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# Bulbil Formation on *Lilium longiflorum* Thunb. cv. Nellie White by Foliar Applications of PBA[1]

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*Additional index words.* Easter lily, 6(benzylamino),9(2-tetrahydropyranyl), 9-H purine (PBA).

*Abstract.* **Foliar applications of 6(Benzylamino),9(2-tetrahydropyranyl), 9-H purine (PBA) to Easter lily induced large numbers of bulbils in leaf axils on above ground stems.**

Lilies may be propagated by seed or asexually by scales (7), by natural formation of daughter bulbs and by stem bulblets developed in the axils of leaves underground or above ground (5). Bulbil formation, however, rarely occurs on *Lilium longiflorum*. Propagation by the natural process of daughter bulbs is slow and not commercially practical. Stem bulblets require 2 years to produce commercial size bulbs for forcing and scales 3 years.

PBA has been reported to increase lateral branching in various crops (1, 2, 3, 4, 6). This study investigated the influence of PBA on *Lilium longiflorum*.

The size 6-7 precooled bulbs were planted in 15 cm standard plastic pots in a mixture of 50% sphagnum peat moss and 25% each of vermiculite and calcined clay by volume. The bulbs were watered in using 236 mls per pot of a combination of 1.6 g/liter each of p-dimethyl-aminobenzene diazo sodium sulfate and pento-chloronitrobenzene. The plants were placed in a 10°C cold room for 3 weeks and then moved to a greenhouse and forced at temperatures of 15°C (night) and 21° (day).

Half the plants were treated when they were 5 cm above the soil line and half when they were 15 cm above the soil line. Each height group received PBA at concentrations of 0, 50, 100, and 1000 ppm and at 1, 2, or 3 applications at 2 week intervals. There were 4 plants per treatment. The chemical was applied as a spray completely wetting the foliage, using an average of 15 ml per plant. Measurements were taken of the width of the 10 uppermost leaves on the main stem; stem diameter at a point midway between the soil line and top of the stem; average pedicel diameter, bud count when the first flower opened on each plant and days to flower senescence. Bulbil and bulblet counts were made 14 weeks from the last chemical application.

As a result of treatment stem size was increased, pedicels were shortened and thickened, and leaf width increased. The most outstanding result of the experiment was the formation and development of bulbils in the leaf axils. Bulbils were more numerous on the lower portion of the stem but were well distributed up the stem, the number and height on the stem increasing with concentration and number of of applications of PBA. PBA influenced both bulbil and bulblet production. The greatest effect was observed when the initial treatments were applied at the 15 cm height (Table I). A concentration of 500 ppm applied 3 times produced the greatest number of bulbils but was not significantly different from 500 ppm applied twice or 1000 ppm applied either 2 or 3 times. PBA at 1000 ppm applied twice, however, caused about 50% of the flower buds to abort and 3 applications caused complete abortion of flower buds.

The size of the bulbils at the time they were removed from the parent plant ranged from 1 to 4 cm in diameter (Fig. 1). Subsequent planting of bulbils from all treatments produced healthy plants.

Fig. 1. Typical bulbil development resulting from PBA applications.

Bulblet production ranged from 1 on controls to 5 on plants receiving 3 applications of 1000 ppm each. In all treatments the number of bulblets produced was in direct relationship to the number of times the chemical was applied and concentration used. Significant increases in stem diameters were related to concentration and number of times PBA was applied. The greatest differences were with the 500 ppm treatment which averaged 2.0 cm compared to the control of 1.1 cm. Length of the pedicels was reduced and the diameter increased. Average leaf width was increased about 25%. Flower number was not affected by any

Table 1. Effects of PBA concentration and number of applications on average bulbil and bulblet production per plant when applied to plants 5 cm and 15 cm in height.

| PBA concn (ppm) | No. of applications | No. bulbils: Plant height at application 5 cm | No. bulbils: Plant height at application 15 cm | No. bulblets: Plant height at application 5 cm | No. bulblets: Plant height at application 15 cm |
|---|---|---|---|---|---|
| 0 | | 0 d | 0 e | 0 e | 0.5 d |
| 50 | 1 | 1.5 bcd | 2.5 de | 1.0 e | 2.0 cd |
| | 2 | 2.2 bcd | 5.5 de | 1.5 cde | 2.5 bcd |
| | 3 | 2.8 bcd | 17.5 bcd | 1.8 bcd | 2.8 bcd |
| 100 | 1 | 1.2 cd | 3.5 cde | 1.2 de | 2.5 bcd |
| | 2 | 2.5 bcd | 18.8 bc | 1.8 cde | 2.8 bcd |
| | 3 | 10.0 bc | 28.5 ab | 2.0 cde | 3.2 bcd |
| 500 | 1 | 2.8 bcd | 14.5 bcd | 3.0 abc | 1.8 d |
| | 2 | 10.8 b | 34.0 a | 3.5 ab | 3.2 bcd |
| | 3 | 31.5 a | 40.5 a | 4.5 a | 3.5 bc |
| 1000 | 1 | 9.5 bc | 16.5 bcd | 1.8 cde | 2.5 bcd |
| | 2 | 32.2 a | 35.0 a | 2.5 bcd | 3.5 bc |
| | 3 | 39.0 a | 4.5 a | 34.5 a | 4.2 a |

[z]Mean separation within columns by Duncans multiple range test, 5% level.

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treatment except with a triple application of 1000 ppm that caused bud abortion. Date of flowering was not affected by treatments of less than 500 ppm. At this concentration time of flowering was related to number of applications with about 4 days delay on plants receiving 3 applications.

Stems which received no PBA were dead at the time of bulbil harvest but those receiving PBA showed increasing amounts of green color in direct relationship to the amount of PBA applied.

These results suggest that bulbil induction by PBA might be used for Easter lily propagation.

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# Differences in Chilling Effects on Shoot Emergence from the Bulb and on Leaf Emergence from the Scale Bulblet in *Lilium longiflorum* Thunb.[1]


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*Additional index words.* cold treatment, scale propagation



*Abstract.* **Shoot emergence from the bulb was promoted, while leaf emergence from the scale bulblet was retarded as the chilling duration of bulbs was increased from 0 to 5 weeks prior to planting or to scale propagation.**


Cold treatments promote shoot emergence in *Lilium* and have been used as a programming technique in forcing. If bulb cold treatment prior to scaling would likewise promote early leaf development from the resulting new scale bulblets, this technique might be used in commercial scale propagation to increase photosynthetic surface, net assimilation, and movement of substrate from the parent scale to the newly developing bulblet (2). This experiment was designed to study the influence of bulb cold treatment prior to scale propagation on leaf development from new scale bublets.

Bulbs of 'Hinomoto' (14 - 15 cm in circumference) produced on the island of Okino-erabu (27°N latitude), Kagoshima Prefecture, Japan, were received in Kagoshima City on July 12, 1977, and stored at 25°C in the dark. On August 8, 1977, they were soaked in 45°C water for 30 min. After drying, the bulbs were soaked in 1% Benlate for 30 min prior to dark storing at 10° and/or 25°C.

After the storage of 35 days, the outer and middle scales were removed (1) (Fig. 1) and the outer scales discarded. The detached middle scales and the bulb cores consisting of the inner scales still attached to the basal plate, were used in this experiment. Both were planted out of doors 3 cm below the soil surface in wooden boxes filled with a mixture of 1 sand :1 loam. The boxes were covered with a sheet of cheese cloth. No nutrients were applied. From 26 to 28 bulb cores and from 152 to 230 scales were used for each treatment. The number of emerging shoots and the number of scale bulblets with developing leaves was determined weekly. Leaf emergence was expressed as the percentage of bulbs or scale bulblets having initiated shoots and/or leaves. The experiment was terminated on January 7, 1978 for bulb shoot emergence and on April 22, 1978 for scale bulblet foliation.

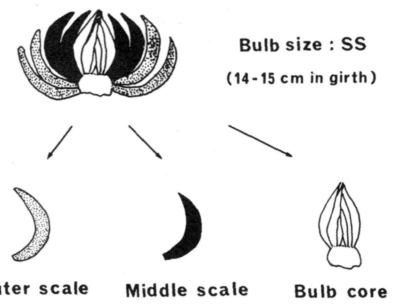


Fig. 1. Collection of middle scales and the remaining bulb used for the experiment.

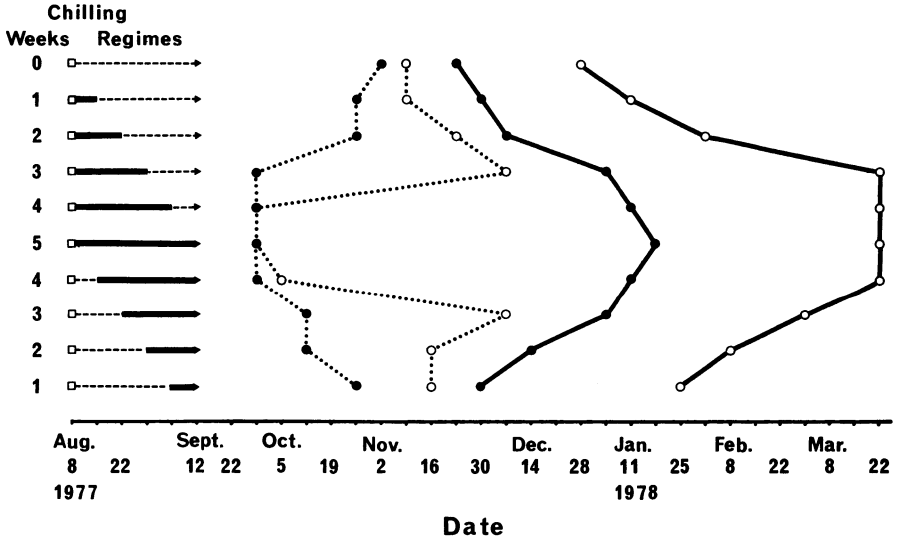


Fig. 2. Effect of the bulb cold treatment prior to planting or scaling on the leaf emergence from the remaining bulb or the newly developed scale bulblet. □ Hot water treatment; ▶ Planting or scaling; ---- 25°C; ____ 10°C; ..... Remaining bulb; _____ Scale bulblet; ● Date of the first leaf emergence; ○ Date of the leaf emergence over 80%.


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