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Varietal Differences of the Development of the Scale Bulblet in the Easter Lily

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Introduction

The authors have reported, with the Easter lily cv. 'Hinomoto', that the development of the scale bulblet is influenced by the external or the internal factors, e.g., temperature, light, growth-substances, bulb-size or scale-size, scale-position etc[1-10].

In the practical scale propagation, many kinds of cultivars are used, and it is known that some of them sprout their leaves more rapidly and/or produce larger scale bulblets than others. However, the details of these varietal differences are not known. In this experiment, therefore, it was designed to clarify the varietal differences of the development of the scale bulblet, using some representative commercial cultivars.

Materials and Methods

Six cultivars, 'Saeki No. 40', 'Saeki No. 30', 'Georgia', 'Hinomoto', 'Hikari' and 'Uemura-aojiku', produced in Okino-erabu Island, Kagoshima Pref., were received in Kagoshima on July 6, 1977 (Table 1). On July 8, the bulbs were soaked in 45°C water for 30 min. After the water on the outer scales dried under normal room conditions, the middle scales

Table 1. The features of parent bulb or scale used and the size of scale bulblet developed

Cultivar	Number of bulbs	Circumference (cm)	Scale position	Number of scales collected	Diameter of the scale bulblet (mm)
Saeki No. 40	20	17.6 ± 0.6	M	8.6 ± 1.6	9.4 ± 1.8
			I	4.7 ± 0.8	7.1 ± 2.1
Georgia	21	16.8 ± 0.8	M	6.8 ± 1.3	9.2 ± 1.6
			I	6.0 ± 1.1	7.1 ± 1.4
Hinomoto	20	17.3 ± 0.7	M	4.9 ± 1.3	8.8 ± 1.8
			I	5.6 ± 2.0	7.8 ± 1.5
Uemura-aojiku	19	16.7 ± 0.8	M	10.2 ± 2.7	8.1 ± 1.4
			I	65.7 ± 1.5	5.3 ± 1.4
Saeki No. 30	20	17.1 ± 0.8	M	10.2 ± 2.4	9.9 ± 1.5
			I	6.7 ± 1.6	7.3 ± 1.3
Hikari	19	17.6 ± 0.6	M	13.5 ± 2.2	9.0 ± 1.5
			I	6.7 ± 2.2	5.7 ± 1.2

and the inner scales were collected. On July 9, these scales were planted 3 cm below the soil surface in the wooden boxes (60 × 35 × 11 cm) filled with the mixture of sand and loam in equal volumes. They were kept outdoors, covered with a sheet of cheese cloth and watered, without any nutrient, as needed to maintain adequate moisture. The number of the parent scales used was 90~100 for each lot in one box. After the beginning of leaf emergence, the number of the leafed scale bulblets was counted weekly. The ratio of the leaf emergence was presented as percentage of the leafed bulblets to the newly developed bulblets. On Dec. 20, all of the scale bulblets were sampled and situation of the parent scale, number of the scale bulblets, plant type, and appearance of the stem roots on the Epigeous Type Plant (ETP) and the Hypo-Epigeous Type Plant (HETP) were examined.

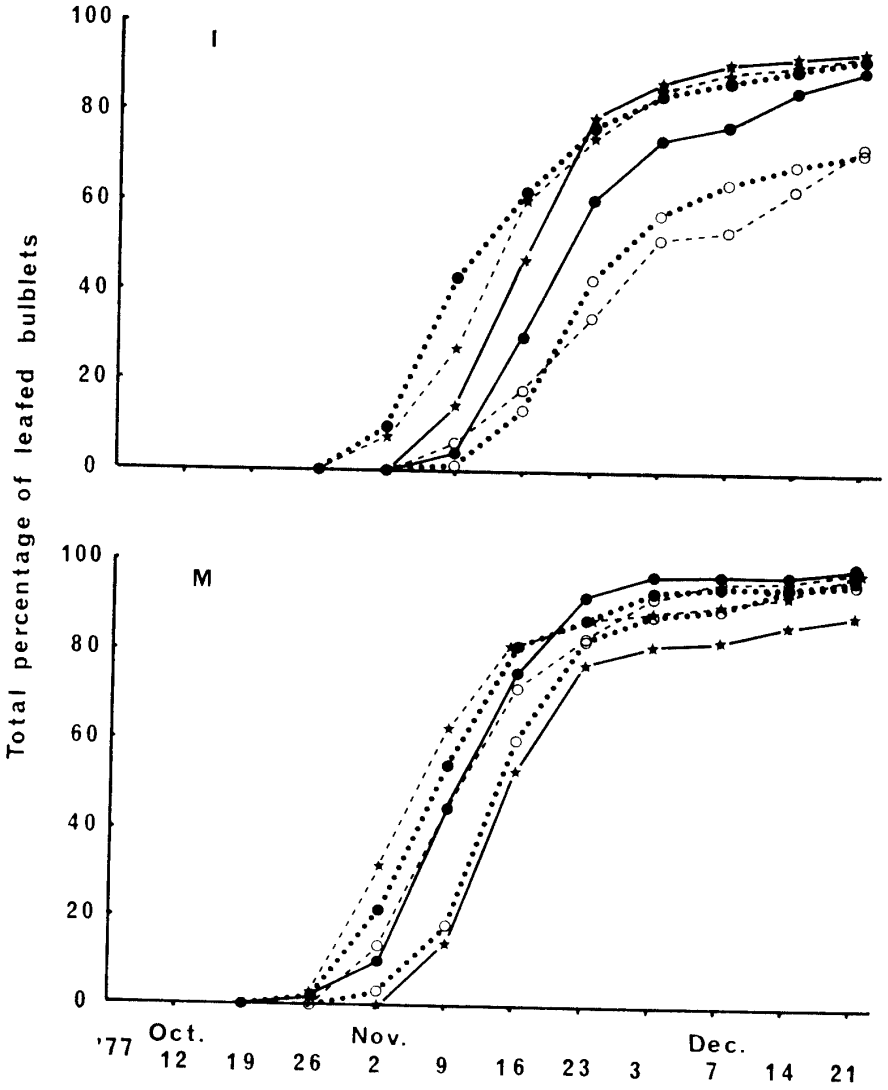

Fig. 1. Varietal differences of the leaf emergence from the scale bulblet developed on the inner scale (I) and the middle scale (M).
★- -★ Hikari, ★—★ Hinomoto, ●•••● Saeki No.30, ●—● Georgia, ○•••○ Uemura-aojiku, ○- -○ Saeki No.40.

Results and Discussion

1. Leaf emergence of the scale bulblet (Fig. 1)

As shown in Fig. 1, the middle-scale-bulblets, i.e., scale bulblets which developed on the middle scale, sprouted their leaves more rapidly than the inner-scale-bulblets, i.e., scale bulblets which developed on the inner scale. This result was the same as that of the authors, obtained previously with cv. 'Hinomoto'[9]. The difference between the rapidest leaf emergence and the slowest leaf emergence was greater on the inner-scale-bulblet than on the middle-scale-bulblet.

In case of the middle-scale-bulblet, 'Hikari' and 'Saeki No. 30' were included in the rapidest leaf emergence group and 'Uemura-aojiku' was belonged to the slowest group. On the other hand, in case of the inner-scale-bulblet, 'Saeki No. 30' and 'Hikari' sprouted their leaves most rapidly, while 'Uemura-aojiku' and 'Saeki No. 40' most slowly. Thus 'Saeki No. 30' and 'Hikari' sprouted their leaves most rapidly and 'Uemura-aojiku' most slowly, in both cases of the middle-scale-bulblet and the inner-scale-bulblet.

2. Situation of the parent scale (Fig. 2)

Regardless of cultivars, survival ratio of the inner scale was higher than that of the middle scale. Among the cultivars used, 'Saeki No. 30' showed the lowest survival-ratio of the parent scale and the reverse was the case in the dead scale. This may partially be due to the rapid leaf emergence (Fig. 1). Although 'Hikari' sprouted their leaves as rapidly as 'Saeki No. 30', survival-ratio of the parent scale was very high. This difference between these cultivars may be due to the varietal characteristics.

3. Number and size of the newly developed scale bulblet (Fig. 3 and Table 1).

Independent of cultivars, greater number of scale bulblets developed on middle scales than that on inner scales. This was almost the same as the result observed previously with cv. 'Hinomoto' by the authors[6].

Considering the scale weight, the number of the scale bulblets was greater with

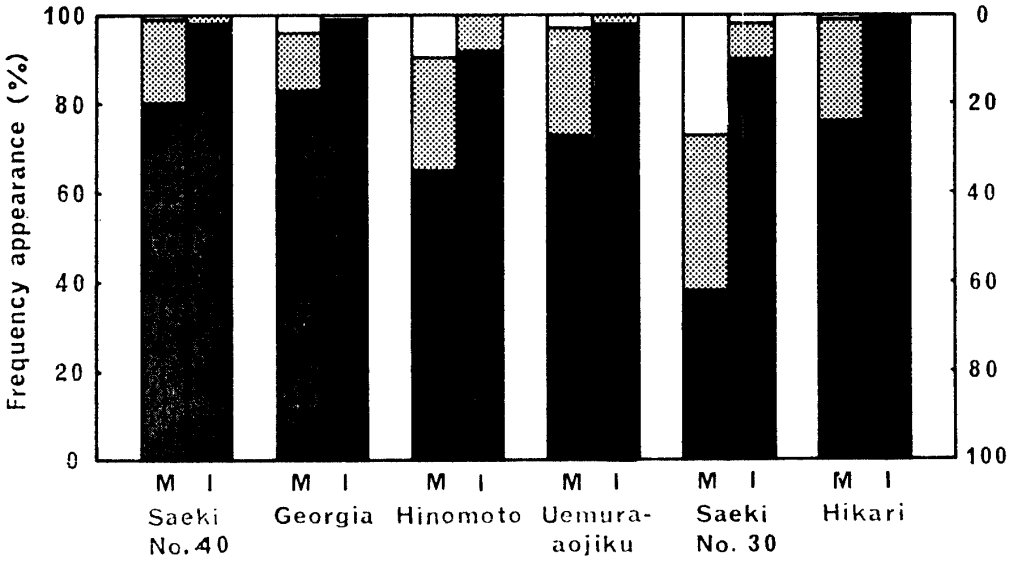

Fig. 2. Varietal differences of the situation of the parent scale due to scale position.
Black column; alive, dotted column; partially alive, and white column; dead. M; middle scale and I; inner scale.

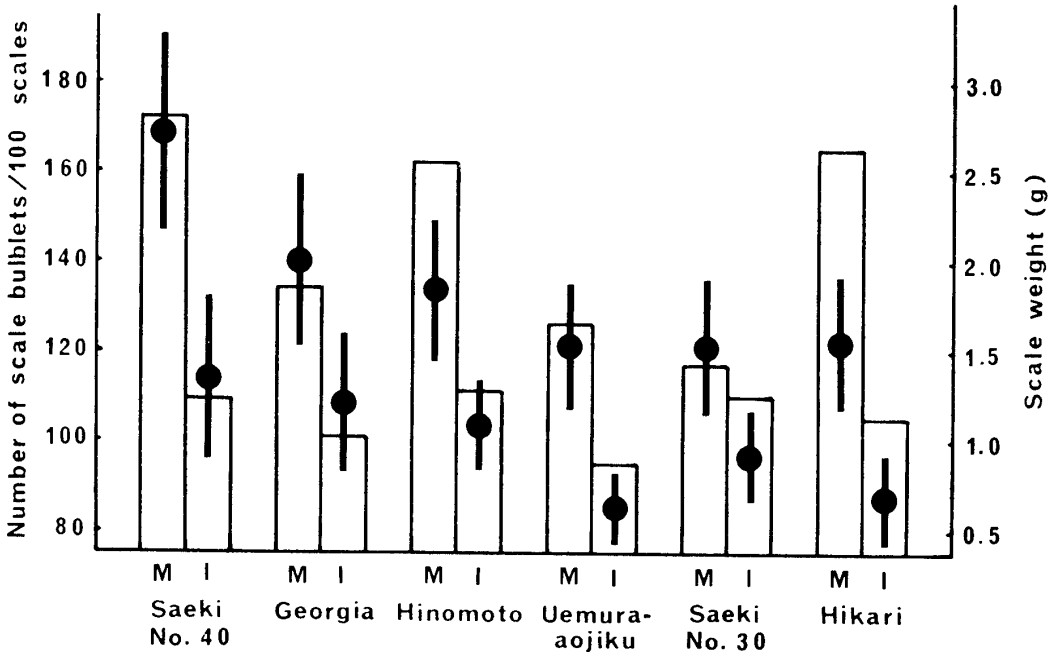

Fig. 3. Varietal differences of the number of scale bulblet (white column) and scale weight (black circle with bar) due to scale position.
M; middle scale, and I; inner scale.

'Hikari' and 'Hinomoto' than those with other cultivars. Regardless of cultivars, the middle-scale-bulblet was greater in the size of scale bulblet than the inner-scale-bulblet (Table 1). The middle-scale-bulblet of 'Saeki No. 30' was larger and that of 'Uemura-aojiku' was smaller, than those of others. The inner-scale-bulblet of 'Saeki No. 30' was larger than those of others and those of 'Uemura-aojiku' and of 'Hikari' were smallest of all.

The difference between the size of the middle-scale-bulblet and that of the inner-scale-bulblet was greatest with 'Hikari' and smallest with 'Hinomoto'.

Above data suggest that the size of scale bulblet is due to the size of the parent scale and/or the number of the newly developed bulblet. This means that it is very difficult to find out the varietal difference in bulblet size, on this examination date.

4. Plant type (Type of leaf emergence, Fig. 4)

With 'Saeki No. 40', 'Georgia', 'Hinomoto' and 'Uemura-aojiku', Epigeous Type Plant (ETP)-appearance from the middle scale was almost the same as that from the inner scale. With 'Saeki No. 30' and 'Hikari', that of the former was greater than that of the latter. ETP ratio was lowest with 'Uemura-aojiku' and highest with 'Saeki No. 30' and 'Georgia'.

Hypogeous Type Plant (HTP)-appearance from the inner scale was greater than that from the middle one, with 'Uemura-aojiku', 'Saeki No. 30' and 'Hikari'. HTP-ratio was highest with 'Hikari' and lowest of all with 'Georgia'.

It is quite interesting that Hypo-Epigeous Type Plant (HETP)-ratio was higher with 'Uemura-aojiku' than with other cultivars, not only on the inner scale but also on the middle scale. In case of this cultivar, the size of the middle-scale-bulblet was smaller than those of others, though it was larger than that of any other inner-scale-bulblets (Table 1). In spite of this fact, inner scales of all cultivars developed HEPTs in lesser degree than those of middle scales of 'Uemura-aojiku'. This suggests that 'Uemura-aojiku' is quite apt for producing HETPs.

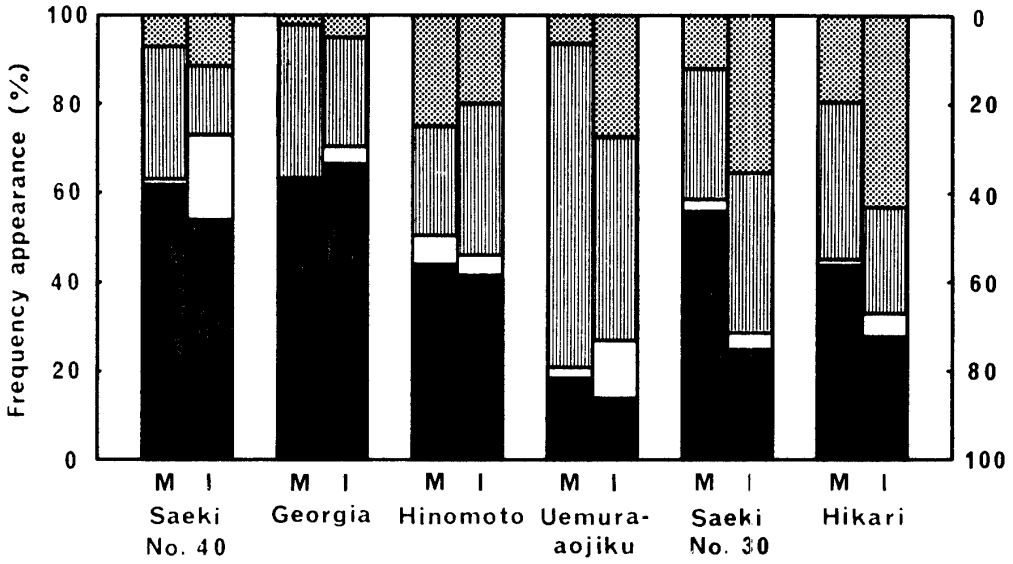

Fig. 4. Varietal differences of the plant type of the scale bulblet due to scale position.
Black column; ETP, white column; No Green Leaf Bulblet, striped column; HETP, and dotted column; HTP. M; middle scale, and I; inner scale.

5. Appearance of stem root on ETPs and HETPs (Fig. 5)

Appearance of stem root (stem root ratio) was presented as percentage of the ETPs or the HETPs having stem roots to the total number of ETPs or HETPs developed both from the middle scales and from the inner scales.

The stem root ratio on ETPs was extremely higher than that on HETPs, regardless of cultivars. The stem root appearance was lowest with 'Hinomoto' and highest with 'Saeki

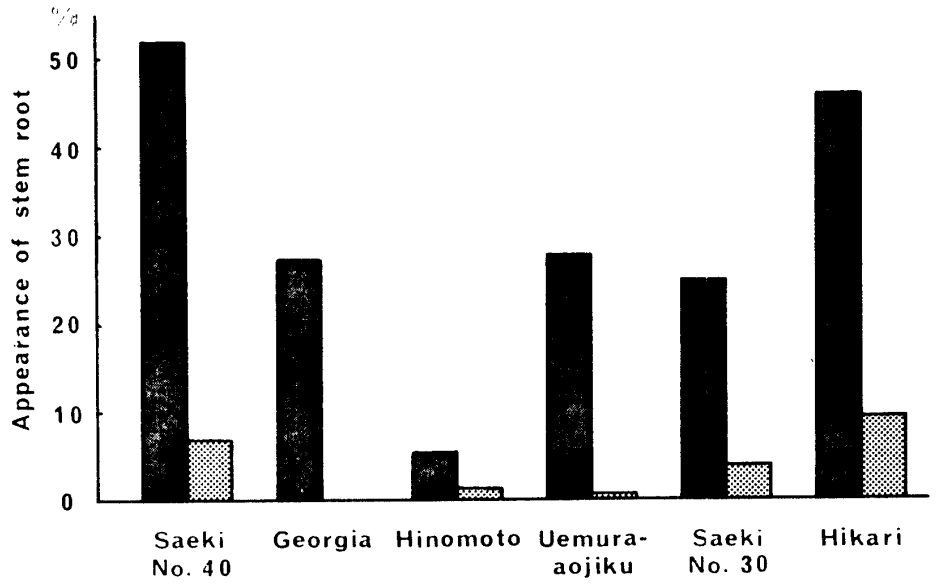

Fig. 5. Varietal differences of the appearance of the stem root on ETPs (black column) and HETPs (dotted column).

No.40' and 'Hikari'. According to the previous observation with 'Hinomoto', it was assumed that the earlier bolting would be followed by the earlier stem root formation. In this point of view, it is quite reasonable to assume that the stem root ratio of 'Hikari' should be high owing to the rapid leaf emergence. However, that of 'Saeki No.40' was quite high, though the leaf emergence was not so rapid as in case of 'Hikari'. Moreover, Uemura-aojiku's stem root ratio was rather high, though the leaf of the scale bulblet emerged latest of all. These differences may be due to the varietal characteristics; 'Saeki No.40' and 'Uemura-aojiku' would belong to the early-stem root appearance group and 'Saeki No. 30' to the late-stem root appearance group.

According to the above results, varietal characteristics of the development of the scale bulblet were summarized as shown in Table 2.

Table 2. Comparison of the varietal differences in the development of the scale bulblet.

Cultivars	Leaf emergence of scale bulblet	Survival of parent scale	Number of scale bulblets	Plant type			Stem-root appearance
				ETP	HETP	HTP	
Hinomoto	Middle ~ Late	++	++	++	++	++	+
Hikari	Early	++	++	++	++	+++	+++
Georgia	Middle	++	+	+++	++	+	++
Saeki No. 40	Middle ~ Late	++	+	+++	+	+	+++
Saeki No. 30	Early	+	+	++	++	+++	++
Uemura-aojiku	Late	++	+	+	+++	++	++

N.B. +++ ~ +; much (many) ~ few

Acknowledgement

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Summary

This experiment was designed to clarify the varietal characteristics of the development of the scale bulblet with 6 representative Easter lily cultivars; 'Hinomoto', 'Hikari', 'Georgia', 'Saeki No.40', 'Saeki No.30' and 'Uemura-aojiku'.

Middle and inner scales were planted on July 9, 1977 and leaf emergence of the scale bulblet was observed weekly. On Dec. 20, 1977, the lily plants were sampled, and situation of the parent scale, number and size of the scale bulblet, plant type and stem-root-appearance were examined.

As shown in Table 2, leaf emergence from the scale bulblet was rapid with 'Hikari' and 'Saeki No. 30' and slow with 'Uemura-aojiku'. The number of the scale bulblet developed on a parent scale was greater with 'Hinomoto' and 'Hikari' than those in others. ETP-appearance was greater with 'Georgia' and 'Saeki No. 40' than those with others and least of all with 'Uemura-aojiku'. HETP-appearance was greatest with 'Uemura-aojiku' and least with 'Saeki No. 40'. HTP-appearance was greatest with 'Saeki No. 40' and 'Hikari', and least, with 'Hinomoto'. Stem-root-appearance of ETPs was greater with 'Saeki No. 40' and 'Hikari' than those in others and least, with 'Hinomoto'.

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