms
produce the plants of higher quality with more abundant flowering than smaller corms.
4. During cultivation it is necessary to provide potted freesia with appropriate amount of
nutrients. Good results are obtained using a slow-release fertilizer Osmocote Plus 5-6.

Literature cited

### Tables

Table 1. Effects of cultivar and size of mother corms and fertilization on the morphological traits of potted freesia – experiment I

<table>
<thead>
<tr>
<th>Trait</th>
<th>Cultivars (A)</th>
<th>Size of corms (B)</th>
<th>Fertilization (C)</th>
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<tr>
<td></td>
<td>Pinokkio</td>
<td>Popey</td>
<td>Smarty</td>
</tr>
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LSD_{0.05} A – 1,84 B – 2,65 C – n.s. (no significant)
Table 2. Effects of fertilization, cultivar and size of mother corms on blooming of potted freesia – experiment II

<table>
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<tr>
<th>Trait (Cultivar)</th>
<th>(A)</th>
<th>Fertilization (B)</th>
<th>Without fertilization*</th>
<th>Size of corms (C)</th>
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<td>C - 1,27</td>
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