PEST ADVISORY LEAFLET NO. 46

Plant Protection Service
Secretariat of the Pacific Community

September 2005

WATER HYACINTH

Introduction

Water hyacinth, *Eichhornia crassipes,* is a free-floating (but sometimes rooted) freshwater plant of the family Pontederiaceae (Figure 1). It has attractive flowers and these have been the reason for its spread around the world. Water hyacinth does not cause problems in its native range, the Amazon basin in South America, but outside that area it is a menace. It impacts on human health, food security, water and power supplies, navigation, biodiversity and natural ecosystem functions in many tropical and subtropical regions because of its ability to quickly invade and choke freshwater bodies. It can grow almost anywhere in the tropics, affecting stationary or slow-moving water bodies such as small roadside drains and ponds to large lakes like Lake Victoria in Central Africa or slow moving rivers like the Sepik River system in Papua New Guinea (PNG). Water hyacinth is regarded as the world's worst water weed (Holm et al., 1979) and is among the 100 most troublesome invasive alien species in the world (www.issg.org/database) .

Figure 1: Water hyacinth, *Eichhornia crassipes.*

Distribution

Water hyacinth is native to Brazil. However, it is now a cosmopolitan weed having being spread from it native range and reported from most countries between 40^0 N and 45^0S (Holm et al., 1977). In the Pacific it is reported from American Samoa, Cook Islands, CNMI, Fiji, French Polynesia, FSM, Guam, Marshall Islands, New Caledonia, PNG, Samoa, Solomon Islands, and Vanuatu (Waterhouse, 1985; PIER Database, 2003).

Water hyacinth goes by different names in the Pacific: wota haisin (PNG), riri vai (Cook Islands), bekabe kairanga, jal khumbe (Fiji); bung el ralm (Palau), (PIER Database, 2003).

Description

Water hyacinth is a perennial herb that grows on the surface of freshwater. It has very short stems that are not visible because they stay underwater. Leaves are rosetted, with glossy leaf blades ovate to round on spongy air-filled petioles varying from 10 cm to one metre tall. Plants growing at the water's edge or in less crowded conditions, such as over open water, are much shorter and may have swollen air-filled petioles that help the plant to stay afloat on the surface (Figure 2). The floral parts are characterised by a tall inflorescence stalk with about 8-15 irregular individual mauve or purplish flowers. The middle upper petal of the flower has a distinctive yellowish blotch.

Biology

The flowers generally last for one day before they wither. The inflorescence stalk then bends downwards into the water where it deposits thousands of tiny seeds. Seeds mature 18 days after pollination and thousands of viable seeds are deposited into the water. Most of the seeds stay viable in mud for a very long time – up to 17 years. Seed germination occurs in mud during periods of exposure at low water levels. However, the rapid growth and spread of water hyacinth is usually the result of vegetative reproduction through the development of side daughter plants (stolons) that break off and form entirely new floating plants. In one season a few plants can multiply vegetatively to cover an area the size of a tennis court. Roots are fibrous and plants growing in mud may dislodge when water levels rise and float freely with their roots hanging in the water column. In ideal conditions (warm, nutrient-rich water), water hyacinth grows rapidly with populations doubling in an average of 10 days.

Problems

The formation of stolons results in massive and continous mats of interlocking plants that can clog up

rivers and choke the life out of ponds and lakes (Figure 2).

Some of the most common problems caused by water hyacinth infestations include:

◆ Disruptions to water transportation (by canoes, dinghies, and larger vessels). This was a serious issue in the Sepik River during the early 1990s (Julien and Orapa, 2001). The weed formed thick mats that covered the surface of river canals and oxbow lakes, obstructing people's access to communication, schools, health centres, government services, food gardens, fishing grounds and local markets for sale of crops;

◆ Effects on fish and wildlife can be immeasurable. In severely affected water bodies, fish may die as a result of increasingly anaerobic conditions. Populations of wildlife like water birds, amphibians and reptiles may also be affected;

◆ Changes in water chemistry. Thick mats of water hyacinth affect the chemistry of the water by absorbing large amounts of nitrogen, phosphorus and other nutrients and locking these nutrients up. It may be useful for cleaning polluted water bodies of heavy metals but its presence is not good for normal areas. In addition, the weed physically prevents sunlight (required for photosynthesis) from entering the water and directly affects the growth and survival of microscopic, oxygen-producing phytoplanktons and zooplanktons vital for the food chain and survival of larger organisms like fish;

◆ Loss of water from the surface of ponds and lakes is known to be higher through evapotranspiration than through normal evaporation from the surface of water. This can be a serious issue for irrigation or livestock watering ponds in dry areas.

◆ Damage to infrastructure. The build-up of water hyacinth against fence lines and low bridges, and its growth in dams, irrigation canals, and floodwater drainage systems in urban areas can result in serious and costly damage to these structures;

◆ Obstruction of water flow. The thick mats prevent free flow of water. This can lead to higher incidences of water-borne diseases or promote conditions favourable to disease vectors like mosquitoes and snails and harbour harmful animals like snakes.

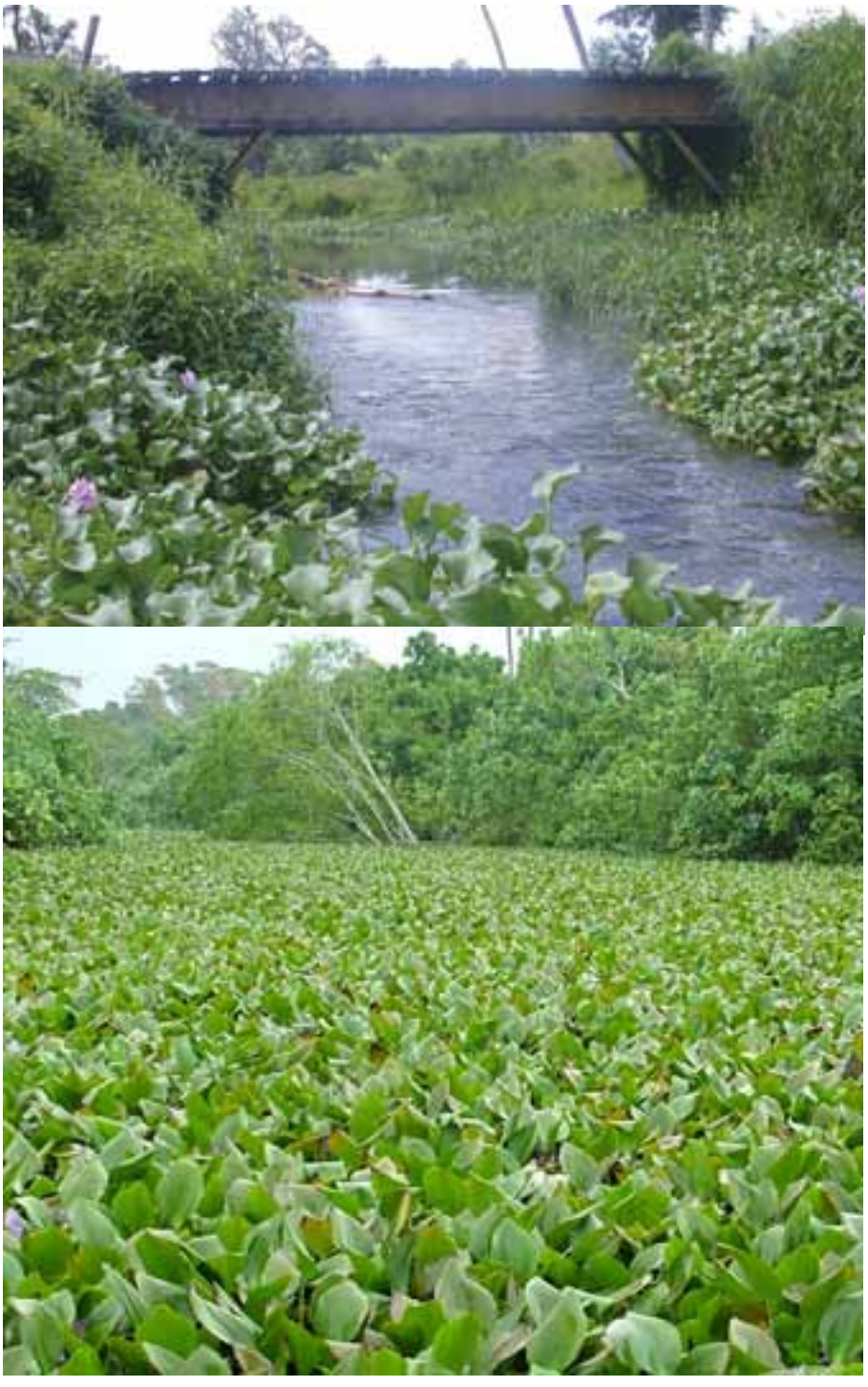

Figure 2: Water hyacinth choked rivers in Vanuatu.

Management of water hyacinth

Prevention

The ideal method of preventing the introduction of this alien invader is through public awareness, particularly on the part of people living near rivers and lakes. The aim should be to prevent the weed being introduced from

Figure 3: Adult *Neochetina eichhorniae* weevil (left), cause scarring of leaves (middle), and larvae (right) damage the crowns of water hyacinth plants, reducing their vigour.

another area, even for personal use in small ornamental ponds or tanks. In some countries, water hyacinth is a prohibited plant by law. When new outbreaks occur, the plants should be destroyed as soon as possible because timing is critical. The longer they are left, the more seeds will be produced and deposited. Long distance spread of water hyacinth is always facilitated by people who find it as an attractive ornamental plant.

Figure 4: Biocontrol can reduce tall vigourous plants (above) into small sickly clumps (below).

Physical or mechanical control

Water hyacinth is easy to pull out of the water or mud and can be killed by spreading it out on dry ground to dry for a few days in the sun. It can then be burnt – with diesel if partially dried. Slashing water hyacinth plants while they are still growing in the water does not kill them but instead promotes further growth and must therefore be avoided.

Chemical control

Herbicides mainly 2,4-D and Glyphosate can kill water hyacinth, but the Secretariat of the Pacific Community (SPC) does not recommend the use of herbicides in waterways because of danger to people using the water resources and to aquatic life such as fish.

Biological control

Using the natural enemies of a weed to suppress its growth is called biological control. A number of effective natural enemies (biocontrol agents) of water hyacinth have been released worldwide for its control. Some of these are available in a number of countries in the Pacific Islands region. The most widely used agents are the weevils *Neochetina eichhorniae* and *N. bruchi*, which together have given good control of water hyacinth and are available in Papua New Guinea and some areas of Australia. *N. eichhorniae* (Figure 3) was released and is available in Fiji (since 1977), Solomon Islands (since 1982) and Vanuatu (in 2004). Additional host-specific biological control agents available in the Pacific region include the pyralid moths *Niphograpta albiguttalis* and *Xubida infusellus*. Both moths are present in Australia but only *X. infusellus* is established at one locality in PNG (Julien and Orapa, 2001).

Biocontrol agents can take anything between 2 – 6 years to become effective. Once established, biological control is permanent and self-sustaining, requiring very little or no additional intervention in the long term as the weed and biocontrol agent reach a point where they live in a state of equilibrium with each other. Their populations then fluctuate seasonally with little impact on people. Plant vigour and sizes should be reduced (Figure 4) and the weed should be too weak to form large floating mats.

Utilisation of water hyacinth

Some efforts have been made to use water hyacinth in cottage industries in Southeast Asian countries for making paper, handicrafts and household

furniture, but there are many limitations. In any case, these uses require only small amounts of the plant and do not solve the massive weed problems water hyacinth creates. Animals (e.g. cattle and pigs) can feed on the leaves, but the plant is mostly water (95% of plant weight). They will have to consume large quantities of the leaves to get any nutritional benefits but too often the animal will get a full stomach. A much more useful way to use water hyacinth can be in the area of biogas production but the problem of harvesting sufficient quantities often from inaccessible areas will have to be solved first.

Integrated control

A weed management programme that integrates physical and biological control methods has been used successfully in a number of places including the Sepik River in PNG, where it is common practice to slash the sides of canals, enabling the current to carry mats of water hyacinth to the sea. Erecting floating booms of bamboo or dry lightweight logs at the entrances to lakes or tributaries of larger rivers could help prevent the spread of water hyacinth into unaffected waterways.

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Photos supplied by Warea Orapa.

Original text: English

Published by the Secretariat of the Pacific Community.
Printed with financial assistance from the European Union.

Secretariat of the Pacific Community Cataloguing-in-publication data

Water hyacinth / Secretary of the Pacific Community.
(Pest Advisory Leaflet, no. 46 / Secretariat of the Pacific Community)
ISSN 1017-6276

1. Water hyacinth – Control 2 Invasive plants — Control
I. Title II. Secretariat of the Pacific Community III. Series

628.97 AACR2
Pacific Agdex 642
ISBN 982-00-0102-1