

Plio-Pleistocene Plant Megafossils from the Lukundol Formation (Nakkhu Khola, Lalitpur District, Central Nepal)-First Results

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ABSTRACT

The lacustrine sediments of the Kathmandu Basin are rich in plant mega and micro fossils. The Lukundol Formation which is distributed in the southern part of the Kathmandu Basin yielded nicely preserved plant megafossils from different locations. A 5.5 m thick carbonaceous clay bed at the left bank of the Nakkhu Khola, near Chyasikot village, Lalitpur contains abundant plant debris, leaf impressions, seed and fruits, gymnosperm needles and cones. The plant fossils discovered from this location are identified as *Berberis asiatica* (leaf), *Rhododendron arboreum* (leaf), *Rhododendron barbatum* (leaf), *Litsea elongata* (leaf), *Pinus roxburghii* (needles and cones) *Trapa bispinosa* and *Trapa quadrispinosa* (fruits). Many leaf impressions are also collected from Bungmati and Chovar area. This paper deals with the first reporting of plant fossils from Nakkhu Khola section. The findings from other sections will be reported separately.

Key words: Plio-Pleistocene, Plant megafossils, Lukundol Formation, Kathmandu Basin

INTRODUCTION

The Lukundol Formation is the oldest lacustrine sediments distributed in the southern part of the Kathmandu Valley. It is well exposed along Nakkhu Khola, Bagmati River, Harkate Khola and Kodku Khola sections. The total thickness of this formation along the Khahare Khola near Lukundol village is 205 m. It consists of conglomerate with minor amount of sand and clay lenses at the basal part. The conglomerate beds are named differently by different authors e.g. Basal Boulder Beds (Shrestha, 1998), Tarebhir Formation (Sakai 2001). The conglomerate beds are followed by thick beds of black to grey organic clay, silt and sand. There are frequent lignite layers found in association with organic clay beds. The top part consists of alternative beds of clay and gravels and the uppermost part is covered by very thick gravel beds. In Nakkhu and Bagmati Rivers, the thickness of exposures varies from few meters to few tens of meters in the river bank terraces. The age of Lukundol Formation ranges from the Gaus Chron to the early Brunhes Chron i.e. Late Pliocene to Early Pleistocene (Yoshida & Gautam 1988). The Lukundol Formation yielded many vertebrate fossils (Sharma 1974, West & Munthe 1981, West *et al.* 1988, Sah *et al.* 1995), mollucan fossils (Gurung *et al.* 2001), pollen and spores (Yoshida & Igarashi 1984, Igarashi *et al.* 1988, Bhandari & Paudyal 2007) but there is no plant megafossils reported from this formation so far. This paper deals with some plant megafossils discovered from the Lukundol Formation at the left bank of Nakkhu

Khola, near Chyasikot, Lalitpur.

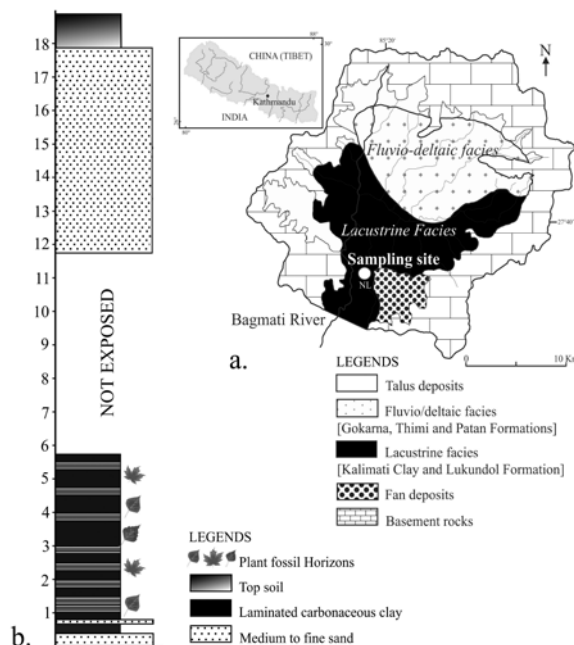


Fig. 1. (a) Geology of the Kathmandu Basin (with fossil location in the white circle), modified after Sakai (2001), (b) Lithostratigraphical details of the Lukundol Formation exposed at the left bank of Nakkhu Khola near Chyasikot, Lalitpur.

MATERIAL AND METHODS

The sampling location lies at the left bank of Nakkhu Khola (co-ordinates 27°37'55.45" N and 85°18'25" E, altitude 1320 m amsl). The exposure is 18.93 m thick consisting of medium to fine sand, silt, silty clay and carbonaceous clay. The lower part of the exposure (5.5 m from the river bed) is carbonaceous clay rich in plant megafossils while the middle part is covered by vegetation and the upper part is highly weathered sand. The bottom part was found to be good for the sampling of plant mega-fossils. The plant fossils were collected by splitting the clay and silt laminations with common knife. It was quite easy to split the faintly indurated claystones and siltstones through the interface of parallel laminations. The fossils were carefully wrapped in newspapers and placed inside the polyethylene sample bags with proper labeling and brought to the Central Department of Geology, Tribhuvan University, Nepal for further cleaning and processing. High resolution photographs were taken with NIKON D-5200 digital camera with proper scaling and orientation. After this the fossils and photographs were carried to Birbal Sahni Institute of Palaeobotany, (Lucknow, India) for further determination. The fossils were brought back and stored at Central Department of Geology Museum after identification.

RESULTS

Altogether 7 species of plant fossils belonging to five families are identified to lower taxonomic level. They are listed below.

Locality: Chyasikot, Left bank of Nakkhu Khola, Lalitpur

1. Material: Leaf (Plate 1, Fig. 1)

Family: Berberidaceae

Genus: *Berberis*

Species: *asiatica*

Binomial name: *Berberis asiatica* Roxb. ex DC.

2. Material: Leaf (Plate 1, Fig. 2)

Family: Ericaceae

Genus: *Rhododendron*

Species: *arboreum*

Binomial name: *Rhododendron arboreum* Sm.

3. Material: leaf (Plate 1, Fig. 3a,b)

Family: Ericaceae

Genus: *Rhododendron*

Species: *barbatum*

Binomial name: *Rhododendron barbatum* Wallich ex G. Don

4. Material: leaf (Plate 1, Fig. 4a,b)

Family: Lauraceae

Genus: *Litsea*

Species: *elongata*

Binomial name: *Litsea elongata* (Nees) J. D. Hooker

5. Material: Needle (Plate 1, Fig. 5a)

Family: Pinaceae

Genus: *Pinus*

Species: *roxburghii*

Binomial name: *Pinus roxburghii* Sarg.

6. Material: Cone (Plate 1, Fig. 5b)

Family: Pinaceae

Genus: *Pinus*

Species: *roxburghii*

Binomial name: *Pinus roxburghii* Sarg.

7. Material: Fruit (Plate 1, Fig. 6a)

Family: Trapaceae

Genus: *Trapa*

Species: *bispinosa*

Binomial name: *Trapa bispinosa* Roxb.

8. Material: Fruit (Plate 1, Fig. 6b)

Family: Trapaceae

Genus: *Trapa*

Species: *quadrispinosa*

Binomial name: *Trapa quadrispinosa* Roxb.

CONCLUSION

The Lukundol Formation which constitutes the bottom part of Kathmandu Lake sediments is rich in plant fossils. Plant debris, leaves, cones, fruit and seeds are collected from the Nakkhu Khola area, near Chyasikot, Lalitpur. At least seven species of plant fossils were identified to lower taxonomic level. Plenty of macrophyte such as *Trapa* indicate the lake was shallow and they also indicate the eutrophication condition. *Berberis asiatica* is a shrub growing in rocky dry northern slopes in modern environment while *Rhododendron* and *Litsea* grow together in temperate forests. *Pinus roxburghii* grows in subtropical to lower temperate ecological zone. The fossil assemblages broadly suggest subtropical to lower temperate climate existed during late Pliocene-early Pleistocene time in and around Kathmandu Valley.

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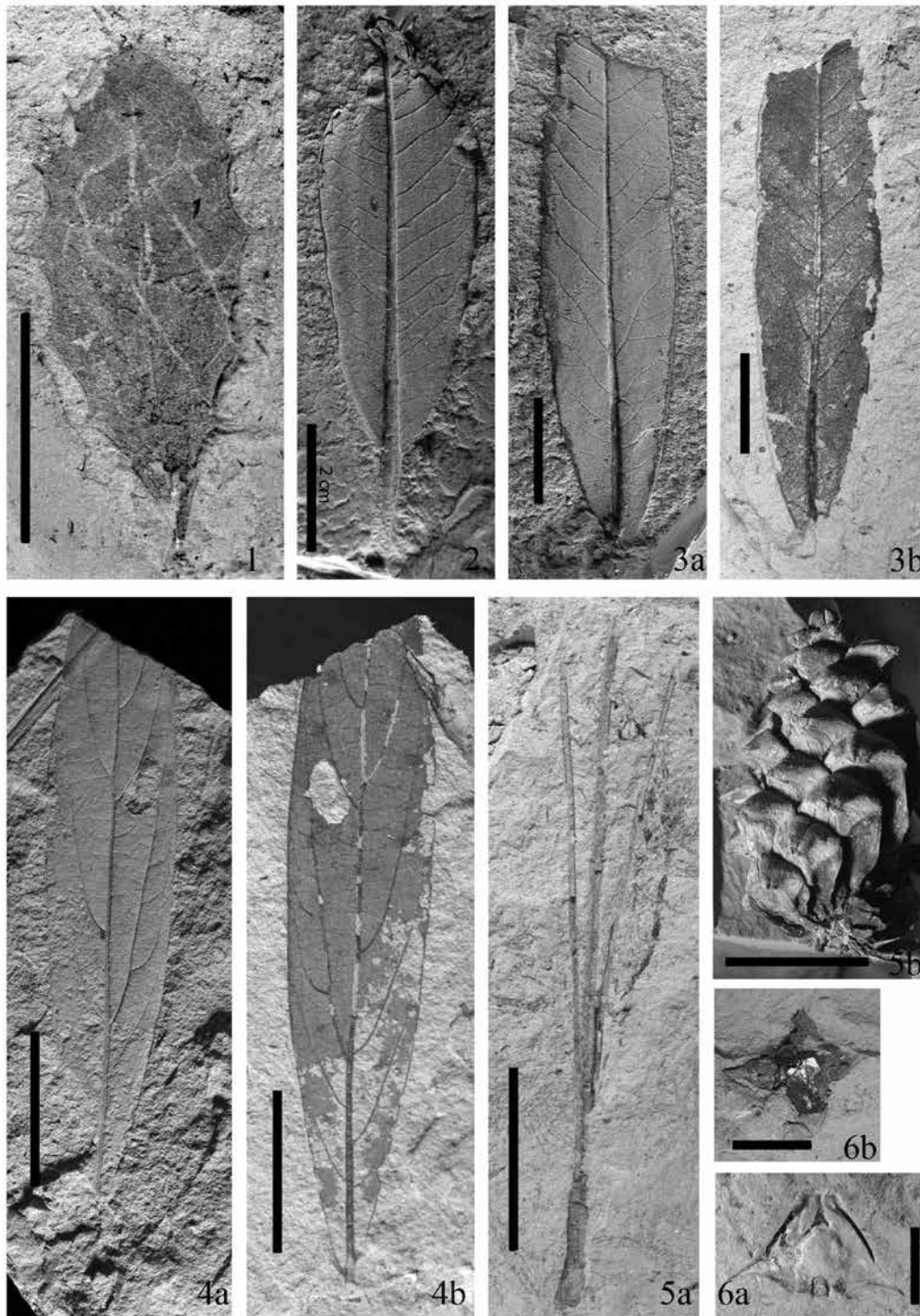


Plate 1. (1). *Berberis asiatica* (leaf), (2). *Rhododendron arboreum* (leaf), (3a). *Rhododendron barbatum* (leaf), (3b). Counterpart of the same leaf, (4a). *Litsea elongata* (leaf), (4b). Counterpart of the same leaf, (5). *Pinus roxburghii* (needles), (5b). *Pinus roxburghii* (cone), (6a). *Trapa bispinosa* (fruit), (6b). *Trapa quadrispinosa* (fruit), Scale bar = 2cm.

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