

VARIATION IN NUMBER OF LOCULI IN OVARY OF *HEVEA* *BRASILIENSIS*

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ABSTRACT

Female flowers of *Hevea brasiliensis* were examined for structure of the ovary at the Rubber Research Institute of Nigeria. Variation in loculi was obtained with occurrence of three, four, five and twenty loculi ovaries. Intra-clonal variation was observed with the occurrence of two or more types of ovary in a single clone and the same inflorescence. Such intra-clonal variation, which is genetic, is due to mutation and instability in mitosis. Seed production during hand pollination can be enhanced through careful pollination to exploit the potential of the multi-loculi ovary.

Keywords: fruit set, *Hevea*, loculi, ovary, pollination

INTRODUCTION

Hevea flower is monoecious and the female flower has tri-loculi ovary with three lobed stigma. There is an ovule in each loculus which is linked to a lobe on the stigma. An ovary will produce a pod if all the ovules are fertilized (Harihar & Yenag, 1984). Consequently, higher number of ovules require higher efficiency of pollination.

Pollination success in *Hevea* is often as low as 3% in open pollination and 5% in hand pollination (Hosen *et al.*, 1981; Olapade & Omokhafa, 1990). The limitation in seed production affects the progress of genetic improvement and uses of seeds such as establishment of rootstock and industrial uses of rubber seed oil. The rubber seed oil is a potential source of alkyd resin which is used in the paint industry (Adefarati, 1986) and can be used as substitute/extender in diesel engines (Perera & Dunn, 1990).

Field observations at the Rubber Research Institute of Nigeria revealed the occurrence of four and five lobed pods which can increase seed production. This study was conducted to carry out a survey of structure of *Hevea* ovary and determine the occurrence of multi-loculi ovary.

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MATERIALS AND METHODS

Number of loculi per pod was studied in four years viz 1989, 1990, 1992 and 1993. Two sampling techniques were used. These are random sampling and assortative (non-random) sampling.

In random sampling, female flowers with mature ovaries were harvested in experimental *Hevea* trees during the flowering season from February to April each year at the Rubber Research Institute of Nigeria. In non-random sampling, female flowers were collected in nine clones of *Hevea brasiliensis*: RRIM 501, RRIM 600, RRIM 605, RRIM 623, RRIM 628, RRIM 707, GT 1, PB 5/51 and IAN 2960. The flowers were examined for number of lobes on the stigma and a cross-section of ovaries was taken. The number of loculi per ovary was recorded.

RESULTS AND DISCUSSION

Four classes of ovaries were detected. These are three, four, five and twenty loculi ovaries (Tables 1 and 2). In all the loculi examined, each loculus was bearing an ovule. Thus, each seed is produced from an ovule borne singly in the loculus. The stigma lobes were equal to the loculi with each loculus leading to a stigma lobe.

The frequency of occurrence of loculi per ovary was 0.8604, 0.1356, 0.0038 and 0.0002 for three loculi, four loculi, five loculi and twenty loculi ovaries respectively (Table 1). It was also observed that loculi in ovaries having three, four and five loculi were arranged on the central axis while the twenty loculi ovary had two lines of loculi arranged linearly with ten loculi per line. The advantage of higher number of loculi per ovary is that each ovary has the potential to grow each of the ovules to seed.

Table 1. Incidence of multi-loculi *Hevea* ovary in random sampling

Year	Loculi per ovary			
	3	4	5	20
1989	843.00	40.00	6.00	0.00
1990	606.00	78.00	0.00	0.00
1992	2794.00	548.00	9.00	0.00
1993	230.00	39.00	5.00	1.00
Total	4473.00	705.00	20.00	1.00
Proportion	0.8604	0.1356	0.0038	0.0002

The various types of ovary were not clone specific. It was possible to find two or more classes of ovaries in a clone and in a single inflorescence (Tables 1 and 2).

Table 2. Incidence of multi-loculi ovary in nine clones of *Hevea brasiliensis*

Clone	Loculi per ovary			
	3	4	5	20
RRIM 501	88	11	0	0
RRIM 600	90	11	0	0
RRIM 605	98	4	0	0
RRIM 623	75	20	0	0
RRIM 628	80	10	0	0
RRIM 707	97	3	0	0
GT 1	247	2	0	0
PB 5/51	152	18	0	0
IAN 2960	83	17	0	0
Total	1010	96	0	0
Proportion	0.9132	0.0868	0	0

Theoretically, variation within a clone is attributed to environment. However, as in sterno-pleural number in *Drosophila* (Mather & Jinks, 1971), intra-clonal variation of ovary in *Hevea* is genetic. The factors that may be responsible for such occurrence are mutation and instability during mitosis.

Mutation is a sudden change in gene or chromosome character. The frequency of mutations that confer fitness is often very low. The occurrence of twenty loculi ovary with frequency of 0.0002 (*i.e.* 1/5000) can be attributed to mutation. The change in the arrangement of loculi in the twenty loculi ovary is also an indication of a change in mechanism of gene action.

The occurrence of four or five loculi ovary which is a regular feature in the population is due to instability in development. This is more so as *Hevea* is a double diploid with evidence of polypolar mitosis (Shijie *et al.*, 1990). Such mitotic events will produce variation in genotype of daughter cells.

In conclusion, the occurrence of higher number of loculi per ovary is the result of the combined effect of mutation and cell instability during mitosis. The progenies available for evaluation during breeding can be increased through careful hand pollination to ensure that each ovule is fertilized and hence, obtain the full potential of the multi-loculi ovary.

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