

Short report

Repellence and toxicity of *Schinus molle* extracts on *Blattella germanica*

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Abstracts

The biological activities of ethanol and petroleum ether extracts from leaves and fruits of *Schinus molle* against adults of *Blattella germanica* were examined by repellence test and topical application. All extracts produced significant repellent effect and mortality.

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1. Plant

Schinus molle L. (Anacardiaceae), leaves and fruit collected at Bahía Blanca City, South Argentina, in November 2004, and identified at the Herbarium of the Departamento de Biología, Bioquímica y Farmacia, UNS (Herbarium Voucher Number, BBB 10444).

2. Uses in traditional medicine and other reported activities

Astringent, antibacterial, diuretic, digestive stimulant, tonic, antiviral, purgative, for fractures, topical antiseptic, wound healer, to stop bleeding, for toothaches, for rheumatism, stimulant, antidepressant, for menstrual disorders, for respiratory and urinary tract infections, and insecticidal activity [1–8].

3. Previously isolated classes of constituents

Tannins, alkaloids, flavonoids, steroidal saponins, sterols, terpenes, gums, resins and essential oils [9,10].

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Table 1
Repellent effect of the *S. molle* petroleum ether extracts (PEE) on *B. germanica* adults

Treatment	Concentration (% w/v)	Repellence value
PEE from leave	15	0.037±0.064 ab
	10	0.15±0.08 abc
	5	0.38±0.24 d
PEE from fruits	15	0.074±0.064 ab
	10	0.20±0.08 bc
	5	0.26±0.15 cd
DEET	15	0 a
	10	0 a
	5	0 a
Control		1 e

Values are mean±SD., *N*=three replicates of 10 individuals each. Values followed by the same letter are not significantly different (LSD *P*>0.05).

4. Tested material

Ethanol extracts of leaves and fruits (yields: 6.44%, 10.82% respectively). Petroleum ether extracts of leaves and fruits (yields: 0.88%, 0.12% respectively).

5. Studied activities

5.1. Repellency test [11]

Circular white filter papers # 1 (9 cm diameter, Whatman International Ltd., Maidstone, England), divided in two halves, were used. One of the halves was treated with 0.5 ml of acetone or water; the other half was treated with 0.5 ml acetone solutions of petroleum ether or water solution of ethanol plant extract. Each extract was assayed at three concentrations: 5, 10 and 15% (w/v). After solvent evaporation (60 min), the filter paper were fitted together to make a single layer and used to cover the floor of a Petri dish. As control, circular white filter papers divided in two halves, one treated with solvents and the other untreated, were used. As positive control, *N, N* diethyl-*m*-toluamide (DEET), was used. Ten insects were released in the centre of each Petri dish, and their distribution was recorded 24 h later. Each experiment was repeated three times. Finally, a repellency value (RV) was determined as a measure of the repellent effect of the plant extracts. It was calculated as $RV = (T / NT)$ where *T* is the number of insects on the treated zone and *NT* is the number of insects on the untreated zone.

5.2. Adulticidal activity

Acetone solutions of petroleum ether or water solutions of ethanol extracts at 15% (w/v) were topically applied on the first abdominal segment (ventral side) of the insects. A Hamilton microsyringe (Hamilton Co.) provided with a

Table 2
Repellent effect of the *S. molle* ethanol extract (EE) on *B. germanica* adults

Treatment	Concentration (% w/v)	Repellence value
EE from leaves	15	0.12±0.12 ab
	10	0.34±0.28 b
	5	0.36±0.10 b
EE from fruits	15	0.074±0.064 a
	10	0.083±0.14 a
	5	0.69±0.28 c
DEET	15	0 a
	10	0 a
	5	0 a
Control		1 d

Values are mean±SD., *N*=three replicates of 10 individuals each. Values followed by the same letter are not significantly different (LSD *P*>0.05).

Table 3
 Adulticide effect of the *S. molle* leaves and fruits petroleum ether (PE) and ethanol (E) extracts on *B. germanica*

Treatment ^a	Mortality index
PE extract from leaves	0,2+/-0,1 b
EE from leaves	0,53+/-0,12 c
PE extract from fruits	0,4+/-0,1 c
EE from fruits	0,47+/-0,15 c
Control	0 a

Values are mean +/- SD., *N* = three replicates of 10 individuals each. Values followed by the same letter are not significantly different (LSD *P* > 0.05).

^a 15% (w/v).

microapplicator was used and each individual received 2 µl of solution. Insects in the control group were treated with water or acetone alone. After treatment the insects were kept in clean polyethylene Petri dishes. Mortality index was scored at 72 h post-treatment. Each experiment was repeated three times.

Data were analysed by ANOVA (previous transformation to arcsen√*x*). The means were separated using LDS [12].

6. Used insect

Male adults of *Blatella germanica* from a colony reared at the laboratory of Zoología de Invertebrados II, Universidad Nacional del Sur (Bahía Blanca, Province of Buenos Aires, Argentina) were used.

7. Results

Reported in Tables 1 and 2 (repellency) and Table 3 (adulticidal effects).

8. Conclusion

All extracts assayed on *B. germanica* adults produced repellent effect significantly higher than the control treatment. They also produced a concentration-dependent repellent effect. Considerable fluctuations (between neutral to strong) were found on repellency effect using EtOH extracts from different families of plant at concentrations of 50, 70 and 96% (w/v) [11]. In the present study, with minor concentration, always repellent effects were observed.

All extracts assayed produced mortality significantly higher than the control treatment. Significant differences on adulticide activity were found between petroleum ether extract from leaves and the other extracts. A similar percentage of mortality against adults of *Phthorimaea operculella* (Lepidoptera, Gelechiidae) was observed using water, hexanic and acetonic extracts (10% w/v) from leaves of *S. molle* [13]. When water extracts (10% w/v) from *Gliricidia sepium* were incorporated to the diet of adults of *B. germanica* a percentage of 40% of mortality was recorded [14]. In this study, we found that petroleum ether extracts from fruits and ethanol extracts from leaves and fruits of *S. molle* produced 40%, 53% and 47% of mortality whereas the petroleum ether extracts from leaves caused 20% of mortality at 15% (w/v).

These results suggest that *S. molle* extract must be taken into account in control of *B. germanica*.

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