

Effects of paclobutrazol on reproductive and vegetative traits in *Phalaenopsis* Join Grace ‘TH288-4’



Yi- Chien Lu¹, Ting- Hsuan Huang² and Rong- Show Shen³
Department of Horticultural Science, National Chiayi University

INTRODUCTION & AIM

Phalaenopsis is commercially produced throughout the world as flowering potted crop since its plenty flower colors and shapes, long and regulable flowering periods, and high tolerance during shipping. However, its typically long spikes often lead to shipping costs and risks increase. Thus, using plant growth retardants (PGRs) is able to shorten the spikes, produce visually appealing phalaenopsis, simplify the production management, reduce the shipping cost, and stable the yield. Paclobutrazol (PP333, PBZ) is one of the common PGRs, drafting horticultural crops more effectively than the others. This study investigates the effectiveness of application concentration, timing, and frequency of PP333 on shortening the spike of phalaenopsis, providing a protocol for academia and industry to produce single-flower potted phalaenopsis products.

MATERIALS & METHODS

Mature, 10.8 cm potted and produced by Join Orchids (Xiaying dist., Tainan City, Taiwan) *Phalaenopsis* Join Grace ‘TH288-4’ with 5-7 leaves spreading 38-46 cm was used. According to application timing and frequency of PP333 (Chia-Tai Co. Ltd., Taiwan), four groups were set up: CK, T2, T2T3, and T7T8 (Table1). Each group was applied PP333 at 0, 250, 500, 750, and 1000 mg·L⁻¹ by foliar spray. All plants were moved to green house set as 30/25 °C on Oct. 2nd, 2022 then moved to cool room set as 20/18 °C to induce flowering on Nov. 9th, 2022. While the first flower bud was 1.5 cm long, truncated the spike, and then phalaenopsis bloomed after two week. Data collection was start when the first flower totally expand. The experiment took place at Horticultural Technology Center, National Chiayi University and the progress was showed as Fig.1.

Table 1 Four PP333 application groups

Group	Timing	Frequency
CK	-	0
T2	Week 2	1
T2T3	Week 2 and 3	1+1
T7T8	Week 7 and 8	1+1

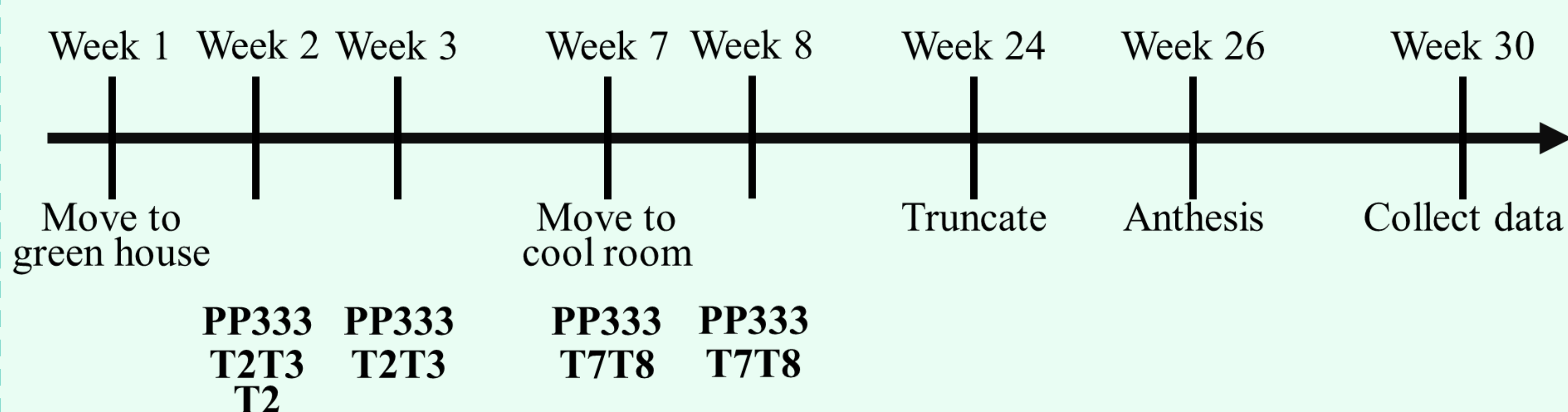


Fig.1 Flow Chart of the test of concentration, timing and frequency of PP333 treatment on the reproductive and vegetative traits of *Phal.* Join Grace ‘TH288-4’.

RESULTS & DISCUSSION

All concentrations except 0 mg·L⁻¹ of PP333 inhibited the spike length from base to first flower by 35%-74% (Table 2). The greatest inhibitory effect were T2 group with 750 mg·L⁻¹, T2T3 group with 500, 750, and 1000 mg·L⁻¹, and T7T7 group with 1000 mg·L⁻¹. As data showed, the spike length of applying PP333 before moved to cool room was shorter than the other ones. As for the spike diameter, only if applied twice with high concentration PP333 did little different. There was no effect on the first size and shape, including flower width, length, and length/ width ratio. What’s more, PP333 did not affect the

appearance of the spike, flower, and leaves (Fig. 2).

Table 2 Effects of concentration, timing, and frequency of PP333 on the reproductive growth traits of *Phal.* Join Grace ‘TH288-4’.

Group	PP333 concn. (mg·L ⁻¹)	Spike length (cm)	Spike diameter (mm)	Flower width (cm)	Flower length (cm)	Flower length/width ratio
CK	0	66.0 a	9.4 g	13.3 bcd	12.3 bcd	0.93 ab
	250	30.0 de	9.8 efg	14.7 abc	13.8 a	0.94 ab
T2	500	27.8 defg	9.8 efg	13.0 cd	13.0 abcd	1.00 a
	750	22.2 fghi	10.2 efg	13.3 cd	12.9 abcd	0.97 ab
	1000	30.2 de	9.5 g	13.9 bcd	12.5 bcd	0.90 ab
	250	25.3 efgh	10.5 defg	13.7 bcd	13.3 abcd	0.97 ab
T2T3	500	19.2 hi	10.8 bcde	13.1 cd	13.3 abcd	1.03 a
	750	19.4 hi	11.5 abcd	14.7 abc	12.6 abcd	0.85 b
	1000	19.3 hi	11.0 abcde	11.7 d	11.9 cd	0.84 b
	250	41.1 b	10.7 cdef	13.4 bcd	13.0 abcd	0.97 ab
T7T8	500	38.9 bc	10.2 efg	13.8 bcd	13.7 ab	1.00 a
	750	42.6 b	10.4 defg	13.8 bcd	12.7 abcd	0.92 ab
	1000	16.7 i	11.0 abcde	-	-	-

Significance

Group (G)	***	***	NS	NS	NS
Concentration (C)	***	NS	NS	NS	NS
G x C	***	NS	NS	NS	NS

^zMean separation within columns by LSD at P<0.05 level.

NS,***,*** Non-significant or significant at P<0.05, 0.01, and 0.001, respectively.



Fig. 2 Effects of concentration, timing and frequency of PP333 on the plant appearance of truncated *Phal.* Join Grace ‘TH288-4’.

However, the roots of those phalaenopsis applied PP333 were thicker than control (Fig. 3). Fig. 4 shows that the cell shape, size of the spikes and roots. Those applied PP333 had smaller and more compact cell structure, proving that PP333 do reduce the cell elongation instead of division.

Fig. 3 Effects of application of PP333 on the root of *Phal.* Join Grace ‘TH288-4’.

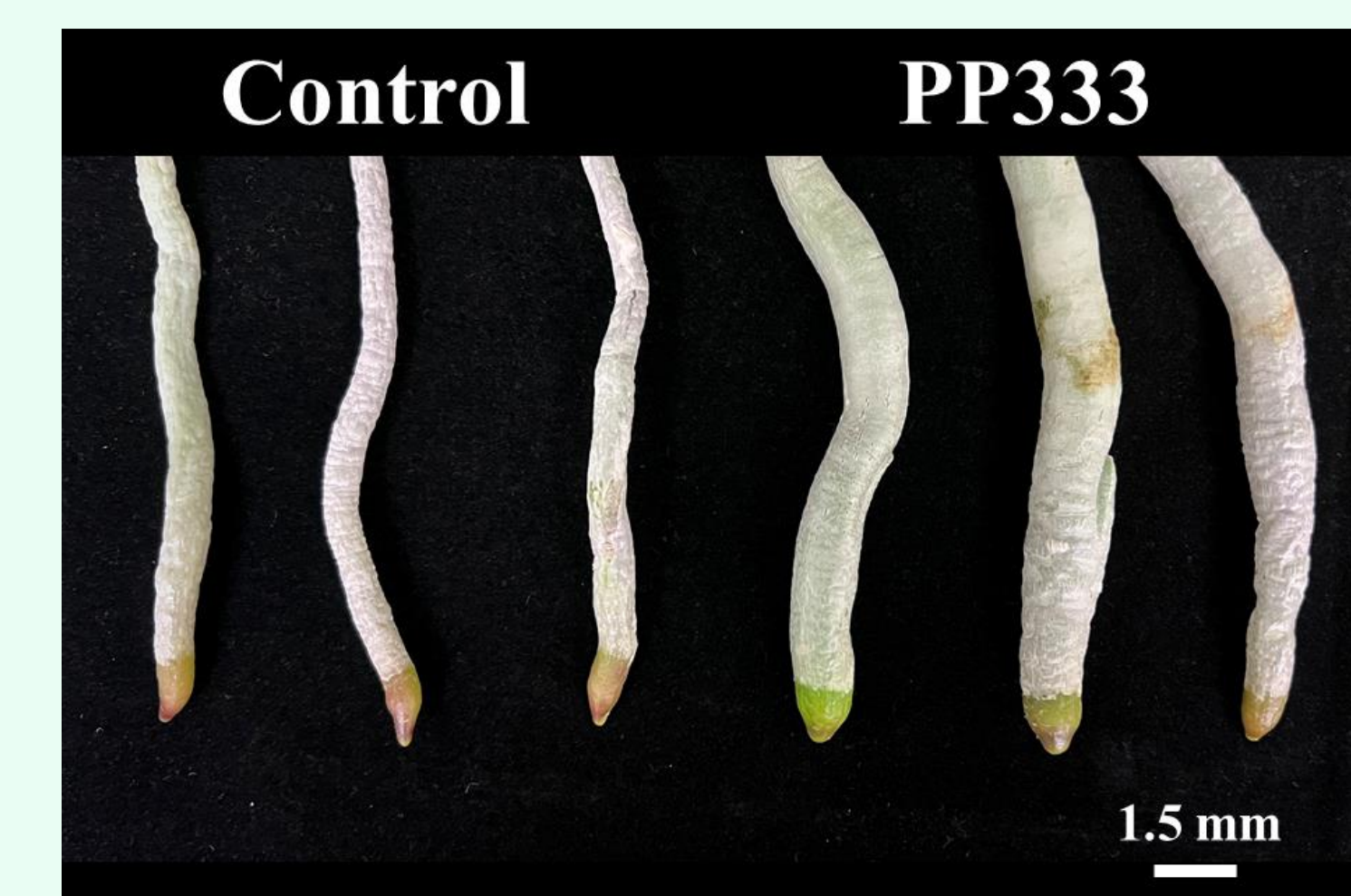
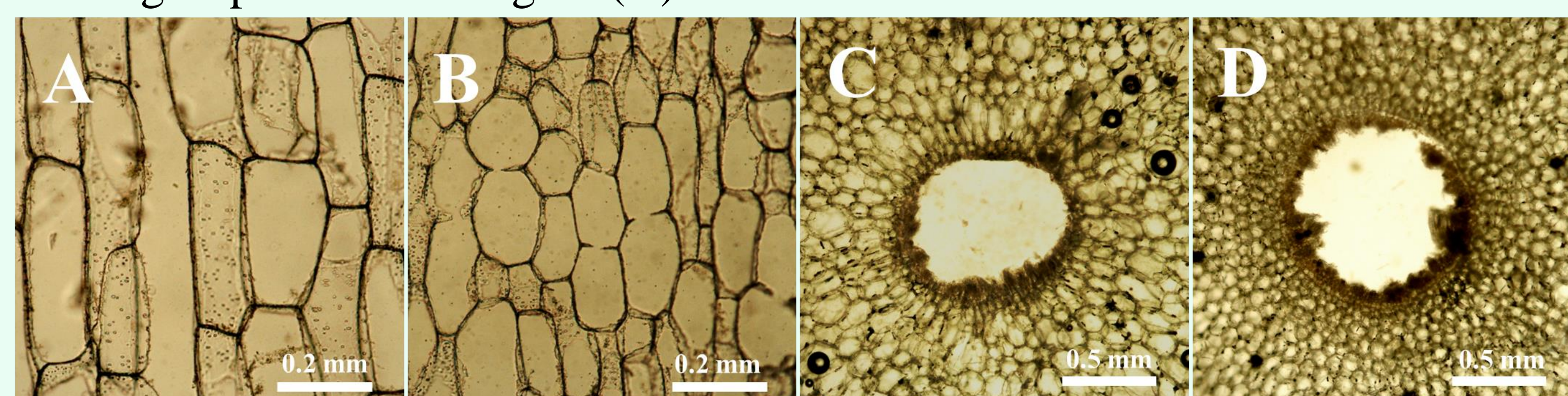


Fig. 4 Effects of PP333 application on the stalk sagittal plane of control(A) and T2T3 group with 1000 mg·L⁻¹(B); the root transverse plane of control(C) and T2T3 group with 1000 mg·L⁻¹(D) of *Phal.* Join Grace ‘TH288-4’.



1. Research assistant, Department of Horticultural Science, National Chiayi University, Chiayi 60004, Taiwan.

2. Ph.D student, Department of Horticultural Science, National Chiayi University, Chiayi 60004, Taiwan.

3. Professor, Department of Horticultural Science, National Chiayi University, Chiayi 60004, Taiwan. (Corresponding author)