

## **TREATMENT OF DOMESTIC WASTE WATER BY THE USE OF PLANTS IN THE ARID ZONES (ALGERIAN NORTHERN SAHARA)**

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### **ABSTRACT**

Arid zones are poor in water resources. This rarity led to minimize the consumption of these heritage and to think of the re-use of waste water in the irrigation after preliminary treatment. Biological epuration by adapted plants represents one of the effective techniques for the treatment of wastewater. Therefore, the aim of present research was to study the efficiency of this technique by analyzing the water obtained from the Wastewater Garden station in the region of TEMACINE. The results showed the capability of this system in the elimination of suspension materials. We have registered a low turbidity and a minimal value of concentration (about 24, 57 mg/l) in the downstream of the station.

The reduction of suspension materials contributes to good yield on DBO5 and DCO. Concerning bacteriological analyses we have registered a better elimination of most bacteria (total and fecal coliformes, the total and fecal Streptococci and the Escherichia coli).

**Keywords:** Wastewater Garden, wastewater, water quality, Temacine, Algeria

### **1. INTRODUCTION**

In front of the necessity that has now become imperative to protect water resources and to contribute to the protection of the public health, very numerous concepts of waste water treatment have been developed. The general principle of purge of waste water by the standing beds of macrophytes is based on the use of ecosystems where the plants take the predominant place. Generally, the system uses the gravity flow of water, and does not require supplemental energy supply. Our work aimed to study the efficiency of a new system of purge; natural process by using plants to treat waste water (purge by plants). The system located near to the old Ksar of Temacine in the wilaya of Ouargla.

### **2. MATERIALS AND METHODS**

The experimental site is a station of wastewater treatment by macrophytes, it is situated near the old Ksar of Témacine in the south-east of Algeria. The water is accumulated in a septic tank, then is derived to the basin of treatment which has a surface of 400 m<sup>2</sup>. Plant species are planted in this basin using a bed of gravel. (Fig. 1) The treated water from the basin is collected in a container of control which is connected directly to a zone of subterranean irrigation of 468 m<sup>2</sup>. The used plants are

known by their hyperaccumulation capacity as the rush, the sledgehammer, the papyrus, the oleander etc.

In our work, we have based on the organoleptic parameters. In parallel, we have made the physico-chemical analysis.

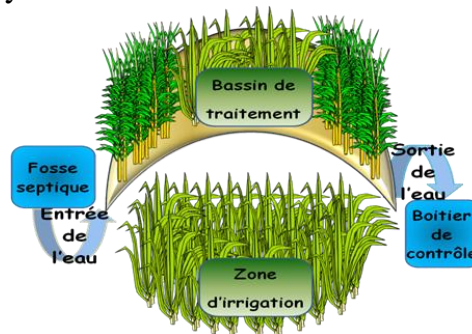


Fig.1: Diagrammatic presentation of the station of purge by plants

### 3.RESULTS AND DISCUSSION

After the analysis of water of the station at the level of 4 sampling points, we have obtained the following results:

- The color of waters was dark in the upstream of the station and clear in the downstream (photo 1), and the most unpleasant odor was at the level of the septic tank, this is not compliant with the Algerian standards of discharge (non-existent odor of treated water).



1 : water of septic tank  
2 : Water of entry of the basin  
3 : Water of exit of the basin  
4 : Water of the container of control

Fig. 1: Variations in turbidity of water from the entering to the exiting side of the station.

- The minimal values that registered at the exiting side of the basin were detected in winter ( $6,85 \pm 0,1$ ), However, the high values that recorded at the level of the containers of control were detected during summer period with a maximum of  $8,36 \pm 0,6$ . These values are in accordance with the Algerian standards of discharge ( $6,5 < \text{pH} < 8,5$ ).

- According of our results, the values of the IT tended to decline when moving to the exiting side of the station WWG. Nevertheless, during summer, values of the IT increased by going towards the entering side of the station, with a maximum of  $6,58 \pm 0,15$  ds/m. This increase of the IT can be attributed to the high rate of the concentration of soluble salts in the basin, as a consequence of a strong evaporation of waters.

- The contents of suspension materials decreased by going from the upstream towards the downstream, This decrease could explained by the utilisation of "liff" in the filters at the level of the septic tank.

The bacteriological analysis showed good results during summer period (00 germ / 100ml), except *Clostridium sulfitoréducteurs* which remained uncountable during all the experiment. Also, a total absence of salmonellas was observed.

## 4. CONCLUSIONS

The results described in this experimental work, show that uncluttered water of the station WWG of Témacine has the following characteristics: a pH in compliance with the Algerian standards of discharge ranged between 6,8 and 8,3. Nevertheless, the electric conductivity is superior to 5 dS/m. Thus uncluttered water of the station is useful only for well drained soils and for very tolerant cultures due to this excessive salinity. Consequently, this reflects the unpleasant odor at the level of the container of control. Concerning the suspension materials, the system ensures a good elimination of these elements (reached 24,57 mg /l). The content in DCO (of 50 in 99 mg / l of O<sub>2</sub>), is in accordance with the Algerian standards of discharge, while the DBO<sub>5</sub> (of 45 to 75 mg / l of O<sub>2</sub>), is however superior to this standards. For all elements, the highest vallues were registered during the summer period.

By contrast to the physico-chemical and biochemical results, bacteriological analysis provided good results during the summer period (00 germ/100ml), except *Clostridium sulfitoréducteurs*, which remained uncountable during all the experiment, and a total absence of salmonellas was also noticed.

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