* PARTIAL REPLACEMENT OF THE ROOTING PROCEDURE OF C H R Y S A N T H E M U M M O R I F O L I U M CUTTINGS BY PRE-ROOTING STORAGE IN THE DARK.

P.A. van de Pol
Department of Horticulture
Agricultural University
P.O. Box 30
6700 AA Wageningen
The Netherlands

Abstract

Part of the rooting procedure of C h r y s a n t h e m u m m o r i - f o l i u m 'Pink Boston' and 'Refour' cuttings can be replaced by pre-rooting storage in the dark. Pre-rooting storage of 7 days at temperatures between 9° and 21°C was adequate. Longer periods of dark storage resulted in increase of root growth but also in severe senescence of the basal leaves.

1. Introduction

The rooting process can be divided in two phases: one is inside the stem (root initiation, and formation of root primordia) and the other, root growth is outside the stem (Hartmann and Kester, 1983). In commercial propagation the actual rooting is always in light. However, it has been shown with carnation cuttings that the first phase of root formation can be carried out also in the dark (Van de Pol and Vogelezang, 1983). Thus propagation space and time can be saved. Examination of the possibility of using pre-rooting dry storage in the dark as well as the effect of temperature during this treatment were purpose of the present study.

2. Materials and methods

The experiments were carried out during June-July period. Stock plants of C h r y s a n t h e m u m m o r i f o l i u m cvs. 'Pink Boston' and 'Refour' with 4 unfolded leaves were harvested from shoots bearing 6 leaves. All the cuttings were dipped for 10 minutes in IBA solution of 250 ppm. The cuttings were packed in plastic pots, 7 cm in height, which were inserted in polyethylene bags. This procedure was applied in order to minimize the excess of free space, to avoid pressure damage and for drainage of condensation water via the bottom of the

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plastic pot. Pre-rooting temperature treatments were in controlled rooms in the dark. The rooting procedure was in peat/sand mixture 1 : 1 - v : v at pH 5.5 or in aerated water culture. The cuttings were covered with plastic and misted a few times a day. The minimal temperature of the air and the rooting medium was kept at 25°C. Root weight was measured 7 days after inserting the cuttings in substrate.

3. Results

Anatomical observation after 14 days of pre-rooting storage in the dark at 9°C showed (figure 1) the appearence of root primordia within the stem.

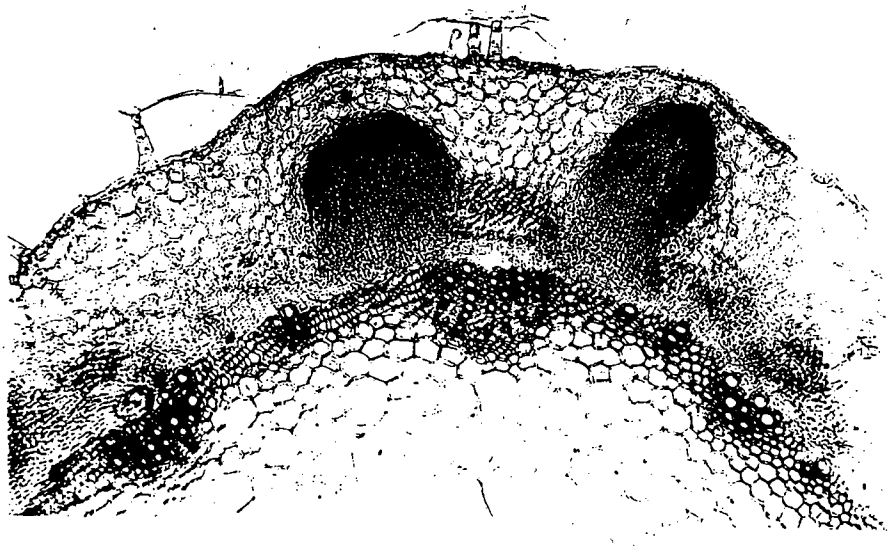

Figure 1 - Appearence of root primordia witin a cutting of C h r y s a n t h e m u m m o r i f o l i u m 'Pink Boston' after 14 days of pre-rooting storage in the dark at 9°C.

Pre-rooting treatment during 7 days at different temperatures resulted in a profound improvement of root development after 7 days in hydroculture (figure 2). Pre-rooting storage at 0°C caused significant increase in the root weight of C h r y s a n t h e m u m m o r i f o l i u m 'Pink Boston' cuttings in comparison with unstored control cuttings, 58 mg and 5 mg per cutting respectively. Increase in the pre-rooting temperature resulted in a further improvement in root growth. The root weight of cuttings, stored in the dark at 17°C was 317 mg per cutting in comparison with 5 mg of the fresh control.

Due to difficulties of root measurements the differences between the effects of various temperature treatments were less pronounced when cuttings were rooted in peat/sand rooting medium (table 1). However, it can be seen that the dark pre-rooting treatment improved the root formation in peat/sand substrate. The weight of the root clod of cuttings of 'Pink Boston', stored at temperatures between 1° and 9°C was 2 g per clod and between 17° and 25°C it was 11-13 g per clod in comparison with 0.9 g of the fresh control cuttings. Similar results were also obtained with the cultivar 'Refour'. The effect of temperature during the pre-rooting treatment on the root development after 7 days of 'Pink Boston' is demonstrated in figure 3.

The data on the importance of the duration of the pre-rooting treatment at various temperatures on the further root development are summarized in table 2. The data show that the maximum root growth was obtained when cuttings were stored for 11-14 days at 17°C with 11.4 and 13.7 g per clod respectively in comparison with 5.7 and 10.1 g at 13°C and 8.9 and 6.9 g per clod at 21°C. However, after 11 and 14 days of storage yellowing and browning of the basal leaf on the cuttings developed at these temperatures (table 3). No leaf damage was observed after 7 days of pre-rooting treatments at a temperature range of 9-25°C. The effect of various periods of pre-rooting storage at 10°C is demonstrated in figure 4.

4. Discussion

The results demonstrate that part of the rooting procedure of C h r y s a n t h e m u m cuttings can be replaced by dry storage in the dark. Similar to Carnation cuttings (Van de Pol and Vogelezang, 1983) the phase of the rooting process inside the stem can be realized when cuttings are packed in temperature controlled dark rooms. In the areas of C h r y s a n t h e m u m production as in The Netherlands where about 1 billion C h r y s a n t h e m u m cuttings are rooted yearly, the savings in space and time may have a substantial economical value, particularly in long distance shipments of cuttings, when the pre-rooting storage can be done during the transport period.

Symptoms of advanced senescence, yellowing and browning of the basal leaves, were present in cuttings, stored for 11 and 14 days at temperatures of 13-28°C. This senescence was correlated with maximum root growth. Therefore it is possible that the yellowing is a result of stimulated sinck activity of the developing root system. It is also possible that the senescence of the basal leaf is a direct effect of a

prolonged exposure to the dark. This senescence is accelerated by increasing temperatures during the dark (Halevy and Mayak, 1981). No leaf damage developed during rooting, when cuttings were stored for 7 days.

References

Halevy, A.H. and Mayak, S., 1981. Senescence and Postharvest Physiology of Cut Flowers-Part 2. Hort. Rev. Vol. 3: 107-108.

Hartmann, H.F. and Kester, D.E., 1983. Plant Propagation: Principles and practices. 4. Prentice-Hall, New Yersey, U.S.A.: 236.

Pol, P.A. van de and Vogelezang, J.V.M., 1983. Accelerated rooting of carnation 'Red Baron' by temperature pre-treatment. Scientia Hortic. 20: 287-294.

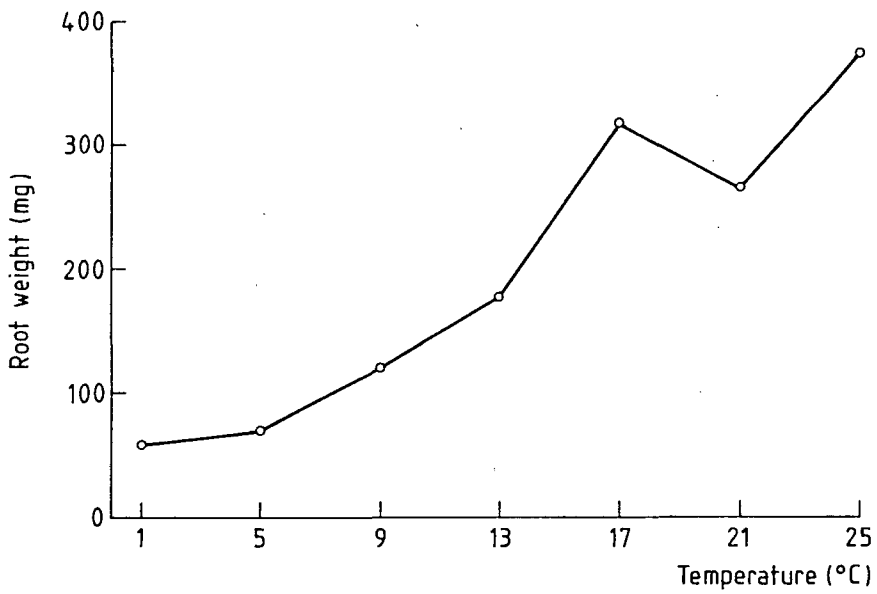

Figure 2 - Effect of pre-rooting (7 days) temperatures on root growth (fresh weight mg) in hydroculture of C h r y s a n t h e m u m m o r i f o l i u m 'Pink Boston' cuttings. Root weight of non-stored cuttings was 5 mg. N = 30.

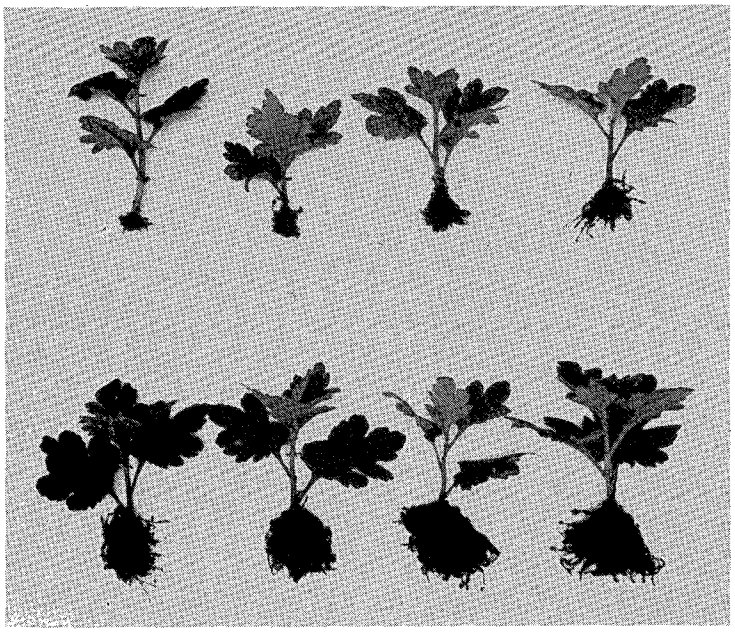

Figure 3 - Effect of temperature during 7 days of pre-rooting treatment of C h r y s a n t h e m u m m o r i f o l i u m 'Pink Boston' cuttings on root development after 7 days.
Upper row from left to right: control (fresh); 1°C; 5°C; 9°C.
Bottom row from left to right: 13°C; 17°C; 21°C; 25°C.

Figure 4 - Effect of various periods of pre-rooting storage at 10°C of C h r y s a n t h e m u m m o r i f o l i u m 'Pink Boston' cuttings on root development after 7 days.
From left to right: 0, 6, 9, 12 and 15 days.

Table 1 - Effect of pre-rooting (7 days) temperatures on root growth (g/clod) in peat/sand substrate of *Chrysanthemum morifolium* 'Pink Boston' and 'Refour' cuttings. N = 15.

Pre-rooting temperature (°C)	Root clod (g)	
	'Pink Boston'	'Refour'
control (fresh cuttings)	0.9 ± 0.3	0.4 ± 0.2
1	2.0 ± 0.7	0.5 ± 0.4
5	2.2 ± 0.9	2.5 ± 1.1
9	2.7 ± 1.4	2.7 ± 1.7
13	5.1 ± 1.3	9.0 ± 2.9
17	11.3 ± 4.3	14.5 ± 4.4
21	13.0 ± 4.1	16.9 ± 5.8
25	13.1 ± 4.4	21.1 ± 7.6

Table 2 - Effect of duration (days) of pre-rooting storage at different temperatures on root growth (g/clod) in peat/sand substrate of *Chrysanthemum morifolium* 'Refour' cuttings. N = 30. L.S.D. (5% level) = 2.3.

Pre-rooting temperature (°C)	days of pre-rooting storage			
	4	7	11	14
1	-	-	-	0.2
9	0.2	2.0	3.3	3.6
13	0.7	2.4	5.7	10.1
17	1.5	2.9	11.4	13.6
21	0.4	5.0	8.9	6.9
25	1.0	5.0	7.8	-
28	0.9	3.1	-	-