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INFLUENCE OF GROWTH REGULATORS ON FLOWERING AND FOLIAGE YIELD IN FOXGLOVE (DIGITALIS LANATA Ehrh.)

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An experiment was conducted to assess the effect of plant growth regulators on the growth attributes, flowering, foliage yield and total glycoside content in *Digitalis lanata*. The results revealed that spray of CCC 500 ppm recorded significantly higher leaf number, root weight, foliage yield and total glycoside content. Lesser clump number was noticed with this treatmant causing assimilates to be diverted into leaves and roots. Thus, vegetative parts provided alternate sinks for excess assimilates.

The leaves of *Digitalis* are used as a cardiac stimulant and tonic. The major sources of cardiac glycosides are certain members of the *Digitalis* (*Scrophulariaceae*) particularly the purple foxglove, *D. purpurea* and the woolly foxglove *D. lanata*. For this reason, these are also often referred to as digitalis glycosides. Since, these glycosides obtained from various species of *Digitalis* have so far not bean synthesised, extensive cultivation of *D. lanata* (having three to four times more alkaloids than *D. purpurea* has become imperative to meet the pharmaceutical requirements.

The size of the "sink" has been shown to affect the yield and dry matter distribution in maize, (Thorne, 1962) and wheat (Bingham, 1967). This study was conducted to assess the importance of flower removal as it affects foliage yield by employing several growth regulators.

MATERIAL AND METHODS

The experiment was conducted at Horticultural Research Station, Kodaikanal from 1976 to 1981. The seedlings of *D. lanata* were transplanted with a spacing of 45cm x 30 cm in a plot measuring 1.5M x 1.8M size. The experiment was laid out in a Randomised Block Design replicated thrice. Five growth regulators were employed for the study. The datails of the treatments were as follows:

Growth regulators used :

1.	Maleic Hydrazide (MH)	: 2000, 4000, 6000 and 8000 ppm
2.	Ethrel	: 250, 500, 750 and 1000 ppm
3.	Cycocel (CCC)	: 100, 200, 500 and 1000 ppm
4.	Alar	: 100, 250, 500 and 1000 ppm
5.	Phosphon D	: 250, 500, 1000 and 2000 ppm

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The growth regulators were sprayed one month after transplanting and repeated at monthly intervals till flowering. A few drops of "Teepol" were added as a wetting agent to the spray solution

Data were collected on plant height, number of leaves, number of clumps, dried root weight and foliage yield at harvest. The dried leaves from various treatments were analysed for their total glycoside content as per A.O.A.C. method (Anon. 1960).

RESULTS AND DISCUSSION

The values for plant height, number of leaves, number of clumps, dried root weight and foliage yield and total glycoside content are furnished in Table. Based on experimental data, the results are discussed below.

Plant height:

Plants sprayed with Alar at 250 ppm recorded the maximum plant height (36.5 cm) followed by Ethrel 500 ppm (36.1 cm) and they differed significantly from control (28.1 cm).

Leaf number:

Treatments with CCC 500 ppm (84 9) and Alar 250 ppm (80 4) registered higher leaf number which was significant by more than control (71.3). The lowest number of leaves was noted with the treatment MH 8000 ppm (60.0).

Clump number:

The lowest number (2.1) was recorded by sprays of MH 8000 ppm Ethrel and Alar at lower concentrations (250 ppm) increased the clump number (5.2) which was on par with the control (4.7).

Dried root weight:

Significantly higher root weight was noted under CCC 500 ppm (232.3 g/plot) when compared to control (166.3 g/plot). MH and phosphon D at higher concentrations of 8000 and 2000 ppm respectively reduced the dry weight of roots (133.3 and 132 3 g/plot respectively).

Dried foliage yield:

Plants sprayed with CCC 500 ppm registered the highest foliage yield (525.1 g/plot) followed by Alar 250 ppm (459.9 g/plot) and they differed significantly from control (375.0 g/plot). On the other hand, MH had a negatiue effect as it decreased the dry weight of leaves with increasing concentrations.

Total glycoside content:

CCC 500 ppm and Alar 250 ppm (0.34%) registered higher values than control (0.30%). The treatment which gave the least value from control was MH 8000 ppm (0 28%) which was not in any way significantly inferior to control.

The plant height was enhanced by sprays of Alar while the leaf number by CCC treatments. Retardation in vegetative growth is normally associated as an effect of B-Nine (N-dimethyl aminosuccinic acid) in chrysanthemum (Sen and Sen, 1968). However in

the present study, the effect of Alar on *D. lanata* was the reverse and this needs further work.

The increase in leaf number by CCC sprays is mainly brought about by the induction of lateral bud expansion resulting in prodution of new leaves.

Increased clump number was noted by Alar and Ethrel treatments. This might be due to increase in carbohydrate content and atleast partly, to the reduced rate of respiration (Suryanarayana and Madhava Rao, 1978). On the other hand, clump number was markedly reduced by MH sprays. The CCC treated plants were also found to record less number of clumps per plant. This showed that the assimilates were efficiently diverted to alternate sinks (leaves). This view is supported by altered partitioning of assimilates. This decreased rate of flowering caused more assimtlates to be diverted to leaves and roots thereby influencing greater foliage and root yield in CCC treated plants. Similar results were reported by Cockshull and Hughes (1978) in *Chrysanthemum* and Wien *et al*. (1973) in *Phaseolus* after flower removal.

The total glycoside content was increased by CCC and Alar sprays. Increased root production may explain for the enhanced total glycoside content of leaves on treatment with CCC and Alar as the roots are the recognised sites of synthesis of glycosides.

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Table Effect of plant growth regulators on *Digitalis lanata*.

Treatment	Concentration (ppm)	Plant height (cm)	Leaf number per plant	Clump number per plant	Dried root weight (g/plot)	*Dried foliage yield*		Total glycoside content (percent)
						Plot yield (g)	Percent increase over control	
MH	2000	27.9	71 5	4.5	179	375	0.24	0.30
	4000	26.2	68.2	4.0	163	300	—20.00	0.30
	8000	23.0	62.5	3.5	162	230	—38.48	0.29
	8000	21.1	60.0	2.1	133	200	—46.67	0.28
Mean		24.55	65.55	3.53	159	276	—	0.29
Ethrel	250	30.0	74.0	5.2	191	415	10 85	0.31
	500	36.1	79.9	5.0	196	430	14.88	0.33
	750	27.5	75.6	4.7	211	445	18.91	0.32
	1000	25.0	72.9	3.6	184	415	10.67	0.30
Mean		29.65	75.60	4.63	196	426	—	0.31
CCC	100	30.0	75.8	5.0	194	421	12.48	0.31
	200	32.9	79.0	4.1	205	444	18.59	0 32
	500	29·0	84.9	4.8	232	525	40.03	0 34
	1000	27.4	71.5	3.5	197	420	12.00	0.32
Mean		29 83	77.80	4.35	207	452	—	0.32
Alar	100	31.0	74.0	4.9	201	425	13.33	0.32
	250	36.5	80.4	5.2	226	459	22.64	0.34
	500	30.5	75.1	5.0	199	440	17.52	0.33
	1000	26.4	73.0	4.0	185	400	6.67	0.32
Mean		31.10	75.63	4.78	203	431	—	0.32
Phosphon D	250	28 5	72.0	4.2	191	417	11.41	0.30
	500	26.5	70.0	4.9	208	430	14.67	0.32
	1000	24 0	65.1	5.1	204	385	2.67	0.30
	2000	20 8	60.4	4.0	132	325	—13.31	0.29
Mean		24.95	66.88	4.55	184	389	—	0.303
Control		28 1	71.3	4.7	166	375	—	0.30
C. D. (5%)		4.37	8.99	0.53	25	30	—	0.03