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RESEARCH NOTE

SPIDERS, PREDACIOUS INSECTS AND MITES ON SOUTH AFRICAN COTTON

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ABSTRACT

Key words: Alphamethrin, cotton, endosulfan, predacious insects, spiders

In a study of alphamethrin and endosulfan sprays on red spider mite predators on cotton, an average of 75,1 % of all predacious arthropods collected in alphamethrin-treated plots, 76,5 % in endosulfan-treated plots and 73,6 % in untreated control plots, were spiders.

Uittreksel

SPINNEKOPPE, PREDATORIESE INSEKTE EN MYTE IN SUID-AFRIKAANSE KATOEN

In 'n ondersoek na alfametrien en endosulfan bespuitings op rooispinmytpredatore in katoen, was 75,1 % van die predatoriese arthropode versamel in alfametrien-behandelde persele, 76,5 % in endosulfan-behandelde persele en 73,6 % in onbehandelde persele, spinnekoppe.

During 1987/88 a study was undertaken at the Hartebeespoort Experimental Farm in the south-eastern Transvaal to determine the effects of two commonly used pesticides on spider mite predators, especially spiders (Van den Berg, 1989), on cotton. Although spiders are predacious and feed almost exclusively on insects and mites, past investigations of the predator complex on cotton in South Africa have concentrated on the predacious insect and mite component, while spiders were largely ignored.

Acala 1517/70, the cultivar which constitutes 60 % of all cotton planted in South Africa, was used in this study. The block of cotton, approximately 1,2 ha in extent was divided into 30 plots of 22 × 15,5 m and the trial laid out in a randomized block design with three treatments, each replicated 10 times.

The two pesticides used were alphamethrin, a non-systemic synthetic pyrethroid and endosulfan, an organochlorine insecticide with translaminar activity. According to Botha *et al.* (1988) alphamethrin is known to be 'hard' on natural enemies and stimulate spider mite populations, while endosulfan has a suppressive effect on spider mites and is 'soft' on predators. Both pesticides were applied on 29 January, 19 February, 26 February, 11 March and 25 March 1988.

Spiders, predacious insects and mites were collected using the whole plant bag sampling method which gives an absolute estimate of population density (Fleischer *et al.*, 1985) and is one of the most accurate sampling methods available. Ninety plants were sampled weekly at random for sixteen weeks and all predacious arthropods collected. The spiders collected were represented by 18 families (Van den Berg, Dippenaar-Schoeman & Schoonbee, 1990), predacious insects by seven families and predacious mites by one family.

Evidence as to the role of spiders in the biocontrol of spider mites include studies by Parent (1973), Coates (1974) and Dippenaar-Schoeman (1976) which showed that spiders were important in reducing spider mite populations in apple orchards and strawberry fields. The most important proof of their role in mite control on crops is that of Dippenaar-Schoeman (1976), where fewer mites were found in the presence of spiders in strawberry beds and a 50 % reduction in yield occurred when spiders were removed from a system infested with tetranychid mites.

In the untreated plots, 73,6 % (1021) of all predacious arthropods collected were spiders, compared to 367 predacious insects and mites (Table 1). Throughout the season there were consistently more spiders than predacious insects, the percentage of spiders in the total predator complex ranging between 63,7 % and 90,4 %.

The lowest numbers of spiders and predacious insects were collected in the alphamethrin-treated plots (Table 1), but even here 75,1 % of all predators collected were spiders. Throughout the season 59,7 % to 100 % of the predacious arthropods collected per week, were spiders.

In endosulfan-treated plots, the total number of predators collected (934) was slightly higher than in alphamethrin-treated plots (868) and the percentage of spiders present (76,5 %) was also higher. Throughout the season 54,2 % to 100 % of all predacious arthropods collected per week in endosulfan-treated plots, were spiders (Table 1).

In the alphamethrin-treated plots, the ratio of spiders to insects increased to 86 % in the treatment period and 72,7 % in the post-treatment period from 65,4 % in the pre-treatment period. Comparable values in endosulfan-treated plots were 80,4 % in the treatment period, 81,9 % post-treatment and 69,7 % pre-treatment. In the untreated control plots the difference was much less marked with an increase to 74 % in the treatment period and 77,9 % in the post-treatment period from 69,4 % in the pre-treatment period. This may indicate that spiders were not as susceptible to alphamethrin and endosulfan as were other predacious insects. Studies by Laster & Brazzel (1968), Dinkins *et al.*, (1971) and Roach & Hopkins (1981) also show that spiders are less susceptible to insecticides than other predators. The behaviour and niches occupied by different spider families, play an important role in determining the effect of pesticides on them (Van den Berg *et al.*, 1990).

Studies in other countries indicate that spiders are the dominant component of the predator complex on cotton. In Oklahoma, spiders were the most abundant predator, averaging 68,1 % of all the pre-

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TABLE 1 A comparison of the numbers of spiders, predacious insects and predacious mites collected per week on cotton at the Hartebeespoort Experimental Farm in the untreated control, alphamethrin-treated and endosulfan-treated plots from 7 January to 21 April 1988

	Pre-treatment period				Treatment period								Post-treatment period				
Group	7/1	13/1	20/1	27/1	3/2	10/2	17/2	24/2	2/3	9/3	16/3	23/3	30/3	7/4	13/4	21/4	Total
								Untreated Control									
Spiders	72	72	55	77	56	45	62	68	47	78	65	81	66	48	60	69	1 021
Insects	31	41	26	24	23	22	31	32	26	23	10	8	7	21	26	15	366
Mites	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
								Alphamethrin									
Spiders	70	71	61	61	36	34	49	51	32	44	53	26	16	16	17	15	652
Insects	42	48	27	22	5	18	9	2	4	10	4	1	0	1	7	16	216
Mites	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
								Endosulfan									
Spiders	48	82	68	53	45	39	33	40	39	36	46	37	45	37	32	35	715
Insects	32	20	35	22	5	33	10	11	5	5	2	6	0	10	5	11	212
Mites	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	2	7

dators collected on unsprayed cotton (Johnson *et al.*, 1976). In Arizona, Plagens (1983) found that spiders comprised between 40,9 and 78,7 % of the general predators collected weekly in a cotton field, with an average of 57,6 % for the season. In south-east Queensland, Bishop (1980) found that spiders formed a significant part of the total predatory fauna on cotton.

Botha (1986) recorded only five spiders in his studies of spider mite predators on cotton in the Transvaal, but some sampling techniques fail to detect spiders (Byerly *et al.*, 1978). Therefore, the method used for sampling predacious arthropods on cotton, and especially spiders, is of major importance.

Although alphamethrin and endosulfan treatments did not have a marked effect on the ratio of spiders to predacious insects and mites in the present study, a 78,1 % decrease between pre- and post-treatment means was observed in the alphamethrin-treated plots, compared to a 49,4 % decrease in endosulfan-treated plots. The varying effects of alphamethrin and endosulfan on spider numbers is discussed by Van den Berg *et al.* (1990).

This is the first study of the predacious fauna on cotton in South Africa, which is not limited to the predacious insect component. Spiders were easily the numerically dominant group, representing 74,2 % of all predators collected. This is an important factor which should be taken into account when further studies of the predacious fauna in cotton fields are conducted.

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