

**CHAPTER VI**

**PALAEOENVIRONMENT  
AND  
PHYTOGEOGRAPHY**

## PALAEOENVIRONMENT AND PHYTOGEOGRAPHY

Indian subcontinent is the part of southeast Asia. It is an important region in the consideration of origin and phytogeography of extant flowering plants. Bailey (1949) and Takhtajan (1969) consider southeast Asia as one of the probable place of origin of the Angiosperms. Palaeogeography of the world has been well studied by Smith and Briden (1979).

The investigations made so far dealing with the Cretaceous and Tertiary Flora have enabled now to reconstruct the palaeovegetation and palaeoclimate. The Deccan Intertrappean flora mainly of the Nagpur - Chhindwara area (Central India) has been investigated in much detail as number of fossiliferous localities have been discovered and analyzed for their palaeofloristic composition (Bande and Prakash 1982, 1986, Lakhanpal 1973, Mahabale 1966, Prakash 1960, 1972, Bonde 2008).

Occurrence of *Cocos*, *Nypa*, *Areca*, *Sabal*, *Phoenix*, *Corypha*, *Borassus*, *Hyphaene*, *Sonneratia*, *Acrostichum*, *Peyssonelia*, *Mahabalea phytelphantoides*, *Enigmocarpon*, *Cyclanthodendron*, *Musostrobocaulon*, *Aeschynomene*, *Azolla*, *Salvinia*, *Rodeites* indicates marshy habitat. However, woods of *Boswellia serrata*, *Mallotus philippensis* indicate dry deciduous habitat. In general the flora indicate a typical tropical climate with more humidity during the Late Cretaceous period, than today.

The investigations of *Palmoxylon blanfordi* Schenk (1982), *P.mandlaensis* Lakhanpal et al.(1979)*P. dilacunosum* Ambwani (1984) *P .arecoides* sp.nov., *Rhizopalmoxylon macrorhizon* Bonde et al.(2008), *Mahabalea phoenicoides* sp.nov., *Palmacites umariense* sp.nov., *Ailanthoxylon indicum* Prakash et al. (1967), *Elaeocarpoxyton ghughuensis* Awasthi et al. (1996), and *Euphorbiocarpon drypeteoides* Mehrotra et al. (1983), is indicative of the typical tropical climate and deciduous habitat of the floral elements of Mandla district during the Late Cretaceous period.

The fossil flora of Mandla district, Madhya Pradesh has been investigated in detail by the Palaeobotanists such as Bande, Khatri, Ingle, Ambwani, Prakash, Bonde, Mehrotra and others. The flora is exposed at number of localities like Mohgaon-Palasundar, Ghughua, Samnapur, Parapani, Chabi, Umaria, Silther, Deori, Bhama, Barbaspur and others (List given). These extinct forms do not occur in the extant flora in Mandla district but they occur in moist forests of Western Ghats and North East

India. The fossil flora of Nagpur- Chhindwara region and Mandla region indicates that most of these forms today are distributed in wet evergreen to semievergreen forests of the Western Ghats in Maharashtra, Karnataka and Kerala states. In the Mandla assemblage (fossils) the modern species thus represented are: *Hyphaene dichotoma*, *Cocos coronata*, *Chrysalidocarpus tutescous*, *Homalium zeylanicum*, *Hydnocarpus wightiana*, *Garcinia xanthochymus*, *Sterculia guttata*, *Grewia levigata*, *Atalantia monophylla*, *Limonia acidissima*, *Gomphandra tetrandra*, *Gomphrena polymorpha*, *Heynea trijuga*, *Barringtonia acutangula*, *Bischofia javanica* and *Syzygium cumini*. *Bursera serrata* although not represented in the modern flora of these areas, is known to occur in the eastern moist zone of west Bengal, Assam, Orissa and tropical forests of upper and lower Myanmar and in the Rajmahal Hills, extending to Eastern Ghats especially in the valleys and along the water courses. Similarly, *Polyalthia simiarum*, an evergreen tree inhabits the moist forests of Orissa, Mayurbhanj, in the lower hill forests of North Bengal, Assam, Chittagong hilltracks and Myanmar. Another comparable modern species *Draconlomeum mangiferum* is now restricted to the Andaman and Nicobar Islands and Myanmar. However, this species has been described from the Neogene localities of the Siwaliks and West Bengal (Prakash, 1979; Ghosh and Roy, 1979). Thus, indicating that it was well represented in India in the past but has become restricted to Myanmar and Andaman and Nicobar Islands due to changes in the climatic conditions.

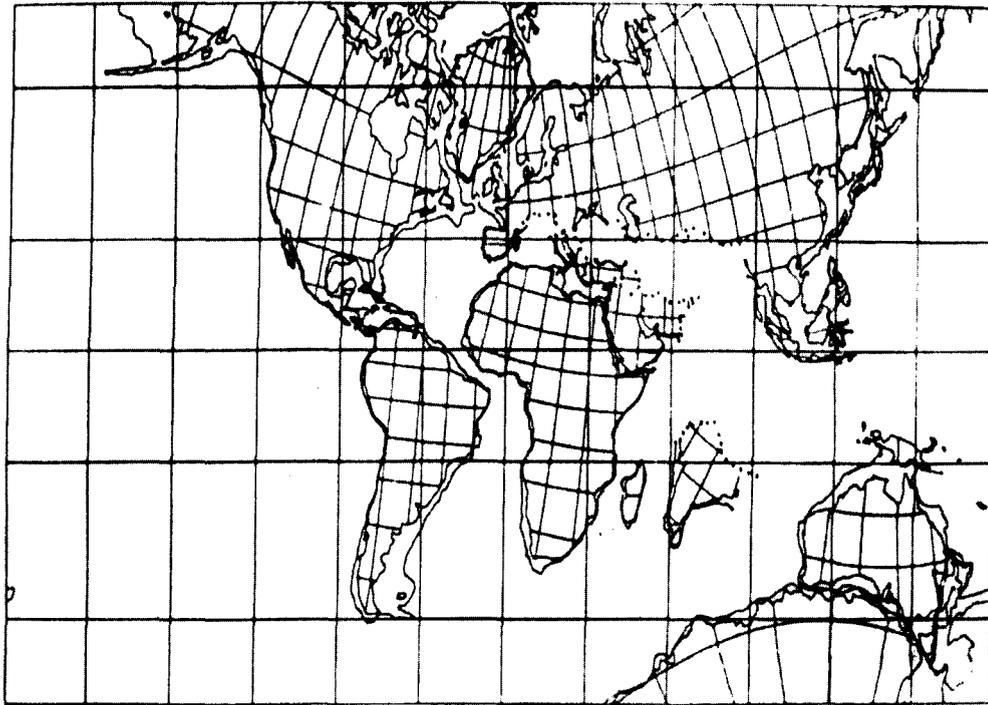
In the Nagpur-Chhindwara-Nawargaon assemblage (fossil), the modern comparable taxa which occur in the wet evergreen forests of Konkan and Western Ghats are *Musa* sp., *Sonneratia apetala*, *Elaeocarpus ferrugineus*, *Ailanthus malabarica*, *Barringtonia acutangula*, *Tetrameles nudiflora*, *Amoora rohituka* and *Evodia roxburghiana*. Thus, it appears that the fossil assemblages of Nagpur-Chhindwara-Nawargaon area and Mandla District suggest a forest type in Central India comparable to the one found today in the Konkan and the Western Ghats. However, the Mandla assemblage (fossil) shows a greater percentage of evergreen species than the Nagpur – Chhindwara - Nawargaon (fossil) assemblage.

During the Late Cretaceous- Early Tertiary periods, India occupied a southerly position astride the equator in the Eocene period. The palaeomagnetic studies of the traps reveal the position of Nagpur Chhindwara, as late as in Miocene at 7° N. During this period the rainfall declined which is also supposed to be related to the uplift of the Himalayas in the wake of the Northward drift of the Indian Landmass. Thus, a

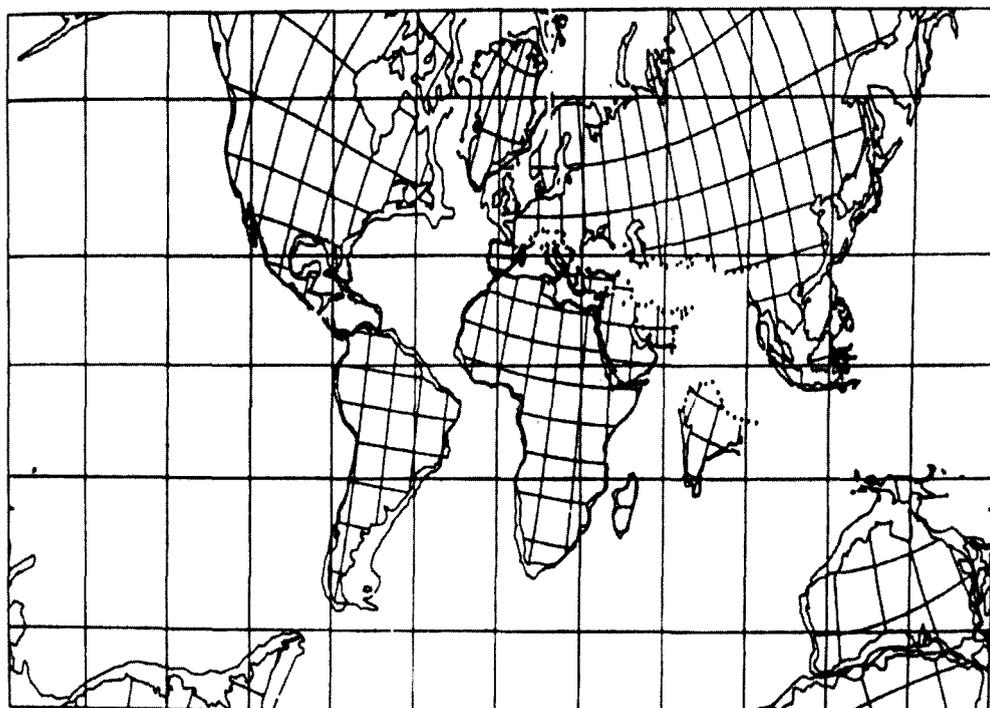
monsoon regime was introduced. The Himalayas were elevated in four stages of which the last was in the Late Pliocene to Early Pleistocene period during which the present trend of precipitation occurred in the Peninsular India. During this period, wet evergreen type of forest was established on the coromandel coast; as revealed by petrified woods in Cuddlore Series (Ramanujam, 1968). The subsequent northward movement along with the uplift of the Himalayas and maximum rise of Western Ghats in the Pliocene period resulted into the drier conditions from the wet evergreen forests (Meher Homji, 1974). The rate of drift of India during the Tertiary has been estimated at about 6 cm per year (Meher Homji, 1976).

In comparison to India, major portion of Indian subcontinent viz. Jawa, Sumatra, Bali, Borneo, Myanmar, Malaysia and many Island Nations experienced uniform humid climate during this period.

# Palaeoenvironment and Phytogeography



**I - Palaeogeographical map during Late Cretaceous Period  
(from Smith and Briden, 1979)**



**II - Palaeogeographical map during Palaeocene Period  
(from Smith and Briden, 1979)**