Ecological adaptation of the seed microsculptures of Saussurea from different altitudes (Qinghai-Tibet plateau)

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It is well known that seed morphology is less affected by environmental factors and therefore typically used in phylogenetic analysis (Ozcan and Zorlu 2009). The features of microsculpture have been used in taxonomy of some plants (Schneider and Boldrini 2011). However, it has been shown that the microsculpture plays a critical role in plant’s adaption to environments (Karcz et al. 2005). For example, leaf micro-morphological traits have been reported to be associated with altitude, which suggests that the species responses to different ecological conditions (Paridari et al. 2013). In the same rationale, plant seeds also response to certain ecological conditions such as altitudes (Zhou and Bao 2014). Theoretically, the response should cause the change of seed microsculptures because of different altitudes. Thus, the same species at different altitudes may have different seed microsculptures although it is well known that seed morphology is less affected by environmental factors (Ozcan and Zorlu 2009). To test the hypothesis, the microsculptures of Saussurea were investigated at different altitudes.

Saussurea is a genus with more than 300 species worldwide, belonging to Asteraceae. Most Saussurea are annual, biannual or perennial herbs and a few of them are thistle-like plants. Jia et al. (2005) and Dawa et al. (2009) have found that some Saussurea such as, S medusa and S involucrata have medical values with anti-inflammatory and analgesic activities. Thus, it is necessary to analyse individual characters of these species to make full use of these plants. Cypselae surface has been used in phylogenetic analyses (Schneider and Boldrini 2011). However, little is known about the effects of altitude on microsculpture pattern in these plants, although previous work showed that altitude has impacts on plant morphologies including plant size and seed number (Guo et al. 2010).