PRELIMINARY SURVEY OF THE FLORA AND FAUNA ASSOCIATED WITH WATER HYACINTH (*Eichhornia crassipes* [MART] SOLMS.) IN GHANA

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Summary

The flora and fauna associated with *Eichhornia crassipes* in streams in the Accra Metropolitan area in Ghana are discussed in this paper. A vertebrate (Ranidae), 8 algae, and 18 invertebrates were found with the plant. The algal species were of three classes; Bacillariophyceae, Chlorophyceae and Cyanophyceae. The invertebrate groups found were; Annelida, Arachnida, Crustacea, Insecta, Mollusca, Nematoda and Tardigrata. Two of the inverts (a tardigrate and a lepidopteran larva) caused some damage to the plant but they cannot be described as biocontrol agents. The range of organisms found associated with plant indicate that they could be important as a biological museum for teaching and research. The association of gastropods, which are the hosts of the bilharzia parasite, and Culicidae, which transmits filariasis, with the plant could pose serious health problems, therefore an effective control strategy is needed.

Introduction

Eichhornia crassipes or water hyacinth is native to South America from where it spread throughout the tropical and sub-tropical parts of the world. The first introduction of the plant into Africa was probably in 1890 in Egypt (Gopal,1987). Since then, it has been reported from other parts of the African continent (Gopal, 1987; Wild,1961).

In Ghana, the plant was first reported in 1984 from the Tema township (de Graft-Johnson, 1988). By 1987, *Eichhornia crassipes* had invaded ditches, ponds, streams and river estuaries of lagoons in the Accra and Tema metropolitan areas. Since then, it has spread quickly,(probably because of its aesthetic value) to other urban centres like Akosombo, Kumasi, Cape Coast and Sekondi-Takoradi.

To the florist the plant has aesthetic value, and may appear harmless, but in large populations, it is regarded as a weed, and often may interfere or compete with man's use of the water. The noxious effects of the plant include the following: it interferes with free movement of boat on the water, it obstructs recreation and fishing; it reduces water flow in irrigation channels; degrades water quality for domestic use; may kill fish; it increases loss of water through evapotranspiration; enhances the breeding of vectors of diseases which serve as agents for dispersal of several diseases, and finally shading of planktonic and submerged communities.

If water hyacinth populations are high reaching weed status, they must be eradicated. Unfortunately there is no simple way to eradicate the plant. Three control methods have been adopted; mechanical, chemical, and biological. Mechanical devices harvest the weeds, and chemicals kill them. Both methods are not effective; at least in third world countries, largely because they are expensive (Sankaran, 1976) and the weeds return sometimes in more devastating proportions. Mitchell (1974) reported that in 1956 and 1957, Zaire spent $ 1 million in an unsuccessful attempt to control *Eichhornia crassipes* in the Congo river. Similarly, for nearly two decades, and not until the introduction of biocontrol agents, Sudan spent nearly 2.5 million Sudanese pounds annually in a chemical eradication programme of this weed.

Biocontrol is a form of population management. It is the use of an organism to reduce a plant or animal population that is not desirable to man. Various insects, such as *Neochetina eichhorniae* and *Neochetina bruchi*, have been

used successfully to control Water hyacinth in the USA, Australia, India and Sudan (Harley, 1988).

Since the reported introduction of this plant into Ghana, no work has been done on the occurrence of local biocontrol agents of the plant. Yet, biocontrol is a vital component in most management schemes for water hyacinth (Harley, 1988). This initial survey is, therefore, aimed at identifying organisms associated with the plant with the view of assessing their pest status. It is expected that an integrated management scheme for the weed in Ghana would be developed using information accruing from this and other studies.

Experimental

The water hyacinth communities selected for this study were located within the Accra metropolitan area, viz:

(a) A roadside community in stream around Kwame Nkrumah circle.

(b) A community in stream around the Tetteh Quarshie circle. In each location, the depth of the water was 1m and there was total (100%) water hyacinth coverage. (c) Kpeshie stream - a stream east of Ghana International Trade Fair Site. Water hyacinth coverage was 60% with an average water depth of 0.8m.

The water hyacinth communities were sampled, twice a month, in February, July and October, 1992. Five samples were collected from each site on each sampling day. Each sample was removed from an area of 1 m^2. The plants were collected from the streams into plastic bowls containing water and sent to the laboratory within 1 hour of collection.

In the laboratory, the plants were put into plastic bowls containing 10% formalin and shaken very well. They were then transferred into another plastic bowl containing water and also shaken very well. The contents of the three bowls were then filtered through Endecotts sieves of aperture 212 μm and 100 μm.

Organisms trapped in the filters were washed into glass bottles containing five percent formalin for preservation. Water from the finer mesh filter was concentrated by filtering it through a plankton bucket of aperture 60 μm and algal samples collected. These were preserved in a mixture of iodine and four percent formalin. The petioles, stems and stolons of the plant were then dissected to expose any organisms in them. The organisms were sorted out and identified.

Results

Various groups of flora and fauna were found associated with *Eichhornia crassipes* from the communities sampled. Table 1 gives the array of algal flora and Table 2 that of the fauna.

TABLE 1

Algal flora associated with water hyacinth in two streams in Accra

Division	:	**Chrysophycophyta**	
Class	:	**Bacillariophyceae**	
		Biddulphia sp.	***(Centrales)***
		Diatoma vulgae	***(Pennales)***
		Navicula sp.	**(Pennales)**
		Cyanochloronta	
Division	:	**Cyanophyceae**	
Class	:	***Anabaena sp.***	**(Oscillatoriales)**
		Oscillatoria sp.	**(Oscillatoriales)**
		Chlorophycophyta	
Division	:	**Chlorophyceae**	
Class	:	***Pediastrum sp.***	**(Chlorococcales)**
		Scenedesmus sp.	**(Chlorococcales)**
		Spirogyra sp.	**(Zgynematales)**

TABLE 2

Fauna associated with various parts of water hyacinth

Plant part	Animal group	Sampling Stations: Circle stream	Sampling Stations: Kpeshie stream
LEAF	ARACHNIDA		
	Caenothrombium albam (Acarina)	3	0
	Tegenaria sp. (Araneae)	0	2
	INSECTA		
	Lepidopteran larva	1	0
PETIOLE, AND STEM	STOLON		
	INSECTA	7	2
	Dytiscidae (Coleoptera)	3	0
	Coenagriidae (Odonnata) naian	2	1
	Povilla adusta (Ephemeroptera) naiad	2	2
	Culex sp. (Culicidae) pupa	1	0
	TARDIGRATA		
	A Tardigrate		
	VERTERBRATE	4	0
	Ranidae		
ROOT	MOLLUSCA		
	Biomphalaria pfeiferi		
	Bulinus globosa	8	3
	Bydrobio sp.	10	2
	Bydrobio sp.	0	2
	Lymnaea stagnalis	15	0
	Pachymelamia sp.	2	5
	CRUSTACEA		
	Simocephalus sp.	2	0
	Daphnia sp.	1	0
	Copepod		
	NAMETODA		
	Diplogasteridae	1	0
	Unidentified forms	7	2
	ANNELIDA		
	Hirudinea (Leech)	0	1
	Oligochaete (Naidid worm)	1	0

Water hyacinth associated algal flora consisted of eight species: there were three diatoms, three green algae and two blue-greens.

In Table 2 is shown the number of vertebrates and invertebrates associated with various parts of the water hyacinth. The Lepidopteran larva (caterpillar) was found feeding on the leaves. It died on the plant by the following day. A tardigrade was found inside one of the several petioles dissected. The worm had eaten away the tissues of the petiole around its body, and damage to the petiole was slight. Young frogs (Ranidae) were the only vertebrates associated with the plant.

Discussion

The wide range of organisms found associated with the water hyacinth are of interest for two main reasons. Firstly, the plant could be important as a biological museum for teaching and research. Secondly the presence of Culicidae which transmits filariasis, and gastropods which

are the hosts of the bilharzia parasite indicate that the water hyacinth could present serious health problems in future. Hence, there is the need for an effective control scheme for the plant.

Out of the 18 invertebrates observed on the plant, two were noted to have caused some damage to it. These two were probably not natural enemies of the water hyacinth since the Lepidopteran larva did not live long on the plant and only one out of several dissected petioles was attacked by a tardigrade, damaging it slightly.

Work is in progress to locate local natural pests of the plant with potential for biocontrol. Attention is being focused on water hyacinth plants which show symptoms of fungal or insect attack. Information arising from such studies could be used in drawing up an effective integrated control programme for water hyacinth in Ghana using local biocontrol agents.

The water hyacinth may continue to spread to new sites. It may be interesting to test some of the biocontrol agents found effective elsewhere such as *Neochetina eichhorniae* and *Neochetina bruchi* provided they have no adverse effect on our local flora and fauna.

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