**Introduction**

The genus *Bromus* L. (tribe Bromeae, family Poaceae) comprises about 160 annual and perennial species (Acedo and Liamas 2001), distributed all over the world. *Bromus* species are among important range grasses of Iran and are placed in six sections, of which section *Genea* Dum. contains six perennial species found in Iran (Bor 1970). The available literature dealing with cytogenetics of *Bromus* (e.g. Devesa *et al*. 1990; Lövkvist and Hultgård 1999), indicates the importance of such cytological studies for understanding the evolution of the genus *Bromus*. Therefore, we studied chiasma frequency and distribution, as well as chromosomal association and segregation, in ten Iranian populations of six *Bromus* species from the section *Genea*. The results uncovered several hitherto undescribed inter-population variations in cytological characteristics.

**Materials and methods**

**Plant material**

We studied ten populations of six *Bromus* species: *B. tectorum* L. (two populations), *B. sericeus* Drobow. (two populations), *B. madritensis* L. (one population), *B. rubens* L. (two populations), *B. fasciculatus* Presl. (one population), and *B. sterilis* (two populations). Voucher specimens are deposited in the Herbarium of Shahid Beheshti University (HSBU) and Herbarium of Iran Botanical Garden (TARI).

**Cytological preparation and meiotic analysis**

Young flower buds were collected from ten randomly selected plants of each population, fixed in glacial acetic acid: ethanol (1 : 3) for 24 h, and then washed and preserved in 70% ethanol at 4°C until used, following Sheidai *et al*. (2003). Cytological preparations used squash technique and 2% aceto-orcein as the stain.

Between 50 and 100 pollen mother cells (PMCs) were analysed for chiasma frequency and distribution at diakinesis/metaphase stage, and 500 PMCs were analysed for chromosome segregation during the anaphase and telophase stages. Pollen stainability, as a measure of fertility, was determined by staining a minimum of 1000 pollen grains with 2% acetocarmine: 50% glycerin (1 : 1) for about 30 min. Round/complete pollens which were stained were taken as fertile, while incomplete/shrunken pollens with no stain were considered as infertile (Sheidai *et al*. 2003).

**Results and discussion**

Overall, the *Bromus* species studied here showed pollen fertility of 88% (*B. rubens*) to 99% (*B. tectorum*). The possible reasons for a low reduction of pollen fertility in *Bromus* species may be chromosome stickiness, laggard formation and cytomixis.

**Chromosome number and chiasmata**

Both populations of *B. tectorum* possessed $n = 7$ ($2n = 2x = 14$) chromosome number (figure 1 b,d), supporting an earlier report (Lövkvist and Hultgård 1999; but see also Devesa *et al*. 1990). Although more total and terminal chiasmata as well as ring bivalents were observed in Zahedan population of *B. tectorum* compared to the Fars population (table 1), the differences were not significant ($t = 1.18, P = 0.30$). The two populations of *B. sericeus* studied differed in their ploidy level. The Iranshahr population possessed $n = 14$ ($2n = 4x = 28$) chromosome number (figure 1c), while the Khash population possessed $n = 7$ ($2n = 2x = 14$). The earlier study on this species reports the somatic chromosome number of $2n = 14$ (Bolkovskikh *et al*. 1969). Therefore, this is the first report on among-population variation in ploidy level of *B. sericeus*.

**Keywords.** B-chromosomes; *Bromus*; chiasma frequency; cytomixis.

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Figure 1. Representative meiotic cells in Bromus species. (a) *B. rubens* showing $n = 14$; (b) *B. tectorum* (Za- hedan population) showing $n = 7$; (c) *B. sericeus* (Iranshahr population) showing $n = 14$; (d) *B. tectorum* (Fars population) showing $n = 7$; (e) *B. fasciculatus* (Booshehr population) showing $n = 14$; (f) *B. sterilis* (Kerman population) showing $n = 7$ (scale bar = 10 μm).