INTRODUCTION

Acorus calamus Linn commonly known as sweet flag or ‘Bach’ in India belongs to family Araceae. It is an important medicinal and aromatic plant having wide usage in almost all herbal based systems. Acorus calamus L. has rich ethno botanical aspects [1,8,10,13]. It is an important medhya drug capable of improving memory and intellect and is a highly valued herbal medicine in India. This is a polymorphic species, wide spread in North temperate region, tropical Asia and Eastern North America.

In India A. calamus grows in varying agroclimatic conditions right from the tropical South and subtropical plains to temperate marshes from Kashmir to the north east ascending to an altitude of 1500-2200m in the Himalayan ranges. In the present investigation ten ecotypes were collected from local areas of Ranchi, Hazaribagh, Khunti, Tamar, Namkum and Palandu and their detailed cytological studies were performed.

MATERIALS AND METHODS

All the ten ecotypes of Acorus calamus L. were collected from different localities of Jharkhand, India. Acetocarmine squashes of root tips fixed in 1:3 acetoalcohol with large or medium sized chromosomes were treated with 0.002M aqueous solution of 8-hydrony quinoline for 3½ hour at 4°C prior to fixation. Ten best metaphase plates were observed under high power and length of long and short arms were measured. Microphotographs were taken with Nikon D SLR Camera-D-70S.

RESULTS AND DISCUSSION

The data for karyotype observations in the ten ecotypes of A. calamus L. collected from Plandu, Namkum, Hazaribagh, Tamar, Khunti and Ranchi are presented in (Table 1) and fig.1-20. The root tip cells showed basic chromosomal number as x = 9 in the five ecotypes (Palandu collection II, Hazaribagh collection I and II, Tamar collection and Birsa chawk Ranchi collection) and x = 7 were reported in the ecotype (Palandu collection I, III and IV, Namkum collection and Khunti collection). The length of all the ecotypes ranged between 3.48 µ to 0.51 µ.

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Figure 7-10: Mitotic metaphase chromosomes of four ecotypes of Acorus calamus L.

Figure 11-15: Idiograms of ecotypes of Acorus calamus L.

Table 1: Chromosomal diversity among different ecotypes of Acorus calamus L.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Ecotypes under consideration (Acorus calamus L. collected from Ranchi, Jharkhand)</th>
<th>Present study</th>
<th>Previous reports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Chromosome number</td>
<td>Chromosome size (µ)</td>
</tr>
<tr>
<td>1.</td>
<td>Palandu collection I</td>
<td>7</td>
<td>0.91 – 1.83</td>
</tr>
<tr>
<td>2.</td>
<td>Palandu collection II</td>
<td>9</td>
<td>0.84 – 1.94</td>
</tr>
</tbody>
</table>

Based upon ploidy status and geographical distribution. A. calamus L. has been classified as
(i) Diploidy variety (2n = 2x = 24; North America)
(ii) Triploid variety (2n = 3x = 36; Europe)
(iii) Tetraploid variety (2n = 4x = 48; East Asia, India and Japan)
(iv) Hexaploid variety (2n = 6x = 72; Kashmir area, India).

The species has been primarily defined on the basis of genomic differences [11]. In the family Araceae as a whole, the basic chromosome number 7, is suggested as the ancestral basic chromosome number of the family. Aneuploid changes of chromosome number might have produced basic number of x = 6, 7, 8, 9 and 10 in early evolution of the family [12]. Previous reports on chromosome number in Acorus calamus L. have indicated 9, 11 and 12 as base number [2,6]. Similarly several chromosome counts have been reported for A. calamus L. suggesting additional basic chromosome numbers e.g. x = 9 (2n = 45 from South India, 2n = 54 from Kashmir India) and x = 11 or aneuploidy based on x = 9, 2n = 44 from Thailand [5]. The chromosome count of 2n = 35 is indicative for aneuploidy derived from the triploid cytotype with 2n = 36 [4]. The Acorus calamus L. of European countries were recorded triploid 2n = 36, indicative of 12 as the base number. Whereas the Kashmir population with 2n = 54 [3] and 2n = 72 [7] are designated as hexaploids.
In the present study the changes in the diploid chromosome complement among the ecotypes of Acorus calamus L. clearly indicated that aneuploidy have played any major role in evolution. The basic chromosome number may be \( x = 7 \) and from it \( x = 9 \) might be derived through duplication of chromosome or by non-disjunction at anaphase. Mookherjea [9] stresses the basic chromosome number in Acorus calamus as \( x = 9 \). Acorus calamus L. appears to follow a diversity in chromosome number with respect to their geographical distribution.

Besides the numerical changes discussed above, the karyotypes in Acorus calamus also indicates variations in chromosome size with their geographical distribution indicating changes in their nuclear DNA in evolution.

The size of chromosome in the present study was reported between 3.48 \( \mu \) to 0.51 \( \mu \) in length. Whereas, the size of South Indian Acorus calamus L. chromosome ranged between 0.75 \( \mu \) and 2.1 \( \mu \) in length [12]. Short sized chromosomes (2.2 to 1.4\( \mu \)) have been observed in Acorus calamus from South Indian [14].

Karyotypes show differences in absolute chromosome size indicating changes in nuclear DNA content in evolution and mostly acentric chromosomes may have derived. Reduction in chromosome size appears to have been an adaptation to an aquatic habitat.

CONCLUSION

On the basis of above finding it may be concluded that all the ten ecotypes of Acorus calamus L. under investigation were not stable due to difference in their basic chromosome number. Chromosomal diversity was observed among ecotypes reported from Ranchi Jharkhand India.

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