

Caribbean Science and Innovation Meeting 2019

Theme of **Biodiversity** (including knowledge, preservation, valorization, sustainable agriculture and bioeconomy)

Management of the water reservoir of Gaschet affected by a colonizing species: The water hyacinth (*Eichhornia crassipes*)

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Extended abstracts

Context and objectives

The county council of Guadeloupe created in 1988 the largest fresh water reserve (Gaschet) to allow the development of agriculture in the driest area of this island. This artificial water body has an area of 115 hectares with a capacity of 2.7 million m³. The water hyacinth appeared in Gaschet at the end of 2010. Currently, it is the predominant aquatic plant species. The development of this invasive plant according to the criteria of IUCN (2008) and DEAL (2013) is a matter of concern. Environmental contamination by heavy metal and pesticides is a worldwide problem. *Eichhornia crassipes* showed a hyper-accumulation capacity for lead, chromium, cadmium and arsenic. The hyperaccumulation of this plant needs to be confirmed for a large range of pollutants.

The objective was to characterize: its current expansion, the effect of the season on the biomass stock present on the pond, its impact on the water resource. We also determined heavy metal and pesticide bioaccumulations in water hyacinth.

Material and Methods

The fresh mass of mature plants was measured in Gaschet reservoir. The mapping of the study area was based on aerial orthophotography (Aerotropix, mapping with Qgis). The estimation of the hyacinth area allows to estimate the hyacinth biomass in Gaschet during wet (December 2017) and dry (April 2018) seasons. The potential of water loss (ETR) of the mature plant under greenhouse conditions is permitted to estimate the evapotranspiration in the reservoir. The water and sediments of Gaschet present heavy metals (i.e. Pb, Ba, Li, Al, As, Co, Ti, Hg), and pesticides (i.e. glyphosate - 2,4D - Asulame). In this study, 7 heavy metals and 179 pesticides have been measured in different compartments of the water hyacinth (root, petiole, leaf).

Results and discussion

According to the literature, this species has a strict vegetative reproduction in Guadeloupe. Our results (figure 1) also show that the area covered by living hyacinth was halved during the dry season with a total biomass decreased from 1,425 tons to 713 tons. Water losses by evapotranspiration from mature hyacinth amount to 898 g/d/plant, corresponding to 277,000 m³ of water lost in 4 months (ie 10% of the water resource of the pond).

The first results show that the hyacinth at Gaschet contains no pesticides. On the other hand, it contains heavy metals (Arsenic, Cadmium, Chromium, Copper, Nickel, Lead and Zinc) (Figure 2). However, in low amounts in the shoot parts. The dead roots are always more concentrated in metals than shoot.

Recommendations

The physical extraction of the plant in Gaschet will be planning at the end of the dry season with mechanical collection. The compost will be a means of economic recovery. This species it is also capable to accumulate heavy metals. Further studies are therefore still necessary to determine, how best to manage the water hyacinth in Gaschet (phytoremediation, carbon energy or organic matter for crops).

Conclusion

Management of hyacinth should be established to prevent the development of hyacinth biomass on the site. This species already consumes a significant fraction of the water resource and the low accumulation of pollutant in the plant could allow different ways of valorization of this biomass (compost, forage, biogas ...)

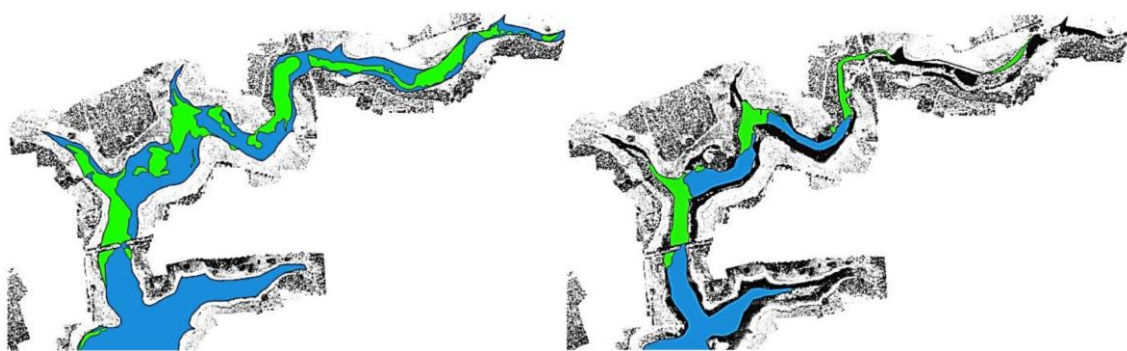


Figure 1 - Mapping of the Gaschet area in wet season on the left and in dry season on the right. Our work allowed us to estimate the loss of biomass between the wet and dry season at 50%, and the loss of water due to the hyacinth at a volume of more than 10% loss of water mass in the reservoir.

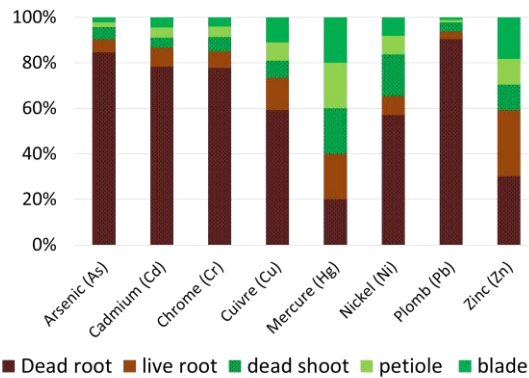


Figure 2 – Heavy metals distribution in water hyacinth