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Effects Of Some Aqueous Plant Extracts As Termicidal Agents On Microtermes Thoracalis Infesting Sugarcane Setts At The Faculty Of Agricultural Sciences Experimental Farm, University Of Gezira, Sudan

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Abstract: ***Termites, Microtermes thoracalis, is a major insect pest in all sugarcane plantations in the Sudan. All recommended insecticides are long persisting and might have a negative impact on sugarcane plantation environment. Some plant substances provide active effects against insect pests on other crops. The objective of this research was to test some of these plants for termite control. Some of these plants substances were tested as aqueous solutions in termite hot-spot area under sugarcane at Gezira University research farm. The plant substances were Clitoria, Capparis, Lantana and bitter apple with a standard insecticide chlorpyrifos and a control. Each plant substance was made as aqueous solution 16 mg/ml (w/v) and the chlorpyrifos was 4.8 mg/ml (w/v) The experiment was arranged in a randomized complete block design with four replicates. Sugarcane setts were dipped in the plant substance solutions and control while the standard was sprayed, as recommended on sugarcane setts. Data collected were germination percentage after two, four, six and eight weeks after planting (WAP) while the damage due to termite was record eight WAP. The results showed significant differences between plant substances and the control for germination percentage eight WAP. However, the highest germination percentage was recorded by chlorpyrifos. The digged out sugarcane setts 8 WAP showed high infestation among plant substances and the control in the range of 70-84%. While the best performance was reflected by the standard chlorpyrifos. It was concluded that the insecticidal activity of long persistence was fundamental for termite control in sugarcane.***

I. INTRODUCTION

Sugarcane *Saccharumofficinarum* is the important source of sugar in all tropical and subtropical countries of the world. Estimates for years 1966 and 1967 showed that the world production of cane sugar was 40 to 41 million tons Within 4 decades the sugar production increased to 136.3 tons (WABCG, 2002). However, sugar cane as a crop is attacked by many pests including stem borers, sugar cane scale insects, and white grubs. Nevertheless Termites have an important place in economic entomology, due to damages they cause to buildings and crops, Damage to buildings in America and Asia, amounting to many millions of pounds, exceed damages caused by natural disasters and fires. However in developing countries they have even more impact, upon destroying local houses as reported by Pearce (1997).

In Sudan, termites were reported in most parts of the country particularly in the southern region (Harris, 1969). However, the sugarcane plantation areas are epidemic due to termite infestation. The damage is great in Kenana and Assalaia and somewhat mediocre in Sennar and much less in Gunied and New Halfa sugarcane plantations (Hassan 1995).

Termites damage on sugarcane show up within 8-12 weeks after planting and in most eases 14 – 37% of the area will be gappy and replanting is needed (Hassan, 1995).

Termites infestation on sugarcane was combat through insecticides use. In the past products of chlorinated hydrocarbons insecticides such as Dieldrin and Endrin were used. However, new products of cyclodynes, orgnophosphates, carbamates, and a nitro guanidine were also used. Hassan (1995). So far insecticides are applied at planting. Nevertheless, insecticides hazards such as pest resurgence, appearance of secondary pests, pests resistance and other environmental hazards should be considered, since sugarcane is a food crop. The situation altogether necessitates continuous search for more potent method of control and new cultural practices to be at hand to combat termites. Thus, the objective of this work was to evaluate the uses of some aqueous solutions of plant substances (Clitoria, lantana, Handal, and Capparis) as a repellent for control of termites attacking sugarcane setts during the first two months after planting.

II. MATERIALS AND METHODS

A. STUDY DESIGN

The experiment was conducted at the research farm of the Faculty of Agricultural Sciences, University of Gezira, Wad Medani (14 24”N, 33 39”E, 407.0 m above sea level). as randomized complete block design (RCB) with four replications to give 24 plots. The cane seed cutts were planted tail to tail before being covered with earth. The plots were immediately irrigated after that. Each plot was containing 30 seed cuts that were distributed among 3 furrows. That is to say each furrow had 10 seed cuts.

B. SOURCE OF SEED CANE

The seed cane, variety Co 6806, was provided by Sugarcane Research Centre Gunied, Gezira state.

C. CULTURAL PRACTICES

The cultural practices were carried out as stated and practiced in sugar cane production companies (Hassan, 1995).

D. EXPERIMENT ON PLANT GERMINATION

a. PLANT SUBSTANCES

The plant substances, were root of Clitoria, *Clitoriaternatea*. root of Lantana, *Lantana camara*. leaves of Capparis, *Capparisspinosa*, and fruit of Bitter apple, *Citrullus colocythis*.

b. SAMPLE COLLECTION OF THE PLANT SUBSTANCES

For Clitoria, Lantana and Capparis the concerned parts were separated an dried under room condition while the fruits of bitter apple were collected from the wild, and left for further dryness, again under room condition. After drying the concerned parts of each plant was milled using moulinex 252 cover food processors miller. From each plant a lot of powder of 160 grams was prepared.

c. PREPARATION OF AQUEOUS SOLUTION

For each plant material a bucket of 15 liter size was assigned .Each bucket was filled to 2/3 (10 L) with tap water. The powder of 160 grams was added to the assigned bucket and agitated for five minutes and allowed under room condition for 24 hours, before being sieved using a muslin cloth.

d. TREATMENT OF SEED CANE SETTS

The treatments used in this experiment were aqueous solutions of plant substances stated above in addition to tap water as a control and chlorpyrifos at 480 grams active ingredient (ai) per100 litre of tap water as standard. Seed cane setts were chopped to give a seed cut of three eye buds. For plant substances, the seed cuts were dipped in the concerned aqueous solution for 5 minutes before being layed in the allotted plots, while the control (water) and the standard (chlorpyrifos) were sprayed on the seed cuts allotted to the concerned plots.

E. EXPERIMENT ON TERMITES TRAPPING

The traps were made from corrugated food packing cartoons. The cartoons were cut into pieces .Each piece size was 9 x14 cm. The piece was rolled to make a cylinder shape of 9 cm length. The cylinder shape was fixed by a ring of money rubber band. For each treatment 30 traps were prepared. For each plant aqueous solutions, 30 traps were dipped in for 5-10 seconds and then allowed it to dry at room temperature condition. Similarly, 30 traps were dipped in the solution of the standard insecticide (chlorpyrifos) and tap water (control).

The traps were rolled to make the cylinder shapes before being taken to the field .Each trap was buried to 2/3 in the earth along the moist water channel branched from Abu 20

The labeled traps were put randomly. The traps were harvested 2, 4, 6 and 8 days later.

F. DATA COLLECTION

The data collected cover the percentage of seed cane germination, termite infested setts and infested traps.

a. GERMINATION PERCENTAGES

The seed canes germination were monitored for 2, 3, 6 and 8 weeks after planting (WAP).

b. PERCENTAGES OF INFESTED SETTS

The percentages damage due to termite infestation was monitored through digging out of seed cane setts in two furrows per plot, 8 weeks after planting (WAP).

c. PERCENTAGES OF INFESTED TRAPS

The harvested traps were sorted out into infested for those harpouring the termite and non-infested for clear traps.

G. STATISTICAL ANALYSIS

The data were analyzed using MSTATA[R] and subjected to appropriate transformation. The one-way analysis of variance (ANOVA) was used to determine the significant association and different among the variables. Duncan's multiple range test (DMRT) was also used to determine significant differences among treatments. Value of P<0.05 was considered significant throughout the study.

III. RESULT AND DISCUSSION

A. GERMINATION PERCENTAGE

Table 1 Showed significant differences among different treatments. However, the two WAP control reflected a lower germination percentage compared to other treatments. There were no significant differences between Chlorpyifos, Lantana and Handal. While Clitoria and Capparis showed significant differences compared to Chlorpyrifos and Handal. Best performance of germination percentage was shown by Chlorpyifos and Handal. Nevertheless, similar result was recorded in 4 (WAP) and 6 (WAP).The result was changed in 8 (WAP) where the control was the least in term of germination percentage while the Chlorpyrifos was the top, followed by Lantana and Handal substances. The germination percentage among treatments of Clitoria and Capparis were the least among plant substances. The insecticidal activity of Handal and Lantana was reported before (Chavan and Nikam,1982, Alias 2012). However the insecticidal component of Handal may be due to saponine, glucocides and alkaloids (Alias,2012). It proves that the high germination levels among plots of Handal and Lantana (Table 1) due to the action of the insecticidal substance of these two plants on the contrary the effect of Clitoria was poor compared to the results reported by (Ali, 2007). This may be due to loss of the insecticidal character after drying of Clitoria as used in this research. Capparis plant may not have an insecticidal component since it is used in Chinese medicine (Bown, 2010). Nevertheless the germination among Chlorpyrifos plots was acceptable, This product was recommended to be used on sugarcane against termite (M. awdalla, Hassan et al 1991 and Hassan et al 2013) because of its long persistence in the environment (Hassan et al 2008, and Elnour and Eljack 2001).

Plant substances	Germination % after planting			
	2 weeks	4 weeks	6 weeks	8 weeks
Clitoria	2.8 (8) b	5.8 (17.9) ab	4.5 (19.7) b	31 (26.6) c
Capparis	2.7(7.3) b	4.9 (15.2) b	4.6 (21) b	29.9 (23.9 c
Handal	3.8(14.8) a	6 (25.1) a	5.1 (26.5) ab	34.7 (32.3) b
Lantana	3.3 (11) ab	5.7 (22.4) ab	5.2 (28) ab	37.3 (34.4) b
Dursban	3.8(15.1) a	6.1 (25.4) a	5.8 (33.3) a	41.6 (36.3) a
Control	1.4 (2.7) c	3.6 (8.6) c	2.9 (11.8) c	21.5 (16.7) d
SE	0.25	0.37	0.47	3.18
CV (%)	16.7	27.9	19.5	26.01

ab = Significant differences between groups/treatments, a, b, & c = represent statistical significant differences within treatments.

Table 1: Effect of aqueous solution of plant substances on germination percentages of sugarcanes at various periods

Data were transformed to square root. Actual data between parenthesis. Means followed by the same letter (s) are not significantly different at 5% level (P<0.005) of significance using DMRT.

B. PERCENTAGE OF TERMITE INFESTATION

Table (2) Showed significant differences among the different treatments. However the percentage of termite infestation was significantly high in control and Clitoria treatments. On other hand the Chlorpyrifos reflected a significantly lower infestation compared to all treatments. Damage due to termite infestation on sugarcane was reported by several authors (Harris, 1971; pearce, 1997; Grace et al., 1989; Elnour et al., 1998). About 53 species of termites were recorded on sugarcane worldwide. Digging out of the cane setts 8 (WAP) Showed the damage of termite that was started at the end of the cane, hollowed the stem and filled it with soil. Similar damage was reported by (Abushama and Kambal 1977). Despite the high germination during the 8 (WAP) the termite infestation was over 70% among all plant substance which indicate that all of them loose their insecticidal character as started in literature(pearce 1997).

From Table 1 and Table 2 one could safely stated that the poor germination among treatments was due to termite infestation.

plant substance	% Termite infestation
Clitoria	83.5 a
Capparis	73.7 b
Handal	69.2 b
Lantana	72.8 b
Chlorpyrifos	43.3 c
Control	84.3 a
SE	7.5529
CV%	26.01

a, b, & c = represent statistical significant differences within 8weeks after planting.

Table 2: Effect of aqueous solution of plant substances on seed canes infested by Termite eight (8) Weeks after planting (WAP)

Means followed by the same letter (s) are not significantly different at 5% level (P<0.005) using DMRT.

C. PERCENTAGE TERMITE INFESTATION ON TRAPS

Table 3 showed that, there were significant differences between treatments. The control reported the highest infestation (70%) while Chlorpyrifos reflected lowest infestation (3.3%). Nevertheless were no significant differences between Clitoria and Capparis treatments (35-37%) and between Handal and Lantana treatments(4.8 and 4.5%) on other hand Chlorpyrifos and control (3% and 70%) each one of them was a hot spot area for termite since 70% of traps were infested with the insect within 8 days in the control. Similar result were reported by (Ali, 2007; Montasir, 2006) in field of sugarcane and groundnut (Hassan, 2010).

Treatment	%Traps collection
Clitoria	35.3b
Capparis	37.1b
Handal	4.8 c
Lantana	4.5 c
Chlorpyrifos	3,3d
Control	70.4 a
SE	6.8
CV%	34

Table (3): Effect of aqueous solution of some plant substances on Traps infested by Termite buried after eight weeks

Means followed by the different letter(s) are significantly different at 5% level (P<0.005) using DMRT.

IV. CONCLUSION

From the results obtained it was conclusion that, long persistence insecticides is fundamental character for termite control. Corrugated cartoon traps was a quick test for presence of termite in the field providing the availability of a moist soil. The plant materials Handal and Lantana were effective Termicidal agents.

V. RECOMMENDATION

Although there is small chance of building resistance among termite through uses of long persisting insecticides as happened in other insects. That is because in termite, insecticides act on workers (sterile females), That have no power to transfer the resistance genes from one generation to another. Long persistence insecticides may affect the environmental balance in sugarcane plantation. Hence future work should concentrate on insecticides with long persistence, effective in termite control and consider the environmental balance such as pyrethroid and other of similar character. All plant substances were proved to be effective against termites but not given in sugarcane. I suggested more future studies to control termite by these aqueous plants extracts especially both Lantana and Handal in other crops.

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