Table 3. Effect of gelling agent concentration (plus 1 μM NOA) on *C. volubilis* root production in vitro and subsequent survival 3 months after transfer to potting soil.[z]

Gelling agent concn (% w/v)	Rooted explants (%)	Survival (%)
0.125	84 ± 4	27 ± 2
0.25	80 ± 0	60 ± 0
0.375	82 ± 2	65 ± 5
0.5	51 ± 3	70 ± 0

[z]Mean of two experiments, 20 replicates each, ± SE.

which would reduce desiccation of the plants.

In the case of *C. volubilis*, selection of the appropriate type of auxin and gel concentration during root induction can indirectly enhance survival of plantlets when transferred out of culture. It is likely that other similar modifications to the final stages of in vitro propagation can enhance the efficiency of the transfer of plantlets to the nursery. This is often the limiting step in the application of tissue culture in commercial plant propagation.

Literature Cited

1. Bornman, C.H. and T.C. Vogelmann. 1984. Effect of rigidity of gel medium on benzyl adenine-induced adventitious bud formation and vitrification in *Picea abies*. Physiol. Plant. 61:505–512.
2. Deberg, P.C. 1983. Effects of agar brand and concentration on the tissue culture medium. Physiol. Plant. 59:270–276.
3. Deberg, P.C., Y. Harbaoui, and R. Lemeur. 1981. Mass propagation of globe artichoke (*Gnara scolymus*): evaluation of different hypotheses to overcome vitrification, with special reference to water potential. Physiol. Plant. 53:181–187.
4. deFossard, R.A., A. Myint, and A.C.M. Lee. 1974. A broad spectrum tissue culture experiment with tobacco (*Nicotiana tabacum*) pith tissue callus. Physiol. Plant. 31:125–130.
5. Elliot, W.R. and D.L. Jones. 1984. Encyclopaedia of Australian plants. Lothian, Melbourne, Australia.
6. Leigh, J., R. Boden, and J. Briggs. 1984. Extinct and endangered plants of Australia. MacMillan, Sydney, Australia.
7. Murashige, T. and F. Skoog. 1962. A revised medium for rapid growth and bioassays with tobacco tissue cultures. Physiol. Plant. 15:473–497.
8. Williams, R.R., A.M. Taji, and J.A. Bolton, 1984. In vitro propagation of *Dampiera diversifolia* and *Prostanthera rotundifolia*. Plant Cell Tissue & Organ Cult. 3:273–281.
9. Williams, R.R. and A.M. Taji. 1987. Effects of temperature, darkness and gelling agent on long-term storage of in vitro shoot cultures of Australian woody plant species. Plant Cell Tissue & Organ Cult. 11:151–156.

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Floral Induction in *2n* and *4n* *Dieffenbachia maculata* 'Perfection' After Treatment with Gibberellic Acid

R.J. Henny

Central Florida Research and Education Center, IFAS, University of Florida, 2807 Binion Road, Apopka, FL 32703

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Abstract. **Autotetraploid (*4n*) plants of *Dieffenbachia maculata* (Lodd.) G. Don 'Perfection' flowered poorly, compared to diploids (*2n*), following treatment with 250 or 500 mg foliar spray of gibberellic acid (GA_3)/liter. GA_3-treated *4n* plants produced bracts that normally precede flowering but remained vegetative and produced additional distal shoots instead of flowers.**

Foliar sprays of gibberellic acid (GA_3) have been a reliable method for inducing flowering of diploid (*2n*) *Dieffenbachia* breeding lines (Henny, 1980). A single foliar spray until runoff of 250 mg GA_3/liter is the standard application method and results in flowering within 3 to 4 months following treatment. Recent attempts to stimulate flowering of newly developed auto- and allotetraploid (*4n*) cultivars using the same treatment method have not produced consistent results. GA_3-treated *4n* plants occasionally flowered but usually produced one or more bracts followed by new distal vegetative shoots instead of flowers. This resulted in plants with multiple distal shoots that is rarely observed, as *Dieffenbachia* normally only branch basally at or below the soil line. The following study was initiated to compare further the response of *2n* and *4n* *Dieffenbachia* to GA_3 treatment.

2n and *4n* plants of *Dieffenbachia maculata* 'Perfection' were the test material in this study. Uniform 20-cm tip cuttings were rooted directly into 15-cm pots containing 2 Canadian peat : 1 perlite : 1 vermiculite (by volume) amended with 0.6 kg Micromax (micronutrient source)/m^3 and 0.8 kg dolomite/m^3. Fertilizer used was Osmocote (19N–6P–12K) at 5.0 g/pot applied every 3 months. Plants were grown in a shaded greenhouse with 230 $\mu mol \cdot s^{-1} \cdot m^{-2}$ maximum light level under natural photoperiod and a 35/18C day/night temperature range. After 2 months of growth, 10 plants of each ploidy level were treated with a single foliar spray of GA_3 at 0, 250, or 500 $mg \cdot liter^{-1}$ on 15 July 1985. Plants were sprayed on the upper and lower leaf surfaces until runoff. Triton X-100 at 1 drop/liter was used as a wetting agent. A second experiment was conducted using the same procedure as above with treatments applied 15 Dec. 1985. In this experiment, the GA_3 rates used were 0, 125, 250, and 500 $mg \cdot liter^{-1}$.

Data consisted of recording the number of days to opening of the first inflorescence (determined by unfurling of the spathe) of each treated plant plus the total number of inflorescences produced and the number of distal shoots.

In the summer experiment, no untreated *2n* or *4n* plants flowered (Table 1). All GA_3-treated *2n* plants flowered, while six out of 10 and eight out of 10 *4n* plants flowered at the 250- and 500-$mg \cdot liter^{-1}$ rate, respectively. The nonflowering *4n* plants averaged 2.9 and 2.6 distal shoots at the 250- and 500-$mg \cdot liter^{-1}$ rates, respectively. Four of 20 treated *2n* plants also produced additional distal shoots. Average number of days to flowering was ≈85 days for *2n* and 94 days for *4n* plants.

In the winter experiment, the number of *2n* plants that flowered was zero, five, nine, and 10 out of 10 at 0, 125, 250, and 500 mg GA_3/liter, respectively, compared to zero, zero, one, and three in the *4n* plants at the same rates (Table 1). Time to flower for *2n* plants was shorter by 16 days on average than for *4n* plants. The mean number of inflorescences per plant increased among *2n* and *4n* plants at higher GA_3 rates; however, only three *4n* plants bloomed. *2n* plants produced an average of three times as many inflorescences as *4n* plants. All main effects and interactions were primarily linear in both experiments. These results indicate that *4n* *Dieffenbachia* require higher rates of GA_3 to flower and also more time to produce open

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Table 1. Percent flowering, mean number of inflorescences, and number of distal shoots on *2n* and *4n Dieffenbachia maculata* 'Perfection' following treatment with three concentrations of gibberellic acid (GA_3) during summer and winter.

Ploidy level	GA_3 concn (mg·liter^{-1})	Plant flowering (%)	No. inflorescences produced	Time to flowering (days)	No. distal shoots
Summer (treated 15 July)					
2n	0	0	0.0	---	1.0
	250	100	4.5	80.3	1.4
	500	100	5.5	84.8	1.1
4n	0	0	0.0	---	1.0
	250	60	1.7	93.6	2.9
	500	80	2.4	94.0	2.6
Significance[z]					
Concn linear		---	90.2**	---	50.8**
Concn quadratic		---	9.8**	---	49.2**
2n vs. *4n*		---	**	---	**
Concn linear × ploidy		---	82.2**	---	75.0**
Concn quadratic × ploidy		---	17.8*	---	25.0NS
Winter (treated 15 December)					
2n	0	0	0	---	1.0
	125	50	2.0	122	1.4
	250	90	6.6	119	1.3
	500	100	7.4	115	1.1
4n	0	0	0	---	1.0
	125	0	0	---	1.0
	250	10	0.2	138	3.0
	500	30	0.8	133	2.6
Significance[z]					
Concn linear		---	92.8**	---	54.9**
Concn quadratic		---	3.9NS	---	24.5**
Concn cubic		---	3.3NS	---	20.6**
2n vs. *4n*		---	**	---	**
Concn linear × ploidy		---	86.2**	---	57.5**
Concn quadratic × ploidy		---	9.6*	---	3.9NS
Concn cubic × ploidy		---	4.2NS	---	38.5**

[z]Regression analyses were performed on tests with significant differences between treatments as determined by a F test. The analyses are given as the percentage of the treatment sum of square (%TrSS) for which each term accounts, followed by the significance level of corresponding F value denoted as follows: ** = 1%, and NS = nonsignificant.

inflorescences than *2n* plants of the same cultivar. Likewise, both *2n* and *4n* plants required longer to flower when treated in the winter than in the summer (compare winter and summer treatments in Table 1), presumably due to cooler temperatures and slower growth. Summer treatment of *4n* plants yielded more inflorescences than winter treatment, whereas *2n* plants produced more following winter treatment. Data from the experiment conducted in winter indicate that a 125-mg·liter^{-1} treatment rate was insufficient to ensure more than 50% flowering of *2n* plants and totally ineffective on *4n* plants. Most (95%) non-flowering *4n* plants treated with 250 or 500 mg GA_3/liter produced a bract followed by one or more new distal vegetative shoots, indicating that GA_3-treatment had initiated a flowering response but did not sustain the physiological changes required for complete induction. The change in physiology may have temporarily eliminated apical dominance, thus allowing development of new distal shoots. Similar results were observed with *Calocasia esculenta* (L.) Schutt (Alamu and McDavid, 1978), which also produced bracts following GA_3-treatment but no inflorescences. However, in that study, additional distal shoot production was not mentioned. GA_3-treatment of *2n Dieffenbachia* cultivars with a 250-mg·liter^{-1} foliar spray of GA_3 continues to be a reliable method of inducing flowering regardless of season. However, treatment levels for *4n* cultivars should be at least 500 mg·liter^{-1} for summer treatment and higher rates may be essential for winter treatment.

Literature Cited

Henny, R.J. (1980). Gibberellic acid (GA_3) induces flowering in *Dieffenbachia maculata* 'Perfection'. HortScience 15(5):613.

Alamu, S. and C.R. McDavid. (1978). Promotion of flowering in edible aroids by gibberellic acid. Trop. Agr. (Trinidad) 55(1):81–86.