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Environmental variations drive polyploid evolution in neotropical *Eugenia* species (Myrtaceae)

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ABSTRACT. Polyploidy is one of the most important mechanisms of speciation and diversification in plant evolution. Polyploidy results in genetic variation among individuals of the same species and even between populations, and may be responsible for differences in environmental tolerance between populations of the same species. This study determined chromosome numbers of *Eugenia* L. (Myrtaceae, x = 11) for 26 populations of 14 species by conventional cytogenetic techniques. Nine species (13 populations) were diploid (2n = 2x = 22), but diploid and/or polyploid cytotypes were found in the other five species (13 populations), with 2n = 33, 2n = 44, and 2n = 55. Data on chromosome number/ploidy level for other *Eugenia* species/populations were collected from the literature and included in this cytogeographic

analysis. For each collection point (32 species and 62 populations), environmental variables were recorded using georeferencing techniques through the DIVA-GIS v.7.5 program. Environmental variables such as temperature, altitude, rainfall, solar radiation, soil type, and vegetation were analyzed with the R program, using Mann-Whitney and chi-square tests, principal component analysis, and graphic analyses, such as scatterplots, boxplots, and barplot. Polyploid and diploid populations had different spatial distribution patterns and were found in areas subjected to different environmental conditions. Polyploid individuals were collected from locations with more adverse environmental conditions, usually at higher elevations than the diploid individuals. Polyploidy allows species to occur at locations with varying environmental conditions. As diploidy and polyploidy occur under different environmental conditions, species with cytotypes exhibit wide environmental tolerance.

Key words: Chromosomes; Karyotype; Neotropics; Myrtaceae; Cytogeography; Polyploidy