

## TAR OIL AS A NEW ALTERNATIVE FOR CONTROLLING THE TWO SPOTTED SPIDER MITE, *TETRANYCHUS URTICAE* (KOCH) INFESTING SOYBEAN PLANTS

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### **Abstract**

Tar oil was prepared as soluble liquid 95% and evaluated against the two spotted spider mite, *Tetranychus urticae* (Koch) infesting soybean plants (*Glycin max*) in Beni Suef Governorate and its associated predacious mites at different concentrations 1, 1.5 and 2% (V./V.). Its acaricidal effect increased with increasing concentration and time after application up to 12 days. 2% concentration was suitable for controlling the two spotted spider mite, *T. urticae* with less effect against predacious mites.

### **INTRODUCTION**

The two-spotted spider mite, *Tetranychus urticae* (Koch) is considered as one of the most economically important pest in Egypt infesting field crops, orchard trees, ornamentals, medical plants and vegetables crops. Chemical control of this pest with acaricides is the most effective mean but because of its high cost, risk to man, beneficial animals, and environmental pollution, therefore efforts should be directed towards finding new alternatives being more safe, and cheap for controlling different pests. In Egypt, many researches were conducted for controlling injurious mites with many alternatives related to: Mineral and plant oils (Iskander and El-Sisi, 2001), (Mousa and El-Sisi, 2001a). Surface active agents (Rizk *et. al.*, 1999, El-Sisi *et. al.*, 2006). Mineral salts (Mousa and El-Sisi, 2001b) and foliar fertilizers (El-Sisi and Mousa, 2001).

Tar oil used in this study acts 50% waste distillation of charcoal manufacture, is considered a new alternative compound, which proved acaricidal effect against the stored grain mite, *Tyrophagous putrescentige* (Shrank) (El-Sanady and El-Sisi, 2011) when prepared as dustable powder, also against bollworm (Amer and El-Sisi, 2011) when prepared as soluble liquid.

The aim of this work was to investigate the acaricidal efficacy of tar oil locally prepared as soluble liquid against the spider mite, *T. urticae* (Koch) infested soybean plants and its side effect on dominate associated predacious mites and other pests.

## MATERIALS AND METHODS

### Crude tar oil

Tar oil, a crude compound from the waste distillation of charcoal manufacture under 55°C in Egypt New & Renewable Energy Authority (NREA), seven district, Nasr City, used as active ingredient in this study.

-Wetting and spreading agent:

600 m.l.: It is nonionic surfactant, brief name of polyethylene glycol 600 mon laurate.

### Methods

#### 1- Preparation of tar oil as soluble liquid formulation:

It was done by dissolving 5 ml of spreading agent 600 m.l. in 95 ml tar oil.

#### 2-Field evaluation of the locally prepared tar oil 95% against *T. urticae* infested soybean plants and its associated predacious mites:

This experiment was carried out in Beni Suef governorate in soybean field heavily infested with the two spotted spider mite *T. urticae* to evaluate the acaricidal efficacy of tar oil 95% SL and its side effect on the associated predacious mites. The experiment area was divided into four treatments, three of it for tar oil, at concentrations of 1, 1.5 and 2% (V./V.) and one for the control, and each treatment included three replicates. The replicates were distributed in a complete randomized block design. Spraying was done using a knapsack sprayer at July, 10, 2012. Sample was 10 leaves/each replicate and collected randomly before spraying and after 3, 6, 9, 12 and 15 days after spray. Alive spider mite and predatory mites were counted and percentages of reduction were calculated using Henderson and Tilton equation (1955). The data were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05 level, using SAS program (SAS, 1988).

## RESULTS AND DISCUSSION

### **Effect of tar oil 95% SL on population densities of the two spotted spider mite, *T. urticae***

Results in table (1) indicated that tar oil at concentrations 1, 1.5 and 2% decreased the mean alive number/10 leaves of moveable stages of *T. urticae* infested soybean plants in Beni Suef governorate compared with untreated. Also, the reduction percentages increased as well as increasing concentration of tar oil and, by increasing time after spraying up to 12 days of treatment.

Statistical analysis in table (1) showed highly significant differences between the application of tar oil at different concentrations 1, 1.5 and 2% comparing with untreated on the mean alive number/10 leaves of moveable stages of the spider mite, *T. urticae* ( $F = 131.63$ , L.S.D.  $0.05 = 8.3$ ).

### **Acaricidal efficacy of tar oil 95% SL against the two spotted spider mite, *T. urticae* infested soybean plants**

Table (2) showed the acaricidal activity of tar oil expressed as reduction percentages of *T. urticae* on soybean plants calculated according to **Henderson and Tilton equation (1955)**, indicated that it increased by increasing both concentration and time after application up to 12 days of application. The reduction percentages were 55.7, 66.5 and 79.6% after 12 days for the three increasing concentrations 1.0% 1.5% and 2% respectively. However percentage began to decrease after two weeks averaging 39.9%, 54.9% and 66.1% for the same concentrations respectively.

### **Side effect of tar oil 95% SL on predacious mites associated with the two spotted spider mite *T. urticae* infesting soybean plants**

The predacious mites collected in this study were: *Agistemus exertus* Gonzalez (Family : Stigmaeidae) and *Phytoseiulus persimilis* Athias-Henriot, *Euseius scutalis* H.-H. and *Neoseiulus neoreticulatus* Yousef & El-Borollosy (Family : Phytoseiidae). Table (3) gave the number of predatory mites before and after application while its reduction percentages shown in table (4), indicated that the general mean reduction was 17.59%, 21.60% and 31.95% for tar oil at 1%, 1.5% and 2% respectively.

This study indicated that the predacious mites are more tolerant against tar oil than *T. urticae*.

It could be concluded that concentration 2% of tar oil was suitable for controlling the spider mite, *T. urticae* on soybean plants with less bad effect against predacious mites, as well as no phytotoxicity on treated plants.

Statistical analysis in table (3) showed highly significant differences between the application of tar oil at concentrations 1, 1.5 and 2% compared with untreated on the mean alive number/10 leaves of predacious mites ( $F = 161.06$ , L.S.D.  $0.05 = 1.51$ ).

Results obtained well agreed with those of El-Sanady and El-Sisi, 2011 and Amer and El-Sisi, 2011. The toxic effects against spider mite might be due to its contents of phenols, creosote and anthracene (Tomlin, 1994).

It could be concluded that concentration 2% of tar oil was the suitable for controlling spider mite, *T. urticae* on soybean plants with less bad effects against predacious mites.

Table. 1. Effect of tar oil 95% SL at different concentrations on population densities of the two spotted spider mite, *Tetranychus urticae* (Koch) on soybean plants in Beni-Suef governorate during summer season 2012.

Treatment	Conc.% (V./V.)	Mean alive number/10 leaves before treatment	Mean alive number/10 leaves after indicated days					Mean No./10 leaves
			3	6	9	12	15	
Tar oil	1.0	245.0	201.7	167.7	158.3	146.7	188.3	172.43
	1.5	268.3	195.0	165.0	150.0	121.7	155.0	157.34
	2.0	241.7	113.3	85.0	80.0	66.7	105.0	90.0
Untreated	-	273.3	281.7	306.7	356.7	370.0	350.0	333.02
F 0.05	-							131.63***
L.S.D.								8.3

**L.S.D.**= Least significant difference at 0.05

Table. 2. The reduction percentages of the two spotted spider mite, *Tetranychus urticae* (Koch) after application with tar oil on soybean plants in Beni Suef governorate.

Treatment	Conc.% (V./V.)	%reduction of moving stages after application					Average percent reduction
		3 days	6 days	9 days	12 days	15 days	
Tar oil	1.0	20.1	39.2	50.5	55.7	39.9	40.1
	1.5	29.5	45.2	54.2	66.5	54.9	50.1
	2.0	54.4	68.7	74.6	79.6	66.1	68.6

Table. 3. Effect of tar oil 95% SL at different concentrations on associated predaceous mites on soybean plants in Beni-Suef governorate during summer season 2012.

Treatment	Conc.% (V./V.)	Mean alive number/10 leaves before treatment	Mean alive numbers 10 leaves on indicated days of treatments					Mean No./10 leaves
			3	6	9	12	15	
Tar oil	1.0	51.67	43.33	46.67	63.67	80.33	100	66.80
	1.5	43.33	40.00	38.67	47.33	63.33	91.67	56.20
	2.0	51.67	41.00	43.00	53.00	64.00	85.00	57.20
Untreated	-	55.00	61.67	74.00	83.33	98.33	130.00	89.47
F 0.05				-				116.06***
L.S.D.								1.51

L.S.D.= Least significant difference at 0.05

Table. 4. Reduction percentages of predacious mites populations after application of tar oil on soybean plants in Beni-Suef governorate during summer season 2012.

Treatment	Conc.% (V./V.)	%reduction of moving stages after application					Average percent reduction
		3 days	6 days	9 days	12 days	15 days	
Tar oil	1.0	25.21	12.90	18.67	13.04	18.12	17.59
	1.5	17.67	33.67	27.90	18.25	10.49	21.60
	2.0	29.23	38.15	32.30	30.72	30.40	31.95

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## الزيت القطراني كبديل جديد لمكافحة العنكبوت الأحمر ذي البقعتين الذي يصيب فول الصويا

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تم تحضير الزيت المعدني القطراني المجهز علي صورة محلول قابل للذوبان ٩٥% وتم تقييمه ضد العنكبوت الأحمر ذي البقعتين الذي يصيب نباتات فول الصويا في محافظة بني سويف وتأثيره الجانبي ضد الأكاروسات المفترسة وذلك بتركيزات ١، ١،٥، ٢% (حجم/حجم). دلت النتائج المتحصل عليها علي أن نسبة الخفض في تعداد العنكبوت الأحمر تزداد بزيادة التركيز المستخدم كذلك بزيادة المدة بعد الرش حتي ١٢ يوماً، حيث كانت أعلي معدلات للخفض في تعداد الآفة. ويمكن القول أن تركيز ٢% مناسب لمكافحة العنكبوت الأحمر ذي البقعتين الذي يعتبر من أهم آفات محصول فول الصويا ويسبب خسائر جسيمة للمحصول مع وجود تأثير جانبي قليل ضد الأكاروسات المفترسة. ولذا فإن هذه المادة يمكن أن تدخل في برامج مكافحة المتكاملة لمكافحة العنكبوت الأحمر علي محصول فول الصويا بإعباره من أهم الآفات التي تؤثر في إنتاجية المحصول كما وكيفا.