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Effect of Spray Deposition on Bollworm (*Earias vittella* Stoll) Damage and Yield in Hybrid 6 Cotton

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ABSTRACT

Studies on the effect of spray deposition by different sprayers(Electrodyn, Kanpsack (Hydraulic, Mistblower and Heli) on bollworm damage and yield indicated a positive correlation between spray deposition and yield and it was negative with bollworm damage. The regression coefficient was also positive and significant, indicating that an increase of unit deposition in upper surface and lower surface of upper leaves and total deposition increases in yield by an amount of 22.92, 22.95 and 11.09 kgs/ha. respectively.

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INTRODUCTION

Cotton is one of the most important cash crops of Gujarat, which is subjected to attack by various insect pests through out the crop period. The farmers are using large quantities of new chemicals to overcome the pest menace and this is a major crop on which a large proportion of the insecticides produced in the world is used. Of the total quantity of different pesticides produced in India, about 40.5% is consumed by this crop alone which is valued at Rs. 139 crores (Banerjee, 1981). The effective application method play a key role in increasing the efficacy of the chemical. In the present application method, only less than 10% of sprayed fluid reaches the target pests (Pawar and Kadam 1986). The other 90% of the spray fluid will either fall on the ground or lost in the atmosphere and thus a wastage. Any effective system of spraying which can minimise the wastage would save our precious chemical, time and energy, and increase the bioefficacy of pesticides

Electrostatic spraying systems, which involves the deposition of electrically charged spray droplets on the surface of the pests and crop, which create an attraction between the spray particles and the surfaces, thereby, increasing the percentage of droplets that impinge on the plants, improving the coverage and spray deposition. Heli sprayer is control droplets sprayey (c.d.s.), consists of a spray head (including spinning disc) and a handle to hold it. The energy required for running the motor is produced from seperate power packer unit of 6 volt dry battery. In this sprayer the controlled droplet application is achieved due to centrifugal force generated by the spinning disc. The superiority of electrodyn sprayer over conventional sprayers(Knapsack Hydraulic, Mistblower and Heli) in cotton pest management is well known both abroad and in India. (Brasher *et al.*, 1971, Coffee, 1981, Herzog *et al.*, 1983, Manley, 1982, Pasupathy and Venugopal, 1986, Pawar and Kadam 1986 and Muralidharan, 1987). In the present study, an attempt was made to find out the impact of increased spray deposition on bollworm damage and yield of seed cotton.

MATERIALS AND METHODS

The experiment was conducted during 1983-86 at Anand campus of Gujarat Agricultural University (Variety : Hybrid 6-Cotton, Spacing : 1.2 m x 0.6 m; plot size : Gross : 18.0 m x 4.8 m = 86.4 m^2, Net : 15.6 x 2.4 m = 37.44 m^2). The electrodynamic formulations of cypermethrin (Cymbush 25 ED) was applied through Electrodyn sprayer, which was compared with EC formulation of cypermethrin (Cymbush 25 EC) applied through Knapasak (Hydraulic)(cypermethrin 100 ppm), Mistblower (cypermethrin 200 ppm) and Heli (cypermethrin 50 gm a.i./h) sprayers. The observations on *Earias* damage to buds, bolls and loculi were recorded from 10 tagged plants and yield of seed cotton was recorded from a net plot. The spray deposited by these sprayers on a unit area and spray drift to soil was also determined during 1986-87 using a fluorescent tracer. Uvitex-OB and methodology described by Arnold *et al.*, (1984). The spray deposited by these sprayers on upper and lower surfaces of upper leaves and total deposition was correlated with bollworm damage and yield and regression equations were also worked out.

RESULTS AND DISCUSSION

The percentage infestation to buds, bolls and loculi and yield of seed cotton in different treatments are shown in figure-1. (Pooled result for the years 1983-84, 1984-85 & 1985-86). Persual of the data shows that bollworm damage to buds, bolls and loculi was least in plots sprayed with ED sprayer, followed by Knapsack, Heli and Mistblower sprayed plots. The highest yield of seed cotton (1977 kgs/ha) was recorded in plots sprayed with ED sprayer, followed by plots sprayed with Knapsack (1739 kgs/ha.), Heli (1686 kgs/ha.) and Mistblower (1556 kgs/ha.). Spray deposited by different sprayers in unit area is depicted in fig. 2. It indicates that a significantly high deposition on upper and lower surfaces of upper leaves was recorded in ED sprayer(15.16 & 11.69 ng/cm^2) followed by Knapsack(1.64 and 0.66 ng/cm^2). Heli(1.43 and 0.40 ng/cm^2), and Mistblower (0.89 and 0.36 ng/cm^2). The highest total deposition was also observed in ED sprayer (31.51 ng/cm^2) followed by Mistblower (7.16 ng/cm^2), Knapsack (4.39 ng/cm^2). and Heli (4.08 ng/cm^2) sprayers. The maximum spray drift to soil was observed in Knapsack sprayer followed by Mistblower and Heli. It was least in case of ED sprayer. The spray deposited by different sprayers on upper and lower surfaces of upper leaves and total deposition was correlated with bollworm damage and yield and the regression equation determined are given in Table 1. From the table it can be seen that the spray deposition is significantly and positively correlated with yield which means that an increase in spray deposition has significantly contributed in increasing the yield. The association between the deposition with percentage buds, bolls and loculi damage had shown a negative correlation indicating a decrease in percentage infestation by *E. vittella* to flowerbuds, bolls and loculi due to increase in spray deposition.

The regression coefficient of the linear regression equation is positive and significant (Table-1). It indicates that an increase of unit deposition in upper and lower surfaces of upper leaves and total deposition increased the yield by an amount of 22.92, 27.95 and 11.09 kgs/ha. respectively.

The increased deposition by ED sprayer was reported earlier by Law and Mills (1980), Arnold and Pye (1981) and Mortan (1982) which confirm the present observation. As there is a high degree of positive correlation between spray deposition and yield and also between spray deposition and bollworm damage, it can be concluded that any spraying system which results in more spray deposition on plant can effectively control the bollworm with a resulting increase in seed cotton yield. From the study, it has been observed that ED sprayer deposited more toxicant and recorded

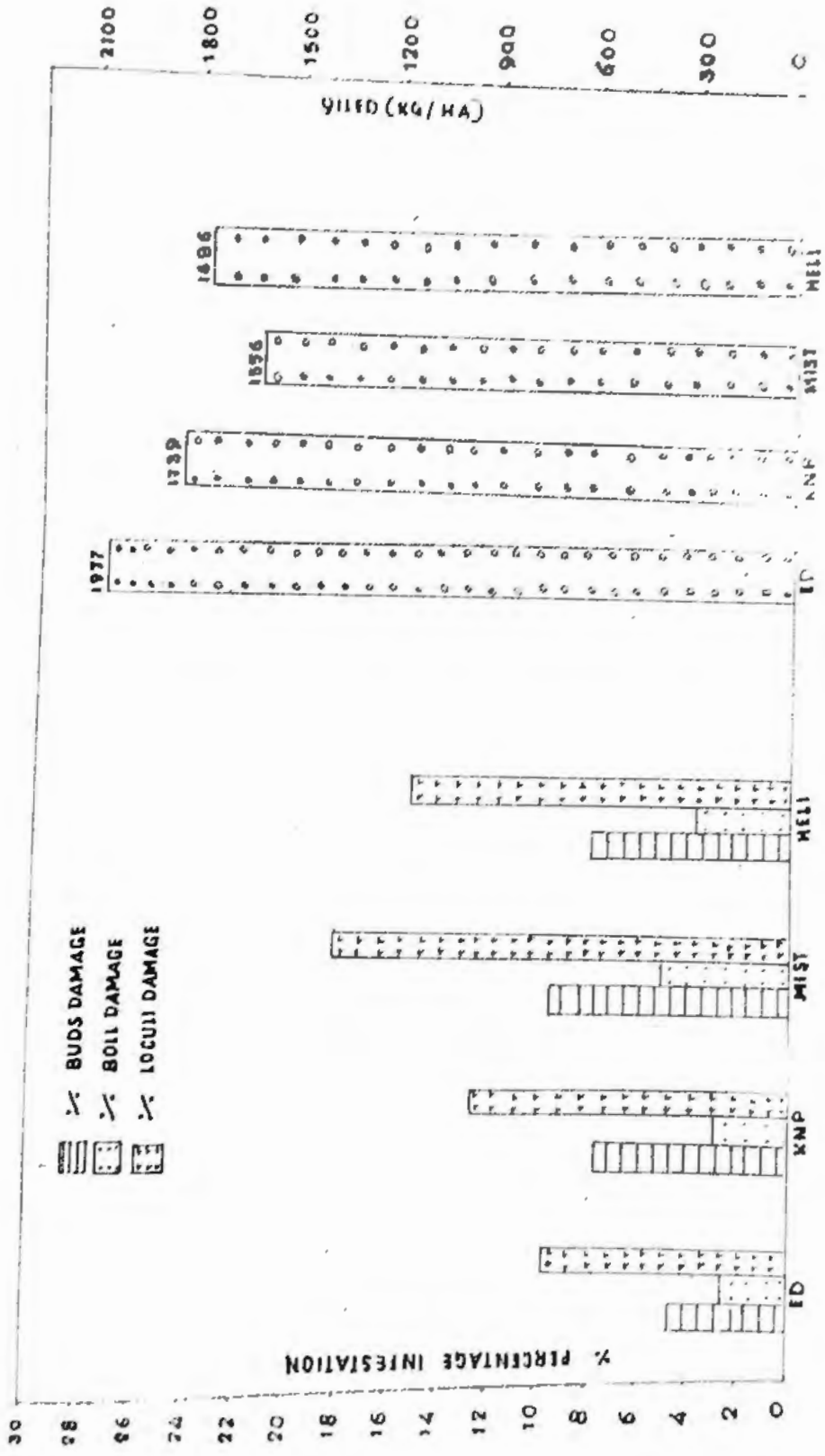

Fig. 1 : Per cent damage due to Earias and yield of seed cotton/HA (Pooled for the years 1983-84, 1984-85 and 1985-86)

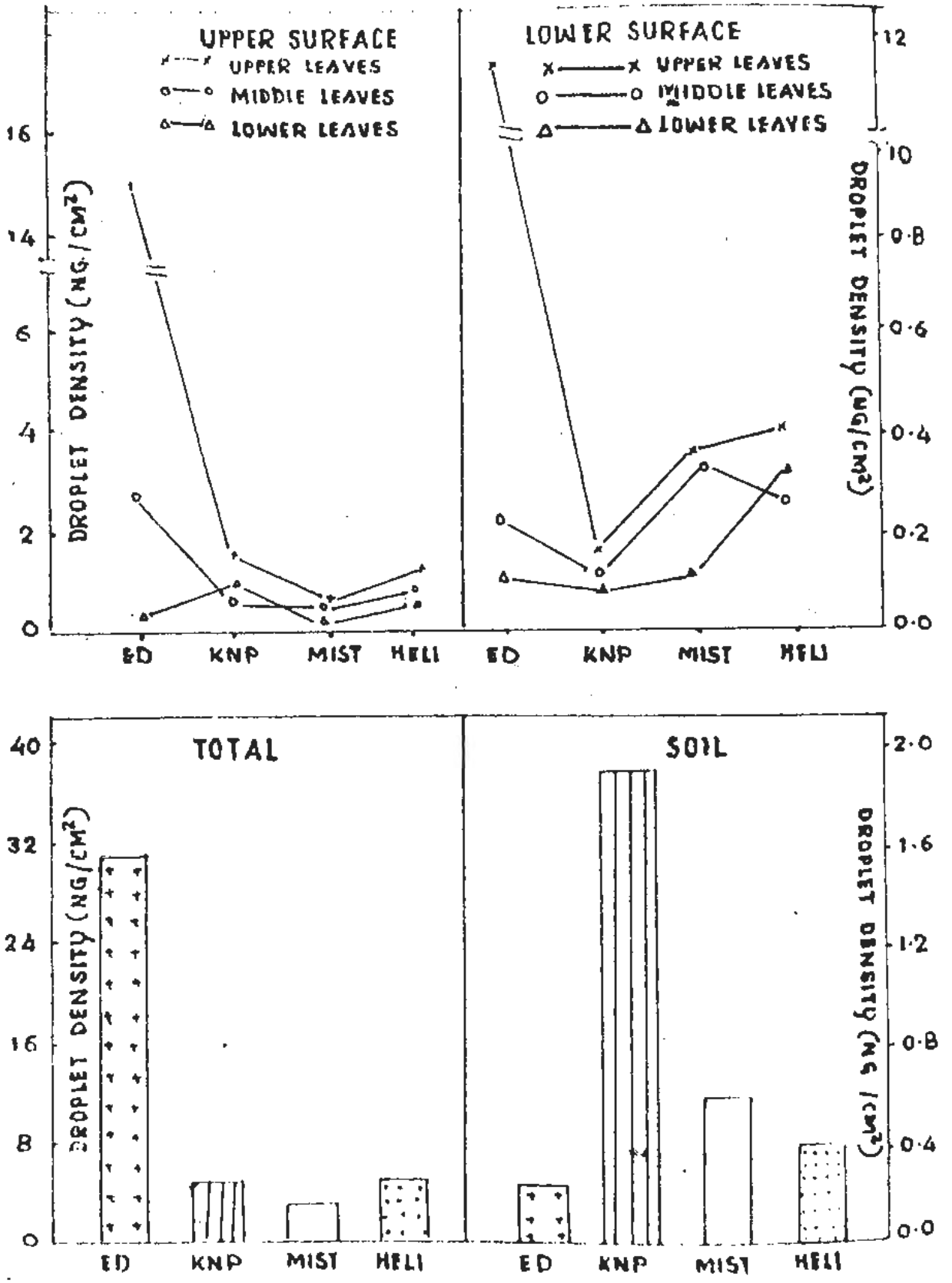

Fig. 2 : Droplet deposition (NG/CM^2) by different sprayers at various levels of cotton

TABLE 1

Correlation and regression equations between spray deposition and yield and bollworms damage.

(A) Correlation equation

Spray deposition	*Yield*	*BOLL WORMS DAMAGE*		
		% Bud damage	*% Boll damage*	*% Locuti damage*
Upper leaves :				
(a) Upper surface	0.7517**	-0.4648	-0.2573	-0.2202
(b) Lower surface	0.7227**	-0.04591	-0.02514	-0.0215
(c) Total	0.6762*	-0.4319	-0.2208	-0.1908

(B) Regression euqation

Dependent	Variable	Linear regression equation.		R^2
Yield	Y	1631.85 + 22.92**	X_1	53.54
	Y	1649.80 + 27.95 **	X_2	52.20
	Y	1610.64 + 11.09*	X_3	45.72

** Significant at 1% level.

* Significant at 5% level.

X_1 Deposition on upper surface of upper leaves.

X_2 Deposition on lower surface of upper leaves.

X_3 Total deposition.

less boloworm damage and higher yield compared to conventional sprayers which also confirms the importance of spraying system to increase the bio-efficacy of the chemical.

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