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Effect of domestication on the genotypical and phenotypical diversity of *Allanblackia parviflora* A. Chev in Ghana

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Abstract

Understanding the genetic and morphological diversity of *Allanblackia parviflora* in Ghana holds paramount significance, particularly in the context of its domestication for sustainable agricultural practices. *A. parviflora*, a tree species indigenous to rainforest zones of West Africa, exhibits considerable potential for economic development and ecological restoration. As interest grows in harnessing its valuable traits for commercial cultivation, comprehending the genetic and morphological variations within *A. parviflora* populations becomes imperative, as it is especially important for the local population due to production of edible oil. Despite the nutritional and socio-economic importance of this tree, it is still at the early stages of its domestication process.

The present study seeks to unravel the genetic and morphological diversity across *A. parviflora* populations in four ecological zones in Ghana, shedding light on traits relevant to domestication efforts. By elucidating these aspects, we aim to facilitate the informed domestication and utilisation of *A. parviflora*, thereby fostering economic prosperity and ecological resilience in the region.

The data and samples were collected across four ecological zones in Ghana, namely the Moist Semi-Deciduous North West (MSNW) zone, the Moist Evergreen (ME) zone, the Wet Evergreen (WE) zone and the Moist Semi-Deciduous Southeast (MSSE) zone, and in each zone we sampled trees from farms (cultivated) and from forest (wild). In total, seven fruit traits and six tree traits were used for evaluating morphological diversity, and 1091 SNP markers were developed by the DArT seq platform to assess the genetic diversity of the selected individuals.

The basic genetic diversity indices showed a rather low genetic diversity (observed heterozygosity ranged from 0.029 to 0.044) and low differentiation between populations (pairwise F_{st} between ecological zones ranged from 0.0013 to 0.0078), however the results from AMOVA showed significant variation between cultivated and wild individuals within each ecological zone. ANOVA of the morphological traits showed significant differences of some fruit traits (number of seeds per fruit and fruit weight) between ecological zones. The results imply that both ecological zones and farmers' selection have an influence on shaping the genetic and phenotypical diversity of *A. parviflora* in Ghana.

Keywords: Genetic diversity, morphological traits, Non-timber forest products, orphan crops, SNP markers