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BRAZILIAN BIOMES OF CERRADO AND CAATINGA AS POTENTIAL TERRESTRIAL ENVIRONMENTS ANALOGUES TO MARS

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Although Cerrado and Caatinga are not perfect representation of Mars, they allow to learn about the habitability and adaptation mechanisms of particular organisms.

Brazil is considered one of the most important hotspots in the world with a high level of biodiversity and biomes that have geological and environmental characteristics that resemble Mars (Duarte et al. 2012). It has more than 600 different habitats covering 53 large ecosystems, and presents a variety of extreme Brazilian environments, not only natural, but also promoted by human actions. Among the Brazilian biomes, the Caatinga and the Cerrado are the ones that exhibit features more similar to other similar terrestrial environments widely used for Astrobiology research.

This is a qualitative approach research that focuses on understanding and explaining the dynamics of the content. From this, the methodological development will proceed in a descriptive way, seeking to present details of phenomena and processes. And that in particular, in this work, the Brazilian environments of the Caatinga and the Cerrado are treated as analogous to Mars.

In the Cerrado, the temperature is 40° C in summer and 10° C in winter. In this biome, the incidence of UV radiation is high and with average values of 475 and 500 W/m^2 in open areas. In addition, regions of Cerrado suffer from an acidic pH between 4 and 5, due to the high levels of aluminum concentration, which can become toxic when soluble in soil. There are water deficits during the dry seasons, with strong insolation and low humidity, resembling an environment from the first Martian era. It is noteworthy that in the Cerrado, extremophiles such as the Crenarchaeota and Thermobrachium kingdoms, from the phylum actinomycete, in addition to the bacterium Flavobacterium sp were isolated (Genuário et al. 2019).

The Caatinga suffers from high radiation rates and temperatures can reach 45° C in the summer, while the soil can reach 60° C. There is low rainfall and water deficit in the region almost every month of the year. So, the Caatinga is similar to the environments of the third and current era of Mars, as it has a high level of radiation, low availability of water and a very arid environment. Due to these long periods of drought, there is a climatic adaptation of the local biota because of the limited availability of water. In this environment, extremophiles of the Bacillus, Pseudomonas and Staphylococcus genera were isolated. Pseudomonas and Staphylococcus were isolated (Belmok et al. 2019).

Fig. 1. Comparison between Mars and different extreme terrestrial environments in Brazil and in the world. Label: (A) Caatinga in Brazil (B) Namib Desert in Africa (C) Cerrado in Brazil (D) Atacama Desert in Chile (E) Mars.

It is also important to note that the Caatinga and the Cerrado, in certain periods of the year, have characteristics very similar to other analogous terrestrial environments widely used for research in Astrobiology, as seen in the Figure 1.

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