Because of these circumstances, the development of new chabana flowers and the commercial production of these flowers is necessary. It is estimated that there are more than 5 million people who enjoy the Tea Ceremony and if only a proportion of them use bought flowers, the demand would be substantial. The commercial production and supply of flowers for chabana will help in the protection of endangered plants in the wild.

The author has introduced flowers suitable for this purpose from time to time.

Accelerating Rooting by the Pretreatment of Direct Stuck Cuttings of Chrysanthemum

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INTRODUCTION

The cultivation of *Dendranthema* 'Seiun', a summer-autumn flowering cultivar, by the direct planting of shoots before rooting is widely adopted for savings in labor costs. However, the rooting of autumn-flowering cultivars grown for late season sale using light-culture techniques and production is not reliable because the planting season in mid summer is too hot. To solve this problem, methods to stimulate the initiation of root primordia by the pretreatment of shoots were investigated.

MATERIALS AND METHODS

Experiment 1: Temperature and Light Condition Before Cutting. Shoots of *D.* 'Set Alps' were kept at 5C in the dark in a cardboard box, at 20C, illuminated with a metal halide lamp and at 25C in natural light in a north-facing room. The shoots were collected 22 Sept. 1997 and 30 shoots were set in #2.5 pots, after the whole shoot was dipped in 40 ppm IBA, drained, and kept in a sealed plastic bag for 9 days.

Experiment 2: Temperature Treatment and Duration. Shoots treated in the same way as above were kept at 15C for 5, 6, and 7 days, also at 20C and 25C for 4, 5, and 6 days, respectively. The shoots were collected 10 March 1998. After dipping in IBA solution the shoots were dried for 4 h because in Exp. 1 some shoots rotted. After treatments the shoots were set in beds, kept at 20C with a 4-h light break for 4 to 5 days and root development was investigated.

Experiment 3: Methods of IBA Treatment. Treatments were by powder (0.5% IBA) applied to the cut surface, as a spray of 0.2% solution to the cut surface, by dipping the cut surface in a 0.2% solution, a spray of 0.04% solution to the cut surface, dipping the cut surface in a 0.04% solution, dipping the shoot in a 0.04% solution, and dipping the shoot in a 0.004% solution were compared. Pretreated shoots were preincubated at 25C for 4 days. The experiment then continued in the same way as Experiment 2.

RESULTS AND DISCUSSIONS

1) Pre-incubation at 5C showed no effects on root initiation after 9 days, but 50% to 60% of the shoots at 20C and 80% to 85% at 25C, respectively, rooted. Including root primordia initiation, almost 100% of shoots responded at both 20 and 25C. Light irradiation stimulated root development, but additional light during pretreatment is not essential.
2) For root primordia initiation 7 days was required at 15C, 5 days at 20C, and 4 days at 25C. These shoots rooted 100% after being set in beds.
3) Shoots were normal in appearance with the IBA powdered treatment, the 0.04% sprayed solution to the cut surface, the shoot dipped in 0.004% solution, and in the untreated control. With the powder and the control 95% of shoots initiated root primordia while 65% rooted with the 0.04% spray solution to the cut surface and those dipped in 0.004% IBA solution.

   Rooting after 3 days was best in the control (93%), followed by the shoot dipping of 0.004% solution, cut surface dipping in 0.04% solution, cut surface spray of 0.04% solution, and powder dressing. However, in treatments of the cut surface dipped in 0.04% solution, 10% of the cut surface shoots rotted.

   In treatments where no abnormal appearances were observed, all shoots initiated root primordia.
4) It became clear that almost all shoots can form roots by using a pretreatment with IBA powder; a spray of 0.04 % solution to the cut surface; or dipping of the shoot in 0.004% solution, then drying; and keeping at 15C for 7 days, 20C for 5 days, or 25C for 4 days.