SPONSORS

The European Union and the Governments of the Republic of Uganda, the Republic of Kenya and the United Republic of Tanzania have enabled the journal to revive. Fisheries Scientists and Hydrobiologists from East, Central, Southern, Northern and West Africa, with substantial support from Scientists in the United States, Canada, Europe, Asia, Australia and New Zealand will help support it.

EDITOR

Dr. F.W.B. Bugenyi, Director, Fisheries Research Institute (FIRI) Jinja, Uganda.

THE EDITORIAL BOARD

Dr. F.W.B. Bugenyi
Dr. L. Obeng
Dr. E. Okemwa
Prof. P.O.J. Bwathondi
Prof. A.M.A. Imebvere
Prof. J. Okedi
Dr. F.L. Orach-Meza
Dr. M. Ngoile
Dr. K. Mavuti

Prof. M.A.H. Saad
Prof. M.N. Bruton
Prof. J.H. Magasa
Dr. B. Satia
Prof. G. Ntakimazi
Dr. Yte Wongbe
Dr. K. Matovu
Dr. G. Oguta
Prof. S. Dadzie

THE INTERNATIONAL EDITORIAL COMMITTEE

Dr. R. G. Hecky
Dr. R.H. Lowe-McConnell
Dr. F. Witte
Dr. H. Kawanabe
Prof. P. Denny
Dr. M.J.M. Hootsman

Dr. D. Pauly
Prof. J. Moreau
Dr. G. Fryer
Dr. R. Welcomme
Dr. P. Kelderman

PROGRAMME

The African Journal of Tropical Hydrobiology and Fisheries will only accept original and well supported ideas on techniques, methodology and research findings from aquatic scientists, fishery economists and sociologists.

The Journal will therefore strengthen the African research scientists by making research material available and also increasing the awareness and utility of aquatic resources. Its quality will conform to international standards, and will be published in English and French.

MANUSCRIPT ADDRESS

Manuscripts should be addressed to The Editor, Afr. J. Trop. Hydrobiol. Fish., (FIRI) P.O. 343, Jinja-Uganda.

REPRINTS

Authors will receive 25 reprints free of charge. Extra reprints may be procured on cost.

SUBSCRIPTION

Annual Subscription:
Individuals : US $50.00
Students : US $ 25.00
Institutions : US $ 75.00
Evaluation of indigenous molluscicides in water against schistosomiasis vectors

B. MAKANGA1, A. MONKIEDGE2 AND C. J. OBBO1

1 Zoology Department, Makerere University
P.O.Box 7062
Kampala, Uganda.

2 Institute of Medical Research and Study of Medical Plants (C.E.P.M.)
P.O. Box 11878 Yaounde, Cameroon.

ABSTRACT

Seven varieties of indigenous Phytolacca dodecandra l’Hérit (Phytolaccaceae) were field-tried for molluscicidal potency. Varieties (U96) and (U95) collected from Kabarole and Kabale respectively were the most potent with LD90 equal to 2.54 and 6.46 mg/l respectively. Water bodies ranging between 4,770 and 347,510 litres in Kibinba rice fields were treated with up to 50mg/l. Snails kills were monitored every three months and 92 - 100% mortality rates were realized. HPLC fingerprints revealed the two P. dodecandra varieties to contain highest concentration of the active principle, oleanoglycotoxin-A or lemmatoxin-A.

INTRODUCTION

It was reported from Entebbe Peninsula that out of 358 migrants, 144 were infected with Schistosoma mansoni (ODONGO-AGINYA and MUGISA, 1987). The snail vectors in the peninsula were reported to be Biomphalaria choanomphala and B. pfeifferi. Four years later, LAKWO and ODONG-AGINYA (1991) reported higher snail infection in Kitubulu than in Bugonga area and Nakiwogo. The snail surveys of 1992 at several sites on the shore of Lake Victoria, Fig.1, (Nakiwogo Pier, Kigungu, Botanical Gardens, Bugonga and Fisheries Training Institute (FTI), did not reveal any significant numbers of Biomphalaria spp., the vectors of S. mansoni. It was only from the...
Pier that 14 *B. pfeifferi* were collected. When screened for *S. mansoni* cercariae, they were negative.

The vector for *S. haematobium*, *Bulinus globosus*, was found at all the sites surveyed except at F.T.I. None of the screened *B. globosus*, was positive for the urinary schistosomiasis parasite, *S. haematobium*.

It was concluded that with time, *Biomphalaria* spp. in Entebbe Peninsula had declined tremendously to give new hopes of the disappearance of gastro-intestinal schistosomiasis along the shores of L. Victoria in this area. *Bulinus globosus*, however, poses a big threat of urogenital schistosomiasis as migrants frequent the shore and urinate therein.

Of the 1309 inhabitants of Kibimba Rice Scheme, 258 were found infected with *S. mansoni*. Infection varied from light to moderate (100 - 500 eggs per gram of faeces). Most heavy infections were seen in the age groups 5-9 and 10-19 years (36 and 44\% respectively).

Therefore *Phytolacca* trials were redirected to Kibimba from Entebbe Peninsula because many *Biomphalaria* snails screened were positive for *S. mansoni* cercariae unlike those from the Peninsula.

**MATERIALS AND METHODS**

Semi-ripe berries of four *P. dodecandra* varieties were collected from wild-growing plants, in Gulu (U93), Rakai (U94), Kabale (U95) and Kabarole (Fort-Portal) (U96). They were dried in the shade. A grain miller was used to get a fine powder of each variety.

Ten grams of each variety was sent to the Royal Danish School of Pharmacy, Denmark, for HPLC finger prints.

Laboratory toxicity evaluation was done in order to determine LD50 and LD90 of each variety. Only the water extracts were used. Cold extraction was allowed to proceed for 24 hours. Faecal samples were collected from school-going boys and girls at Nainala Quarters, Labour Line Quarter, Kasobere, Bubusi, Mahoma, Kibimba Quarter, Kibimba Nursery and Kibimba Primary School. Egg counts were done at the Institute of Public Health, Makerere University Medical School.

**RESULTS**

Table 1 summarizes the LD50 and LD90 of *Phytolacca* varieties against *Biomphalaria* snails.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Serial No.</th>
<th>LD50 (mg/l)</th>
<th>LD90 (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopian</td>
<td>E44</td>
<td>2.64</td>
<td>3.53</td>
</tr>
<tr>
<td>Fort Portal</td>
<td>U96</td>
<td>1.88</td>
<td>2.54</td>
</tr>
<tr>
<td><em>Rakai</em></td>
<td>U94</td>
<td>2.73</td>
<td>3.47</td>
</tr>
<tr>
<td>Kabale</td>
<td>U95</td>
<td>4.67</td>
<td>6.46</td>
</tr>
<tr>
<td>Gulu</td>
<td>U93</td>
<td>5.11</td>
<td>6.56</td>
</tr>
</tbody>
</table>

* *Collected from one site only.*

Fig. 1 shows some of the sites along the shores of Lake Victoria where snail survey was done.

Figure 2 shows the HPLC finger prints for (five) *Phytolacca* varieties. This includes variety E44 from the Institute of Pathobiology, Addis Ababa, Ethiopia. The peak heights correspond to the relative quantity of lemmatoxin in each sample. Judging from the origins of the varieties, altitude, temperature and soil conditions seem to influence the composition of the toxins.

Table 2 summarizes the results of the first field *Phytolacca* trials at Kibimba Rice fields. Assessment of toxicity was followed by counting numbers of snails still alive 24 hours after application of the water extract of *Phytolacca*. The results show that indigenous *Phytolacca* berry extracts could be used effectively to control the schistosomiasis vectors and curtail schistosomiasis transmission.
Table 2. Toxicity of Phytolacca varieties U95 and U96 in Kibimba Rice Fields.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Volume of water (m$^3$)</th>
<th>Weight of Phytolacca (kg)</th>
<th>Snails alive after 24 hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>1.35</td>
<td>0</td>
</tr>
<tr>
<td>1°</td>
<td>74</td>
<td>3.70</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>05</td>
<td>0.25</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>35</td>
<td>1.75</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>0.50</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>31</td>
<td>1.55</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>05</td>
<td>0.15</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3 shows the result of Phytolacca trials three months after the first trials.

Figure 3 shows the southern part of Kibimba Rice Scheme where the different sites for Phytolacca trials are located. Water flows from Lake towards site 10, gives off tributaries 3, 10, 8 and crosses the main road towards the North. This study was limited to the southern part of the Rice Scheme.
DISCUSSION

Our findings in Entebbe Peninsula about the snail vectors for gastro-intestinal schistosomiasis, revealed that the vectors present cannot pose a very serious risk of the disease. Similarly, the cleanliness of urinal bilharzia vectors is another sign of relief. Intestinal schistosomiasis was a big worry more than two decades ago. PRENTICE, PANESAR and COLES, 1970; PRENTICE, 1972). The use of Phytolacca. (Endod in Ethiopia), for the control of schistosomiasis dates back to 1964 (LEMA, 1965; 1972). The potential use of Plant Molluscicides against Bilharzia was reviewed a decade ago in a meeting of the UNDP, World Bank/WHO Special Programme for Research and Training in Tropical Diseases Scientific Working Group on Plant Molluscicides (MOTT, 1987). It was felt that there was need to assess not only the molluscidal effects but also the ecotoxicity of the plant under test to non target organisms and also the user.

LAMBERT et al. (1991) were commissioned by IDRC to undertake a comprehensive toxicological study of Phytolacca or Endod. Their findings were that the plant was not dangerous to the user with the exception of slight irritation of the eyes and nose. The plant was found to kill the water fleas, Daphnia and related organisms. Juvenile fish were also found to be affected. Algae, on the other hand, suffered slightly.

Our observations in Kibimba Rice fields also showed that fish fry would get intoxicated at the beginning of the applications; but as water continued to flow, they would recover to normality.

The 100% snail kills observed makes us advocate for the use of Phytolacca dodecandra against schistosomiasis vectors wherever they occur.

ACKNOWLEDGEMENTS

We are grateful to Dr. Akilu, the UNICEF Country representative, for financial support and provision of Endod variety E44. Dr. Lemmisch of the Royal Danish School of Pharmacy, Denmark is acknowledged for the HPLC fingerprints. Our gratitude goes to the Town Clerk of Entebbe for permission to conduct snail surveys in the peninsula. We recognize the co-operation and assistance of RC Chairmen in Kibimba and all the workers.

REFERENCES


