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LEAF CUTICLE OF *LITSEA* FROM THE TERTIARY LIGNITE OF NEYVELI, SOUTH INDIA[1]

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ABSTRACT

The paper describes fossil cuticle belonging to *Litsea* from the Neyveli lignite in South Arcot district, South India. The cuticle on comparison with many living taxa has been found to come closest to the modern cuticle of the genus *Litsea* of the family Lauraceae.

INTRODUCTION

So far not much work has been done on the fossil cuticles in India. Jacob & Jacob (1953) have described cuticles from Tertiary lignite of Cuddalore, while Kulkarni and Phadtara (1980) and Dalvi & Kulkarni (1982) have described them from Ratnagiri lignite. Although considerable work on the composition, microstructure, pollen and woods has been done on the Neyveli lignite by Navale (1965, 1968, 1969, 1970) and Ramanujam (1966), yet hardly any work has been done on fossil cuticles from these deposits. The lignite samples analysed and reported here are very rich in cuticles.

MATERIAL AND METHODS

Samples of lignite were collected by the author in 1982 from Neyveli lignite mines, South Arcot district, South India. These were taken from fresh diggings. The samples yielded numerous very well preserved, small and large leaves. Lignite samples were treated with Con. HNO_3 for about 48 hours, washed thoroughly with water till free of acid, and then treated with 10% KOH for about 10-30 minutes. The samples were thoroughly washed again with water and cuticles were obtained by sieveing the residue. After drying the material was mounted in Canada Balsam. Terminology used here is the same as given by Stace (1965).

OBSERVATION

Slides show well preserved epidermis and cuticle of both the upper and lower surface of leaf. The cells of the upper epidermis are thick walled, 27 × 19 μm in size with sinuous walls, the epidermis is devoid of any stomata or openings, hence the leaves are hypostomatic (Fig. 1).

The lower epidermis is thick walled, it has smooth walled cells 26 × 19 μm in size. Many paracytic type of stomata are irregularly distributed

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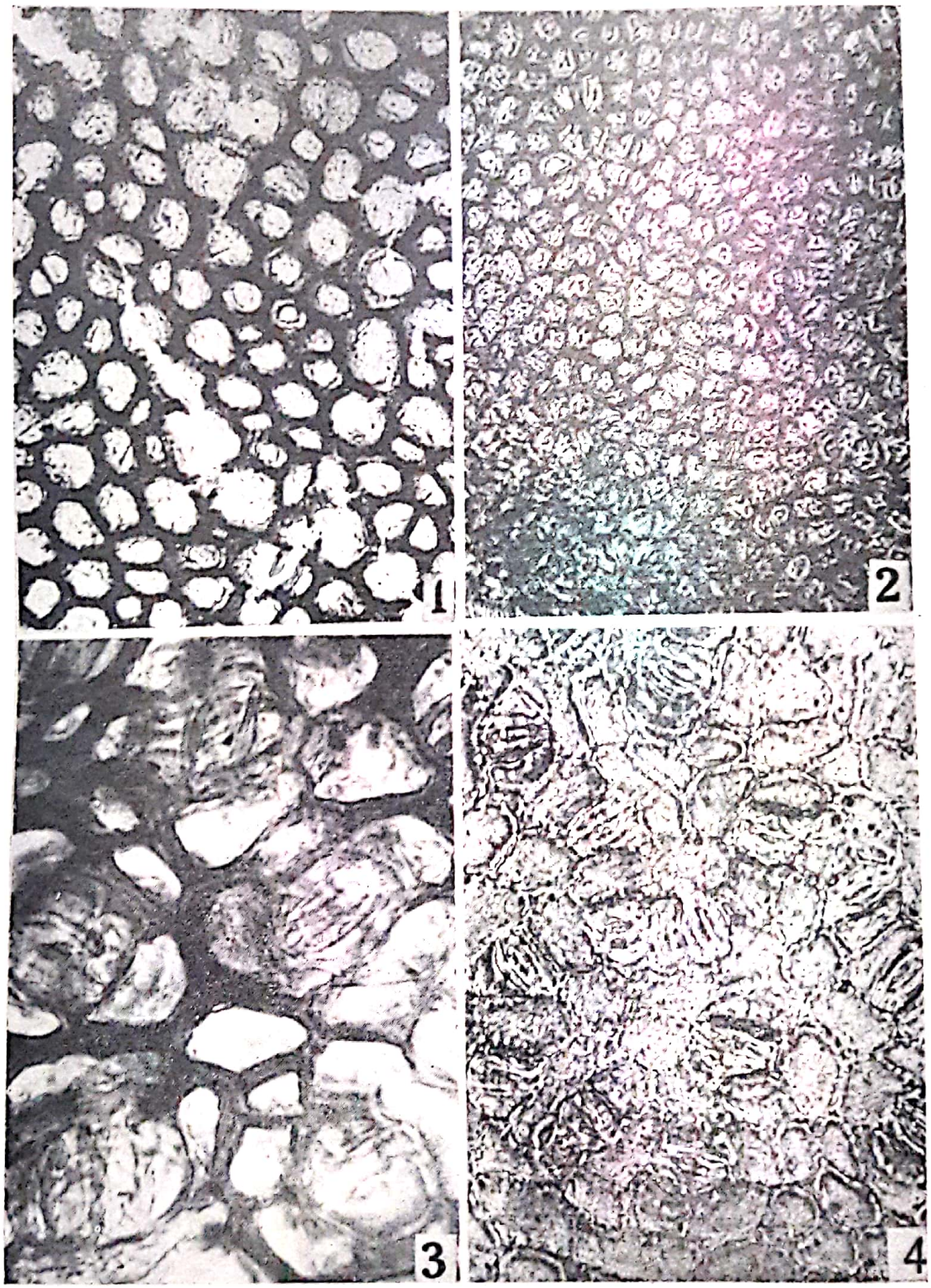

Figs. 1-4. Fig. 1. Upper epidermis of the fossil *Litsea*. Fig. 2. Upper epidermis of living *Litsea polyantha*. Fig. 3. Lower epidermis of fossil *Litsea* showing stomata. Fig. 4. Lower epidermis of *L. polyantha* with stomata (Figs. 1 & 2 ×100; Figs. 3&4 ×400)

throughout; stomata are 33×26 μm in size. The wall common to guard cells and accessory cells readilly breaks down and gives an impression of horizontal elongation to the stomatal apparatus (Fig. 3). Trichomes, their bases and striations of any kind are absent. Stomatal frequency is 26 and stomatal index is 23.

DISCUSSION

This cuticle has been compared with taxa of many families having paracytic type of stomata (Metcalfe & Chalk, 1950). After a thorough scrutiny it has been found that fossil cuticle shows affinities with members of the family Lauraceae. Many taxa like *Litsea*, *Cinnamomum*, *Cassytha* etc. have been studied for their cuticular structures (Table I; Bandulska, 1926, 1928). It has been found that fossil cuticle shows very close resemblance with the cuticle of *Litsea* (Figs. 2 & 4), in characters like irregularly arranged paracytic type of stomata, epidermal cell structure, stomatal frequency and stomatal index (Table I). Cuticles of *Litsea* both fossil and living have been figured and described by Bandulska (1926). The fossil cuticle described here resembles these in structure and arrangement of stomata and also in structure of epidermal cells.

The data presented here go to show that the present fossil cuticle comes closest to the modern cuticle of the genus *Litsea* of Lauraceae.

Earlier to this investigation, leaf impressions of *Litsea* have been described by Puri (1945) from the Karewa beds of Kashmir, which are of lower Pleistocene age. Bande and Prakash (1980) described an Eocene fossil wood *Laurinoxylon deccanensis* from the Deccan Intertrappean beds near Shahpura. The presence of leaves and cuticles of *Litsea* from the Neyveli lignite which is of Miocene-Pliocene age indicates that the family Lauraceae was well established during the Tertiary.

Lauraceae at present occurs in tropical and Eastern Himalayas in India.

TABLE I

CUTICULAR CHARACTERS OF LIVING AND FOSSIL *LITSEA* AND *CASSYTHA*

Name of the taxa which show resemblance with the fossil	Upper epidermis	Lower epidermis cell size	Type of Stomata	Arrangement of stomata	Stomatal size	Stomatal frequency	Stomatal Index
Cassytha filiformis (Linn.) Thunb.	Cell elongated with undulate walls	29×17μm	Paracytic	Irregular	29×23μm	32	12.5
Litsea foliosa (Sieb. & Zucc.)	Cells some what rounded with sinuous walls	19×13 μm	Paracytic	Irregular	23×16 μm	30	26
Litsea polyantha (Fuss.)	Cells rounded with sinuous walls	26×16 μm	Paracytic	Irregular	29×23 μm	32	23
Fossil cuticle	Rounded cells with sinuous walls	26×18 μm	Paracytic	Irregular	33×26 μm	26	23

Some of the species like *Litsea lanuginosa* are also found in Garhwal, Nainital, Mussorie, Sikkim and near Kalka in Simla. Many species of *Litsea* still grow in South India and the occurance of fossil which closely resembles *Litsea* from Neyveli lignite mine in South India, indicates that during the Miocene-Pliocene times, *Litsea* was widely distributed in South India as it is presently found in this region.

REFERENCES

BANDE, M. B. AND U. PRAKASH 1980. Four new fossil dicotyledonous woods from the Deccan intertrappean beds near Shahpura, Mandla District, M. P. *Geophytology* **10** : 268-271.

BANDULSKA, H. 1926. On the cuticles of some recent and fossil Lauraceae. *J. Linn. Soc. Lond.*, **47** : 383-425.

BANDULSKA, H. 1928. A *Cinnamon* from Bourne mouth, Eocene. *J. Linn. Soc. Lond.* **48** : 139-147.

DALVI, N. S. AND A. R. KULKARNI 1928. Leaf cuticles from Lignitic beds of Ratnagiri district, Maharashtra. *Geophytology* **12** : 223-232.

JACOB, K. AND C. JACOB 1953. Cuticles from the Tertiary lignite of Cuddalore, South Arcot, India. *Proc. 7th. Int. bot. Cong.* : 573.

KULKARNI, A. R. AND N. R. PHADTARE 1980. Leaf epidermis of *Nypa* from lignitic beds of Ratnagiri District Maharashtra, *Geophytology* **10** : 125-128.

METCALFE, C. R. AND L. CHALK 1950. Anatomy of Dicotyledons **1** & **2**, Oxford.

NAVALE, G. K. B. 1965. Microstructure of Neyveli lignite. *Metals & Minerals Review* **3** : 27.

NAVALE, G. K. B. 1968. Woody tissue resembling the woods of Ebenaceae in the microstructure Neyveli lignite. *Palaeobotanist* **16** : 191-194.

NAVALE, G. K. B. 1969. An approach to nomenclature and classification of lignite microconsituents. *Bull. Geol. Soc.* India. **6** : 89-92.

NAVALE, G. K. B. 1970. Petrology of Neyveli lignite. *C. R. 6th Cong. Int. Stratigr. Carb. Geol.* **3** : 1207-1222.

PURI, G. S. 1945. Some Fossil leaves of *Litsea lanuginosa* Nees from the Karewa beds at Lidarmarg Pirpanjal, Kashmir. *J. Indian bot. Soc.* **24** : 95-100.

RAMANUJAM, C. G. K. 1966. Palynology of the Miocene Lignite from South Arcot District, Madras. *Palaeobotanist* **8** : 38-42.

STAGE, C. A. 1965. Cuticular studies as an aid to plant taxonomy. *Bull. British Mus. Lond.* **4** : 1-78.