

CHROMOSOME NUMBERS IN SOME MOSSES FROM IRAN

S. M. Ghaffari, S. Ahmadi, S. Shirzadian & A. Tavasoli

Received 2019, 12. 23; accepted for publication 2020. 06. 06

Ghaffari S. M., Ahmadi, S., Shirzadian, S. & Tavasoli, A. 2020. 06. 30: Chromosome numbers in some mosses from Iran. *-Iran. J. Bot. 26 (1): 67-70. Tehran.*

Original meiotic chromosome numbers are reported for seven species in four families of mosses from Iran including: *Amblystegium serpens* (n=19), *Anomodon rugelii* (n=11), *Didymodon tophaceus* (n=13), *Drepanocladus exannulatus* (n=11), *Eucladium verticillatum* (n=11), *Fissidens viridulus* var. *tenuifolius* (n=10) and *Grimmia pulvinata* (n=13). Chromosome count for *Fissidens viridulus* var. *tenuifolius* is reported here for the first time. Report for five other species are new for flora of Iran.

Seyed Mahmood Ghaffari (correspondence <ghaffari@ibb.ut.ac.ir>), Institute of Biochemistry & Biophysics (IBB), University of Tehran, Tehran, Iran.- Shahla Ahmadi, Lorestan Agricultural and Education Research Center, Agricultural Research, Education and Extension Organization (AREEO), Khorramabad, Iran.- Saeed Shirzadian, Department of Botany, Iranian Research Institute of Plant Protection, Agricultural Research, Education and Extension Organization (AREEO), Tehran, Iran.- Akhtar Tavasoli, Alzahra University, Department of Biology, Tehran, Iran.

Kew words: Bryophyte; chromosome number; meiosis; mosses; Iran

شمارش کروموزومی تعدادی خزه از ایران

سید محمود غفاری: استاد مؤسسه تحقیقات بیوشیمی و بیوفیزیک دانشگاه تهران، تهران، ایران

شهلا احمدی: مربی پژوهش مرکز تحقیقات کشاورزی و منابع طبیعی لرستان، سازمان تحقیقات کشاورزی و منابع طبیعی لرستان،

سازمان تحقیقات، آموزش و ترویج کشاورزی

سعید شیرزادیان: دانشیار مؤسسه تحقیقات گیاه پزشکی ایران، سازمان تحقیقات، آموزش و ترویج کشاورزی

اخترتوسلی: دانشیار دانشکده زیست شناسی دانشگاه الزهراء، تهران، ایران

شمارش کروموزومی در تقسیم میوزی برای هفت گونه متعلق به چهار تیره از خزهای ایران به قرار ذیل گزارش می شود:

Amblystegium serpens (n=19), *Anomodon rugelii* (n=11), *Didymodon tophaceus* (n=13), *Drepanocladus exannulatus* (n=11), *Eucladium verticillatum* (n=11), *Fissidens viridulus* var. *tenuifolius* (n=10) and *Grimmia pulvinata* (n=13).

شمارش کروموزومی گونه *Fissidens viridulus* var. *tenuifolius* (n=10) برای اولین بار گزارش می شود. گزارش پنج گونه دیگر برای فلور ایران جدید می باشد.

INTRODUCTION

Akhani and Kürschner (2004) prepared an annotated checklist of the Iranian bryoflora including 437 taxa, which 367 of them were mosses. In the recent years some new records of mosses introduced

by Zare & al. (2011), Shirzadian (2011), Shirzadian & al. (2014) and Shirzadian & Akhooei Darzikolaie (2016). Cytological studies in mosses for flora of Iran is limited to two previous papers. This paper is the third study on the cytology of the Iranian mosses. The

first and second chromosome numbers were reported by Shirzadian & al. (2003) and Shirzadian & Djavadi (2005) respectively. The present paper deals with the cytological results in seven species by the meiotic studies.

MATERIALS AND METHODS

More than 20 specimens of mosses representing seven species were collected between September 2001 and August 2002 from Lorestan province and north parts of Iran. Capsules with very light brown opercula were fixed in 1:3 acetic alcohol for 24 hours and then squashed in acetocarmine. The magnification of all figures is X 2500. Vouchers specimens are preserved in the herbarium of the Ministry of Jihad –e-Agriculture (IRAN) at the Iranian Research Institute of plant protection (Tehran, Iran).

RESULTS

Amblystegiaceae

Amblystegium serpens (Hedw.) Schimp, n=19
Lorestan: Khorramabad, Makhmal kouh, Sar-e-morgh 1490m.

Previous chromosome count for this species is n=20 by Shirzadian & al. (2003) from north parts of Iran. Meiosis in our sample showed five tetravalents and nine bivalents at first metaphase (fig. 1A). In some cells, laggard chromosomes were observed at first anaphase (fig. 1B). According to Fritsch (1991), this taxon has various chromosome numbers of n=7,9,9 + m,10,10 + m, 11, 12, 19, 19 + m, 20, 21, 22, and 40.

Drepanocladus exannulatus (B.S.G.) Warnst. n=11
Golestan province

Meiosis in this species showed stickiness and clamping of chromosomes at first metaphase. Many sporocytes were observed in order to ascertain the correct chromosome count. The number n=11, observed at metaphase one (fig. 1C) and (11-11) segregation at first anaphase (fig. 1D). Three previous reports for this species were n=12 and two reports were n=11 (see Fritsch 1991).

Fissidentaceae

Fissidens viridulus (Sw.) Wahlenb. var. *tenuifolius* (Boal.) A. J. Smith

Lorestan: Khorramabad, Makhmal Kouh, 1300m.

There are chromosome reports for the genus *Fissidens* from many parts of the world and numbers include

n=5,6,8,10,12,13,16 and 24. Of these n=10,12,16, and 24 are polyploids (Fritsch 1991, Ramsay 2011). This taxon has two races of ploidy (diploidy with n=5 and tetraploidy with n=10). Our sample was tetraploid and showed 10 bivalents at first metaphase (fig. 1E). In some cells Chromatid Bridge was recognized at first anaphase (fig. 1F). According to our data, this is the first chromosome count for this variety.

Grimmiaceae

Grimmia pulvinata (Hedw.) Sm. n=13

Lorestan: Khorramabad, Kamalvand, 1500m.

Our sample was diploid and showed 13 bivalents at metaphase one (fig. 1G). The most of bivalents were in ring form. Tetraploid races of n=26 is reported by Bryan (1973) from Austria and same count of n=26 is reported by Ramsay (2011) from Australia for *Grimmia pulvinata* var. *africana*. This count is first report for flora of Iran.

Pottiaceae

Didymodon topiaceus (Brid.) Garov. n=13

Lorestan: Khorramabad, Makhmal kouh, 1440m.

This species showed 13 bivalents at first metaphase, which one of them was largest from others (fig. 1H). At second metaphase, 13 diads were observed at each pole (fig. 1I). In some cells one m chromosome were observed at first metaphase (fig. 1J). All previous chromosome numbers reports agrees with the present count (see Fritsch 1991). This is the first chromosome number report for flora of Iran.

Eucladium verticillatum (Brid.) B.S.G. n=11

Lorestan: Khorramabad, Tang shabikhoon, 1220m.

E. verticillatum is known from Eurasia, Africa, and Central and North America (Zander 1994).

Previous count for this species is n=13 (see Fritsch 1991), which is different with our sample of n=11. Meiosis in this species showed stickiness and clamping of chromosomes at first metaphase (fig. 1K). *Anomodon rugelii* (C. Muell.) Keissl. n=11

Mazandaran: north foot of Alborz Mountains south of Sari

Meiosis in this species showed five tetravalents and one bivalent at first metaphase (fig. 1L), which is agreement with the more previous reports (see Fritsch 1991). This is the first chromosome number report for flora of Iran.

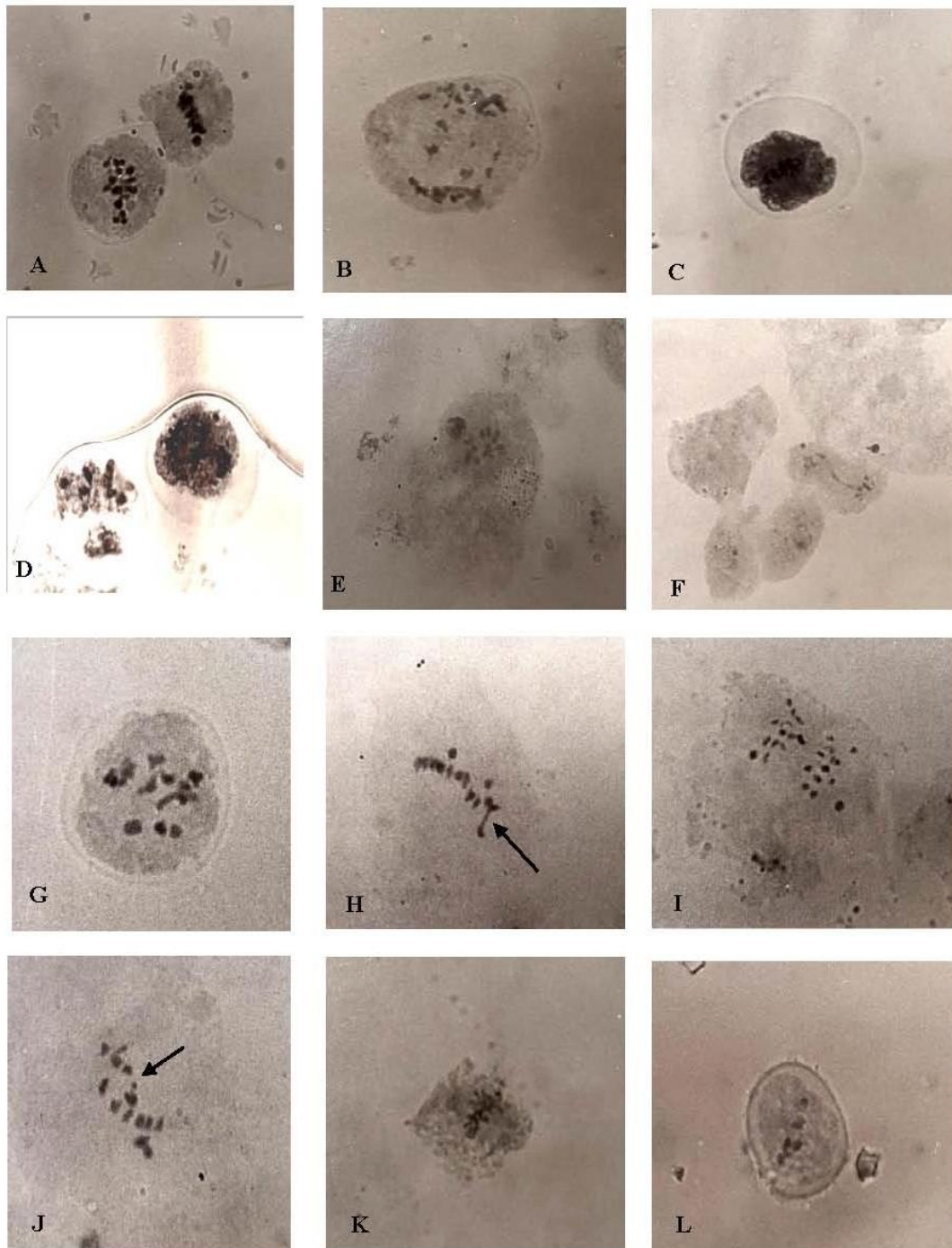


Fig. 1. A-B: *Amblystegium serpens* n=20. A, first metaphase, showing 5 tetravalents and 9 bivalents, B, anaphase one, showing laggard chromosomes; C-D, *Drepanocladus exannulatus*, n=11; C, first metaphase, D, first anaphase (11-11) segregation; E-F, *Fissidens viridulus* var. *tenuifolius* n=10; E, first metaphase, F, anaphase one, showing chromatid bridge; G, *Grimmia pulvinata* n=13, first metaphase; H-I, *Didymodon tophaceus* n=13; H, first metaphase, showing large chromosome (arrow), I, second metaphase; J, first metaphase, showing m chromosome (arrow); K, *Eucladium verticillatum* n=11, first metaphase; L, *Anomodon rugelii* n=11, first metaphase, showing 5 tetravalents and one bivalent.

REFERENCES

- Akhani, H. & Kürschner, H. 2004: An annotated and updated checklist of Iranian bryoflora. -Cryplog. Bryol. 25 (4): 315-347.
- Bryan, V. S. 1973: Chromosome studies on mosses from Austria, Czechoslovakia and other parts of Europe. -Österr. Bot. Z. 121: 187-226.
- Ramsay, H. P. 2011: Australian mosses- new chromosome numbers and a compilation of chromosome data. -Telopea 13 (3): 577-619.
- Fritsch, R. 1991: Index to bryophyte chromosome counts. -Bryophytorum bibliotheca 40: 1-352.
- Shirzadian, S., Ghaffari, S. M. & Djavadi, S. B. 2003: Chromosome counts in some mosses of Iran. -Rostaniha 4: 125-136.
- Shirzadian, S. & Djavadi, S. B. 2005: Chromosome report for *Bryum caespiticum* from Iran. -Rostaniha 6 (2): 161-162.
- Shirzadian, S. 2011: Five new records of mosses to the flora of Iran. -Phytomorology 61 (3-4): 68-71.
- Shirzadian, S., Akhoondi Darzikolae, S. & Uniyal, P. L. 2014: Seven new records of mosses in Iran. -Telopea 17: 393-401.
- Shirzadian, S. & Akhoondi Darzikolae, S. 2016: Two new mosses of Grimmiaceae for Iranian bryoflora. -Nova Biologica Reperta 3 (2): 166-166.
- Zander, R. H. 1944: *Eucladium*. P. 246. In Sharp, A. J., H. Crum and P.M. Eckel (eds). The moss flora of Mexico vol. 1. -Memoirs of New York. 378p.
- Zare, H., Akbarinia, M., Hedenäs, L. & Maassoumi, A. A. 2011: Eighteen mosses from the Hyrcanian forest region new to Iran. -Journal of Bryology 33 (1): 62-65.