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**CHAPTER - III**  
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**PREVIOUS WORK**

### PREVIOUS WORK

The Gondwana era shows a classical and stratigraphical sequence of typical terrestrial rocks and some time they are associated with shallow marine sediments. They comprise a distinct floral composition showing homotaxial rocks of other countries having similar climatic and geomorphic arrangement. Indian Gondwana shows distinct lithological and stratigraphical sequence which ranges from Late carboniferous to Early Cretaceous. It is already pointed out that the Gondwana period is classified into two or three distinct divisions representing characteristic floras. In the present work the fossil flora of Kota Stage exposed in the Maharashtra is focused as the main object. Therefore it is relevant to know the previous work on Upper Gondwana formations contributed by earlier workers.

Geographically Upper Gondwana rocks in India are distributed at numerous places. In the northern India they are well developed in the Rajmahal hills in Bihar as well as Umia and Bhuj formation in Cutch. In the central parts of India they appeared in Madhya Pradesh around Jabalpur and in Hoshangabad district. In Southern India they are distributed as series of detached out crops along the east coast starting from Orissa and ending in the Tamil Nadu. The central part of this coastal region occupied by Andhra Pradesh. The Upper Gondwana have a characteristic of lithological characters, having limestone deposits and the

rocks resulted from volcanic activities. The climate in the Upper Gondwana period having lot of moisture along the coastal region. Hence the flora developed here show the combination of several groups. They include Cycadophytes, conifers, pteridosperms, ginkogals and the ferns. Among the ferns Osmundaceae and Matonieaceae are dominant. Therefore based upon the variation of these elements the climate is mostly considered as tropical type. The previous work on the florestics of each stage is studied in the following pattern.

#### The Rajmahal Stage

It is named after the Rajmahal hills situated in the north eastern direction of the Raniganj field in Bihar. This is the type area where it rests upon Barakar. Rajmahal stage in Bihar shows a rich Upper Gondwana deposits. In the south Rajmahal stage is exposed at Collapalli in Andhra Pradesh. Rajmahal stage marks the resume of Upper Gondwana and characterised by the presence of Ptilophyllum flora. Several workers have made contributions on the Rajmahal flora. Important workers are Feistmantel (1877, 1879) Oldham and Morris (1863), Seward and Sahni (1920), Sahni (1928, 1931), Sahni and Rao (1933), Bose and Kasat (1972), Bose and Banerji (1981), Bose and Jain (1967), Rao and Bose (1971), Vishnu Mittre (1953 - 1959), Sharma (1966 - 1989), Bohra and Sharma (1980), Gupta (1966) and others. The flora includes following groups.

(A) Pteridophytes :

They are represented by following groups

## Family - Lycopodiaceae

A vegetative axis was described by Srivastava (1945) as Lycopodites gracilis. Recently Pal and Ghosh (1987) have revised its name as Paralycopodium.

Srivastava (1945) also described a petrified stem as Lycoxylon indicum.

## Family - Equisetaceae

Oldham and Morris (1863) reported Equisetites rajmahalensis from this famous area.

## Family - Osmundaceae

Sahni and Rao (1933) reported a vegetative frond as Cladophlebis indica. Gupta (1956 a) reported another species as Cladophlebis sahnii from Rajmahal hills. V. Mitre (1956) reported a beautifully preserved petrified stem under the name Osmudites sahnii.

## Family - Dipteridaceae

Gupta (1955 b) reported Hausmania indica. The nomenclature of this plant is recently revised by Bose and Shah (1968) as H. crenita.

Family - Matoniaceae

Bose and Shah (1968) reported Phebopteris from Rajmahal hills.

Genus - Sphaenopteris Brongniart.

This genus is a noncommittal form genus having no specific affinity. Sahni and Rao (1944) described S. rajmahalensis. Ganju (1946) reported S. khairbaniensis. Recently Bose and Shah (1968) described following two species :

- (1) S. bindrabunesis
- (2) S. petagonica

The fern rhizomes are described under the generic name Rhizomopteris Schimper.

Ganju (1946) described R. chakshu. Gupta (1955) described R. sahnii and R. rajmahalensis.

### Cycadophyta

This group forms the main constituent of the Rajmahal flora and show several plants belonging to following orders,

- (1) Cycadeoidales, (2) Cycadales.

These plants are preserved as impressions and petrifications. They represents leaves, stems, cones etc.

The leaves are abundant and represented by several genera.

### Cycadeoidales

Leaves - They belongs to following genera.

Genus - Ptilophyllum Morris is the most common and forms dominant member of the group. Bose and Kasat (1972) have given brief account of this genus and reported following species of Ptilophyllum from the Rajmahal hills.

- (1) P. acutifolium Morris
- (2) P. rarinervis (Feistmantel) Bose and Kasat
- (3) P. cutchense Morris
- (4) P. tenerrimum Feistmantel
- (5) P. oldhamii Jacob and Jacob
- (6) P. indicum Jacob and Jacob
- (7) P. horridum Ray
- (8) P.sakrigaliensis Sah
- (9) P. institacallum Bose
- (10) P. distans (Feistmantel) Jacob and Jacob
- (11) P. jabalpureense Jacob and Jacob
- (12) P. gladiatum Bose and Sukh Dev.
- (13) P. sahnii Gupta and Sharma
- (14) P. nipanica Vishnu Mittre
- (15) P. amarjolense Bose

The maximum number of species belonging to Ptilophyllum strongly supports the name of Upper Gondwana flora as the Ptilophyllum flora.

Genus - Pterophyllum Brongniart

It represents the second common leaf genus and characterised by large size of the leaf. Further it shows lateral attachment of the pinnae to the rachis. While in Ptilophyllum the basal part of pinnae partly covers the rachis and the leaves are smaller in size earlier Oldham and Morris (1863) recognised nine species of Pterophyllum. However Seward (1917) transferred these species under Nilssonina.

According to Bose (1974) the genus Nilssonina is absent in India and therefore he transferred these species again under Pterophyllum. According to Bose and Banerji (1981) following species of Pterophyllum occur in the Rajmahals.

- (1) P. distans Morris
- (2) P. rajmahalense Morris
- (3) P. medlicottinum Oldham and Morris
- (4) P. princeps Oldham and Morris
- (5) P. morrisianum Oldham
- (6) P. kingianum Feistmantel
- (7) P. incisum Sahnii and Rao
- (8) P. guptii Bose and Banerji

Out of these 8 species Pterophyllum kingianum occurs at Gollapalli in Andhra Pradesh. While others are found in the Rajmahal hills. Hence it appears that the genus Pterophyllum dominates in the Rajmahal flora along with Ptilophyllum.

Genus - Dictyozomites Oldham 1863

The leaf is characterised by reticulated venation and auriculate base. According to Bose and Zeba-Bano (1978) following five species are found in the Rajmahal stage. They are,

- (1) D. indicus Feistmantel
- (2) D. sahnii Gupta and Sharma
- (3) D. hallei Sahni and Rao
- (4) D. falcatus Morris Medlicott and Blandford
- (5) D. feistmantelii Bose and Zeba-Bano

The fifth species D. feistmantelii occurs at Collapalli in Andhra Pradesh. Which is homotaxial with Rajmahal stage. This indicates the distribution of Dictyozomites having one species present on the east coast and four species in Rajmahal hills.

Genus - Otozomites Braun 1842

The leaf is characterised by small triangular pinnae having radiating pattern of venation and auriculate base. According to Bose (1974) Genus - Otozomites is some what rare in India. The Rajmahal stage shows following species

- (1) O. gondwanesis Bose
- (2) O. sp.

The second species comes from Athgarh sandstone



in Orissa and reported by Patra (1973). The Athgarh stage is equivalent to Rajmahal stage.

Genus - Anomozomites Schimper 1870

Following three species are known Rajmahal stage

- (1) A. creanata (McClelland) Bose and Banerji
- (2) A. amarjolense Sharma, Surana and Singh
- (3) A. fissus Feistmantel

Order - Cycadales

Following leaf genera of this group occur in the Rajmahal stage.

Genus - Taeniopteris Brongniart

It is a strap shaped leaf having distinct midrib from which simple or forked lateral veins are given out. Bose and Banerji (1981) suggests that the leaf shows affinities of cycadales and Pentoxylales. From Rajmahal stage following five species are known.

- (1) T. spatulata McClelland
- (2) T. oldhamii Bose and Banerji
- (3) T. buskoghatensis Bose and Banerji

Genus - Morrisia Bose 1958

Bose (1958) created this new genus having unipinnate leaves with pinnae showing similarities with Taeniopteris.

According to Bose and Banerji (1981) following three species, are known from Rajmahal stage

- (1) M. McClellandi (Oldham and Morris) Bose 1958
- (2) M. dentata (Rao and Jacob) Bose and Banerji 1981
- (3) M. rajmahalensis (Feistmantel) Bose and Banerji 1981

Genus - Cycadites Sternberg

It is some what rare in India and according to Bose and Banerji (1981) only one species is known from Rajmahal hills namely C. rajmahalensis. The above account gives a brief information of Cycadophytic leaves previously noted by several workers in India. The stem of Cycadeoidales are also known from India and they belong to following genera.

Genus - Bucklandia Presl 1825

The genus shows affinities of Williamsoniaceae and represented by following three species in Rajmahal hills.

- (1) B. indica Seward
- (2) B. sahnii Bose
- (3) B. guptaii Sharma

Reproductive organs include flowers. Both unisexual and Bisexual flowers are found.

Genus - Williamsonia Carruthers

The genus represents unisexual flowers representing

both male and female flower. Sahni (1932) described the well known female flower W. seawardiana from Rajmahal hills. In addition to this other species found in the Rajmahal are as follows

- (1) W. sahnii Gupta 1943
- (2) W. harrisiana Bose 1968
- (3) W. indica Seward 1917
- (4) W. microps Feistmantel 1877
- (5) W. guptai Sharma 1968
- (6) W. amarjolense Sharma 1968

So it appears that total number of species belonging to Williamsonia are seven.

#### Genus - Weltrichia Braun

The genus represents male flower and in the Rajmahal hills. It is represented by following three Species.

- (1) W. santalensis (Sitholey and Bose) Bose 1967
- (2) W. pollyandra (Ganju) Sitholey and Bose 1971
- (3) W. singhii Bose 1967

#### Genus - Cycadeoidea Buckland

It represents the bisexual flower and C. dacylota is the only species reported by Bose (1966) is known from Rajmahal hills.

#### Genus - Cycadolepis Saporta

It is a detached scale leaf from Rajmahal hills

following two species are known

- (1) C. indica Gupta
- (2) C. oldhamii Bose and Jain

### Coniferales

In India coniferous plant remains are known by sterile shoots, roots, leaves and frutification. They belong to following families.

#### Family - Araucariaceae

Among the conifers it is the most primitive family and abundantly represented in the Indian fossil flora. It has a long range starting from Carboniferous to Eocene.

#### Genus - Brachyphyllum Brongniart 1828

It represents a sterile shoot. According to Sahni (1928)

- (1) B. mamillare Brangniart
- (2) B. expansum Sternberg

are known from Rajmahal hills. Recently V. Mittre (1959) described a new species B. florinii from this region. Hence it appears that three species of Brachyphyllum are known from Rajmahal hills.

#### Genus - Pagiophyllum Heer 1881

Following two species are known from Rajmahal hills

- (1) P. cf peregrianum Sahni
- (2) P. araucaroides V. Mittre

The roots are described under the generic name Araumyleon Bohera and Sharma. It shows diarchxylem and fan shaped secondary wood. Bohera and Sharma (1980), Sharma (1989) have described the anatomy of A. pakurense. This species comes from Rajmahal hills and shows irregular secondary growth.

Genus - Araucarites Presl 1838

It represents a detached cone scale. Patra (1973) described Araucarites of macropteres from Athgarh in Orissa. It represents Rajmahal stage. However the genus is absent in the type area.

#### Stems :

These are abundantly found in India and mostly common in the Palaeozoic rocks. However they are also found in the Mesozoic strata. Earlier there was some confusion in the identification of fossil woods belonging to Arucaricaceae. Hence the generic names used, were Dadoxylon or Araucarioxylon. Recently Lepekhan (1972) suggested that use of the term Araucarioxylon should be used for those woods having secondary xylem. The following species which were earlier described as species of Dadoxylon are now transferred to the genus Araucarioxylon. Following species of the genus have been reported from Rajmahal hills.

- (1) A. agathioides (Krausel and Jain) Bose and Maheshwari
- (2) A. rajmahalense Sahni

- (3) A. amaraparense (Sah and Jain) Bose and Maheshwari 1974
- (4) A. brindabunense (Sah and Jain) Bose and Maheshwari 1974
- (5) A. mandroense (Sah and Jain) Bose and Maheshwari 1974
- (6) A. santalense (Sah and Jain) Bose and Maheshwari 1974

Genus - Allocladus Townrow 1967

Feistmantel (1877) described a specimen as Echinostrobus rajmahalensis. Recently Townrow (1967) has changed the nomenclature and described it as Allocladus rajmahalensis.

Genus - Moranocladus Seward and Sahni 1920

Earlier Zellier (1902) reported a coniferous stem from Morand valley in Madhya Pradesh under the name Araucarites oldhamii. Seward and Sahni (1920) instituted the genus Morania for this plant and later on changed its name as Moranocladus. Hence the nomenclature is M. oldhamii which represents a vegetative branch having spirally arranged leaves.

#### REPRODUCTIVE ORGANS

Genus - Megastrobilus Bose and Jain

It is a female cone belonging to Araucariaceae. Bose and Jain (1964) described it from Rajmahal hills. The cone is compact and shows spirally arranged megasporophylls having a single seed present in the

medullary region of each cone scale. The affinities of this cone shows close relation with genus Araucaria.

Family - Podocarpaceae

This family shows a wider distribution in the southern hemisphere and in the Mesozoic rocks of India. It is found in the form of vegetative and reproductive branches. Male and Female cones, petrified woods and pollen grains.

Genus - Elatocladus Halle 1913

It represents sterile branches and found in large number of the Mesozoic rocks of India. From Rajmahal hills following three species are known

- (1) E. conferta (Oldham and Morris) Halle 1913
- (2) E. sahnii Vishnu - Mittre 1959
- (3) E. sp.

Genus - Indophyllum V. Mittre 1959

The genus represents leaves which are adpressed but extends above their cushion. On the basis of cuticular characters. Vishnu - Mittre (1959) instituted this genus. Following three species are known from Rajmahal hills.

- (1) I. sahnii V. Mittre
- (2) I. raoii V. Mittre
- (3) I. nipanica V. Mittre

REPRODUCTIVE ORGANS :

Genus - Podostrobus Rao and Bose (1971)

Rao (1943 a) reported a male cone from Rajmahal hills under the name Masculostrobus rajmahalensis V. Mittre (1959) described another male cone from the same area having three winged pollen grains. The earlier cone showed two winged pollen grains. Barnard (1968) reexamined these cones and made same suggestions Rao and Bose (1971) finally revised the nomenclature and named this cone as Podostrobus. Hence from India two cones are known namely

- (1) P. rajmahalensis
- (2) P. sahnii

Genus - Stachyotaxus Notherost 1886

Rao (1950) described a fertile coniferous branch from Rajmahal hills under the name Stachyotaxus. The leaves of E. conferta resemble with vegetative parts of it. The fertile part consists of a cone having megasporophylls. Rao (1964) described the specimen as S. sampathkumarani. According to Bose and Maheshwari (1974) the specimen agree with Beaniopsis rajmahalensis described by Rao and Ganju and hence it was merged with stachyotaxus and named as Stachyotaxus rajmahalensis.

Genus - Nipaniostrobus Rao 1943

It is a female cone having spirally arranged scales, showing single seed. The affinities of this cone shows



relations with living genus Dacrydium of Podocarpaceae  
V. Mittre (1959) described following two species.

- (1) N. acicutifolia
- (2) N. pagiophylloides

Genus - Nipanioruha Rao 1947

It represents a coniferous shoot having a megastrobilus. The seeds are present on spirally arranged scales around the axis V. Mittre (1959) described two species of the genus namely.

- (1) N. lanceolata
- (2) N. curvifolia

Genus - Mehtaia V. Mittre 1959

Rao (1943) described two cones which he thought are younger cones of Nipaniostrobus sahnii V. Mittre (1959) reported similar cone with three different species and established new genus Mehtaia. It is further suggested that the cones show affinities of the living genus Microcachrys and Phyllocladus. Following species are known

- (1) M. rajmahalensis
- (2) M. nipaniensis
- (3) M. santalensis

Genus - Sitholeya V. Mittre

The author described a single species Sitholeya rajmahalensis which shows a fertile shoot producing a single

terminal inverted ovule. It is compared with the living genera. Dacrydium and Podocarpus.

Genus - Strobilites Lindley and Hutton 1833

Earlier Feistmantel (1877 a) described a frutification from Rajmahal hills. Which he thought a member of cycadales. Sahni (1928) further studied it and named as Strobilites pascoei. In addition to this he also described another species S. seawardii from these above reports. It appears that Mesozoic rocks of India represents number of reproductive organs belonging to podocarpaceae. It is further interesting to add that like leaves other vegetative parts; such as woods are also found abundently. The woods occur in large number and described under different generic names like Podocarpoxylon Gothan Circoporoxylon Krausel and Mesembrioxylon Seward.

Genus - Podocarpoxylon Gothan 1905

Earlier woods of podocarpaceae were described by Indian authors under the generic name of Mesembrioxylon Seward (1919). Recently Bose and Maheshwari (1974) suggested that the name Podocarpoxylon is a correct name for such woods and hence they transferred the species of Mesembrioxylon described by Indian workers under Podocarpoxylon. We accept this revision and accordingly the Rajmahal stage represent following species.

- (1) Podocarpoxylon indicum (Bhardwaj) Bose and Maheshwari
- (2) Podocarpoxylon rajmahalense (Jain) Bose and Maheshwari

Family - Taxaceae

Genus - Torreyites Seward 1919

The genus represents a foliage comparable with the living genus Torreya myristica. Ganju (1947a) described T. sitholeyi from Rajmahal hills. So far this is the only report of leaves belonging to Taxaceae from Rajmahal stage.

Genus - Taxaceoxylon Krausel and Jain 1964

It represents wood of Taxaceae showing spiral bands associated with tracheids of secondary xylem. Bharadwaj (1952) described Taxoxylon rajmahalensis from Rajmahal hills. Recently Krausel and Jain (1964) have changed the nomenclature and described it as Taxaceoxylon rajmahalensis.

Family - Cupressaceae

Genus - Cupressioxylon Goppert 1850

The genus represents a wood of cupressaceae. Bharadwaj (1953) described C. (Taxodioxylon) rajmahalensis from Rajmahal hills.

Conifers with doubtful affinities

Genus - Conites Sternberg 1823

The affinities of the genus are some what doubtful and it represents the strobili. Sahni (1928) described a cone as C. rajmahalensis from this region.

Order - Ginkgoales

Genus - Ginkgoites Seward 1919

Sah and Jain (1965) described G. rajmahalense from Rajmahal hills. It represents foliage of the order. Srivastava and Sah (1966) have reported Ginkgo (Ginkgoites digitata Brongniart from Tagutola in Rajmahal hills.

Order - Pentaxylales

Sahni (1948) instituted a new and synthetic group of gymnosperms. It shows affinities of Cycadophytes and conifers. Following organs of the order have been described.

Genus - Pentaxylon Srivastava 1945

Srivastava (1945) described a stem showing five vascular bundles from Rajmahal hills. It was named as P.sahnii.

Genus - Nipanioxylon Srivastava 1945

Also described the genus Nipanioxylon belonging to Pentaxylales. Here the stem shows more than five vascular bundles. Srivastava (1945) reported N. guptii from Rajmahal hills.

Genus - Nipaniophyllum Sahnii 1948

It is a petrified leaf and Sahni (1948) described a species under the name N. raoi.

Genus - Carnoconites Srivastava 1946

It is a female cone showing seeds without interseminal scales following two species are known

- 1) C. compactum
- 2) C. laxum

Genus - Sahnia V. Mittre 1953

It represents male reproductive structure of Pentaxylon sahnii V. Mittre (1953) described S. nipaniensis from Rajmahal hills.

#### Pteridosperms

Genus - Cycadopteris Zigno 1860

It is a foliage of corystospermaceae. Bose (1958b) reported Cycadopteris sp. from Chunkhal from Rajmahal hills.

Genus - Thinnfeldia Ettingshausen 1852

Gururaja and Pant (1970) have described T. indica from Basgo beds of Rajmahal hills. Sah and Sukh-Dev (1957) described another species namely T. chunakhalensis from Chunkhal in Rajmahal hills.

Recently Sharma et. al. (1971) have described following species of the genus from Amarjole in Rajmahal hills.

- 1) T. amerjolense
- 2) T. feistmantelii
- 3) Thinnfeldia cf. T. lancifolia

KOTA STAGE

In the Pranhita-Godavari Valley the Kota Stage is developed near the type area Kota village in Chandrapur district of Maharashtra. It is exposed at following places in peninnsular India.

- 1) Vemavaram beds in Krishna Godavari basin
- 2) Raghavpuram shales in Godavari basin
- 3) Sriperamatur beds in Palar basin

Hence it appears that the Kota stage is found in Maharashtra, Andhra Pradesh and Tamil Nadu. Mostly on the eastern coast of India. The rocks are brown or red colour sandstones. They show a rich assemblage of plant as well as animal fossils. Rajanikanth and Sukh-Dev (1989) have given brief account of fossil flora found in the Kota stage of Chandrapur district. In addition to this recent work following workers have made earlier contributions on the fossil flora of Kota stage. Rao and Shah (1959), Satsangi and Shah (1973), Govindan (1975), Datta et.al. (1978), Yadagiri et.al. (1980) and Jain (1959, 1973, 1983). Following accounts gives a group wise report of fossil plants described from Kota stage.

Pteridophytes :

Family - Osmundaceae

Genus - Cladophlebis Brongniart (1849)

Sahni and Rao (1953) have described Cladophlebis

indica from Sriperamatur beds. Rajanikanth and Sukh-Dev (1989) have described Cladophlebis sp. from Chandrapur district of Maharashtra.

Family - Gleicheniaceae

Genus - Gleichenia

Bose et.al. (1982) have reported following two species. These genus

- 1) G. nardenskioldii
- 2) Gleichenia sp. from Gangapur beds of Andhra Pradesh

Genus - Sphenopteris Stenberg 1825

Rajanikanth and Sukh-Dev (1989) have described Sphenopteris sp. from Chandrapur in Maharashtra. From the above account it appears that the Pteridophytes are meagre in Kota stage.

### The Pteridosperms

Family - Corystospermaceae

Genus - Dicroidium Gothan 1912

Rao (1959) recorded D. feistmantelii from Vemavaram in Andhra Pradesh. Jain (1968) described Dicroidium from the same locality. Recently Bakshi (1968) described Dicroidium sp. from Raghavapuram mud. stone in Andhra Pradesh.

Genus - Thinnfeldia Ettingshausen

Feistmantel (1877) described T. subtrigona from

Vemavaram in Andhra Pradesh. Recently Copal et.al. (1957) described Thinnfeldia sp. from Palar basin in Tamil Nadu.

Genus - Pachyperis Brongniart 1828

Bose and Rao (1968) described P. indica from Vemavaram beds in Andhra Pradesh. Sukh-Dev and Rajanikanth (1968) have reported from Gangapur beds in Adilabadh district of Andhra Pradesh a new species of the genus namely P. gangapurensis.

### Cycadeoidales

The group includes several leaf genera which are as follows -

Genus - Ptilophyllum Morris 1840

According to Bose and Kasat (1972) genus - Ptilophyllum occurs at several places belonging to Kota stage in Andhra Pradesh. It is found at Vemavaram, Raghavpuram Collapalli, Gangapur and Kota, In Tamil Nadu it occurs at Sriperamatur, Sivaganga and Terani. Following species are known from the above mentioned places.

- 1) P. acutifolium Morris
- 2) P. cutchense Morris
- 3) P. rarinervis (Feistmantel) Bose and Kasat
- 4) P. distans Jacob and Jacob
- 5) P. horridum Roy

Recently Jeyasingh and Sudharsan (1989) have reported P. acutifolium and P. cutchense from Sivaganga beds in Tamil Nadu.



Genus - Pterophyllum Brongniart 1828

The genus is distinguished from Ptilophyllum in having large pinnae and attachment of the pinnae to the rachis laterally. Bose and Banerji (1981) have given a brief account of Pterophyllum in India. From that account following three species have been reported from Kota stage. They are one P. incisum Sahni and Rao from Vemavaram P. footeanum Feistmantel from Vemavaram.

P. kingianum Feistmantel from Gollapalli

Recently three more species have been reported from the Kota stage of east coast. Vagyan and Zutling (1986) reported P. distans from Uppugunduru in Prakasam district of Andhra Pradesh. Vagyan and Mane (1989) reported P. incisum from the above place. Recently Jayasingh and Sudharsan (1989) have described P. medilicotianum Oldham and Morris. P. morrisianum Oldham from Sivaganga formation in Tamil Nadu. Hence it appears that six species of Pterophyllum are known from Kota stage.

Genus - Dictyozamites Oldham 1863

Bose and Zeba-Bano (1978) have given a brief account of Dictyozamites in India. According to them following two species occur in the Kota Stage.

- 1) D. indicus Feistmantel
- 2) D. feistmantelii Bose and Zeba-Bano

Recently Vagyan and Jamane (1987) reported

D. feistmantelii and D. falcatus from Uppugunduru in Andhra Pradesh. Sukh-Dev and Rajanikanth reported D. feistmantelii from Sivaganga beds in Tamil Nadu. Sukh-Dev and Rajanikanth (1988) reported a new species namely D. gondwanensis from Gangapur beds in Andhra Pradesh. This indicated four species of Dictyozamites occur in the Kota Stage.

Genus - Otozamites Braun 1842

According to Bose (1974) genus - Otozamites is some what rare in India. Following two species are known from the Kota stage.

- 1) O. vemavaramensis Bose and Jain
- 2) O. gondwanensis Bose

These species are known from a single locality Vemavaram. However Vagyan (1986) reported O. vemavaramensis from Uppugunduru in Andhra Pradesh. Hence it appears that Otozamites is same what common in the Kota stage of Andhra Pradesh. It is absent at other localities.

Order - Cycadales

Genus - Taeniopteris Brongniart 1832

According to Bose and Banerji (1981) following three species of the genus are known from the Kota stage. They are

- 1) T. spatulata McClenlland
- 2) T. haburensis Bose and Banerji
- 3) T. buskoghatensis Bose and Banerji

Sukh-Dev and Rajanikanth (1988) reported T. spatulata

from Gangapur beds in Andhra Pradesh as well as Sivaganga beds in Tamil Nadu.

Genus - Anomozamites Schimper

This leaf is comparatively less common than Taeniopteris and known from very few localities.

Record of Anomozamites sp. was made by Bose et.al. (1928) from Andhra Pradesh. Recently Sukh-Dev and Rajanikanth (1988) reported occurrence of A. haburensis. Bose and Banerji from Sivaganga beds in Tamil Nadu. Further addition was made by Jayasingh and Sudharsan (1989) who reported A. hansapurensis. Bose and Banerji from the above formation.

Genus - Morrisia Bose 1958

Bose (1958) instituted this new genus for a uniplanate leaf. According to Bose and Banerji (1981) two species of Morrisia are known from Kota stage. They are

- 1) M. rajmahalensis (Feistmantel) Bose and Banerji
- 2) M. McClenlandi (Oldham and Morris) Bose

#### REPRODUCTIVE ORGANS

They are rare and only one occurrence of the Williamsonia is noted from Raghavpuram, It is described by Bakshi (1967) as W. blandfordii Feistmantel.

### Coniferales

The group is equally common like Cycadophytes in the Kota flora. Conifers belonging to several families have been reported. Mostly they represent leaves and woods and very rarely as reproductive organs.

#### Family - Araucariaceae

It is the most primitive family of the conifers and known by following genera.

#### Genus - Brachyphyllum Brongniart 1828

It represent vegetative shoots having spirally arranged conical or rhomboidal leaves. The leaves are more broader than the length. Sahni (1928) noted following species of the genus from Kota beds of coastal region. They are

- 1) B. rhombicum (Feistmantel) Sahni 1928
- 2) B. expansum (Halle) Sahni 1928

In addition to those species Sukh-Dev and Rajanikanth (1988) added a new species namely B. theraniense from Sivaganga beds in Tamil Nadu.

#### Genus - Pagiophyllum Heer 1881

It also represents a vegetative shoot having spirally arranged leaves but here the leaves are more longer than the breadth. Bakshi (1967) reported Pagiophyllum sp. cf. P. perigranum (Lindley and Hutten) Sahni from Raghavpuram in West Godavari district of Andhra Pradesh. Jain (1968) reported Pagiophyllum sp. from Vemavaram in Prakasam

district of Andhra Pradesh. Bose and Sukh-Dev (1972) and Sukh-Dev and Rajanikanth (1988) have reported P. marwarensis from Gangapur beds. Rajanikanth and Sukh-Dev (1989) described two fragmentary specimens from Kota stage in Maharashtra as Pagiophyllum sp.

Genus - Allocladus Townrow 1967

Sukh-Dev and Rajanikanth (1988) reported A. bansaensis from Gangapur beds in Andhra Pradesh.

Genus - Araucarites Presl 1838

Sukh-Dev and Rajanikanth (1988) reported from Sivaganga following two species :

- 1) A. cutchense Feistmantel
- 2) A. minutes Bose and Maheshwari

Genus - Desmiophyllum Lesquereux 1878

Sahni (1928) reported D. indicum from Raghavapuram in Andhra Pradesh. Vagyan (1984) reported the occurrence of D. indicum from Vemavaram in Andhra Pradesh.

Genus - Araucarioxylon Kraus 1870

It represents the secondary xylem and several woods belonging to Araucariaceae having secondary Xylem only are included under Araucarioxylon by Lepekhina (1972). Hence woods described earlier as Dadoxylon are now merged with Araucarioxylon. Rajanikanth and Sukh-Dev (1988) reported three species of Araucarioxylon from Kota stage in

Maharashtra. They are

- 1) A. santalenses (Sah and Jain) Bose and Maheshwari
- 2) A. pranhitensis Rajanikanth and Sukh-Dev
- 3) Araucarioxylon sp.

The Araucarian woods found in the Kota Stage of Maharashtra needs further investigation.. It will bring to light more species of this genus.

Family - Podocarpaceae

Genus - Podocarpoxylon Gothan 1905

Bose and Banerji (1974) have replaced the genus Mesembrioxylon Seward for Podocarpoxylon on the basis principle of priority. Therefore the Indian podocarpaceous woods are now described as species of Podocarpoxylon. Folowing list gives the different species of Podocarpoxylon reported from the Kota

- 1) Podocarpoxylon parthasarthyi (Sahni) Bose and Maheshwari from Tamil Nadu.
- 2) Podocarpoxylon godovarianum (Sahni) Bose and Maheshwari from Andhra Pradesh.
- 3) Podocarpoxylon tirumangalense (Suryanarayana) Bose and Maheshwari from Andhra Pradesh..
- 4) Podocarpoxylon krauselii Rajanikanth and Sukh-Dev from Maharashtra.
- 5) Podocarposylon chandrapurens Rajanikanth and Sukh-Dev from Maharashtra.

Genus - Elatocladus Halle 1913

According to (Sahni) (1928) following species occur from different localities belonging to Kota stage.

- 1) E. plana from Sriperumatur in Tamil Nadu and Raghavapuram in Andhra Pradesh.
- 2) E. conferta from Chirakunt in Andhra Pradesh.
- 3) E. jabalpurensis from Vemavaram in Andhra Pradesh.

The above reports are further supported by following workers.

Bakshi (1967) reported E. conferta from Raghavapuram. Recently Vagyani and Jamane (1987) reported E. plana from Uppuguduru in Andhra Pradesh, Jeyasingh and Sudharsan (1989) reported E. plana from Sivaganga in Tamil Nadu. Bose et.al. (1982) described E. confertus, E. Kingianum and Elatocladus Sp. from Gangapur beds in Andhra Pradesh. Recently Pandya et.al. (1990) have described a new species E. Vemavaramensis from Vemavaram,. However they think that the age of Vemavaram beds is Early cretaceous. This is a doubtful situation and most of the workers support the age of Vemavaram beds as Kota stage. Hence the inclusion of E. Vemavaramensis in Kota stage is justified.

Family - Cupressaceae

Genus - Cupressinoxylon Coppert 1850

The family is poorly represented in India. Following woods have been described by Sahni (1931) from the Kota stage.

- 1) C. coromondelianum from Sriperamatur
- 2) C. alterans from Raghavapuram

Family - Taxaceae

Genus - Taxaceoxylon Krausel and Jain 1964

The name Taxoxylon Unger is replaced by genus Taxaceoxylon Krausel and Jain (1964) for Indian wood of Taxaceae. Recently Rajanikanth and Sukh-Dev (1989) described following three species of Taxaceoxylon from Maharashtra.

- 1) T. Sahnii
- 2) T. Sp.a
- 3) T. Sp. b

The authors are unable to distinguish T. Sp.a and T. Sp.b clearly and the nomenclature appears to be tentative. It is found that occurrence of Taxinean woods in the Kota stage is quite common. In our work, we have described two woods belonging to this genus. Hence critical description of T. Sp.a. and T. Sp.b is desirable.

Genus - Torreyites Seward 1919

The genus represents a sterile branch of Taxaceae. Seward and Sahni (1920) reported T. constricta from Vemavaram in Andhra Pradesh.

Genus - Arthrotaxites Unger 1849

Sahni (1928) described Arthrotaxites feistmantelii



from Nagaon in Madhya Pradesh. The specimen represent a fertile branch having female cones.

### Fructifications

They do not suggest clear affinities to particular family. But they are included under coniferales.

Genus - Conites Sternberg 1823

Sahni (1928) described following species belonging to Kota Stage.

- 1) C. verticillatus from Sriperumatur Tamil Nadu.
- 2) C. sriperamaturensis from Sriperamatur Tamil Nadu.
- 3) Conites Sp. from Vemavaram in Andhra Pradesh.
- 4) C. sessilis from Vemavaram in Andhra Pradesh, and sriperamatur Tamil Nadu.

### Ginkgoales

Genus - Ginkgoites Seward 1919

It represents a leaf and following species are known from India. Seward and Sahni (1920) described

- 1) G. crassipes from Raghavauram in Andhra Pradesh and Sripermatore in Tamil Nadu.

Vagyan (1985) reported G. crassipes from Uppugunduru in Prakasam district of Andhra Pradesh and observed that G. crassipes has wider distribution along the east coast of India

2) Bakshi (1967) reported

A) G. feistmanteli Bose and Sukh-dev from  
Raghavapuram

B) Ginkgoites sp. from the above locality

Genus - Ginkgoxylon

Biradar and Mahabale (1978) described G. dixitii  
from Kota beds Andhra Pradesh.

### Jabalpur Stage

It forms the next stage of Upper Gondwana and shows a distinct composition. The rocks are widely distributed in Madhya Pradesh. It is further divided into two parts such as Chaugan Stage which form the basal part and the Jabalpur Stage which form the Upper Stage. The rocks consist of soft sandstones and lignites or coal deposits. The stage indicates the climate of Mesozoic flora and is quite rich in having several plant fossils. It is distinguished from Rajmahal Stage in having maximum members of Conifers. While the cycadophytes are moderately represented.

### Pteridophytes

Family - Osmundaceae

Genus - Cladophlebis Brongniart

Sahni and Rao (1933) reported Cladophlebis indica  
from Jabalpur stage.

Family - Dicksoniaceae

Bose (1960) reported Coniopteris hymenophylloides from Chul hills near Jabalpur town.

Family - Gleicheniaceae

Feistmantel (1882) and Seward and Sahni (1920) discribed Gleichenites rawahensis from Bansa in Madhya Pradesh.

Family - Dipteridaceae

Genus - Hausmannia Dunker

According to Sukh-Dev (1974) followng three species of the genus are known from Jatamao in Madhya Pradesh.

- 1) H. buchii
- 2) H. dichotoma
- 3) H. crookshanki

Ferns with uncertain affinities

Genus - Aiethopteris Sternberg

According to Feistmantel (1977 b) followng three species of the genus are known from Jabalpur stage.

- 1) A. medlicotti Oldham
- 2) A. lobifolia Schimper

Genus - Sphenoteris Brongniart

Bose (1960) discribed Sphenopteris Sp. from Chul near Jabalpur town.

## Cycadophyta

## Order - Cycadeoidales

Jabalpur stage shows equal presence of cycadophytes and conifers. Among the cycadophytes the vegetative organs are represented as leaves and stems.

Genus - Ptilophyllum Morris

Its occurrence is quite common in Jabalpur stage and is represented by following ten species.

- 1) P. acutifolium Morris
- 2) P. cutehense Morris
- 3) P. oldhamii Jacob and Jacob
- 4) P. indicum Jacob and Jacob
- 5) P. horridum Roy
- 6) P. sakrigaliensis Sah
- 7) P. distans (Feistmantel) Jacob and Jacob
- 8) P. institacallum Bose
- 9) P. Jabalpurense Jacob and Jacob
- 10) P. gladiatum Bose and Sukh-dev

Genus - Pterophyllum Brongniart 1828

When compared with the genus Ptilophyllum, Pterophyllum appears to be less common in the Jabalpur stage. According to Bose and Banerji (1981) following two species are known in the Jabalpure flora.

- 1) P. distans Morris
- 2) P. medlicottianum Oldham and Morris

Genus - Dictyozamites Oldham

It also shows limited occurrence in the Jabalpur stage and represented by two species found in Hoshangabad district of Madhya Pradesh.

- 1) D. indicus Feistmantel
- 2) D. feistmantelii Bose and Zeba Bano

Genus - Bucklandia Presl 1825

According to Sahní (1932) it is a stem of Williamsoniaceae and was known from Rajmahal Hills. Recently Bose (1958) described Bucklandia sp. from Marhpiaria in Madhya Pradesh.

Order - Cycadels

Genus - Taeniopteris Brongniart 1832

It is represented by a following species

- 1) T. satulata McClelland

Genus - Anomozamites Schimper 1870

It is also represented by a single species : Bose and Banerji (1981) reported

A. hansapurensis

Coniferophyta

Order - Coniferales

Family - Araucariaceae

This is a primitive family and represented by vegetative as well as reproductive organs in this stage. These organs are leaves and cone, scales. However the woods of Araucariaceae have not been reported from Jabalpur stage.

This is the distinct feature of Jabalpur flora because Araucarian woods are known from earlier stages like Rajmahal and Kota.

Genus - Pagiophyllum Heer

It is a sterile shoot of Araucariaceae and distinguished from Brachyphyllum in having vertical length of the leaf is more than the breadth. Phylogenetically it is an allied genus to the Brachyphyllum. Following species have been reported by Sahni (1932) and Bose and Sukh-Dev (1972).

- 1) P. perigranum (Lindley and Hutton) Sahni
- 2) P. cf. perigranum (Lindley and Hutton) Sahni
- 3) P. bansanesis Bose and Sukh-Dev
- 4) P. marwarensis Bose and Sukh-Dev
- 5) P. rewaensis Bose and Sukh-Dev

Genus - Brachyphyllum Brongniart

It is also a sterile shoot of Araucariaceae and represented by six species in Jabalpur stage. Sahni(1928) and Bose and Maheshwari (1974) have reported the following species.

- 1) B. mamillare Brongniart
- 2) B. rhombicum (Feistmantel) Sahni
- 3) B. feistmantelii (Halle) Sahni
- 4) B. expansum (Sternberg) Sahni
- 5) B. expansum (Sternberg) Var indica Sahni
- 6) B. sehoraensis Bose and Maheshwari

Genus - Desmlophyllum Lesquereux 1828

According to Sahni (1928) the affinities of the genus is doubtful. However Bose and Maheshwari (1974) suggest the affinity of Araucariaceae to this genus. It is a strap shaped leaf where the attachment is not known. Sahni (1928) reported. D. indicum for Madhya Pradesh.

Genus - Araucarites Presl 1838

It is a cone scale and following four species have been described by Feistmantel (1876) and Bose and Maheshwari (1974)

- 1) A. cutchense
- 2) A. latifolia
- 3) A. minutus
- 4) A. sehoraensis

Genus - Araucaria Bose and Maheshwari

It is a seed scale of Araucariaceae having a prolonged leaf and a ligule. Only one species is known from Jabalpur stage.

- 1) A. pantiana Bose and Maheshwari

Family - Podocarpaceae

Genus - Elatocladus Halle 1913

It is a sterile shoot of Podocarpaceae showing spirally

arranged leaves. Sahni (1928) noted occurrence of following four species from Jabalpur stage.

- 1) E. conferta Halle
- 2) E. plana (Feistmantel) Seward
- 3) E. tenerrima (Feistmantel) Sahni
- 4) E. Jabalpurensis (Feistmantel) Seward

Genus - Conites Sternberg 1923

According to Sahni (1928) these are coniferous cones. But their affinities are not clear. Sahni (1928) reported conites Sp. Cf. Strobilites anceps. Berry from Bansa in South Rewa district of Madhya Pradesh.

Genus - Strobilites Lindley and Hutton 1833

Sahni described (1928) Strobilites Sewardi from Jabalpur stage. It shows affinities of Podocarpaceae. Since it is associated with a shoot of Elatocladus Jabalpurensis.

### Ginkgoales

The group is not common in the Jabalpur stage and represented by only leaves.

Genus - Ginkgoites Seward 1919

Only one species is known from Sher river in Madhya Pradesh. It is Ginkgoites lobata Feistmantel.

Genus - Phonicopsis Heer

Feistmantel (1877) reported Phonicopsis Sp. from Sher river.



Genus - Baiera Brown

Bose (1958) reported Baiera Sp. from Sher river.

Pteridosperms

They are represented by vegetative organs.

Genus - Pachypteris Brongniart 1828

Earlier Seward and Sahni (1928) reported Retinosporites indica from Sher river. However Bose and Rao (1968) suggested that it should be merged with the genus - Pachyptenis and named it as P. indica.

Genus - Cycadopteris Zigno 1860

The occurrence of this genus from India is due to recent report by Bose (1958 a). He first reported Cycadopteris Sp. from Bansa. Recently Bose and Sukh-Dev (1958) have made further investigation of this genus and noted following five species from Jabalpur stage in India.

- 1) C. brauniana Zigno
- 2) C. pulcherima Bose and Sukh-Dev
- 3) C. auriculata Bose and Sukh-Dev
- 4) C. indica Bose and Sukh-Dev
- 5) C. majus Bose and Sukh-Dev

Umia Stage :

It is named after a village in Cutch called as Umia. It marks the end of the Upper Gondwana. The Umia stage is the Upper most division of the Mesozoic. It consists of soft and variously coloured sandstones and shales having

thickness of 900 Meters. The lower part is mostly made up of conglomerates and the Upper part is formed by marine deposits of sandstones. The Upper Gondwana rocks show some relations with the east-coast gondwana. The animal fossils include Cephalopods and lamellibranches. The plant fossils include mostly Cycadophytes and conifers. According to Krishnan (1960) the Umia series is divided into Lower Umia and Upper Bhuj. He considers the flora is homotaxial with that of the Jabalpur stage. The age of the Umia stage ranges from Upper Jurassic to Lower Cretaceous. Wadia (1953) consider Umia series as the Upper Jurassic. However the paleobotanical data indicates the age of Lower Cretaceous.

#### Pteridophytes

Division - Lycopsidea

Family - Isoetaceae

Genus - Isoetites Muenster

It represents a vegetative and reproductive parts. Bose and Roy (1964) described following two species of the genus belonging to Umia stage.

1) I. serratifolius

2) I. indicus

Genus - Selaginellites Zeiller

It is a branched leaf stem showing resemblance with the genus Selaginella. Bose and Banerji (1984) described Selaginellites sp. from Trambau in Cutch.

Division - Sphenopsida

Order - Equisetales

Family - Equisetaceae

Genus - Equisetites Sternberg 1833

Bose and Banerji (1984) reported the following species.

- 1) E. rajmahalensis Oldham and Morris

The author described this plant from Kakadbhit and Dharasi in Cutch.

Family - Osmundaceae

Genus - Todites

Sukh-Dev (1974) noted T. indicus from Cutch.

Family - Matoniaceae

Genus - Matonidium Schenk 1871

Sahni (1936) described M. indicum from Himamtnagar sandstone in Western India. Zeba-Bano and Bose (1981) described M. cingulatum from Cutch.

Genus - Phlebopteris Brongniart 1836

Banerji (1982) P. minutifolium from Cutch.

Family - Dipteridaceae

Genus - Hausmannia Dunker 1846

Bose and Banerji (1984) reported from Chawad river in Cutch H. dichotoma Dunker.

Genus - Dictyophyllum Lindley and Hutton 1834

Bose and Banerji (1984) reported Dictyophyllum sp. from Chawad river in Cutch.

#### Unclassified ferns

Genus - Weichselia Stienler

Sahni (1936-37) described W. reticulata Stokes & Webb from Cretaceous of Gujarat. It is a Xerophytic fern. The above plant is also reported by Roy (1968) from Cutch.

Genus - Onychiopsis Yokoyama

Roy (1967) described O. psilotoides from Cutch

#### Pteridosperms

Genus - Pachypteris Brangniart 1828

Bose and Banerji (1984) described the following species from Cutch.

- 1) P. indica (Oldham and Morris) Bose and Roy
- 2) P. specifica Feistmantel
- 3) P. cf. elegans Archangelsky

Genus - Thinnfeldia Ettingshausen 1852

Maheshwari (1986) described T. indica Feistmantel from Tamil Nadu.

#### Caytoniales

Genus - Segenopteris (1838)

Bose and Banerji (1984) described Segenopteris cf. colpodes Harris from Cutch.

Genus - Caytonia Thomas 1925

Bose and Banerji (1984) described C. indica from Cutch.

### Cycadophytes

Genus - Ptilophyllum Morris 1840

According to Bose and Kasat (1972) six species of the genus are found in the Umia stage. They are

- 1) P. acutifolium Morris
- 2) P. cutchense Morris
- 3) P. distans Jacob and Jacob
- 4) P. oldhamii Jacob and Jacob
- 5) P. horridum Roy
- 6) P. sakrigaliense Sah

Pterophyllum Brongniart 1828

Comparing to Ptilophyllum only one species of Pterophyllum is known from Cutch. Bose and Banerji (1981) described P. distans from Cutch.

Genus - Pseudoctenis Seward 1911

Bose and Banerji (1984) reported P. fragilis from Cutch.

Genus - Ctenozamites Nathorst 1886

Bose and Banerji (1984) described C. kachchensis from Trambau, Kurbi and Kakadbhit in Cutch.

Genus - Otozamites Brawn 1843

Roy, (1965) described O. imbricatus from Loharia and Trambau in Cutch. Bose and Banerji (1984) have revised the fossil flora of Cutch and noted following species.

- 1) O. imbricatus Feistmantel
- 2) O. walkamotacnsis Bose and Zeba-Bano
- 3) O. kachchensis Bose and Banerji

Genus - Anomozamites Schimper 1870

Bose and Banerji (1984) described Anomozamites cf. fissus Feistmantel from Cutch.

Genus - Nilssonipoteris Nothorst 1909

Bose and Banerji (1984) described two new species of the genus. They are

- 1) N. pannuceus
- 2) N. variabilis

Genus - Tacniopteris Brongniart

Bose and Banerji (1981) described from Cutch.

- 1) T. cf. spatulata McClelland.
- 2) T. kutchensis Bose and Banerji

#### Fructifications

Genus - Williamsonia Carruthers 1870

Bose and Banerji (1984) recently reported following three new species from Cutch.

- 1) W. kakadbhitensis
- 2) W. trambauensis
- 3) W. sukhpurensis

Genus - Weltrichia Braun 1874

It represented a male flower Bose and Banerji (1984) reported a new species W. harrisiana from Cutch.

Genus - Cycadolephis Saporta

It is a scale leaf. Feistmantel (1876) described C. pilosa from Cutch. Recently Bose and Banerji (1984) reported Cycadolepis sp. from Cutch.

Genus - Benneticarpus Harris 1932

It represents a fruit of Williamasonia. Bose and Banerji (1984) described Benniticarpus sp. from Cutch.

### Coniferales

Family - Araucariaceae

Genus - Brachyphyllum Brongniart

Bose and Banerji (1984) reported following new species

- 1) B. royii Bose and Banerji

Genus - Pagiophyllum Heer 1881

Sahni (1928) reported Pagiophyllum cf. p. divericatum from Cutch. Recently Bose and Banerji (1984) reported following three species from Cutch.

- 1) P. grantii
- 2) P. chawadensis
- 3) P. morrisii

Genus - Araucarites Presl 1838

Seward and Sahni (1920) reported A. cutchensis

Feistmantel from Cutch. It appears to be a typical plant of the Cutch flora. Recently Bose and Banerji (1984) described following three species from Cutch.

- 1) A. minutes Bose and Maheshwari
- 2) A. janaianus Bose and Banerji
- 3) A. cf. nipanionsis Singh

Genus - Allocladus Towanrow 1967

Sterile shoot bearing leaves in simple helix Bose and Banerji (1984) described a new species namely A. biswasianus from Cutch.

Family - Podocarpaceae

Genus - Elatocladus Halle 1913

Sahni (1928) reported E. tenerrima from Cutch. According to Bose and Banerji (1984) following four species are known from Cutch flora.

- 1) E. confertus (Oldham and Morris) Halle
- 2) E. cf. tenerriums (Feistmantel) Sahni
- 3) E. jabalpurensis (feistmantel) Sahni
- 4) E. chawadensis Bose and Banerji

#### Fructification

Genus - Conites Sternburg

Bose and Banerji (1984) described following two species from Cutch.



1) Conites sp. A

2) Conites sp. B

Genus - Strobilites Lindley and Hutten 1833

Bose and Banerji (1984) described Strobilites cf. Sewardii Sahni from Cutch.

Genus - Rajmahalia Sahni and Rao 1934

Bose and Banerji (1984) described receptacle of Rajmahalia sp. from Cutch. Author thinks that the nature of receptacle is somewhat doubtful.

Genus - Kachchia Bose and Banerji 1984

It is main rachis of microsporophyllus. They described K. navicula from Cutch.