

Cytotaxonomical Evaluation of the two Adiantoid ferns of Uttar Pradesh

S. Dominic Rajkumar*, Shashank Kumar Singh, Shobhit Kumar Srivastava & Ravi Pratap Gautam

Department of Botany, St. Andrew's College (PG), Gorakhpur, Uttar Pradesh

*Email: dominicrajkumar1@gmail.com

Published: 15 December, 2012; Vol.1(2):10-13; © Gayathri Technological Publication, 2012.

Abstract

Adiantum edgeworthii Hooker and *Adiantum lunulatum* Burm., are two tropical species found in humid forests. *A. lunulatum* is a common species and *A. edgeworthii* is a rare species found at the foot hills of Himalayas in Uttar Pradesh. This is the first report of *A. edgeworthii* from Uttar Pradesh. The tetraploid cytotype of $n=60$ for *A. lunulatum* and the diploid cytotype of $n=30$ for *A. edgeworthii* are the first report to Uttar Pradesh. The sporangia and the spores have been found to be normal.

Key words: Cytotaxonomy, *Adiantum edgeworthii*, *A. lunulatum*, cytotype, Himalayas, Uttar Pradesh.

Introduction

The family Adiantaceae is a well known group of ferns found in the tropical and subtropical regions. In *Adiantum* about twenty-five species are reported from India (Dixit 1984; Khullar 1994; Borthakur *et al.*, 2001, Rajkumar *et al.*, 2012), 10 species are reported to be present in South India (Dixit 1984, Manickam & Irudayaraj, 1992) and nine species in Assam (Borthakur *et al.*, 2001). Chandra (2000) has reported about 26 species from India. In Uttar Pradesh only four species have been reported so far (Rajkumar *et al.*, 2012). Rajkumar *et al.*, (2011) have reported for the first time the presence of *Adiantum lunulatum* in Uttar Pradesh. In the present study the chromosome count for *Adiantum edgeworthii* Hooker and *Adiantum lunulatum* Burm., are reported. The chromosome numbers for these two species are reported for the first time from Uttar Pradesh.

Uttar Pradesh (Fig. 1) is present at the foot hills of the Himalayas and is situated between 23° 52' N and 31° 28' N Latitudes and 77° 30' E and 84° 39' E Longitude. For chromosome count the technique of Manton, (1950) was followed.

Description

1. *Adiantum edgeworthii* Hooker, Sp. Fil. 2: 14; t. 81 B. (1851); Beddome, Ferns Brit. India: t. 17 (1865); Hope, J. Bombay Nat. Hist. Soc. 13: 237 (1900).

Adiantum caudatum L. var. *edgeworthii* (Hooker) Beddome, Handbook Ferns Brit. India; 84 (1883).

Adiantum caudatum var. *rhizophorum* Wall. ex Clarke, Trans. Linn. Soc. London 2 Bot. 1: 453 (1880).

Rhizome erect, apex scaly, scales light-brown, linear to lanceolate, margin almost entire, apex acuminate. Stipes proximate, 2.5-7cm long, black thin wiry, glabrous, glossy; rachis black, glossy, glabrous, with a terminal small pinnae like structure or extended with a proliferous vegetative bud at its apex. Lamina pinnate, 12-22 cm long, 1.5-2.5 cm broad, linear to lanceolate, texture herbaceous, glabrous; pinnae many, 15-24 pairs, alternate, very shortly petiolate or sessile, petiole dark brown, dimidiate, triangular, base cuneate side margins nearly straight, entire upper margin lobed into 3-5 primary truncate lobes with an acute apex that may again be shallowly lobed; lower

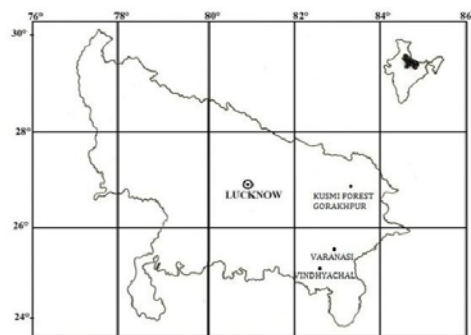


Fig- 1. Map of the study area – Uttar Pradesh.



pinnae somewhat smaller, downwards deflexed; veins fine, free. Sori indusiate, oblong, elongated, discrete, generally placed in the middle of the outer margin where the margin slightly depressed from the general outline, almost all lobes fertile or 1-2 lobes sterile; indusia light brown, sub reniform, glabrous, margin almost entire. Spores dark brown, $31 \times 38 \mu\text{m}$.

2. *Adiantum lunulatum* Burm., Fl. Ind. 235 (1768); Beddome, Ferns S. India, t. 1 (1864); Handb. Ferns Br. India, 82 (1883); Clarke, Trans. Linn. Soc. Lond. II Bot. 1: 452 (1880); Mehra & Bir, Res. Bull. Panjab Univ. (N.S.), 15 : 105 (1964); Dhir, Ferns N.W. Himal. 31 (1980); Dhir & Sood, Fern Fl. Muss. Hills, 19, Fig. 7 (1988).

Adiantum philippense L., Sp. Pl. 2: 1094 (1753); Ching, Ic. Fil. Sin. 5. Pl. 214 (1958); Holtt., Fl. Mal. 2: 598 (1954); Nayer and Kaur, Comp. Beddome handb. 23 (1974); Iwastuki in fl. East. Himal. (3Rep). 172 (1957); Dixit, Cens. Ind: Pterid. 75 (1984); Jamir & Rao, Ferns Nagaland, 162 Pl. 37 (1988).

Rhizome erect, up to 2 cm thick; scales ovate-lanceolate, apex acuminate, margin entire. Stipes tufted, wiry, numerous up to 14×0.3 cm, dark brown and black, scaly at the basal most part, glabrous above. Lamina lanceolate, up to 31×6 cm, simply pinnate; pinnae 8 - 20 pairs, alternate, distinctly stalked, pinnae fan shaped, up to 5×2.5 cm, dimidiate, upper edge rounded, lobed, margin entire in sterile pinnae; veins distinct above and below, dichotomously, flabellately branched, free, reaching the margin; pinnae green, glabrous. Sori continuous along the edge of the lobe, crescent shaped, spores triangular, $25 \times 31 \mu\text{m}$.

Specimens examined

1. *A. edgeworthii* (Fig. 2): **Vindhyachal-Varanasi**, 05.09.2012, 80m, 445.
2. *A. lunulatum* (Fig. 3): **Kusmi forest - Gorakhpur**, 26.09.2012, 90m, 451.

All specimens are deposited at the Department of Botany, St. Andrew's college (PG), Gorakhpur.



Fig. 1: *A.edgeworthii*



Fig.2: *A.lunulatum*

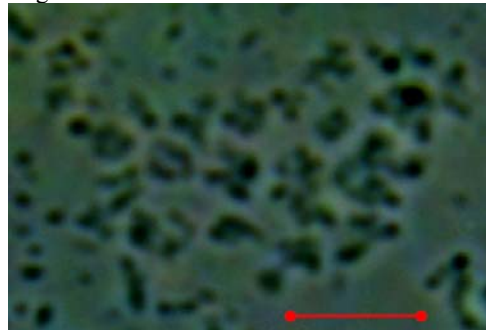


Fig. 3. Meiotic squash ($n= 30$) of a spore mother cell of *A. edgeworthii* (The scale – marker equals $10 \mu\text{m}$)

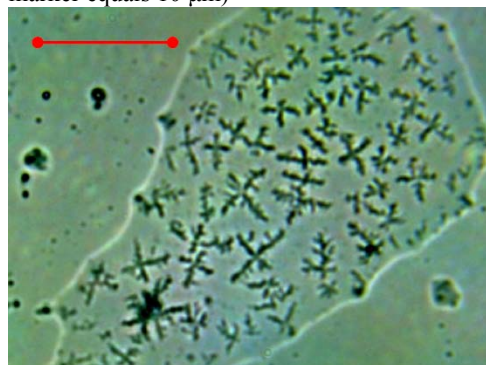


Fig. 5. Meiotic squash ($n= 60$) of a spore mother cell of *A. lunulatum*(The scale – marker equals $10 \mu\text{m}$)

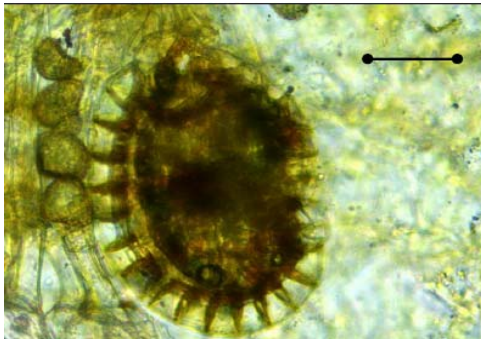


Fig-6. An individual normal sporangium of *A. edgeworthii* (The scale – marker equals 10 μ m)



Fig-7. An individual normal sporangium of *A. lunulatum* (The scale – marker equals 10 μ m)

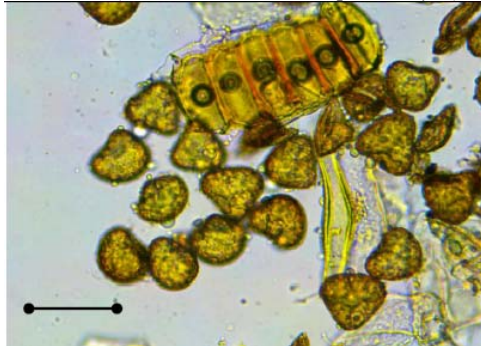


Fig- 8. A sporangium showing normal spores in *A. edgeworthii* (The scale – marker equals 10 μ m)

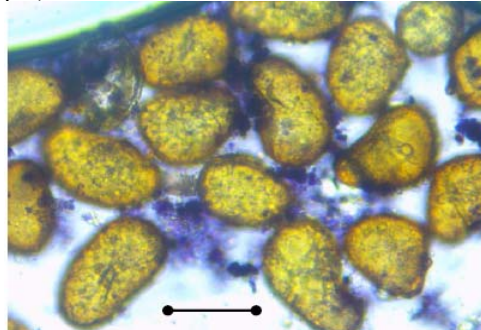


Fig- 9. A sporangium showing normal spores in *A. lunulatum* (The scale – marker equals 10 μ m)

Discussion

Adiantum lunulatum is a common species found in Uttar Pradesh. *A. lunulatum* was first reported by Rajkumar *et al.* (2011) in Uttar Pradesh. In *A. lunulatum* diploid ($n=30$) and tetraploid cytotypes ($n= 60$) have been reported widely from several localities in India. *A. edgeworthii* is a rare species collected from the hilly areas adjoining Varanasi and is the first report of this species from Uttar Pradesh. In this species also both diploid ($n=30$) and tetraploid cytotypes ($n= 60$) have been reported but only the diploid cytotype is very common (Khullar *et al.*, 1988; Punetha 1989; Bir & Verma, 2010) and there is only a single report of the tetraploid cytotype (Verma, 1961; Khullar & Mehra, 1972; Bir & Verma, 2010) from India. In the present study the tetraploid cytotype of $n= 60$ (Fig. 4) for *A. lunulatum* and the diploid cytotype of $n= 30$ (Fig. 5) for *A. edgeworthii* are observed and reported for the first time for Uttar Pradesh. The sporangia (Fig. 6 - *A. edgeworthii* & 7 - *A. lunulatum*) and the spores (Fig. 8 - *A. edgeworthii* & 9 - *A. lunulatum*) have been found to be normal.

Acknowledgements

The authors are thankful to the Principal, St. Andrew's college (PG), Gorakhpur, Uttar Pradesh, India for the facilities and the encouragement given to us. One of the authors (SDR) is thankful to CSIR, India (CSIR Sanction No. 38 (1282) 11/EMR -II) for the financial assistance.

References

- Bir, S.S. and Verma, S.C. 2010. Chromosome atlas of the Indian Pteridophytes. Bishen Singh Mahaendra Pal Singh, Dehra Dun.
- Chandra, S. 2000. The ferns of India (Enumeration, Synonyms & Distribution). International Book Distributors, Dehradun.
- Borthakur, S.K., Deka, P. and Nath, K.K. 2001. Illustrated manual of ferns of Assam. Bishen Singh Mahendra Pal Singh, Dehradun.
- Dixit, R.D. 1984. A Census of the Indian Pteridophytes. *Bot. Surv. India.*, Dept. of Environment, Howrah.
- Khullar, S.P. 1994. An illustrated fern flora of western Himalaya, Vol. 1. International Book Distributors, Dehradun, India.
- Khullar, S.P. and Mehra, P.N. 1972. Cytotaxonomy of Western Himalayan ferns I.



- Schizaeaceous series. *Res. Bull. Sci. (ns) Panjab Univ.*, 23: 189 – 204.
- Khullar, S.P., Sharma, S. S. and Verma, S. C. 1988. In Bir S. S. (ed.) SOCGI Plant chromosome number Reports VI. *J. Cytol & Genet.*, 23: 38 – 50.
- Manickam, V.S and Irudayaraj, V. 1992. Pteridophyte flora of the Western Ghats - South India. BI Publications, New Delhi.
- Punetha, N. 1989. Cytological observations on ferns of Kumaon. N W Himalaya. In Trivedi *et al.* (eds.) Plant Science Research in India. Today and Tomorrow's Printers and Publishers, New Delhi, pp 459 – 465.
- Rajkumar, S. D., Srivastava, S.K., Gautam, R. P. and Singh, S.K. 2011. Plantlet formation and spore production – a rare coincidence in *Adiantum lunulatum* Burm. (Adiantaceae - Pteridophyta) of Uttar Pradesh. *IJBT* 1 (Special Issue): 149 – 151.
- Rajkumar, S. D., Srivastava, S.K., Singh, S.K. and Gautam, R. P. 2012. The family Adiantaceae (Presl) Ching (Pteridophyta) of Eastern Uttar Pradesh. *Indian Journal of Forestry* (In Press).
- Verma, S. C. 1961. In Mehra, P. N. Chromosome numbers in Himalayan ferns. *Res. Bull. (ns) Panjab Univ. Sci.* 12: 139 – 164.

Manuscript Progress Date

Received : 19.11.2012
Revised : 26.11.2012
Accepted : 09.12.2012
