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Chromosome number and ploidy level of *Androsace maxima (Primulaceae)* in Austria

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Abstract: The chromosome number of *Androsace maxima (Primulaceae)* is presented for the first time from Austrian material: It is 2n = 6x = 60. Since the different ploidy levels known so far for *A. maxima* (di-, tetra- and hexaploid) reveal geographic patterns, possible reasons and possible taxonomic consequences are discussed.

Key Words: *Androsace maxima*, chromosome number, polyploidy.

Zusammenfassung: Chromosomenzahl und Ploidiestufe von *Androsace maxima (Primulaceae)* in Österreich.

Die Chromosomenzahl von *Androsace maxima*, zum ersten Mal an österreichischem Material bestimmt, ist 2n = 6x = 60. Da die bislang bekannten unterschiedlichen Ploidiestufen (di-, tetra- und hexaploid) ein geographisches Muster zeigen, werden mögliche Gründe und mögliche taxonomische Konsequenzen diskutiert.

Introduction

Androsace maxima is an annual species of mostly steppe habitats with a large distribution area ranging from Morocco in the west to Mongolia in the east (MEUSEL & al. 1978). In Austria it is currently restricted to the eastern, Pannonian districts (Lower Austria, Vienna, Burgenland), where it is rare and classified as "threatened by extinction" ("vom Aussterben bedroht") or "critical" according to IUCN (NIKLFELD & SCHRATT-EHRENDORFER 1999).

Based on the number x = 10, three ploidy levels (di-, tetra- and hexaploid) are known so far (see discussion). The chromosome number of *Androsace maxima* in Austria (as well as in the eastern part of Europe) has not yet been determined (DOBEŠ & VITEK 2000), so we provide the first counts for this region.

Material and Methods

Seeds taken from the field (accession 1, see Table 1) and from herbarium material (accession 2, see Table 1) were germinated on filter paper. Root tips of seedlings were pretreated with 0,008 M 8-hydroxyquinoline for 2 hrs at room temperature and for 2 hrs at 4°C, fixed in ethanol acetic acid (3 1) for 12 hrs at room temperature, and stored in –20°C until use. For chromosome staining Feulgen reaction was used according to standard protocols. Slides were examined with a Polyvar microscope (Reichert-Jung) and photos were taken on monochrome film (Kodak Technical Pan 100). Ten well-spread mitotic plates per accession were examined.

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Table 1: Plant material.

accession 1: Nord-Burgenland, Leithagebirge, K. 166 ENE Jois; 166 m s. m.; (8066/2); Straßenböschung; 13.5.2001: G. M. Schneeweiß & P. Schönswetter (WU).

accession 2: Niederösterreich, Thermenlinie, am Südostrand des Verkehrsübungsplatzes NW von Teesdorf bei Baden bei Wien; 234 m s. m.; (8063/2); Acker; 21.5.1998: W. Till s. n. (WU).

Results

The chromosome number in both populations of *Androsace maxima* analysed was 2n = 6x = 60 (Fig. 1). Most of the chromosomes are small and submetacentric. Several (5 to 6) chromosomes are bigger metacentrics or submetacentrics. Only two chromosome pairs revealed the presence of clearly distinguishable satellites and secondary constrictions (see Fig. 1A). One pair of satellites was almost two times larger than the other. The presence of other smaller satellites at the very ends of some chromosomes, in subterminal position, was observed in several metaphase plates. The size and types of chromosomes are similar in both populations studied.

Discussion

The different cytotypes of *Androsace maxima* show a geographical pattern. In the southwestern part of its distribution area (Morocco to France) only diploids were reported (GALLAND 1985 for Morocco, FERNÁNDEZ CASAS 1980, LUQUE & DÍAZ LIFANTE 1991 for Spain, VERLAQUE & FILOSA 1992 for France). In the eastern part (Austria to Mongolia)

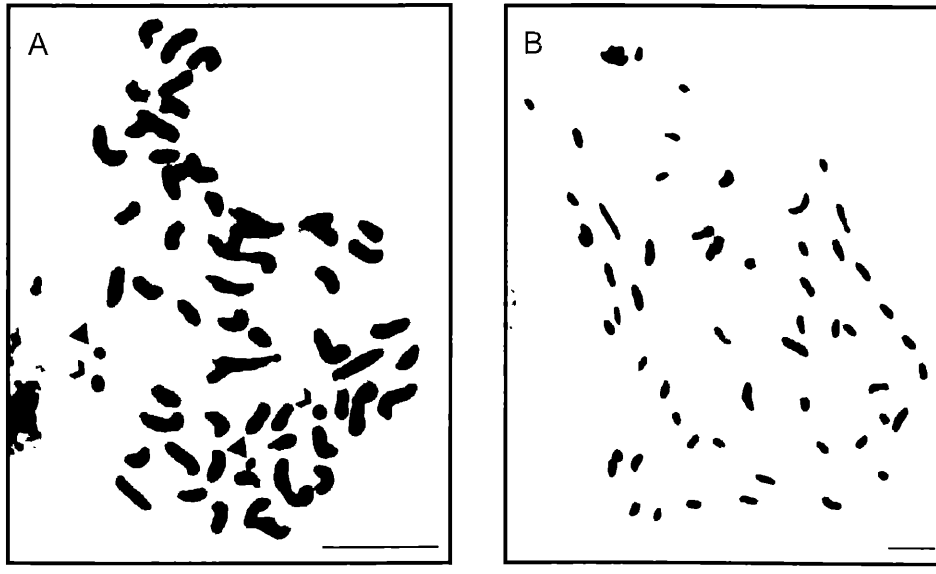


Fig. 1: Plates of *Androsace maxima*. **A:** accession 1: metaphase. – **B:** accession 2: prometaphase. Scale bar 5 µm. Arrowheads indicate the two pairs of satellites.

polyploids seem to dominate: hexaploids are known from Austria (present data), Turkey (KRESS 1984) and Iran (ARYAVAND 1980), tetraploids are known from Syria (KLIPHUIS & BARKOUDAH 1977), Iran (ARYAVAND 1977), Kazachstan (ZAKIROVA & NAFANAILOVA 1988), southern Siberia (KRASNIKOV 1991) and Mongolia (MĚSÍČEK & SOJÁK 1992), diploids were reported only once from southern Siberia (KRASNOBOROV & al. 1980[1]). Thus, the Austrian populations fit well into the eastern group, strengthening the picture, that within the eastern group hexaploids occur in the west (Austria to Iran), whereas tetraploids occur in the east (Syria to Mongolia) with some overlap in the Middle East.

Hexaploid *Androsace maxima* occupies a geographically intermediate position between the diploids in the southwestern part and (prevailing) tetraploids in the eastern part. It can be speculated that this is the result of hybridization events in contact zones of diploid and tetraploid cytotypes.

Additionally, the correlation of ploidy level and distribution also indicates that there are probably more taxa to be distinguished within *Androsace maxima*. Few infraspecific taxa are distinguished so far, e. g., *subsp. caucasica* (Kusn.) Federov (in TACHTADŽJAN & FEDOROV 1972, but see MENICKY 2000) from Caucasus or *subsp. turczaninovii* from Central Asia (Mongolia: MĚSÍČEK & SOJÁK 1992). If these infraspecific taxa correlate with different cytotypes, is not known yet. Further investigations, especially further chromosome analyses from areas not covered so far, are heavily needed.

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[1] These authors also report the aneuploid number of 2n = 38, which requires confirmation, since no pictures of the deviating plate(s) are provided.

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