Biodiesel from energy crops: Influence of culture parameters

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1. Introduction - In recent years it has been necessary to find alternative energy sources that do not harm the environment, and that contribute to preventing climate change reducing greenhouse gases emissions. The use of edible vegetable oils to obtain biodiesel has generated competition for land between biofuels and food crops, causing the controversy "food versus fuel". Jatropha crops is considered one of the best options for production of biodiesel due to its characteristics: adaptation in marginal lands, not suitable for human consumption, regenerative action of eroded soils [1,2]. The aim of this work is to study the influence of *Jatropha Curcas* culture parameters on the yield and quality of both, the extracted oil and the biofuel obtained by transesterification reaction of the oil with methanol. The culture parameters are: type of water, type of irrigation and dose of evapotranspiration.

2. Experimental – The raw material used are *Jatropha Curcas* seeds, from an energy crop developed on the island of Fuerteventura. In this work the culture variables studied are: type of irrigation water (desalinated and regenerated), type of irrigation (superficial and buried) and type of dose (75 and 100% of ETP). The oil of the *Jatropha Curcas* seed was extracted by a Soxhlet system using hexane as a solvent, then biodiesel was obtained by reaction of that oil with methanol through a catalytic reaction in two stages keeping all the reaction variables constant. The first stage is an esterification with H_2SO_4 to decrease acidity and the second one is a basic transesterification with NaOH to obtain methylesters (FAME).

3. Results and Discussion – The yields in extracted oil are greater than 50%, increasing when using reclaimed water. The oil presents at 40ºC a viscosity of 27.1 ± 0.89 cSt, Density of 0.8925±0.0113 g/cm^3 and acidity index of 1.15-2.72 mg KO/g, much lower than that reported in the literature for Jatropha, which favors the production of biodiesel. The highest oil yields are obtained with regenerated water and buried irrigation regardless of the dose used (Fig.1). The yield of the reaction depends on the type of culture employed with higher values when using desalinated water and surface irrigation. Analogously to oil, the highest production of biodiesel is obtained using reclaimed water and buried irrigation regardless of the dose. All the biofuels obtained comply with the UNE 14214 Biodiesel standard regarding FAMEs concentration (Fig.2), acidity, density and viscosity.

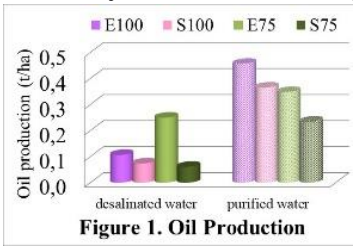

Figure 1. Oil Production

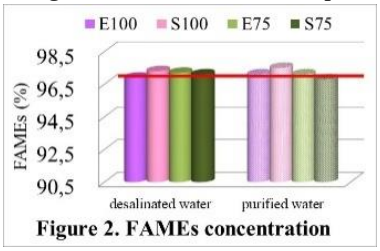

Figure 2. FAMEs concentration

4. Conclusions – The culture parameters selection could lead to greater productions and better quality for the oil and the biofuel prepared. The highest productions are obtained using reclaimed water, buried irrigation and 100% of ETP, 0.457 t / ha of oil and 0.313 t / ha of biodiesel. These results, in addition to the energy benefits, contribute to the fight against the desertification of degraded soils.

5. References

[1] P. Mazumdar, V.B. Burugadda, V.V. Goud and L. Sahoo, *Biomass and Bioenergy*, **46**, (2012) p. 546.
[2] S. Thapa, N. Indrawan and P.R. Bhoi, *Environmental Technology & Innovation*, **9**, (2018) p. 210.