Flower Bud Formation in Orchids

I. On the Floral Initiation and Development in Miniature Cymbidiums

Kiyoshi Kosugi, Masato Yokoi, Nobuyuki Asai and
Kazutaka Matsuda
Laboraory of Floriculture and Ornamental Horticulture

Abstract

Flower bud formation in orchids. I. On the floral initiation and development in miniature cymbidiums., K. Kosugi, M. Yokoi, N. Asai and K. Matsuda, Faculty of Horticulture, Chiba University, Matsudo, Japan. *Tech. Bull. Fac. Hort. Chiba. Univ.* No. 19: 23-27, 1971.

Flower bud formation in miniature cymbidium cultivar 'Shiratama-Nishiki' was observed in the plants grown in the greenhouse of Faculty of Horticulture, Chiba University in 1966 and 1967. Flower bud initiaton in this cultivar occurred in early July in 1966 and late June in 1967 and the flower buds developed to the pollen sac and stigma formation stage by late July in 1966, and early August in 1967.

During this decade, orchid culture has become very popular for pot plant and cut flower markets in Japan. However, very few reports on orchid flowering in relation to floral development have been published (Eguchi and Kato, 1943, Ikeda and Yabukame, 1943, Rotor and MacDaniels, 1951, Kosugi, 1952, Rotor, 1952, 1959, Arditti, 1967, etc.). So, the authors intend to study the flowering of orchids from the standpoint of their flower bud formation. This paper is the first report of a series of orchid floral formation studies.

Materials and Methods

Experiment in 1966

Material used in this experiment was miniature cymbidium cultivar 'Shiratama-Nishiki', one of the hybrids of Oiso strain, grown in the greenhouse of Faculty of Horticulture, Chiba University. Five new buds were collected weeky from June 4 to September 2, 1966 and the buds were stored in 70% ethanol. After storing for some time, the scales around the growing point of a bud were removed using surgeon's knife, and the growing point was observed under the binocular stereoscopic microscopes and the photographs were taken.

Experiment in 1967

Same cultivar, 'Shiratama-Nishiki', was used in this experiment. Flower bud samples were taken weekly from May 29 to September 4, 1967 and the buds were stored and observed by the same procedure as in the experiment in 1966.

Results and Conclusion

Flower bud formation occurred in the third or fourth or both buds counting from the lowest bud on the current shoot (Figs. 1 and 2). The developmental stages of the cymbidium flower buds were determined as follows (see also Tables 1 and 2):

Stage Ⅰ. Vegetative stage. The growing point is still low and is covered with 8-10 scales (Fig. 3A).

Stage Ⅱ. Growing point-enlarged stage. The growing point enlarges to form a flower spike (Fig. 3B).

Stage Ⅲ. Floret bract formation stage. Bracts of a floret begin to appear on the swelling apical dome, from its lower to upper parts (Fig. 3C).

Stage Ⅳ. Floret primordium formation stage. A floret primordium appears in the inner part (axil) of each bract, initiating on the apical dome in an acropetal order (Fig. 3D).

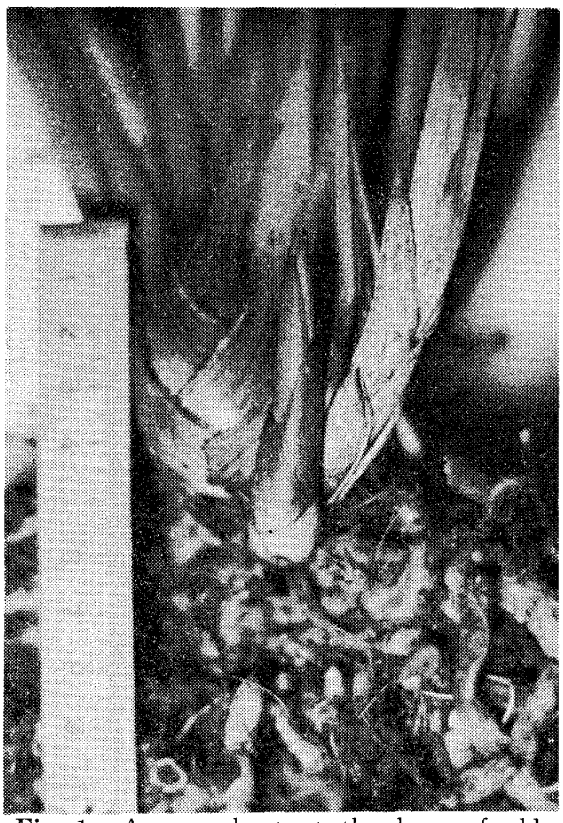


Fig. 1. A new shoot at the base of old pseudobulbs.

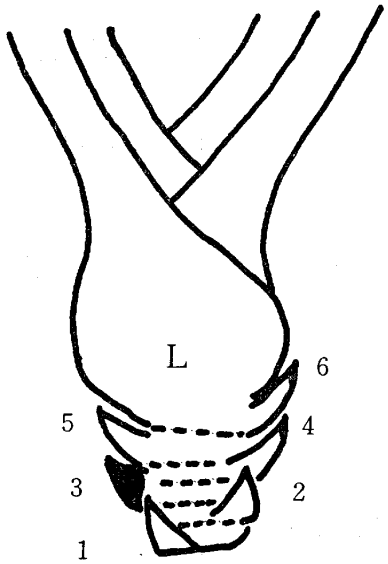
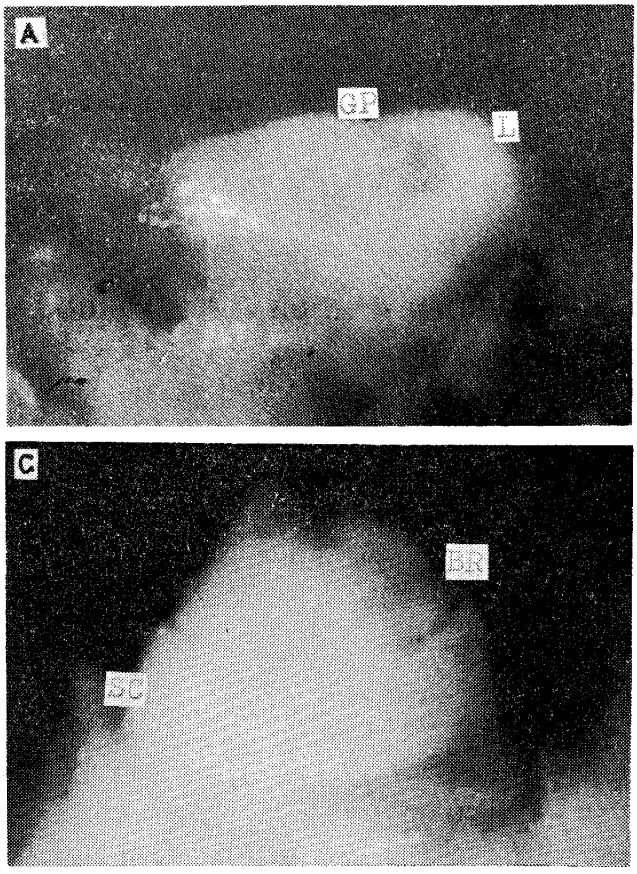


Fig. 2. Lateral buds at the base of a new shoot, seen when leaves are removed. No. 3, or both No. 3 and No. 4, buds will initiate flowers.



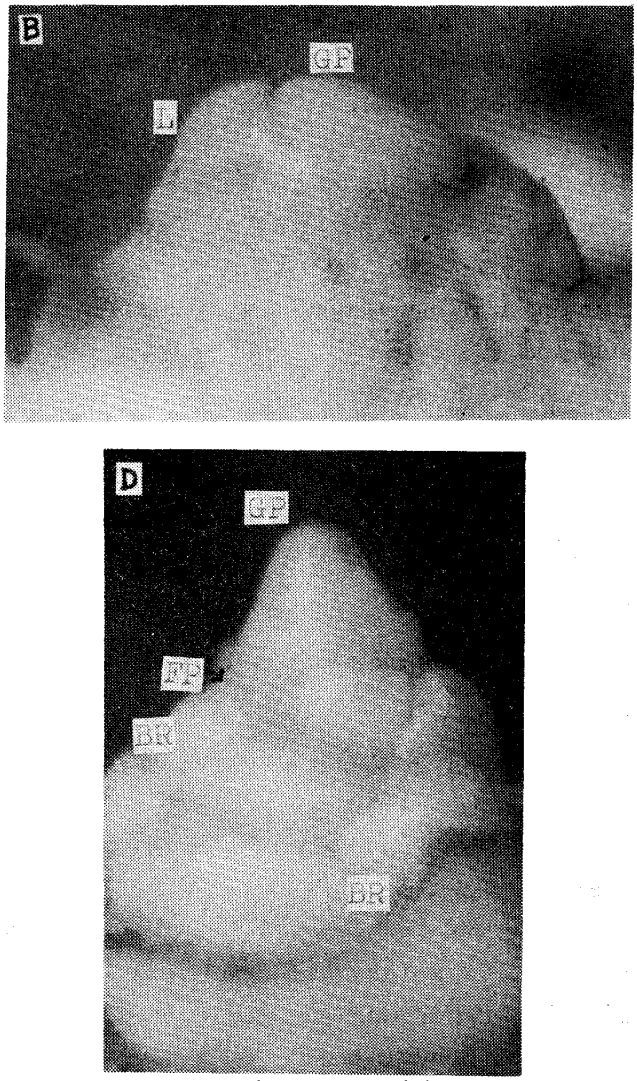


Fig. 3. Developmental stages of flower buds in miniature cymbidiums, 'Shiratama-Nishiki'.
(A) Vegetative (stage Ⅰ). (B) Growing point enlarges (stage Ⅱ). (C) Floret bract formation (stage Ⅲ). (D) Floret primordium formation (stage Ⅳ).
Abbreviations used were: Gp: growing point; L: leaves; BR: bract; SC: scale; FP: floret primordium.

Stage Ⅴ. Sepal formation stage. The floret primordium swells more and a groove appears on the primordium, differentiating 2 sepals on the upper bank of the primordium and a dorsal sepal on the lower bank (Fig. 4E).

Stage Ⅵ. Petal formation stage. In the middle of 2 sepals, a labellum appears and then, 2 petals distinguished in between the dorsal and the two upper sepals, thus with a labellum forming a triangle in upright position (Fig. 4F' G).

Stage Ⅶ. Column formation stage. A column formation occurs in the central part of each floret (Fig. 4G).

Stage Ⅷ. Pollen sac and stigma formation stage. Four pollen sacs appear on the upper part of the column, and 3 stigmas appear on its lower part (Fig. 4H).

Experiment in 1966

Table 1. Developmental stages of flower buds in miniature cymbidium cultivar 'Shiratama-Nishiki'. 1966.

Date examined	No. of buds examined	Stages of flower bud formation							
				Stages of the first floret development					
		Vegetative	Growing point enlarged	Bract formation	Floret primordium formation	Sepal formation	Petal formation	Column formation	Pollen sac and stigma formation
June 4	5	5							
10	5	4							1
17	5	5							
24	5	5							
July 1	5	2	1	2					
9	5	5							
16	5	3	1	1					
23	5	4					1		
30	5								5
Aug. 5	5	1		1			1		2
12	5	2							3

Table 2. Developmental stages of flower buds in miniature cymbidium cultivar 'Shiratama-Nishiki'. 1967.

Date examined	No. of buds examined	Stages of flower bud formation						
				Stages of the first floret development				
		Vegetative	Growing point enlarged	Bract formation	Floret primordium formation	Sepal formation	Petal formation	Column formation
June 26	5	4	1					
July 3	5	4	1					
10	5	2		2	1			
17	5	5						
24	5	3	1		1			
31	5	3					2	
Aug. 7	5	3			2			
14	5	4						1
21	5	3			1			1
28	5	3						2
Sep. 4	5	3						2

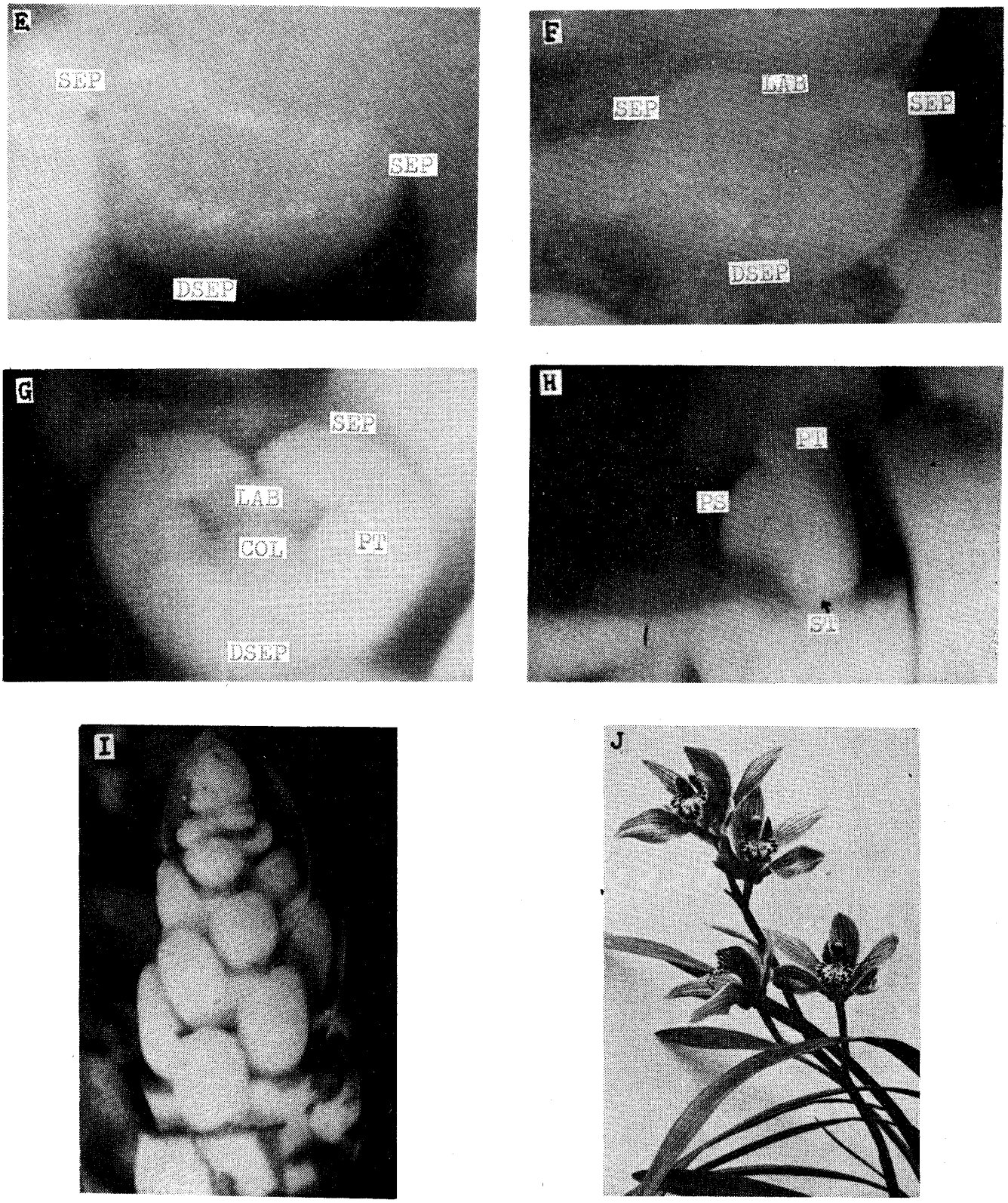


Fig. 4. Develepmental stages of magnified florets and flower buds in miniature cymbidiums.
(E) Sepal formation (stage Ⅴ). (F) Labellum formation (stage Ⅵ). (G) Petal and column formation (stage Ⅵ and stage Ⅶ). (H) Pollen sac and stigma formation (stage Ⅷ). (I) A flower spike with many florets. (J) Miniature cymbidiums, 'Shiratama-Nishiki' in bloom. (Early December).

Abbreviations used were: SEP: sepal; DSEP: dorsal sepal; LAB: labellum; COL: column; PS: pollen sac; ST: stigma; PT: petal.

Results obtained in this experiment are summarized in Table 1. Normal flower bud initiation occurred on July 1, and flower buds developed to the pollen sac and stigma formation stage by July 30, 1966. However, a sample taken on June 10 already reached stage Ⅷ, as seen in Table 1. Although the reason for this unusual rapid floral development is not clear, this is considered to be abnormal.

Experiment in 1967

Results obtained are shown in Table 2. Data in this Table show that the flower bud initiation occurred on June 26, and the flower buds progressed up to the pollen sac and stigma formation stage by August 7, 1967.

From these results, it may be concluded that the flower bud initiation in miniature cymbidiums, cultivar 'Shiratama-Nishiki' takes place from late June to the early July, and the flower bud differentiates pollen sacs and stigmas from the period of late July to early August.

References

1) Arditti, J. (1966): Orchid Rev. **74**:208.

2) ---------- (1967): Orchid Rev. **75**: 253.

3) Eguchi, T. and K. Kato (1943): Nettai-Engei **11** (in Japanese).

4) Ikeda, M. and M. Yabukame (1943): Nettai-Engei **11** (in Japanese).

5) Kosugi, K. (1952): J. Hort. Assoc. Japan **21**:179 (in Japanese).

6) Rotor, G. B., Jr. (1952): Cornell Exp. Sta. Bull. 885.

7) ---------- (1959): In 'The orchids- A scientific survey', Ronald Press Co., N. Y., p.397.

8) ---------- and L. H. MacDaniels (1951): Amer. J. Bot. **38**: 147.

摘　　要

ランの花芽形成

Ⅰ　小形シンビジウムの花芽分化と発育

小形シンビジウムの栽培種'白玉錦'の花芽形成について1966年および1967年に，千葉県松戸市の千葉大園芸学部において実験を行なった．その結果，1966年には7月上旬に花芽分化が始まり，7月下旬には，やく・柱頭形成の段階まで花芽が発育した。1967年には6月下旬に花芽分化が始まり，8月上旬に，やく・柱頭形成の段階まで進んだ．