A Phytochemical approach towards the development of a larvicide against the *Anopheles Gambiae* Larvae

Woquan Sama and Edith O. Ajaiyeoba

Department of Pharmacognosy, Faculty of Pharmacy, Univerity of Ibadan, Ibadan, Nigeria

and

Institute for Advanced Medical Research and Training, Malaria Research Laboratories, Phytomedicine Unit, College of Medicine, University of Ibadan.

Objectives

- To identify plants used as insecticidal agents from the phytomedicine of Nigeria and Cameroon.
- To separate, isolate and identify the compounds in the plants responsible for the larvicidal toxicity.

Methods

- Methanol extracts of all plant parts were extracted into hexane, chloroform and ethylacetate with the aid of a separating funnel.
- Extracts soluble in these solvents concentrated to a soft extract and test solutions of 50, 25, 12.5 and 6.25 mg/ml were prepared by dissolving appropriate quantities of the extracts in ethanol.
- Larvae used for the assay were collected from tyre print breeding sites in Ibadan, Nigeria.
- 1 ml of each dilution was poured into sterile white disposable cups containing 99 ml dechlorinated water and 20 fourth instar larvae were added

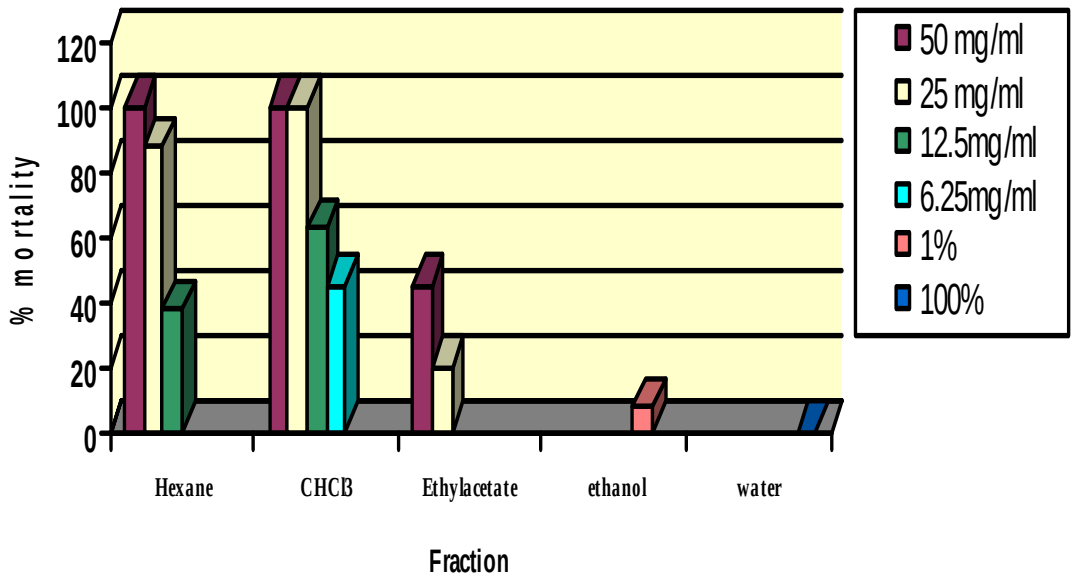
Methods

- After 24 hr contact at room temperature, the number of dead larvae in each cup were counted.
- The larvae were considered dead if they were immobile and unable to reach the water surface.
- Control experiments without the extract and with 1% ethanol were run in the same assay. All experiments were done in duplicates.
- The chloroform soluble fraction of *Q. africana* root bark was subjected to column chromatography and the fractions obtained were also subjected to lavicidal toxicity screening on the Kisumu strain of *An. gambiae.* These were performed at concentration of between 15 and 0.31 mg/ml

Results

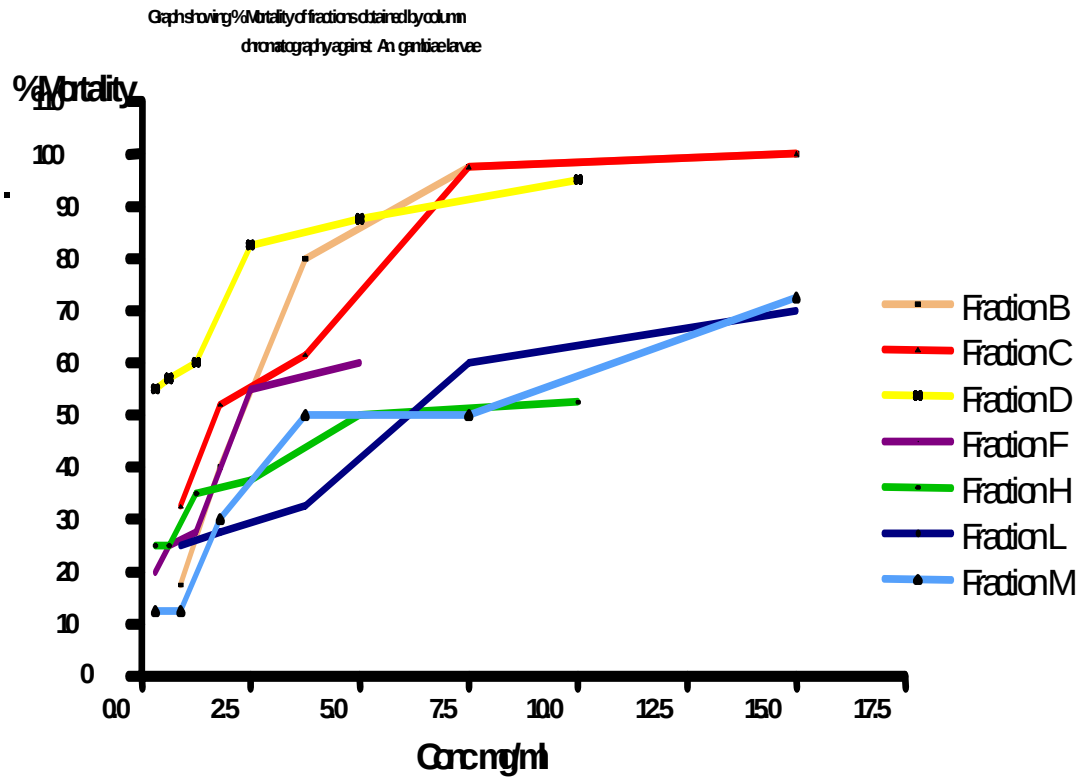
- The chloroform soluble fraction of the *Q. africana* root bark displayed the highest larvicidal toxicity with an IC_{50} of 6.2 mg/ml.

Chart showing larvicidal properties of fractions obtained from the root bark of *Q. africana*



Results

- Fractions obtained from the column were pooled based on thin layer chromatographic results.
- Fractions B, C and D displayed the highest larvicidal toxicities with IC_{50}s of 2.2 mg/ml, 1.4 mg/ml and 0.16 mg/ml respectively.



Discussion & Conclusions

- The most active extract obtained after partitioning the crude extract against different solvents was the chloroform soluble extract. Further separation and isolation this extract on a column, eluting with increasing ratios of chloroform and ethyl acetate yielded fractions with very promising larvicidal activities.
-
- *Q. africana* is a plant from the family Simaroubaceae and plants of this family contain a group of compounds called the quassinoids which display a wide range of biological activities *in vitro* and/or *in vivo,* including antitumor, antimalarial, antiviral, anti-inflammatory, antifeedant, insecticidal, amoebicidal, antiulcer and herbicidal activities.

- The compounds screened during this study have exhibited intrinsic larvicidal toxicity and may serve as good alternatives to vector control agents.

Future perspectives

- Vector control is facing a threat due to the emergence of resistance in vector mosquitoes to conventional synthetic insecticides, warranting either countermeasures or development of newer insecticides.
- Botanical insecticides may serve as suitable alternatives to synthetic insecticides in future as they are relatively safe, degradable and are readily available in many areas of the world. Though several plants from different families have been reported for mosquitocidal activity, only a few have moved from the laboratory to field use.
- Investigating the new sources of natural products to isolate more potent and less toxic quassinoids and structurally modifying the known compounds to retain activity and lower toxicity are still the best possible ways to develop larvicidal compounds.
- Experiments to determine the structures of the compounds responsible for the larvicidal activity are ongoing.