Mongolian Journal of Biological Sciences 2011 Vol. 9(1-2): 3-7

Cotyledon Numbers of Two *Peganum* Species (Peganaceae) in Mongolia

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Abstract

Most seedlings of *Peganum harmala* and *P. nigellastrum* have two cotyledons, but up to 10% of all seedlings of *P. harmala* have to three cotyledons, and up to 1.7% has four cotyledons. Up to 5.4% on *P. nigellastrum* have only three cotyledons. Frequency of three cotyledonous seedlings among these two species was significantly different. The present results report three cotyledonous seedlings, as well as four cotyledonous seedlings in the family Peganaceae, in addition to two cotyledonous seedlings. On both species, the frequency of three cotyledonous seedlings was increased with increased annual precipitation and decreased air temperature, and in localities, which isolated from main distribution range. The frequency of three cotyledonous seedlings of *P. harmala* increased with increasing soil alkalization, but that of *P. nigellastrum* increased with decreasing alkalization.

Key words: *Peganum harmala, Peganum nigellastrum*, cotyledon, seedlings

Introduction

Most angiosperms are mono- or dicotyledonous, but three cotyledons have also been reported for plants of over 15 families (Conner & Agrawal, 2005). The number of cotyledons was unclear for species of Peganaceae van Tieghem.

Previous studies supposed that cotyledon number range is related with hormonal asymmetric distribution (Liu *et al*., 1993; Mayer *et al*., 1993; Hadfi *et al*., 1998; Al-Hammadi *et al*., 2003; Orlova *et al*., 2006; Swarup *et al*., 2004), some kind of selection (Taylor & Mundell, 1999), lack of genetic variation (Conner & Agrawal, 2005), and maternal effects (Al-Hammadi *et al*., 2003).

The purpose of this study is to seek whether three cotyledons occur in the family Peganaceae and to determine whether cotyledon number range is related with loss of habitat.

Materials and Methods

Climatic data is given according to the report of Namkhaijantsan (2009). Mean air temperature in July was fluctuated between 20 and 25°C in the Dzungaria, Valley of Lakes, Gobi Altai and north of East Gobi regions; between 10 and 15°C in the Mongol-Dahuria region, and more than 25°C in the Trans-Altai Gobi and East Gobi regions. Annual precipitation was 100 -150 mm in Dzungaria, East Gobi and Valley of Lakes; 150-200 mm in Gobi Altai; 50-100 mm in west of East Gobi region; less than 50 mm in Trans-Altai Gobi, and 300-400 mm in Mongol-Dahuria.

Soil pH is one of main factors for plant metabolism (Fink, 1976), and it was 7.4-8.0 (slight alkalic) in Valley of Lakes, Gobi Altai and east of East Gobi; 8.1-9.0 (strong alkalic) in Dzungaria, Trans-Altai Gobi, west of East Gobi and Mongol-Dahuria (Batkhishig, 2009).

The seed collection at the Institute of Botany, Mongolian Academy of Sciences was used for seed germination and seedling morphology. In total, 13 seed samples were examined (Table 1), collected between 1983-2007, from above-mentioned regions. Mongol-Dahuria and Dzungaria belong to the province Western Siberia and Dzungaria of Mts. Tien Shan, respectively, and Valley of Lakes, East Gobi, Gobi Altai, Trans-Altai Gobi belong to the province Mongolia, according to botany-geographic divisions (Grubov, 1963; Takhtajan, 1978).

When plants shed seeds, we harvested capsules then dried them in paper bags. The seeds were sampled randomly in the population.

Weight of thousand seeds was measured with 10 repetitions using an analytic scale - Shimadzu AY220 (d-0.1 mg). Seed germination was determined at 25±1°C for 10 days in the seed germinator, without dormancy breaking treatments using Petri dishes and moist blotter