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Original Article

Normalized Seed Weight of Three Species of the Genus *Peganum* L. (Peganaceae Van Tieghem) in Mongolia

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Abstract

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Variation of seed weight of *Peganum* species is positively correlated with mean seed weight in big populations. It was insignificant in small populations, suggesting normalized seed weight is useful to distinguish the population sizes. Normalized seed weight is increased with increasing aridity index and precipitation amount in most sites. Within populations of *Peganum harmala*, variation of seed weight and normalized seed weight corresponded to Nei's diversity index, while within other species, mean seed weight corresponded to Nei's diversity index. The normalized seed weight was lowest in human-dispersal species, highest in hydro-dispersal species, but it was moderate in wind-human-dispersal species. Low normalized seed weight is associated to species with low genetic diversity, while high normalized seed weight to species with high genetic diversity. Variation of seed weight was related with precipitation and climatic aridity and genetic diversity within species and mean seed weight was with climatic aridity and genetic diversity within species, but normalized seed weight was related with precipitation, climatic aridity and genetic diversity inter- and within species.

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Introduction

Evolution of seed weight is governed by climatic (Zhang, 1998; Moles *et al*., 2005; Liu *et al.,* 2014) and genetic factors (Ohto *et al.,* 2005; Cai *et al.,* 2012). The climatic factors, such as temperature and precipitation had much less explanatory power than did plant traits, such as seed dispersal syndrome (Tiffney, 2004) and plant growth form (Eriksson, 2000).

Variations of seed weight between or within plant species are due to the evolutionary responses of plants (Zhang, 1998; Doganlar *et al.,* 2000). Meyer (1997) reported that seed weight (named as *seed mass*) is increased with a decreasing climatic aridity, while Harel *et al* (2011) found that seed weight decreased with increasing aridity and rainfall variability. Seed weight positively correlated with precipitation, and temperature (Busso & Perryman, 2005; Moles *et al.,* 2005). Stromberg & Boudell (2013) concluded that small seed weight is independently associated with wet and disturbed conditions in dryland riparian ecosystems.

Genetic diversity is useful in understanding the evolutionary relationships of different taxa (Kresovich & McFerson, 1992; Booy *et al.,* 2000; Ohto *et al.,* 2005). The larger populations with low levels of disruption have the highest genetic diversity (Maguire & Sedgley, 1997). Lammy *et al.* (1999) suggested that genetic diversity is usually low in isolated populations as a consequence of genetic drift, inbreeding, bottlenecks and founder effects. Quantitative