NOTE

Selaginella crassipes (Selaginellaceae), a New Report from India

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ABSTRACT: *Selaginella crassipes* is previously known as an endemic species to Sri Lanka (Ceylon). In this paper, it is recorded, for the first time, from different localities of Maharashtra state of India. *S. crassipes* closely related with *S. proniflora* but it differs in number of morphological characters such as habit, margin of lateral leaves, length of arista of median leaves, ornamentation of spores etc. Taxonomic description of the species based on the observation under the light microscope and SEM is provided.

KEY WORDS: India, *Selaginella*, Selaginellaceae, Sri Lanka.

INTRODUCTION

Selaginella P. Beauv. is a cosmopolitan genus represented by about 750 species in the world (Jermy, 1990) and 65 species in India (Dixit, 1992; Madhusoodanan and Nampy, 1994; Antony *et al*., 2002; Nisha *et al*., 2010). Alston (1945) was the first person who enumerated 58 species of and provided a key for *Selaginella* from British India. Out of which, 44 species are confined to the present political boundaries of India. Alston (1952) made a revision of the West Indian species of *Selaginella*. Later Panigrahi and Dixit (1966, 1967, 1968) made extensive survey of Indian *Selaginella*. Afterward Dixit (1992) published a monograph of "Selaginellaceae of India".

During the botanical survey of South India, from 2005 to 2009, we collected the plants of *Selaginella* from Maharashtra state of India. After careful examination we determined some specimens as *S. crassipes* Spring. Previously this species was known only from Sri Lanka (Ceylon) and regarded as an endemic species to that island in a number of literatures (Alston, 1945; Baker, 1887). The present study revealed that it is widely distributed in Maharashtra state of India. Thus, this is the first report of *S. crassipes* from India. Information of macro-morphological and the micro-morphological characters of this species are scanty. In this paper the detail description of the species, including spores, is given based on observation under both the light microscope and SEM.

MATERIAL AND METHOD

The materials for the present study were collected in 2005 to 2009 from different localities of Maharashtra state of India. Habitat and the morphometric details were observed in the field. Fresh materials were fixed in FAA for further examination in the laboratory. The herbarium vouchers were prepared from each locality and deposited in the Botanical Survey of India (BSA), Central Circle Allahabad.

For the morphological studies, randomly five plants were taken from each locality and the micrographs were taken with Leica DMLB DC300 Microscope. For SEM studies, spores were dehydrated in alcohol series, dried in a critical point dryer, and then were placed over the adhesive surface of double-sided tape affixed on the aluminium stub to have gold coating done. The materials were sterio-scanned for microstructures under suitable magnification at an accelerating potential of 15KV using Scanning Electron Microscope LEO 430.

TAXONOMIC TREATMENT

Selaginella crassipes Spring in Mem. Acad. Roy. Sci. Belgique 24: 243, *no. 181* (1850).

S. fergusonii Hieron., Hedwigia 43: 59, *no. 61* (1904). Type: SRI LANKA (CEYLON): without exact locality, Ferguson 273(K).

Type: SRI LANKA (CEYLON): without exact locality, *Walker* 40 (K).

Mesophytic herb, main stem 4-14 cm long, erect, pale yellow, copiously pinnate and erecto- patent branches copiously compound (Fig. 1A). Rhizophores soft, present at base up to first branch, rarely up to second branch. Lateral leaves distinctly arranged on lower 1/2 part of main stem and continuous on upper

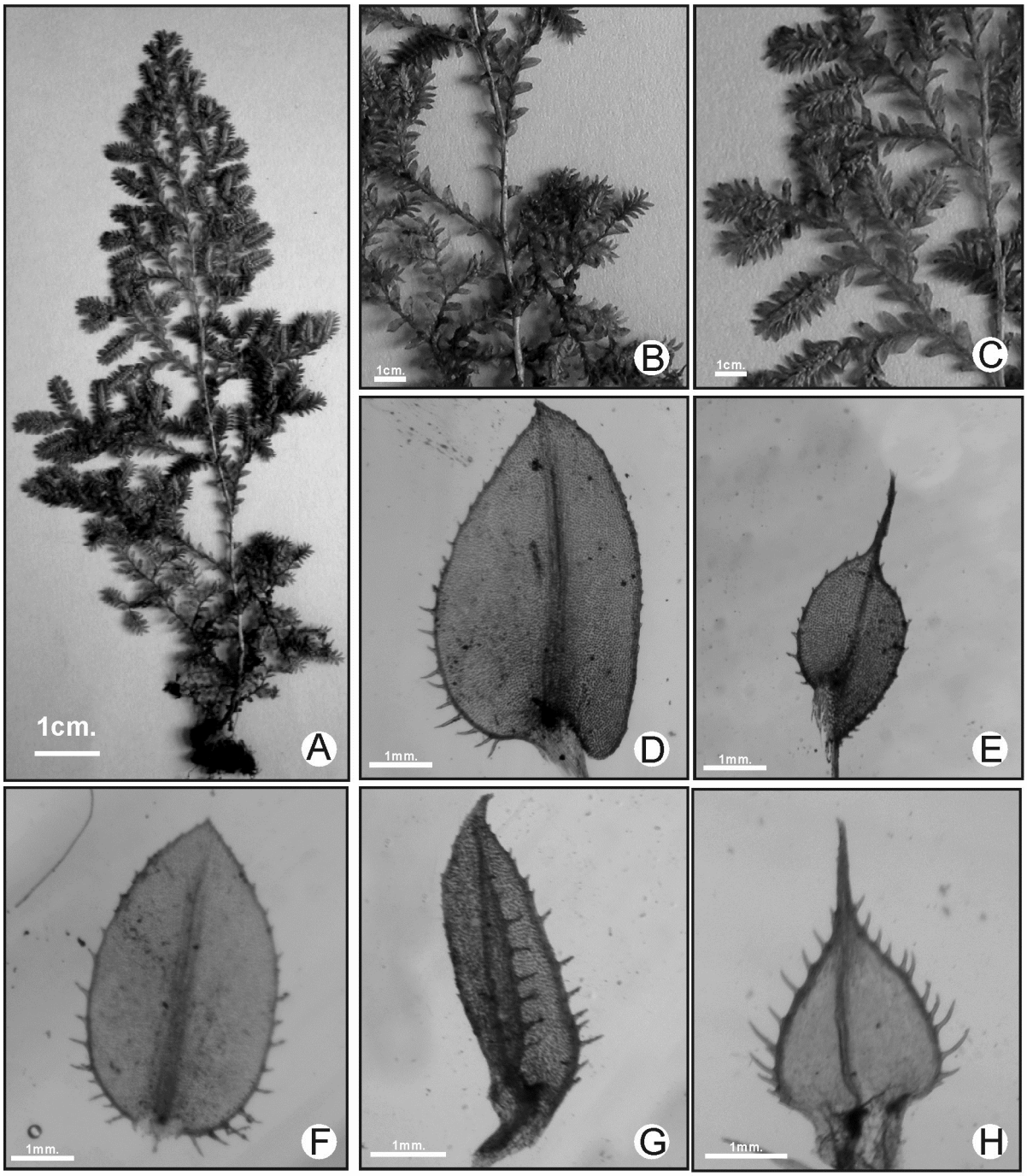

Fig. 1. *Selaginella crassipes* Spring. A. Habit; B. and C. Parts of plant to show vegetative part and cone respectively; D. Lateral leaf; E. Median leaf; F. Axillary leaf; G. Microsporophyll with sporophyll flap; H. Megasporophyll.

1/2 part of main stem including branches, shape ovate, less oblique and cordate at base, acute at tip and margin on one side ciliate to serrulate towards tip while on other side serrulate from base to tip (Fig. 1D). Median leaves distinctly arranged on main stem and continuous on branches, shape ovate, highly oblique and cordate at base, aristate at tip (arista up to 1/2 of leaf lamina sometimes slightly more than 1/2 of leaf lamina) and margin serrate (Fig. 1E). Axillary leaves present at axis of branches, shape ovate, obtuse at base, acute at tip and margin ciliate at base while serrate to serrulate towards tip (Fig. 1F). Spikes ressupinate, 4-7 mm long, twin, rarely single at end of every lateral branches (Fig. 1B, C). Sporophylls dimorphic. Megasporophylls borne in

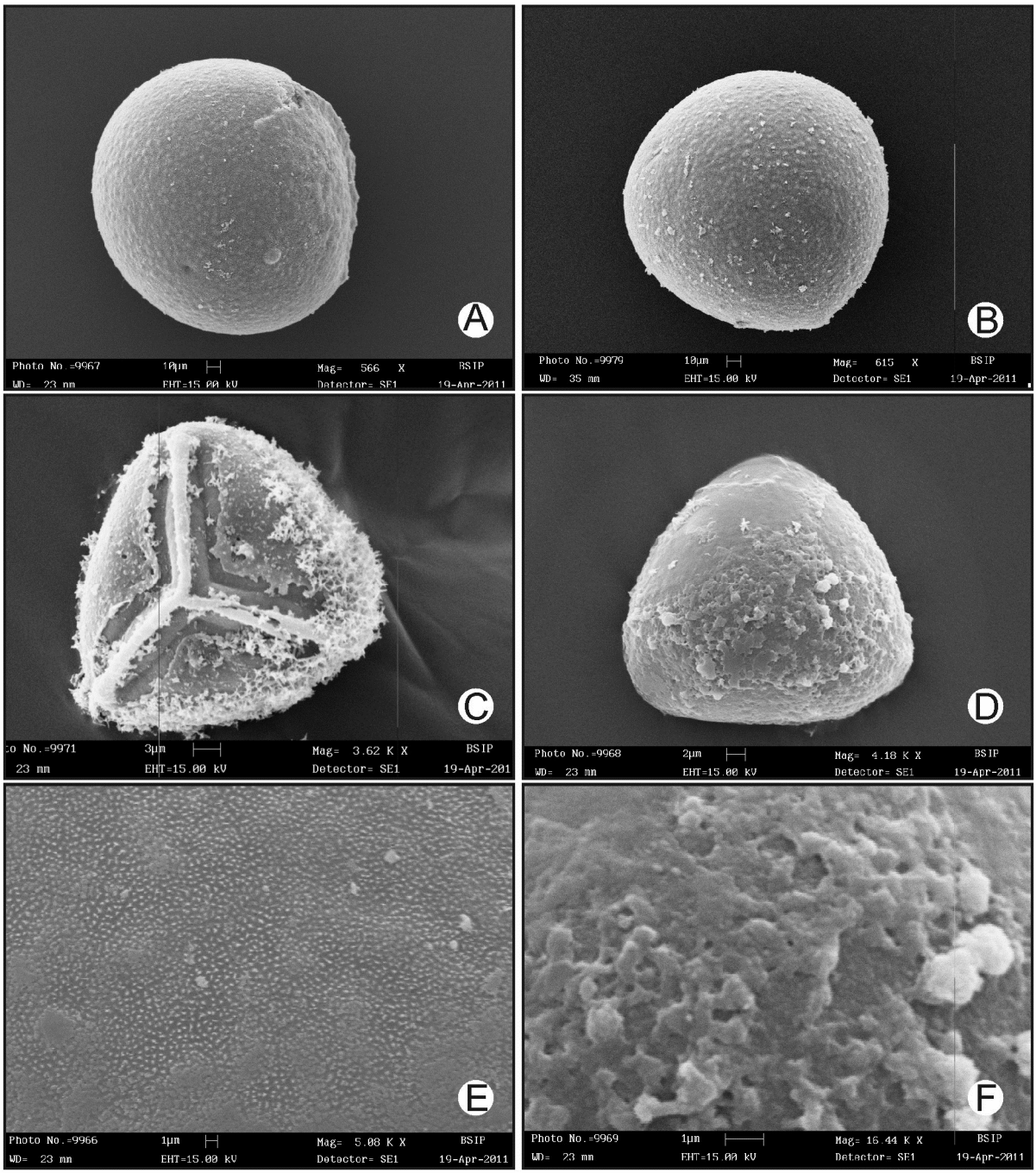

Fig. 2. Spores of *Selaginella crassipes* Spring. A. and B. Megaspore; C. and D. Microspore; A. Lateral view showing a portion of triradiate ridge; B. Distal view; C. Proximal view; D. Distal view; E. and F. A portion of B. and D. further magnified to show detail surface respectively.

same plane as lateral leaf (Fig. 1C), smaller in size, shape ovate, obtuse at base, cuspidate at tip and margin ciliate (Fig. 1H). Microsporophylls borne in same plane as the median leaf (Fig. 1B), larger in size, shape ovate-lanceolate, less oblique at base, acute at tip, margin on one side ciliate to serrulate towards tip while on other side serrulate and sporophyll flap 2/3 or more than 2/3 as long as sporophyll lamina with ciliate margin (Fig. 1G). Megaspores 4 per sporangium, 180-225 µm in diameter, white in colour, shape triangular, trilete and granulose (Fig. 2A, B, C). Microspores numerous, 28.5-40 µm in diameter, dark

red in colour, triangular, trilete and warty (Fig. 2C, D, F).

Examined specimens: INDIA: Maharashtra: Satara, Pratapgarh. 04 Oct. 2006. *S. K. Singh and P. K. Shukla SMH81704* (BSA); Mahrola. 19 Oct. 2007. *S. K. Singh and P. K. Shukla SMH81751* (BSA); Khambhil. 19 Oct. 2007. *S. K. Singh and P. K. Shukla SMH81753* (BSA); Kolhapur, Tilari Nagar. 23 Oct. 2007. *S. K.Singh and P. K. Shukla SMH81758* (BSA). Sri Lanka (Ceylon): Adam's Peak, 5000 ft., *Gardner 1274* (K).

Distribution: India (Maharashtra: Satara: Pratapgarh, Mahrola, Khambhil; Kolhapur: Tilari Nagar) and Sri Lanka (Adam's Peak or Sri Pada and upper mountain zone) (Fig. 3).

Ecology: Grow in humus-rich, moist, shaded and sloppy floor of forest.

Phenology: Plants mature or fertile during the months of Sept.-Oct.

Closely related taxa: *S. crassipes* resembles closely to *S. proniflora* (Lam.) Baker in general appearance, but it is quite distinct morphologically from the latter species. Comparison between *S. crassipes* and *S. proniflora* is based on the descriptions given by Baker (1874), Alston (1945) and our observations (Table 1).

Table 1. Comparison in between closely related taxa *S. crassipes* and *S. proniflora*.

Characters	*S. crassipes* Spring	*S. proniflora* (Lam.) Baker
Habit	Erect	Trailing
Margin of lateral leaves	Serrulate but ciliate at base	Strongly ciliate
Length of arista of median leaves	Up to ½ as long as the leaf lamina	More than ½ as long as the leaf lamina but shorter than lamina
Shape of megasporophylls	Ovate-lanceolate	Oblong-lanceolate
Ornamentation of megaspore	Granulose	Reticulate
Ornamentation of microspore	Warty	Reticulate with spine

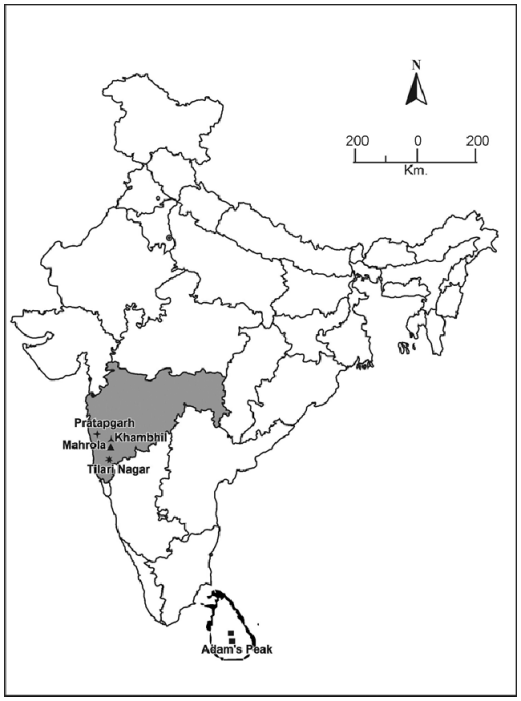

Fig. 3. Distribution map of *Selaginella crassipes* in India including Sri Lanka, Nepal and Bhutan. Gray area showing the distribution region.

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印度卷柏科新紀錄種－*Selaginella crassipes*

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摘要：*Selaginella crassipes* 原為斯里蘭卡之特有種，本文首次發現了此種在印度馬哈拉斯特拉邦的分佈紀錄。*S. crassipes* 和同屬的 *S. proniflora* 非常相似，但仍有許多特徵存在差異，如習性、側葉的邊緣、中葉刺狀物的長度以及孢子表面飾紋…等都是可分辨的特徵。本文也提供了利用光學顯微鏡和電子顯微鏡觀察此物種下的描述。

關鍵詞：印度、卷柏科、卷柏屬、斯里蘭卡。