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Recycling and Physicochemical Study of Olive Mill Waste Water from the SIDI BEL ABBES Region: Western Algeria

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ABSTRACT

Olive mill waste water (liquid effluents) are by-products of the olive industry resulting during the extraction of olive oil and whose rejection without any prior treatment represents a real nuisance for the environment. Because of their highly polluting effect due to their richness in organic matter and polyphenols, this waste constitutes a major problem for the agricultural sector. It is therefore necessary to think about their treatment and their valorization. This necessarily requires a better understanding of their physicochemical composition. Therefore, the main objective of our study is to provide a physicochemical characterization of these effluents in order to recycle the olive mill waste water by targeting different measurements including pH, acidity, suspended matter, organic matter, polyphenols, electrical conductivity, etc. Our results showed that the olive mill waste waters analyzed: i/ have an acidic pH, ii/ are loaded with ionizing species iii/ are also rich in organic matter, iv/ have a very high-water content (96%). These waste waters are also characterized by a significant presence of suspended matter (18.5g/l) and phenolic compounds (0.45g/l). Taken as a whole, our physicochemical study reinforces the idea that the prior treatment of olive mill waste waters is necessary to reduce their environmental impacts.

Keywords: Olive mill waste water, industrial effluent, organic materials.

1. Introduction

The production of olive oil is one of the main industrial activities in the Mediterranean Basin. This industry, which is so beneficial to the national economy, generates liquid waste called "Olive Mill Waste Water" which is a by-product of olive oil. The considerable expansion of this industrial sector in the last decades has brought as a side-effect a significant increase of the amounts of olive mill effluents (OME) generated. The treatment and the recycling of these wastewaters is therefore a task of global concern that should be addressed urgently. Olive mill waste water are very polluting waters, heavily loaded with organic matter and particularly affect the quality of the waters into which they are discharged. It is estimated that every ton of milled olives corresponds to about 0.80 ton of OMWs (Aktas et al., 2001). In the Mediterranean countries OMWs total production reaches about 30 million m^3 per year (Dionisi et al., 2005) [1].

2. Results and Discussion

2.1. pH and Acidity :

The pH of the olive mill wast water (OMWW) is equal to 4.35 which is an acidic pH due to the origin of the OMWW and we can notice that the acidity is equal to 1.62%. The OMWW have an acidic behavior because they are rich in organic acids (phenolics, fatty acids, etc.) which explains the different acidic pH values obtained. As for the acidity of our OMWW, it depends on several factors such as: their time of storage and also the oxidation of the effluent, the transformation of phenolic alcohols into phenolic acids is also one of the reasons for the rate of the acidity obtained which confirms our acidic pH[2].

2.2. Conductivity:

Our olive mill waste water indicates a conductivity equal to 8.4 mS/cm, this conductivity is higher than the Algerian regulation but it is explained by the presence of salts in our effluent, this is due to the salting of

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the olives and this before their crushing. High conductivity can be manifested by the presence of different mineral salts dissolved in our olive mill waste water.

2.3. Suspende solids:

The suspended solids present in our OMWW are high given the authorized standards which are in the interval (0.03 – 0.035g/L). The presence of suspended matter affects the quality of our olive mill waste water, because most of the time these suspended particles can be settled into sludge.

2.4. Organic matters :

The OMWW are known for their high organic matter composition, our effluent contains a concentration of 78.2g/L in organic compounds which means a polluting capacity for environment. Among the organic compounds present in our OMWW, we have: fatty acids & phenols.

2.5. Dry matter:

The dry matter content is lower compared to the results of Di Giovacchino et al. -1988- on the centrifugation olive mill waste water (161.2 g/L) but remains quite high which shows a significant presence of water in the OMWW.

2.6. Phenols compounds:

Our olive mill waste water has a polyphenol content equal to 450mg/L. The phenolic composition of omww depends on several factors including the maturity of the olives, their variety, climate change among others[2]; but the most important factor is the technique used to separate the oily phase (OMWW) from the aqueous phase. Phenolic compounds suffered degradation during storage and consequently a reduction in their content, which explains our results.

Table 1*: Physico-chemical parameters of the olive mill waste water of Sidi Bel Abbes*

Parameters	pH	Conductivity (uS/cm)	Acidity (%)	Suspended matter (g/L)	Organic matter (g/L)	Dry matter (g/L)	Polyphenols (g/L)
Results	4.35	8.4	1.62%	18.5%	78.2 %	9.6	0.45

3. Conclusions

Olive mill waste water is a by-product of olive growing, which are characterized by a dark brown color and a strong odor, the release of omww in liquid form presents a significant threat to the environment because of their toxicity linked to the organic acids and phenolic products present [3]. The study of the physicochemical parameters of our effluent showed that the vegetable water is very acidic, rich in suspended matter and has a conductivity higher than the standards described by the Algerian authorities. It is also characterized by a high concentration of organic matter and polyphenols. The presence of phenolic compounds in our vegetable oil is harmful when used by farmers, which requires us to provide chemical treatment before its valorization and its recycling.

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