J. Agric. Sci. Mansoura Univ., 28 (2): 1301 - 1310, 2003

EFFECT OF USING AGRYL, SILVER MULCH, NON INSECTICIDES AND INSECTICIDES AS A METHODS OF EXCLUDING WHITEFLY AND SILVER LEAF DISORDER AFFECTING FALL GROWN SQUASH *(Cucurbia pepo*, L.)

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ABSTRACT

The study was carried out during the two successive fall seasons, 1999 and 2000 at Nubaria. A squash hybrid Ambassador was cultivated under the drip irrigation system. Nine treatments were used as follows: Agryl 17, Silver mulch, Azadrachtin, mineral oil, Admire, Silver mulch + Azadrachtin, Silver mulch + mineral oil , Silver mulch + Admire and control (without treatments). The aim of the study is to investigate a reliable strategy using non insecticidal treatments for reducing the incidence of Silver leaf disorder that affect yield and quality. The obtained results could be summarized as follows:-

1. Protected treatments affected the incidence of whitefly infestation, but decreased significantly the occurrence of whitefly than that of control. Agryl provided complete prevention of whitefly during the two seasons. Silver mulch treatment showed a high mean counted numbers of whitefly after 33 days from planting. Spraying treatment of both Azodrachtin and mineral oil were significantly reduced the incidence of whitefly than the treatments Silver mulch and control. Combined treatments of each Silver mulch with Admire and Azadrachtin and mineral oil were insignificantly the efficient ones that greatly reduced the number of whitefly.
2. No symptoms of squash silver leaf had been detected on plants covered with Agryl. The percentage of infection reached 100% on the control plants after 45 days. The combined treatments of Silver mulch + Admire reduced the percentage of infection followed by Silver mulch + Azadrachtin, respectively.
3. As for total yield, Agryl 17 gave the highest significant total yield followed by the combined treatments of Silver mulch + Azadrachtin and Silver mulch + Admire, respectively. The control treatment showed significantly the lowest total yield.
4. A positive correlation between the number of whitefly and percentage of infection with correlation coefficient 0.827. On the other hand, a negative correlation was observed between total yield and number of whitefly with correlation coefficient -0.720.

INTRODUCTION

Squash silver leaf (SSL) disorder becoming a big problem for fall season production. Symptoms first appear as a lightening of the veins of new foliar growth. On subsequent new growth, this paleness intensifies and veins appear silver, particularly along the midrib and laterals. Finally, the interveinal area and the entire upper leaf surface become silver, while the lower surface remains normal (Simon *et al.*, 1988). Fruit color can be lighter than usual and color breaks occur in dark fruited varieties.

Substantial economic losses have been attributed to SSL due to poor fruit quality and yield reduction (Barger *et al* , 1988).

Obsorn *et al.* (1988) suggested that the damage might be due to toxicogenic factor produced by whitefly. Yokomi *et al.* (1990) mentioned that a preliminary evidence that SSL symptom induction was caused by direct feeding of the sweet potato whitefly, and they suggested that an insect toxin may be involved. Yokomi *et al.* (1990) stated data virtually eliminate the possibility that whitefly transmitted plant pathogenic agent is involved in SSL etiology.

Chuster *et al.* (1991) showed that symptoms appeared on uninfected that developed after plants were infested with SPWF and when the infested lower leaves were removed and the young leaves protected from infestation with insecticides, new growth was asymptomatic or nearly so and symptomatic leaves remained symptomatic.

Cohen (1992) showed that SSL was induced by nymphal feeding activity, however, the physiological condition of the host was influenced by light intensity quality and duration are important factors in SSL expression.

Whitefly control with insecticides is so difficult due to the frequent occurrence of development of pesticide resistance in whitefly population. The talk of other reliable means for reducing vector populations has compound the problem, barriers such as raw covers, and repellent mulches, which affect photo tactic responses of whiteflies, had shown some promise in delaying or reducing disease incidence (Faust and Coppedge, 1992).

Reflective mulches had been used successfully to reduce the incidence of Aphid borne virus disease in squash and other crops (Brown *et al.*, 1993).

The mulches reflect short waves light, which confuses incoming able aphids and reduces the incidence of their a lighting on plant (Summers *et al.*, 1995). The newer reflective metallic mulches had been show to elicit various levels of deterrency of aphid (Chalfant *et al.*, 1977 and Webb and Linda, 1992).

Botanical extract from neem seeds, Azadrachtins, disrupt changes in insect larvae causing death during molting (McLaughlin, 1922).

Floating row covers is the generic name given to a group of materials that are made of synthetic fabrics with various sizes that transmit variable amounts of light (at least 75% light transmission for all materials). The materials normally are placed over the beds after seeding and before germination, allowing the plant to grow under the cover (Perring *et al.*, 1986). They also stated that recently, floating cover, have been used to protect cucurbits from insect vectored viruses particularly their aphid and whitefly vectors.

Oils considered to be physical poisons that interfere with respiration in Arthropods, although some plant oils may contain toxicants soap and detergents either synthetic or naturally derived are active against all life stages, except eggs. The detergent and oil act as pesticides (McLaughlin, 1992).

The present study was carried out to investigate a reliable strategy using non insecticidal treatment for reducing whitefly population in squash field to reduce the incidence of silver leaf disorder that is greatly affect yield and quality of fall squash production.

MATERIALS AND METHODS

The present study was conducted at Nubaria, 60 km southwest of Alexandria under drip irrigation system throughout two successive fall seasons of 1999 and 2000. Ambassador F_1 hybrid squash (Dark green fruited hybrid) seeds were planted in the field at the first of August in both seasons, in rows 1.8 m width and 0.4 m distance between plants. Each experimental unit was 3 rows of 10 m long with four replicates (Data recorded on the middle row).

Nine treatments were conducted as follows:-

1. Agryl (a light weight 17g/m^2) spun bonded polyethylene floating row cover used over wire loops over beds directly after planting.
2. Silver mulch (colorup-specially AG Reedlay CA 936540).
3. Admire (Insecticide) was sprayed as follows: 125 cm/100 letters.
4. Neem seed extract (Azadrachtin) sprayed every 3 days, 300 cm/feddan.
5. Mineral oil (Super Masrona 4) 0.5% + detergent (10 ml/L) applied every 3 days.
6. Treatments two and three combined (SM + Ad).
7. Treatments two and four combined (SM + Az).
8. Treatments two and five combined (SM + MO).
9. Control (untreated).

All normal agricultural practices, spraying and fertigation were carried out as usual.

Estimation of whitefly populations was done by counting adult numbers every week sampling ten leaves from each experimental unit from the middle row (40 leaves / treatment), early in the morning. Plants showed symptoms were identified visually every week after 20 days from planting.

Total yield data were obtained by weighting all fruits picked during the inter season from each experimental unit, and expressed as kg/plot.

The angular transformation percentage of infested plants was done. The Randomized Complete Block Design was used and analysis of variance was carried out according to Duncan (1985) and Snedecor and Cochran (1967).

RESULTS AND DISCUSSION

The included results in Tables 1 and 2 and Fig. 1 show that the measured densities of whitefly population in untreated plots of control treatment increased rapidly and reached higher mean number of 8.5 and 150 adults per ten leaves on September the 29th in the subsequent years 1999 and 2000, respectively, all the performed protective treatments,, more or less affected the incidence of whitefly infestation, but significantly decreased the occurrence of whitefly than that of the untreated control. In this concern, the use of Agryl provided complete prevention of adults incidence on the plants during both the planting seasons. Silver mulch treatment showed a high overall mean numbers of counted adults comprised 36.8 and 20.3 adults per ten leaves in 1999 and 2000, respectively, despite it gave effective repellency

in a period 33 days after planting. This results is in agreement with the findings of Faust and Coppedge (1992), who stated that the use of reflective mulch delayed the build up of sweet potato whitefly and infection of sweet potato whitefly transmitted tomato mottle gremini virus in tomatoes.

Table 1: Mean number of whitefly adult on squash plants treated with nine protective treatments in the fall season 1999.

Treatments	Whitefly adult number / ten squash leaves						
	24th Aug.	1st Sept.	8th Sept.	15th Sept	22th Sept	29th Sept.	Mean
Agryl 17	0 b	0 d	0 e	0 f	0 f	0 g	0 f
Silver mulch	0 b	2.6 c	6.5 bc	23.4 b	43.5 b	45.9 b	20.3 b
Azadrachtin	0 b	5.2 b	3.9 c	10.8cd	9.5 d	26.4 d	9.3 d
Mineral oil + Ditr.	1.3 b	5.0 b	1.3 e	14.0 c	33.1 c	33.5 c	14.4 c
Admire	0 b	1.3 cd	8.5 b	7.1 d	10.1 d	11.1 e	6.4 de
Silver mulch + Azadrachtin	0 b	0 d	2.5 d	2.0 ef	4.4 e	5.2 f	2.4 ef
Silver mulch + mineral oil	0 b	0 d	4.3 cd	5.2 de	8.4 d	12.9 e	5.1 e
Silver mulch + Admire	0 b	1.3 cd	2.0 d	3.9 def	4.5 e	3.9 fg	2.6 ef
Control	15.6 a	36.1 a	21.8 a	46.1 a	93.3 a	104.6a	52.9 a

Values with the alphabetical letter in common do not differ significantly in the same column using Duncans Multiple Range Test.

Table 2: Mean number of whitefly adult on squash plants treated with nine protective treatments in the fall season 2000.

Treatments	Whitefly adult number / ten squash leaves						
	24th Aug.	1st Sept.	8th Sept.	15th Sept	22th Sept	29th Sept.	Mean
Agryl 17	0 c	0 f	0 f	0 e	0 f	0 e	0 f
Silver mulch	0 c	5.8 d	13.0 c	50.4 b	78.4 b	72.1 b	36.8 b
Azadrachtin	3.2 b	10.1 c	25.7 b	24.5 e	62.4 c	60.1 c	31.0 cd
Mineral oil + Ditr.	3.6 b	6.9 d	29.0 b	43.9 c	57.2 c	52.4 e	32.2 c
Admire	1.3 bc	16.2 b	13.6 c	33.1 d	45.5 d	53.9 e	27.3 d
Silver mulch + Azadrachtin	0 c	2.6 ef	7.1 d	6.5 g	6.5 e	14.9 f	6.3 e
Silver mulch + mineral oil	0 c	5.2 de	7.8 d	10.8 f	11.0 e	13.0 f	7.9 e
Silver mulch + Admire	0 c	3.0 ef	4.3 e	12.1 f	8.5 e	16.2 f	7.3 e
Control	15.5 a	40.9 a	78.0 a	107.2a	136.5a	195.0a	95.5 a

Values with the alphabetical letter in common do not differ significantly in the same column using Duncans Multiple Range Test.

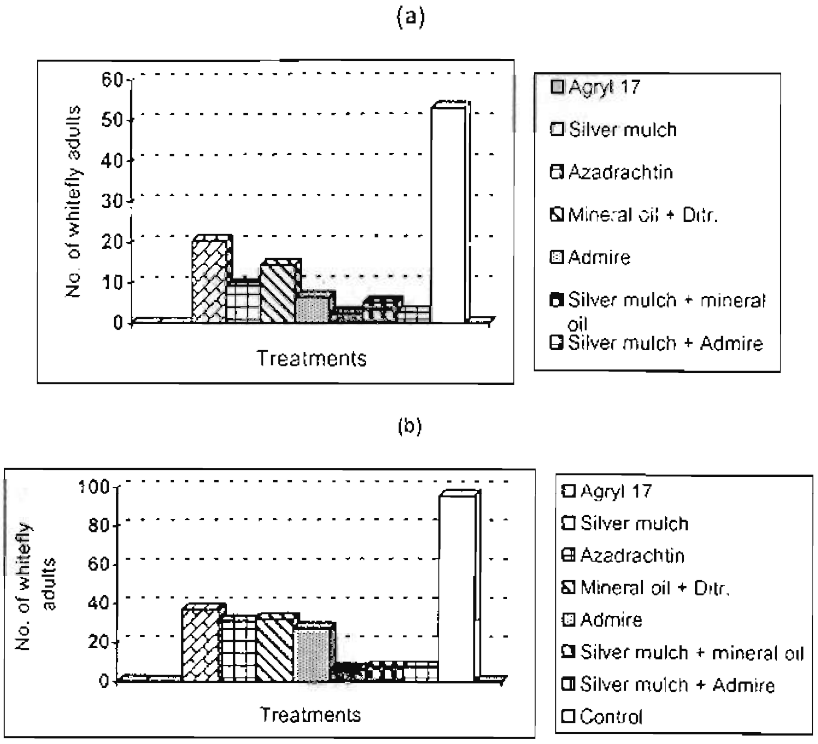


Fig. 1: Number of whitefly adults on squash plants treated with nine protective treatments in two seasons 1999 (a) and 2000 (b).

Spraying treatments of both tested insecticides Azadrachtin and mineral oil plus detergent, to more or less extent, were efficient and significantly reduced the incidence of whitefly adults on the treated plants than the treatments of Silver mulch or/and untreated control. Hegab *et al.* (1992) came also to the same results, they showed that spray treatments provided good control for whitefly adults.

Combined treatments of each of sprayed insecticide, Admire, Azadrachtin and mineral oil plus Silver mulch were insignificantly the efficient ones that greatly reduced the overall means of counted adults on squash plants nextly to Agryl 17 treatment, which prevent the incidence of whitefly infestation (Tables 1 and 2).

Also, the exhibited data in Tables (3 and 4) and Fig. (2) elucidate percentages of symptom plants with Silver leaf show the same trend of above cited results of whitefly occurrence on squash plants. No symptoms of squash silver leaf had been detected on plants covered with Agryl 17. The percentage of infection reached 100% on the plants of untreated control after forty five days from plants.

Table 3: Percent of plants showing silver leaf symptoms and total yield for nine protective treatments in the fall season 1999.

Treatments	Percentage of plants showing silver leaf symptoms							Total yield Kg/plant
	24th Aug.	1st Sept.	8th Sept.	15th Sept	22th Sept	29th Sept.	Mean	
Agryl 17	0 b	0 c	0 e	0 g	0 e	0 e	0	10.23a
Silver mulch	0 b	0 c	2.5 cd	9.7 bc	23.2 b	46.3 b	13.6	5.32 e
Azadrachtin	0 b	0 c	3.8 bc	9.0 cd	15.2 c	24.5 d	8.8	7.80 c
Mineral oil + Ditr.	0 b	2.0 b	5.2 b	12.7 b	21.5 b	37.5 c	13.3	6.47 d
Admire	0 b	0 c	0 e	6.0 de	12.2 c	15.2 e	5.6	8.56 b
Silver mulch + Azadrachtin	0 b	0 c	1.5 de	1.5 fg	3.5 d	7.5 f	2.3	9.05 b
Silver mulch + mineral oil	0 b	0 c	0 e	4.5 ef	14.5 c	15.0 e	5.7	8.64 b
Silver mulch + Admire	0 b	0 c	0 e	1.0 g	3.5 d	6.0 f	1.8	9.25 b
Control	10 a	33.0 a	85.0 a	100 a	100 a	100 a	71.3	4.36 f

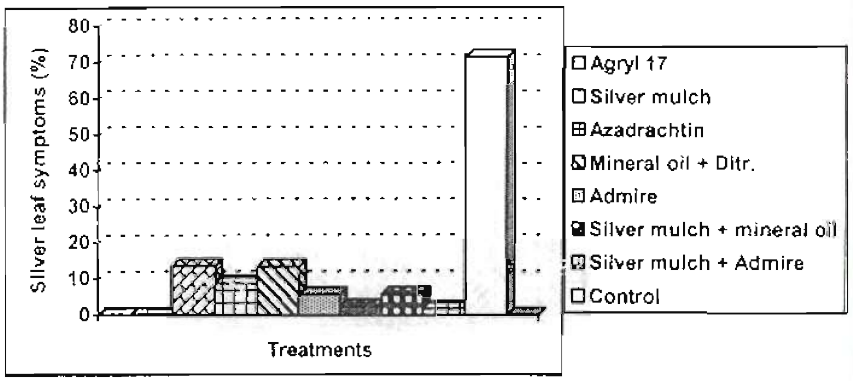
Values with the alphabetical letter in common do not differ significantly in the same column using Duncans Multiple Range Test.

Table 4: Percent of plants showing silver leaf symptoms and total yield for nine protective treatments in the fall season 2000.

Treatments	Percentage of plants showing silver leaf symptoms							Total yield Kg/plant
	24th Aug.	1st Sept.	8th Sept.	15th Sept	22th Sept	29th Sept.	Mean	
Agryl 17	0 b	0 d	0 d	0 e	0 e	0 f	0.0	11.35a
Silver mulch	0 b	0 d	0 d	12.0 c	30.1 b	45.5 b	14.6	6.91 e
Azadrachtin	0 b	2.5 c	6.5 c	12.6 c	31.3 b	40.5 c	15.7	7.60 ef
Mineral oil + Ditr.	0 b	4.9 b	9.9 b	24.6 b	30.0 b	44.5 b	19.0	8.55 de
Admire	0 b	0 d	2.5 d	10.6 c	21.2 c	24.3 d	9.8	9.00 d
Silver mulch + Azadrachtin	0 b	0 d	0 d	7.5 d	9.4 e	15.8 e	5.5	9.94 bc
Silver mulch + mineral oil	0 b	0 d	0 d	10.7 c	13.2 d	24.2 d	8.0	9.15 cd
Silver mulch + Admire	0 b	0 d	0 d	9.7 cd	9.7 de	12.6 e	5.3	19.63ab
Control	22.2 a	37.5 a	80.0 a	100 a	100a	100 a	73.3	5.2 f

Values with the alphabetical letter in common do not differ significantly in the same column using Duncans Multiple Range Test.

(a)



(b)

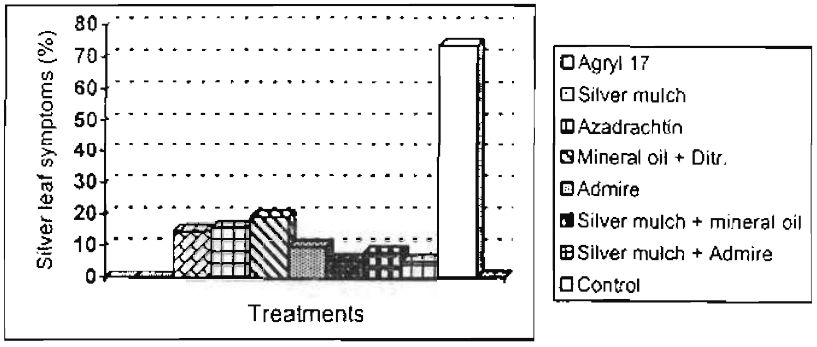
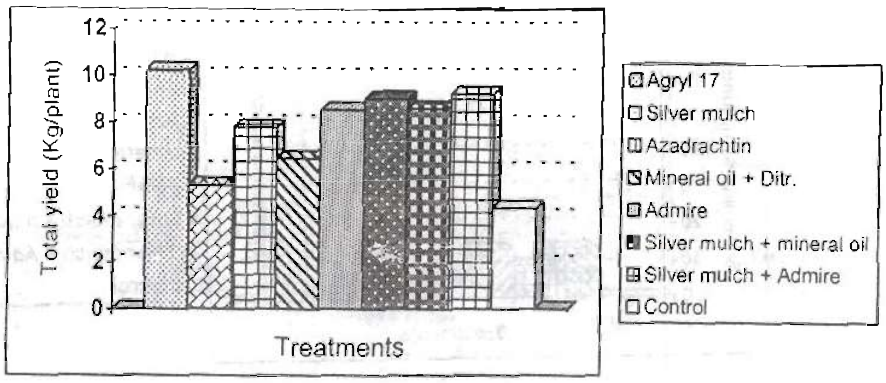


Fig. 2: Percent of plants showing silver leaf symptoms treated with nine protective treatments in two seasons 1999 (a) and 2000 (b).

The combined treatments of Silver mulch with each of the tested spraying materials gave a good reduction of squash Silver leaf symptoms. The use of Silver mulch with Admire spraying greatly reduced the percentage of infected plants with squash silver leaf to 6.0 and 12.6% for 1999 and 2000, respectively, followed by the combined treatment of Silver mulch + Azadrachtin 7.5 and 15.8% for 1999 and 2000, respectively, assuring that use of Azadrachtin sprays combined with Silver mulch can be a good alternative to pesticide.

Results tabulated in Tables (3 and 4) show also that Agryl 17 gave the highest significant total yield. Spraying with Admiral or Azadrachtin combined with Silver mulch were the following treatments to Agryl treatment in the two seasons of 1999 and 2000. The control treatment significantly showed the lowest total yield followed by Silver mulch (Fig. 3).

(a)



(b)

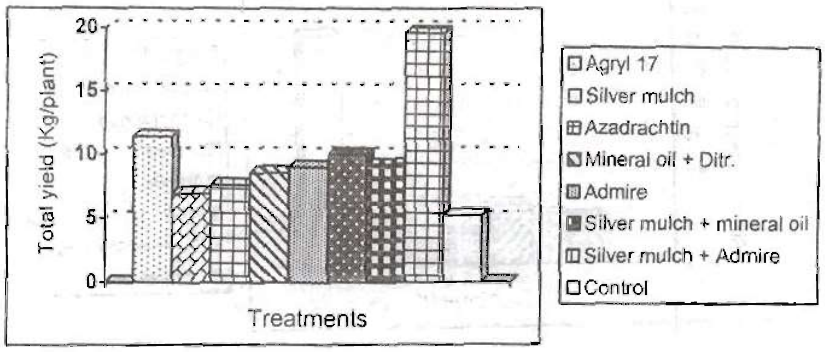


Fig. 3: Total yield of squash plants treated with nine protective treatments in two seasons 1999 (a) and 2000 (b).

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تأثير إستخدام الأجريل والمالش الفضى وبعض المبيدات الغير حشرية والحشرية على الذبابة البيضاء والإصابة بفيرس Silver leaf التى تؤثر على زراعات الكوسة فى الخريف.

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معهد بحوث البساتين.

أجريت هذه الدراسة خلال موسمى الخريف لعام ١٩٩٩ ، ٢٠٠٠ فى النوبارية. إستخدم هجين الكوسة "إمبسادور" تحت ظروف نظام الرى بالتنقيط. تضمنت هذه الدراسة على ٩ معاملات هى: التغطية بالأجريل – المالش الفضى – الرش بمستخلص النيم – الرش بالزيت المعدنى – الرش بالمبيد الحشرى أدماير – المالش الفضى مع مستخلص النيم – المالش الفضى مع الزيت المعدنى – المالش الفضى مع الأدماير – الكنترول الغير معامل بأى معاملات.

تهدف هذه الدراسة إلى إستخدام بعض المواد البديلة للمبيدات الحشرية للحد من إنتشار الذبابة البيضاء على زراعات الكوسة لتقليل ظهور الأوراق الفضية على الكوسة والتى تؤثر على كمية المحصول وعلى صفات الثمار. وتتلخص أهم النتائج فى النقاط التالية:-

١- أثرت المعاملات المختلفة معنوياً على أعداد الذبابة البيضاء على نباتات الكوسة ، حيث أوضح الأجريل أن إستخدامه يمنع وصول الحشرات إلى النباتات خلال موسمى الزراعة. بينما قلل المالش الفضى من متوسط أعداد الحشرات خلال الثلاثة والثلاثون يوما الأولى من الزراعة. وكانت معاملات الرش بمستخلص النيم والزيت المعدنى ذات تأثير معنوى على تقليل عدد الحشرات بالمقارنة بالكنترول. كما كان للمعاملات المزدوجة التى إستخدم فيها المالش الفضى مع الأدماير ومستخلص النيم والزيت المعدنى لها تأثير معنوى على تقليل عدد الحشرات بدرجة عالية.

٢- ظهرت أعراض الورقة الفضية على النباتات بنسبة ١٠٠% فى الكنترول ، بينما لم تظهر الأعراض تماماً عند إستخدام الأجريل وذلك بعد ٤٥ يوم من الزراعة. أما المعاملات المزدوجة والتى تم فيها إستخدام المالش الفضى مع الأدماير ومستخلص النيم فكان ظهور الورقة الفضية بها قليل.

٣- أوضحت النتائج أن إستخدام الأجريل أعطى محصولا كليا مرتفعا ويليه إستخدام المعاملة المزدوجة المالش الفضى مع النيم والمالش الفضى مع الأدماير. وأعطى الكنترول أقل محصول بفروق معنوية واضحة.