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Influence of Two Systemic Granular Insecticides on Growth of Cotton

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ABSTRACT

Influence of two granular insecticides *viz.* disulfoton and aldicarb applied to soil on plant emergence and growth of cotton was studied. Germination was neither impaired nor delayed by both the insecticides at 1.5 and 2.5 kg a.i./ha. There was significant increase in plant height, laminar area and weight of the plants due to the application of these granular insecticides.

INTRODUCTION

Systemic granular insecticides as soil application are being used in recent years in the control of various crop pests. The effect of these compounds on plant emergence, growth and other fruiting behaviour of cotton has been investigated by several workers as reviewed by Pfrimmer (1966). Better plant growth in terms of height, dry matter, moisture content, leaf area, number of leaves and branches of cotton by application of systemic insecticides to soil and seed was observed by Sithanantham (1968). Since very little information is available in India on this, the present investigation was undertaken at Agricultural College and Research Institute, Coimbatore to find out the influence of two systemic granular insecticides *viz.* disulfoton 5% G (Di-syston) and aldicarb 10% G (Temik) applied to soil on plant emergence and growth of cotton.

MATERIALS AND METHODS

A field experiment was conducted in a randomized block design in a clayey loam soil. The insecticides disulfoton and aldicarb were tried at 1.75 and 2.75 kg a.i./ha at the time of sowing and as side dressing at late square formation stage. They were also tried as double (combined) application as basal and side dressings. Basally, the granules were applied on one side of the ridge 5 cm away from the seed in a furrow formed with an iron hook and covered with soil. Side dressing was done 70 days after sowing on one side of the ridge 15 cm away from the plant in a furrow of 8 cm depth. MCU 1 cotton variety was used in the study.

Germination was recorded every day after the third day of sowing upto

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14th day as per the procedures of the Association of Official Seed Analysts (Anon., 1960). The percentage germination and earliness indices were worked out as per the method adopted by Bartlett (1937).

The cotyledons of germinating plants were observed for possible phytotoxic symptoms. Observations on plant height, leaf area and fresh weight of the plants were made. The height of four fixed sampled plants at two periods *viz.* 60 and 95 days after sowing was observed. The laminar area of 2nd and 3rd leaf from the terminal region of a sampled plant was recorded with the help of planimeter at 22 and 105 days after sowing. At the same periods, fresh weight of two pulled out plants was also recorded.

RESULTS AND DISCUSSION

Studies made on the effect of systemic insecticides applied to soil basally on seedling emergence clearly indicated that germination was neither impaired nor delayed by the insecticides at both the concentrations tested (Table I). Similar results have also been obtained by Hopkins and Taft (1965) with aldicarb, Cowan *et al.* (1966) and Pfrimmer (1966) with disulfoton and aldicarb and Sithanantham (1968) with phorate and disulfoton on cotton. However, adverse effect on germination has been reported by Tsai and You (1961), Leigh (1963) and Davis *et al.* (1966) with phorate and aldicarb on cotton.

In the observation of phytotoxic injury, symptoms in the form of 'shot holes' and leaf margin necrosis on the cotyledons were noticed being more pronounced in disulfoton treated plants at both concentrations. However the plants recovered later and there was no subsequent retardation in growth due to this effect. Earlier, Leigh (1963) recorded such symptoms in cotton by the application of phorate and disyston granules at higher doses.

TABLE I. Effect of soil application of granular insecticides on germination of cotton

Dose in a. i. kg/ha	Disulfoton		Aldicarb	
	Germination %	Earliness index	Germination %	Earliness index
1.75	86.11 (68.13)	0.88	80.40 (63.72)	0.88
2.75	88.67 (70.33)	0.88	85.51 (67.63)	0.89
Untreated Check	86.47 (68.41)	0.89		
Not significant				

Figures in parentheses are Arc sine values

From the plant height measurements, it is evident that systemic granular insecticides in general had promoted the plant vigour (Table II). Aldicarb induced the growth markedly (54.87 cm) as compared to disulfoton (50.92 cm) and untreated check (39.23 cm). Application of insecticides basally and combination of basal and side dressing of insecticides enhanced the plant growth than side dressing alone. Similar increase in plant growth of cotton was observed from basal application of phorate and disyston by

TABLE II. Effect of soil application of granular insecticides on growth of cotton plants

Time of application	Plant Height (cm)				Mean
	Disulfoton		Aldicarb		
	60 days	95 days	60 days	95 days	
Basal	46.09	60.58	51.13	66.76	56.14**
Side dressing	39.78	53.92	36.62	54.64	46.24**
Basal+ side dressing	48.24	56.91	51.38	68.71	56.31**
Mean	50.92**		54.87**		
Untreated check	39.23				

** Significant at 1% level

Leigh (1963). Parencia *et el.* (1958), Arthur and Hyche (1959) and Sithanantham (1968) have also obtained supporting data to the better growth of the plants in association with insecticidal application.

El-Kadi *et al.* (1964 a) from the detailed laboratory studies, concluded that such an increased growth could only be due to the ability of these insecticides to produce better conditions favouring the growth of the young plants and in this case, the organophosphorus insecticides could be considered as a source of phosphorus in the root zone of growing plant.

The laminar area of individual leaf was found to be markedly increased by application of aldicarb (Table III). Increased leaf area in cotton by the basal application of phorate and disyston has also been observed by Leigh (1963) and Sithanantham (1968).

The fresh weight of the plants treated with basal and double application of insecticides was also observed to be influenced by the increase in plant height and laminar area (Table III). Similar results were also reported by El-Kadi *et al.* (1964 b) by seed treatment of cotton with disyston.

TABLE III. Effect of soil application of granular insecticides on the weight and leaf area of cotton plants

Time of application	Fresh weight g/plant				Mean	Leaf area sq. cm/2 leaves				Mean
	Disulfoton		Aldicarb			Disulfoton		Aldicarb		
	22 days	105 days	22 days	150 days		22 days	105 days	22 days	105 days	
Basal	3.896	297.552	4.275	402.895	177.154**	36.86	90.21	40.79	95.66	64.38**
Side dressing	3.406	165.486	2.751	167.770	84.853**	27.03	130.98	21.73	137.40	79.28**
Basal+Side dressing	4.254	331.805	5.275	328.253	167.396**	40.77	101.39	50.74	122.15	78.76**
Mean	134.400		151.869			71.20**		78.07**		
Untreated	49.248					61.76				

** Significant at 1% level

The plausible explanation elucidated by Leigh (1963) was that these changes suggest physiological responses substantiating the work of Hacskaylo and Ergle (1955) who found that cotton plants grown in nutrient solution containing schradan, contained increased chlorophyll and carotenoids in leaves and exhibited other physiological changes. Leigh (1963) also reported that the plant responses indicated above were not due to the control of insects alone since in some cases, interestingly contrasting bloom rate and maturity results were obtained even in the presence of insect infestation. Harding and Wolfenbarger (1963) also indicated that the insecticides themselves might be stimulating the growth of turnip and cabbage plants since the increase in weight was not entirely attributed to insect control.

In view of the results now obtained it may be concluded that application of systemic granular insecticides could have stimulated the plant growth of cotton without any detrimental effect.

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