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# KARYOMORPHOLOGICAL ANALYSIS IN *HEVEA BRASILIENSIS*

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## SUMMARY

Karyomorphological analysis of 4 clones of *Hevea brasiliensis* Muell. Arg. viz., RRIM 600, GT 1, PB 235 and PB 314 was carried out. The karyotype formula for RRIM 600, GT 1, PB 235 and PB 314 was 9 m + 8 sm + 1 st, 10 m + 7 sm + 1 st, 12 m + 5 sm + 1 st and 8 m + 8 sm + 2 st respectively. All the 4 clones are diploid with 2n = 36 and fall under 2A karyotype category. Even though there is gross similarity in the karyotype, in critical analysis there is a significant difference in chromosome morphology with reference to centromeric position and total chromosome length. More isobrachial chromosomes are seen in PB 235, while the highest number of heterobrachial chromosomes are found in PB 314. The karyotype of PB 314 is found to be more specialized than the other 3 clones studied here.

**Key Words :** *Hevea brasiliensis*, karyomorphology, clones.

## INTRODUCTION

*Hevea brasiliensis* Muell. Arg., the para rubber tree, belonging to the family Euphorbiaceae is the most important source of natural rubber. A large number of clones are extensively grown for natural rubber. The somatic chromosome number of 2n = 36 has been reported previously by a host of authors for this species (Bangham 1931, Ramaer 1935, Paddock 1943, Baldwin 1947, Ross 1959, Majumdar 1964, Ong 1981, Saraswathyamma et al. 1984). The chromosomes are very small, therefore, only very few attempts have been made so far to study their morphology. Ong (1975, 1981) made a preliminary study on the pachytene analysis and karyomorphology of this species from Malaysia. However, karyomorphological studies at the clonal level have not so far been reported in this taxon. The present study deals with detailed karyotype analysis in four clones of *H. brasiliensis* viz., RRIM 600, GT 1, PB 235 and PB 314 to find out the interclonal relationships.

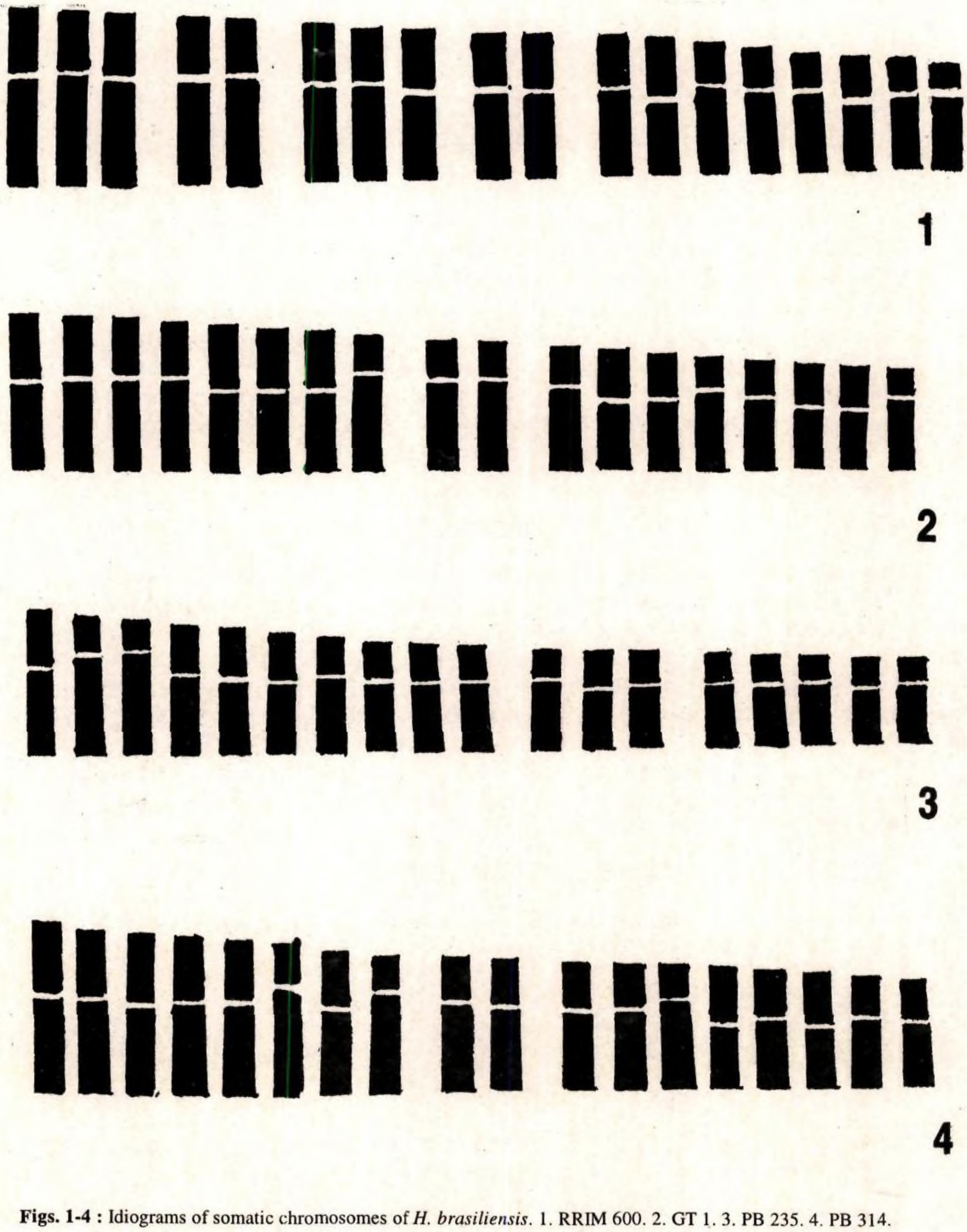
## MATERIALS AND METHODS

Fresh shoot tips of the clones RRIM 600, GT 1, PB 235 and PB 314 were collected from RRII experimental field. The shoot tips were pretreated with saturated solution of paradichlorobenzene a 10°C for 3 h and fixed in 3 : 1 : 1 ethyl alcohol-acetic-chloroform mixture. After hydrolysing in 1 N HCL for 5 min at 60°C, it was kept overnight in 2% acetocarmine solution. Preparations were made by squashing the shoot tips in 45% acetic acid.

The system proposed by Stebbins (1958), Huziwara (1962) and Levan et al. (1964) were followed for karyotype analysis. The ANOVA for total chromosome length and arm ratio was carried out from 5 replicates of each clone.

## OBSERVATIONS

All the 4 clones, RRIM 600, GT 1, PB 235 and PB 314 showed 2n = 36 in their somatic complement. Details of chromosomes are shown in the idiograms (Figs. 1-4).



**Figs. 1-4 :** Idiograms of somatic chromosomes of *H. brasiliensis*. 1. RRIM 600. 2. GT 1. 3. PB 235. 4. PB 314.

In RRIM 600, the length of the chromosomes ranged from 1.8 µm to 3.5 µm. The total chromosome length (TCL) of the haploid complement was 49.08 µm. The F% ranged from 22.2 to 46.2. The TF% was 36.9. The karyotype formula (KF) was 9 m + 8 sm + 1 st in the haploid complement. It belonged to 2A karyotype category.

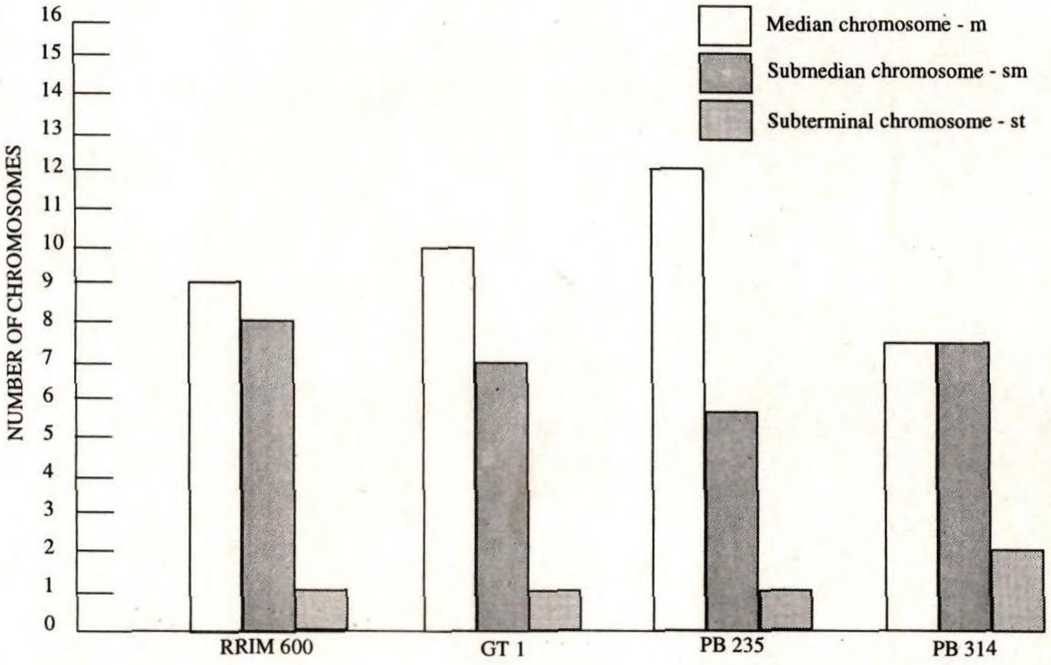
In GT 1, the chromosome length varied from 1.7 µm to 3.3 µm. The TCL was 45.04 µm. The F% ranged from 23.5 to 44.8 and TF% was 36. The KF was 10 m + 7 sm + 1 st and it falls under 2A karyotype category.

In PB 235, the chromosome length ranged from 1.6 µm to 3.1 µm. The TCL was 40.5 µm. The F% ranged from 21 to 47 and TF% was 38.1. The karyotype belonged to 2A category and the KF of the haploid complement was 12 m + 5 sm + 1 st.

In PB 314, the range of chromosome length was between 1.8 µm and 3.5 µm. The TCL was 47.66 µm. The F% varied from 21.7 to 45.5 and TF% was found to be 36.8. The karyotype belonged to 2A category and the KF was 8 m + 8 sm + 2 st.

## DISCUSSION

Chromosomes of the 4 clones studied here are smaller and their length ranged from 1.6 µm to 3.5 µm. The clone PB 235 is characterized by both smaller size and lower TCL content. The highest TCL is noted in RRIM 600 followed by PB 314, GT 1 and PB 235. All of them belong to 2A



**Figs. 5:** Frequency of m, sm and st types of chromosomes in clones of *Hevea brasiliensis*.

karyotype category. Though there is some gross similarity in karyotype category, in critical analysis they differ in chromosome morphology with reference to the centromeric position. Total short arm length (TSL) is highest in RRIM 600 (18.1 µm) followed by PB 314 (17.5 µm), GT 1 (16.2 µm) and PB 235 (15.4 µm). The average chromosome length values are 2.7 µm, 2.5 µm, 2.2 µm and 2.6 µm in RRIM 600, GT 1, PB 235 and PB 314 respectively. The frequency of m, sm and st types of chromosomes also vary among these clones (Fig. 5). In PB 235, 12 out of 18 chromosomes in the haploid complement are found to be isobrachial whereas the highest number of heterobrachial chromosomes are found in PB 314. Besides these differences, variations can be noticed in F% and TF%. These differences within clones were found to be statistically significant as revealed by the ANOVA test.

According to Stebbins (1971), the 2 basic features which bring about karyotype asymmetry are (i) shifting of the centromere from median to sub-median and sub-terminal positions and (ii) increasing intrakaryotypic size difference of chromosomes. Of the 4 clones studied here, 2 sub-terminal chromosomes are noticed in PB 314 while the rest have only one sub-terminal chromosome in their haploid complement. PB 314 also possessed the least number of metacentric chromosomes (8). The karyomorphological evidence thus reveals that PB 314 is more specialized than the other 3 clones studied. It is suggested that the structural changes might have brought about the change in the chromosome morphology of the different clones studied in the present investigation.

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