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KARYOMORPHOLOGICAL STUDIES IN *Scoparia dulcis* L.

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Karyomorphological studies have been carried out in two populations of *Scoparia dulcis* L of the family Scrophulariaceae. In both the populations, somatic chromosome number was reported as 2n = 40. Analysis of somatic chromosomes revealed chromosomes of smaller size which show its advance nature. Total form value differed in two populations, one (Sd1013) was symmetrical while the other (Sd0913) was asymmetrical in nature.

INTRODUCTION

Scoparia dulcis L is a member of family Scrophulariaceae. This plant occurs as a weed in Gaya and other parts of the state of Bihar. According to Moore (1954), weed is a plant which interferes with man's utilization of land for specific purpose. Weeds can thrive under adverse situations (Sinha,2014). Many weeds successfully compete with cultivated crops because of their modified structure which enables them to sustain during adverse circumstances therefore, it is often said that weeds possess general purpose genotype (Baker,1965) keeping this point under consideration mitotic study in two populations of *Scoparia dulcis* have been undertaken in the present investigation.

MATERIAL AND METHODS

For mitotic studies seeds of *Scoparia dulcis* were collected from two different populations, one was growing in kharkhura (Sd0913) area of Gaya and the other was in a waste land area of A.P. Colony (Sd1013), Gaya. The root tips which were obtained from germinating seeds were pre-treated in paradichlorobenzene for duration of 3 hours and 15 minutes. Root tips were fixed in 1:3 aceto-alcohol and stained in 2% aceto-carmine. Slides were made permanent by following the method as given by Celarier (1956). The karyotypic studies have been made from temporary as well as permanent slides.

The percentage of total form has been calculated by the formula given by Huziwara (1962). Chromosome types have been classified on the basis of their length as follow:-

Type	Length of Chromosome
A	4.0µ
B	3.5µ to 3.99µ
C	3.0µ to 3.49µ
D	2.5µ to 2.99µ
E	2.0µ to 2.49µ
F	less than 2.0µ

OBSERVATION

Sd0913

Materials for mitosis were collected from the seed of the plants growing in the Kharkhura locality of Gaya town. The somatic chromosome number was found to be 2n=40 invariably in almost all the root tip cells, that were squashed and examined (Fig-1). The size of the chromosomes varied from 0.74 µ to 2.26 µ. On the basis of the length, the chromosomes were categorised in to three groups: two pairs of 'D' type, five pairs of 'E' type and thirteen pairs were of 'F' type. From the detailed karyotypic studies it was found that eight pairs of chromosomes were of Sub-median type, eleven pairs of Median type and one pair of Sub-terminal type. All the twenty pairs of chromosomes have been represented in the idiogram (Fig-2). The detailed karyotypic measurements are summarized in Table-1

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Sd1013

This population was growing in a waste land area of A.P. Colony Gaya. Detailed mitotic study was carried from the growing root tips of the seeds of plants.

The somatic chromosome number was found to be 2n = 40 in almost all the root tip cells that were squashed in aceto-carmine and examined (fig-3). The chromosomes on the whole were somewhat smaller in size in comparison to other locality. The length of the chromosomes varied from 0.74 µ to 2.12 µ. On the basis of their length, they were grouped under two main categories: one pair was of 'E' type and nineteen pairs were of 'F' type. From the detailed analysis of karyotype of this locality, it was found that fourteen pairs of chromosomes were of Median type and six pairs of chromosomes were of Sub-median type. No SAT chromosome was observed. All the twenty pairs of chromosomes have been represented in idiogram (Fig-4). The detailed karyotypic measurements are summarized in Table-2.

DISCUSSION

A critical study of the morphology of the somatic chromosome has been done in two populations of *Scoparia dulcis*. In the population of Gaya town, the total chromatin length of somatic chromosomes were found to be 68.30 µ (Table-1). Eleven pairs of chromosomes were of median type, eight were of sub-median type while remaining one was sub-terminal chromosome. The smallest chromosome measured 0.76µ while the largest one was found to be 2.62µ. Total form value was 42.10 per cent. However, in the population Sd1013 the total form value percentage was calculated to be 48.12. In this case, no sub-terminal chromosome was reported. The number of median chromosomes was much more than sub-terminal chromosome (Table-2). In this case the largest chromosome measured was 2.21µ in the length while smallest chromosome was 0.74 µ in length. When the total form percentage of the two populations of Gaya town is compared, somatic chromosomes of Sd1013 population to be more symmetrical than the population Sd0913. Overall, the chromosomes were smaller in size but there was significant variation in the larger size of chromosome in both the populations. Difference in the length of chromosomes indicates that re-patterning of chromosome involving unequal translocation or pericentric inversion in addition to elimination or acquisition of heterochromatin is evident. However, gene mutation which is a potential source of variation cannot be ruled out (Jackson, 1971 and Harlan & Dewet, 1975). Therefore, it can be said that evolution of karyotype has contributed to the colonization of the species concerned.

On average, chromosomes are small in size and this fits in to the pattern known for the families of evolutionary advanced status (Stebbins, 1971; Trivedi and Roy, 1972 and Trivedi, 1981). According to some workers, the smaller size of chromosome might have occurred as a result of fragmentation of longer chromosomes (Sharma and Sharma, 1959 and Chennaveeraiah and Krishnappa, 1965). Variation in chromosome size is usually correlated with climatic adaptation. Adaptation to cold at high altitude may result in reduction of chromosome size by the loss of inert chromatin from the karyotype (Stebbins, 1950 and Singh et al., 1971). However, in the present investigation, materials have neither been collected from colder region nor higher altitude region, so the above explanation does not fit in the investigation. According to Tobgy (1943), variations in size of the chromosomes might occur due to coiling of chromonemata and distribution of heterochromatin. However, in none of the populations chromosomes show fuzzy appearance, therefore the compactness of the coiling of chromonemata may not be the reason behind the chromosome differences. On the other hand, the presence of heterochromatin may bring about differences (Trivedi and Sinha, 1986 and Kumari, 2013).

Table-1

Somatic chromosomes of Sd 0913

Sl No. of Chromosome pairs	Chromosome type	*Position of the constrictions*		*Length of the component portions in μ*		*Total length in μ*	*T.F. %*
		Primary	*Secondary*	*Long arm*	*Short arm*		
1	D	Sm		*1.52*	*1.10*	*2.62*	
2	D	Sm		*1.38*	*1.14*	*2.52*	
3	E	Sm		*1.50*	*0.75*	*2.25*	
4	E	M		*1.12*	*1.12*	*2.24*	
5	E	Sm		*1.51*	*0.59*	*2.10*	
6	E	Sm		*1.10*	*0.92*	*2.02*	
7	E	M		*1.00*	*1.00*	*2.00*	
8	F	St		*1.50*	*0.37*	*1.87*	
9	F	Sm		*1.30*	*0.50*	*1.80*	
10	F	M		*0.75*	*0.75*	*1.50*	*42.10*
11	F	M		*0.75*	*0.75*	*1.50*	
12	F	M		*0.75*	*0.75*	*1.50*	
13	F	M		*0.75*	*0.75*	*1.50*	
14	F	Sm		*1.12*	*0.37*	*1.49*	
15	F	M		*0.75*	*0.75*	*1.50*	
16	F	M		*0.70*	*0.70*	*1.40*	
17	F	M		*0.65*	*0.65*	*1.30*	
18	F	M		*0.60*	*0.60*	*1.20*	
19	F	Sm		*0.70*	*0.42*	*1.12*	
20	F	M		*0.38*	*0.38*	*0.76*	

Total chromatin length is 68.30 μ

The karyotype formula for this locality is:

2(DSm) + 3(Esm) + 2(EM) + 1(FSt) + 3 (FSm) + 9(FM)

Table-2

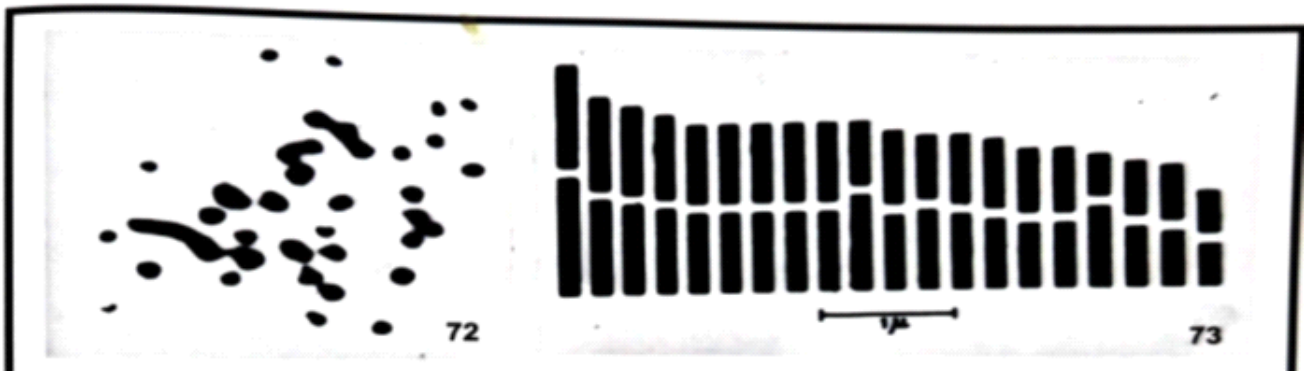
Somatic chromosomes of Sd 1013

Sl No. of Chromosome pairs	Chromosome type	*Position of the constrictions*		*Length of the component portions in μ*		*Total length in μ*	*T.F. %*
		Primary	*Secondary*	*Long arm*	*Short arm*		
1	E	Sm		1.12	*1.00*	*2.12*	
2	F	M		*0.90*	*0.90*	*1.80*	
3	F	M		0.85	*0.85*	*1.70*	
4	F	M		*0.80*	*0.80*	*1.60*	
5	F	M		*0.75*	*0.75*	*1.50*	
6	F	M		*0.75*	*0.75*	*1.50*	
7	F	M		*0.75*	*0.75*	*1.50*	
8	F	M		*0.75*	*0.75*	*1.50*	
9	F	M		*0.75*	*0.75*	*1.50*	
10	F	Sm		*0.75*	*0.75*	*1.50*	*48.12*
11	F	M		*0.70*	*0.70*	*1.40*	
12	F	Sm		*0.75*	*0.60*	*1.35*	
13	F	Sm		*0.70*	*0.65*	*1.35*	
14	F	M		*0.65*	*0.65*	*1.30*	
15	F	M		*0.60*	*0.60*	*1.20*	
16	F	M		*0.60*	*0.60*	*1.20*	
17	F	Sm		*0.75*	*0.30*	*1.12*	
18	F	Sm		*0.55*	*0.50*	*1.05*	
19	F	M		*0.55*	*0.50*	*1.00*	
20	F	M		*0.37*	*0.37*	*0.74*	

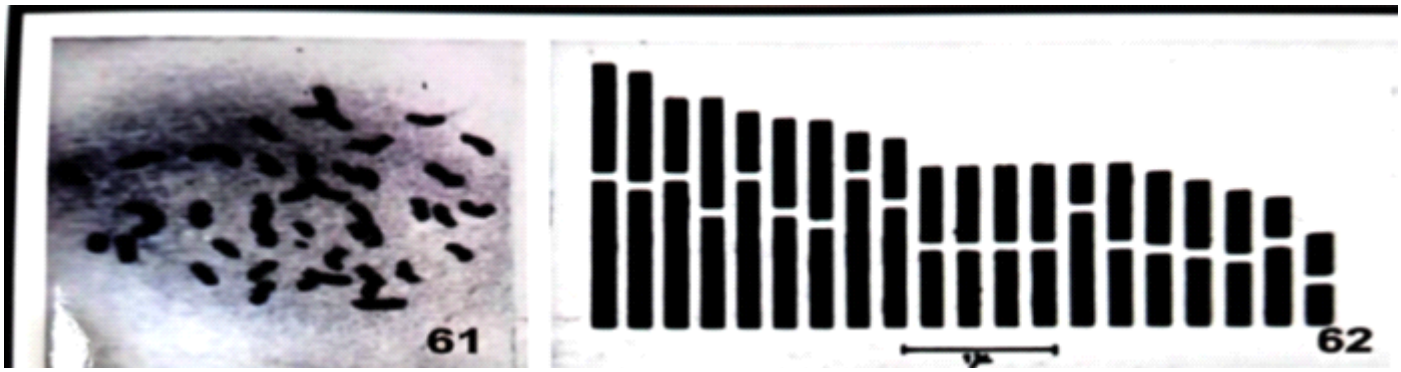
Total chromatin length is 55.86 μ

The karyotype formula for this locality is:

1(Esm) + 14(FM)a + 5(FSm)



Karyotype and Idiogram of population Sd0913



Karyotype and Idiogram of population Sd1013

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Book Review

"**Microbial Resources of Indo-Myanmar (Burma) Hot Spot Region : Conservation and Sustainable Development with Special Reference to North-East India**" is an ideally illustrated compendium of serious research endeavours edited by **Dr. N. Irabanta Singh**, Formerly Professor (Higher Academic Grade), Centre of Advanced Study in Life Sciences, Manipur University (A central university), Imphal (India). Dr. Singh is a widely acclaimed figure of national and international eminence in the fields of Aerobiology, Allergology, Microbial Epidemiology and Bioresource Management. The book appears to be a remarkable reflection of the tremendous and specialized experience of Professor Singh on microbial phytopathology and biodiversity conservation in the North-Eastern India.

The theme of the book dwells upon an important aspect of the Indo-Myanmar Hot Spot Region-conservation and sustainable development of microbial biodiversity-which is a comprehensive vision and philosophy of co-existence of mutually related life forms of endless variety and their endemic characterization. In view of the intense and growing overexploitation of natural resources of the Indo-Myanmar Hot Spot, especially of the north-eastern states of India, the editor's choice commendably justifies his prudence and eco-friendly sensitivity.

The book encompasses a total of 27 original research contributions from eminent life scientists of a host of super-specialized sub-disciplines from the important centres of research of north eastern provinces of India. These papers are appropriately grouped into seven sections, each focusing on a particular microbial resource. The editor has to be credited for his conscious effort in arranging the research articles so systematically with an eye on the contradistinctive significance of various microbial resources. These include Bacterial resources, Viral resources, Algal resources, Fungal resources, Mite resources, Earthworms gut content Microbial resources, and lastly Microbial resources of sustainable development. The editor's wisdom and his outstanding comprehension of microbial resources of the region are tangibly depicted throughout the book. The content and coverage in each article constantly focus on the central theme and analyse the significance of the chosen bioresources in terms of their conservational priority. Each contribution has its own uniqueness without any thematic replication of other articles.

Lucidity of expression and concluding remarks add to the beauty of the text and may attract equally the experts of the subject as well as the young researchers. Despite some sporadic typographical errors, which may be rectified in subsequent editions, the book has every merit of enriching the library holdings of higher institutions as well as personal collections of a wide readership.

The publisher also deserves congratulations over the success of this beautiful publication.

Dr. Mahesh Roy
Chief Editor
Int. J. Mendel