

IMPACT AND ERADICATION OF WATER HYACINTH (EICHHORNIA CRASSIPES) IN NIGERIA

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ABSTRACT

Once water hyacinth entry into a community water bodies, often it's become hard to eradicate and looks as it has come to stay. One of the worse impacts of water hyacinth is the destruction of biodiversity which well thought-out enormous. Farming as well as economic losses to water hyacinth are always excessive. Control is not an easy task, because mechanical control is considered costly; chemical/herbicides control requires permanent application while biological control is considered delayed and sometimes mixture of achievements as well as failure. Nigeria may adapt from countries that make used of this weed to create opportunities and jobs for its populace.

Keywords: *Impact, Eradication, Water Hyacinth, (Eichhornia Crassipes), Nigeria.*

Introduction:

Water hyacinth (Eichhornia crassipes) (Mart.) originated from Brazil, South America and is one of the world's most predominant aggressive aquatic plants (Wilson et al., 2007). Eichhornia crassipes, it has been popularly described as the most worrying weed on the globe, this is because of its high rate of multiplication. Its stored energy in a semi-succulent stem with a fibrous system of roots (Ndimele et al., 2011). Water hyacinth which before 1984 was alien to Nigeria water systems has now turned into a problem and has spread to almost all

Parts of the country. Records from Nigeria indicate that thirty states out of thirty-six together with Federal Capital Territory in the country are invaded by the plant. Water hyacinth not only disrupting to the environment and ecosystems also passes uncertainties to ecological activities, cultural and the economic realities of the indigenous community especially their day to day activities such as fishing, farming as well as other activities related to water bodies (Chukwuka et al., 2007). In Nigeria, therefore, this aquatic weed (water hyacinth) in inland waters increase generally. Ita in Chukwuka (2007) reported that there are about 76 species of aquatic plants which prove to be weeds. Among all the weeds in Nigeria water hyacinth in particular is of concern because of its higher rate of multiplication as well as colonization.

Water hyacinth (*Eichhornia crassipes*) was introduced to Nigeria and other countries in Africa as an ornamental plant which became a nuisance weed, this has happened due to the advanced level of nutrients in urban industrial and municipal waste water where it lives (Chukwuka, 2007).

Eichhornia crassipes is categorized into three (3) main parts; a fleshy leaf that forms the basis of photosynthetic accumulation, a greenish semi-succulent stem and a rather brownish fibrous root network (Ndimele, 2012).

High propagation causes water hyacinth to increase within 50 days as many as (7) folds. It has been stated that two (2) water hyacinth plants can propagate into 1,200 offspring in 120 days (Ndimele et al., 2012). The plant usually grows in places with high solar energy ranging from 450 to 550 watts per metre square of land. Because of its high photosynthetic fixation ability of up to 1.52%, when compared to typical crops in Sub-Saharan Africa like Maize, with a value of 1.0%, Cocoa (0.5%) Elephant grass (0.48%) and Groundnut (0.29%) therefore, there is no doubt water hyacinth has a rapid growth tendency (Edewor, 1988).

During the cultivation of water hyacinth, especially in the swampy areas of South America, it has a yearly average production of 350-1,700 tons per hectare of wet vegetation (Ndimele et al., 2012). With its high growth rate water hyacinth can easily block waterways.

Origin of water hyacinth

It is popularly reported that water hyacinth was described as a wild plants collected from the Fransico River in 1824 in Amazon Basin Brazil (Monsanto 1996). Although, on the African continent, water hyacinth entered Lake Victoria through the Kagere River which drains the Rwanda and Burundi water catchments in 1990 (Oselana, 1990). the plant is thought to have slip away from an attractive pond in Rwanda into Kagere River which is a major branch of the Lake Victoria.

In the late 1980s and in the early 1990s the water hyacinth has spread very quickly to almost all countries in Africa and it is therefore, a possibility that all fresh water bodies in Africa are likely to be infested by this 'Killer' weed as manifested by its numerous negative consequences. Water hyacinth named killer because of its high rate of multiplication which cannot be eliminated easily, as such leads to destruction of almost all water activities in the environment, in which most of the people as well as other organism's relay on for their survival.

Characteristics of water hyacinth

Under favourable condition of the environment it is easy for the plant to double its number between 5-15 days (Oselana, 1990). Equally, if the plant is free from disturbances its biomass weights 25kg per square metre or 400 tonnes per hectare.

In *Eichhornia crassipes* each flower produces a seed shell which can contain up to 200 seeds and these seeds remain viable for up to 15 years in water, silt or mud (Borokini and Babalola, 2012). Vegetative propagation is the method used by the plant to produce daughter plants that can be produced at about two weeks' stage (Monsanto, 1996).

Reproduction in the plant consists of both sexual and vegetative. The eye-catching flowers are carried in bunches on prickles. The pontederiaceae is one of only two monocot families that show the hereditary polymorphism of thistly in which all flowers of each individual possess one of the three distinct corresponding style and stamen length phenotype. The flower

spike consists of 8-35 flowers arranged in coiled order on a stalk about 15cm long (Wright and Parcell, 1995).

Pollination is by nectar and pollen gathering insects. After the maturing of the flower on spike, then the flower stalk bends so that the inflorescence drops into water. The fruits dispersed and seeds are released into water. After all, the seed then taken away by the movement of water and latter accumulate in the substrate.

Proliferation in water hyacinth occurs when the environment is favourable for growth, and then the plant will require only water or wet mud to germinate. The growth is quicker in eutrophic water that has higher concentration of nutrient with absent or very slow movement of water. Naturally, the system of water hyacinth where the flow of water is hydroponic movement of nutrient is also affected and constantly lower the nutrient over the roots as such leads to massive infestation (Julien and Orapa, 2001).

Current trends on the impact and eradication of water hyacinth

Impact and eradication on the environment and ecosystems

International Union for Conservation of Nature (IUCN) recognized water hyacinth as one of the 100 most destructive weed (Tellez et al., 2008). It has ability to grow rapidly and has high dispersal capabilities as well as rapid reproduction output (Zhang et al., 2010).

In Africa, water hyacinth is recorded as a noxious weed in many countries and is the most prevalent cause's damage to water plant species (Patel, 2012). Estimate cause of damage by water hyacinth for seven African countries reaches up to US \$20-50 Million every year and for the entire African continent it costs as much as US \$100 Million yearly (UNEP, 2006)

Mechanical control and manual

Water hyacinth can be controlled physically which involves emptying of the water body and manual removal of the weeds (Patel, 2012). Machines such as weed harvesters, crusher boats and destruction boat are very costly to buy, approximately US \$ 600-1,200 per hectare (Malik, 2007).

Chemical control

Chemical control method of eradicating water hyacinth is used worldwide to reduce the population through chemical/herbicides (such as Paraquat, Diqaut, Glyphosate, Amitrate, 2,4-D acid) (Villamagna and Murphy, 2010). Aquait animal and plants lives are mostly put at danger by the long-lasting use of the chemicals in which reduces the water quality (Malik, 2007).

Biological control

Scientists have now moved their attention to natural enemies of water hyacinth which include plant pathogens. The purpose of this is not to eradicate the weeds, but to minimize its abundance to a reasonable level in which it is no more noxious to the environment and to ecosystems (Villamagna and Murphy, 2010).

Impact of water hyacinth on Ecological communities

The accumulation of macrophytes and the shape of each species plays a vital role in determining the combination of phytoplankton, zooplankton, fish present in fresh water ecosystems (Meerhoff et al.,2006). The floating nature of water hyacinth enables it to have both a unique and a complex structure in the fresh water ecosystems in which it lives. Change in the initial production of a lake can cause distress within the ecosystem (Mehra, 2003).

Impact on Water quality

The impact of water hyacinth on water quality concentrates mainly on the problems of the accumulation of the carpets formed by the meshing of individual plants. Most recent record of impact are lower phytoplankton increased and dissolved oxygen concentration beneath mat, because virtually there are found in the deeper site of the water (Rommes et al., 2003). Higher sedimentation rates through different roots of the plants is one of the water quality impact and inside water hyacinth mats there is a shortage of photosynthesis which makes it difficult to release oxygen into the water as do phytoplankton and submerged vegetation (Meerhoff et al.,

2003). Because of the limited penetration of light resulted from hyacinth mat a lot of dissolved oxygen reduced within water column.

Impact on Phytoplankton

It is quite challenging for water hyacinth to form on an area which is non-aquatic vegetation, but it can out-compete submersed vegetation and phytoplankton. Water weed like water hyacinth has accessibility to photosynthesized and absorb nutrient from the water column. In some situations, in Nigeria free floating plant like water hyacinth can marginalise phytoplankton and submerged vegetation when natural controls do not exist outside the native range (Brendonck et al., 2003).

However, research shows that where water hyacinths are removed from the water body the number of phytoplankton increased as in shallow reservoir. Another trouble water hyacinth showed was destruction in the production of phytoplankton as well as submerged vegetation more efficiently under their mats, with the exception of some colonial types that may in the first captured within water hyacinth roots (Biendo et al., 2007 in Kateragga and Sterner, 2009).

Impact on Fish

Currently impact of water hyacinth on fish is essentially on the community composition and current food web as well as the density and area cover by water hyacinth. Macrophytes environment with different levels of food availability, plant density, structural complexity and physiochemical factor, vary fish density as well as species composition within the macrophytes community (Grenouille et al., 2002).

Impact on blockage of water ways and hampering agriculture

Complex rate of reproduction and propagation of water hyacinth resulted to the blockage of water ways. These weeds destructed the movement of ships and boat especially in the infested areas in Nigeria, as such dense carpet of this weeds blocked irrigation channels and flow of water becomes difficult to reach the crop areas (Shanab et al., 2010). Clogging of the water

bodies by water hyacinth usually resulted to flood and accumulation of this weed especially in irrigation channels cause great loss in farming. Water hyacinth causes destruction to the fishing activities because tanks and ponds are rendered unfit due to aggressiveness of this weed. At the end there is afraid that this water hyacinth may block electrical materials like turbines as well as obstructing electricity generation.

Recent development in progress

In Florida USA are aimed at the production of a bio-herbicide that can be used in collaboration with present insect biocontrol agents. The target is a bio-herbicide that will help to improve the overall effectiveness of the biological control systems under different control situations (Coetzee, 2011). Therefore, effort aims to hit back (decrease biomass) rather than hit down (weed kill and biomass eradication) plans. There are lots of expectations in future that proposal for high-scale field trials will be underway to develop a commercially viable bio-herbicide formulation (Hill, 2011).

Discussion

Despite many countries emphases in relation to the impact of water hyacinth invasion, there is no any positive account that Nigeria government is certainly serious about eradication of this nuisance weed (Semanya, 2012). As earlier seen Nigeria belongs to the continent which is susceptible to the invasion of such plant and other species all over the globe. Nigeria anticipates noxiousness of water hyacinth is not a serious issue to be giving much attention, because the disruption made by water hyacinth is not directly on agricultural crops or harmful to human health. They always think control of this weed is irrelevant, and costly difficult to eradicate.

In view of the above consideration by government of Nigeria up to now there is no realistic success in the eradication of this weed, and gathering information in relation to this weed has been for the past difficult for Nigeria government especially information within the invaded areas (Gitay

and Nobel, 1997 in Center, 2002). Nigeria government must equip with the knowledge and ways to eradicate this weed as soon as it can, so as to sustain present high danger of difficulty in eradicating it.

Water hyacinth first recorded control effort was in 1905, when sodium arsenate was used in Florida USA, since then expectation of possible research and development in the control of water hyacinth were established. Therefore, information on the control of the plant may be effective and efficiently manage in areas where new infestations are recorded such as Nigeria (Hill, 2004).

Commendably, Nigerian government should for the interest of indigenous people and environment established an effective control of the plant infestation. And a kind of surveillance group to investigate into what type of method to be use.

Conclusion

The menace of water hyacinth to aquatic ecosystems is real. The invasion of water bodies in Nigeria by gathering of this nuisance aquatic weed is menace that must be solved with all amount of seriousness. Approach in the complete elimination of this weed may not be the last alternative because of the high cost and most of eradication ways may do promote disruption to the environment. Nonetheless, all focus now is on biological control method as believed to be the best approach which offers up to date and sustainable option to this menace weed.

However, utilization of this plant in which it can be harnessed and taking into appropriate economic development of the country may in future sound a vital alternative. All these proposals may be successful if there is motivation from the government and other non-governmental organization in form of instituting of trial programmes or factories that make use of the potential natural materials of this weed and transform some of these potential benefits into country sources of creating revenues as well as serves as jobs.

Furthermore, these institutions need motivation, and could be in form of research grants, public campaign to local people in the environment,

extension services especially in the current technology on the utilization of water hyacinth and possible operatives of factories. At the end this may create reduction in poverty within the community as well as the environment at large.

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