
CHAPTER - VI

GENERAL CONSIDERATION

The Gondwana system of India comprises sedimentary rocks of considerable interest due to the distinct flora developed in the Gondwana period. It ranges from Upper carboniferous to early Cretaceous spreading over a period of 150 million years. It is usually divided into Lower Gondwanas which include Talchir, Karharbari and Raniganj, Barakar. While the Upper Gondwanas comprised Rajmahal, Kota, Jabalpur and Umia series. The Lower Gondwana represents the Glossopteris flora. While the Upper Gondwanas represents the Ptilophyllum flora. Mahabale (1966) supported the idea of transitional beds discovered by Feistmantel, Lele and Wadia. These workers support the Middle Gondwana representing Triassic period where the distinct flora called as Dicroidium flora was developed. The climatic condition of individual floras are quite distinct and they throw much light on the Paleoenvironment of the period. The Lower Gondwana shows uniformity in the floral composition. While the Upper Gondwanas shows much heterogeneous combination due to warm and humid climate. Therefore the elements are distinct having Cycadophytes, Conifers, Pteridosperms, few ferns and Ginkgoals.

Therefore Upper Gondwana flora formed a constant source of inspiration to paleobotanist due to its heterogeneous nature within the Upper Gondwana flora. Rajmahal floras attracts by several workers while the Kota flora was spread less attention. The Kota stage has a wide distribution ranging from coastal part of Orissa, Andhra Pradesh which forms the major bulk. However few small pockets are found in the interior of Andhra Pradesh

and a narrow belt in Maharashtra. The present work is undertaken to analyse the fossil flora of Kota stage developed in Chandrapur district in Maharashtra. The initial contribution on this were made by Biradar (), Mahabale and Rajanikanth and Sukh-Dev (1989). The fossiliferous locality in Chandrapur district are found in the Wardha-Godavari valley. The village Kota which lies on the East bank of Pranhita river and is about 8 Kms. from Sironcha from Kota and Sironcha petrified woods as well as few plant impressions were collected. The locality Chitur which is 30 Kms. from Kota is more rich yielding petrified wood as well as plant impression. The present work describe silicified coniferous wood and the plant impressions from these places. The flora shows a distinct combination of Cycadophytes, Conifers, Pteridosperms and Arthropytes.

The Coniferous Woods

Totally six wood have been described and identified on the basis of anatomical characters. They were compared with the already known relevant species of the genera and when necessary a new species were formed to distinguish them from others.

Genus - Araucarioxylon Kraus

It represents the family Araucariaceae which is consider has the most primitive family among the conifers. It's fossil record shows a wide range starting from Palaeozoic and then extending Mesozoic and Cenozoic while describing the fossil Araucarin wood the term Araucarioxylon was used by workers which some confusion. It was suggested that the Palaeozoic woods

should be described under the generic name Dadoxylon while the Araucarian wood found in Mesozoic and Cenozoic were described under the Araucarioxylon. Recently Lepekhan (1972) and Maheshwari (1982) have made some contribution on the choice of generic names of Araucarian woods. The Lepekhan scheme is found more visible and instigated by many workers. Accordingly those Araucarian wood having pith, primary xylem, secondary xylem should be described under Dadoxylon while those showing only secondary wood are identified with the genus Araucarioxylon. We have excepted this scheme and described a wood under the name Araucarioxylon chandrapurensis which is a new species. Bose and Maheshwari (1974) have revised the Indian Araucarian wood and renamed. Some earlier species of Dadoxylon has Araucarioxylon species. In the collection the Araucarian woods are few and therefore it appears that the flora was more diversified representing other coniferous families.

Genus - Podocarpoxylon Gothan

The genus represents the family Podocarpaceae which is a typical element of the Upper Gondwana flora. It is represented by large number of woods and also impressions while describing the Podocarpaceae wood. The choice of name was uncertain for Indian Paleobotanist. They described many woods under the generic name Mesembrioxylon Seward 1919. However Bose and Maheshwari critically studied the different podocarpaceae genera and suggested that the name Podocarpoxylon was instituted by Gothan (1905) and on the basis of principle of priority and in accordance with international code of botanical nomenclature. The name Podocarpoxylon is a correct name. As such they also

revised the earlier wood described by Indian workers and merged them under the species of Podocarpoxyton. In the present work two new species of Podocarpoxyton are included the first is Podocarpoxyton sewardii which is distinct from other species and identified as a new species. The second one is Podocarpoxyton chiturensis which is also distant and described as a new species. P. chiturensis the specific name indicating the place of its collection. Rajanikanth and Sukh-Dev have described two new species namely

(1) P. krauselii

(2) P. chandrapurensis

from this area. Hence the present work shows that the family Podocarpaceae is much more abundant in Kota formation showing as many as four species of Podocarpoxyton.

Genus - Taxaceoxyton Krausel and Jain 1964

The genus represents the family Taxaceae which is a modern family of conifers. Bhardwaj (1953) earlier described a fossil wood has Taxoxyton rajmahalense. The genus Taxoxyton was established by Unger. However Krausel and Jain (1964) are of the opinion the name Taxoxyton is a correct name for describing woods of Taxaceae. The suggestion is accepted here and two woods have been included. In the present work namely

(1) T. antiquum (Boeshore and Gray)

This wood is known from east coast as well as Rajmahal hills. Hence it shows presence of Taxanian wood both in the coastal as well as interior parts of Andhra Pradesh.

The second species T. biradarii appears to be a distinct wood and hence described as a new species. Rajanikanth and Sukh-Dev have described three woods of Taxaceae from Kota region. The first is T. sahnii. The second is Taxaceoxylon sp.a and third is Taxaceoxylon sp.b.

The representation of a and b shows on obscure pitcher of the Taxaceoxylon in the Kota region both present investigation gives much correct direction by adding a new species as well as a species which was earlier known from coastal region which is due to this area. This indicates family Taxaceae got position having more evolved state as well as a wider distribution. This gives a brief idea of Taxaceae in time and space. So far the Upper Gondwana period is concerned.

Genus - Planoxylon Stopes 1916

It represents a transitional conifer having characters of Araucariaceae and Pinaceae. The genus was established by Stopes on the woods collected from Cretaceous of Newland and Vagyani and Mahabale (1972) reported it's first occurrence from Lower Tertiary of India. They described P. indicum from Chandrapur district. Recently Nishida described species of Planoxylon from Cretaceous of Japan. Prasad (1981) added P. stopese from the Upper Permian of Indonacia. This indicates a wide range of Planoxylon namely from Palaeozoic to Cretaceous. The genus represents a transitional conifers which evolved in the Permian and continued upto Cretaceous. It must have separated. Later on into two distinct lines. Such as Pinaceae and Araucariaceae presences of Planoxylon mahabali in present

work shows that it was also preserved in the Mesozoic of India **146**

However its records in Cretaceous are not available in our country. This needs intensive search of several wood belonging to Upper Gondwana sediments. The present report suggests that Planoxylon was a typical conifer of the Mesozoic and phylogenetically it has special significance.

The Impressions

They represent following groups :

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| (1) Cycadophytic | (2) Conifers |
| (3) Pteridosperms | (4) Pteridophytes |

Cycadophytes

Genus - Ptilophyllum Morris

It is one of the commonest member and abundantly found in the Upper Gondwana flora in India. Therefore Upper Gondwana flora is named as Ptilophyllum flora. Bose and Kasat (1972) have given a brief account of Ptilophyllum in India and described more than 15 species of it Mahabale and Satyanarayana have added two new species to the genus. Hence the number appears to be about 17 Ptilophyllum has wider distribution in India and his reported from Rajmahal hills in Bihar, Jabalpur, Madhya Pradesh, Cutch, Vemavaram, Raghavpuram, Gangapur and Raghudevapuram in Andhra Pradesh, Sriperambudur and Sivaganga in Tamil Nadu from type locality Kota only two species have been reported by Srinivasrao et.al. (1979). They have reported P. acutifolium and P. cutchense

In the present work. Following three species are included namely
P. cutchenses (2) Ptilophyllum cf. P. institacallum P. cf.
P. sahnii.

This indicates occurrences of two more species of the genus which were not reported earlier. The occurs of P. cutchenses is conformed. Hence it appears that the Kota stage shows rich appearances of Ptilophyllum on coastal side but somewhat restricted on the interior part of Kota stage.

Genus - Dictyozamites Oldham

Bose and Zeba-Bano (1978) have given a brief account of genus Dictyozamites in India. Accordingly six species are known from different Upper Gondwana formation. In the present work two species are reported.

- (1) D. falcatus
- (2) D. kotaense sp.nov.

Occurrence of a new species gives additional information about Dictyozamites in India. Though much common like Ptilophyllum. It is one of the major element of the flora occurrence of a new species in the distinct feature of this investigation.

Genus - Otozamites Braun

According to Bose 1974 It is a rare genus and 5 species are known from Rajmahal, Andhra Pradesh and Cutch. In the present work only one species namely O. vemavaramensis is reported. Bose and Jain (1967) first described it from Vemavaram a coastal part of Andhra Pradesh. Now it is presents in the interior of the Kota formation. This suggests its wider distribution.

Genus - Pseudoctensis

It is also a rare genus in India and known by single species P. fragilis by Bose and Banerji (1984) from Cutch. Here it is represented by Pseudoctensis cf. P. fragilis. Which indicates an additional information and wider distribution in India.

Conifers

Conifers represents a major compounds of the fossil flora of Kota stage. SahnI (1928) Rajanikanth and Sukh-Dev (1989) have reported number of conifer genera from Kota stage. In the present work the group is represented by three genera namely

- (1) Elatocladus Halle
- (2) Brachyphyllum Brongniart
- (3) Torriytes Seward

Genus - Elatocladus Halle

It is a sterile shoot of Podocarpaceae and shows frequent occurrence in the Mesozoic flora of India. More than half dozen species are known from India. In present work it is represented by three species presences of Elatocladus suppose the representation of Podocarpaceae in the flora. The woods of Podocarpaceae are already described in this work. E. tenerrimus occurs at Madras and Sivaganga in Tamil Nadu and also at Cutch and Nepal. Here it is reported from chitur which is new place for the plant. Second sp. E. plana also comes from Chitur. It is one of the common member of the Upper Gondwana flora and almost known from all the East Coast locality. It's present at

Chitur supports the wider distribution of E. plana ranging from East Coast to Kota beds in Maharashtra. These sp. is E. jabalpurensis is also reported from Chitur. Earlier it is known from M.P., A.P., Cutch and Bhutan. It's presences here gives support to its earlier occurrence in A.P. However from Chitur it is known for first time.

Genus - Brachyphyllum

It represents sterile shoot of Araucariaceae and supports the occurrences of Araucarian woods in this region. It is represented by a single sp. namely B. expansum from Kota like E. plana B. expansum is also a characteristic member of the Mesozoic flora of India. Earlier it is known from Coastal parts of A.P. and T.N. Its presence here supports the wider occurrence of B. expansum in the Kota stage.

Genus - Torriytes

Torriytes represents the foliage of taxaceae. It is compare with living genus Torriytes. Two sp. of genus occur in India. One from Vemavaram in A.P. and other from Rajmahal hills in Bihar. In the present work T. constricta is described from Chitur which indicates horizontal wider distribution of the genus.

Pteridosperms

In India three genera of Pteridosperms are known. First is Dicroidium, Second is Thinnfeldia, & third Pachypteris.

Pachypteris is more common in M.P. and Cutch. Sahni (1928) reported it in Rajmahal hills in A.P. in Kota stage. Here

P. indica is described from Kota in Chandrapur district in Maharashtra. It suggests wider distribution of Pachypteris in the Peinnsular India ranging from A.P. to Maharashtra.

Pteridophytes

Genus - Equisetites is a typical Arthrophyte known from Upper Jurassic to Lower Cretaceous beds in India. It has two species namely E. rajmahalensis reported from Rajmahal hills in Bihar. E. sehorensis reported from Sehora in M.P. In the present work Equisetites sp. is included which broad the agreed E. rajmahalensis. Here it is described from Chitur in Maharashtra which support wider distribution of the plant in India. It further gives some clues about the palaeoclimate of this region. It is suggested warm and numid climate was preventing in this area. The second genus is Sphenopteris it is included under unclassified ferns by Surange () Sphenopteris is known from several Upper Gondwana localities. Rajanikanth and Sukh-Dev (1989) described Sphenopteris sp. a from Kota formation in Maharashtra. In the present work Sphenopteris kotaense which is described as a new sp. due to distinct features. It's report here supports the earlier occurrence and gives more information about the morphology of the genus.

The overall picture of the forestic composition found here shows the cycadophytes and conifers are more dominate representing both woods and foliage. While Pteridosperms and Pteridophytes are some what restricted. This is due to difference of Palaeoclimate of the area. It is generally suggested that

Pteridophytes are abundant in Rajmahal and Jabalpur Stage and some what meger in Penninsular India. The difference is also due to a phenonmean of rising of Himalayas. So far the age is concerned to Kota formation as different views. It ranges from Jurassic to Cretaceous. The coniferous woods are more dominant in the Rajmahal as well as in the Kota stage. Sukh-Dev (1989) suggested early Cretaceous age to Rajmahal. But usually Kota is younger than Rajmahal and this suggestion is not suitable for the age of Kota flora. Baksi (1867) suggested Raghavpuram, Vemavaram beds indicates Kota stage and have Upper Jurassic age. Sukh-Dev and Rajanikanth (1989) indicate that Kota beds are showing uncomformity with Gangapur beds which have Early Cretaceous age. On the base of animal fossil Lower Jurassic age was suggested to Kota formation by Jain (1973, 83) Yadgiri et.al. The Middle Jurassic age wa suggested on the basis of animal fossil by Tripaty (1975) and Govindan (1975). Rajeshwar Rao et.al. (1983) suggested Middle Jurassic, Upper Jurassic age to Kota formation. Considering this views and presences of dominance of Conifers and Cycadophytes it appears that Upper Jurassic age to Kota formation is more probable. Further work in this direction is necessary to substantait (support) this view.