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EFFECT OF SIX WOOD EXTRACTS FROM FAMILY MELIACEAE AGAINST *Psammotermes hybostoma* (DESNEUX) (ISOPTERA: RHIMOTERMITIDAE). B - EFFECT OF SPRING WOOD EXTRACTS

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ABSTRACT

This study was carried out to study the toxic effects of different wood spring extracts from certain woody trees belong to Family Meliaceae in spring against *Psammotermes hybostoma* at the Tropical Farm, Aswan Botanical Garden and Fac. of Science, Aswan Univ. during 2011 and 2012 seasons. The meliaceous trees chosen were *Khaya senegalensis, K. ivorensis, Swietenia mahagoni, S. macrophylla, Azedarachta indica* and *Melia azedarach.* Summarized results revealed that, *S. mahagoni* followed by *K. ivorensis* produced the highest values of total extracts while, *M. azedarach* and *S. macrophylla* produced the lowest values in the two seasons. Using water as a solvent produced the highest values of all wood extracts compared to the other solvents. Moreover, increasing concentrations up to 400 mg/l of the different spring wood extracts resulted in gradual increases in mortality percentage for the 3^{rd} instars of termite. Using 350 ppm of either *M. azedarach* or *K. ivorensis* alcohol + benzene extracts caused the highest values of mortality percentage for *P. hybostoma*. On the other hand, spring wood extract by benzene alone from either *M. azedarach* or *K. senegalensis* at 350 ppm resulted in the most effective treatments on termite compared to the other treatments. According to LC 90 (350 ppm) values, results revealed that either alcohol + benzene extract or benzene extract alone of the tested trees was highly toxic to *P. hybostoma* 3^{rd} instars worker**.** Meanwhile, according to LC 50 values using the lowest concentrations (75 and 100 ppm) of alcohol + benzene extract for *M. azaderach* and *S. macrophylla*, respectively led to toxic effect on *P. hybostoma* equal to the toxicity of other trees at the highest concentration.

INTRODUCTION

Mahogany common name for the Meliaceae, a widely distributed family of chiefly tropical shrubs and trees. In Egypt, most species of this family grow very well throughout the Republic and to be more superior in growth in Upper Egypt. The valuable hardwood called mahogany is obtained from many members of the family and vary in color from golden to deep brown, which produced a valuable wood for carpentry, joinery, furniture, cabinet work, ship building, decorative veneer, decorative boxes and cases. And is also commonly used for window frames, paneling, doors and staircases. It is suitable for light construction, light flooring, vehicle bodies, handles, sporting goods, musical instruments, pulpwood and most of all as pesticides. However, the six successful woody trees are *Khaya senegalensis, K. ivorensis, Swietenia mahagoni, S. macrophylla, Azadirachta indica* and *Melia azedarach* which belong to family Meliaceae. These valuable trees contain certain components which have some biological activity as insect's antifeedant (Nakatani *et al.,* 2000) against several insects.

Extracts are the compounds present in trees that can be extracted by organic solvents. They are found in higher concentrations in the bark and wood of most timber trees and are generally considered to be biosynthesized in order to slow or prevent pathogen invasion. Their production is under strict genetic control, and some individual compounds are limited to individual species. Such compounds such as these are broadly classified as secondary metabolites. The biological value of these secondary metabolites is due to the presence of chemical substances that produce a definite physiological action. The most important of these include: alkaloids, glycosides, steroids, flavanoids, fatty acids, phenols, resins, phosphorus and calcium for cell growth, replacement, and body building (Chidambara. *et al*., 2003). Moreover, green plants posses the broadest spectrum of synthetic activity and have been the source of many useful compounds (Sofowora, 1986). Coincidentally, the last decade has also witnessed increasing intensive studies on extracts and biologically active compounds isolated from plant species used for natural therapies or herbal medicine (Rıos and Recio, 2005).

Subterranean termites are the most destroyers in arid and semi- arid ecosystems (Krishmo, 1989). The sand termite, *Psammotermes hybostoma* (Desneux) considered a serious pest in Aswan Province (Rizk *et al*., 1982, Abdel Wahab and Rizk, 1998 and Abdel Wahab *et al*., 1998). Termites mostly feed on dead plant material, generally in the form of wood, leaf litter, soil or animal dung, and many species of termites are economically significant as pests that can cause serious structural damage to buildings, crops or plantation forests (Shaalan *et al.,* 2006). The various effects of the extracts on these insects included, attractively, repellence, toxicity, stimulation or inhibition of feeding and growth (Carter, 1976 and Hanif *et al*., 1988). Therefore, this study was designed to examine the effects of spring wood extracts of some Meliaceae trees against *Psammotermes hybostoma* (Desneux).

MATERIALS AND METHODS

This study was carried out at the Tropical Farm, Kom- Ombo, Aswan Botanical Garden, Hort. Res. Inst., Agric.Res. Center and Zoology Dept., Fac. of Science Aswan Univ. during the seasons of 2011 and 2012 to study the effect of wood extracts of some tree species on *Psammotermes hybostoma* termite.

Botanical extracts:

Wood species:

Six wood tree species i.e., *Khaya senegalensis, K. ivorensis, Swietenia mahagoni, S. macrophylla, Azadirachta indica, and Melia azaderach* at age of 15 years were investigated in the present study.

Extraction technique:

Wood samples from the main branches (at least 10 cm in diameter) in the spring (15th April) were dried at 70 ° C and milled then ground with 40- 60 mech. Three solvent were used i.e., ethyl alcohol + benzene (1:2 by volume) for 4 h., wood residue were air dried then extracted by benzene for 4 h., as wood residue were air dried then extracted by water for 4 h. according to ASTM D- 1107 – 56 (1989). Wood samples were weighed before and after each extraction then each was calculated as percentage of wood in both seasons.

Termite species: *Psammotermes hybostoma* termite was used in the present study**.** These termites are abundant in arid and semi- arid regions of Upper Egypt, and the highly infested places are these of high moisture content.

Collection and preparation for tests: *P. hybostoma* individuals were collected from several cardboard baits buried in the Saddaka, El- Shallal district, Aswan Province, Egypt. The termite colony was kept in a large plastic container for three months. The container was filled with corsage cardboard as termite feeding. One day prior to test termite workers as externally undifferentiated insects beyond the 3rd instars were counted (50 individuals) and transferred to the test plastic container and starved for 24 h. before the test.

1-Bioassay:

Preliminary screening and toxicological tests: For testing termite workers in both preliminary and LC 50 investigations, a stock solution of crude extract was prepared at 1 gm in 10 ml of absolute ethyl alcohol (100.000 ml/ l) and required concentrations were prepared in ethyl alcohol for preliminary screening and toxicological tests. Crude extracts were screened at descending series of concentrations (10, 50, 100, 200, 300 and 400 mg/ L) to determine the LC30, LC 50 and LC90. In addition control (ethyl alcohol + benzene, benzene and water).

Extracts that caused 100% mortality at 200 ppm were only selected and permitted for testing at the next concentration and so on. Termite workers were subjected to different concentrations (at least five concentrations) of crude botanical extracts (paper pads treated with each conc.) fixed in plastic containers to determine LC 50. About 50 healthy workers beyond the 3rd instars were starved for 24 h. before testing and released into plastic containers containing 50 gm sterile sand and 1 ml distilled water. Containers were incubated at room temperature and mortality percent was recorded after 24 h. Abbott's formula (1925) which was used to correct mortality percentage if the control mortality percent was between 5 and 20%.

2-Statistical analysis:

Data analysis was performed using ANOVA according to the method of Snedecor (1965), and L.S.D. mentioned by Little and Hills (1978). The probate analysis statistical method and Litchified and Wilcoxon (1949) was used to calculate the logarithmic concentration probate line (LC- P lines) and the medium lethal concentration (LC 50), also the high lethal concentration (LC 90) values for each tested extract.

RESULTES

1 - **Wood extracts:**

Data shown in Table (1) illustrate the mean values of spring wood extract percentages of 2011 and 2012 for the tested meliaceous trees as affected by alcohol and benzene, benzene and water as solvents. This study has shown that, there were differences between the wood extract percentages of this trees and the highest content of total extracts in wood can be obtained by *S. mahogany* followed by *K. ivorensis* while, the lowest one can be obtained with *M. azaderach* in the two seasons. Also, there were significantly differences between the solvents used and_the values of wood extract percentages for the studied trees were increased due to using water as a solvent compared to the other applied solvents. Meanwhile, using benzene alone as a solvent resulted in the lowest values of wood extract percentage in the two seasons.

Table (1) : Wood extracts percentage for six species of Family Meliaceae in the two seasons of 2011 and 2012.

Species	Wood extract % by 3 different solvents							
	First season (2011)				Second season (2012)			
	Alcohol & benzene	Benzene	Water	Total extract	Alcohol & benzene	Benzene	Water	Total extracts
Khaya senegalensis	1.08	0.16	2.98	4.22	1.16	0.17	3.12	4.45
Khaya ivorensis	0.96	0.14	3.50	4.59	1.02	0.16	3.65	4.82
Azadirachta indica	1.04	0.26	1.78	3.08	1.13	0.28	1.89	3.30
Melia azaderach	1.20	0.25	1.48	2.93	1.29	0.27	1.57	3.13
Swietenia mahagoni	1.41	0.19	2.99	4.59	1.52	0.21	3.20	4.92
Swietenia macrophylla	0.94	0.21	1.79	2.94	1.01	0.22	1.90	3.14
L.S.D. at 1 %	0.23	N.S.	0.51	0.66	0.23	N.S	0.49	0.66
at 5 %	0.16	N.S.	0.36	0.46	0.16	N.S.	0.35	0.46

2 - Preliminary screening of the wood extracts in winter against *P. hybostoma*:

Data in Table (2) show the preliminary screening of different crude wood extract against 3rd instars of *P. hybostoma* in spring of the two seasons. Data indicated that, increasing concentrations of the different crude wood extracts up to 400 mg/l resulted in gradual increases of mortality percentage for the 3rd instars of termite. However, 10 and 50 mg/l concentrations were the lowest effective for all the tree species, while 300 and 400 mg/l were the most effective treatments in compared to the other treatments. Using 300 mg/l of alcohol + benzene extract from *K. senegalensis, K. ivorensis, A. indica* and *M. azaderach* resulted in the highest values of mortality percentages for termite compared to benzene extract alone. Meanwhile, 300 mg/l of benzene alone for *S. mahagoni* and *S. macrophylla* resulted in the best results. *S.*

macrophylla followed by *M. azaderach* extracts were the most effective treatments compared to the other tree species on the 3rd instars of *P. hybostoma*.

Table (2) : Preliminary screening of different crude wood extracts in spring against 3rd instars individuals of *Psammoterms hybostoma* (24 hr).

Wood extracts in spring		Mortality (%) at concentration mg/ l					
		10	50	100	200	300	400
Khaya Senegalensis	Alcohol&benzene	0	12	22	55	78	100
	Benzene	0	8	18	32	61	100
Khaya ivorensis	Alcohol&benzene	4	11	23	35	82	100
	Benzene	0	13	15	38	81	100
Azadirachta indica	Alcohol&benzene	1	14	24	41	63	100
	Benzene	0	5	17	44	55	100
Melia azaderach	Alcohol&benzene	1	2	71	88	91	100
	Benzene	1	1	22	87	90	100
Swietenia mahagoni	Alcohol&benzene	0	4	32	28	41	100
	Benzene	1	2	11	61	78	100
Swietenia macrophylla	Alcohol&benzene	0	15	41	91	92	100
	Benzene	0	8	32	92	93	100
Control	Alcohol&benzene	1	0	1	9	14	13
	Benzene	1	0	1	7	12	13
	Water	0	0	0	0	0	0

3 - Toxicity of spring wood extract by alcohol and benzene:

Data of toxicity and mortality percentage of spring wood extract by alcohol and benzene tested against 3rd instars of *P. hybostoma* were presented in Table (3). However, the tested trees were significantly differed in their toxicity and mortality percentage.

Table (3): Toxicity and mortality percentage of spring wood extract by alcohol & benzene against 3rd instar of *Psammoterms hybostoma*.

Wood extracts	Concentration (ppm)						
	100	150	200	250	300	350	Mean (A)
Khaya senegalensis	9.25	16.75	24.50	36.50	65.00	81.50	38.92
Khaya ivorensis	24.00	32.75	53.25	61.25	93.25	95.25	59.96
Azadirachta indica	18.75	29.00	37.75	44.25	53.50	92.50	45.96
Melia azaderach	52.75	70.00	75.75	83.25	93.25	99.25	79.04
Swietenia mahagoni	24.00	34.00	45.25	62.50	72.75	91.50	55.00
Swietenia macrophylla	25.25	42.25	64.00	70.25	78.50	87.00	61.21
Mean (B)	25.67	37.46	50.08	59.67	76.04	91.17	
LSD at 1%	A : 11.93	B : 4.91	AB : 12.02				
at 5%	A : 8.62	B : 2.03	AB : 4.96				

A = Wood extracts B = Concentration (ppm) AB = Interaction

The highest mortality percentage was recorded with *M. azaderach* followed by *S. macrophylla* while, using *K. senegalensis* extracts resulted in the lowest one. On the other hand, toxicity and mortality percentage were significantly affected by the used concentrations. The increasing in concentrations up to

350 ppm resulted in gradual increases in mortality percentage. In relation to the interaction between the used woody trees and extract concentrations, it is evident that, using 350 ppm of *M. azaderach* and *K. ivorensis* caused the highest values of mortality percentage when compared to the other treatments.

4 - Toxicity spring wood extracts by benzene :

Data presented in Table (4) pointed out that there were significant increases in mortality percentage for *P. hybostoma* instars due to applying the different woody extract treatments. The highest value of mortality percentage (62.67 %) resulted from using *S. macrophylla* extract against 3rd instars of *P. hybostoma*. Concerning the general effect of the tested concentrations on the 3rd instars of *P. hybostoma* regardless of tree species, it is obvious that, the differences between concentrations effect were significant. The highest value (88.79 %) of mortality percentage resulted from using 350 ppm and the lowest one (26.33 %) was with 100 ppm. In regard to the interaction between tree species and the used concentrations on mortality percent of *P. hybostoma*, it was significant and the maximum mortality (92.25%) was recorded for 350 ppm of *K. senegalensis or M. azaderach*, while the lowest mortality was recorded with 100 ppm of *K. ivorensis*..

Table (4): Toxicity and mortality percentage of spring wood extract by benzene against 3rd instars of *Psammoterms hybostoma*.

Wood extracts	Concentration (ppm)						
	100	150	200	250	300	350	Mean(A)
Khaya senegalensis	18.50	21.00	25.75	41.50	49.00	92.25	41.33
Khaya ivorensis	15.00	27.50	42.50	48.50	79.00	91.75	50.71
Azadirachta indica	35.00	38.50	44.00	53.75	66.75	78.00	52.67
Melia azaderach	21.75	37.50	50.75	62.75	77.25	92.25	57.04
Swietenia mahagoni	30.25	40.50	45.50	58.75	70.50	91.00	56.08
Swietenia macrophylla	37.50	46.50	56.00	69.00	79.50	87.50	62.67
Mean (B)	26.33	35.25	44.08	55.71	70.33	88.79	
LSD at 1%	A : N.S	B : 4.28	AB : 10.49				
at 5%	A : 10.47	B : 1.77	AB : 4.33				

A = Wood extract B = Concentration (ppm) AB = Interaction

5 - Toxicity of spring wood extract by water:

Results of mortality percentages for the 3rd instars of *P. hybostoma* as affected by spring wood water extracts are shown in Table (5). The tested meliaceous trees up to 150 ppm were not effect. Using water as solvent for *K. senegalensis* and *M. azaderach* extract resulted in the highest values of mortality percentage for *P. hybostoma* compared to the other trees. Meanwhile, the lowest values of mortality resulted due to using water extract of *S. macrophylla* and *A. indica.* According to data, application of 350 ppm gave the highest value of mortality compared to the other concentrations. On the other hand, the combined effect of wood extract and the used concentrations show that the highest value (28 %) of mortality percentage was due to *M. azaderach* with 350 ppm.

Table (5): Preliminary screening of water wood extracts in spring against 3rd instars individuals of *Psammoterms hybostoma* (24 hr).

Water wood extracts	Mortality (%) at concentration (ppm)							
	10	50	100	150	200	250	300	350
Khaya Senegalensis	0	0	0	0	6	12	24	25
Khaya ivorensis	0	0	0	0	10	12	13	18
Azadirachta indica	0	0	0	0	3	6	9	14
Melia azaderach	0	0	0	0	1	2	17	28
Swietenia mahagoni	0	0	0	0	1	9	11	15
Swietenia macrophylla	0	0	0	0	5	8	9	12
Control	0	0	0	0	0	0	1	5

Toxicity and mortality of spring wood water extracts against the 3rd instars of *P. hybostoma* are presented in Table (6). It is worthy to notice that the differences between meliaceous trees were not significant. Maximum mortality (31.21 %) was obtained due to using *K. senegalensis* extract. On the other hand, the differences between the concentrations used were significant and using 800 ppm of water extract resulted in the highest value of toxicity (44.29 %) compared to the other concentrations. However, data in this table represented the combined effect of the woody extract and the tested concentrations; it was obvious that there were significant differences between water extracts and their concentrations and maximum mortality (49.00 %) was recorded by using 800 ppm of either *K. senegalensis* or *K. ivorensis***.**

Table (6): Toxicity and mortality percentage of spring wood extract by water tested against 3rd instars of *Psammotermes hybostoma.*

Wood extracts	Concentration (ppm)						
	300	400	500	600	700	800	Mean(A)
Khaya senegalensis	13.25	20.25	26.75	34.50	43.50	49.00	31.21
Khaya ivorensis	5.75	15.50	26.00	36.00	44.00	49.00	29.38
Azadirachta indica	6.00	16.75	20.50	26.50	34.75	42.50	24.50
Melia azaderach	15.25	27.50	29.75	34.00	36.50	41.00	30.67
Swietenia mahagoni	12.25	18.75	22.50	32.75	36.50	43.00	27.63
Swietenia macrophylla	11.00	16.25	24.50	35.75	39.25	41.25	28.00
Mean (B)	10.58	19.17	25.00	33.25	39.08	44.29	
LSD at 1%	A : N.S	B : 2.53	AB : 6.20				
at 5%	A : N.S	B : 1.05	AB : 2.56				

A = Wood extracts B = Concentration (ppm) AB = Interaction

6 - LC_{30} , LC_{50} , LC_{90} and slope data of spring wood – alcohol + benzene extracts:

Data shown in Table (7) represented the values of LC 30, LC 50 and LC 90 and slope data of spring plant- alcohol + benzene tested against 3rd instars larva of *Psammotermes hybostoma.* According to LC 90 values data showed that*, K. senegalensis* , *K. ivorensis, A. indica, M. azaderach, S. mahagoni* and *S. macrophylla* alcohol + benzene extract (350 ppm) was resulted in the same effect and highly toxic to *P. hybostoma* 3rd instars worker. The slope values of LC 90 in *A. indica* and *S. mahagoni,* alcohol + benzene extracts were closely similar (0.11 and 0.11) while, the highest slope value (0.25) was due to *M. azedarach*. According to LC 50 values, Table (7) showed that alcohol + benzene extract of *M. azaderach* and *S. macrophylla* trees were highly toxic against termite workers at 75 and 100 ppm, respectively. On the other hand, LC 30 values of the tested trees show that the lowest concentrations (50 and 75 ppm) of *M. azaderach* and *S. macrophylla*, respectively resulted in moderate toxic effect for *P. hybostoma* compared to the other tested trees.

Table (7) : LC_{30} , LC_{50} , LC_{90} and slope data of spring wood – alcohol + benzene extracts against 3rd instars larva of *Psammotermes hybostoma* .

Wood extracts	L.C. 30			L.C. 50			L. C. 90		
	p.p.m	95%	Slop±S.E	p.p.m	95%	Slop±S.E	p.p.m	95%	Slop±S.E
Khaya senegalensis	200	30.59	12.76 ±1.03	250	50.79	17.38 ±1.92	350	90.00	0.10 ±37889.07
Khaya ivorensis	100	30.02	9.23 ±0.60	150	50.01	14.12 ±1.20	350	90.00	0.13 ±44425.27
Azadirachta indica	200	30.02	18.68 ±3.15	250	50.00	37.53 ±5.80	350	90.00	0.11 ±40613.51
Melia azaderach	50	30.31	5.17 ±0.20	75	50.24	6.26 ±0.38	350	90.00	0.25 ±77799.37
Swietenia mahagoni	100	30.03	7.89 ±0.60	200	50.62	12.91 ±1.33	350	90.00	0.11 ±37144.23
Swietenia macrophylla	75	30.47	5.10 ±0.28	100	50.08	6.65 ±0.56	350	90.00	0.12 ±41083.99

7 - **LC_{30} , LC_{50} , LC_{90} and slope data of spring plant – benzene extract:**

Data shown in Table (8) pointed out that, LC 50 values of the tested Meliaceous trees benzene extract in spring was highly toxic to termite (150 ppm for *S. macrophylla* and *M. azaderach*; 200 ppm for *A. indica*, *S. mahagoni* and *K. ivorensis*; 250 ppm for *K. senegalensis*). Also, LC 50 values of the trees were nearly similar (50.00). The highest slope values were obtained with *K. ivorensis* and *S. mahagoni* (16.70 and 14.41, respectively) while; the lowest value (0.03) was obtained with *K. senegalensis*. According to LC 90 values of the tested trees, tabulated data pointed out that benzene extract tested against 3rd larva of termite was highly toxic (350 ppm) and was similar (90.00). The slope values of *K. ivorensis*, *A. indica* and *S. mahagoni* were typical (0.11), also *M. azaderach* and *S. macrophylla* were typical slope values (0.12).

Table (8) : LC_{30} , LC_{50} , LC_{90} and slope data of spring wood – benzene extract against 3rd instars larva of *Psammotermes hybostoma* .

Wood extracts	L.C. 30			L.C. 50			L. C. 90		
	p.p.m	95%	Slop±S.E	p.p.m	95%	Slop±S.E	p.p.m	95%	Slop±S.E
Khaya senegalensis	250	30.28	24.41 ± 2.54	250	50.27	0.03 ± 0.003	350	90.00	0.07 ± 34041.60
Khaya ivorensis	150	30.21	10.62 + 0.87	200	50.08	16.70 ± 1.49	350	90.00	0.11 ± 39999.80
Azadirachta indica	100	30.76	4.98 ± 0.50	200	50.39	10.73 ± 1.52	350	90.00	0.11 ± 35444.75
Melia azaderach	100	30.22	6.92 ± 0.48	150	50.02	11.86 ± 1.23	350	90.00	0.12 ± 39715.28
Swietenia mahagoni	100	30.16	6.78 ± 0.60	200	50.20	14.41 ± 1.75	350	90.00	0.11 ± 39605.31
Swietenia macrophylla	75	30.72	4.78 ± 0.29	150	50.95	7.60 ± 0.74	350	90.00	0.12 ± 37706.11

8 - LC_{30} and Slope data of spring wood – water extract:

Data in Table (9) show LC30 and slope data of spring plant- water extract against termite. In this table, water extracts of the tested woody trees were approximately similar in their effect on *P. hybostoma* at 500 ppm. The slope values were different among the six tree species extracts and the highest value (14.12) was obtained with *A. indica* followed by *S. mahagoni* (9.34), while the lowest one (6.51) was with *M. azaderach.*

Table (9): LC_{30} and Slope data of spring wood – water extracts against 3rd instars larva of *Psammotermes hybostoma* .

Wood extracts	L.C. 30		
	ppm	95%	Slop ± S.E
Khaya senegalensis	500	30.86	8.37 ± 1.39
Khaya ivorensis	500	30.96	8.23 ± 1.23
Azadirachta indica	600	30.27	14.12 ± 4.35
Melia azaderach	500	30.74	6.51 ± 1.85
Swietenia mahagoni	500	30.20	9.34 ± 2.46
Swietenia macrophylla	500	30.64	7.20 ± 1.42

DISCUSSION

Extracts contents are quite variable within individual species and are also site specific (i.e. the extractive content of two genetic clones of an individual species will vary depending on the site the trees are placed). Values also depend on method of extraction, time of extraction vs. date of felling, amount of heartwood, etc. Extracts of woody plants tend to be under-emphasized in classes devoted to wood chemistry basically because there is no real simple way to describe all the materials that can be formed. This is unfortunate because extracts are responsible for many useful and practical aspects of wood, and they can also be a severe detriment to wood and fiber processing. For example, many researchers revealed that, meliaceous trees contain certain components which have some biological activity as insect's antifeedant (Nakatani *et al.,* 2000) against several insects. Moreover, this investigation confirmed the toxic effects of meliaceous trees as a botanical extracts on instars of *P. hybostoma*; there were differences in their effects as reported by Alfazairy *et al.* (1994); Badshah *et al.* (2004);Shaalan *et al*. (2006) and Olufemi *et al.* (2011). Also, mortality percentages due to the used wood extracts were significantly different from control, suggesting the toxic effect of this family against termites. Abdelgaleil *et al*. (2004) reported that *K. senegalensis* trees have many compounds as limonoids named seneganolide A, 2-hydroxyseneganolide A and 2- acetoxyseneganolide A. These limonoids have a wide range of biological activities, including insect antifeeding and growth-regulating properties, and medicinal activities in humans and animals. They also possess antiviral, antifungal and bactericidal properties (Abdelgaleil *et al*., 2001; Abdelgaleil and Nakatani, 2003; Ademola *et al*., 2004). The present study found that, *S. mahagoni* and *K. ivorensis* were superior in total spring wood extracts compared to the other trees. Moreover, toxicity and mortality percentage of spring wood extract by alcohol + benzene were superior to that of the other solvents except for *S. mahagoni,* in which benzene extract alone was the most effective. Data on toxicity in spring extract (alcohol + benzene) pointed out that *M. azaderach* followed by *S. macrophylla* were the most effective on termite compared to the other trees. On the other hand, data of spring wood extract by benzene alone stated that, *S. macrophylla* followed by *M. azaderach* were the best. However, compared to results of sublethal concentrations (LC 30, LC 50 and LC 90) of the tested extracts, organic solvent, were surprisingly better than water extract one. These results were in accordance with that of Alfazairy *et al.* (1994); Winks and Schimmer (1999) and Shaalan *et al*. (2006). Findings suggested that meliaceous wood extracts may produce larvicidal effects (behaving like general toxicants) against *P. hybostoma*. On the other hand, slope value for each of the tested extracts were quite different; which suggested the presence of different compounds and/ or sites of activity rather than differences in compound concentration.

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تأثير مستخلصات ستة أنواع خشبية تابعة لعائلة الماهوجنى على النمل الأبيض
ب- تأثير المستخلصات المنتجة في الربيع

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تم إجراء هذه الدراسة بالمزرعة الاستوائية بكوم أمبو- الحديقة النباتية بأسوان، وكلية العلوم بأسوان خلال عامي ٢٠١١، ٢٠١٢ بغرض دراسة تأثير مبيدات الحشرات نباتية الأصل والناتجة عن ستة أنواع شجرية تابعة لعائلة الماهوجنى وهى: أشجار الكايا السنغالى، الكايا ايفورنسس، سويتنيا ماهوجنى، سويتنيا ماكروفيلا، النيم، والزنزلخت.

وكان أهم النتائج المتحصل عليها ما يلى:

نتج عن أشجار سويتنيا ماهوجنى أعلى القيم الخاصة بالمستخلصات الكلية في الربيع، يليها أشجار الكايا ايفورنسس، ثم أشجار الكايا السنغالى، بينما نتج عن أشجار الزنزلخت أقل القيم. و تفوق الاستخلاص باستخدام الماء في المستخلصات الكلية بكل الأشجار عن الاستخلاص بالمذيبات العضوية المستخدمة.

كانت المستخلصات الناتجة باستخدام الكحول+ البنزين أكثر سمية عن باقى المستخلصات باستثناء أشجار سويتنيا ماهوجنى حيث كان فيها الاستخلاص باستخدام البنزين أكثر سمية، وكانت أشجار الزنزلخت يليها أشجار سويتنيا ماكروفيلا عند الاستخلاص بالكحول والبنزين أكثر سمية للنمل الأبيض عن باقي الأشجار، وكان أقلها سمية أشجار الكايا السنغالى.

كانت المستخلصات الناتجة عن أشجار سويتنيا ماكروفيلا يليها أشجار الزنزلخت باستخدام البنزين أكثر سمية للنمل الأبيض مقارنة بباقى الأشجار، وكان أقلها سمية أشجار الكايا السنغالى.

فى الربيع، كلما زاد تركيز مستخلصات الخشب سواء المستخلصة بالكحول والبنزين معا أو البنزين فقط تبعه زيادة في نسبة موت النمل الأبيض حتى تركيز ٣٥٠ جزء في المليون، وان كان استخدام ٣٥٠ جزء في المليون من مستخلصات (كحول + بنزين) لأشجار الزنزلخت يليها أشجار كايا ايفورنسس قد أدى إلى الحصول على أعلى نسبة موت للنمل الأبيض.

بناء على قيم LC 90 فقد تساوت المستخلصات العضوية لكل أفراد عائلة الماهوجنى في السمية الشديدة للنمل الأبيض عند نفس التركيز (٣٥٠ جزء في المليون)، وبناء على LC 50 فقد نتج عن الاستخلاص بالكحول + البنزين لأشجار الزنزلخت عند تركيز ٧٥جزء في المليون ولأشجار سويتنيا ماكروفيلا عند تركيز ١٠٠ جزء في المليون سمية للنمل الأبيض مساوية للسمية الناتجة عن الأشجار الأخرى عند تركيز أعلى.

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