

**EFFICACY OF PLANT OILS AGAINST *Thrips tabaci* LIND. AND *Tetranychus urticae* KOCH ON BEAN, *Phaseolus vulgaris* UNDER FIELD CONDITIONS IN FAYOUM GOVERNORATE**

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**ABSTRACT:**

According to Ministry of Agriculture Protocol for natural materials, the successful material should give initial effect  $\geq 70\%$  and residual effect  $\geq 40\%$  reduction. This condition was fulfilled at 1.5% concentration of all plant oils tested alone or as mixtures used against *Thrips tabaci* and *Tetranychus urticae* infestations on bean plants. Also, both pests were more susceptible to the oil mixtures of (fixed + volatile) than plant oils alone at 1.5% such as (cottonseed + lemongrass), (linseed + citronella) and (castor + lemongrass) for adults of *T. tabaci* and *T. urticae*. The mixtures showed higher efficiency in general. Concerning the residual effect, onion oil alone and the mixture of (cottonseed + lemongrass) oil at 1.5% caused 100% reduction in adults of both pests. Also, the same reduction occurred by the use of mixtures of (linseed + lemongrass) oil against *T.tabaci* and (castor + chamomile) oil against *T.urticae* .

**Key Words:** Plant oils, *Thrips tabaci*, *Tetranychus urticae*, *Phaseolus vulgaris*, Initial effect, Residual effect.

**INTRODUCTION:**

Piercing sucking insects are the most important pests infesting crops under field conditions in Egypt. The continuous and unwise use of insecticides by farmers lead to adverse effect on naturally occurring biological control agents and biotic environment besides pollution hazards. A better strategy have been developed by the Ministry of Agriculture to maximize the role of natural enemies through the use of safe chemicals including botanical extracts instead of synthetic insecticides (**El-Hariry et al. 1998**). Locally prepared of plant oils in suitable formulation with the determination of the proper concentration to control sucking piercing pests could have many advantages; as being safe to man, animals and plants, decreasing costs of pest control, and their pesticidal efficiency is not reduced with repeated use (**Kazem, 2004**). Efficiency of certain plant oils against sucking piercing pests was studied by relatively few investigators (**Butler and Henneberry 1990; Butler et al. 1991; Mahmoud and Soliman 2007; Keinath, 2008 and Cloyd et al. 2009**). The present work aimed to evaluate the pesticidal efficiency of local preparations of plant oils as emulsifiable concentrates for controlling thrips, *Thrips tabaci* Lind. and spider mite, *Tetranychus urticae* Koch infesting bean seedlings.

**MATERIALS AND METHODS:**

Two field experiments were carried out to evaluate the efficacy of plant oils against thrips, *Thrips tabaci* Lind. and mites, *Tetranychus urticae* Koch infesting bean plants, *Phaseolus vulgaris* during 2008 growing season at Ezbet Hawara-Fayoum Governorate. The experimental area was divided in a complete randomized block design including three replicates for each treatment and each replicate consists of 3 rows 3 meters long at concentrations 0.5, 1.0 and 1.5% for both of fixed oils, volatile oils and two of their mixtures according to **Ministry of Agriculture Protocol (1993)**. Three additional reps. were untreated as control.

Plant oils and their mixtures were formulated as emulsifiable concentrates using polyethylene glycol (9%) as emulsifier and xylene (11%) as co-solvent to 80% crude plant oils for improved emulsification according to **Soliman and Kazem (2006)**.

In the first experiment, on March 28, 2008 oils of cottonseed, linseed, castor, clove, onion, chamomile, citronella and lemongrass were applied at 0.5, 1.0 and 1.5% concentrations against thrip and mite infestations.

In the second experiment on May 27, 2008, oil mixtures of cottonseed, linseed and castor, mixed each with volatile oils of clove, onion, chamomile, citronella or lemongrass were applied at the same concentrations.

For application, a knapsack sprayer, one liter capacity equipped with one nozzle, was used. The application started when the infestation reached about 5 pests /leaf, pre treatment. Populations of thrips and mites were determined on 10 leaves picked up at random before spraying and after 1, 3, 5 and 7 days of treatment. Reduction of population was estimated according to **Henderson and Tilton (1955)**. Any leaf curl, colour change, flaming and dropping that occurred was recorded at 1, 3, 5 and 7 days after spray.

## **RESULTS AND DISCUSSION:**

### **Efficacy of plant oils against *Thrips tabaci* and *Tetranychus urticae*:**

Results indicated that concentration 1.5% of all tested plant oils alone and their mixtures considered were efficient in controlling *T. tabaci* and *T. urticae* on bean plants. They gave initial reduction  $\geq 70\%$  and residual reduction  $\geq 40\%$ . These results satisfies that Protocol of the Ministry of Agriculture. The concentration used did not show any phytotoxic effect on treated plants no curl, colour change, flaming or leaf dropping was observed up to 7 days after treatment. Resulte could be discussed as follows:

#### **1. Effect of treatments against thrips, *T. tabaci*:**

Data in Table (1) revealed that onion oil showed the highest general effect with 98.9% reduction at 1.5% while castor oil had the lowest effect with 85.7% reduction. For oil mixtures at 1.5%, mixtures of (cottonseed + lemongrass), (linseed + citronella) and (castor + lemongrass) gave the highest effects with 95.8, 94.1 and 96.2% reduction, respectively as shown in Tables 2,3 and 4. In this respect, fixed oils such as linseed oil and castor oil mixed with volatile oils exhibited higher general effects compared with fixed oils alone. Also, fixed oils mixed with lemongrass exerted successful initial effect at all tested concentrations except for the mixture of (castor + lemongrass) oil at 0.5%. complete residual effect, (100%) was obtained with onion oil alone and the mixtures of (cottonseed + lemongrass) and (linseed + lemongrass) at 1.5%.

#### **2. Effect of treatments against spider mite, *T. urticae*:**

Data presented in Table (5) indicated that lemongrass and onion oils were the most effective causing 94.8% reduction of population at 1.5% concentration. This pest was more susceptible to the mixtures of (fixed + volatile) oils than plant oils alone. i.e. (cottonseed + lemongrass) oil, (linseed + citronella) oil and (castor + lemongrass) oil gave higher efficiency as general effect at 1.5% with 95.4, 96.3 and 98.2% reduction respectively (Tables 6, 7 and 8). On the other hand, the initial effect of linseed oil mixed with volatile oils was not suitable 0.5 and 1.0% concentrations. Also, oil mixtures of cottonseed and castor failed at these concentrations against this pest

Table 1

Table 2

Table 3

Table 4

Table 5

Table 6



Table 7

Table 8

with initial effect lower than 70%, except that mixtures of (cottonseed + lemongrass) oil and (castor + lemongrass) oil at 1.0% (initial effect 72.3 + 77.8%). Onion oil alone and the mixtures of (cottonseed + lemongrass) oil and (castor + chamomile) oil at 1.5% caused 100% reduction in adults of spider mites as residual effect.

In general, the present study showed that concentration 1.5% of all tested mixtures were successful for the control of spider mites on bean plants. In this respect, **Keinath (2008)** showed that kaolin mixed with volatile plant oils like lemongrass, tea tree and geraniol gave similar effect to the standard insecticide on thrips infesting tomato. Therefore, plant oils and kaolin could be used successfully instead of synthetic insecticides. **Choi et al. (2004)** indicated that sage, spearmint, citronella and lemongrass oils gave > 90% mortality against adults of *Tetranychus urticae* whereas caraway and peppermint oils were highly effective against eggs of the same pest. Also, **Kim et al. (2003)** found that citronella, clove java, lemongrass and thyme with oils were more toxic to the adults of *Llyphagus putrescentiae* than benzyl benzoate and N, N- diethyl- m- toluamide (deet). Lemongrass and thyme white oils gave 76 and 84% mortality. **Kazem et al. (2008)** evaluated the efficiency of three formulations of boiled linseed oil as emulsifiable concentrates for controlling whitefly and aphids on squash plants. The first boiled linseed oil contained capsicum and aginger extracts, the second boiled linseed oil contained garlic and blackpepper extracts and third one was boiled linseed only. All treatments gave an excellent controlling against aphids, ranged from 80 to 100% as initial and residual effects but the third formulation was the best as general effect. **Miresmaili and Isman (2006)** revealed that pure rosemary oil caused complete mortality against *Tetranychus urticae* Koch. at concentrations that are not phytotoxic to the tomato plants in greenhouse. **Tsolakis and Ragusa (2008)** showed that the mixture of caraway oil and fatty acid potassium salts exhibited acaricidal activity on *Tetranychus urticae* with not toxic to the predator of *Phytoseiulus persimilis*. Harmless for the predator in contrast to the spider mite gave this mixture selective toxicity can be used in integrated pest management.

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### تقييم فاعلية بعض الزيوت النباتية ضد التريس والعنكبوت الاحمر على الفاصوليا تحت الظروف الحقلية في محافظة الفيوم

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تم فى هذا البحث تقييم الكفاءة الابادية للزيوت النباتية سواء فى صورة منفردة او مختلطة بتركيزات ٠.٥ ، ١.٠ ، ١.٥% ضد التريس والعنكبوت الاحمر تحت الظروف الحقلية فى قرية هواره بالفيوم وذلك طبقا لبروتوكول وزارة الزراعة لعام ١٩٩٣ الذى ينص على ان المواد الطبيعية المناسبة لمكافحة الافات الثاقبة الماصة هى تلك المواد التى تعطى كفاءة ابادية تصل الى ٧٠% او اكثر كتأثير اولى و ٤٠% فاكتر كتأثير متأخر، الزيوت المستعملة فى هذه الدراسة هى الزيوت الثابتة (القطن، الكتان والخروج) والتي تم خلط كل منها على حدة بالزيوت الطيارة (القرنفل، البصل، الشبج، السترونيلا وحشيشة الليمون) وقد تم تجهيز الزيوت المنفردة والمختلطة بتركيزات قابلة للاستحلاب فى حالة الزيوت المنفردة تم اضافة البولى ايثيلين جليكول (٩%) كمادة مستحلبة والزليلين (١١%) كمذيب مساعد لتحسين خواص الاستحلاب الى ٨٠% من الزيت النباتى الخام. وفى حالة الزيوت المختلطة تم اضافة البولى ايثيلين جليكول (٩%) والزليلين (١١%) الى ٦٠% من الزيت الثابت + ٢٠% من الزيت الطيار وكانت النتائج كما يلى:

#### ١- فاعلية الزيوت النباتية ضد التريس على نبات الفاصوليا:

أشارت النتائج ان الكفاءة الابادية للزيوت النباتية المجهزة بتركيزات قابلة للاستحلاب تزداد بزيادة التركيز وان التركيز ١.٥% يعتبر أنسب تركيز لمكافحة الافة حيث اعطى نسبة كفاءة تصل الى ٧٠% فاكتر للتأثير الاولى و ٤٠% فاكتر للتأثير المتأخر وطبقا للتأثير العام للزيوت المنفردة فان تركيز ١.٥% لزيت البصل حقق اعلى كفاءة ابادية (٩٨.٩%) بلية زيت السترونيلا (٩٥.٨%) اما التأثير العام للزيوت المختلطة فان تركيز ١.٥% لمخاليط الزيوت (القطن + حشيشة الليمون) ، (الكتان + السترونيلا) و (الخروج + حشيشة الليمون) حققت اعلى كفاءة (٩٥.٨% ، ٩٤.١% و ٩٦.٢%) على التوالي مقارنة بالزيوت المنفردة الثابتة (قطن، كتان وخروج) والتي سجلت ٨٨.٦ ، ٨٥.٧ و ٨٥.٧% على التوالي.

#### ٢- فاعلية الزيوت النباتية ضد العنكبوت الاحمر على نبات الفاصوليا:

اظهرت النتائج ان الكفاءة الابادية للزيوت النباتية المجهزة بتركيزات قابلة للاستحلاب تزداد بزيادة التركيز وان التركيز ١.٥% يعتبر أفضل تركيز لمكافحة الافة حيث اعطى نسبة كفاءة تصل الى ٧٠% فاكتر للتأثير الاولى و ٤٠% فاكتر للتأثير المتأخر وطبقا للتأثير العام للزيوت المنفردة فان زيت البصل وحشيشة الليمون حققا اعلى كفاءة ابادية (٩٤.٨%) أما التأثير العام للزيوت المختلطة فان تركيز ١.٥% لمخاليط الزيوت (القطن + حشيشة الليمون)، (الكتان + السترونيلا) و (الخروج + حشيشة الليمون) حققت اعلى كفاءة (٩٥.٤% ، ٩٦.٣% و ٩٨.٢%) على التوالي مقارنة بالزيوت المنفردة الثابتة (قطن، كتان وخروج) والتي سجلت ٨٦.٨ ، ٨٤.١ و ٨٨.٤% على التوالي وبصفة عامة كانت الزيوت النباتية المختلطة اكثر سمية من الزيوت النباتية المنفردة فيما عدا مخلوط زيت (القطن + القرنفل) حيث سجل ٨٣.٤%.

#### ٣- السمية النباتية:

أوضحت النتائج ان الزيوت النباتية المجهزة لم تظهر اى تأثير ضار على بادرات الفاصوليا المعاملة حيث من المعروف أن استخدام الزيوت النباتية فى بداية الموسم نقلل الحاجة للمعاملة بها مرة اخرى فى نهاية الموسم (فترة الحصاد) وهى الفترة التى تظهر فيها مشاكل المتبقيات وبالتالي لاتظهر الزيوت النباتية اى مشاكل تتعلق بالمتبقيات السامة بالاضافة الى امانها على النبات وكفاءتها الابادية العالية فى مكافحة الافات وقلة تأثيرها على الاعداء الحيوية من طفيليات ومفترسات كذلك تعتبر رخيصة الثمن مما يقلل من التكاليف الاقتصادية لعملية مكافحة مقارنة بالمبيدات الحشرية المصنعة.