

EFFICIENCY OF SOME COMPOUNDS AND SOME WEATHER FACTORS ON SOME PIERCING SUCKING INSECTS AND THEIR ASSOCIATED NATURAL PREDATORS IN COTTON FIELDS.

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ABSTRACT

Field experiments were conducted at two successive growing seasons (2003 and 2004) at Sakha Agricultural Station, to evaluate the initial and residual effect of Marshal and Sulphur against cotton aphid, *Aphis gossypii*, (Glov.) Jassid, *Empoasca lypica* (de Berg.) and whitefly, *Bemisia tabaci* (Genn.) and their associated natural enemies, beside the effect of weather factors (mean temperature and relative humidity). Summarized results indicated that, Marshal induced the highest initial and residual reduction giving 100 and 97.3 % in the first season and 88.8 and 78.7 % reduction respectively, in the second season against aphid, while in the two seasons Sulphur gave high initial reduction, where it exhibited 88.2 and 69.2 % respectively, and induced a moderate residual effect, where it exhibited 50.0 and 21.7 % reduction respectively.

Also, Marshal and Sulphur against Jassid induced high initial effect, where they caused 72.1 % and 76.7 % reduction respectively, and a moderate residual effects giving 50.7 and 48.2 % reduction respectively, during 2004 season, but their effect during 2003 season were less than 2004 season.

Also, the effect of both pesticides on whitefly (mature and immature stages) were moderate to weak effect.

As for their side effect on the associated natural predators, Marshal induced moderate effect while Sulphur exhibited a slight effect against (true spider, *Chrysopa* spp., *Peaderus affierii*, *Orius* spp. and *Scymnus* spp.)

Regarding the effect of temperature and relative humidity on the population density of pests, temperature effected on the population of aphid, whitefly (mature and immature stages) and their predators negatively and insignificant while had negative and significant on Jassid during the two seasons. On the other hand, relative humidity effected positively significant on aphid and whitefly, and positively and insignificant on Jassid during 2003 season, meanwhile it exhibited negatively insignificant effect on all insects and their predators during 2004 season.

INTRODUCTION

Cotton (*Gossypium barbadense* L.) is one of the major sources of foreign currency to the Egyptian national income. It is liable to be attacked by several piercing-sucking pests resulting in severe damage throughout all stages of its growth. The piercing-sucking insect especially cotton Aphid, *Aphis gossypii*, (Glov.), Jassid, *Empoasca lypica* (de Berg) and whitefly, *Bemisia tabaci* (Genn.) feed on the suck sap of plant tissues and may transmit of different diseases. Heavy infestation with these insects causes extensive reduction in cotton yield and quality (Guirguis *et al.*, 1975), Butler *et al.*, 1986, Andrews and Kitten (1989) and Harris *et al.*, (1992) and increasing production costs (Hardee and O'Brien, 1990).

The control of such insects in cotton plant is mainly rely on the use of chemical pesticides (Zein *et al.*, 1987; Khalafalla and Abo-Sholooa, 1994; Omar *et al.*, 1996; Abdel-Rahman *et al.*, 1998; Hamid and Korkor 1998; Abo-Sholooa, 2000; Hannau *et al.*, 2002 and Sharaf *et al.*, 2003. The present research was conducted to evaluate the effect of Marshal and Sulphur against these piercing sucking insects, such as cotton aphid, whitefly, Jassid and their associated predatory insects which play an important role in the biological control and determine the effect of temperature and relative humidity on the population density of the same pests in 2003 and 2004 cotton seasons in Kafr El-Sheikh Governorate.

MATERIALS AND METHODS

Experiments were conducted during 2003 and 2004 cotton growing seasons at Sakha Agricultural Research Station Farm, Kafr El-Sheikh Governorate to determine the efficiency of Marshal and Sulphur against piercing-sucking pests, such as cotton aphid, *A. gossypii*, Jassid, *E. lybica* and whitefly, *B. tabaci* (mature and immature stages) and their associated natural enemies, *Chrysopa* spp., *Orius* spp., *Scymnus* spp., *Paederus alfierii* and true spiders (adults).

The field was cultivated with Giza 89 cotton variety. Cotton seeds were sown in April 5th on both seasons, treatments were distributed in a complete randomized block design with four replicates, each of one kerate area (175 m²) and four kerates were used as untreated check.

The chemicals (tested compounds) were sprayed on 9th July, 2003 and 16th July, 2004 seasons. Samples of 25 cotton leaves per replicates were randomly collected from bottom, middle and the top of cotton plants (2 + 1 + 2 leaves per plant, respectively). The upper and lower leaf surfaces were inspected immediately in the field and the number of aphids, jassids and whitefly adults were recorded. The same samples were taken the laboratory to count the number of immature stages of whitefly using binocular microscope. Leaf sampling and insect counting were made just before spray then after 2, 5, 8, 11 and 14 days of spraying.

Associated predators also were count on 100 cotton plants, percent reduction of population estimated by using Henderson and Tiltion equation (1955) to determine the initial effect (after 2 days of spraying and the residual effect (after the next dates) of the tested compounds.

Daily mean temperature and daily mean relative humidity were recorded during the two seasons of the study.

To estimate the relationship between the number of piercing-sucking insects, number of predators and mean temperature and relative humidity, the simple correlation coefficient according to Snedecor (1962) was used.

The tested materials and their rate of application were as follows:

Marshal (Carbosulfan): 25 % W.P. at rate 300 gm/fed

Sulphur: 98 % Sulphur dust at rate 10 kgs/fed.

RESULTS AND DISCUSSION

Data presented in Tables (1 – 4) summarized the toxic effect of the two compounds (Marshal and Sulphur) against aphids, jassid and whitefly infestation and their associated predators in 2003 and 2004 cotton seasons.

Effect of the tested compounds against piercing-sucking insects:

1- Aphids, *A. gossypii*

In case of aphid, the obtained results revealed that, Marshal was effective during the two seasons where induced highly initial kill and residual effect where it caused 100 and 88.8 % initial reduction and 97.3 and 78.7 % residual effect respectively. Also, Sulphur gave highly initial effect during the two seasons where it caused 88.2 and 69.2 % reduction respectively, but proved to have moderate residual effect where induced 50.0 and 21.7 % reduction respectively. These results agree with the finding of Mourad 1992 who reported that, Marshal, Nuvacron, Kerate and Dimethoate were effective against aphid, Zein *et al.*, 1987 found that, aphid was sensitive to Fenitrothion, Dicofol, Primiphos and Primicarb, Khalafalla and Abo-Sholoo, 1994 reported that, Curacron and Larvin were effective against cotton aphid, also Sharaf and El-Basyouni, 2002 found that Curacron and Larvin had high initial effect on aphid, but their residual effect was declined rapidly, while Jojoba, natriilo and sulphur proved to have a moderate initial and residual effects.

2. Jassid, *E. lybica*:

With regard to jassid, data obtained in Table (2) cleared that, Marshal induced a moderate initial effect it caused 47.2 % reduction during 2003 season, while it gave high initial kill 72.1 % reduction during 2004 season but it gave a slight residual effect during the two seasons, it exhibited 29.7 and 50.7 % reduction respectively. As for sulphur the same trend results was obtained where exhibited 56.2 % and 76.7 % initial reduction during 2003 and 2004 seasons respectively, and 24.1 % and 48.2 % residual effect respectively. These results are in harmony with Abdel-Rahman *et al.*, 1998 who reported that, Selecron, Lannate and Decis showed a strong pronounced effects on jassid, also Khalafalla and Abo-Sholoo, 1994 found that, Curacron and Larvin were effective against jassid.

3. Whitefly, *B. tabaci*:

Concerning of whitefly, data obtained in Table (3) revealed that, Marshal induced moderate initial effect it exhibited 79.2 and 54.8 % reduction on mature stage and 70.7 and 36.0 % reduction on immature stage during 2003 and 2004 seasons respectively, while it gave a slight residual effect during the two seasons, it exhibited 59.4 and 26.8 % reduction against mature stage and 52.8 and 22.7 % reduction on immature stage respectively, during the two seasons.

Table (1): Effect of Marshal and Sulphur against aphid, *A. gossypii* on cotton plants during 2003 and 2004 seasons.

Treatments	Rate/fed.	season	Reduction %					Residual effect	General mean
			IK	5 days	8 days	11 days	14 days		
Marshal Sulphur untreated	300 g/fed	2003	100	100	98.5	96.9	93.0	97.3	97.9
	10 kg/fed		88.2	85.4	71.7	42.0	0.0	50.0	57.6
	--		-	-	-	-	-	-	-
Marshal Sulphur untreated	300 g/fed	2004	88.8	86.0	80.3	83.2	65.2	78.7	80.1
	10 kg/fed		69.2	67.2	19.7	0.0	0.0	21.7	31.2
	--		-	-	-	-	-	-	-

Table (2): Effect of Marshal and Sulphur against Jassid, *E. lybica* on cotton plants during 2003 and 2004 seasons.

Treatments	Rate/fed.	season	Before spray	Mean No./100 leaves					Reduction %					Residual effect	General mean
				2 days	5 days	8 days	11 days	14 days	IK	5 days	8 days	11 days	14 days		
Marshal Sulphur untreated	300 g/fed	2003	116	29	27	20	34	38	47.2	45.8	47.8	21.7	3.4	29.7	33.2
	10 kg/fed		106	22	27	25	31	34	56.2	40.6	28.5	21.9	5.4	24.1	30.5
	--		112	53	48	37	42	38	-	-	-	-	-	-	-
Marshal Sulphur untreated	300 g/fed	2004	188	40	38	47	41	66	72.1	74.9	64.8	63.1	0.0	50.7	55.0
	10 kg/fed		174	31	37	45	46	63	76.7	73.7	63.6	55.3	0.0	48.2	53.9
	--		194	118	157	138	110	37	-	-	-	-	-	-	-

Table (3): Effect of Marshal and Sulphur against whitefly, *B. tabaci* (adults and immature stages) on cotton plants during 2003 and 2004 seasons.

Treatments	Rate/fed.	season	Before spray	Mean No./100 leaves					Reduction %					Residual effect	General mean
				2 days	5 days	8 days	11 days	14 days	IK	5 days	8 days	11 days	14 days		
Adults															
Marshal	300 g/fed	2003	614	135	179	193	167	151	79.2	68.8	62.6	56.2	49.8	59.4	63.3
Sulphur	10 kg/fed		505	329	341	376	349	222	39.4	27.8	11.4	0.0	10.3	12.4	17.8
untreated	--		479	511	449	402	297	235	-	-	-	-	-	-	-
Marshal	300 g/fed	2004	958	387	771	1210	1793	1460	54.8	40.4	24.5	17.7	23.8	26.8	32.2
Sulphur	10 kg/fed		908	387	791	1150	1293	1166	52.8	35.3	25.0	37.1	35.5	33.2	37.1
untreated	--		814	727	1100	1361	1832	1615	-	-	-	-	-	-	-
Immature stages															
Marshal	300 g/fed	2003	649	229	251	263	219	195	70.7	65.9	54.6	48.7	45.8	53.8	57.1
Sulphur	10 kg/fed		588	417	388	397	383	360	41.3	41.9	24.4	0.8	0.0	16.8	21.7
untreated	--		559	675	635	499	367	310	-	-	-	-	-	-	-
Marshal	300 g/fed	2004	1719	1223	1109	238	210	290	36.0	41.9	12.1	16.6	20.2	22.7	25.4
Sulphur	10 kg/fed		1950	1105	1160	281	295	322	49.0	46.5	8.0	0.0	21.8	19.2	25.2
untreated	--		2177	2418	2418	343	319	460	-	-	-	-	-	-	-

Table (4): Side effect of Marshal and Sulphur on natural enemies* on cotton plants during 2003 and 2004 seasons.

Treatments	Rate/fed.	season	Before spray	Mean No./100 leaves					Reduction %					Residual effect	General mean
				2 days	5 days	8 days	11 days	14 days	IK	5 days	8 days	11 days	14 days		
Marshal	300 g/fed	2003	64	26	21	24	25	43	45.1	49.0	41.8	26.9	19.6	34.3	36.5
Sulphur	10 kg/fed		66	57	53	50	43	56	0.0	0.0	0.0	0.0	0.0	0.0	0.0
untreated	--		73	54	47	47	39	61	-	-	-	-	-	-	-
Marshal	300 g/fed	2004	130	69	56	45	35	25	48.4	41.6	40.6	26.6	19.0	32.0	35.3
Sulphur	10 kg/fed		134	99	96	81	59	30	28.2	7.8	0.0	0.0	5.7	3.4	8.3
untreated	--		139	143	108	81	51	33	-	-	-	-	-	-	-

* where natural enemies: *Chrysopa* sp., *Paederus affierii*, *Orius* spp., *Scymnus* spp. and true spider.

On the other hand Sulphur gave moderate to weak initial effect it exhibited 39.4 % and 55.8 reduction against mature stage and 41.3 % and 49.0 % reduction against immature stage respectively, during the two seasons, but it induced a weak residual effect against the two stages it gave 12.4 % and 33.2 % for the mature stage and induced 16.8 % and 19.2 % in the immature stage respectively in the two seasons. Many authors studied the effect of some insecticides against whitefly, Omar *et al.*, 1996 found that, Pymetrozine was effective on whitefly, Hamid and Korkor 1998 reported that, Hopa-oil, M-ped, Natrilo, Naturalis and Biofly were effective against immature stages of whitefly, the same results was found by El-Khawalka *et al.*, 1996 who reported that, Natural oil gave excellent control on various stages of whitefly infesting on tomato, Badawy *et al.*, 1999 reported that Bemistop at 500 ml/100 liter water and imidacloprids were effective against whitefly, Hannou *et al.*, 2002 found that Pyriproxyfen (IGR) was the highest efficacy against immature stages of whitefly followed by Capl 2 while Spinosad gave the lowest percentage of reduction, also Sharaf *et al.*, 2003 showed that Confidor and Best induced the highest initial reduction against immature stage of whitefly while Buprofezin and Confidor induced the highest residual activity on immature stages. Confidor and Best induced the highest initial and residual activity against mature stage of whitefly.

Side effect of the tested compounds against natural enemies predators:

Data presented in Table (4) elucidate the side effect of Marshal and Sulphur on natural enemies when sprayed on cotton plants for controlling some sucking insects. Data indicated that, the population density of true spider was higher than the other studied natural enemies (*Chrysoa* spp., *Paederus alfieri*, *Orius* spp. and *Scymnu* spp.) Marshal induced a moderate effect against natural enemies, meanwhile Sulphur gave a slight effect. These results are agreed with the finding of Abdel-Rahman *et al.* 1998 who reported that Selecron, Lannate and Decis showed a strong pronounced effect on natural enemies for aphid and whitefly. On the other hand Sharaf *et al.*, 2003 reported that, Imdacloprid, Confidor, Buprofozin, Thiamethoxam, Diafenthiuron and Triazophos had no clear effect on (true spider, *Coccinella undecimpunctata*, *Chrysoperla carnea* and *Paederus alfieri*)

Effect of temperature and relative humidity on the population fluctuation of aphid, jassid and whitefly:

Table (5) showed, the effect of the daily mean temperature and relative humidity on aphid, jassid, whitefly and their predators.

The effect of temperature on aphid, jassid and whitefly mature stage was positive and insignificantly, while it was negative and insignificantly on whitefly immature stage and predators during the two seasons in plot treated with Marshal and Sulphur, while its effect on all pests and predators were negative and insignificantly during the same seasons in plot untreated, while the effect of relative humidity on aphid and jassid was negative and insignificantly during 2003 season, but was positive and insignificantly during 2004 season, while it was positive and insignificantly on whitefly and predators during the first season but was negative and insignificantly during

the second season on treated plots, also relative humidity affected positively and insignificantly on all pests and predators during the first season but it was negatively and insignificant during 2004 season in untreated plots.

Such findings seem to agree with the results of Bleih, 1981 who found that, the correlation between temperature and cotton aphids was negative while it was positive for relative humidity, Nassef *et al.*, 1996 who found that, temperature induced highly significant and negatively on whitefly in 1990 and 1991 seasons, while positive and insignificant with relative humidity.

Table (5): Simple correlation (r) for the relationship between pest population, predators and daily means of temperature and relative humidity during 2003 and 2004 seasons under chemical control.

Treatments	<i>A. gossypii</i>		<i>E. lybica</i>		<i>B. tabaci</i> (Adult)		<i>B. tabaci</i> (Immature)		Predators	
	Temp.	R. H.	Temp.	R. H.	Temp.	R. H.	Temp.	R. H.	Temp.	R. H.
Season 2003										
Marshal	0.795	-0.826	0.118	-0.790	0.545	0.175	-0.113	0.772	-0.186	0.589
Sulpher	0.660	-0.841	0.640	-0.883*	0.036	0.497	-0.598	0.745	-0.760	0.461
Untreated	-0.859	0.893*	-0.883*	0.528	-0.773	0.920*	-0.829	0.920*	-0.411	0.044
Season 2004										
Marshal	0.418	0.184	0.290	0.158	0.692	0.773	-0.715	-0.611	-0.788	-0.825
Sulpher	0.662	0.610	0.568	0.523	0.855	0.840	-0.633	-0.505	-0.426	-0.408
Untreated	-0.533	-0.527	-0.252	-0.286	-0.711	0.807	-0.662	-0.545	-0.682	-0.715

On the basis of results obtained, it could be concluded that, Marshal (aphicide) and Sulpher induced a high effect on aphid and jassid, while they gave moderate to weak effect on whitefly and natural enemies.

So, Sulpher can be induced with other compounds in a field of pest management in which the dependency on the conventional insecticides.

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فعالية بعض المركبات وتأثير بعض العوامل الجوية على بعض الحشرات الثاقبة الماصة والأعداء الحيوية المصاحبة لها في حقول القطن
جيهان بدوي النجار ، روض أحمد الدكش و صفوت عبد السلام عارف
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة

تم إجراء هذا البحث بمحطة البحوث الزراعية بسخا عامى ٢٠٠٣ ، ٢٠٠٤ لدراسة التأثير الفورى والأثر الباقي لمركب المارشال والكبريت على الحشرات الثاقبة الماصة (المنّ الجاسيد والذبابة البيضاء الأطوار الكاملة والغير كاملة) والأعداء الحيوية المصاحبة لهما في حقول القطن وكذلك تأثير الحرارة والرطوبة على تعدادهما.

أوضحت النتائج أن مركب المارشال أحدث أعلى نسبة خفض في كل من الإبادة الفورية والأثر الباقي على المنّ، حيث كان الانخفاض (١٠٠ % ، ٩٧,٣ % ، ٨٨,٨ % ، ٧٨,٧ % انخفاض على التوالي خلال موسمى ٢٠٠٣ ، ٢٠٠٤ أما مركب الكبريت فقد أحدث تأثير فورى عالى حيث كان الانخفاض ٨٨,٢ % ، ٦٩,٢ % على التوالي بينما كان تأثيره المتبقى على المنّ متوسط حيث أحدث خفض ٥٠ % ، ٢١,٧ % على التوالي خلال نفس الموسمين. أيضا كان لمركبى المارشال والكبريت تأثير فورى عالى على الجاسيد حيث أحدثوا انخفاض ٧٢,١ % ، ٧٦,٧ % على التوالي بينما كان الأثر المتبقى لهم متوسط حيث أعطوا انخفاض ٥٠,٧ % ، ٤٨,٢ % على التوالي خلال موسم ٢٠٠٤ وانخفض تأثيرهم المتبقى على الجاسيد خلال موسم ٢٠٠٣ .

أما تأثير نفس المركبين على الذبابة البيضاء (الأطوار الكاملة والغير كاملة) فلم يعطوا تأثير يذكر عليها خلال الموسمين. بالنسبة للتأثير الجانبى للمركبين على الأعداء الحيوية المصاحبة للأفات فإن المارشال أعطى تأثير متوسط بينما كان تأثير الكبريت ضعيف على كل من العنكبوت الحقيقى (المفترس) - أسد المنّ والرواغة وبقة الأوريس الأسكيمينس.

بالنسبة لتأثير الحرارة على المنّ - الذبابة البيضاء والأعداء الحيوية فكان تأثيرا سالباً غير معنوى بينما كان تأثيرا سالباً ومعنوياً على الجاسيد خلال الموسمين ٢٠٠٣ ، ٢٠٠٤ على جانب آخر فإن تأثير الرطوبة كان موجبا ومعنوياً على المنّ والذبابة البيضاء وكان موجبا وغير معنوى على الجاسيد خلال موسم ٢٠٠٣ بينما أظهرت الرطوبة تأثيرا سالباً وغير معنوياً على كل الأفات وأعدادها الحيوية خلال موسم ٢٠٠٤.