

# Occurrence of fossil *Mitragyna* in the Early Miocene of Himachal Pradesh, India<sup>\*</sup>

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## ABSTRACT

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The paper reports the occurrence of a fossil leaf and a fruit, resembling those of *Mitragyna parvifolia* (Roxb.) Korth., in the Early Miocene sediments of Kasauli Formation exposed around Kasauli township in Himachal Pradesh. It indicates the existence of warm and moist conditions around Kasauli during Early Miocene, in contrast to the presently prevailing cooler conditions. The report forms the earliest known record of the genus from India till now.

**Key-words**—Fossil leaf, Fruit, *Mitragyna*, Early Miocene, Himachal Pradesh, India.

भारत के हिमाचल प्रदेश प्रान्त के प्रारंभिक मायोसीन कल्प में *मित्रागाइना* पादपाश्र्म की उपस्थिति

जसवन्त सिंह गुलेरिया, रश्मि श्रीवास्तव एवं ऋतेश आर्य

सारांश

प्रस्तुत शोध पत्र में हिमाचल प्रदेश के कसौली नामक स्थान के आस-पास अनावरित कसौली शैलसमूह के प्रारंभिक मायोसीन अवसादों में *मित्रागाइना पार्वीफोलिया* (रॉक्सबर्ग) कोर्थ के समरूप एक अशिमत पत्ती एवं एक फल की प्राप्ति का विवरण दिया गया है। इससे प्रारंभिक मायोसीन कल्प के दौरान कसौली के आस-पास वर्तमान समय की शीत स्थितियों के विपरीत उष्ण एवं आर्द्र जलवायुविक स्थितियों का संकेत मिलता है। यह रिपोर्ट भारत से इस वंश के अभी तक ज्ञात अभिलेखों में सर्वाधिक प्राचीन है।

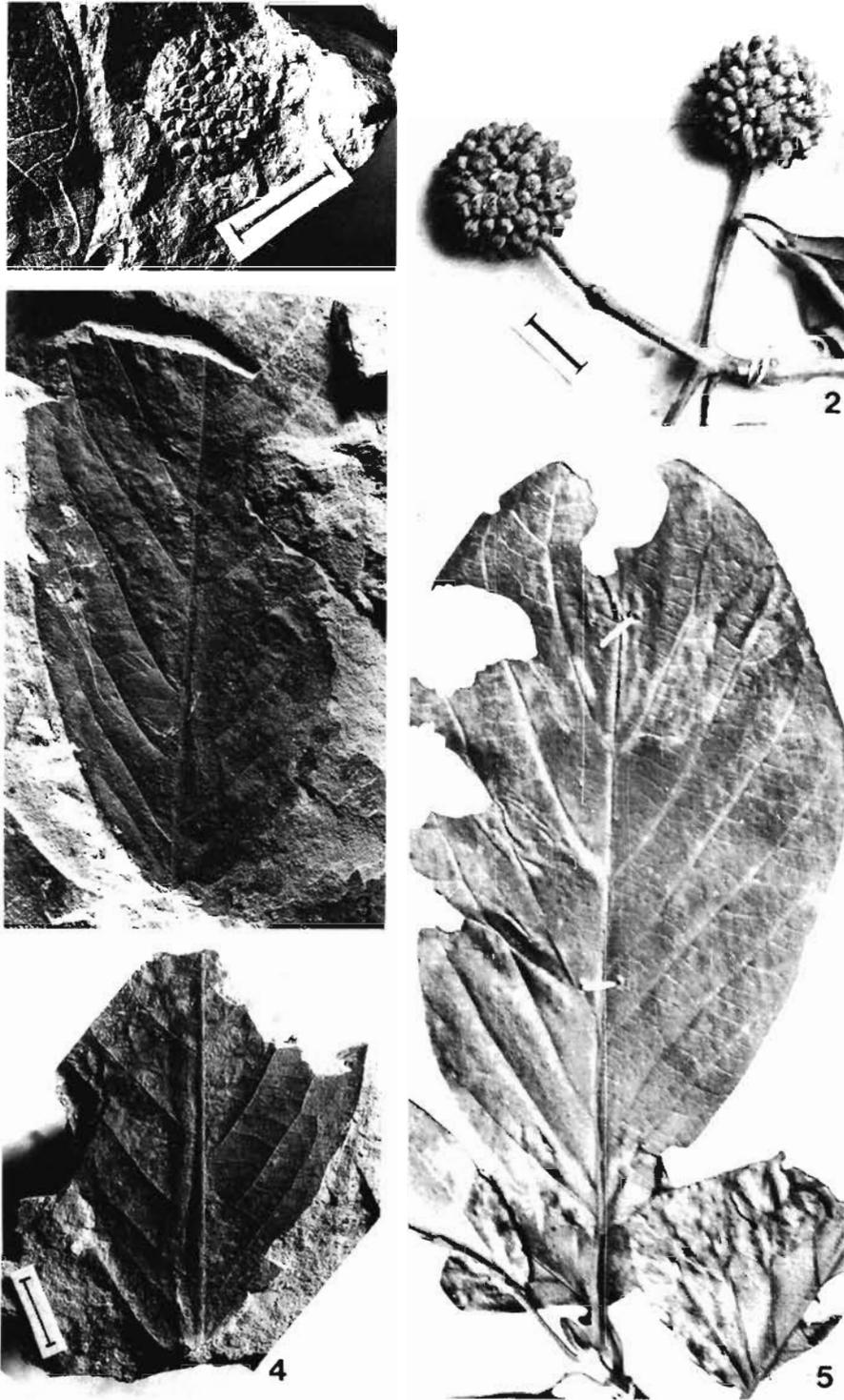
**संकेत शब्द**—अशिमत पत्ती, फल, *मित्रागाइना*, प्रारंभिक मायोसीन, हिमाचल प्रदेश, भारत।

## INTRODUCTION

THE Kasauli Formation is one of the important Tertiary sedimentary deposits around Kasauli Hills of Himachal

Pradesh in Western Himalayas. It is massively developed in and around Kasauli township (Chaudhri, 1969) and its sediments contain well preserved plant remains comprising leaves, fruits, flowers, seeds, buds, etc. Occurrence of plant remains in Kasauli sediments was first reported by Medlicott in 1864 (pp. 12, 97-99). Some palm leaf fragments referred to *Sabal major* Heer were later figured by Feistmantel (1882,

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## PLATE 1

1. A fruit of *Mitragyna sahnii* x 1·5.
2. Modern fruit of *Mitragyna parvifolia*. Natural size.
3. A leaf of *Mitragyna tertiara*. Natural size.
4. Counterpart of leaf of *Mitragyna tertiara*. Natural size.
5. Modern leaf of *Mitragyna parvifolia*. Natural size.

pp. 52-53, figs 3-5). Subsequently Sahni (1953, 1964), Chaudhri (1969), Arya and Awasthi (1994, 1995), Awasthi *et al.* (1996), Mathur *et al.* (1996), Guleria *et al.* (2000) and Arya *et al.* (2001) reported a number of genera from these sediments.

The present material was collected from the road cutting adjoining MES Inspection Bungalow of Kasauli (30°54' 00" N: 76° 58' 00"E) (Fig. 1). The lithology of the formation is well documented (Chaudhri, 1968; Srivastava & Casshyap, 1983; Mathur *et al.*, 1996). The material investigated was mainly found in grey to greenish micaceous siltstone. The specimens have been deposited in the repository of the Birbal Sahni Institute of Palaeobotany, Lucknow.

## SYSTEMATICS

### Family—RUBIACEAE

### Genus—MITRAGYNA Korth.

#### MITRAGYNA TERTIARA Konomatsu & Awasthi, 1999

(Pl. 1:3-4)

*Material*—The description is based on a leaf impression and its counterpart.

*Description*—Leaf simple, appearing symmetrical, seemingly narrow obovate, preserved lamina length 8.8 cm, maximum width 4.9 cm, apex broken, base missing, margin entire, texture chartaceous, petiole not preserved; venation pinnate, camptodromous - eucamptodromous, primary vein (1°), simple, stout, almost straight, secondary veins (2°) angle of divergence acute, moderate 32°-36°, relatively thinner than primary vein, alternate to opposite, more or less uniformly curved, intersecondary veins absent; tertiary veins (3°) angle of origin 75°-80°, pattern percurrent, simple, oblique, closely spaced, higher order venation not seen.

*Affinities*—The important characters of the fossil leaf are: simple, narrow obovate chartaceous leaf with entire margin, eucamptodromous venation, secondaries alternate to opposite in arrangement and tertiaries percurrent, simple, obliquely arranged. In all these characters the fossil shows close similarity with modern leaves of *Mitragyna parvifolia* (Roxb.) Korth. A lot of variation in shape and size of the extant leaves of *Mitragyna parvifolia* was observed while surveying them at the Herbarium of the Forest Research Institute, Dehradun. However, the fossils were found to show the best resemblance with leaves of *Mitragyna parvifolia* (Roxb.) Korth. of the F.R.I. Herbarium Sheet no. 105/155661.

*Specimen no.*—BSIP38392.

#### MITRAGYNA SAHNII sp. nov.

(Pl. 1:1)

*Material*—It consists of a single fruit impression.

*Description*—Fruit specimen more or less circular. Multiple/composite fruit, round to globose in shape, 1.3 cm in diameter, surface uneven, angular-polygonal due to aggregate nature of fruit.

*Affinities*—Comparisons were made with fruits of various genera, such as, *Casuarina* Linn. (Casuarinaceae), *Cudrania* Trecul. (Moraceae), *Datura* Linn. (Solanaceae), *Guazuma* Miller. (Sterculiaceae) (Bose *et al.*, 1998, p. 246, photo no. 790), *Mitragyna* Korth. (Rubiaceae) (Bose *et al.*, 1998, p. 327, photo no. 1044-46) and *Nephelium* Linn. (Sapindaceae) showing apparent similarity with the fossil. It was found that the fossil fruit shows best resemblance in shape and size with the modern fruits of *Mitragyna parvifolia*. The fossil forms the first record of *Mitragyna parvifolia* fruit. Its occurrence is not at all surprising and is very much expected along with its leaves in the same sediments. As the fruit has not been found in organic connection with the leaf of *Mitragyna tertiarum*, a new specific name *Mitragyna sahnii* has been assigned to it. The specific name is after late Professor Birbal Sahni who

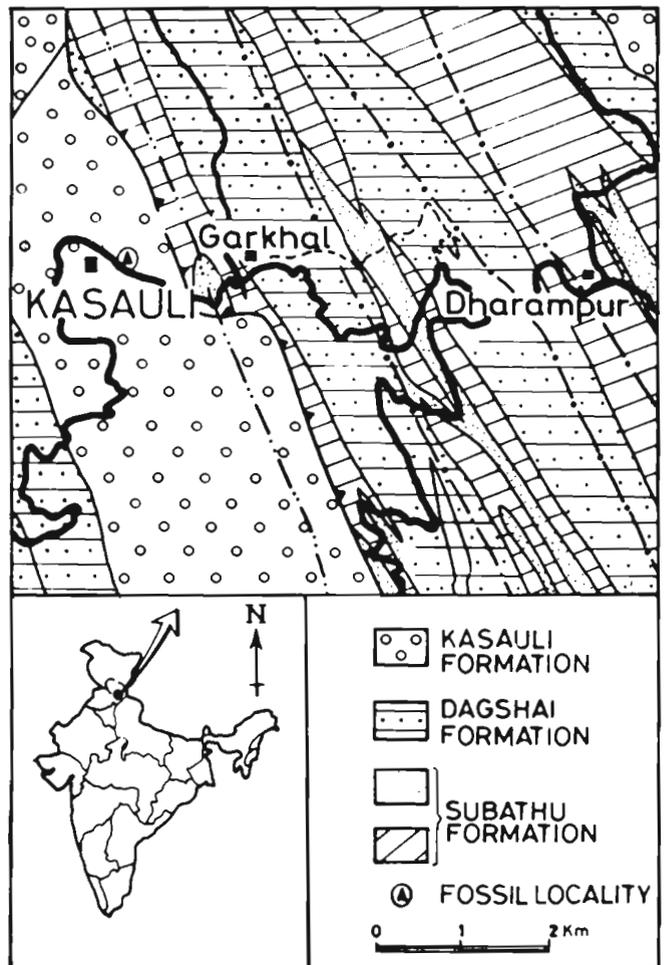


Fig. 1—Geological map of Kasauli and adjoining area (after Bhatia, 1982) showing fossil locality.

first described some plant fossils in detail from the Kasauli sediments. Hopefully, in future the leaves and fruits may be found in organic connection on the same branch.

*Holotype*—Specimen No. BSIP 38393.

*Discussion*—The authors are aware of only two records of fossil leaves of *Mitragyna* namely, *M. parvifolia* and *M. tertiara*. The former has been reported by Bande and Srivastava (1990, p. 352) from the Late Cenozoic sediments of Palamu District, Bihar. The exact age of these sediments is yet to be ascertained. The shale bed from which *M. parvifolia* has been reported is said to be of Late Tertiary or Quaternary in age by Puri and Misra (1982), Bande and Srivastava (1990, p. 364). It has also been considered to be post - Pliocene (Post-Tertiary) in age by Guleria (1992, p. 305). The latter (*M. tertiara*) showing resemblance with modern *Mitragyna parvifolia* has recently been reported from the Upper Miocene sediments of Arung Khola, Nepal (Konomatsu & Awasthi, 1999, p. 172). The authors are not aware of any previous report of a fossil fruit of *Mitragyna* from India or elsewhere although a number of fruits referable to the family Rubiaceae have been recorded by Vaudois-Mièja (1976). Since both the fossil leaf and the fruit described herein show close resemblance with those of the modern *Mitragyna*, the former has been placed under the already existing species, *Mitragyna tertiara* Konomatsu and Awasthi (1999), which was established to represent the fossil leaves of *Mitragyna parvifolia* and the later has been given a new name *M. sahnii* as no fruit of *Mitragyna* is known so far.

The present fossils of *Mitragyna* reported from Kasauli sediments of Himachal Pradesh form the earliest known record of the genus from the Tertiary (Early Miocene) of India.

The extant *Mitragyna parvifolia* (Roxb.) Korth. with which the fossils show resemblance, is a large to medium-sized deciduous tree, often buttressed at the base, attaining a height of 20 m and a girth of about 2 m. It is found throughout the greater part of India ascending up to an altitude of 1,300 m in outer Himalayas and extends from the Ravi eastwards to Uttar Pradesh, Madhya Pradesh, Bihar, common in peninsular India, often gregarious, particularly in moist and low-lying places around banks and swamps (Brandis, 1971; Sastri, 1962). It is an important component of tropical moist deciduous forests of India (Champion & Seth, 1968).

Plant fossils are reliable indicators of past climate specially when they can be related to extant taxa. This is possible while dealing with Neogene plant remains. In view of the present day ecological and climatic requirements of *Mitragyna parvifolia* it has been deduced that during Early Miocene, warm and moist conditions prevailed around Kasauli area. Further, the altitude of the area might have been around 1,300 m in contrast to its present height of about 2,100 m. Thus plant fossils indicate a considerable change in climatic

conditions and throw light on uplift of the sediments since Early Miocene.

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