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Dusting vs Spraying of Insecticide for Control of Pod Borer, *Helicoverpa armigera* in Chickpea

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In chickpea, farmers apply insecticide mainly in the form of dust and they often report that dusting is better than spraying for the control of *Helicoverpa armigera* in chickpea.

During the 1990/91 postrainy season, a trial was conducted at ICRISAT Center to test the available dust (1.5%) and two spray formulations, the emulsifiable concentrate (EC 20) and the acquaflow (AF 20), of quinalphos for the control of pod borer in chickpea. Three adjacent plots of chickpea (ICCV 2), each measuring 0.03 ha were marked and treated twice with one specific formulation. The first application was made when the chickpea had fully flowered and the second when pods were formed. A mist blower was used for both dusting and spraying. For dusting, the mist blower was used with a deflector (Pawar 1990) to direct the dust well into the crop. Pod borer larvae were counted before treatment and 24, 48, and 72 h after each treatment in all the three plots. The average per cent reduction in larval populations following two applications is given in Table 1.

Table 1. Larval populations of *Helicoverpa armigera* recorded on chickpea before treatment and 24, 48, and 72 h after application of quinalphos in different formulations, ICRISAT Center, India, postrainy season 1990/91.

Formulation and dosage of quinalphos[2]	*H. armigera*[1] plant^{-1}			
	Before application	24 h later	48 h later	72 h later
		Small larvae (<20 mm)		
Dust 1.5%	8.4	4.2 (50)[3]	1.8 (79)	0.2 (98)
EC 20	8.0	5.6 (30)	4.0 (50)	1.8 (77)
AF 20	8.9	5.2 (42)	3.4 (62)	1.4 (84)
SE	±0.26	±0.42	±0.66	±0.05
		Big larvae (>20 mm)		
Dust 1.5%	1.5	1.0 (33)	0.8 (47)	0.8 (47)
EC 20	1.4	1.0 (28)	0.7 (50)	0.5 (64)
AF 20	1.4	0.9 (36)	0.7 (50)	0.5 (64)
SE	±0.02	±0.02	±0.02	±0.05

1. Average of the two applications.
2. Dust (1.5%) applied at 25 kg ha^{-1}; emulsifiable concentrate 20 and acquaflow 20 at 2 L ha^{-1}.
3. Figures in parentheses are percentage reduction of larval population after applications.

Following the insecticide application, the activity of small larvae (<20 mm) showed a greater decrease in the dusted plot and the activity of bigger larvae (>20 mm) showed a greater decrease in the sprayed plots. It was observed that the dust stuck well onto the plants because of the exudate which chickpea produces. Among the sprayed plots, the plot sprayed with AF formulation had better protection than the one sprayed with EC formulation. Further, it was observed that the AF formulation, a powder soluble in water, was more convenient for preparing a spray solution than the EC. The manufacturer claims that the AF is safer for the operator than the EC.

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Performance of Chickpea Crosses in F_2 and F_3 Generations Against *Helicoverpa armigera* (Hübner)

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Three chickpea lines, GL 645 (kabuli), Desi 3108, and LCG 3580 (desi) were identified as tolerant to the pod borer, *Helicoverpa armigera* (Hübner) among 540 chickpea germplasm and breeding materials that were screened in the fields (Chhabra et al. 1990). These materials were used in the breeding program as 'donors' to evolve high-yielding pest-resistant varieties. Nine crosses, in the combinations given below were made and 108 progenies were advanced to the F_2 generation.

Desi 3108 × GL 645
Desi 3108 × LCG 3580
PBG 1 × LCG 3580
LCG 3580 × GL 645
PBG 1 × GL 645
PBG 1 × Desi 3108
GL 769 × GL 645
GL 769 × LCG 3580
GL 769 × Desi 3108

During the 1990/91 postrainy season, 108 progenies in the F_2 generation along with the parents (18) and F_1s (9 populations) were sown in a randomized-block design (RBD) in two replication plots, each measuring 2.0 × 0.45 m^2, to test them for *H. armigera* incidence. The material was surrounded by the 'infestor' (highly susceptible material to pod borer) rows so as to put more pest pressure on the test progenies. To record pod damage, 2 plants of each progeny, parent and F_1, were tagged at random in each replication. Pod damage due to pod borer was recorded by collecting all the pods of the tagged plants at the time of harvest. The data were pooled and statistically analyzed (Table 1).

Twenty promising progenies selected out of the 108 progenies of the F_2 generation were screened for pod borer resistance during the 1991/92 postrainy season. The materials were sown along with the parents in single rows of 3 m in RBD with four replications.

To assess the damage due to pod borer, all the pods of the 2 tagged plants were removed at the time of harvest and examined. The data were pooled and the percentage of pods damaged was calculated. The data were statistically analyzed (Table 1).

In the F_2 generation, pod damage varied from 14% to 24% as against 13% to 23% in the parents and 43% in the susceptible line. The pod damage in crosses and parents

Table 1. Performance of chickpea crosses in F_2 and F_3 progenies against *Helicoverpa armigera* at Ludhiana, postrainy seasons 1990/91 and 1991/92.

Cross/parent	Pod damage by borer (%) 1990/91	Pod damage by borer (%) 1991/92
Desi 3108 × GL 645	24 (29)[1]	16 (23)
Desi 3108 × LCG 3580	20 (27)	5 (12)
PBG 1 × LCG 3580	14 (22)	6 (14)
LCG 3580 × GL 645	19 (26)	12 (20)
PBG 1 × GL 645	24 (29)	7 (15)
PBG 1 × Desi 3108	16 (23)	18 (25)
GL 769 × GL 645	23 (29)	10 (19)
GL 769 × LCG 3580	23 (29)	18 (25)
GL 769 × Desi 3108	20 (26)	5 (13)
GL 769	23 (29)	23 (28)
GL 645	13 (21)	20 (27)
LCG 3580	14 (22)	16 (23)
Desi 3108	16 (24)	21 (27)
PBG 1	20 (27)	17 (23)
Infestor (susceptible) line	43 (41)	44 (42)
CD at 5%	10.3	5.3
CV (%)	21.3	16.7

1. Figures in parentheses are square root transformations.