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Article

Effect of hot water leaf and bark extract of *Swietenia mahagoni* against the *Culex quinquefasciatus* and *Aedes aegypti* larvae

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Abstract: Mosquito larvae control is essential to prevent mosquito borne diseases such as dengue, Zika, filariasis and chikungunya. Plant extract has the larvicidal properties with less toxicity to other living creatures and no resistance compared to synthetic chemical pesticides. Effect of hot water leaf and bark extract of a forest tree species (*Swietenia mahagoni*) against the 3rd instar larvae of *Culex quinquefasciatus* and *Aedes aegypti* was studied in vitro using five different concentrations (1-5%) of hot water leaf and bark extracts of *Swietenia mahagoni*. It was observed that, 5% concentrated hot water leaf extract was the most toxic killing 70% larvae of *Culex quiquefasciatus* and 50% larvae of *Aedesa egypti* after 24 hours exposure. Similarly, 5% hot water bark extracts killed 65% and 55% of *Culex quiquefasciatus* and *Aedes aegypti* larvae respectively. The minimum LC_{50}, LC_{90} and LC_{95} values of hot water leaf extract of *Swietenia mahagoni* against *Culex quinquefasciatus* Say and *Aedes aegypti* (L.) with 95% confidence limits were 2.662, 6.968, 8.70 and 2.128, 4.964, 6.054 respectively after 72 hours of exposure. In hot water bark extract of *Swietenia mahagoni* against *Culex quinquefasciatus* Say and *Aedes aegypti* (L.) with 95% confidence limits after 72 hours of exposure minimum LC_{50}, LC_{90} and LC_{95}values were 1.780, 6.540, 9.458 and 1.370, 4.570, 6.430. The present investigation revealed the possible utilization of hot water leaf and bark extract of *Swietenia mahagoni* to control mosquito borne disease. Further study is needed to know the active ingredients of the leaf and bark extract of the experimented plant.

Keywords: *Aedes aegypti*; extract; mosquito; larvae; *Swietenia mahagoni*

1. Introduction

Mosquitoes act as a vector for the transmission of several communicable diseases like dengue fever, yellow fever, filariasis, malaria, schistosomiasis, Japanese encephalitis, etc and cause millions of death every year (WHO, 2009; 2010). Filariasis is a parasitic and infectious tropical disease, that is caused by thread-like filarial nematode worms *Wuchereria bancrofti*, is transmitted by *Culex quinquefasciatus* mosquitoes. Dengue fever and dengue hemorrhagic fever are acute febrile diseases which occur in the tropics, can be life-threatening, and are caused by four closely related virus serotypes of the genus *Flavivirus* . Dengue is transmitted to humans by the *Aedes aegypti* or more rarely the *Aedes albopictus* mosquito, both of which feed exclusively during daylight hours (WHO, 2006). Diversity of mosquitoes in Bangladesh is not negligible. There are 123 species of mosquitoes belonging to some genera and sub genera have been reported of which 22 species are of medico-

veterinary important (Irish *et al*., 2016). Begum and Ahmed (1986) recorded 8 species belonging to the genus *Culex* which act as vector in the country.

To prevent mosquito borne diseases it is necessary to control the insect. Mosquito control is a worldwide problem due to their vector nature and resurgence of much infectious disease (Khan, 1999). The control measures may be directed to the control of either adult mosquitoes or their larvae. As larval breeding grounds are confined to limited stagnant water bodies, it is easy to control larvae rather than adult. Different methods such as chemical, cultural, ecological, physical and biological are used all over the world to prevent mosquito. The prime technique to control mosquito all over the world is the application of synthetic insecticides (Ghosh *et al.*, 2012).

Most of the synthetic insecticides are highly toxic to fishes, birds, mammals and require precautions in handling and technical skill in operations. It has a great deal of residual toxicity, which may get multiplied biologically in the food chain.

This has created a world-wide interest in the development of alternative strategies including the search for new type of insecticides and re-evaluation and use of age-old traditional botanicals. Plants act as a vast source of bioactive organic chemicals, which can play a considerable role in mosquito control. *Swietenia mahagoni* (L.) belongs to the Meliaceae family and it is native to the West Indies. It was introduced to Bangladesh in 1980 and now grown in any parts of the country. The plant possesses various secondary metabolites which are responsible for its anti-bacterial, anti-fungal, anti-malarial, anti-diabetic antioxidant, anti-ulcer, anti-viral, anti-diarrhoeal, anti-pyretic and anti-inflammatory properties. This antimicrobial activity encouraged to work on identification of phytochemical and antimicrobial investigation of this herbal plant.

The leaf and bark of the mahoganies are extensively used as febrifuge, which could be associated with its use as an anti malarial drug (Sahgal *et al.*, 2009). Traditionally, different parts of this plant have been used in the treatment of fever, diabetes, malaria, hypertension and tuberculosis (Chen *et al*., 2007). *S. mahagoni* seeds have been applied as a folk medicine for the treatment of hypertension, diabetes, and malaria (Nagalakshmi *et al.*, 2001). As a part of the searching for insecticidal potential of the forest plants, the present study was under taken to test hot water leaf and bark extract of *S. mahagani* on the 3rd instar larvae of mosquito *Culex quinquefasciatus* and *Aedes aegypti*.

2. Materials and Methods

The experiments were conducted to determine the toxic potentiality of hot water leaf and bark extract of *Swietenia mahagoni* against the late 3rd instar larvae of *Culex quinquefasciatus* Say and *Aedes aegypti* (L.) under normal laboratory condition (Air temperature 25º-32ºC, water temperature 23ºC-30ºC, and relative humidity 60%-90%).

2.1. Place of the study

The experiment was carried out in the laboratory of Medical Entomology, Department of Zoology, Jahangirnagar University, Savar, Dhaka from June, 2009 to May, 2010. The laboratory had all the facilities for rearing the mosquitoes and experimental setup.

2.2. Test species

Larval population of the mosquites *Culex quinquefasciatus* Say and *Aedes aegypti* (L.).

2.3. Supplies and equipment

Dropper, plastic pot, plastic cup, sieve, gloves and aspirator were needed as collecting equipment and materials. For rearing, rearing cage, earthen bowl, petri dish, dropper, brush, mosquito net, plastic cup, pipette, cotton, glucose tube, straw infused water, tap water, test plants, cerelac® baby food. Yeast powder, glucose and pigeon were used.

2.4. *Culex quinquefasciatus* larvae collection

The experimental 3rd instar larvae of *Culex quinquefasciatus* Say were wild population; collected from different areas of Savar region such as stagnant drains, ditches, derelict ponds, pits and lakes containing dirty water. The collections were usually made in the morning between 8.00 a.m. and 10.00 a.m. by means of long handled dipper. The larvae along with the breeding place water were transferred into plastic jars covered with netting and then they were taken into the laboratory. In the laboratory, the larvae were cleaned with normal tap water and were kept in water in an earthen bowl. Then the 3rd instar larvae of *Culex quinquefasciatus* Say were separated by dropper. The identification of the larvae of *Culex quinquefasciatus* Say was confirmed following

the keys of system of Bram (Bram, 1967). In the late 3rd instar larvae 8th metathoracic and 7th thoracic setae were long, strongly branched and inserted on support plate but these characteristics are lacking in the second instar larvae. The 3rd instar larvae had two tufts on each side of metathorax, whereas the 2nd instar had only one tuft. Moreover the 3rd instar also had an additional seta on the metathorax which were absent in the 2nd instar. The 4th instar larvae were identified by chaetotaxy and by sclerotization of the tenth segment. In this study late 3rd instar larvae of *Culex quinquefasciatys* Say were used because the late 3rd instar larvae are more susceptible to insecticides than 4th instar. Third instar larvae are actively feed, but 4th instar is slow feeding stage.

2.4.1. *Aedes aegypti* (L.) larvae collection

To collect wild eggs of *Aedes aegypti* mosquito ovitrap was placed in different areas of Jahangirnagar University campus. For the preparation of ovitrap a long strip of filter paper wrapped inside a black colored glass jar. Some water was kept in the bottom of glass jar so that some portion of the filter paper became wetted and moistened. *Aedes* mosquito laid eggs on the moist surface of the filter paper. The egg strips were dried in the air for 1-2 days after collecting the eggs. After that the egg strip was placed in normal tap water for hatching. After one days the egg hatched and new larvae came out. In normal laboratory conditions the hatched larvae of the mosquito were reared. They were kept in an earthen jar and as larval food, daily Cerelac® baby food and yeast granules were provided. The bowls were kept in mosquito rearing cages to prevent egg-laying by other mosquito species. The larvae became pupae after 4th larval molt. When pupation starts, the pupae were separated from the larvae using a dropper and kept in a previously water filled plastic bowl. Then the pupae were kept in mosquito rearing cages for the emergence of adult mosquitoes. In the mosquito-rearing cage adult mosquitoes emerged from the pupae. As food for adults, 10% glucose solution was supplied daily. The male mosquitoes took only the glucose feed throughout their lifetime. For the first two or three days of emergence, the female also took only the sugar feed. From the third day of emergence, the female took blood meal and the glucose meal throughout her life. The blood meals of pigeon were supplied to the females for the autogenous development. For about half an hour to one hour, the pigeon was kept tight on the cage's roof, which allowed the females to suck blood to their full content. After a blood meal females oviposit two to three days later. For laying eggs *Aedes aegypti* preferred clean water. The egg rafts were transferred after oviposition to an earthen bowl filled with water for hatching and then the bowl was kept within a mosquito rearing cage. The experimental larvae were lab reared F1 generation.

2.5. Test plant

Swietenia mahagoni is commonly called as Mehagoni belonging to the family Meliaceae. It is generally grown in the moist and semi deciduous area of Bangladesh such as Chittagong and Chittagong Hill Tracts and plants usually as avenue tree all over the Bangladesh. It is long woody plant of compound leaf. Its fruits have medicinal value for diabetes patient and mainly used for timber importance.

2.6. Collection of plant parts and preparation of extracts

The comparative larvicidal properties of leaves, and bark of *Swietenia mahagoni* were investigated against 3rd instar larvae of mosquito *Culex quinquefasciatus* Say and *Aedes aegypti* (L.). A total of 5 different concentrations of solutions were used. The plant parts were collected from Jahangirnagar University campus and Savar area. For the extraction standard procedures has been followed. For preparation of extract of plant parts that were collected must be fresh and infected parts were avoided.

2.6.1. Preparation of hot water extract

For the preparation of hot water leaf and bark extract following procedures were followed

The plant parts were dried and powdered by mortar-pestle and Blender. It was then filtered through a net filter. The hot water extract commonly known as *Kwath*, (the extraction procedure for Ayurvedic medicine) was prepared from 5 mg of the dried powdered plant materials by adding 100 ml distilled water and thoroughly mixed to make a uniform suspension. It was then boiled till the volume was reduced to 40 ml and filtered. This filtrate was collection 1. The residue was again boiled with 100 ml of water till the volume was reduced to 40 ml and filtered. This filtrate was collection II. The two filtrates were then added and reduced to 20 ml by gentle heating and the mixture was known as hot water extract. Repeating the full process by 5 times 100 ml, of stock solution was being produced. This solution is 100% concentrated.

This 100% concentrated solution is diluted to prepare 5%, 4%, 3%, 2% and 1% by individual dilution. In this process-

5% Solution: 100 ml solution was mixed with 1900 ml of distilled water to make 2 liter of 5% concentrated solution. From this solution the rest of the concentrated solutions were made.

4% Solution: 320 ml of 5% solution was mixed with 80 ml of distilled water to prepare 400 ml of 4% concentrated solution.

3% Solution: 240 ml of 5% solution was mixed with 160 ml of distilled water to prepare 400 ml of 3% concentrated solution.

2% Solution: 160 ml of 5% solution was mixed with 240 ml of distilled water to prepare 400 ml of 2% concentrated solution.

1% Solution: 80 ml of 5% solution was mixed with 320 ml of distilled water to prepare 400 ml of 1% concentrated solution.

2.7. Bioassay

Bioassay of 2 experimental parts that is leaf and bark of *Swietenia mahagoni* was carried out in the laboratory against late 3rd instar larvae of *Culex quinquefasciatus* Say and *Aedes aegypti* (L.). For each test part of the plant, five different concentrations were used (5%, 4%, 3%, 2% and 1%) as hot water extract. Five replications were maintained for each concentration. Five replications were also maintained for control. For each replication 80 ml solution were taken in a disposable cup and 20 larvae were exposed in it. The plastic cups were covered with fine mosquito net to prevent contamination, and then the cups were kept undisturbed. Mortality of larvae was recorded on 24, 48 and 72, hours of exposure.

2.8. Data analysis

The dose response data were analyzed by using Probit Analisis Program Version 1.5 (James *et al*., 1995) developed by the 'Ecological Monitoring Research Division', Environmental Monitoring Systems Laboratory, U. S. Environmental Protection Agency (EPA), Cincinnati, Ohio 45268. The program was used to determine Chi-square, Intercept, slope and lethal concentration (LC) values. Plot adjusted probits and predicted regression lines were also determined by this software. For multiple group comparisons, differences of means among groups were compared using one way analysis of variance (ANOVA). DMRT (Duncan Multiple Range Test), Bonferroni and LSD (Least Square Difference) were done using SPSS (Statistical Package for Social Science) program (version 12). Graphical representations were done using Microsoft Office Excel 2007.

3. Results and Discussion

3.1. Effect of hot water leaf extract

The result showed that after 24 hours of exposure, the hot water leaf extract of *S. mahagoni* was effective against the 3rd instar larvae of *Culex* and *Aedes.* In the larvae of *Culex* highest mortality was observed in 5% concentration killing 70% of the larvae, followed by 45% in 4%, 30% in 3%, 15% in 2% and no mortality observed in 1% concentration and control (Figure 1). In *Aedes* highest mortality also found at 5% concentration killing 50% of the larvae, followed by 40% in 4%, 25% in 3%, 20% in 2% and 10% in 1% concentration. No mortality was found in the control (Figure 2). After 48 hours of exposure, in *Culex* the highest mortality was recorded in 5% concentration killing 80% of the larvae, followed by 60% in 4%, 40% in 3%, 15% in 2% and 5% in 1% concentration (Figure 1). In *Aedes* highest mortality was observed after 48 hours, in 5% concentration killing 65% of the larvae, followed by 45% in 4%, 40% in 3%, 30% in 2% and 15% in 1% concentration (Figure 2). After 72 hours of exposure in *Culex* highest mortality was observed in 5% concentration killing 90% of the larvae, followed by 70% in 4%, 50% in 3%, 25% in 2% and 15% in 1% concentration (Figure 1). In *Aedes* highest mortality recorded at 5% concentration killing 85% of the larvae, followed by 65% in 4%, 50% in 3%, 40% in 2% concentration and 15% in 1% concentration after 72 hours of application. No mortality was observed in the control (Figure 2). Probit analysis revealed the LC_{50}, LC_{90} and LC_{95} values of the hot water leaf extract of *S. mahagoni* with 95% confidence limit against *C quinquefasciatus* were relatively low. LC_{50} value after 24 hours of exposure was 3.96, where after 48 and 72 hours it was 3.34 and 2.66 respectively. LC_{90} value after 24 hours of exposure was 8.15, where after 48 and 72 hours it was 7.26 and 6.69 respectively. LC_{95} value after 24 hours of exposure was 10.00, where after 48 and 72 hours it was 9.04 and 8.70 respectively (Table 1). But probit analysis of hot water leaf extract of *S. mahagoni* with 95% confidence limit against *A aegypti* showed that, LC_{50} value after 24 hours of exposure is 5.61, where after 48 and 72 hours it is 3.85 and 2.58 respectively. LC_{90} value after 24 hours of exposure is 27.79, where after 48 and 72 hours it is 18.79 and 7.80 respectively. LC_{95} value after 24 hours of exposure is 43.74, where after 48 and 72 hours it is 29.45 and 10.66 respectively.

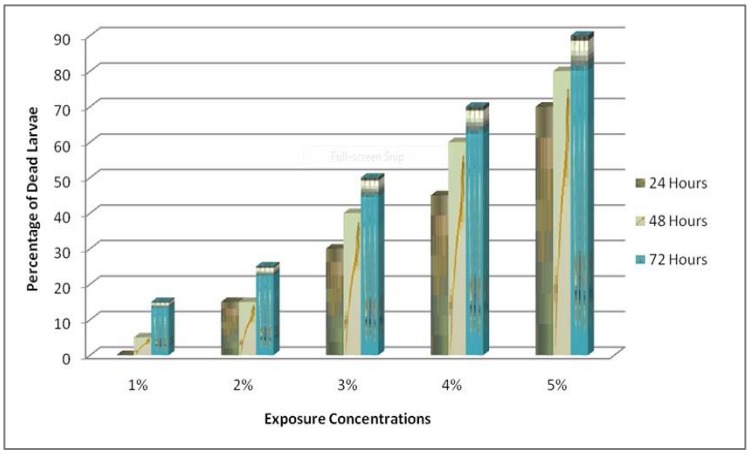

Figure 1. Effect of different concentrations of hot water leaf extract of *Swietenia mahagoni* against the late 3rd instar larvae of *Culex quinquefasciatus* Say after three different hours of exposure.

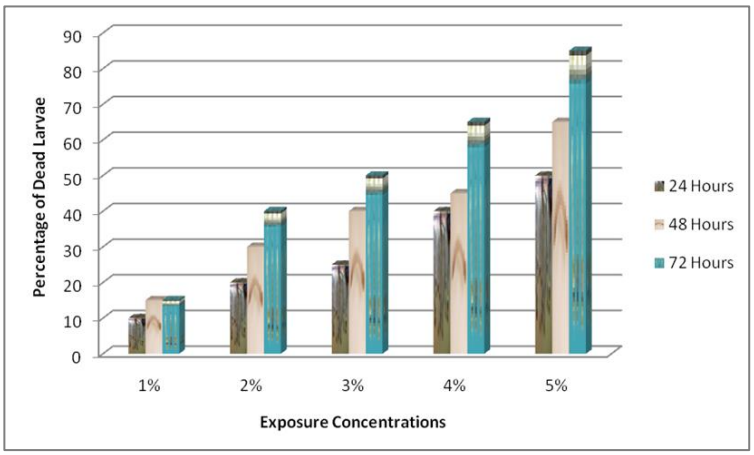

Figure 2. Effect of different concentrations of hot water leaf extract of *Swietenia mahagoni* against the late 3rd instar larvae of *Aedes aegypti* (L.) after three different hours of exposure.

Table 1. LC values of Hot water leaf extract of *Swietenia mahagoni* against *Culex quinquefasciatus* Say and *Aedes aegypti* (L.) with 95% confidence limits at different time points.

OBSERVATION TIME	LC VALUES	95% CONFIDENCE LIMITS			
		Lower		Upper	
		Cu. quinquefasciatus	*Ae. aegypti*	*Cu. quinquefasciatus*	*Ae. aegypti*
After 24 hours	LC_{50}	3.352	3.840	5.039	23.095
	LC_{90}	6.008	10.910	17.184	2651.693
	LC_{95}	6.963	14.407	24.770	10357.308
After 48 hours	LC_{50}	2.802	2.796	4.093	7.656
	LC_{90}	5.473	8.772	13.405	377.328
	LC_{95}	6.449	11.695	19.250	1181.584
After 72 hours	LC_{50}	2.128	1.981	3.269	3.298
	LC_{90}	4.964	5.367	12.480	18.641
	LC_{95}	6.054	6.749	19.016	32.124

3.2. Effect of hot water bark extract

Hot water bark extract of *S. mahagoni* was effective against the 3rd instar larvae of *C. quinquefasciatus* after 24 hours of exposure. Highest mortality observed in 5% concentration killing 65% of the larvae, followed by 50% in 4%, 20% in 3%, 15% in 2% and 5% in 1% concentration. No mortality was observed in the control (Figure

3). In *Aedes* highest mortality occurred at 5% concentration killing 55% of the larvae, followed by 50% in 4%, 30% in 3%, 25% in 2% and 15% in 1% concentration. No mortality was observed in the control (Figure 4) After 48 hours, in *Cullex* highest mortality was recorded in 5% concentration killing 85% of the larvae, followed by 60% in 4%, 40% in 3%, 35% in 2% and 20% in 1% concentration. No mortality was observed in the control (Figure 3). Larvae of *Aedes* showed the highest mortality in 5% concentration killing 80% of the larvae, followed by 75% in 4%, 55% in 3%, 40% in 2% and 30% in 1% concentration. No mortality was observed in the control (Figure 4).

After 72 hours in *Culex* highest mortality was observed in 5% concentration killing 90% of the larvae, followed by 80% in 4%, 65% in 3%, 45% in 2% and 35% in 1% concentration. No mortality was observed in the control (Figure 3). In *Aedes* highest mortality occurred at 5% concentration killing 100% of the larvae, followed by 85% in 4%, 75% in 3%, 55% in 2% and 45% in 1% concentration. No mortality was observed in the control (Figure 4).

Probit analysis revealed the LC_{50}, LC_{90} and LC_{95} values of the hot water bark extract of *S. mahagoni* with 95% confidence limit against *C quinquefasciatus* were relatively low. LC_{50} value after 24 hours of exposure was 4.23, where after 48 and 72 hours it was 2.79 and 1.78 respectively. LC_{90} value after 24 hours of exposure was 10.85, where after 48 and 72 hours it was 9.90 and 6.54 respectively. LC_{95} value after 24 hours of exposure was 14.17, where after 48 and 72 hours it was 14.18 and 9.45 respectively (Table 2).

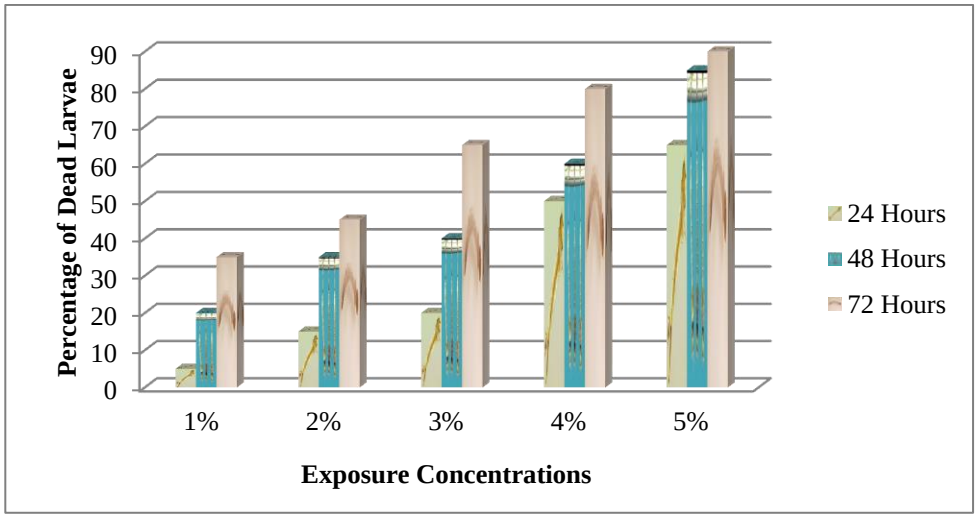

Figure 3. Effect of different concentrations of hot water bark extract of *Swietenia mahagoni* against the late 3rd instar larvae of *Culex quinquefasciatus* Say after three different hours of exposure.

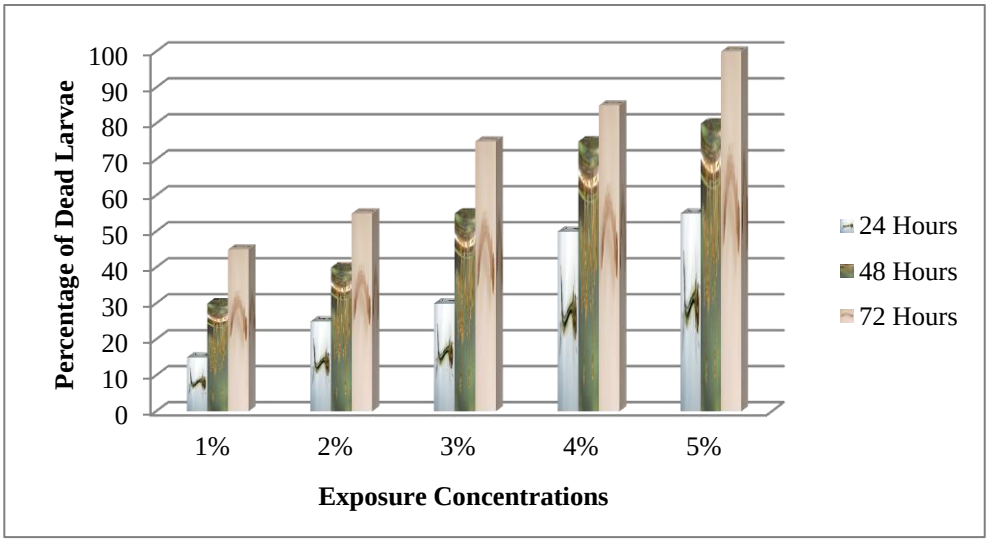

Figure 4. Effect of different concentrations of hot water bark extract of *Swietenia mahagoni* against the late 3rd instar larvae of *Aedes aegypti* (L.) after three different hours of exposure.

Table 2. LC values of hot water bark extract of *Swietenia mahagoni* against *Culex quinquefasciatus* Say and *Aedes aegypti* (L.) with 95% confidence limits at different time points.

OBSERVATION TIME	LC VALUES	95% CONFIDENCE LIMITS			
		Lower		Upper	
		Cu. quinquefasciatus	*Ae. aegypti*	*Cu. quinquefasciatus*	*Ae. aegypti*
After 24 hours	LC_{50}	3.431	3.12	6.159	13.808
	LC_{90}	7.047	10.138	35.128	1924.532
	LC_{95}	8.488	13.654	58.582	8022.632
After 48 hours	LC_{50}	2.088	1.389	3.765	2.927
	LC_{90}	6.174	5.623	35.438	42.736
	LC_{95}	7.944	7.472	70.709	102.226
After 72 hours	LC_{50}	1.106	0.771	2.336	1.824
	LC_{90}	4.431	3.327	17.462	9.227
	LC_{95}	5.790	4.321	35.032	17.029

In Bangladesh like all over the world synthetic insecticides are being used as the major insect control practice. Various formulations such as bait, ULV spray, fumigants, and oil-based suspensions of organochlorine, organophosphate and carbamates compound are applied. For mosquito control Prolethrine, D-Fenothrine formulated in coil, mats or spray. The indiscriminate use of synthetic chemical pesticides raised too many serious problems including genetic resistance by pest species, toxic residues, increasing costs of application and storage, environmental pollution, hazards for handling (Arifuzzahan, 2001).

To get relieve from these public health as well as environmental hazards new techniques have been evolved which include the development of botanical pest control materials from indigenous plants. Many plant extracts of terrestrial and aquatic origin have been reported to suppress mosquito larval population and suggested to be advantageous for field use in mosquito control programs (Saxena and Yadav, 1983).

Vigneshwaran and Lalita (2017) studied Antibacterial activity of seed extracts of *Swietenia mahagoni* and found that the ethanolic extract and ethyl acetate extract of *Swietenia mahagoni* seed at different doses (40, 60, 80mg/ml) level have significant anti-microbial activity. The plant can be considered as low cost, potent, herbal medicine for good anti-microbial activity.

Tohfa *et al*. (2000) reported that crude seed extract of *Anacardium ccidentale, Swietenia mahagoni and Terminalia catappa* can kill more than 70% of larvae of dengue vector *Aedes aegypti* after 24 hours of exposure. Minimum LC_{50} value was recorded in fresh seed extract of *Anacardium occidentale* (1.44) followed by *Swietenia mahagoni* (3.11) and *Terminalia catappa* after 24 hours of exposure at 5% concentration.

Yasotha *et al*. (2020) studied phytochemical and antimicrobial potential of seed and bark extracts of *swietenia mahagoni* (L.) and found that presence of phytocompounds including alkaloids, terpenoids, tannins, and glycosides as major active constituents in the seed and bark of *Swietenia mahagoni*. The seed and bark extracts exhibit positively significant antimicrobial activity against the standard strains. The fungal activity was good in seed extracts, and bacterial activity was significant in bark extracts.

Anacardium occidentale L. contain rich secondary metabolites in their leaf and shoot powder, fruits and other parts that have shown diverse applications. The secondary metabolites present in *Anacardium* plants which display great antioxidant and antimicrobial effects (Salehi *et al*., 2019). Larvicidal activity of *Anacardium occidentale* as an alternative to control *Aedes aegypti* and its toxicity in *Rattusnor vegicus* was studied by Guissoni *et al*. (2013) and found that the lethal concentrations LC_{50} and LC_{90}, of *Anacardium occidentale* were, respectively, 6.55 and 10.98 ppm. The products showed larvicidal potential against *Ae. aegypti* and no sign of toxicity was evident in the parameters analyzed.

Phytochemical screening of *Terminalia catappa* leaf on n-hexane fraction revealed the contents of steroid, terpenoid, saponin, and flavonoid compounds, while ethyl acetate and water-ethanol fraction contained tannin, saponin, and flavonoid compounds. The preliminary test exhibited that water-ethanol fraction possessed the highest larvicidal activity on *Ae. aegypti* larvae with larval death of 96.67% at 2000 ppm concentration (Redo *et al*., 2019). The effect of aqueous, ethanol and acetone extracts of *Terminalia catappa* leaves against the larvae and pupae of *Aedesa egypti* mosquito was studied. Early 3rd instar larvae of *Aedes aegypti* mosquitoes and pupae were exposed for up to three days, to a dilution of 2, 4, 6, 8 and 10% of aqueous extracts and 100, 200, 300, 400 and 500ppm of ethanol and acetone extract of leaves. All tested extracts showed larval mortality. Except aqueous extract, other extracts showed pupal mortality. However, larval mortality was greatest with the

ethanol extract followed by acetone and aqueous extract. Maximum pupal mortality was observed in acetone extract followed by ethanolic extract. Based on Probit analysis, the LC_{50} values of aqueous, ethanol and acetone extract of *Terminalia catappa* for the 3rd instar larvae was found to be 5%, 166.0 ppm and 177.8 ppm and for the pupae it was 169.8 ppm and 161.4 ppm for ethanolic and acetone extract respectively Torres *et al*. (2015) studied characterization and bioassay for larvicidal activity of *Anacardium occidentale* shell waste fractions against dengue vector *Aedes aegypti* and found that The hexane fraction gave the strongest activity among the fractions with an LC_{50} of 4.01 mg/L and LC_{90} of 11.29 mg/L highly comparable to the commercial larvicide, which exhibited an LC_{50} of 1.71 mg/L and LC_{90} of 8.41 mg/L. The dichloromethane fraction exhibited 9.70 mg/L LC_{50} and 18.44 mg/L LC_{90}. The remarkable toxicity effects exhibited by these fractions indicate their potential to provide core structures from which sustainable and environmentally safe plant-based larvicidal agents can be synthesized. From the above discussion it can be interpreted that hot water seed and bark extracts are highly effective against the larvae of *Aedes aegypti* (L.) and in terms of larvae of *Culex quinquefasciatus* Say. From the significant test there is significant difference between bark and leaf, bark and seed, leaf and seed.

4. Conclusions

The present study was conducted to evaluate the comparative toxic potentiality of two different parts of *Swietenia mahagoni* against the larvae of dengue and filarial vector mosquitoes *Aedes aegypti* and *Culex quinquefasciatus.* The experiment was done under the normal laboratory condition (air temperature 25º-32ºC, water temperature 23ºC-30ºC, and relative humidity 60%-90%), with different concentrations 5%, 4%, 3% 2% and 1% to compare their effectiveness against the 3rd instar larvae of *Aedes aegypti* (L.) and *Culex quinquefasciatus* Say. After 24 hours of exposure it was observed that 5% concentrated hot water leaf extract was most toxic killing 70% and 65% larvae of *Cules* and *Aedes* respectively. The lowest LC_{50} value against the *Cu*. *quinquefasciatus* was observed in hot water leaf extract was (1.224), followed by hot water bark extract (4.230). Lowest LC_{50} value was observed against *Aedes aegypti* in hot water leaf extract (1.295) followed by hot water bark extract (4.584). The presence of several bioactive chemicals like alkaloids, saponins, tannins, flavonoids and steroids can be attributed to the susceptibility of the plant extracts as killing agent against mosquito larvae. Biochemical analysis is required to identify the active ingredients which perform as toxic substances against the mosquito larvae. It will help to reduce the use of synthetic insecticides promoting the biological components which will keep our environment healthy and hazardless. The use of botanicals will create a new horizon for upcoming generations.

Data availability

All relevant data are within the manuscript.

Conflict of interest

None to declare.

Authors' contribution

Md. Nazmul Hasan: conceptualization, methodology, data collection, analysis and manuscript writing; Tahmina Akter: conceptualization, supervision, manuscript reviewing and editing; Md. Junayed: manuscript preparation, data analysis, reviewing and editing; Saadia Ahmad: conceptualization, supervision, manuscript reviewing and editing. All authors have read and approved the final manuscript.

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