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Increasing 'Bradford' Pear Crotch Angles and Lateral Shoot Counts with Benzyladenine or Promalin Sprays

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'Bradford' pear *(Pyrus calleryana* Decne.), one of the most widely planted ornamental trees in U.S. Dept. of Agriculture zones 5 to 8, is characterized by an oval-to-pyramidal form and dense, ascending branches. With age, many symmetrical specimens split. Pruning during nursery production to remove narrow, bark-embedded, structurally weak crotches and increase branch spacing has had limited success in alleviating splitting (Dirr, 1990). Growth regulators, such as the cytokininbenzyladenine (BA) or the combination of gibberellins and BA (Promalin; Abbott Laboratories, North Chicago, Ill.) have improved plant structure of several fruit tree species by stimulating branching and increasing primary branch crotch angles (Greene and Miller, 1988; Keen et al., 1989; Williams and Billingsley, 1970). The objective of this study was to determine the effects of foliar-applied BA and Promalin on 'Bradford' pear branching and crotch angles.

'Bradford' pear liners (23 cm long) were transplanted on 22 Mar. 1988 into 11.3-liter pots of 3 pine bark: 1 peatmoss (v/v) amended with (in $kg \cdot m^{-3}$) 3.6 dolomitic limestone, 1.2 gypsum, 0.9 Micromax (Grace-Sierra, Milpitas, Calif.), and 8.3 Osmocote 17N–3P–10K (Grace-Sierra). Plants were placed outdoors in full sun in Mobile, Ala., and maintained under overhead irrigation. On 20 Sept. 1988, plants were pruned to 130 cm high and leaves were left on only the uppermost 10 nodes. The following foliar spray treatments were applied to the upper 30 cm of shoots: 150, 300, or 450 mg BA/liter or 300, 600, or 900 mg Promalin/liter with Buffer X surfactant at 0.2%. A nontreated control was included for comparison. Trees were randomized completely with six single-plant replicates. Plant height, lateral shoot count (>2 cm long) and lengths, and crotch angles were recorded on 18 Nov. 1988. The experiment was repeated in 1989 with the following changes: liners were transplanted on 20 Apr., treatments were applied 12 Sept., the upper 8 cm of terminal shoots and leaves below the uppermost remaining 10 nodes were removed, BA at 600 $mg \cdot liter^{-1}$ and Promalin at 1200 $mg \cdot liter^{-1}$ were included as additional treatments, and data were collected in Dec. 1989.

Lateral shoot counts and crotch angles increased in both years with increasing concentrations of BA or Promalin (Table 1). The increase in shoot count was 65% to 440% (1988) and 43% to 174% (1989) with BA concentrations ≥ 300 $mg \cdot liter^{-1}$, and 240% to 490% (1988) and 43% to 239% (1989) with Promalin concentrations ≥ 300 $mg \cdot liter^{-1}$. Almost all new lateral shoots developed from the 30-cm section of shoot treated with BA or Promalin. Crotch angles increased 26% to 30% (1988) and 10% to 26% (1989) with BA and 26% to 34% (1988) and 6% to 38% (1989) with Promalin. Promalin resulted in more shoots (9.6 vs. 5.3, 1988; 4.9 vs. 3.9, 1989) and greater crotch angles (58° vs. 52°, 1988) than BA. Mean lateral shoot lengths decreased linearly in 1989 but increased in 1988 (data not shown) from 9% to 23% with BA and 15% to 57% with Promalin. The reduction was most evident for BA and Promalin at concentrations ≥ 450 $mg \cdot liter^{-1}$ and 900 $mg \cdot liter^{-1}$, respectively. Mean shoot lengths of BA- and Promalin-treated trees were 9.1 and 7.8 cm, respectively, and lateral shoot length of control plants averaged 11.1 cm. Greene and Miller (1988) reported that reducing the number of lateral shoots by pinching apexes of shoots soon after applying BA effectively increased the length of BA-induced lateral shoots. Plant heights were not affected by treatments in either test.

This research supports previous research in which lateral shoot development (Cody et al., 1985; Keen et rd., 1989; Williams and Billingsley, 1970) and crotch angles increased (Cody et al., 1985; Greene and Miller, 1988; Williams and Billingsley, 1970) and lateral shoot length decreased (Greene and Miller, 1988) in fruit trees when BA or Promalin was applied. Our results indicate that BA and Promalin can increase 'Bradford' pear crotch angles and potentially lessen the splitting of older trees. Increased lateral development may require selective pruning to avoid branch crowding as trees mature.

Literature Cited

Cody, C.A., F.E. Larsen, and R. Fritts, Jr. 1985. Stimulation of lateral branch development in tree fruit nursery stock with GA_{4+7} + BA. HortScience 20:758-759.

Dirr, M.A. 1990. Manual of woody landscapeplants. 4th ed. Stipes Publishing, Champaign, Ill.

Greene, D.W. and P. Miller. 1988. Effects of growth regulator sprays and notching on growth and branching of 'Starkrimson Delicious' apple trees. J. Amer. Soc. Hort. Sci. 113:18-23.

Koen, T.B., K.M. Jones, and M.J. Oakford. 1989. Promoting branching in young trees of apple cv. Red Delicious using growth regulators. J. Hort. Sci. 64:521-525.

Williams, M.W. and H.D. Billingsley. 1970. Increasing the number and crotch angles of primary branches of apple trees with cytokinins and gibberellic acid. J. Amer. Soc. Hort. Sci. 95:649-451.

Table 1. Effects of BA and Promalin on 'Bradford' pear tree primary shoot development.

Treatment	Lateral shoot[z] (no.) 1988	Lateral shoot[z] (no.) 1989	Crotch angle (degree) 1988	Crotch angle (degree) 1989	Mean lateral shoot length (cm) 1989
Control	2.0	2.3	45	46	11.1
BA ($mg \cdot liter^{-1}$)					
150	1.8	2.3	42	51	10.1
300	3.3	3.3	57	50	10.7
450	10.8	3.5	58	59	6.9
600	---	6.3	---	58	8.6
Significance					
Linear	**	**	**	*	*
Quadratic	*	NS	NS	NS	NS
Promalin ($mg \cdot liter^{-1}$)					
300	6.8	3.3	57	49	9.4
600	10.3	2.8	58	49	10.8
900	11.8	6.0	60	61	6.1
1200	---	7.8	---	63	4.8
Significance					
Linear	**	**	**	**	**
Quadratic	NS	*	NS	NS	NS
BA vs. Promalin	*	*	*	NS	NS

[z]Shoots >2 cm long were counted.
[NS,*,**]Nonsignificant or significant at $P \leq 0.05$ or 0.01, respectively control included in regression analyses.

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