Controlling water hyacinth infestation in Lake Tana using Fungal pathogen .In case of Gondar Zuria Wereda, Lemeba Kebela.

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ABSTRACT

Eichornia crassipes is one of the most dangerous aquatic weeds for Lake Tana and other water Bodies of Ethiopia .Use of natural enemies of the weed to discourage its propagation and impact is one of the best recommended options by scientific society.Among them, there are more fungi naturally a pathogen for water hyacinth and other plants. To use those pathogens to manage the highly water hyacinth infestation area of Lake Tana specfically Gondar Zuria woreda , Lemeba Kebela , infected water hyacinth plant material by fungi were collected from Goregora side of Lake Tana. The collection was done from infected water hyacinth leaves by fungi.All isolated fungi(*Zygomycota .,Candidaalbicanaa,Trichoderma ,Aspergillus flavus, Fusarium s,Aspergillus niger,Pencillium and Rhizocotosolani spp)* were attempted to infect the healthy water hyacinth in Lemeba Kebela by spraying 2ooo ml cultured mixed fungi in 20 metre square areas and after three weeks of exprement the fungi were severely affected the weeds and expanded in all wetland areas of lemba kebala that infested by water hyacinth but in some exprement areas the leaf of water hyacinth show disease symptoms after 7 days of fungi releasd on targeted area.

This observational research shows that the fungi were high potential to attack healthy water hyacinth at high enviroment temprature and at less humidity.

Keywords: *Fungi, Eichhornia crassipes, Temprature, Humidity.*

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1. Introduction

Water hyacinth is a free — floating perennial plant native to tropical and sub-tropical South America. It rises above the surface of the water as much as 1 meter in height and have 80 cm root below the surface of water. The leaves are 10–20 cm wide and float above the water surface. They have long, spongy and bulbous stalks. It reproduces primarily by way of runners or stolons. Each plant additionally can produce thousands of seeds each year and seeds can remain viable for more than 28 years [1]. It also doubles their population in two weeks. International Union for Conservation of Nature(IUCN's) has listed this species as one of the 100 most dangerous invasive species [2] and the top 10 worst weeds in the world [3]. The water hyacinth appeared in Ethiopia in 1965 at the Koka Reservoir and in the Awash River[4]. It affects navigation, water flow, recreational use of aquatic systems, and causes mechanical damage to hydroelectric systems [5]. It is also responsible for drastic changes in the plant and animal communities of fresh water environments and acts as an agent for the spread of serious diseases in tropical countries. The impact of Eichhornia crassipes on the physico–chemical characteristics of the water in general are declines in temperature, pH, biological oxygen demand (organic load), and nutrient levels [6].Among controlling mechanisms of water hyacinth infestation in Lake Tana biological method using plant pathogens [7]and Eco-friendly Chemicals [8] have been found highly effective against water hyacinth under experimental conditions. Among biological control, several fungi species are known to cause diseases of water hyacinth have not impacts on commone aquatic plants and fish according to Admas *etal.,2020 [9] report.*Those fungi are *Rhizoctonia solani, aspergillus flavus, Tricothcium roseum, Fusarium spp and Aspergillus niger* and in this research report it attempted to see the consequence of those fungi on Echinochloa and Cyperus papyrus, algae and barbus fishe of the Lake Tana.But, no scientific data were recorded that shows the impacts on those biodiversity . Hence, the aim of this study were

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control the highly water hyacinth infestation area of Lemeba Kebela of Lake Tana by those fungi and other indignious fungi to studied area .

2. MATERIAL AND METHODS

2.1. Study Area

The study areas were located in northern part of Lake Tana, Maksegnte woreda at Lemeba Kebela.

2.2. Sampling method

Diseased water hyacinth leaves (showing browning, wilting, yellowing, spots, blights, or combinations were collected randomly from biological control experment ponds of water-hyacinth and in the wet lands areas of Lake Tana at Goregora . Fungal pathogens are able to infect various plant parts such as roots, stems, leaves, flowers and fruits, inducing characteristic visible symptoms like spots, blights, anthracite and wilts. Collected infected parts of waterhyacinth was cut into small pieces. After washing the tissues thoroughly in sterile water, the causal fungi are isolated from plant tissues exhibiting clear symptoms. The infected tissues along with adjacent small unaffected tissue are cut into small pieces (2–5 mm squares) and by using flame-sterilized forceps, they are transferred to sterile petridishes containing 97% ethanol used for surface sterilization of plant tissues. The plant parts were transferred to PDA plates and incubated for 5-7 d for the complete growth of fungi. The fungi were identified according to cultural characters [10,11 and 12] .

The isolated fungi both in wetland areas and ponds were *Zygomycota .,Candidaalbicanaa ,Trichoderma ,Aspergillus flavus, Fusarium , Asperg illus niger spp,Pencillium and Rhizocotosolani spp.*

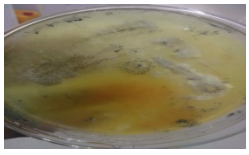

Figure 1.*Zygomycota fungi*

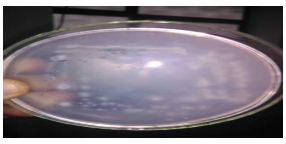

Figure 2.Candida albicana and *Trichoderma fungi*

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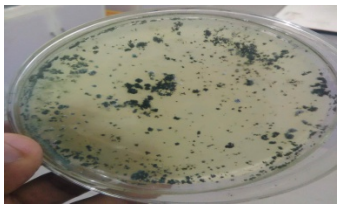

Figure 3. *Aspergillus flavus, Asperg illus niger spp and Pencillium fungi*

3. Results and discussion

Eight fungi species were attempted to affect the healthy water hyacinth in the wetland areas of Lemeba Kebela,Lake Tana . Those fungi were *Zygomycota .,Candidaalbicanaa,Trichoderma ,Aspergillus flavus, Fusarium,Aspergillus niger,Pencillium and Rhizocotosolani spp.* The isolates showed minimum lesion growth during the first week. The released fungi to water hyacinth were start to attack the heakthy water hyacinth leaf and stem when the season becomes hot and the fungi became adpated the enviroment . After three weeks of the experment as shown below in **figure 1** the fungi affected healthy water hyacinth and the leaf became necrotic **.**

Figure 1. After 3 weeks of the experment Decmber 2019

This observation research showed that when the temprature increased disease severity was proportionally increased as shown below in **figure 2 and 3** in diffrent month**.**

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Figure 2.After 5 weeks of the experment on January 2020.

Figure 3.After 9 weeks of the experemnt on April 2020.

But, when the temprature became cold and during rainy season the infected waterhyacinth by fungi start propagated by un dead stem parts and grow new water hyacinth plant by its seeds as shown in **figure 4**

Figure 4. After 16 weeks of the experment in June 2020.

For comparisions to see the effcts of the fungi on water hyacinth and un treatead water hyacinth by fungi , this research study has taken Sheha - Gomenga Kebela wet land that highly infested by water hyacinth and not linked with Lemeba Kebela wetland for control and as shown **in Figure 5** did not show a disease symptoms compared with Lemeba Kebela

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Figure 5.Control in April 2020 at Sheha Gomenga .

Similarly, pathogencity tests of indigenous fungal pathogens on water hyacinth were tried in different countries. For instance, in Lake Victoria, Lake Naivasha and Nairobi Dam in Kenya were tried with 20 strains of pathogenic fungi. The Pathogenicity tests indicated that *Cercospora, Fusarium* and *Alternaria* spp. were diagnosed as potential mycoherbicides[13] on water hyacinth. Martinez and Charudattan (1998) reported that *Alternaria* spp. and *Fusarium* spp. were highly virulent and severely damaged the inoculated water hyacinth leaves. Accordingly our research finding also related with this author because in our case *Fusariume fungi* was one of the promising biological control of this study.

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4. CONCLUSION AND RECOMMENDATION.

Zygomycota,Candida albicanaa, Trichoderma ,Aspergillus flavus, Fusarium ,Asperg illus niger,Pencillium and Rhizocotosolani spp fungi were synergistically can minimize water hyacinth expansion in Lake Tana at high temprature and less humidity. Therefore , after releasing those fungi to target area of the water hyacinth infestation area, the healthy water hyacinth is expected to become dead by fungi and this research finding highly recommend to collect the dead water hyacith manually and mechanically immediatelly .Also, it will be better to study other fungi effcts on water hyacinth in the rain seasons.

Finally, most parts of the lake is thretened by water hyacinth and exposed for soil sedmentation in side of Dembeya, Maksegnete and Fogera dstrictes since this places of the Lake edge have accessed for erosion soils .Since this soil holds nutrients and make a good opportunity for spreads of water hyacinth, but the lake that surrounds by Bahrdar city have not observed this weed because it has not get the chance to get favorable nutrient source in the forms of agricultural run off. Therefore, in addition to apply the above mentioned fungi to minimize the infestations of water hyacinth,also , if urbanization is expaneded in all Tana lake edges the lake will protected from any enviroment pollutanet since at the time standardized buffer zone is established and the lake will never have a chance to connect with any enviroment pollutanet source.

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