

Palaeo Environmental Study of the Flora of Deccan Intertrappean Beds from Some New Fossiliferous Localities –A Review

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Abstract: *The major objective of the Palaeobotanical studies is to understand the vegetation pattern of the entire geological time scale. Since the vegetation of a particular time and space is directly governed by the local environmental conditions, a better understanding of the subject can provide important information on Palaeoenvironmental conditions of the associated rock and sediments. Palaeoenvironment deals with the environmental, climatic and ecological conditions of the geological past. Environment is the surrounding condition by which contemporaneous plants and animals are influenced and subjected to modifications in their growth and development. Environment of a particular region is thus controlled by climate. The present review is about Palaeoenvironmental study of some new fossiliferous localities.*

Keywords: Review, Palaeoenvironment, Deccan, Intertrappean beds, Flora

1. Introduction

Palaeoenvironment deals with the environmental, climatic and ecological conditions of the geological past. Environment is the surrounding condition by which contemporaneous plants and animals are influenced and subjected to modifications in their growth and development. Environment of a particular region is thus controlled by climate. The plant diversity can be interpreted since the life on our planet. Earth was originated about 3.5 billion years ago. The first organisms were prokaryotes without cell membranes and all were heterotrophic in nature. The possibility of reconstructing past environment depends on the accurate identification of diverse fossil assemblage. In order to infer the climate of Deccan traps a critical analysis of the flora of Deccan trap has been made (Uttam-Prakash, 1973).

The Deccan Traps are flood basalts distributed widely across western and central peninsular India and formed at the end of the Cretaceous. The Deccan volcanism has been implicated in the mass extinctions that occurred at this time. Sediments preserved within the basalts are known as the Deccan Intertrappeans. Many of the Intertrappean rock sequences are fossiliferous and therefore provide an excellent opportunity to reconstruct terrestrial palaeoenvironments of peninsular India during the late Cretaceous period.

The presence of more humid and warm conditions during the period of Deccan Trap formation is further strengthened by the fact that the Intertrappean beds which had Palmoxylon are now relatively poor in palms. *Rodeites*, a hydropterid sporocarp has been compared with *Regnellidium*, a water fern of Brazil and *Cyclanthodendron* found in the Deccan Intertrappean beds, has been compared with the tropical American genus *Cyclanthus*. These forms provide a link between the flora of the Deccan and modern flora of tropical America. In the past, these groups had a wide distribution but became scanty in recent times.

On the basis of Palaeobotanical evidences, Lakhanpal (1970) reconstructed Palaeogeography of India during Tertiary period. According to him, the Tethys sea began to recede at the end of Cretaceous and in its stead started the elevation of chain of mountains. India started acquiring its present position with the rise of Himalayas and recession of the seas during the Miocene time.

Sparganium is another important temperate genus. *Sparganium ramosum* and *S. simplex* are the only two species occurring in Indian region. Their disappearance from the Trap country might be due to some tectonic movements which changed the topography of plateau and the environment due to which these plants could not survive there and moved north wards to suitable places. The occurrence of this temperate genus as well as the South American tropical elements in the Deccan flora during the early Tertiary of India is quite enigmatic and needs further check up with modern plants before a true picture of their systematic position is well known.

In addition to the above mentioned forms, some fossil Algae and Fungi are also described from the Deccan Intertrappean beds of India. From the study of fossil algae, it seems that the semi-tropical rain forest type of climate was prevailing at that time in the Deccan Trap areas. Some of the Algae were found in reproductive stages viz., *Mougeotiales deccani* and *Spirogyrites deccanii* described by Barlinge and Paradkar (1979). The fact that these fossils occurring in the reproductive stages confirms the findings of Prof. Sahni, that process of fossilization took place in autumn as evidenced by the reproductive structures of *Azolla intertrappea*.

Deccan Intertrappean exposures have revealed a number of Fungi (Jain, 1974) that grew luxuriantly. These varied fungal forms indicate a warm and humid palaeoclimate for the Deccan Intertrappean period in which these cherts were formed.

Chitale (1975), Lakhanpal (1974) have published excellent review on fossil plants of Deccan Intertrappean beds. Fungal spores and microfossils have been recovered from oil-

bearing sediments. Palaeoecological studies of fungi must deal interaction with the biotic environment provided by plants and animals. The interaction of fungi with higher plants with reference to palaeobotanical evidences need to be documented in appropriate manner by exploring more fossil fungi and chemical and geological aspects.

Many lines of evidences strongly suggests that the presence of diverse group of land plants earlier than upper Silurian period. (Thomas Taylor 1981)

The Palaeobotanical evidences are in favour of a tropical to sub-tropical climate throughout the Tertiary era in Indian region. The fossil plants are suggestive of evergreen, estuarine forests in parts of peninsular and extrapeninsular region. The forests could grow luxuriantly and thrived for a considerable length of time because of the favourable climate (Bonde, 1990).

Occurrence of *Acrostichum* along the coastal palms, mangrooves and marsh plants described earlier from Deccan Intertrappean beds of India suggests that it was linked to the equatorial ocean (South Western Tethys Sea) probably through Narmada Valley during the deposition of Intertrappean sediments. *Acrostichum* is hydropterid fern occurring in marsh swamp environment or on mud flats of back water areas of the coastal environment which can be referred to as a component of mangroove ecosystem for all ecological consideration. So presence of *Acrostichum* at Nawargaon is an indication of deposition at the sea level. Its occurrence in the Intertrappeans is phytogeographically significant and also implies a considerable coastal advance during Late Cretaceous. Thus, the occurrence of *Acrostichum* signals the existence of mangroove ecosystem and prevalence of a humid tropical climate, when the peninsular India occupied an equatorial position during Late Cretaceous (Bonde and Kumaran, 2002).

From the above discussion it is clear that most of the megafossils occurring in the Deccan Interrappean flora had a warm humid tropical or sub-tropical climate for the Deccan Traps. In addition to megafossils, survey of microfossils referable to or affiliated with modern taxa also helps in determining the possible palaeoclimatic or palaeoenvironmental pattern of the Deccan Traps (Ramanujam, 1974). Microfossils are not reliable because in most cases pollen and spores described from the Deccan Intertrappean beds of India have been classified artificially and their relationship with the modern plants is not yet certain (Uttam Prakash, 1973).

Fossil records helps to draw at least roughly the coastline of old Tethyan sea and accordingly, an arm which must have washed the northern shores of the Deccan. The older marine beds of Narmada valley confirm existence of the sea arm in and around Central India prior to the initiation of Deccan volcanism (Acharya and Lahari, 1991).

Now a days Palaeoecology and Palaeoclimate have been studied by using Palynology as a tool. The mangroove vegetation produces large quantity of pollen grains, which are small and with highly resistant exine, these are abundant plant remains in the sediments. On the basis of this

vegetation the reconstruction of past vegetation and changes in environmental conditions can be studied (Kumaran, 2005). According to K.P.N. Kumaran (2005) mangroove deposits can be excellent indicators of Palaeoclimatic events such as rainfall variations. Singh (2005) stated that during late Cretaceous due to the Deccan Volcanism warmer conditions reappeared, eliminating some plants including few angiosperm groups and introducing new or more diverse angiosperms. Many angiosperms modified their floral structure to facilitate pollination by insects.

2. Conclusion

The Deccan Intertrappean flora is unique in the sense that it includes a large number of plant fossils, representing almost all groups of plant kingdom. This flora can be considered as the parental stock of the modern Indian flora. The recorded fossil flora was inhabitant of tropical forests as most of the genera exist in the evergreen to semi-evergreen forest of Western Ghats - North-East India. The recorded fossil flora was inhabitant of tropical forests as most of the genera exist in the evergreen to semi-evergreen forest of Western Ghats - North-East India. The abundance of palms and plants such as *Barringtonia*, *Calophyllum*, etc. It can be inferred that the Deccan Intertrappean beds were enjoying a warm, humid, tropical or subtropical climate.

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