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Habitat Fragmentation and Isolation-by-Distance Driven Population Divergence of *Oryza rufipogon* in Sri Lanka

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Abstract

Wild relatives of rice are an important genetic resources in rice breeding. *Oryza rufipogon* is a diploid perennial species belongs to AA genome group and sexually compatible with cultivated rice. The putative ancestor of Asian cultivated rice (*Oryza sativa*) is endangered in Sri Lanka due to habitat loss and land fragmentation. However, no proper studies have been performed on population diversity and habitat fragmentation of the Sri Lankan wild rice species used in our breeding programs. In this study, we explore the genetic diversity of five *Oryza rufipogon* populations using 33 microsatellite loci to infer the effects of habitat fragmentation and isolation by-distance (IBD) on genetic structure. Results of AMOVA revealed among population variance (43.7%) and within population (56.31%) variance. Partial Mantel tests ($r^2=0.306$; p value= 0.027) showed that population divergence of Sri Lankan *O. rufipogon* based on isolation by distance was statistically significant. Genetic diversity of *O. rufipogon* was recorded at population level (0.41) and the individual level (0.62). Preferred habitats of *O. rufipogon* are swampy areas like marshes, open ditches, swamps, ponds, pools, along river banks, at the edges of lakes and in or at the margins of rice fields. Some populations grow under submergence and saline conditions. The water depth preferences are between 0.2-4.0 m. As a result of human activities such as agriculture, urbanization and industry have destroyed natural habitats, leading to increasing habitat fragmentation. Conclusively, these results indicate that IBD due to historical rather than recent fragmentation, followed by local adaptation, has driven population divergence in *O. rufipogon*. Understanding genetic diversity and eco-geographic variation of wild rice in Sri Lanka is timely requirement it provides opportunities to design conservation strategies and basic information for proper utilization of wild genetic resources in rice genetic improvement and breeding.

Keywords: Crop improvement, Habitat, Mantel test, Genetic structure, Wild rice