U. of K. J. Agric. Sci. 17(3), 413-418, 2009

A Note on the Effect of Aqueous Filtrates of Argel Plant Parts (*Solenostemma argel*, Del Hyne) on the Mortality of Cotton Soil Termite (*Microtermes thoracalis* Sjost.) (Isoptera: Termitidae)

Omar A.A. Sidahmed[1], Khalid O.A.M. Eldoush[2] and Awad Khalafalla Taha[2]

[1]**Department of Plant Protection, Faculty of Agriculture, Omdurman Islamic University, P.O. Box 382 Omdurman - Sudan,** *E-mail*: **a.omerahmed@yahoo.com**

[2]**Department of Plant Protection, College of Agricultural Studies, Sudan University of Science and Technology, Shambat - Sudan.**

Abstract: A laboratory experiment was carried out to evaluate the efficacy of three concentrations (5 %, 7.5 % and 10 %) of aqueous filtrate of argel (*Solenostemma argel*) against workers and soldiers of the cotton soil termite (*Microtermes thoracalis*). The synthetic insecticide Morisban 4 was used as a standard. Statistical analysis showed significant differences between the tested concentrations of argel aqueous filtrates and Morisban 4 compared with the untreated control. The highest concentration (10%) of argel aqueous filtrates and Morisban 4 gave 100% mortality for termites. The study proved the suitability of argel parts for controlling termites, and represents a good environmental and alternative method for synthetic insecticides of termites.

Key words: Termite; *Microtermes thoracalis*; *Solenostemma argel;* aqueous filtrate

Termites are social insects that are primarily wood-feeders, but they also feed on a variety of other organic substrates, such as living trees, leaf litter, soil, lichens and animal faeces. They occur throughout the tropics and subtropics as well as in many temperate areas of the world. In natural ecosystems, they perform a beneficial role in nutrient cycles by accelerating decomposition. However, a number of species can be important pests in man-made ecosystems, such as agricultural and forest plantations as well as in urban and rural areas inhabited by man. They cause damage to trees, wooden structures, earthen dams, underground electrical cables, wooden buildings, wooden furnishings and items made of paper (Kirton 2005). In Sudan, the cotton soil termite (*Microtermes thoracalis*) is most probably present in all parts of the country except the sandy, dry desert and semi-desert areas. It damages a number of crops like

cotton, groundnut, sorghum, wheat, maize, sesame, kenaf and tomatoes in a typical manner. The amount of damage can be very different from one year to another (Schmutterer 1969).

More than 1000 species of plants have been reported to have chemicals in leaves, stems, flowers, seeds and roots which have insecticidal properties, only a few of them have been used for insect control on commercial scale (Badshah *et al*. 2004). The chemical poisons of argel plant (*Solenostemma argel*) are mostly alkaloids (Al-Doghairi *et al.* 2004). Alkaloids are plant products, which are nitrogenous in nature. They are heterocyclic compounds having strong effects on the nervous system of animals and causing death (Badshah *et al*. 2004). Various workers have studied different plant extracts for their toxicity, attraction and repellency in various natural products, against different insect species (e.g., El-Kamali 2001; Al-Doghairi *et al.* 2004; Badshah *et al*. 2004; Sidahmed *et al*. 2009). A laboratory trial was conducted to study the toxic effects of the argel plant aqueous extracts, which may serve as toxicant in termite's control.

Termites were collected from infested roots of maize and tomato, grown at the demonstration farm of the College of Agricultural Studies at Shambat, Sudan. The samples were carried to the laboratory and identified as *M. thoracalis* (Schmutterer 1969). The workers and soldiers were separated from the soil and root debris under low light and immediately placed inside a small dark container with lids and kept for experimental use.

Argel plants were bought from the local market and shoot, leaves and branches were separately crushed by hand and ground by a blender (Moulinex). The powders were weighed by a sensitive balance and mixed with tap water for preparation of aqueous extracts. Three concentrations of each extract (5%, 7.5% and 10%) were left for 24 hours under room condition and filtered by a cotton cloth.

For bioassay tests, 15 termites of the same size were put in a sterilized Petri dish (9 cm in diameter) and used as a replicate. Each Petri dish contained a filter paper treated by dipping in the treatment concentrations for two minutes. In addition, the insecticide Chlorpyriphos 48 % EC (Morisban 4) (Devidayal Agro Chemicals, India) was used as a standard with a recommended dose of 10 ml/l. Tap water was used in the control groups. Three replicates were used for each treatment. No food was provided for the termites. Mortality rates were calculated after 24 hours. All replicates were placed immediately inside a dark container. Relative humidity was kept above 80 % by spraying tap water inside the walls of the container, according to the method of Badshah *et al*. (2004) and Acda (2007). Analysis of variance was used for data analysis. Data were transformed by Arc sine transformation. Duncan's multiple range test was used for mean separation (Gomez and Gomez 1984).

The results in Table 1 show that all concentrations of argel parts (shoots, leaves and branches) aqueous filtrates and the standard insecticide significantly increased the mortality percentage of *M. thoracalis* compared with the untreated control. The highest concentrations gave 100 % mortality similar to the standard insecticide. No significant differences were found between the argel parts and between their concentrations. Termites in the control groups were alive up to 5 days.

The aqueous filtrates of argel parts gave higher mortality percentage against *Microtermes thoracalis* than the untreated control. These findings agree with the results of El-Kamali (2001), Al-Doghairi *et al.* (2004) and Sidahmed *et al.* (2009). El-Kamali (2001) reported that the application of water extracts from the stems, roots, fruits and flowers of argel against *Culex* sp. larvae is more potent as biocide than the extract of each part alone. Also, Al-Doghairi *et al.* (2004) mentioned that bioactive effects of methanolic extract of shoot parts of argel are mainly attributed to the presence of a variety of bioactive organic substances, mainly sterols, teroenes, pergenine, glycosides and alkaloid; and Sidahmed *et al.* (2009) indicated that Argel shoot aqueous filtrates increased significantly the mortality of adult females of white scale insect (*Parlatoria blanchardii*).

Table1. Effect of vegetative parts of argel aqueous extracts on mortality of *Microtermes* sp.

Treatment	Conc. (%)	Mortality (%)
Argel shoots aqueous extract	5	98.1 (85.4)ab
	7.5	97.8 (85.9)ab
	10	100 (90.0)a
Argel leaves aqueous extract	5	88.7 (70.92)ab
	7.5	88.9 (78.25)ab
	10	100 (90.0)a
Argel branches aqueous extract	5	77.7 (67.96)b
	7.5	97.7 (87.29)ab
	10	100 (90)a
Control		0.0 (0.33)c
Morisban 4		100 (90)a
C.V. (%)		14.29

*Means in a column followed by the same letter(s) are not significantly different at P< 0.05; according to Duncan's multiple range test.
*Means between brackets are transformed to Arc sine transformation

In conclusion, the argel filtrates are promising alternatives for the synthetic insecticides. Therefore, further laboratory and field investigations on their efficacy against termites and other pests are needed.

REFERENCES

Acda, M.N. (2007). Toxicity of Thiamethoxam against Philippine subterranean termites. *Journal of Insect Science* 7, Online: *insectscience.org/7.26.*

Al-Doghairi, M.; El-Nadi, A.; El-hag, E. and Al-Ayedh, H. (2004). Effect of *Solenostemma argel* on oviposition and egg hatchability of *Culex pipiens* L. larvae. *Journal of Phytotherapy Research* 18(4), 335-338.

Badshah, H. Farmanullah; Salihah, Z.; Saljoqi, A. and Shakur, M. (2004). Toxic effects of AK (*Calotropis procera*) plant extracts against termites (*Heterotermes indicola* and *Coptotermes heimi*) Isoptera : Rhinotermitidae. *Pakistan Journal of Biological Sciences* 7 (9), 1603 - 1606.

El-Kamali, H.H. (2001). Larvicidal activity of crude aqueous extracts of *Solenostemma argel* against mosquito larvae. *Journal of Herbs, Spices and Medicinal Plants* 8 (4), 83-86.

Gomez, K.A. and Gomez, A.A. (1984). *Statistical Procedures for Agricultural Research*. John Wiley and Sons, New York. 680 p.

Kirton, L. G. (2005). The importance of accurate termite taxonomy in the broader perspective of termite management. *Proceedings of the Fifth International Conference on Urban Pests*. Chow-Yang Lee and William H. Robinson (Editors).

Schmutterer, H. (1969). *Pests of Crops in North East and Central Africa – With Particular Reference to Sudan*. Stuttgart, Gustav Fischer Verlage Portland. New York, U.S.A. 296 p.

Sidahmed, O.A.A.; Taha, A.K; Mardi, H.G. and Mohammed, T.I. (2009). The efficiency of spraying date palm trees with argel (*Solanostema argel* Hayne) for the control of the white scale insect (*Parlatoria blanchardii* Targ.) (Homoptera, Diaspididae). *Journal of Science and Technology* 10 (1), 142- 149.

تاثير المرشحات المائية لأجزاء نبات الحرجل (*Solenostemma argel*, Del Hyne) علي موت ألنمل الأبيض لتربة القطن (*Microtermes thoracalis* Sjost.) (Isoptera:Termitida)

عمر احمد عبدالله سيد احمد [1] وخالد عثمان علي محمد الدوش [2]
وعوض خلف الله طه [2]

[1]قسم وقاية المحاصيل ، كلية الزراعة - جامعة أمدرمان الإسلامية، ص. ب 382 أمدرمان – السودان.
[2] قسم وقاية المحاصيل ، كلية الدراسات الزراعية - جامعة السودان للعلوم والتكنولوجيا، الخرطوم بحرى - السودان

مؤجز البحث: أجريت تجربة معملية لتقويم فعالية ثلاثة تركيزات (5% و7.5% و10%) للمرشح المائي لنبات الحرجل (*Solenostemma argel*) ضد شغالات وجنود ألنمل الابيض (*Microtermes thoracalis*) في تربة القطن، وإستخدم المبيد الصناعي مورسبان 4 كمبيد قياسي (شاهد). أظهر التحليل الإحصائي فروقات معنوية بين التركيزات المختبرة للمرشح المائي للحرجل والمورسبان 4 مقارنة بالشاهد. أعطي أعلي تركيز للمرشح المائي (10%) والمورسبان 4 نسبة موت بلغت 100% للنمل الابيض. أثبتت الدراسة ملاءمه أجزاء الحرجل لمكافحة النمل الابيض، وتمثل طريقة بيئية جيدة وبديلة للمبيدات المصنعة.