

SOME FOSSIL LEAVES FROM THE SIWALIK GROUP

ANIL K. MATHUR*

Department of Geology, Panjab University, Chandigarh

ABSTRACT

In all, six fossil leaf taxa have been described from Chinji Formation (Lower Siwalik) and Tatrot Formation (Upper Siwalik) in the present contribution which include a new species *Litsea bhatiai*. The remaining five taxa have been left under open nomenclature.

INTRODUCTION

The occurrence of fossil leaves and wood from the Siwalik Group has been recorded by a number of workers but these are without any detailed description or illustration. However, GHOSH AND GHOSH (1958) were perhaps the first to describe and illustrate *Anisopteroxylon jawalamukhi*, a new fossil wood species from the Middle Siwaliks near Jawalamukhi (district Kangra), Himachal Pradesh. Subsequently, RAWAT (1964) described a silicified fossil wood *Dipterocarpoxyton* sp. from ? Lower or Middle Siwaliks exposed near Mohand (Uttar Pradesh). SAHNI (1964) described and illustrated from a Lower Siwalik (Palandri Formation = Chinji Formation) marl near Poonch (Jammu and Kashmir State) one new grass leaf (*Poacites sivalicus*) beside two new palm leaves (*Palmoxylon wadiai* and *P. jammuense*) described from Boulder Conglomerate Formation (Upper Siwalik) near Jammu. In a series of papers LAKHANPAL (1965, 1967, 1968, 1969) and LAKHANPAL AND DAYAL (1966) recorded or described plant fossils from a well known locality of Lower Siwaliks near village Balu Goloa, about 12 km northwest of Jawalamukhi (Himachal Pradesh). The taxa recorded in these works included four new species viz., *Zizyphus sivalicus*, *Berchemia balugoloensis* (Rhamnaceae), *Ficus precunia* (Moraceae) and *Fissistigma senii* (Anonaceae) and two other leaf taxa (*Smilax* sp. and *Lagerstroemia* sp.) and a fruit (*Dalbergia* sp.). DAYAL AND CHAUDHURI (1967) in a brief note, illustrated four species of dicotyledonous leaves from Nahan Formation (\equiv Kamlial-Chinji sequence of Lower Siwaliks) from near Kalka, Himachal Pradesh and assigned them to the non-committal genus *Dicotylophyllum*. LAKHANPAL (1970) reviewed the entire gamut of the Tertiary floras of India and discussed the palaeogeography of the subcontinent on the joint evidence of plant and animal fossils. VERMA (1968) described four fossil leaves from beds placed by him in the upper part of the Lower Siwaliks or Lower part of Middle Siwaliks exposed along Bagh Rao near Hardwar. The assemblage contained three new species (*Meliaceaphyllum mahagonites*, *Eucalyptophyllum raoi* and *Diospyros embroypteris*) and ? *Croton tegelis*. Of these, the first one belonged to a new genus of the family Meliaceae.

Recently, the author (MATHUR, 1974) described and illustrated a new fossil seed (*Boraginocarpus lakhanpalii*) belonging to the family Boraginaceae from the Tatrot Formation (Upper Siwalik) near Chandigarh.

NANDI (1975) while discussing the palynostratigraphy of the Siwalik Group of Punjab listed the works on palynomorphs and other fossil plants from the Siwaliks.

*Present address : Geological Survey of India, Shillong-3, India.

It is obvious from the foregoing that there are not many records of fossil leaves from the Siwaliks. This is mainly because of the fact that their preservation in sandy siltstones in which they generally occur is often poor. The author collected a number of fossil leaves from the Lower Siwaliks (Chinji Formation) near Jawalamukhi (31° 55' : 76° 20') and the Upper Siwaliks (Tatrot Formation) near Daulatpur (32°0' : 76°15'), Kangra District, Himachal Pradesh, but due to their poor preservation it was possible only to identify six taxa of which one is a new species. Of the remaining four could be identified up to the generic level and another up to the family level. The geology of the area around Jawalamukhi and Daulatpur is given in the work of SAHNI AND MATHUR (1964).

SYSTEMATIC DESCRIPTION

The classification adopted in this contribution is after HUTCHINSON (1964). However, the author has followed SAHNI (1964) in retaining the artificial genus *Poacites* Brongniart and placed it in the family Graminae since its exact affinities are still unknown.

Holotype and a paratype of the new species and hypotypes of the indeterminate taxa have been deposited in the Museum, Centre of Advanced Study in Geology, Panjab University, Chandigarh, under catalogue Nos. CASGF 440-446.

Family—LAURACEAE

Genus—**Litsea** Lamarck

Litsea bhatiai sp. nov. (Pl. 1, Fig. 1).

Name—The species is named in honour of Professor S. B. Bhatia, Department of Geology, Panjab University, Chandigarh.

Holotype—A leaf impression from the Tatrot Formation, 1.5 km north of Daulatpur, Kangra District, Himachal Pradesh.

Paratype—A partially preserved leaf impression from the same horizon.

Material—One complete and a partially preserved leaf impression from the Tatrot Formation near Daulatpur (Sample DA/35).

Diagnosis—An elongate lanceolate, triplinerved *Litsea* with short pointed apex.

Description—Leaf medium sized, elongate, lanceolate, about three times as long as wide ; apex acute, not elongate, base slightly broader than the apex ; venation reticulate, triplinerved with two lateral nerves running close to the margin for about 1/4 length from the base and eventually merging with the margin ; midrib straight, moderately thick, gradually thinning towards apex, dividing the leaf into slightly unequal parts ; secondaries thin, moderately widely spaced seven pairs with fifth pair secondaries opposite and the remaining alternating, generally bifurcating at short distance from midrib ; margin entire.

	Length	Width
	(Measurements in mm)	
Holotype (CASGF 440)	83.0	28.0
Paratype (CASGF 441)	50.0 (preserved)	30.0 (preserved)

Remarks—This new species resembles closely *Litsea consimilis* Nees, known to be living in the Western Himalayas between altitudes 1,000—3,000 metres (COLLETT, 1921; p. 434),

in overall shape and size but differs from it in having a short pointed apex, secondaries bifurcating at shorter distance from midrib, and the two lateral nerves shorter and running closer to the margin.

Family—PAPILIONACEAE

Genus—**Papilionid** gen. et. sp. indet. (Pl. 1, Fig. 3)

Material—One partially preserved leaf impression from Chinji Formation (Lower Siwalik) near Jawalamukhi (sample JW/2).

Description—Leaf apparently broadly ovate, exact shape indiscernible, apex not preserved, base obtuse; petiole not preserved; venation unicostate reticulate; midrib prominent, fairly thick, straight in the preserved part of leaf; six pair of secondaries preserved, nearly straight, bifurcating and curving upwards near the margin, meeting it in a short distance; margin entire; other details unknown.

	Length	Width
	<i>(Measurements in mm)</i>	
Hypotype (CASGF 442)	40.00 (preserved)	28.0 (preserved)

Remarks—This fossil leaf from the Lower Siwalik near Jawalamukhi resembles somewhat the Papilionid leaves in the overall preserved outline, venation and midrib. However, precise generic and specific identification has not been possible.

Family—EUPHORBIACEAE

Genus—**Mallotus** Louriero

Mallotus sp. (Pl. 1, Fig. 6)

Material—One partially preserved leaf impression from Chinji Formation (Lower Siwalik) near Jawalamukhi (sample JW/3).

Description—Leaf apparently ovate, exact shape not discernible, apex not preserved; base obtuse; venation unicostate reticulate; midrib prominent, not very thick, thinning towards apex; six pairs of secondaries preserved, prominent, curved upwards near the margin, ending abruptly there; margin entire; further details unknown.

	Length	Width
	<i>(Measurements in mm)</i>	
Hypotype (CASGF 443)	65.0 (preserved)	40.0 (preserved)

Remarks—This partially preserved indeterminate leaf impression from the Lower Siwalik near Jawalamukhi has a characteristic broad base, strong secondary venation, strong midrib and an entire margin which suggest its placement in the genus *Mallotus* Lauriero. The generic placement has been confirmed by Dr. R. N. Laxhanpal of Birbal Sahni Institute of Palaeobotany, Lucknow.

Family—GRAMINAE

Genus—**Poacites** Brongniart

Poacites sp. indet. A (Pl. 1, Fig. 4)

Material—One partially preserved leaf impression from Chinji Formation (Lower Siwalik) near Jawalamukhi (sample JW/5).

Description—Leaf linear, broad apex and base not preserved ; midrib very prominent, thick ; veins of two types, the only more prominent vein dividing leaf into nearly equal parts, running parallel to midrib, the finer interstitial veins also running parallel to midrib ; cross-veins absent ; lamina unplicated ; other features unknown.

	Length	Width
	(<i>Measurements in mm</i>)	
Hypotype (CASGF 444)	53.0 (preserved)	35.0 (preserved)

Remarks—The present partially preserved monocotyledonous leaf impression is wider and has a more prominent midrib as compared to *P. sivalicus* originally described by SAHNI (1964) from the Palandri Formation (Lower Siwalik) of Sudanatti Tehsil (Jammu and Kashmir State). However, precise specific identification has not been possible.

Poacites sp. indet. B (Pl. 1, Fig. 2)

Material—Two partially preserved leaf impressions from Chinji Formation (Lower Siwalik) near Jawalamukhi (sample JW/6).

Description—Leaf linear, moderately wide, narrowing towards apex ; apex and base not preserved ; midrib prominent, thin, sharp ; veins parallel to midrib of unequal prominence, the more prominent ones occurring at unequal intervals, cross-veins absent, lamina unplicated, other features unknown.

	Length	Width
	(<i>Measurements in mm</i>)	
Hypotype (CASGF 445)	50.0 (preserved)	13.0

Remarks—The present leaf impression also resembles *P. sivalicus* Sahni in venation and in having a prominent thin, midrib. It, however, differs in having a lesser width and narrow apex.

Poacites sp. indet. C (Pl. 1, Fig. 5)

Material—One partially preserved leaf impression from Tatrot Formation (Upper Siwalik) near Daulatpur (sample BA/36).

Description—Leaf linear, moderately wide ; apex and base not preserved ; midrib prominent, thin, sharp ; veins parallel to midrib, one slightly less prominent and thinner than midrib dividing leaf in unequal parts on one half of leaf, not preserved in the other half ; cross-venation not very distinct, lamina unplicated, other features unknown.

	Length	Width
	(<i>Measurements in mm</i>)	
Hypotype (CASGF 446)	34.0 (preserved)	18.0 (preserved)

Remarks—This partially preserved leaf impression differs from *P. sivalicus* Sahni and the other two indeterminate species of *Poacites* described above in the presence of cross-venation.

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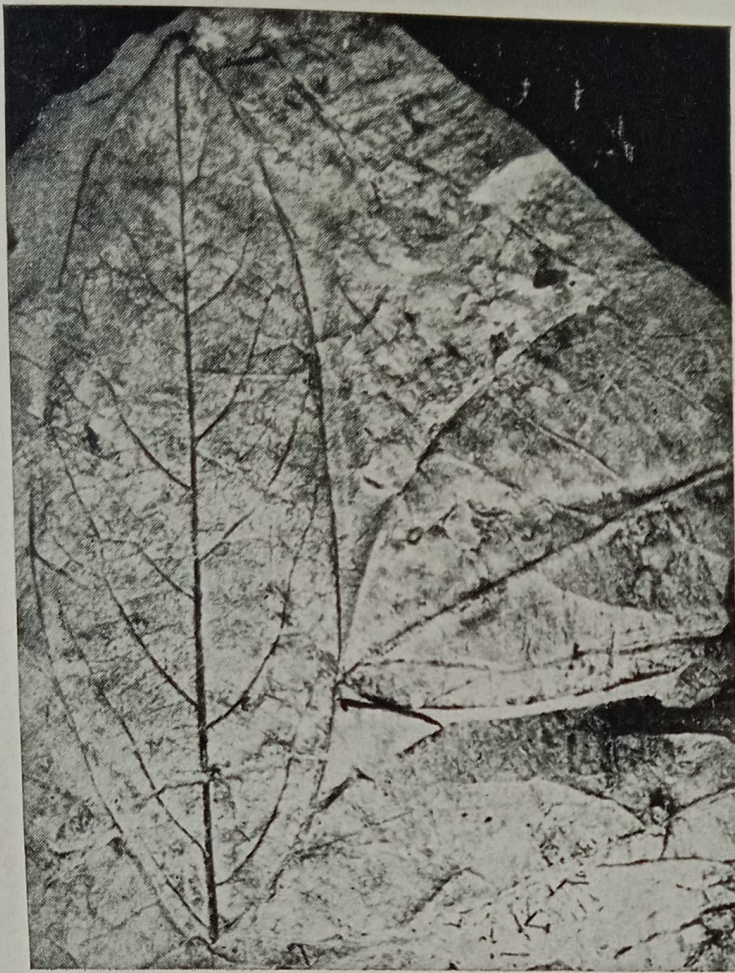
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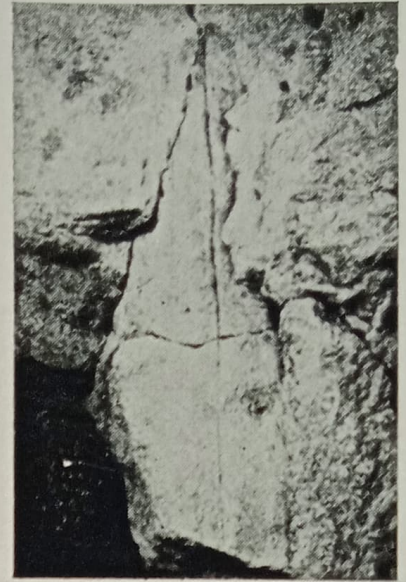
EXPLANATION OF PLATE 1

(All figures natural size)

1. *Litsea bhatiai* sp. nov.—Holotype (CASGF 440) and paratype (CASGF 441)
2. *Poacites* sp. indet. B—Hypotype (CASGF 444)
3. *Papiilionid* gen et sp. indet.—Hypotype (CASGF 442)
4. *Poacites* sp. indet. A—Hypotype (CASGF 444)
5. *Poacites* sp. indet. C—Hypotype (CASGF 446)
6. *Mallotus* sp.—Hypotype (CASGF 443)



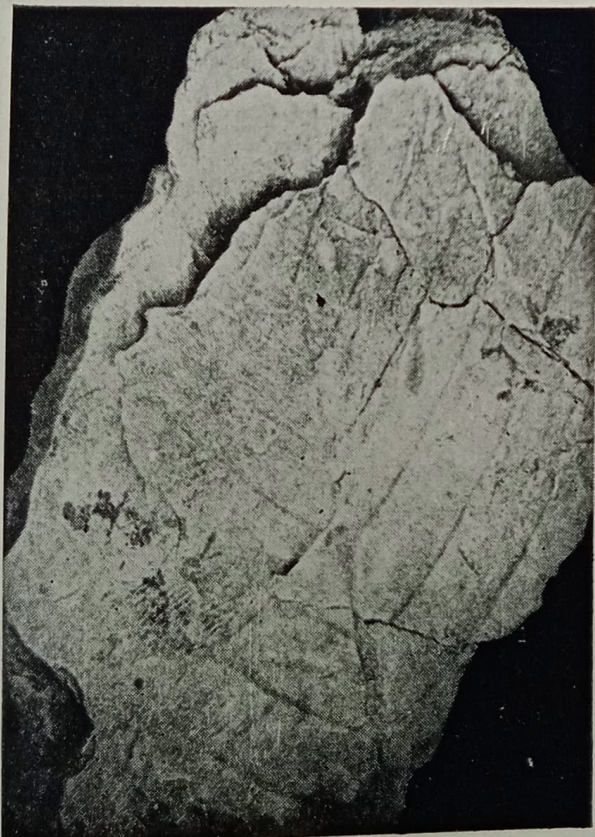
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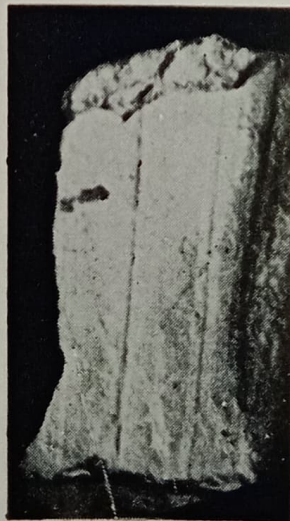
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