Paleoclimatic reconstruction to the Eocene/Oligocene in the Fonseca district, Minas Gerais, Brazil.

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Abstract

Based on leaf physiognomy of the Fonseca Formation paleoflora (Eocene/Oligocene), outcropping in the district of Fonseca, Minas Gerais, a quantitative paleoclimate reconstruction was performed using the Leaf Margin Analysis and the Leaf Area Analysis. The results of these analyses, based on 20 identified morphotypes, indicate that the paleoflora of Fonseca dwells in an environment with a mean annual temperature (MAT) between 27 and 27.7 °C, and a mean annual precipitation (MAP) between 1004 and 1135 mm. The analysis of the obtained values and taxonomic data suggests the presence of a warm and sub-humid tropical climate.

Key words: Leaf physiognomy, Fonseca Formation, Sub-humid tropical climate.

Introduction

The analysis of the relation between the leaf physiognomy of woody dicotyledonous angiosperms and the climate allowed the development of methods for reconstructing the paleoclimate on the basis of fossil leaves^{1,2}.

In the district of Fonseca (20°09'21"S-43°18'44"W), Minas Gerais, Brazil, deposits crop out on the Fonseca Formation, which contains an important fossiliferous record of insects, fish and vegetables³.

The objective of this project is the reconstruction of the climate of the district of Fonseca during the Eocene/Oligocene (38-28 Ma.), based on fossil leaves of the Fonseca Formation.

Results and Discussion

We analyzed a total of 26 angiosperm fossil samples. These were described according to the Manual of Leaf Architecture⁴, allowing their later classification into 20 morphotypes.

The estimate of the MAT was performed using equations based on the Leaf Margin Analysis^{1,5}, which relates the percentage of woody dicotyledonous species with no teeth of a flora to the MAT¹. Thus we obtained temperature values between 27 and 27.7 °C, which are similar to the value of 26.9 °C reported previously for this paleoflora⁶.

The estimate of the MAP was performed using equations based on the Leaf Area Analysis^{2,7}, which relates the foliar area of the species of flora to the MAP². The obtained values were between 1004 and 1135 mm, which is below the 1200 mm previously estimated⁸.

The values of MAT and MAP correspond to a warm and sub-humid tropical climate. This climatic condition is different to those previously reported by other authors who make reference to a humid climate, tropical and subtropical^{6,8}.

Conclusions

The results obtained here, analyzed in conjunction with previously published taxonomic data, allow us to infer a warm and sub-humid tropical climate, for the time when the Fonseca Formation was deposited during the Eocene-Oligocene transition in southeastern Brazil.

Acknowledgement

The authors wish to thank PIBIC/CNPq for granting the Scientific Initiation scholarship to the first author listed, as well as the IGEO-UFRJ and the Museum of DNPM for providing the material.

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