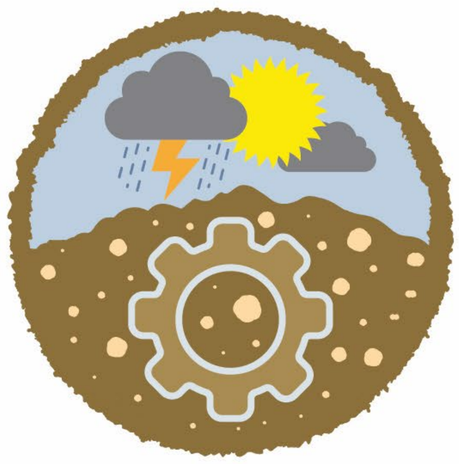

Theme 3
Impacts of soil nutrient management on the environment and climate change

Effect of a biological system in the management of soils contaminated with extra-heavy crude oil

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INTRODUCTION

In Venezuela, oil activity causes different environmental problems during the processing, transportation and storage of hydrocarbons, considerably altering ecosystems, causing deterioration in soil quality and its chemical composition. Currently, biological strategies are used to reduce the effects generated by soil contamination with crude oil; one of them is bioremediation, which is based on the use of microorganisms, bacteria, fungi, and by-products for soil recovery (Ramos, 2019). The use of the arbuscular mycorrhizal (AMF)-plant symbiont system has shown excellent results in reducing the concentration of hydrocarbons in soils, since this symbiosis generates a positive effect that favors the degradation of polluting compounds. Therefore, the objective of this work was to evaluate the AMF-plant symbiont system for the management of a soil contaminated with extra-heavy crude oil.

METHODOLOGY

Soil samples contaminated with extra-heavy crude oil and hydrocarbon-free soil were collected from an area near an oil pit located in El Tigre, Anzoátegui State (Orinoco Oil Belt-Venezuela). Two soil dilutions were used as treatments (S1, S2 and their controls C+ and C-), these soils were treated with a AMF-plant system composed of *Chrysopogon zizanioides* L Nash (vetiver) inoculated with commercial arbuscular mycorrhizae. The parameters measured in the plants were: height (cm) and biomass (g) (Truong *et al.*, 2009). The duration of the trial was 90 days.
, by using the static chamber method (Fig. 2).

RESULTS

Table 1 shows the effect of mycorrhization on the height and biomass parameters of the Vetiver plant grown in two dilutions of soil contaminated with extra-heavy crude oil.

Table 1. Effect of mycorrhization on the Vetiver grass growth

Treatment	S1	S2	C+	C-
Height (cm)	25.80 ±0.87a	16.73±0.57b	19.93± 2.11b	14.87±0.38b
Biomass (g)	10.66 ± 0.66 at	10.76 ± 0.83 at	10.25 ± 3.35A	10.23 ± 2.79 at

*Kruskal-Wallis non-parametric test ($p<0.05$). Different letters between columns show significant differences.

Fig.1. Vetiver plants grown in soils contaminated with extra-heavy crude oil (90-day trial)

Differences between treatments and controls are observed in both heights and biomass, with height reflecting statistically significant differences. These results suggest that the AMF-plant symbiosis promotes plant tolerance to the contaminant (Gao et al., 2011; Brandt et al., 2006), being essential for hydrocarbon degradation and reduction.
The Vetiver-AMF system can be an alternative for the management of soils contaminated with crude oil.

CONCLUSIONS

The tolerance of mycorrhized Vetiver grass to different doses of extra-heavy hydrocarbon was evidenced, suggesting that this biological system can potentially be used in areas impacted by crude oil as a management technique for contaminated soils.

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