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Sorghum nitidum (Vahl) Pers., occurrence, morphology and cytology*

K E PRASADA RAO and N K RAO

Genetic Resources Unit, ICRISAT, Patancheru 502 324, India

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Abstract. The distribution, collection, morphology and cytology of *Sorghum nitidum* (Vahl) Pers. belonging to the section *Parasorghum* of genus *Sorghum* are presented. The species collected in the western ghats of Tamil Nadu and Kerala has 10 normal(A) chromosomes ($2n=10$) and 3 supernumerary(B) chromosomes, which are reported for the first time in Indian collections.

Keywords. *Parasorghum*; *Sorghum nitidum*; B chromosomes.

1. Introduction

Sorghum Moench is an immensely variable genus, and was sub-divided into sections *Chaetosorghum*, *Heterosorghum*, *Parasorghum*, *Sorghum* and *Stiposorghum* (Garber 1950). The species belonging to the section *Parasorghum* are the least known among the genus *Sorghum* and they have been studied very little so far (Rangaswami Ayyangar and Ponnaiya 1941). The Parasorghums are distinguished from the Sorghums (true sorghums) by bearded sheath nodes and a reduced chromosome number $2n=10$ as against $2n=20$ in the latter. Little work has been done on the cytology of these wild sorghum types, probably because of the non-availability of viable seed in any germplasm bank in the world. One such species, *Sorghum nitidum*, belonging to the section *Parasorghum* is reported to be distributed in the southern portion of Asia and tropical Australia (Rangaswami Ayyangar and Ponnaiya 1941). Two accessions of this species were collected in the western ghats in Tamil Nadu and Kerala and their morphology and cytology studied.

2. Distribution and morphology

S. nitidum has been reported to be found in the western ghats of south India at elevations of 1000–7000 ft. It has been found to thrive best in places with annual rainfall of 60–100 inches (Rangaswami Ayyangar and Ponnaiya 1941).

Based on the available information, a special germplasm collection mission to the western ghats in Tamil Nadu and Kerala states of south India was organized by ICRISAT in collaboration with the National Bureau of Plant Genetic Resources (NBPGR), New Delhi and the Tamil Nadu Agricultural University, Coimbatore. Two panicle samples were collected and their locations are shown in table 1.

These samples were brought to the ICRISAT Center and they were grown initially in the glass house and subsequently transplanted in the ICRISAT Botanical Garden during 1988 rainy season. One of the plants which has established, flowered

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Table 1. Location particulars of *S. nitidum* panicle samples collected from western ghats, during December 1987.

| Collection | State | District | Village | Exact location | | |
|------------|------------|----------|-----------|----------------|-----------|----------|
| | | | | Latitude | Longitude | Altitude |
| PMP 48 | Tamil Nadu | Anna | Melpallam | 10° 20'N | 77° 35'E | 1450 m |
| PMP 85 | Kerala | Idukki | Bodimetti | 10° 10'N | 77° 15'E | 1300 m |

and set seed was identified as *S. nitidum* by its distinguishing morphological characters discussed below.

S. nitidum collected in the original habitat was a perennial without any rhizomes spreading in patches on the mountaneous slopes with sparse seed setting. The plant that survived (PMP 85) in the ICRISAT Botanical Garden from the seed of the two accessions collected tillered profusely, spread horizontally on the ground in all directions with thin culms and narrow leaves. Nodes of the culms were bearded; ligule hairs prominent; primary branches of the panicle whorled and simple; racemes terminal (figure 1); peduncles very slender; sessile spikelets small, around 4 mm long and 1.5 mm wide; awns of the sessile spikelet not prominent; pedicelled spikelets around 5 mm long and 1 mm wide, staminate or neuter, lacking lemmas; mature caryopsis abovoid. Seed setting in the plant was also very sparse, just like the plants in the original habitat.

3. Cytology

Meiosis was studied in pollen mother cells (PMCs). Young inflorescences from the surviving plant were fixed in Carnoy's solution for 24 h and stored in 70% alcohol until examined. The anthers were dissected from the spikelets and smeared in acetocarmine (1%), and photomicrographs were taken from temporary slide preparations.

Meiotic studies revealed that the species has 10 chromosomes ($n=5$). In addition to the standard (A) chromosomes, each PMC also contained 3 supernumerary (B) chromosomes (figures 2 and 3). The B chromosomes were smaller in size and paired only among themselves. At diakinesis and metaphase I, of the 140 PMCs studied, the A chromosomes formed 5 bivalents in 97% of the cells; while 2 univalents and 4 bivalents were recorded in 3% of the cells studied. The B chromosomes remained as univalents in 44.3% of the PMCs, however, in 55.7% of the cells two of the three B chromosomes formed a bivalent. Forty five PMCs were studied at anaphase I. Normal segregation (5:5) was observed in the standard chromosomes, and a 2:1 distribution of the B chromosomes was recorded in a majority of the cells. Abnormalities like delayed segregation, bridge formation and division of B chromosomes were observed in 24.4% of the anaphase I cells. Pollen fertility of the plant as observed by stainability with acetocarmine was 50.8%.

In *S. nitidum*, the somatic chromosome numbers $2n=10$, 20 and 40 were observed earlier (Garber 1950; Krishnaswamy and Raman 1953; Celarier 1958; Wu 1978; Gu *et al* 1984). The diploid ($2n=10$) and tetraploid ($2n=20$) forms of the species, morphologically similar except in plant height (Krishnaswamy *et al* 1956), were reported to occur in India. One of the two accessions collected from the western



Figures 1-3 1. *S. nitidum* showing panicle branching, bearded sheath nodes and ligule hairs 2 and 3. B chromosomes (arrows) at meiosis in *S. nitidum* ($\times 990$) 2. Diakinesis showing 5 A bivalents + 1 B bivalent + 1 B univalent 3. Metaphase I showing 5 A bivalents + 1 B bivalent + 1 B univalent

ghats now studied has $2n=10$ chromosomes, therefore, it appears that the diploid form is distributed in peninsular India. Although accessory chromosomes were found in *S. nitidum* maintained at Taiwan University, Taipei (Wu 1978), their occurrence in Indian collections is reported for the first time in this paper.

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