

Effects of Precipitation, Air Temperature and Drought on Calyx Lobe Number of *Peganum nigellastrum* Bge (Peganaceae Van Tieghem)

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Abstract

Calyx lobe number on the first flowers of *Peganum nigellastrum* was 3-5 in the desert-steppe and 5 in the forest-steppe, but it decreased on the next flowers down to 2 or completely disappeared in the desert-steppe, and up to 3-4 in the forest-steppe. The average of 4.4-7.6 mm of precipitation and 11-13°C temperature of 10 days could be adequate for calyx maturity. Calyx could grow for at least 11 days after rainfall and decreasing mean of air temperature. The calyx on the first flowers rapidly grew, compared with that of the next flowers. Maturity rate of calyx on the next flowers was inhibited under drought. Calyx maturity on the first flowers may be completed, using an underground storage of previous year, but calyx on the next flowers may be grown, using only photosynthetic production. Dryness that continued up to 11 days can call increased calyx lobe number of *P. nigellastrum*, and dryness that continues for longer than 11 days calls the decreased calyx lobe number.

Key words: *Peganum nigellastrum*, calyx lobe number, dryness, precipitation, air temperature

Introduction

Drought affects on plant productivity, growth and morphology (Ivanov *et al.*, 2004; Fraser *et al.*, 2009; Jean-Marcel Ribaut *et al.*, 2009), as well as on cellular (Voronin *et al.*, 2003) and subcellular metabolism levels (Zelling *et al.*, 2004). This effect can be estimated by biomorphological changes of above ground biomass of dominant plants (Adar *et al.*, 2006).

The effects of precipitation, temperature (Voronin *et al.*, 2003; Fraser *et al.*, 2009) and drought (Ivanov *et al.*, 2004; Ribaut *et al.*, 2009) on leaf morphology have been described, but the effects of precipitation, temperature and drought on calyx lobe number are still unclear.

Peganum nigellastrum Bge belongs to the family Peganaceae Van Tieghem, and is adapted in the desert and desert-steppe (Shiirevdamba, 1990; Tserenkhanda, 1999; Ivanov *et al.*, 2004). This species is distinguished from other taxa of the genus by calyx leaves incised into 5-7 lobes, hispid and stolon (Bobrov, 1949; Grubov, 1982, 1998). Stolon of this species found in most regions of Mongolia, such as Khangai, Mongol-Daurian, Middle Khalkh, Depression of Great Lakes, Valley of Lakes, Gobi Altai, East Gobi, Alasha Gobi, but calyx are entire or incised into 2-7 lobes. Calyx lobe number of this species may

increase or decrease under different ecological factors.

The purpose of this study was to describe whether precipitation and air temperature and drought affects on the calyx lobe number of *P. nigellastrum* and to explain mechanisms of calyx lobe number range.

Materials and Methods

Calyx lobes of *P. nigellastrum* were sampled and counted in Dalanzadgad (N43°57'48"; E104°43'20", elev. 1461 m) and Mandalgobi cities (N45°76'08"; E106°27'62", elev. 1418 m) are located in the desert-steppe zone, and Altanbulag town (N50°31'84"; E106°48'94", elev. 690 m) in the forest-steppe zone in 2008.

Air temperature in each locality is gradually increased during growing season of *P. nigellastrum*, according to the data of Institute of Meteorology and Hydrology. The average air temperature in Dalanzadgad was higher than in other localities. Maximum air temperature was from July 6 to July 10, 2008 in Dalanzadgad, whereas it was between June 6 and June 10 in Mandalgobi, and between June 25 and June 30 in Altanbulag (Fig. 1).

Amount of precipitation by 5 days was different among the localities. Total amount