

Abstract

Acacia senegal (L.) Willd. is an African leguminous multipurpose tree species belonging to subfamily Mimosoideae and subgenus *Aculeiferum*, highly valued for gum arabic production. This study estimated the genetic diversity within and among Kenyan populations of the species in the Bulla Sambul, Kutulo, Wamba and Meisori populations based on 12 quantitative traits, which included; tree height, diameter at breast height (DBH), number of branches, bark thickness, gum weight and various pod and seed traits on 20 randomly selected trees in every population. Duncan's multiple range test (DMRT) and the dendrogram distinctively divided the populations into two groups; Wamba and Meisori in one group while Bulla Sambul and Kutulo in the other, indicating geographical structuring of the genetic variability. The trees were larger, taller with greater pod and seed traits in the Wamba and Meisori than the Bulla Sambul and Kutulo populations. Contrarily, trees had lighter seeds, more branches with higher gum weight in the Kutulo and Bulla Sambul than the Wamba and Meisori populations. The Shannon–Weaver diversity index (H), depicted 1,000-seed weight as the most varied trait across the populations. These findings provide essential information on the genetic diversity of the species, necessary for delineation of particular zones for seed sources for germplasm conservation, selection for domestication and improved gum arabic production.