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Previous volumes (2010-2016): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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EFFECT OF SOME FOLIAR EXTRACTS ON THE PREDATORY MITE AMBLYSEIUS BARKERI (ACARINA : PHYTOSEIIDAE)

BY F. M. MOMEM * and S. A. A. AMER *

ABSTRACT: The direct toxicity of 4 foliar extracts to the eggs and females of the predacious mite Amblyseius barkeri (Hughes) was tested. Lupin extract was slightly toxic to eggs and females of the predator. Females of A. barkeri suffered a depression in reproduction when fed on prey formerly kept on plant leaves treated with lupin turnip and fenugreek extracts, while the number of prey consumed by females was significantly lower in case of lupin only.

1. INTRODUCTION

The predatory mite Amblyseius barkeri (Hughes) (Acarina : Phytoseiidae) has played an important role in biological control of the onion thrips, Thrips tabaci Lindeman in glasshouses with cucumber in Denmark (HANSEN 1988) and in United States on cabbage (HOY and GLENISTER 1991).

Although few studies have been conducted on A. barkeri, the predator has been shown to be an effective predator on Thrips palmi Karny in Japan (KAJITA 1986) and on tetranychid and eriophyid mites, Tetranychus urticae Koch, Eriophyes dioscoridis Soliman and Abou-Awad in Egypt (REDA and MOMEN 1993; MOMEN in prep.).

It has been also reported to feed on the tarsenomid mite Polyphagotarsonemus latus (Banks) and pollen of various plants (BONDE 1989).

The multi use of pesticides in the field and orchards can have drastic effects on natural enemies (EL-BANHAWY and ABOU-AWAD 1985; EL-BANHAWY and REDA 1988; REDA and EL-BANHAWY 1988) so the attention has been focused to use such plants having acaricidal influences especially on the pest T. urticae (SCHAUER and SCHMUTTERER 1981; AMER 1984; DIMETRY et al 1990; AMER and RASMY 1993 b).

The effect of the plant extracts and their isolates on the predacious mites is not studied extensively yet, although few studies were conducted on several phytoseiid mites such as Typhlodromus fallacis (Garman) (HAMSTEAD 1970); Phytoseiulus persimilis Athias Henriot (MANSOUR et al 1986; SOPP et al. 1990) and Amblyseius gossypi El-Badry (DIMETRY and AMER 1992).

This study was undertaken to provide information on the direct and residual effect of some plant extracts on A. barkeri in the laboratory.

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2. MATERIALS AND METHODS

Three steps were followed during the experiments on effects of different plant extracts on *A. barkeri*.

2.1. Laboratory stock cultures

The stock cultures of *Tetranychus urticae* were collected from infested lima bean (*Phaseolus vulgaris* L.) in the laboratory at N.R.C. Cairo. Phytoseiid stock culture was initiated from approximately 20 females of *A. barkeri* collected from infested grape leaves and twigs of vineyards located at Katta village, Giza Governorate.

2.2. Preparation of the extracts:

Leaves of fenugreek (*Trigonella foenum-graecum* L.), Canna (*Canna indica* L.), Lupin (*Lupinus termis* Forsk) and turnip (*Brassica rapa* L.) were left to dry and then ground. 100 gm of each foliar powder were macerated in 200 ml acetone. After 24 h, the extracts were filtered and evaporated till dryness using a rotary evaporator under vacuum. Each extract was then dissolved in 10 ml acetone.

2.3. Treatment

2.3.1. Direct effect on adult females

Adult females of *A. barkeri* were confined on the lower surfaces of detached raspberry leaves (3 cm. in dia.) while the upper surfaces were placed on cotton saturated with water. Tangle foot was applied on the edge of the discs to prevent the predator from escaping. Mites were sprayed using a glass atomizer. Each test contained 5 concentrations and each concentration had 4 replicates (30 females/replicate) and each assay was repeated twice. In every test, a water control was included. Mortality was recorded 48 h. after application. Corrected mortality counts according to Abbott's formula, were statistically analysed by Finney (1952).

2.3.2. Direct effect on egg stage.

The effect on egg stage was studied by confining 20 females on leaf discs for 24 h., then removed. These discs were sprayed with deposited eggs (24 h. old) in a series of concentrations for 50 sec., and allowed to dry. Observations on egg viability were made twice a day. Eggs not hatching in 5 days were considered non viable. A control was included.

2.3.3. Indirect effect on adult females

The effect of the food-chain toxicity on the reproduction and consumption of the predacious mite *A. barkeri* was also studied. Plant leaves were dipped for 50 sec. in suspensions of different extracts at concentrations equivalent to the LC<sub>50</sub> of the predator and left to dry. Protonymphs of the two spotted spider mite *T. urticae* were transferred to the treated leaves and kept for 24 h. to ensure that they already have sucked plant juice. Twenty gravid females of *A. barkeri* on clean discs were provided daily with a sufficient known number of that prey for 7 days. Observations were taken daily on consumption and reproduction for 7 successive days. A control treatment was included in the experiment.

All the experiments reported herein were carried out in the laboratory at 27 ± 2°C and 70-75 % R.H.

3. RESULTS AND DISCUSSION

Figures 1 and 2 show the relation between the percentage of mortality and the concentrations of the different extracts on adult females and eggs of *A. barkeri*. The data obtained in Table 1 shows that lupin extract was the most toxic to eggs while fenugreek extract was the least. Regarding eggs' stage, the LC<sub>50</sub> values of the tested extracts toxicity were in descending order as follows : lupin, canna, turnip, fenugreek. AMER (unpublished manuscript) indicated that lupin extract was the most efficient acaricide on eggs of the pest *Tetranychus urticae* which was 41.07 times more toxic to eggs than that on *A. barkeri*. 
Lupin and canna extracts have been shown to be toxic extracts on females of *A. barkeri* (Table 1). Tested plant extracts can be arranged according to their LC\(_{50}\) values for adult females in the following descending order of effectiveness: lupin, canna, fenugreek, turnip. Toxicity data shows that female predators were more susceptible to all different extracts than eggs' stage.

Results from Table 1 shows also that lupin, fenugreek, turnip and canna extracts were 74.47, 46.76, 23.33 and 8.40 times more toxic to females of *T. urticae* than to female *A. barkeri*. DIMETRY and AMER (1992) revealed that seeds of fenugreek and rhizomes of canna extracts were toxic to females of *Amblyseius gossipii* El-Badry (LC\(_{50}\) value: 0.119 and 0.1132 gm/ml).

The possibility of transmitting residues to *A. barkeri* through *T. urticae* fed on treated leaves with different extracts for 24 h. was examined in this work. Consumption on prey previously kept on leaves treated with lupin extract was slight toxicity reduced affecting consumption, while no effects were evident in case of canna, fenugreek and turnip (Table 2).

The fecundity of *A. barkeri* ♀ consuming prey formerly reared on treated leaves with lupin, turnip extracts for 24 h. was much less than that of the control (Table 3). In case of canna extract the fecundity was almost as high as that of the control. The results also revealed that egg hatchability was not significantly affected as it averaged between 88-93 % compared with 100 %.

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Fig. 1: Toxicity of the different plant extracts against the adult females of the predacious mite *A. barkeri*.
TABLE I: Toxicity of some foliar extracts to the eggs and females of *T. urticae* and *A. barkeri*.

<table>
<thead>
<tr>
<th>Foliar extracts</th>
<th>Adult females</th>
<th>NO. of fold increase compared with <em>A. barkeri</em> at <em>T. urticae</em> LC₅₀ gm/ml</th>
<th>Eggs</th>
<th>No. of fold increase compared with <em>A. barkeri</em> at <em>T. urticae</em> LC₅₀ gm/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lupin</td>
<td>0.0206⁴</td>
<td>1.534</td>
<td>0.2442⁴</td>
<td>10.03</td>
</tr>
<tr>
<td>Fenugreek</td>
<td>0.0959⁴</td>
<td>4.484</td>
<td>1.83⁴</td>
<td>18.98</td>
</tr>
<tr>
<td>Canna</td>
<td>0.2652⁴</td>
<td>2.229</td>
<td>4.66²</td>
<td>11.86</td>
</tr>
<tr>
<td>Turnip</td>
<td>0.2745⁴</td>
<td>6.404</td>
<td>4.20²</td>
<td>17.21</td>
</tr>
</tbody>
</table>

a: Unpublished data by AMER.

FIG. 2: Toxicity of the different plant extracts against the egg stage of the predacious mite *A. barkeri*. 

![Graph showing toxicity of plant extracts against A. barkeri](image)
Secondary toxicity was reported for fenugreek and canna extracts on *A. gossypi* (DIMETRY and AMER 1992). Also a significant lower consumption and an inhibitory effect on reproduction were recorded on *A. gossypi* when exposed to treated prey.

Canna extract was 8.4 times more toxic to *T. urticae* than *A. barkeri*, also food consumption and fecundity were similar to that of the control when the predator fed on prey kept on treated leaves with canna extract. AMER and RASMY (1993a) stated that canna leaves seemed to contain substances that were toxic, or/and lacking in the proper balance of nutrients essential to *T. urticae* development.

Much information is needed on the adverse effects of different plant extracts on predators, especially when their field application is contemplated.

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*Paru en Octobre 1994.*