

CERRADO AND CAATINGA AS GOOD EXTREME ENVIRONMENTS IN BRAZIL ANALOGUE TO MARS. M. C. V. Andrade¹, B. L. Nascimento-Dias², A. P. Madureira¹, Department of Biotechnology, Federal University of São João del-Rei¹ (millenacva@yahoo.com.br), Department of Physics, Federal University of Juiz de Fora² (bruno.astrobio@gmail.com).

Introduction: Brazil is an interesting country, as it has more than 600 different habitats covering 53 large ecosystems. Thus, Brazil is considered one of the most important hotspots in the world with a high level of biodiversity [1]. There is a variety of extreme Brazilian environments, not only natural, but also promoted by human actions. However, the number of studies in these environments and their microbial diversity for astrobiological purposes are still scarce.

Methodology: This is a research that has a qualitative approach and focuses on understanding and explaining the dynamics of the contents. Based on 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 extreme Brazilian environments analogous to Mars will be treated. Among the chosen environments, Caatinga and Cerrado were selected. The description of extreme Brazilian environments with conditions similar to Mars will be done through documentary research and theoretical bibliographic references on biotechnology and related areas already analysed, and published by means of books and scientific articles.

Results and Discussion: The Cerrado can reach 40 ° C in summer and 10 ° C in winter. In addition, there are water deficits during the dry seasons, with strong insolation and low humidity. Another important point is that approximately 73% of the Cerrado is located between 300 and 900m of altitude. Because of this, the incidence of UV radiation is high and with average values of 475 and 500 W / m² in open areas. The Cerrado still suffers from an acid pH between 4 and 5, due to the high levels of aluminum concentration, which can become toxic when soluble in the soil. Thus, the Cerrado would resemble an environment from the first Martian era. It is worth noting that in the Cerrado, [2-3] extremophiles were isolated, such as those from the *Crenarchaeota* and *Thermobrachium* kingdoms, from the phylum actinomycete, in addition to the bacterium *Flavobacterium sp.*.

The Caatinga is the only biome exclusively Brazilian and is located mostly in the northeast of the country. It is important to note that this region suffers from high radiation rates and temperatures are high, reaching 45 ° C in the summer, while the soil can reach 60 ° C. In addition, the Caatinga has low rainfall and there is a water deficit in almost every month of the year. Due to these long periods of drought, there is a climatic adaptation of the local biota due to the limited availability of water. Thus, the Caatinga offers some

environments similar to the third and current Mars era, as it presents a high level of radiation, a low availability of water and a very arid environment. In this environment, extremophiles of the genera *Bacillus*, *Pseudomonas* and *Staphylococcus* were isolated [4-5]. It is also important to note that the Caatinga, like the Cerrado in certain periods of the year, has characteristics very similar to other analogous terrestrial environments widely used for research in Astrobiology, such as the Atacama Desert in Chile and the Namib Desert in Africa [6] (Fig. 1).



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.

Conclusion: Although those environments it is not a perfect representation, it still allows you to learn about the habitability and adaptive mechanisms these organisms. Therefore, extreme Brazilian environments, such as the Cerrado and the Caatinga, should be further explored and seen as astrobiologically interesting, as they present extreme analogous characteristics that resemble other extraterrestrial environments.

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