EFFECT OF FOLIAR SPRAY OF GROWTH HORMONES ON SEEDLING GROWTH ATTRIBUTES IN *ALBIZIA LEBBECK*

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ILANGO, K., VANANGAMUDI, M. & VANANGAMUDI, K. 2003. Effect of foliar spray of growth hormones on seedling growth attributes in *Albizia lebbeck*. Growth hormones, viz. indole butyric acid, gibberellic acid, abscisic acid, kinetin, maleic hydrazide, cycocel, ethrel and alar, were used in foliar application to study their effects on the seedling growth attributes in *Albizia lebbeck*. Gibberellic acid (GA_3 300 ppm) foliar spray maximized the shoot length, total chlorophyll and soluble protein of the seedlings. Cycocel 3% foliar spray increased the leaf area and total dry weight. Alar 300 ppm gave the highest root length.

Key words: *Albizia lebbeck* - growth hormones - chlorophyll content - soluble protein - shoot length - root length

ILANGO, K., VANANGAMUDI, M. & VANANGAMUDI, K. 2003. Kesan semburan hormon pertumbuhan terhadap ciri-ciri pertumbuhan anak benih *Albizia lebbeck*. Hormon pertumbuhan, iaitu asid butirik indola, asid giberelik, asid absisik, kinetin, maleik hidrazida, sikosel, etrel dan alar, disembur ke atas daun untuk mengkaji kesannya terhadap ciri-ciri petumbuhan anak benih dalam *Albizia lebbeck*. Semburan asid giberelik (GA_3 300 ppm) ke atas daun memaksimumkan panjang pucuk, jumlah klorofil dan protein boleh larut anak benih. Semburan daun menggunakan sikosel 3% menambahkan luas daun dan jumlah berat kering. Alar 300 ppm menyebabkan panjang akar tertinggi.

Introduction

Albizia lebbeck (L) Benth (vagai) is considered the most important tree species for afforestation in India. It is, therefore, also an import source of raw material for various wood industries. A major limiting factor in the afforestation of wastelands is drought stress after transplanting. Success can be increased with the proper use of growth hormones including stimulatory chemicals. Growth hormones and growth stimulants have been extensively used in forestry to enhance the growth and development of seedlings under nursery conditions (Nayital *et al.* 1993). They play a major role in enhancing root growth and internal differentiation, including initiation of cambial activity and xylem differentiation (Wareing *et al.* 1964). As studies on the effect of foliar spray of growth hormones on the production of elite seedlings in tree species are meagre, a study was carried out on *Albizia lebbeck.*

Materials and methods

Three-month-old seedlings of *Albizia lebbeck* (vagai) were transplanted in 30 × 20 cm polybags. On the 10th day after transplanting, bags containing healthy and uniform seedlings in terms of height were arranged and the following hormones, indole butyric acid 300 ppm, gibberellic acid (GA_3) 300 ppm, abscisic acid 300 ppm, kinetin 300 ppm, maleic hydrazide 300 ppm, cycocel 3% , ethrel 3% and alar 300 ppm, were used in foliar application. Water spray served as the control. The chemicals were mixed with 0.5% tween 20 solution. The experiment was set up in randomized block design with three replications of 25 polybags each.

In five randomly selected seedlings in each treatment, observations on shoot and root lengths (primary root), total leaf area (LICOR Model LI 3000 leaf area), total dry weight, total chlorophyll content (Yoshida *et al.* 1971) and soluble protein content (Lowry *et al.* 1951) were made at 30, 60 and 90 days after spraying (DAS). The results were subjected to analysis of variance and tested for significant differences ($p = 0.05$), following Panse and Sukhatme (1967).

Results and discussion

Seedlings which received GA_3 300 ppm spray recorded the highest shoot length compared to the control (Table 1). Several research reports support this result (Ballantyne 1991, Deotale *et al.* 1994). The enhancement of shoot length due to GA_3 application indicated the probability of this growth regulator becoming a limiting factor for plant growth (Bhatnagar & Talwar 1978). Wareing and Phillips (1970) suggested that auxin and gibberellin significantly influenced shoot elongation. The growth promoting action of gibberellin on the growth of plant is probably a consequence of an interaction between the supplied exogenous gibberellin and endogenous auxin. It was further suggested that the application of gibberellin leads to an increased endogenous auxin level through either biogenesis or the destruction of auxin. In the present investigation, alar 300 ppm produced the longest root in *Albizia lebbeck* by reducing the vegetative growth (Table 1). This might be due to the translocation of more photosynthates to the roots (Bhattacharjee 1984).

Table 1 Influence of growth regulators on shoot and root lengths and leaf area in *Albizia lebbeck*

Growth stimulant	Shoot length (cm)			Root length (cm)			Leaf area (cm^2 plant^{-1})		
	30 DAS	90 DAS	150 DAS	30 DAS	90 DAS	150 DAS	30 DAS	90 DAS	150 DAS
Indole butyric acid (IBA)	15.0	33.3	43.2	20.7	38.7	47.7	70.2	126.4	148.2
Gibberellic acid (GA_3)	15.0	40.4	56.3	21.0	38.3	46.8	57.3	164.8	185.6
Abscisic acid (ABA)	15.0	24.2	36.2	20.0	39.2	48.4	64.8	173.4	191.9
Kinetin (KIN)	15.0	29.3	38.5	23.0	36.8	45.2	62.8	188.5	205.3
Maleic hydrazide (MH)	15.0	22.5	34.8	22.0	43.5	52.3	68.4	136.2	163.2
Cycocel (CCC)	15.0	24.0	35.8	22.4	41.8	51.1	70.9	383.7	400.3
Ethrel (ETH)	15.0	21.8	32.2	20.8	33.6	41.4	65.5	135.6	165.8
Alar	15.0	19.7	29.3	21.3	51.0	62.1	66.1	225.3	250.2
Control	15.0	18.3	28.3	21.3	29.6	38.3	66.4	103.8	136.6
SEd		0.48			0.61			3.99	
CD (p=0.05)		0.97			1.22			8.00	

SEd = standard error deviation
CD = critical difference
DAS = days after spraying

The total leaf area was highest in 3% cycocel (CCC) spraying (Table 1). Such increases in leaf area over the control were reported in *Azadirachta indica* both at lower and higher concentrations of CCC (Kumaran *et al.* 1994). Suparna *et al.* (1993) also observed that CCC increased the leaf area in several horticultural crops.

Seedlings sprayed with 3% CCC gave the best dry weight over other treatments and the control (Table 2). This agrees with the findings of Read *et al.* (1972) and Bhattacharjee (1984) that foliar sprays of CCC increased the number, weight and size of tuberous roots of *Dahlia pinnata* and *D. variabilis*, and thereby increased the total dry weight. Although growth retardants such as CCC and ethrel and the inhibitor MH have an inhibitory effect on the growth and development of plants, they help to accumulate a considerable amount of photosynthates resulting in a higher total dry weight. Kumaran *et al.* (1994) found increases in dry weight of *A. indica* seedlings both at lower and higher concentrations of CCCs.

The total chlorophyll content increased with the application of GA_3 300 ppm spray (Table 2). Alar spraying also had a similar augmentative effect. Both retardants and stimulants were thus able to induce greater synthesis of chlorophyll. It is probable that the chlorophyllase enzyme, which is responsible for chlorophyll degradation, may be inhibited by the chemicals leading to a higher accumulation of chlorophyll (Paricha *et al.* 1977).

The highest soluble protein content was observed in GA_3 300 ppm spraying (Table 2). In general, soluble protein content was reduced by growth retardants compared to growth promoters. Such an effect was also reported by Pain and Basu (1985) in agricultural crops. The beneficial effect of GA_3 on soluble protein content might be due to the increased supply of nutrients to the growing tissue (Prasad & Mohammad 1987).

Table 2 Influence of growth regulators on total dry weight, total chlorophyll and soluble protein in *Albizia lebbeck*

Growth stimulant	Total dry weight (g plant^{-1})			Total chlorophyll (mg g^{-1})			Soluble protein (mg g^{-1})		
	30 DAS	90 DAS	150 DAS	30 DAS	90 DAS	150 DAS	30 DAS	90 DAS	150 DAS
IBA	1.95	3.74	4.58	1.22	2.60	4.06	2.93	4.59	5.39
GA_3	2.01	3.59	4.97	1.19	2.82	4.72	3.02	4.91	5.64
ABA	1.96	4.19	5.92	1.19	2.54	3.52	2.86	4.52	5.34
KIN	1.96	5.90	7.61	1.23	2.82	3.14	2.86	4.24	5.24
MH	2.08	3.80	4.31	1.22	2.07	3.80	2.94	4.30	5.29
CCC	1.85	9.15	10.70	1.28	2.20	3.98	3.01	4.60	5.41
ETH	1.92	8.65	9.66	1.21	2.30	3.82	2.85	3.83	4.71
Alar	2.06	3.57	5.42	1.45	2.70	4.29	2.93	4.15	4.92
Control	1.87	2.66	4.21	1.23	1.94	3.66	2.94	3.70	4.51
SEd		0.354			0.203			0.039	
CD (p=0.05)		0.710			0.406			0.079	

SEd = standard error deviation
CD = critical difference
DAS = days after spraying

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