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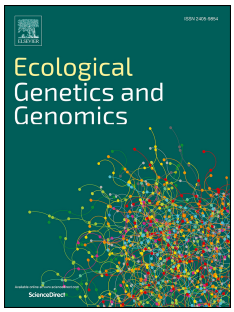

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High genetic variation and low gene flow among populations of *Viscum verrucosum* in semi-arid savanna, southwest Zimbabwe

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ABSTRACT

Despite the increasing recognition of the ecological role of mistletoes, little is known about their genetic diversity. In this regard, we assessed the genetic variation within and among populations of *Viscum verrucosum* using random amplified polymorphic DNA (RAPDs). Analysis of molecular variance (AMOVA) and phylogenetic analysis based on genetic distance matrices were used to partition variation within and among populations, and the relationship between geographical and genetic distance was established using a Mantel's test. Mean population genetic diversity was high (P = 77.19%, A = 1.58, h = 0.30, H′ = 0.44) relative to other outcrossing mistletoe species. Genetic differentiation among the populations was high (G_{ST} = 0.366), also with low gene flow (N_m = 0.433) among populations. The genetic distance was significantly correlated to geographic distance (r = –0.849, p = 0.002), consistent with isolation-by-distance model suggesting constrained genetic exchange between geographically distant populations. Consequently, most of the genetic variation was retained within (63%) than among (37%) populations. In conclusion, findings of this study suggest that isolation-by-distance coupled with low seed dispersal limit gene flow, and determine the high levels of genetic structure of *V. verrucosum* populations, while historically elevated rates of gene flow may explain the high genetic diversity detected in these populations.

Keywords: genetic diversity; gene flow (Nm); isolation-by-distance; parasitic plants; mistletoes; RAPD markers

1. Introduction

Mistletoes, through high transpiration rates, high litter nutrient concentrations, and extended periods of litterfall, act as ecosystem engineers and keystone species [1] altering host performance, soil moisture content, litterfall rates, and nutrient availability [2, 3, 4], which can ultimately influence local plant biomass, species composition and spatial distribution (e.g. grasses, [5, 6]. These changes to the understorey properties, together with additional mistletoe resources such as nutrient-rich foliage, flowers, fruits and nectar in infected host canopies, also alter the structure and function of animal assemblages (e.g. insects, [7, 8]; birds, [9, 10]). However, despite the significant role played by parasitic plants in ecosystem structure and function, little is known about their genetic diversity.

In semi-arid savanna southwest Zimbabwe, woodlands are under increasing disturbance due to human activities such as deforestation and agricultural expansion. This has resulted in