

SEQUENTIAL SPRAY SCHEDULES OF INSECTICIDES TO CONTROL BOLLWORMS AS TARGET PESTS IN ADDITION TO CERTAIN SAP SUCKERS AS NON-TARGET PESTS IN COTTON FIELDS

M.A. NASSEF AND W.M. WATSON

Plant protection Research Institute, Agricultural Research Centre, Dokki, Giza.

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Abstract

The effectiveness of seven sequential spray schedules of insecticides on the percentage reduction of bollworms population in cotton fields and their additional effect on the population of four sap sucking pests was studied in 1995 and 1996 seasons. Results indicated the superior activity of two schedules including 3 sprays against the target pests: (Catabron followed by Kindo/Polo or Cymbush/Aplaud then Larvin) and (Empire or Merlin followed by Larvin then Kindo or Cymbush).

INTRODUCTION

The pink bollworm, *Pectinophora gossypiella* (Saund.) and the spiny bollworm, *Earias insulana* (Boisd.) are major pests attacking cotton in Egypt. Unfortunately, at the time of excessive bollworms infestation by the end of the season, cotton plants are liable to the attack of certain sucking pests, e.g. cotton aphids (*Aphis gossypii*), jassid (*Empoasca lybica*), whitefly (*Bemisia tabaci*) and the common red spider mite (*Tetranychus spp.*).

The combined effect of insecticide treatments against cotton bollworm and sucking insects was studied by several investigators, Khalil et al. (1978-1979), Burris et al. (1985), Awad et al. (1993), Khalafalla and Abo-Sholooa (1993), Abo-Sholooa et al. (1995) and Khidr et al. (1996).

The present study aimed to clarify the efficiency of seven sequential spray schedules of insecticide treatments against bollworms and sucking insect pests attacking cotton plants.

MATERIALS AND METHODS

Experiments were conducted during the cotton growing seasons of 1995 and 1996 at Sidey-Salem region, Kafr El-Sheikh Governorate (Egypt). Giza 75 cotton variety was cultivated on April 4-6 in 1995 and March 25-28 in 1996. Normal agricultural practices were followed. Seven sequential spray schedules of insecticidal treatments were tested. The experimental field was divided into 8 strips of 5 feddans each. One strip was devoted for each schedule and the 8th one was left untreated as a control. The insecticides used and their rates of application per feddan were as follows:

- * Synthetic Pyrethroids: cypermethrin (Cymbush) 10% EC, 600 ml; cypermethrin (S1R-cis-and R1S-cis-isomers) (Fastac) 10% EC, 100 ml; lambdacyhalothrin (Kindo) 5% EC, 375 ml. and esfenvalerate (Sumialpha) 5% EC, 600 ml.
- * Organophosphates: chlorpyrifos (Dursban) 48% EC, 1 L.
- * Carbamates: thiodicarb (Larvin) 80% DF, 500 g.
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- * Chitin Synthesis Inhibitors (CSIs): diafenthiuron (Polo) 50% SC, 300 ml. and buprofezin (Applaud) 25% WP, 800g.
- * Mixtures: Catabron [profenofos (Curacron) 47.34% + chlorfluazuron (IKI-7899) 2.6%] EC, 750 ml; Dennate [methomyl (Lannate) 27% + diflubenzuron (Dimilin) 4%] FL, 1L; Empire [Dursban 48% + Dimilin 4%] FL, 1L and Merlin [Dursban 48% + Dowco 439,3%] EC, 1L.

Each sequential schedule included three sprays using Beem spray ground motor at 600 liters water solution/feddan. The three sprays were conducted on July 13, July 27 and August 10 in 1995 and August 6, August 20 and September 3 in 1996. Tested sequential schedules were as follows:

1st spray	2nd spray	3rd spray
1 Catabron	Synthetic Pyrethroids/CSIs	Carbamates
2 Dennate	Organophosphates	Synthetic Pyrethroids
3 Empire or Merlin	Carbamates	Synthetic Pyrethroids
4 Empire or Merlin	Synthetic Pyrethroids	Organophosphates
5 Organophosphates	Synthetic Pyrethroids	Catabron
6 Carbamates	Catabron	Synthetic Pyrethroids/CSIs
7 Organophosphates	Carbamates	Synthetic Pyrethroids

Weekly samples of 500 green bolls were collected at random across the diagonals of each experimental strip. Sampling started on July 12 and continued till August 23 in 1995 and from August 5 till September 16 in 1996. Bolls were examined internally and counts of both pink and spiny bollworms larvae were made. The percent reduction in larval population was then worked out using Henderson and Tilton equation (1955).

To determine the efficiency of tested sequential spray programmes on nontarget sucking insect pests, random samples were collected from the diagonals of the inner area of each experimental strip. Considered sap suckers were the cotton aphids *A.gossypii*, jassid (*E.lybica*), whitefly (*B.tabaci*) and common red spider mite (*Tetranychus* spp.). Every sample consisted of 1000 leaves representing the different levels of the plant (2, 1 and 2 leaves/plant from the upper, middle and lower levels, respectively). The upper and lower leaf surfaces were examined carefully and counts of aphids, jassids and the whitefly adults were made. As for the common red spider mite and whitefly immatures, counts were made in the laboratory under the binocular microscope. Leaf sampling and insect counting were made just before each spray, then 2, 5, 7 and 14 days after it. Percent reduction in population was estimated according to Henderson and Tilton equation (1955).

RESULTS AND DISCUSSION

The effect of seven sequential spray schedules of insecticides on the percentage reduction of bollworms population in cotton field during 1995 and 1996 seasons is shown in Table 1. The additional effect of sprayed chemicals on the existing sap sucking pests in treated fields is further shown in Table 2.

Data indicate that in 1995, all tested spray schedules caused more than 64% reduction in bollworm population, compared to 79% in 1996. The superior performance of the four sequential schedules that started with insecticide-IGR mixtures in the first spray is evident as they caused 74.84-82.19 and 81.51-85.92% reduction in 1995 and 1996, respectively. The least effectiveness was achieved by the 6th or 7th schedules (carbamates - Catabron - synthetic pyrethroids / CSI) and (Organophosphates - carbamates - synthetic pyrethroids) as they caused respective reductions of 68.44 and 64.44% in 1995 and 79.82 and 79.89% in 1996. The 5th schedule (Organophosphates-synthetic pyrethroids-Catabron) expressed moderate reductions of 73.37 and 80.45% in 1995 and 1996, respectively.

Table 1. Effect of sequential insecticide schedules on the percentage reduction of bollworms population in 1995 and 1996.

1st* spray	Sequential		Larvae/100 bolls*		% reduction
	2nd* spray	3rd* spray	Pre-treatment population	Post-treatment population	
1995					
1. Catabron	Kindo/Polo	Larvin	4.2	2.67	79.66
2. Dennate	Dursban	Fastac	3.6	2.83	74.84
3. Empire	Larvin	Kindo	3	1.67	82.19
4. Merlin	Fastac	Dursban	2.8	2.17	75.20
5. Dursban	Fastac	Catabron	2.8	2.33	73.37
6. Larvin	Catabron	Kido/Polo	2.2	2.17	68.44
7. Dursban	Larvin	Cymbush	1.8	2.00	64.44
8. Control	Control	Control	4	12.50	-
1996					
1. Catabron	Cymbush/Applaud	Larvin	5.8	3.50	85.92
2. Dennate	Dursban	Sumialpha	5.2	3.67	83.53
3. merlin	Larvin	Cymbush	6.2	4.33	83.70
4. Empire	Sumialpha	Dursban	4	3.17	81.51
5. Dursban	Cymbush	Catabron	4.4	3.67	80.54
6. Larvin	Catabron	Cymbush/Applaud	5.4	4.67	79.82
7. Dursban	Larvin	Sumialpha	6	5.17	79.89
8. Control	Control	Control	4.2	18.00	-

Data in Table 2 indicate that the highest initial and residual effect on whitefly adult population resulted from the 1st, 3rd and 6th spray schedules in 1995 (54.31, 53.19 and 57.15% reduction, respectively). A similar trend of efficacy was observed for whitefly immature stages (41.60, 41.64 and 42.83% reduction, respectively).

As for aphids, the trend of efficacy was nearly similar to that observed for whitefly. Insecticides caused 78.88, 78.01 and 73.25% population reduction for the 1st, 3rd and 6th schedules, respectively.

It is worth mentioning that the 1st and 2nd sprays of all tested schedules reduced the population density of jassids and spider mites to minimum. The highest combined effects were recorded for the 1st, 3rd and 7th schedules, with corresponding respective population reductions of 90.71, 91.08 and 90.04% for jassids and 79.71, 68.89 and 79.35% for mite.

Table 2 further shows the effect of sequential use of insecticides on the percentage reduction in sucking insect pests populations during 1996 season. Data reflect a nearly similar trend to that of 1995. The 1st, 3rd and 6th schedules caused the highest initial and residual reduction of the sucking pests population (53.17, 58.08 and 55.92% reduction for whitefly adult population, 46.78, 44.42 and 44.57% for immature stages, 71.37, 76.41 and 72.15% for aphids, 89.32, 93.14 and 85.74% for jassids and 79.62, 77.01 and 78.05% for spider mite).

Results generally support the effectiveness of certain tested bollworms insecticides against the sucking pests. Such findings are in agreement with those obtained by Khalil *et al.* (1978-1979), Awad *et al.* (1993), and Khalafalla and Abo-Sholoua (1993).

In conclusion, the 1st sequential schedule (Catabron-synthetic pyrethroids/CSIs - carbamates) and the 3rd one (Empire or Merlin-carbamates-synthetic pyrethroids) may be recommended for application against bollworms in cotton fields since they seem to cause the highest population reduction of both bollworms and sucking pests.

Table 2. Effect of sequential use of insecticides on the percentage reduction in sucking pests populations during 1995 and 1996 seasons.

1st* spray	Sequential			Mean percentage reduction														
	2nd* spray	3rd* spray	B. tabaci (adult)			B. tabaci (immature)			A. gossypii			E. lybica			Tetranychus spp.			
			I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
1995																		
1. Catabron	Kindo/Polo	Larvin	53.95	54.66	54.31	34.03	49.16	41.60	73.31	84.44	78.88	84.00	97.42	90.71	72.62	86.80	79.71	
2. Dennate	Dursban	Fastac	38.31	44.37	41.64	37.29	31.71	34.50	68.76	77.18	72.97	63.99	91.57	77.78	55.26	76.82	66.04	
3. Empire	Larvin	Kindo	51.60	54.78	53.19	41.58	41.69	41.64	74.82	81.20	78.01	83.74	98.42	91.08	56.99	80.78	68.89	
4. Merlin	Fastac	Dursban	46.75	50.77	48.76	26.49	25.54	26.02	69.92	76.14	73.03	76.31	95.91	86.11	59.18	77.05	68.12	
5. Dursban	Fastac	Catabron	40.14	49.71	44.93	25.14	29.80	27.47	65.87	76.35	71.11	81.53	96.46	89.00	58.07	74.37	66.22	
6. Larvin	Catabron	Kindo/Polo	55.15	59.15	57.15	35.10	50.55	42.83	72.00	74.50	73.25	56.75	92.35	74.55	61.62	75.02	68.32	
7. Dursban	Larvin	Cymbush	46.53	53.10	49.82	38.00	41.60	39.80	67.63	65.48	66.56	82.39	97.68	90.04	71.65	87.04	79.55	
1996																		
1. Catabron	Cymbush/applaud	Larvin	49.26	57.07	53.17	42.33	51.22	46.78	69.65	73.08	71.37	85.91	92.73	89.32	74.41	84.83	79.62	
2. Dennate	Dursban	Sumialpha	40.88	49.62	45.25	31.09	31.93	31.51	65.64	72.65	69.15	72.03	90.15	81.09	56.69	85.60	71.15	
3. Merlin	Larvin	Cymbush	55.03	61.13	58.08	41.71	47.12	44.42	75.69	77.13	76.41	88.87	97.40	93.14	68.59	85.43	77.01	
4. Empire	Sumialpha	Dursban	45.12	45.16	45.14	25.50	26.43	25.97	59.80	75.44	67.62	63.01	89.12	76.07	65.51	73.72	69.62	
5. Dursban	Cymbush	Catabron	46.60	45.77	46.19	34.20	33.04	33.62	55.98	63.92	59.95	72.61	79.83	76.22	58.73	70.05	64.39	
6. Larvin	Catabron	Cymbush/applaud	50.75	61.08	55.92	36.79	46.35	41.57	73.23	71.06	72.15	79.07	92.41	85.74	72.96	83.14	78.05	
7. Dursban	Larvin	Sumialpha	42.21	43.31	42.76	36.96	37.82	37.39	58.76	63.71	61.24	70.06	90.05	80.06	67.78	82.43	75.11	

I = Initial effect

II = Residual effect

III = Combined effect

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**فعالية بعض البرامج المتتابعة لرش المبيدات لمكافحة ديدان
اللوذ كآفات مستهدفة وبعض الآفات الثاقبة الماصة
غير المستهدفة فى حقول القطن**

محمد عبد الفتاح ناصف ، وطسن متى وطسن

معهد بحوث وقاية النباتات - مركز البحوث الزراعية، الدقى ، الجيزه.

أجريت دراسة حقلية خلال موسمى القطن عامى ١٩٩٥، ١٩٩٦ لتقييم كفاءة سبعة برامج متتابعة لرش المبيدات فى خفض تعداد ديدان اللوذ كآفات مستهدفة إضافة إلى بعض الآفات الثاقبة الماصة غير المستهدفة. أوضحت النتائج تميز برنامجين ينصح بالتوصية بأحدهما لما لهما من تأثير كبير فى خفض تعداد ديدان اللوذ وتعداد بعض الآفات الثاقبة الماصة المصاحبة (الذبابة البيضاء ، المن، نطاطات الاوراق والعنكبوت الاحمر). ويتضمن كل برنامج من هذين البرنامجين ٣ رشاشات على النحو التالى:

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