Mixed models identify physic nut genotypes adapted to environments with different phosphorus availability

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ABSTRACT. The aim of this study was to screen physic nut (Jatropha curcas) genotypes that differ in their phosphorous (P) use, using mixed models. The experiment was conducted in a greenhouse located in the experimental area of the Centro de Ciências Agrárias of the Universidade Federal do Espírito Santo, in Alegre, ES, Brazil. The experiment was arranged in a randomized block design, using a 10 x 3-factorial scheme, including ten physic nut genotypes and two environments that differed in their levels of soil P availability (10 and
60 mg/dm$^3$), each with four replications. After 100 days of cultivation, we evaluated the plant height, stem diameter, root volume, root dry matter, aerial part dry matter, total dry matter, as well as the efficiency of absorption, and use. The parameters were estimated for combined selection while considering the studied parameters: stability and adaptability for both environments were obtained using the harmonic mean of the relative performance of the predicted genotypic values. High genotype by environment interactions were observed for most physic nut traits, indicating considerable influences of P availability on the phenotypic value. The genotype Paraíso simultaneously presented high adaptability and stability for aerial part dry matter, total dry matter, and P translocation efficiency. The genotype CNPAE-C2 showed a positive response to P fertilization by increasing both the total and aerial part dry matter.

**Key words:** *Jatropha curcas*; Plant nutrition; REML/BLUP