J. Bamboo and Rattan, Vol. 1, No. 3, pp. 199–203 (2002)

Also available online - www.vsppub.com

Karyotype analysis in *Calamus palustris* Griff.

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Abstract—The information on cytological characteristics including numerical and structural changes is necessary to understand the taxonomic relationship and the evolutionary changes in detail. Karyological studies were conducted in *Calamus palustris* Griff., a promising medium diameter cane, collected from Andaman islands, India. This is the first report on the chromosome number of this species. The diploid chromosome number observed was 28. However, in addition to the normal complement, cells with abnormal number of chromosomes, i.e. 14 and 26 also could be found.

Key words: Cane; *Calamus palustris*; chromosome studies; karyotype analysis; chromosome number variations in somatic cells.

INTRODUCTION

Calamus palustris Griff. is a medium diameter cane reported from Burma and Andaman Islands in India [1]. It is also known to occur widely from Southern China southwards to Peninsular Malaysia [2]. This species can reach up to 30 m in length with diameter ranging from 2.5 to 5.5 cm. It was found to be suitable for good quality peel, core, bends or furniture frame [3].

The information on cytological characteristics including numerical and structural changes is necessary to understand the evolutionary changes in detail. Previously, chromosomal studies were conducted and observations were reported in 7 species of *Calamus* by various researchers. Sharma and Sarkar [4] conducted karyological studies in *C. arborescens* Griff., *C. khasianus* Becc., *C. leptospadix* Griff. and *C. rotang* L. and reported 2n as 28 in all the species. In *C. caryotoids* Cunningham ex Mart, Darlington and Janaki Ammal [5] have reported 2n as 28 while Read [6] noted 26 chromosomes. He also reported 2n as 26 in *C. muelleri* H. Wendl. In *C. scipionum* Lour., the 2n number was reported to be 28 [7]. Since then, not many karyological studies have been conducted in this genus. During the last 15 to 20 years, *Calamus* has received much attention at international level

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and many new species of this genus have been reported. Work on many other aspects are progressing well, while karyological studies have received no attention; such research is necessary to analyse the emergence of new species or varieties. Hence, cytological studies were conducted in *C. palustris* collected from Andaman Islands as a part of the project on Genetic Diversity and Conservation of Rattans in Andaman and Nicobar Islands. Confirmation of plant identity was made by Dr. C. Renuka and voucher specimens deposited in KFRI Herbarium (Acc. No. 7457).

MATERIALS AND METHODS

Seeds of *C. palustris* were collected from the Andaman Islands. Seeds were kept in moist saw dust for germination and they started germinating within two months. Root tips were collected at different intervals between 10 am and 2 pm from the seedlings. We have planted these seedlings in the field and hence, there will be no difficulty in getting more specimens in future. For better fixation, the root caps were removed. Various traditional methods were tried to prepare the slides with mitotic chromosomes but spreading of chromosomes was not satisfactory. Later pretreatment with 2,4-dichlorobenzene gave encouraging results. Root tips were pretreated with saturated 2,4-dichlorobenzene for 15 to 30 min. Then they were washed thoroughly in running water. The root tips were heated in a mixture of 2 percent aceto-orcein and 1 *N* hydrochloric acid in 9 : 1 ratio for a few seconds directly over the flame. Then the extreme tips of the roots were squashed in aceto-orcein and slides were prepared. Photographs of well scattered meta-phase plates were taken in addition to the camera lucida drawings.

RESULTS AND DISCUSSION

Twenty eight chromosomes were present in the cell. The chromosomes were of size between 2.46 to 0.89/μm. They were of different size and shape as follows (Fig. 1):

(i) Three pairs of comparatively long chromosomes each having two constrictions, one nearly median and other sub-terminal in position.

(ii) Three pairs of comparatively long chromosomes with sub-median primary constriction.

(iii) Three pairs of medium sized chromosomes with sub-median primary constrictions.

(iv) Four pairs of medium sized chromosomes with median primary constrictions.

(v) One pair of short chromosomes.

In addition to the normal complement, cells with abnormal number of chromosomes were also met with. A cell with 14 somatic chromosomes in the process of duplication (Fig. 2) and a cell with 26 chromosomes (Fig. 3) were seen. Figure 4 is the same as Fig. 3 with numbers 1 to 26 added.

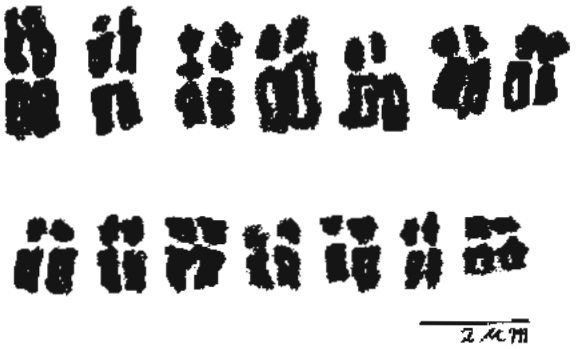

Figure 1. Karyotype of *Calamus palustris* Griff., 2n = 28.

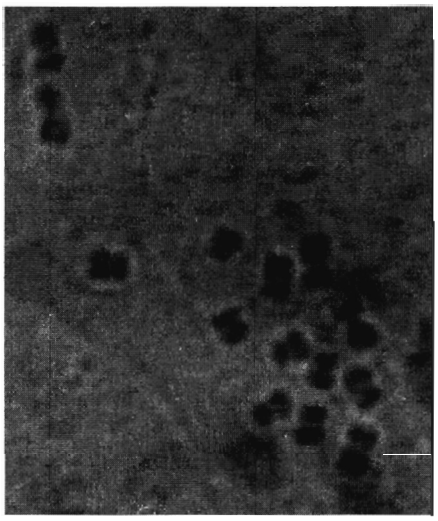

Figure 2. A cell with 14 chromosomes (haploid set).

In palms, except in a few cases, a general homogeneity is seen, where the different species of the same genus have the same chromosome number [4]; but in some genera different chromosome numbers are reported. In *Licuala grandis* and *L. paludosa*, n is reported to be 8 while in *L. peltata* and *L. spinosa* n is 14. In *Calamus* two basic numbers, namely, 13 and 14 are reported. In *C. rotang, C. arborescens, C. leptospadix, and C. khasianus*, 2n was reported to be 28.

Moreover, somatic cells with varying chromosome numbers were observed in addition to the normal number in the same individual. These types of abnormalities were reported in many other species of palms, like *Chrysalidocarpus* and *Rhapis*. In *Arenga saccharifera*, abnormal nuclei with 6 and 36 chromosomes against a normal cell with 32 chromosomes were reported and such abnormalities were reported to arise by non-disjunction of chromosomes [4]. They also opined that the widespread and universal occurrence of such behaviour obviously imply that they play some significant role in the life process of the plant. Such irregularities

Figure 3. A cell with 26 chromosomes.

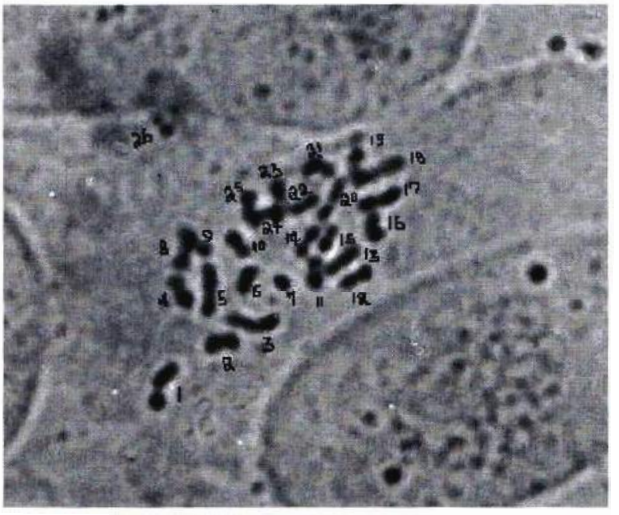

Figure 4. As Fig. 3, with numbers 1 to 26 added.

in chromosome behaviour in somatic cells have been met within a number of vegetatively reproducing plants, especially those belonging to monocot families such as *Amaryllidaceae, Liliaceae, Dioscoreaceae*, etc. It has been pointed out that this behaviour has a distinct role in evolution.

Acknowledgements

We would like to express our gratitude to the Director, KFRI for providing facilities to conduct this study successfully. The financial support provided by IPGRI, Malaysia is acknowledged.

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