



A New Diploid Cytotype of *Nephrolepis Falciformis* J. SM. (Nephrolepidaceae - Pteridophyta) From Uttar Pradesh, India

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Abstract

Nephrolepis falciformis J. Sm., is a species mainly found in tropical and humid forests. It is a very rare species discovered in the present study area (Sohagi Barwa Wildlife Sanctuary, Uttar Pradesh, India). The diploid cytotype of $n=41$ is the first report for this species and a new record to the plant kingdom. Only the tetraploid cytotype of $n=82$ has been only reported from Uttar Pradesh. The sporangia and the spores have been found to be normal.

Keywords: Cytotaxonomy, *Nephrolepis*, Diploid, Cytotype, India.

Introduction

Nephrolepis (Nephros- Kidney; *lepis*- the indusium kidney-shaped and scale like) is genus of plants in the family Nephrolepidaceae, this family is also termed as sword ferns or macho ferns. It is represented by about 30 species. Some *Nephrolepis* species may prove to be a good source of new antimicrobial chemicals (Rani, *et al.*, 2010). Some species of *Nephrolepis* are grown as ornamental plants. Some species are reported to be good plants for cleaning indoor air (Kent, *et al.*, 2007). *Nephrolepis falciformis* J. Sm. (Fig.1. B, C, D, & E) is a species of herb from family of sword ferns. Basically, it is a South American and is very rare species distributed in tropical and humid regions of the world. In India it is mostly distributed in South India, Madhya Pradesh, Uttar Pradesh, Bihar and Uttarakhand. In India about 8 species have been listed by Dixit, (1984).

The nomenclature, identity and distribution are a great confusion for this species. *Nephrolepis falciformis* J. Sm. grows well in moist and shady places either terrestrial or as epiphyte (Hovenkamp and Miyamoto, 2005), similarly Patil and Dongare, (2014) have also contributed. It is also grown in garden as cultivated plant. It shows a high level of

plasticity and on fewer occasion it has also evolved as bi-pinnatifid form recorded by Gautam, *et al.*, (2015). The recent exploration in foot hill ranges revealed the presence of the diploid cytotype and is the first report for this species. Only the tetraploid cytotype of $n=82$ has been reported so far and hence the present report of the diploid cytotype of $n=41$ (Fig.1. K & L) adds to the intraspecific diversity within the species.

The present species was collected from Sohagi Barwa Wildlife Sanctuary, Maharajganj district, Uttar Pradesh. Uttar Pradesh (Fig.1. A.) is situated between $23^{\circ} 52' N$ and $31^{\circ} 28' N$ Latitudes and $77^{\circ} 30' E$ and $84^{\circ} 39' E$ Longitude. The Maharajganj district has an almost uniform altitude of 94-96 m above sea level. A remarkable feature of its land scale is the total absence of marked topography.

Materials and Method

For cytological studies of young sori of plant was fixed in the field in a mixture of absolute ethanol, chloroform and glacial acetic acid (6:3:1). For chromosome counting the standard acetocarmine technique of Manton, (1950) was followed. Morphological,

ecological and cytological observations were made.

Strongly falcate median pinnae, the strikingly light colour (fresh plants are bright green and the dry specimens are pale yellowish brown. The degree of pinnation strongly varies within a single frond, with the median fertile pinnae often very pronouncedly falcate, with the apex frequently curved back somewhat towards the midrib, but the more basal and apical pinnae usually only slightly or not at all falcate. The sori are mostly nearly marginal. A few hairs are usually present on the upper surface of the costae especially near the points of attachment, often forming a rather characteristic sparse tuft. The scales on rachis are small and sparse and conspicuous due to the dark colour. A distinct form occurs on New Guinea, which differs from the typical form in a number of aspects: fronds long, slender, often stated to be pendent, often many in a tuft, strongly narrowed at base to strongly reduced (semi-circular) basal pinnae, middle pinna relatively small and not strongly falcate; rachis and fronds nearly glabrous, scales where present small.

Specimens Examined

Nephrolepis falciformis – Sohagi Barwa Wildlife Sanctuary, Maharajganj district, Uttar Pradesh, India. 90 m, 28.02.2019, SACH 1251 A & B. The herbarium is deposited in the

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Ecology

Found at the elevation of 90 m in shade and open places. It is both terrestrial and epiphytic.

The tetraploid cytotype of *N. falciformis* has been reported from Uttar Pradesh, (Singh, 2015), India. The diploid ($n=41$) cytotype which forms the base number for this genus has not been reported until the present finding. (Fig.1. K & L). Wagner and Wagner, (1980), Abraham, *et al.*, (1962), Manickam and Rajkumar, (1999) are of the view that high chromosome numbers have a high survival rate and they tend to adapt morphologically to the local environment rather than the low numbered species which slowly die out. The diploid cytotype of this species is also very rarely seen and the present report is first for this species. Significantly not much cytological works have been carried so far for *N. falciformis* worldwide, except the tetraploid count ($n = 82$) given by Singh, (2015) from Western Uttar Pradesh, India. The diploid cytotype of *Nephrolepis falciformis* has revealed that, this species was found to have normal sporangia (Fig.1. H & I) and spores (Fig.1. I & J) without any irregularities. The spore size has been observed to be $28 \times 20 \mu$. The stomata size was also observed to be $42 \times 28 \mu$.

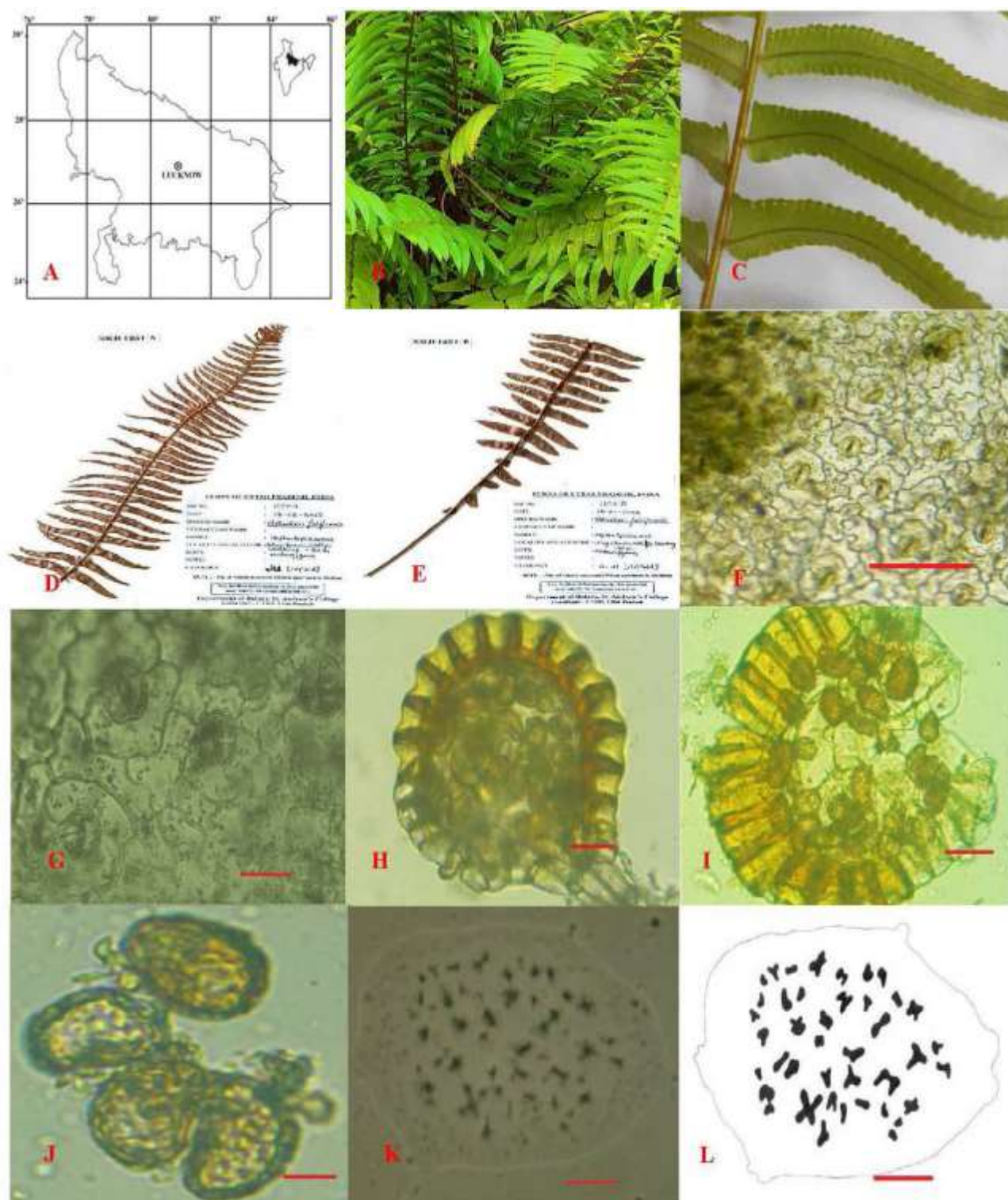


Fig. 1-

- A. Map of study area
- B. Habit of *Nephrolepis falciformis*
- C. Pinna of *N. falciformis*
- D. Herbarium specimen -part I
- E. Herbarium specimen -part II
- F. Stomata 10X
- G. Stomata 40X

- H. Sporangium 40X
- I. Sporangium with spores 40X
- J. Spores Enlarged (40X)
- K. Meiotic squash (n=41) 100X
- L. Line diagram

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References

1. Abraham, A., Ninan, C.A. and Mathew, P.M. "Studies on the cytology and phylogeny of the Pteridophytes VII. Observations on one hundred species of South Indian Ferns." *J. Indian Bot. Soc.* 41(1962): 339-539.
2. Chandra, S. and Surjit, K. "Additions to the ferns endemic to India." *Indian fern J.* 1(1984): 83- 87.
3. Dixit, R. D. "A Census of the Indian Pteridophytes." *Bot. Surv. India., Dept. of Environment, Howrah, India* (1984).
4. Gautam, R. P., Rajkumar, S. D., Singh, S. K. and Srivastava, S. K. "Is *Nephrolepis falciformis* J. Sm. evolving to bipinnate form?." *Int. J. Pharm. Bio. Sci.* 6.4 (2015): (B) 597 - 602.
5. Hovenkamp, P. and F. Miyamoto. "A conspectus of the Native and Naturalized Species of *Nephrolepis* (Nephrolepidaceae) in the World." *Blumea* 50.2 (2005): 279-322.
6. Kent, D. K., Andrew, J. K., John, G. and James, M.C. "Using Houseplants to Clean Indoor Air". *Cooperative Extension Service, College of Tropical Agriculture and Human Resources University of Hawai'i at Manoa: Ornamentals and Flowers* (2007): 37.
7. Manickam, V. S. and Rajkumar, S. D. "Polymorphic ferns of the Western Ghats South India." *Bishen Singh Mahendra Pal Singh publication, Dehra Dun, India* (1999).
8. Manton, I. "Problems of cytology and Evolution in the Pteridophyta." *Cambridge Univ Press, Cambridge* (1950).
9. Patil, S. and Meena, D. "*Nephrolepis undulatae*: A new distributional record of Western Ghats, India." *Bioscience Discovery*, 5.1 (2014): 82-84.
10. Rani, D., Khare, P. B. and Dantu, P. K. "In Vitro antibacterial and antifungal properties of aqueous and non-aqueous frond extracts of *Psilotum nudum*, *Nephrolepis biserata* and *Nephrolepis cordifolia*." *Indian J. Pharm. Sci.* 72.6 (2010):818-22.
11. Singh, S. K. "Cytogenetical studies on the fern flora of Western Uttar Pradesh, Northern India." *PhD, Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India* (2015).
12. Wagner, W. H. and Florence S. W. "Polyploidy in Pteridophytes." *Polyploidy: Biological Relevance Plenum Publ. Corp., New York* (1980): 199- 214.

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