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On the Cytotaxonomy in five Ecotypes of *Acorus calamus* L. collected from Jharkhand

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Abstract : Cytotaxonomical studies have been carried out on some ecotypes of *Acorus calamus* L. Mitotic studies were made in five ecotypes, two of them were collected from Hazaribagh, and three of them were collected from Khunti, Tamar and Birsa Chowk, Ranchi. Parameters for Cytotaxonomical comparision included, type of chromosome, haploid chromosome number, arm length, (long arm, short arm), length of chromosome, total chromatin length, and arm ratio (L/S).

Key Words: ***Meloidogyne incognita*, 28-Homobrassinolide, Tomato cultivars, Morphological parameters, Antioxidants.**

INTRODUCTION

Acorus calamus L. is found almost throughout India in marshy places, ascending in the Himalayas up to 1828 mts in the Sikkim. The countries growing this crop are USSR, Central Europe, Rumania, India and Japan. The rhizomes and root are the plant part which is of medicinal and aromatic value. The principal constituent of *A. calamus* L. or sweet flag rhizome is volatile oil. It is an important medhya drug capable of improving memory and intellect and is a highly valued herbal medicine in India and other European countries. This forms an ingredient of several drugs of unani, ayurvedic on modern system of medicine. It has a pleasant smell, which resembles mandarin oranges, however it has a sour taste. It is propagated through rhizomes.

Formerly in this family Araceae as a whole the basic chromosome number ranges from $x = 8$ to $x = 22$. The basic number $x = 7$ is suggested as the ancestral basic number of the family and it seems that aneuploid changes of chromosome number produced basic number of $x = 6$, 7, 8, 9 and 10 in early evolution of the family[1]. Previous reports[2] of chromosome number in *Acorus calamus* L. have indicated 9, 11 and 12 as base number.

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MATERIALS AND METHODS

Rhizomes of all the five ecotypes (Hazaribagh I, Hazaribagh II, Birsa Chowk collection, Khunti collection and Tamar collection) were sown in the experimental pots. Actively growing young root tip segments were pretreated with 8-hydroxy quinoline (2 mM) for 3½ h at 4ºC and subsequently fixed in acetic acid : alcohol (1:3). These were hydrolysed in HCL at 60ºC for 10-15 min and were stained in 2% acetocarmine. Squash preparation were made with a drop of 45% acetic acid. The temporary slides were observed under light microscope. Ten best metaphase plates were observed and length of long arm and short arms were meseared with the help of stage and occular under high power. Microphotograph were taken with Nikon Digital Camera D 70 S.

RESULT AND DISCUSSION

The cytotaxonomical observation of all the five ecotypes were ploted in the table-1 and are represented

by fig.-1 to 6. The basic chromosome number observed was $x = 9$ in the four ecotypes (Hazaribagh I, Hazaribagh II, Tamar and Birsa Chowk collection) and $x = 7$ was reported in the ecotype Khunti collection. Length of the chromosome of all the ecotypes were in between 2.97 to 0.66. Maximum chromosome length (2.97) was observed in the ecotype Khunti collection. Minimum chromosome length 0.66 was observed in the ecotype Birsa Chowk collection. A total haploid chromosome length of all the ecotype were in between 13.13 to 16.25. Maximum TCL was reported in Birsa Chowk collection and minimum was reported in Hazaribagh I. In all the five ecotype of *Acorus calamus* L., nearly subterminal (+), nearly subterminal (–), nearly submedian (+), nearly submedian (–) submedian, nearly median terminal and median chromosome were reported.

Among the five ecotypes the minimum number (1) of terminal chromosome were observed in Hazaribagh I and Birsa Chowk collection, and minimum number (1) of median chromosome was observed in Hazaribagh collection II.

The changes in the diploid chromosome complement among the ecotypes of *Acorus calamus* L. under consideration indicates that aneuploidy have played any major role in evolution. It is likely that $x = 7$ may be the basic number from which $x = 9$ can be derived through duplication of chromosome by non – disjunction at anaphase. Previous report[3] stresses the basic number in *Acorus* $x = 9$.

After scrutining of table-1 it is evident that among the five ecotypes considered only one median chromosome were present and nearly submedians, nearly subterminal, terminal and nearly median chromosome were present which indicate their asymmetrical nature[4,5]. The morphologically primitive members are with symmetrical karyotypes whereas, advanced members are with asymmetrical karyotypes[6]. *Acorus calamus* having asymmetrical nature of karyotype is considered advanced. Among all the five ecotypes under consideration ecotype Birsa Chowk collection, is considered highly advanced as it contains maximum number of nearly subtelocentrics and telocentrics. The earlier karyomorphological reports[7] in the members of Araceae confirms our findings.

In the above five ecotypes of *Acorus calamus* L. the karyotype was analysed for the first time. The chromosome number is in conformity with the previous reports.

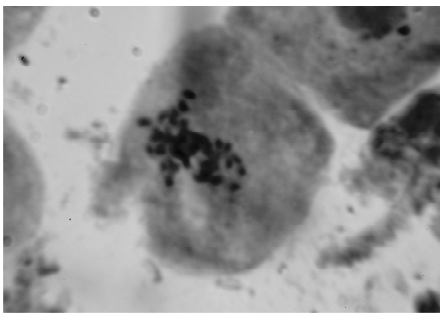

Fig.1. Hazaribagh collection I

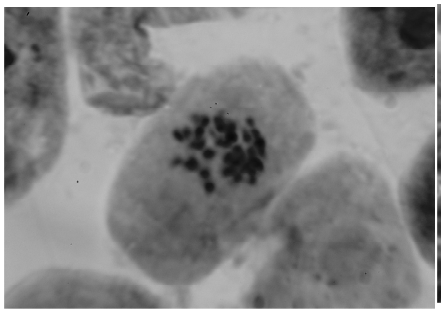

Fig.2. Hazaribagh collection II

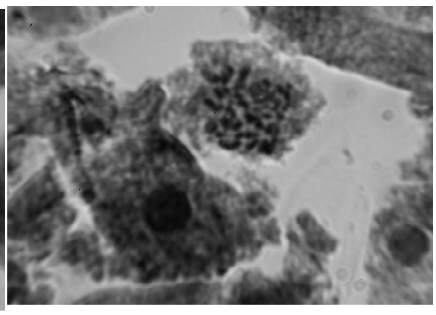

Fig.3. Tamar collection III

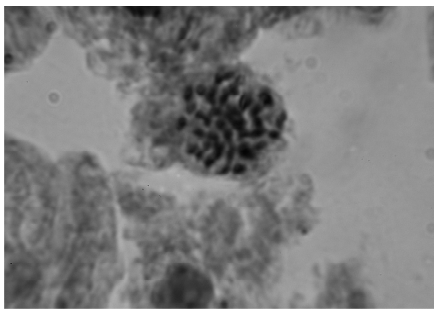

Fig.4. Khunti collection IV

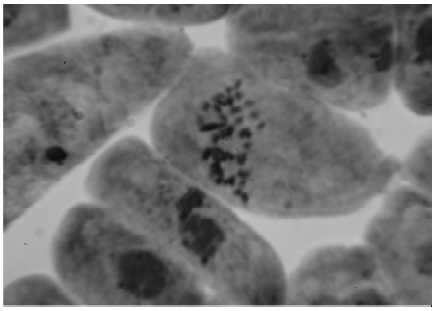

Fig.5. Birsa Chowk collection V

Plate-I. Fig. 1-5, Mitotic Mataphase chromosome of five ecotype of *Acorus calamus.*

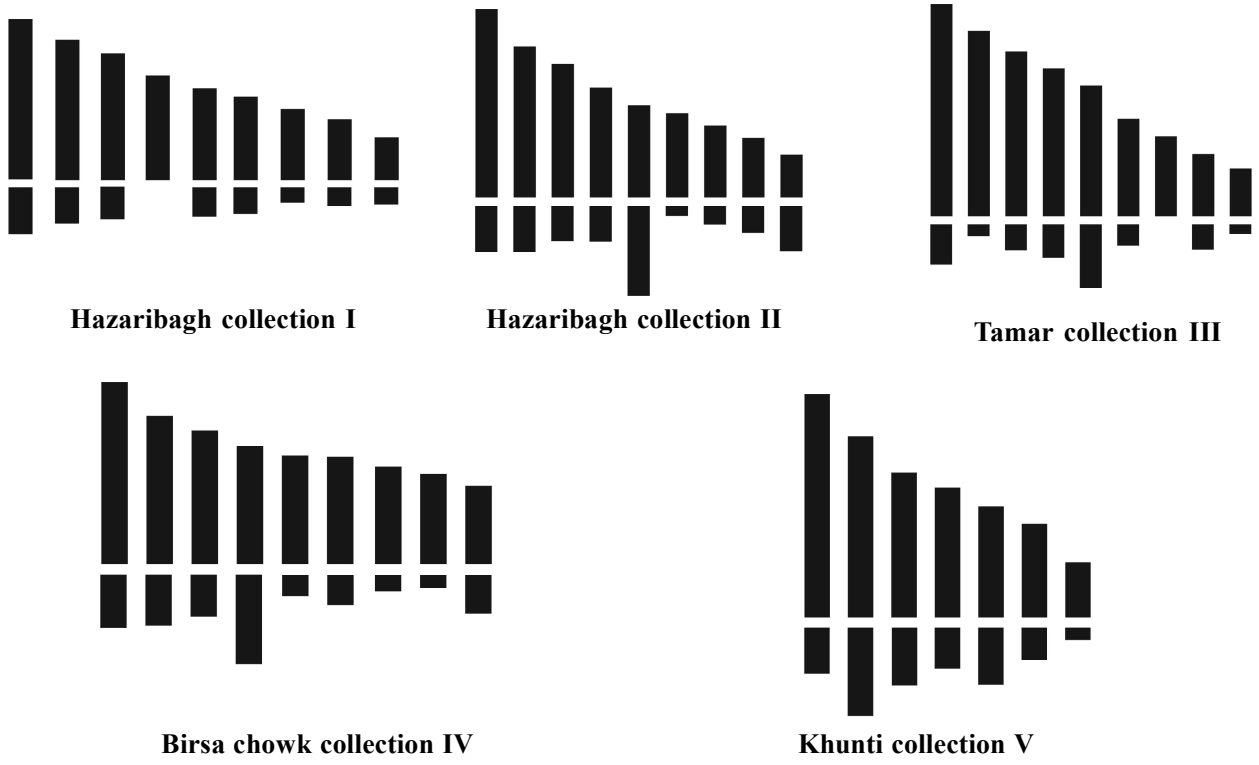

Fig.6. Idiograms of five ecotypes of *Acorus calamus* L.

Table-1: Cytotaxonomical data of five different ecotypes of *Acorus calamus* L.

Ecotypes under consideration	Chrom.	Arm length long arm	Arm length short arm	Chromosome length	Arm ratio	Classification
Acorus calamus Hazaribagh collection I	I	1.76 ± 0.06	0.51 ± 0.13	2.27 ± 0.07	3.93 ± 1.01	Nearly submedian (+)
	II	1.51 ± 0.13	0.47 ± 0.16	1.98 ± 0.22	3.96 ± 1.30	Nearly submedian (+)
	III	1.35 ± 0.03	0.44 ± 0.11	1.79 ± 0.07	3.76 ± 1.36	Nearly submedian (+)
	IV	1.24 ± 0.07	0.00	1.24 ± 0.07	0.00	Terminal
	V	1.10	0.36 ± 0.26	1.46 ± 0.26	2.08 ± 1.50	Nearly submedian (-)
	VI	1.02 ± 0.07	0.36 ± 0.03	1.39 ± 0.03	2.88 ± 0.44	Nearly submedian (-)
	VII	0.99 ± 0.06	0.14 ± 0.07	1.13 ± 0.09	3.00 ± 1.52	Submedian
	VIII	0.84 ± 0.16	0.25 ± 0.16	1.10	1.66 ± 1.20	Nearly submedian (-)
	IX	0.51 ± 0.03	0.25 ± 0.07	0.77 ± 0.11	2.44 ± 0.78	Nearly submedian (-)
Total haploid chromosome length ?				**13.13**		
Acorus calamus Hazaribagh collection II	I	2.27 ± 0.07	0.66 ± 0.06	2.93 ± 0.13	3.49 ± 0.26	Nearly submedian (+)
	II	1.72 ± 0.07	0.66 ± 0.06	2.38 ± 0.09	2.65 ± 0.26	Nearly submedian (-)
	III	1.57 ± 0.07	0.47 ± 0.07	2.05 ± 0.14	3.44 ± 0.44	Nearly submedian (+)
	IV	1.39 ± 0.03	0.47 ± 0.25	1.79 ± 0.28	1.41 ± 0.76	Nearly median
	V	1.17 ± 0.07	1.10	2.27 ± 0.07	1.06 ± 0.06	Nearly median
	VI	1.13 ± 0.03	0.11 ± 0.11	1.24 ± 0.09	1.11 ± 1.11	Nearly median
	VII	0.91 ± 0.03	0.25 ± 0.03	1.17 ± 0.07	3.66 ± 0.33	Nearly submedian (+)
	VIII	0.77 ± 0.00	0.33 ± 0.06	1.10 ± 0.06	2.52 ± 0.51	Nearly submedian (-)
	IX	0.58 ± 0.03	0.58 ± 0.03	1.20 ± 0.06	1.00	Median

Table continued.....

Table continued.....

Total haploid chromosome length ?				**16.13**		
Acorus calamus Tamar collection	I	1.72 ± 0.07	0.58 ± 0.16	2.31 ± 0.16	3.42 ± 0.90	Nearly submedian (+)
	II	1.50 ± 0.07	0.58 ± 0.09	2.09 ± 0.06	2.73 ± 0.55	Nearly submedian (-)
	III	1.43	0.44 ± 0.22	1.53 ± 0.55	1.44 ± 0.72	Nearly median
	IV	1.24 ± 0.07	0.84 ± 0.03	2.09 ± 0.06	1.49 ± 0.13	Nearly median
	V	1.10	0.25 ± 0.16	1.35 ± 0.16	2.33 ± 1.45	Nearly submedian (-)
	VI	1.10	0.29 ± 0.16	1.39 ± 0.16	1.77 ± 0.96	Nearly submedian (-)
	VII	1.06 ± 0.04	0.14 ± 0.07	1.21 ± 0.06	3.16 ± 1.59	Nearly submedian (+)
	VIII	0.91 ± 0.03	0.07 ± 0.07	0.99 ± 0.06	1.33 ± 1.33	Nearly median
	IX	0.80 ± 0.03	0.33	1.13 ± 0.03	2.44 ± 0.11	Nearly submedian (-)
Total haploid chromosome length ?				**14.09**		
Acorus calamus Khunti collection	I	2.38 ± 0.09	0.58 ± 0.13	2.97 ± 0.11	4.71 ± 1.47	Nearly subterminal (-)
	II	1.90 ± 0.16	0.95 ± 0.07	2.86 ± 0.11	2.04 ± 0.29	Nearly submedian (-)
	III	1.54 ± 0.22	0.77 ± 0.22	2.31 ± 0.22	2.70 ± 1.19	Nearly submedian (-)
	IV	1.32 ± 0.11	0.47 ± 0.07	1.79 ± 0.09	2.97 ± 0.69	Nearly submedian (-)
	V	1.17 ± 0.07	0.77 ± 0.22	1.94 ± 0.28	1.92 ± 0.70	Nearly submedian (-)
	VI	1.10	0.36 ± 0.18	1.46 ± 0.18	1.33 ± 0.66	Nearly median
	VII	0.62 ± 0.07	0.40 ± 0.03	1.02 ± 0.09	1.55 ± 0.15	Nearly median
Total haploid chromosome length ?				**14.35**		
Acorus calamus Birsa Chowk collection	I	2.60 ± 0.07	0.33 ± 0.06	2.93 ± 0.09	8.52 ± 1.66	Nearly subterminal (+)
	II	2.38 ± 0.09	0.22 ± 0.00	2.60 ± 0.09	10.80 ± 0.44	Nearly subterminal (+)
	III	2.12 ± 0.07	0.33 ± 0.06	2.45 ± 0.13	6.88 ± 1.16	Nearly subterminal (-)
	IV	1.76 ± 0.11	0.36 ± 0.09	1.79 ± 0.40	5.66 ± 1.76	Nearly subterminal (-)
	V	1.43 ± 0.19	0.80 ± 0.16	2.23 ± 0.19	1.97 ± 0.61	Nearly submedian (-)
	VI	1.24 ± 0.14	0.26 ± 0.15	1.51 ± 0.29	2.40 ± 1.28	Nearly submedian (-)
	VII	1.02 ± 0.07	0.00	1.02 ± 0.07	0.00	Terminal
	VIII	0.77 ± 0.06	0.29 ± 0.03	1.06 ± 0.07	2.72 ± 0.43	Nearly submedian (-)
	IX	0.58 ± 0.03	0.03 ± 0.03	0.66 ± 0.06	1.66 ± 1.66	Nearly submedian (-)
Total haploid chromosome length ?				**16.25**		

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