

ARAUCAMATE – STUDY ON THE POTENTIAL DISTRIBUTION OF ARAUCÁRIA AND YERBA MATE FOR A GENETIC USE AND CONSERVATION PROGRAM

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Araucaria angustifolia (Bertol.) O. Kuntze (*Araucaria*) and *Ilex paraguariensis* St. Hil. (*yerba mate*) are forest species of great ecological importance, native to South America, whose exploitation and trade subsidized the economic and social development of the Center-South region of Brazil. The natural forests of these species occur in a diverse mosaic of soil conditions (MARCONDES et al., 2015; BOGNOLA et al., 2017), climate (FRITZSONS et al., 2018 a, b) and landscape, in most of the Atlantic Forest Biome. The intense anthropic pressure and deforestation have resulted in the reduction of the effective size of the populations of these two species, increasing the risks of inbreeding and loss of alleles due to the effect of genetic drift (SHIMIZU, 2000). Such vulnerability will be intensified in the face of global climate change scenarios. However, there is no information on how the species adapt to the new scenarios, nor are strategies defined for conservation under future habitat conditions.

Information on the location and geographical scope of natural populations can contribute significantly to rescuing genes still unknown to the scientific community. The combination of niche models with population genetic data of the species (see WREGE et al., 2016; 2017), in a GIS environment, can generate maps and information that can be used to select priority areas for the conservation of these species and which have greater potential for cultivation. To this end, since 2015, research actions have been developed in the project “Distribution of natural occurrence of *araucaria* and *yerba mate* populations for use in a genetic conservation program” - ARAUCAMATE, financed by Embrapa (Figure 1). The research focuses on identifying the environmental and genetic factors that influence the spatial distribution of natural populations of *araucaria* and *yerba mate* in the Center-South region of Brazil and also phenotypic parameters of commercial interest. In order to measure the impact of climate change projected by the IPCC, niche models of natural populations are also being developed until the year 2100, considering the projections of temperature increase in different scenarios.

Mapping and other information generated can be applied to genetic improvement and forestry programs, to subsidize the sustainable use of regional biodiversity and strengthen productive chains in the sectors of teas (*yerba mate*), pine nuts and wood (*araucaria*). They will also serve to define adaptation actions for these species in the face of climate change, such as the selection of areas for the conservation of genetic biodiversity, thus helping to define public policies aimed at maintaining the resilience of populations of both species, in the face of risks to survival in the coming decades.

NEXT STEPS AND RECOMMENDATIONS

1. Reached:

- Identification of limiting climatic factors for the distribution of *araucaria* and *yerba mate* in southern Brazil;
- Maps of the current potential distribution of the *araucaria* (base period: 1976-2005), and projected according to future climate scenarios (2011-2040; 2041-2070; 2071-2100).

2. Under development:

- Expansion of the climate and pedological information base about these two species;
- Maps with the potential distribution of *yerba mate* in Brazil - base period and future climatic scenarios;
- Growth models of *araucaria*, based on dendrochronology;
- Quantification of phytochemicals and nutrients in *yerba mate* leaves for characterization of populations and selection for silvicultural use;
- Genotyping of *araucaria* and *yerba mate* to differentiate natural populations;
- Growth models for *araucaria* and *yerba mate* associated with the genetic material of populations and the environment.

NEXT STEPS AND RECOMMENDATIONS

- Expansion of the number of populations characterized in the field;
- Improvement of field and laboratory methodology;
- Improvement of the mathematical modeling of the distribution of species including a greater number of environmental layers;
- Use of more advanced genotyping techniques for the genetic characterization of populations;
- Use of information to define priority areas for the conservation of the species' genetic biodiversity.

DATA PUBLISHED IN:

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Continued in Annex

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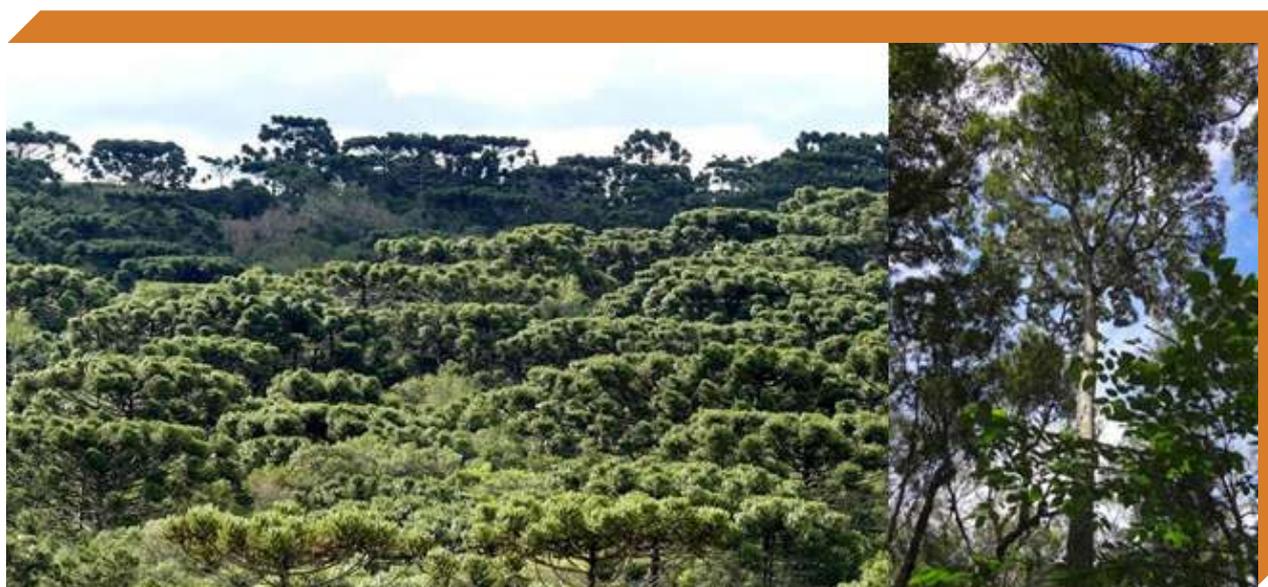
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Figure 1: (A) Natural occurrence of araucaria in the Pampa biome, in the municipalities of Santana da Boa Vista-Canguçu-Pelotas, state of Rio Grande do Sul, representing the southern limit of occurrence of the species in Brazil. (B) Natural occurrence of yerba mate in the Pampa biome, in the municipalities of Santana da Boa Vista-Canguçu-Pelotas, state of Rio Grande do Sul.



Credit: Marcos Silveira Wrege.