## CHROMOSOME NUMBER OF *ANTHERAEA FRITHII* MOORE (LEP:SATURNIIDAE)

*Antheraea frithii* Mr., known to produce tasar silk (Jolly *et al.*[1], 1968) is commercially unexploited. It is endemic in eastern hilly tracts of India (Meghalaya, Manipur, etc.) at altitudes 900–1,200 msl and feeds primarily on *Terminalia*. Detailed morphology of this species has been studied by Jolly *et al.*[4] (1974). However, the insect remained untapped so far as its cytological aspects are concerned. The present communication deals with the chromosome number of *A. frithii* Mr. collected from Manipur and the cytological behaviour observed in the course of interspecific hybridisation studies.

Testes from live pupae were dissected two weeks prior to emergence, fixed in acetic-alcohol (1:3) for 4 h and then preserved in 70% alcohol. Temporary acetocarmine squashes were prepared following the staining technique of Jolly *et al.* (1970). The chromosome counts of the metaphase spermatocytes were carried out at 16 × 100$^{x}$ magnification, the camera lucida diagrams drawn and microphotographed (Fig. 1).

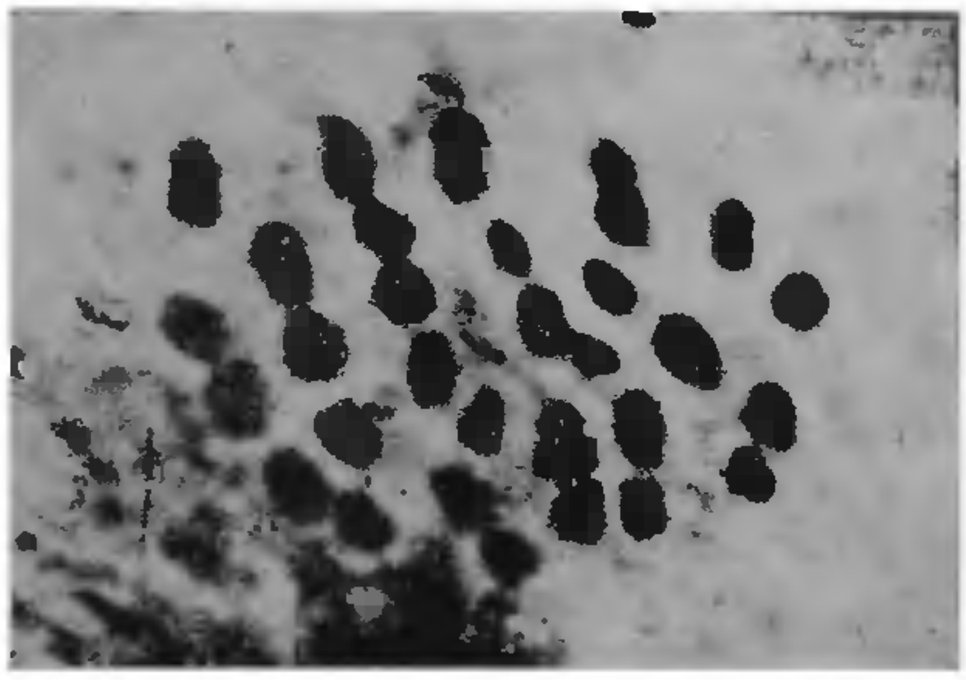

FIG. 1. Polar view of metaphase I showing haploid chromosome number of *A. frithii* Mr. ($n = 31$).

The chromosome number established for this species is $n = 31$. The chromosomes were oval and variable in size, as revealed by Fig. 1.

Studies on interspecific hybridisation between *A. frithii* ($n = 31$) and *A. mylitta* ($n = 31$; Sinha and Jolly[5], 1967) showed that though the $F_1$ progenies were healthy, the adults were sterile (Jolly *et al.*[3], 1971). The cytological investigation of the $F_1$ individuals indicated lack of synapsis in most of the cases resulting in 62 (31 + 31) chromosomes during I meiotic metaphase. Some of the cells however exhibited pairing tendency of the chromosomes. These observations suggest a possible close phylogenetic relationship between *A. frithii* Mr. and *A. mylitta* D.

It needs mention here that *A. frithii* is the seventh *Antheraea* species whose chromosome number has been elucidated.

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*March* 21, 1977.

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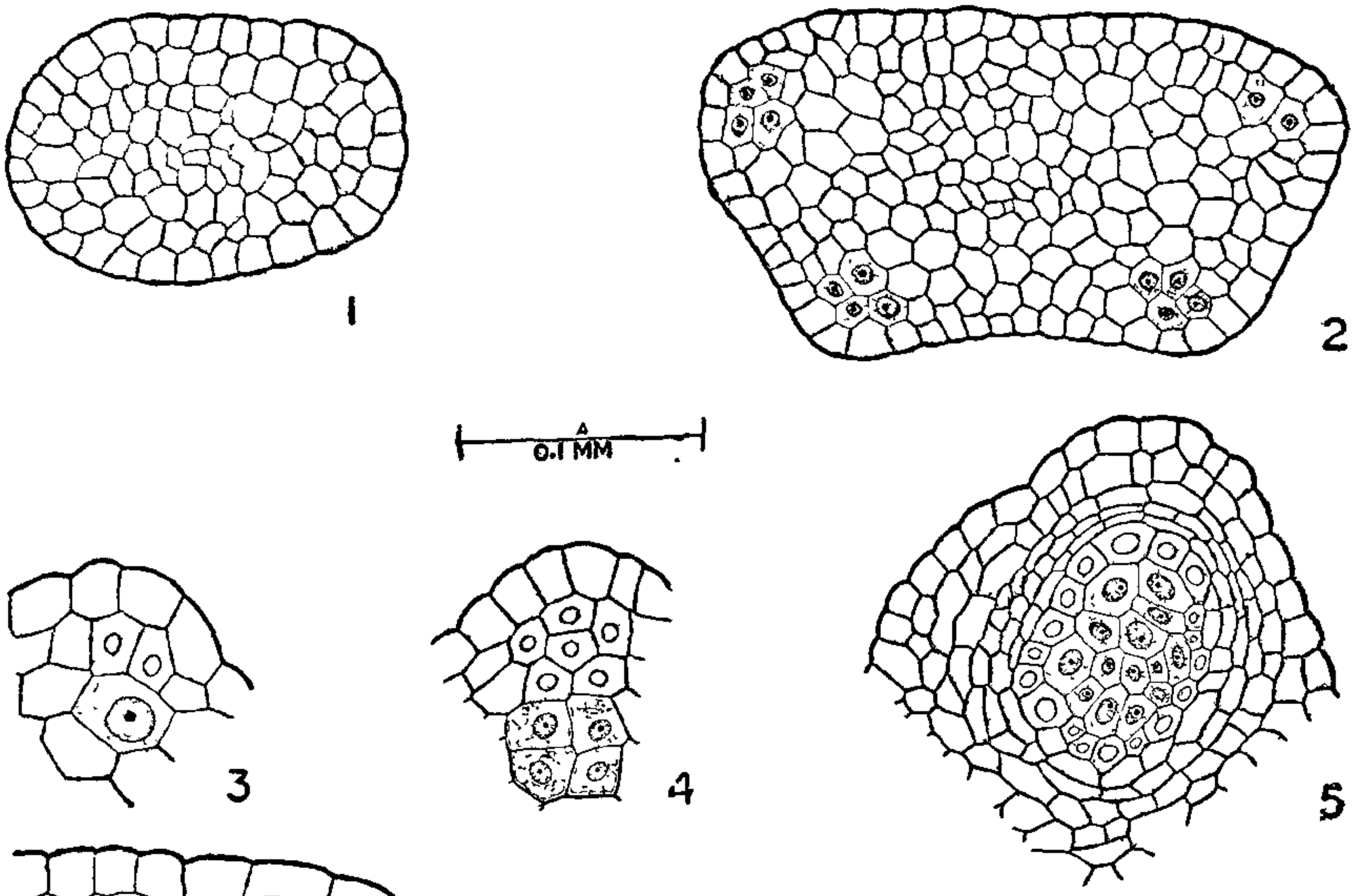
## MICROSPOROGENESIS IN *LITCHI CHINENSIS* L.

THE embryology of Sapindaceae has received very little attention by earlier workers[1]. Very little is known about the microsporogenesis in *Litchi chinensis*[2]. Hence the present work was undertaken. The floral buds of this species in various stages of development were collected from Horticultural Research Institute, Saharanpur and fixed in Carnoy's fluid. Customary methods of dehydration infiltration and embedding were followed. Sections were cut at 6–8 microns and stained with hematoxylin.

In very young stages of development, the anther appears somewhat oval in cross-section (Fig. 1), having a homogeneous mass of meristematic cells. Later on it becomes somewhat angular and differentiates into four anther lobes (Fig. 2). One, two or sometimes more archesporial cells are differentiated in each anther lobe (Fig. 2). These cells are more conspicuous with dense cytoplasm and prominent nuclei. The archesporial cells elongate radially and divide periclinally to form an outer primary parietal layer and an inner mass of large primary sporogenous cells (Figs. 3, 4). The primary parietal layer further divides periclinally and anticlinally to form the wall layers (Figs. 5–7). The outermost layer of the anther is epidermis. A layer, next to the epidermis, is the endothecium (Figs. 6, 7) which, in fully mature anther, develops fibrous thickenings from its inner tangential walls (Figs. 6, 7). The middle layers vary from 2 to 3 or more cells in thickness (Figs. 6, 7). They gradually become flattened and ultimately degenerate even earlier than the cells of the tapetum. The tapetum is glandular in nature and its cells are full of granulated cytoplasm. Finally the tapetal cells elongate radially and then degenerate.

The primary sporogenous cells divide and redivide to form microspore-mother-cells which are compactly arranged (Figs. 4, 6). The microspore-mother-cell divides meiotically to form first a diad (Fig. 8) and then a tetrad (Figs. 9–11). The microspore tetrads




FIGS. 1–13. Microsporogenesis in *Litchi chinensis* L. Fig. 1. Cross-section of anther in very early stage of development. Fig. 2. Cross-section of anther showing the archesporial cell differentiation. Figs. 3–4. Cross-sections of anther lobes showing stages in microsporogenesis. Figs. 5–7. Stages in the development of wall layers in an anther lobe in cross-sections. Fig. 8. A diad formation. Fig. 9. A tetrad formation. Fig. 10. A tetrahedral tetrad. Fig. 11. An isobilateral tetrad. Figs. 12, 13. A single microspore in polar and equatorial view respectively.

EN—Endothecium; EP—Epidermis; FT—Fibrous thickenings; ML—Middle layer; S—Microspore; SC—Sporogenous cell; T—Tapetum. Scale A for Figs. 1, 2, 5–7. Scale B for Figs. 3, 4, 8–13.

are usually arranged in a tetrahedral manner (Fig. 10) and rarely they are isobilateral (Fig. 11). Later on the microspores separate from each other in a tetrad. A single celled microspore is a triangular or a rounded structure (Figs. 12, 13).

The authors are thankful to the Director, Horticultural Research Institute, Saharanpur for their help in procuring the material used in this study and to Dr. V. Singh for his valuable suggestions and laboratory facilities.

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## PHYSIOLOGICAL CHARACTERIZATION OF A SPICE (*CORIANDRUM SATIVUM*) AND A CONDIMENT (*TRIGONELLA FOENUM GRAECUM*) DURING VEGETATIVE AND REPRODUCTIVE STAGES

THE physiology of spices and condiments has not been studied in detail. The astringency and flavour which they impart may be due to phenolics, alkaloids, terpenoids and tannins. Tannins are remarkable for their astringent or 'puckery taste'[1]. Vegetable tannins are polyhydric phenols. The present study was undertaken to have an idea as to the nature of the phenolic substances which may provide some physiological markers for a spice and a condiment.

Seeds of coriander and trigonella were sown in the garden plots. Qualitative and quantitative estimation of phenolic acids was made by using two-dimensional paper chromatography, with benzene : acetic acid : water (60 : 20 : 30) in the first direction and sodium formate : formic acid : water (10 : 1 : 200) in the second. The dried sheets were observed under ultraviolet light and were sprayed with diazotized *p*-nitroaniline or diazotized sulphanilic acid. The extraction and estimation of phenolic acids was made according to the method of Bate-Smith[2].

The total phenol content of coriander was more than that of trigonella during the vegetative and reproductive phases. Trigonella was characterized by more number of phenolic acids when compared to coriander both in vegetative and reproductive phases. Rutin, caffeic acid, cis and trans *p*-coumaric acids and trans-ferulic acids were not present in coriander during vegetative stage. Cis and trans forms of *p*-coumaric acids were observed at the reproductive phase apparently indicating that these two acids may contribute to the spicy nature of coriander which can be substantiated by the highest content of these acids in the dry seeds of coriander. The formation of caffeic acid and chlorogenic acid shows the involvement of shikimic acid pathway in phenolic biosynthesis[3]. The presence of protocatechuic acid is another evidence for the involvement of shikimic acid pool[4]. Protocatechuic acid, chlorogenic acid, *p*-coumaric acids which are the intermediates of shikimic acid are less in trigonella compared to coriander indicating that the spice coriander is more fibrous (because of more lignin *via* shikimic acid pathway) than the condiment trigonella. Thus, phenolics provide physiological

TABLE I

*Phenolic acids in coriander (spice) and trigonella (condiment)*

| Phenolic compound (μg/gm fr. wt.) | Coriander | | | Trigonella | | |
|---|---|---|---|---|---|---|
| | Vegetative stage | Reproductive stage | Dry seed | Vegetative stage | Reproductive stage | Dry seed |
| Protocatechuic acid | 179 | 167 | 760 | 36 | 60 | .. |
| Chlorogenic acid | 305 | 320 | .. | 80 | 90 | .. |
| *p*-hydroxybenzoic acid | 252 | 333 | 960 | 227 | 260 | 480 |
| Vanillic acid | 221 | 347 | 960 | 302 | 360 | 750 |
| Rutin | .. | .. | .. | 111 | 100 | 260 |
| Rutin derivatives | .. | .. | .. | .. | 110 | .. |
| Caffeic acid | .. | .. | .. | 27 | 60 | .. |
| Cis *p*-coumaric acid | .. | 273 | 1440 | 53 | 105 | 260 |
| Trans *p*-coumaric acid | .. | 173 | 1120 | 80 | 90 | .. |
| Trans ferulic acid | .. | .. | .. | 111 | 80 | .. |
| Cis ferulic acid | .. | 467 | 1360 | .. | 320 | .. |
| Cinnamic acid | .. | 40 | .. | .. | .. | .. |
| Total phenols | 45 | 51 | .. | 30 | 15 | .. |

*Note.*—The total phenol content is expressed as μg/gm fresh weight.