Reprinted from HortScience, Vol. 21(4), August 1986
A publication of the American Society for Horticultural Science, Alexandria, Virginia

HortScience 21(4):1006–1007. 1986.

Early Scale Propagation Results in Forcible Bulbs of Easter Lily

E. Matsuo[1] and J.M. van Tuyl
Institute for Horticultural Plant Breeding (IVT), P.O. Box 16, 6700 AA Wageningen, Netherlands

Additional index words. Easter lily, bulb production, bulb storage duration, bulb storage temperature, scale position

Abstract. **Bulb scales from different anatomical positions of Easter lily (*Lilium longiflorum* Thunb.) were field-propagated after the parent bulb had been treated for 0, 5, 10, or 15 weeks at 0°, 10°, 20°, or 30°C. Increasing the duration of bulb storage prior to propagation decreased the harvest weight of newly generated bulbs. Outer or middle scales increased weights of bulbs and numbers of forcible commercial bulbs. The innermost scales resulted in low weights and few forcible commercial bulbs.**

In Japan and the United States, commercial-sized Easter lily bulbs are produced after 2 or 3 growing seasons from scaling. In the Netherlands, there is a research program to produce forcible commercial bulbs after only one growing season from scaling. Towards this end, the following 2 points must be determined: 1) when to start scale propagation, and 2) what part of the parent bulb scales should be used. Van Tuyl (6) established a scale treatment method for the Easter lily. However, this treatment was begun in November after storing the parent bulbs at low temperatures (usually 0°–2°C). Low-temperature storage of parent bulbs delays leaf emergence from scale bulblets and decreases the appearance of the epigeous type plants (ETP) (5), which are desirable for bulb growth (7). These effects may delay bulb growth. Dutch growers traditionally use even the very small scales that are located on the inner side of the parent bulb (inner scale), although the data of Matsuo et al. (1–4) suggested that the inner scales may not be useful for practical scale propagation because of a low percentage of leaf emergence and less ETP compared to the outer or middle scales.

This study was designed to ascertain the date of propagation and the morphological location of the bulb scales for practical scale propagation of the Easter lily.

Bulbs of 'White American' (>20 cm in circumference) were lifted from a trial field

Received for publication 10 June 1985. Research supported by Fellowships from The International Agriculture Centre, Wageningen, and Kagoshima Prefectural Scholarship Foundation, Kagoshima. We express our gratitude to M. Satoh, Kagoshima Univ., for his guidance on our statistical analysis. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Present address: Faculty of Agriculture, Kagoshima University. Kagoshima 890, Japan.

Table 1. Bulb storage conditions and scale treatments prior to field-planting of scales and scale bulblets.

Duration (weeks) of bulb storage at 0°, 10°, 20° or 30°C	Duration (weeks) of scale treatment at			Period of scale treatments	
	25°C	17°C	5°C	From	To
0	14	4	6	28 Sept. 1982	15 Mar. 1983
5	10	4	6	2 Nov. 1982	22 Mar. 1983
10	10	4	6	7 Dec. 1982	26 Apr. 1983
15	10	4	5	11 Jan. 1983	24 May 1983

at the Institute for Horticultural Plant Breeding, Wageningen, Netherlands, on 24 Sept. 1982. After disinfection (1% benomyl + 2% diforatan) for 30 min, bulbs were air-dried, packed in polyethylene bags, and dark-stored at 0°, 10°, 20°, or 30°C for 0 (control), 5, 10, or 15 weeks beginning on 28 Sept.

After the bulb storage, scales were detached and scales (>0.1 g) from each bulb were separated into 4 groups of equal numbers, according to their position on the bulb. They are hereafter referred to as outer scale (OS), middle scale (MS), inner scale (IS), and innermost scale (IMS). The average weights of 10 sample scales were 19.0, 14.0, 10.7, or 3.2 g for the respective groups. From each group, 40 to 50 scales from 5 selected bulbs were planted in a plastic box (45 × 31 × 8 cm) filled with vermiculite. These scales received the temperature treatment according to van Tuyl (7), with a slight modification (Table 1).

For the control lots, the duration at 25°C was lengthened to delay the planting date. After the respective temperature treatments (Table 1), scale bulblets with or without parent scales attached were planted in the trial field. They were grown under normal cultural conditions used in the Netherlands.

On 12 Oct. 1983, bulbs (including stem bulblets) were harvested and weighed. The number of bulbs of forcible size (>10 cm in circumference) was recorded. The data were expressed as the averages of weights or numbers per planted scale, respectively.

Storage temperatures did not significantly influence the weights of bulbs produced (Table 2). The weights of bulbs decreased as the storage duration increased. Scale positions did influence bulb weight, which decreased as the scale origin became morphologically closer to the central axis.

The storage temperatures did not significantly influence the production of forcible bulbs (Table 3). As storage duration increased (or the more central the scale position), fewer commercial bulbs were produced.

The present data indicate that prolonged storage (10 and 15 weeks) might have decreased the growing season—reducing bulb production. Therefore, growers should advance the date of bulb scaling and use only the OS and the MS for practical scale propagation.

Table 2. Effect of bulb storage temperatures, durations, and scale positions on bulb yield[z] of Easter lily 'White American'.

Measurement	Bulb wt (g)[z]
Position[y]	
OS	37.1
MS	35.4
IS	22.6
IMS	5.2
LSD 0.01	4.4
Duration (wks)	
0	40.0
5	34.0
10	25.1
15	12.4
LSD 0.01	3.8
Temperature (C)	
30	25.7
20	22.4
10	22.8
0	24.6
LSD 0.05	3.3

[z]Average weight of bulbs (g) per planted scale.
[y]OS = outer scale, MS = middle scale, IS = inner scale, and IMS = innermost scale.

Table 3. Effect of bulb storage temperatures, durations, and scale positions on forcible bulb production[z] of Easter lily 'White American'.

Measurement	No. bulbs[z]
Position[y]	
OS	1.02
MS	0.95
IS	0.67
IMS	0.01
LSD 0.01	0.12
Duration (wks)	
0	1.10
5	0.90
10	0.70
15	0.39
LSD 0.01	0.10
Temperature (°C)	
30	0.72
20	0.64
10	0.65
0	0.65
LSD 0.05	0.09

[z]Average number of forcible bulbs per planted scale.
[y]OS = outer scale, MS = middle scale, IS = inner scale, and IMS = innermost scale.

Literature Cited

1. Matsuo, E. and K. Arisumi. 1978. Studies on the leaf development of the scale bulblet in the Easter lily (*Lilium longiflorum* Thunb.): II. Relationship between the size of the parent bulb or the parent scale and the type of leaf development (in Japanese with English summary). Bul. Faculty Agr. Kagoshima Univ. 28:1–8.
2. Matsuo, E. and K. Arisumi. 1978. Studies on growth and development of bulbs in the Easter lily (*Lilium longiflorum* Thunb.): VII Scale position dependence of the effect of hot water treatment on the growth behaviour of the scale bulblet. Mem. Faculty Agr. Kagoshima Univ. 14:69–76.
3. Matsuo, E., A. Nonaka, and K. Arisumi. 1977. Some factors influencing the type of leaf development (plant type) of the scale bulblet in the Easter lily, *Lilium longiflorum* Thunb. (in Japanese with English summary). Bul. Faculty Agr. Kagoshima Univ. 27:15–21.
4. Matsuo, E., A. Nonaka, and K. Arisumi. 1978. Studies on the leaf development of the scale bulblet in the Easter lily (*Lilium longiflorum* Thunb.): III. On the relationship between the polarity of a scale and the leaf emergence of the scale bulblet or the plant type (in Japanese with English summary). J. Jpn. Soc. Hort. Sci. 47:415–420.
5. Matsuo, E. and J.M. van Tuyl. 1984. Effect of bulb storage temperature on leaf emergence and plant development during scale propagation of *Lilium longiflorum* 'White American'. Scientia Hort. 24:59–66.
6. Van Tuyl, J.M. 1983. Effect of temperature treatments on the scale propagation of *Lilium longiflorum* 'White American' and *Lilium* x 'Enchantment'. HortScience 18:754–756.
7. Yoshida, T. and Y. Yamashita. 1968. Studies on scale propagation in lilies: I. Effects of temperature and hormones on the growth of scale bulblets (in Japanese). Agr. & Hort. 43:691–692.