ABSTRACT

Jhingurda seam, the topmost seam of Singrauli Coalfield, Madhya Pradesh has been sporologically investigated. The *Sporae dispersae* represented in this seam consists of a large variety of trilete, monolete, monosaccate, disaccate and aleate monospores. In all 110 species belonging to 49 genera have been described, out of which 35 species are new. The fundamental approach behind the generic and specific circumscriptions is based upon the detailed study of various morphographic characters borne by different individuals.

INTRODUCTION

In the present paper the taxa of *Sporae dispersae*, as obtained from the Jhingurda seam of the Singrauli Coalfield, Madhya Pradesh, have been taxonomically described.

The general geography and geology of the area has already been dealt with in an earlier paper (Bharadwaj & Sinha, 1969a) in which the palynological succession and the age of the Jhingurda seam and associated strata have been discussed. Bharadwaj and Sinha (1969b) have described some new miospore genera from this area. Sinha (1969) has reported some acritarchs from the same materials.

In recent years much work has been done on the *Sporae dispersae* of different strata of the Gondwana land. The results have been summarized from India by Bharadwaj (1966), Tanganyika by Hart (1960), Congo by Bose and Kar (1966), Australia by Balme (1964), Brazil by Tiwari and Navale (1967) and by others.

MATERIAL AND METHODS

The present investigations are based on a 165 metre thick bore core (Bore hole No. NCSJ-4) belonging to Jhingurda seam. For details of the material see Bharadwaj and Sinha (1969b).

The technique followed for the maceration and preparation of slides was same as employed by Bharadwaj and Saluja (1964). For the taxonomic studies 6 slides per sample were prepared in glycerine jelly. Slides were thoroughly scanned and all the well preserved specimens were photographed on 35 mm film. The type slides have been deposited at the Museum of the Birbal Sahni Institute of Palaeobotany, Lucknow, India.

TAXONOMIC CONSIDERATIONS

The *Sporae dispersae* obtained from the Jhingurda seam comprises a large variety of trilete, monolete, monosaccate and disaccate monospores. In the present study qualitative as well as quantitative analyses of various morphographic characters have been utilized for generic and specific circumscriptions. The qualitative and quantitative characters taken into taxonomic considerations are same as already discussed by Bharadwaj and Saluja (1964) and Tiwari (1965).

In description of the *Sporae dispersae*, the artificial system of classification as proposed and elaborated by Potonie (1956, 1958, 1960) has been followed as, due to lack of knowledge about the in situ spores a phylogenetic consideration of the present *Sporae dispersae*, on the lines proposed by Schopf, Wilson and Bentall (1944), was not possible.

Amongst the triletes, a new organization has been recorded in the genus *Brevitriletes* Bharad. & Sriv., 1969 wherein the exine sculpture is present only on the distal face and consists of coni and spines. The nature of sculpture and their distribution have been considered to be of specific importance.

In the zonates, *Potonieitriradites* Bharad. & Sinha, 1969a has been described. Nature of distal ornamentation which varies from microgranulose to tuberculate, width and nature of the flange and the nature of the trilete mark have been utilized in specific delimitations.

In the monosaccate genus *Tuberisaccites* Lele & Karim (MS), a new character has been recorded which was not reported by
the original authors. It is the presence of tuberous outgrowths of the exine on both the proximal as well as the distal faces of the central body.

Pollen grains referred to genus Corisaccites Venkat. & Kar, 1966b have been included in the older genus Lueckisporites.

Disaccate striated pollen grains are the most well represented group in the present assemblage, both qualitatively as well as quantitatively. The size of the pollen grain has been taken as the length of pollen grain from one end of the saccus to the other × the breadth of the saccus. The size of the central body has been taken as width (along the direction of one saccus to other) × length. The saccus intrareticulation has been observed to be of four types, viz., fine intrareticulate (meshes ± 1 µ), medium intrareticulate (meshes ± 2 µ), coarse intrareticulate (thick muri and large meshes) and double intrareticulate (5-8 µ reticulum enclosing finer reticulations). The general important characters considered among such pollen grains are the overall shape and size; central body shape, nature of the central body exine, presence or absence of equatorial rim; number of striations, presence or absence of vertical inter-connections in between the striations, their number; distal attachment of sacci to central body, width and shape of sulcus; lateral position of sacci, their shape and nature of intrareticulation.

Genus Faunipollenites Bharad., 1962 has been maintained to include the straited pollen grains, with an indistinct outline of the central body, from the Gondwana formations.

Genus Illinites (Kos.) Pot. & Kl., 1954 as considered here includes all the smaller forms hitherto described under Potonieisporites, Vestigisporites, Sahnites and Illinites. However, the bigger forms previously described under the above genera are included in Potonieisporites (Bhard.) Bharadwaj, 1964.

A new organization has been found in striate monocolpate pollen grains referred to the genus Distriomonocolpites Bharadwaj & Sinha, 1969a. The characteristic feature of this genus is the laevigate and depressed nature of the colpus due to which folds or thickening are found along the zone of colpus. The grains show proximal horizontal striations with vertical interconnections uniting at the lateral ends and forming a closed ring; distally vertical striations are found.

**SYSTEMATIC DESCRIPTION**

Anteturma — Sporites H. Pot., 1893
Turma — Triletes (Reinsch) Pot. & Kr., 1954
Subturma — Asonotriletes Lubber, 1935
Infuratma — Laevigati (Benn. & Kidst.) Pot., 1956
Genus — Leiottiletes (Naum.) Pot. & Kr., 1954

Genotype — Leiottiletes sphaerotriangularis (Loose) Potonie & Kremp, 1954
Remarks — Genus Leiottiletes (Naum.) Pot. & Kr. is known from the Permian of southern as well as northern hemispheres. There is another genus, viz. Deltoidaspora (Miner) Pot., 1956 which has almost similar generic diagnosis as Leiottiletes, but the former is mostly confined to Jurassic and Triassic periods. Leiottiletes directus Balme & Henn., 1956 was transferred to the genus Microfoveolatispora as M. directa by Bharadwaj (1962) in view of the microfoveolate nature of the exine and the presence of secondary folds along the trilete mark. Later Hart (1960) transferred this species to Deltoidaspora as D. directus. However, the microfoveolate exine and the secondary folds along the trilete rays are the characteristic features of Microfoveolatispora unlike the smooth exine and simple rays of Deltoidaspora.

Leiottiletes brevis sp. novo.

P. 1, Figs. 1, 2

Holotype — Pl. 1, Fig. 1, Slide No. 4093
Locus typicus — Bore hole No. NCSJ-4, Sample No. 78.

Diagnosis — Miospores small, trilete, triangular; size range 19-25 µ; trilete mark distinct, rays 1/2 radius to almost upto apices; exine thin, laevigate; extrema lineamenta smooth.

Description — Miospores are triangular with usually concave, rarely straight inter-radial sides and rounded corners. Holotype measures 25 µ. Trilete mark is distinct, rays reach 1/2 the spore radius, or upto the corners, usually all the three rays are equal in length. Exine is thin, laevigate and mostly structureless. Extrema lineamenta is without any ornamentation.

Comparison — Leiottiletes brevis sp. novo. differs from L. virkii Tiwari, 1965 in its smaller size and mostly laevigate structureless exine. Leiottiletes sp. of Bharadwaj (1962; Pl. 1, Figs. 1-3) is larger in size and
appears to be intrastructured. *Leiotriletes* sp. of Bharadwaj and Salujha (1964; Pl. 1, Fig. 1) is roundly triangular in shape and larger in size. *Leiotriletes* sp. of Tiwari (1965; Pl. 1, Fig. 1) is also larger in size. Species of genus *Leiotriletes* described by Kar and Bose (1967) differ from the present species in having thick exine and larger size range.

**Genus — Punctatisporites (Ibr.) Pot. & Kr., 1954**

**Genotype — Punctatisporites punctatus Ibrahim, 1932**

cf. *Punctatisporites* sp.
Pl. 1, Fig. 3

**Description** — Miospores are circular to subcircular in shape, size ranges from 70–65 μ-100×84 μ. Trilete mark is distinct, rays 1/2 to 1/3 (13–35 μ) spore radius long; labra are mostly thick, rarely thin and vertex is low to high. Exine is 2-4 μ thick, laevisgigate, mostly structureless. *Extrema lineamenta* is smooth. 

**Remarks** — The irregular distribution and nature of sculptural elements make the present specimens very characteristic but as the number of such specimens recovered from present assemblage is less, they are referred to the genus *Punctatisporites*.

**Infraturma — Apiculati (Benn. & Kidst.) Pot., 1956**

**Subinfraturma — Granulati Dyb. & Jachow., 1954**

**Genus — Cyclogranisporites Pot. & Kr., 1954**

**Genotype — Cyclogranisporites leopoldii (Kremp) Potonie & Kremp, 1954**

*Cyclogranisporites barakarensis* Sriv. (1970)
Pl. 1, Fig. 4

**Remarks** — Maxima of *C. barakarensis* is 22 μ, while in the specimens studied here, it is 25 μ. However, the mean size of the specimens studied by Srivastava (1970) and the presently described specimens are 24 μ. Size of grana in both cases is less than 1 μ.

**Genus — Planisporites (Knox) Pot. & Kr., 1954**

**Genotype — Planisporites granifer (Ibrahim) Knox, 1950**

cf. *Planisporites* sp. A
Pl. 1, Fig. 5

**Description** — Miospores are circular to subcircular; ± 78–85 μ in diameter. Trilete mark is distinct; rays are 22–35 μ long, labra are thick and vertex is low. Exine is thick, 2-3 μ in optical section, indistinctly punctate, covered with small, ± 2 μ circular to irregular sculptural elements which are sparsely and irregularly distributed. *Extrema lineamenta* is smooth, except at the places where one or two sculptural elements are present.

**Remarks** — The regular distribution and nature of sculptural elements make the present specimens very characteristic but as the number of such specimens recovered from present assemblage is less, they are referred to the genus *Planisporites*.

**Subinfraturma — Nodati Dyb. & Jachow., 1957**

**Genus — Lophotriletes (Ibr.) Pot. & Kr., 1954**

**Genotype — Lophotriletes gibbossus (Ibrahim) Potonie & Kremp, 1954**

*Lophotriletes rectus* Bharad. & Sal., 1964
Pl. 1, Fig. 7

**Remarks** — Bharadwaj and Salujha (1964) have referred three specimens to *Lophotriletes rectus*, out of which Pl. 2, Fig. 28 is bigger in size with bulging inter-radial sides and sparse ornamentation and appears to be different from the holotype. The size of sculptural elements in the present specimens is smaller than that of the specimens described by Bharadwaj and Salujha.
Subinfraturma — *Baculati* Dyb. & Jachow., 1957

**Genus — Horriditriletes** Bharad. & Sal., 1964

*Genotype — Horriditriletes curvibaculosus* Bharadwaj & Saluja, 1964

*Horriditriletes curvibaculosus* Bharad. & Sal., 1964

**Remarks** — In present specimens, number of the curved bacula is lesser than that of the straight bacula.

*Horriditriletes brevis* Bharad. & Sal., 1964

**Remarks** — Miospores studied here have mostly concave or straight inter-radial sides, while those recorded by Bharadwaj and Saluja (1964) show mostly convex inter-radial sides.

*Horriditriletes novus* Tiw., 1965

**Remarks** — The specimens studied here are smaller in size. In other characters the present specimens compare closely with the holotype.

*Horriditriletes pseudoseptatus* sp. nov.

**Holotype** — Pl. 1, Fig. 12, Slide No. 4100

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 82

**Diagnosis** — Triangular miospores; trilete mark distinct; exine thin, usually ornamented with septate bacula, sometimes intermixed with coni.

**Description** — Miospores are triangular with straight to convex inter-radial sides and round apices. Size ranges from 25-50 μ; holotype measures ± 50 μ. Trilete mark is distinct, rays are 9-15 μ long, labra are thin and vertex is low. Exine is thin, ornamented with 2-7 μ × 2-5 μ high bacula and 2-3 μ blunt coni. Usually a few, sometimes all, of the bacula and coni are septate with many septa.

**Reconstruction** — See Text-fig. 1

**Comparison** — Present species resembles *Horriditriletes novus* Tiw., 1965 in having mixed type of ornamentation comprising bacula and coni, but differs in having few to many septate bacula along with simple ornamentation.

**Genus — Cyclobaculisporites** Bharad., 1955

*Lectogenotype — Cyclobaculisporites saarcensis* Bharad., 1966

**Pl. 1, Fig. 13**

*Cyclobaculisporites minutus* Bharad. & Sal., 1964

**Remarks** — The specimens differ from those of Bharadwaj, and Saluja (1964) in mostly having an obscure trilete mark.

**Infraturma — Varitrileti** Venkat. & Kar, 1965

**Genus — Brevitriletes** Bharad. & Sriv., 1969

*Genotype — Brevitriletes Communis* Bharadwaj & Srivastava, 1969

*Brevitriletes communis* Bharad. & Sriv., 1969

**Pl. 1, Fig. 14**

**Remarks** — The specimens studied here show a close similarity with the holotype, but for their slightly smaller size range.

*Brevitriletes jhingurdaiensis* sp. nov.

**Holotype** — Pl. 1, Figs. 15, 16

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 53

**Diagnosis** — Miospores subcircular; 19-36 μ in size, trilete mark distinct or obscure; distally ornamented mostly with a mixed type of sculpture, comprising blunt verrucae, coni or even blunt spines, proximal exine smooth and laevigate.

**Description** — Miospores are mostly subcircular; rarely triangular or circular. Holotype measures 31 μ. Trilete mark is obscure or distinct, rays reaching up to corners, labra are thin and vertex is low. Sculpture is present only on the distal face, comprising blunt verrucae, spines or coni, measuring 1-3 μ × 1 μ. Proximally exine is smooth and laevigate. *Extrema lineamenta* is uneven.

**Reconstruction** — See Text-fig. 2.

**Comparison** — Presently described species resembles *Brevitriletes communis* Bharad. & Sriv., 1969 in its overall size range but differs in the absence of equatorial thickening. Other species of the genus *Brevitriletes* differs
from *B. jhingurdahiensis* sp. nov, in being bigger in size.

Remarks — *Brevitriletes communis* and *B. jhingurdahiensis* include specimens having varied type of sculptural elements. It is because of the fact, that the spines are blunt tipped, the lower half of which resemble a blunt coni or verrucae while the upper portion is straight and blunt just like a baculum. It has been observed that the upper portion of the spine is easily detachable and when it is detached the remaining part of the spine appears like coni or verrucae. So it is assumed here that coni and verrucae are actually blunt spines whose upper part has been lost.

*Brevitriletes crassus* sp. nov.

Pl. 1, Figs. 17, 18

Holotypes — Pl. 1, Fig. 18, Slide No. 4103

Locus typicus — Bore hole No. NCSJ-4, Sample No. 13

Diagnosis — Subcircular to subtriangular miospores; 15-30 μ size; trilete mark obscure or distinct; ornamentation only on distal face, comprising very low to indistinct sculpture; equatorial thickening present.

Description — Miospores are mostly subcircular, rarely circular or triangular; holotype measures 22 μ. Trilete mark is mostly obscure, rarely seen, rays reaching up to the margins. Exine is thin, proximally smooth and laevigate; distally it is ornamented with irregular, very low sculpture which is hardly discernible over the *extrema lineamenta*. In LO analysis, the sculptural elements give appearance of circular, big puncta which indicate hollow nature of sculptural elements. ± 1-2 μ thick equatorial rim is present along the *extrema lineamenta*.

Reconstruction — See Text-fig. 3.

Comparison — *Brevitriletes crassus* sp. nov. differs from *B. communis* Bharad. & Sriv. and *B. jhingurdahiensis* sp. nov. in having very low, indistinct sculpture. Among the other species, *B. levis* Bharad. & Sriv., *B. unicus* (Tiw.) Bharad. & Sriv. are characterized by the presence of a distinct trilete mark and bigger size.

*Brevitriletes baculatus* sp. nov.

Pl. 1, Figs. 19, 20

Holotype — Pl. 1, Fig. 19, Slide No. 4104

Locus typicus — Bore hole No. NCSJ-4, Sample No. 13

Diagnosis — Subcircular to circular miospores; ± 20-26 μ size; trilete mark obscure; distally ornamented with big, blunt bacula.

Description of specimens studied — Miospores are circular to subcircular; holotype measures 21 × 24 μ. Trilete mark is obscure. Exine is thin, proximally laevigate and smooth, distally it is ornamented with ± 2 μ high, mostly blunt, rarely with swollen topped bacula. Bacula are uniformly wide or sometimes slightly wider at the base. 7-25 bacula counted over the *extrema lineamenta*.

Reconstruction — See Text-fig. 4.

Comparison — The present species differs from *Brevitriletes unicus* (Tiw.) Bharad. & Sriv. and *B. communis* Bharad. & Sriv. in having an indistinct trilete mark and in smaller size range. *B. communis* Bharad. & Sriv., *B. jhingurdahiensis* and *B. crassus* although resemble the present species in its size range but differs in the nature of sculptural elements.

Genus — *Microbaculispora* Bharad., 1962

Genotype — *Microbaculispora gondwanensis* Bharadwaj, 1962

*Microbaculispora tentula* Tiw., 1965

Pl. 1, Fig. 21

Remarks — Among the specimens studied, a few are bigger in size as compared to the biggest specimen (56 μ) seen by Tiwari (1965).

Genus — *Microfoveolatispora* Bharad., 1962

Genotype — *Microfoveolatispora raniganjensis* Bharadwaj, 1962

*Microfoveolatispora boharoensis* Tiw., 1965

Pl. 1, Fig. 22

Remarks — Miospores recovered from Jhingurdah seam are usually flattened in polar view. However, in other morphological characters they resemble closely with the holotype.

*Microfoveolatispora indica* sp. nov.

Pl. 1, Figs. 23, 24

1956 — *Granulatisporites trisinus* Balme & Hennelly, Pl. 1, Figs. 7, 8

1962 — *Microfoveolatispora directa* Bharadwaj, Pl. 2, Figs. 45-47
1964 — Microfoveolatispora sp., Bharadwaj & Saluja, Pl. 2, Fig. 50

Holotype — Pl. 1, Fig. 23, Slide No. 4107
Locus typicus — Bore hole No. NCSJ-4, Sample No. 82

Diagnosis — Triangular miospores, known size 53-95 μ; trilete mark distinct, Y-rays accompanied by thin folds; exine covered with faint to distinct, 1 μ wide foveolae.

Description — Miospores are triangular with straight to slightly concave sides and round apices. Holotype measures 60 μ. Trilete mark is distinct, Y-rays reaching ± upto margins and are associated with thin folds. Exine is thin, ± 2 μ in optical section and is mostly covered with faint, 1 μ wide foveolae. Extrema lineamenta is smooth.


Remarks — Bharadwaj (1962) included presently described specimens in Microfoveolatispora directa (Balme & Henn.) Bharad. and transferred the specimens of Leiotriletes directus Balme & Henn., 1956 in M. directa. It has been found that the size range of Leiotriletes directus is only 26-36 μ, secondary folds along trilete rays appears to be very narrow (See Balme & Hennelly, 1956b; Pl. 1, Figs. 1, 2) and the exine is faintly foveolate. So here it is proposed to maintain two species of Microfoveolatispora. First is M. indica sp. nov. having a bigger size range, including all the specimens of M. directa by Bharadwaj (1962) and the second species is M. directa. In view of these facts the specific diagnosis of the latter species should be read as below:

'Triangular, trilete miospores; size ranging from 23-26 μ, trilete rays accompanied by very narrow secondary folds; exine covered with less than 1 μ wide foveolae; extrema lineamenta smooth’.

Figure 1 on Plate 1 of Balme and Hennelly (1956b) is suggested to be the holotype for M. directa.

Infraturma — Zonati Pot. & Kr., 1954

Potonicitriradites Bharad. & Sinha (1969a)

Genotype — Potonicitriradites barakarensis
Bharadwaj & Sinha (1969a)

Potonicitriradites tuberculatus sp. nov.
Pl. 1, Figs. 25, 26

Holotype — Pl. 1, Fig. 25; Slide No. 4108
Locus typicus — Bore hole No. NCSJ-4, Sample No. 62

Diagnosis — Subtriangular to roundly triangular miospores; size range 56-90 μ; central body distinct, conforming to the overall outline of the miospore; proximal exine finely microgranulose, distally with a large number of warty processes. Zona thin, subequatorially attached to the central body on both the faces, warty processes present over the zona also, equatorial rim distinct; inner body usually present.

Description — Miospores are subtriangular to roundly triangular in shape with bulging inter-radial sides and broad rounded apices; holotype measures 83 μ. Central body is distinct, subtriangular to subcircular, usually conforming to the overall outline of the miospore, measuring from 36-55 μ; in holotype it measures 45 μ. Proximal exine is finely microgranulose and distal exine is set with a large number of warty processes, sparsely distributed, measuring ± 2-3 μ, sometimes coalescent with each other. Proximally central body bears a tritele mark, rays reaching ± upto outer margin of the zona, usually thick lipped and sinuous, labra are thick and vertex is high. Zona is thin, 10-15 μ wide, finely microgranulose on both the faces, warty processes are present on distal side, margin is microdentate to smooth. Zona is subequatorially attached on both the faces over the central body, thickened at the inner margin, forming ± 3-6 μ wide, distinct equatorial thickening. Inner body is usually present, circular to subcircular, measuring 34-45 μ, smooth and laevigate.

Comparison — Potonicitriradites tuberculatus sp. nov. differs from P. barakarensis Bharadwaj & Sinha (1969a) in having warty processes on the distal face. The specimens referred by Balme & Hennelly (1956, Pl. 6, Figs. 60, 61) as Cirratriradites splendens compare closely with the present species in the nature of distal exine ornamentation.

Potonicitriradites subtilis sp. nov.
Pl. 1, Figs. 27, 28

Holotype — Pl. 1, Fig. 27, Slide No. 4110
Locus typicus — Bore hole No. NCSJ-4, Sample No. 62

Genotype — Potonicitriradites barakarensis Bharadwaj & Sinha (1969a)
Diagnosis — Subtriangular miospores; size range 65-102 μ; central body thin, distinct; finely microgranulose on both the faces; proximally bearing trilete mark, Y-rays thick lipped, reaching upto the outer margin of the zona, straight to sinuous. Zona thin, flimsy, subequatorially attached on both the faces, thickened at the inner margin, forming an equatorial rim around the central body; inner body mostly present.

Description — Miospores are subtriangular, sometimes subcircular in shape with bulging sides and rounded apices; holotype measures 80 μ. Central body is distinct, subtriangular to subcircular, usually conforming to the overall outline of miospore, measuring from 43-75 μ, in holotype it measures 53 μ. Exine is thin, finely microgranulose on both the faces. Trilete mark is distinct, reaching ± upto outer margin of the zona, rays always thick lipped, usually straight or sinuous, labra are thick and vertex is high. Zona is thin, ± 8-15 μ wide, microgranulose on both the faces, margin dentate to smooth, subequatorially attached on both the faces, thickened at the inner margin, forming a distinct, ± 3-6 μ wide equatorial thickening. Inner body is usually present, subcircular to circular, thin, laevigate and smooth, measuring 35-45 μ.

Comparison — Potoniëtriradiates barakarrensis Bharadwaj & Sinha (1969a) differs from present species in having a thick zona, thick central body with differential ornamentation on the proximal and distal faces. P. tuberculatus sp. nov. has tubercles over the distal surface. The specimens described by Tiwari (1965; Pl. 3, Figs. 55, 56) compare with the present species in their general organisation.

Genus — Barakarites Bharad. & Tiw., 1964

Genotype — Barakarites indicus Bharad. & Tiw., 1964

Barakarites sp. cf. B. indicus Bharad. & Tiw., 1964

Pl. 2, Fig. 30

Description — Pollen grains are subtriangular to subcircular in shape and measure 70-103 μ. Central body is distinct, conforms with the overall shape of pollen grain, measuring 60-80 μ. Proximally it bears 5-10 μ wide, distinct and raised polygonal areas delimited by narrow grooves. The polygonal meshes are restricted to a central portion conforming to the overall shape of the central body. Distally polygonal areas are ill defined, with larger meshes. Exine is intramicropunctate. Trilete mark is distinct, rays reaching up to 1/2 radius of the central body. Saccus is proximally equatorially and distally subequatorially attached, saccus exine is thick and intramicroreticulate.

Remarks — The present specimens compare closely in general with Barakarites indicus but differ in being smaller in size and in having a thicker saccus exine. However, the number of specimens being only two, it is not possible to assess the taxonomic value of these differences so as to distinguish them from B. indicus.
and vertex is high, rays reaching up to 1/2 the radius of the central body. Saccus exine is ± 6 \( \mu \) thick, finely intrapunctate.

**Remarks** — The most characteristic feature of *Barakarites* sp. is its very thick saccus exine at the equator. In this feature alone it differs from *B. indicus* Bharad. & Tiw., 1964 and *B.* sp. cf. *B. indicus*. In this respect it compares rather closely with *B. rotatus* (Balme & Henn.) Bharad. & Tiw., 1964.

**Infraturma** — *Parasacciti* Maheshw., 1967

**Genus** — *Parasaccites* Bharad. & Tiw., 1964

**Genotype** — *Parasaccites korbansis* Bharadwaj & Tiwari, 1964

*Parasaccites diffusus* Tiw., 1965

**Pl. 2, Fig. 32**

**Remarks** — Present specimens closely compare with the original diagnosis, but for their slightly smaller size range.

*Parasaccites bilateralis* Tiw., 1965

**Pl. 2, Fig. 33**

**Remarks** — Specimen is smaller in size than the earlier reported specimens.

*Parasaccites singrauliensis* sp. nov.

**Pl. 2, Figs. 34, 35**

**Holotype** — Pl. 2, Fig. 34; Slide No. 4116

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 114

**Diagnosis** — Circular to subcircular pollen grains, 65 × 60 \( \mu \)-110 × 95 \( \mu \) in size. Central body outline distinct, conforms with overall outline of pollen grain; exine thin, finely microreticulate and without wrinkles. Trilete mark obscure to distinct. Saccus narrow, subequatorially attached both proximally as well as distally.

**Description** — Pollen grains are circular to subcircular in overall shape. Holotype 85 × 75 \( \mu \) in size. Central body is distinct, subcircular, thick, 58 × 60 \( \mu \)-110 × 100 \( \mu \) in size, mediumly microreticulate. Trilete mark is obscure. Saccus is narrow, uniformly broad around the central body, coarsely intrareticulate, muri ± radially arranged. Zones of saccus attachment are bilateral in the same direction on both the sides, leaving an irregular, narrow to wide saccus free area.

**Comparison** — Present species differs in its mode of saccus attachment from all the described species of the genus *Parasaccites*, where the saccus free area are ± circular. The characteristic mode of saccus attachment seen in *P. irregularis* sp. nov, appears to have arisen due to additional encroachment of the saccus on two opposite sides.

**Genus** — *Parastriopollenites* Maheshw., 1967

**Genotype** — *Parastriopollenites rajmahalensis* Maheshwari, 1967

*Parastriopollenites gondwanensis* Maheshw., 1967

**Pl. 2, Fig. 38**

**Remarks** — The specimens assigned to this species from the present assemblage closely compare with the holotype of *P. gondwanensis* Maheshw., 1967 in most of the characters.
Parastriopollenites limbatus Maheshw., 1967

Pl. 3, Fig. 39

Remarks — In the present specimens a very interesting feature has been observed, that is the presence of proximal subtriangular shield. After re-examining the holotype (MAHESHWARI, Pl. 2, Fig. 22) it was found that this shield is also present in the holotype.

Parastriopollenites irregularis sp. novo

Pl. 3, Figs. 40, 41

Holotype — Pl. 3, Fig. 40; Slide No. 4121.
Locus typicus — Bore hole No. NCSJ-4, sample No. 125.

Diagnosis — Overall shape subcircular to circular; size range 115-170 μ. Central body outline distinct, conforms to overall outline of pollen grain; exine thin, irregular big meshes present on both faces. Trilete mark usually indistinct. Saccus thin, finely intramicroreticulate; subequatorially attached both proximally and distally.

Description — Pollen grains are subcircular to circular in overall shape. Holotype measures 130 μ. Central body is distinct, conforms with overall shape of miospore and 98-130 μ in size. Nine to many large tuber like processes are present on both the faces, processes measures 4-12 μ. Exine is coarsely intramicroreticulate. Saccus is narrow, ± 6 μ wide, coarsely intramicroreticulate, saccus attachment is equatorial on one face and subequatorial on the other.

Comparison — Parastriopollenites rajmahalensis Maheshw., 1967 although closely compares with the present species, differs in being smaller in size and in having tuber-like processes on both proximal as well as distal faces. The attachment of saccus in the present species is equatorial on one face and subequatorial on the other, unlike the para-condition found by Lele and Karim (MS).

Infraturma — Divarisaccus Venkat. & Kar, 1966a

Genus — Divarisaccus Venkat. & Kar., 1966a

Genotype — Divarisaccus lelei Venkatachala & Kar, 1966a

Divarisaccus strengeri Bose & Kar, 1966

Pl. 3, Fig. 44

Remarks — The specimens described from the present assemblage compare closely in all the morphographical characters with the original description of the species.

Infraturma — Striasaccites Bharad., 1962

Genus — Striomonosaccites Bharad., 1962

Genotype — Striomonosaccites ovatus Bharad., 1962

Striomonosaccites sp.

Pl. 3, Fig. 45

1962 — Striomonosaccites Bharadwaj, Pl. 7, Figs. 110-111

Description — Pollen grain is subcircular and 110×80 μ in size. Central body is dis-
distinct, subcircular, 77 x 64 μ in size and thick walled. Exine is fine microreticulate and proximally bears 8 horizontal striations (2 of them branched). Saccus is equatorially attached on the proximal face while distally it is subequatorially attached, leaving a circular saccus free area. Saccus is thick and is finely intramicroreticulate.

Remarks — This specimen differs from S. ovatus Bharadwaj, 1962 thick walled central body. S. circularis Bharad. & Sal., 1964 has a bigger size range and faint body striations. The specimens described by Bharadwaj (1962; Pl. 7, Figs. 110-111) closely compared with the present specimen.

Subturma — Disaccites Cooks, 1964
Infraturma — Striareticuloiditi Tiw., 1964
Genus — Korbapollenites Tiw., 1964

Genotype — Korbapollenites novus Tiwari, 1964

Korbapollenites sp.
Pl. 4, Fig. 46

Description — Pollen grain is bilaterally oval and 127 x 103 μ in size. Central body is distinct, horizontally oval, 85 x 62 μ in size, on the proximal face ± 3 μ wide polygonal areas are present and an ill defined, narrow, ± 2μ wide rim is seen around the central body margin. Distal exine is structured. Saccus is continuous on lateral sides, giving a monosaccoid appearance to the pollen grain. Sacci are distally inclined forming a biconcave, ± 25 μ wide sulcus. Sacci exine is mediumly intrareticulate.

Remarks — Korbapollenites novus Tiw., 1964 differs from Korbapollenites sp. in being subcircular in shape, with a circular central body having a distinct marginal rim.

Genus — Primuspollenites Tiw., 1964

Genotype — Primuspollenites levis Tiwari, 1964

Primuspollenites singraulienisis sp. nov.
Pl. 4, Figs. 47, 48

Holotype — Pl. 4, Fig. 49; Slide No. 4127
Locus typicus — Bore hole No. NCSJ-4, Sample No. 125
Diagnosis — Bilateral pollen grains, 69 x 58-125 x 80 μ in size. Central body thick, circular. Reticuloid striations distinct, proximal rim absent. Sacci distally inclined, forming a narrow to wide sulcus, sometime zones of saccus attachment accompanied with narrow thickenings. Sacci medium intrareticulate.

Description — Pollen grains are bilateral in overall shape, notched on both the lateral sides. Holotype size is 95 x 66 μ. Central body is thick, ± circular in overall shape, 26 x 30 μ-28 x 38 μ in size, 34 μ in the holotype. Reticuloid striations are distinct, binding nearly polygonal areas, 2-5 μ in size. Proximal rim is absent. Sacci are proximally equatorially attached, distally inclined forming a straight to irregular, distinct, 5-13 μ wide sulcus. Sometimes the zone of saccus attachment is accompanied by narrow thickenings giving varied appearance to the sulcus. Sacci are medium intrareticulate. In some specimens double
intrareticulation is also found in the saccus exine.

Comparison — *Primuspollenites levis*, the genotype, and *P. densus Tiw., 1965* have vertically oval central body and the sulcus is biconvex. *P. linterus* Tiw., 1965 and *P. dicavus* Tiw., 1965 have boat shaped and dumb-bell shaped sulcus along with the subtriangular and vertically oval central body respectively. *P. singrauliensis* differs from the present species in having a distinct, marginal rim around the central body.

*P. distinctus* sp. nov. is characterized by the presence of a distinct circular central body.

*Primuspollenites brevicorpus* sp. nov.

**Pl. 4, Figs. 51, 52**

**Holotype** — Pl. 4, Fig. 51; Slide No. 4128

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 102

**Diagnosis** — Bilateral pollen grains, 85 \( \times \) 46 \( \mu \) - 105 \( \times \) 52 \( \mu \) in size; central body dense, vertically oval, thick walled; proximally distinct polygonal areas present; distally sacci inclined forming a narrow sulcus with distinctly thickened lateral zones. Sacci usually laterally continuous.

**Description** — Pollen grains are bilateral in overall shape. Holotype measures 90 \( \times \) 72 \( \mu \). Central body is distinct, vertically oval, dense, dark coloured and thick walled. It is 24 \( \times \) 35 \( \mu \) - 28 \( \times \) 34 \( \mu \) in size; 24 \( \times \) 35 \( \mu \) in holotype. Reticuloid striations are distinct, forming \( \pm 2 \mu \) wide polygonal areas. Proximal saccus attachment is diffused, distal attachment being well defined, forming a straight to irregular, narrow, 1-3 \( \mu \) wide sulcus. Zone of saccus attachment is accompanied by narrow thickening. Sacci are usually laterally continuous, and are medium intrareticulate, sometimes finer muri within the meshes are also found.

**Comparison** — Present species compares favourably with *P. densus Tiw., 1965* in having a dense central body, but the size range and the body sacci ratio is smaller in the former. *P. levis Tiw., 1964* has a bigger size range and thin central body with \( \pm \) biconvex sulcus. *P. linterus* Tiw., 1965 has a characteristic boat-shaped sulcus with almost subtriangular central body, while *P. dicavus* Tiw., 1965 is characterized by dumb-bell shaped sulcus, along with comparatively larger, vertically oval, central body, thus differing from the present species.

*P. brevicorpus* sp. nov. is characterized by having a small, dense, vertically oval central body with a narrow and straight sulcus.

*Primuspollenites ovatus* sp. nov.

**Pl. 4, Figs. 53, 54**

**Holotype** — Pl. 4, Fig. 53; Slide No. 4129

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 84.

**Diagnosis** — Bilateral pollen grains, 66 \( \times \) 48 \( \mu \) - 115 \( \times \) 80 \( \mu \) in size. Central body vertically oval with one or both ends acute; proximally bearing \( \pm 1-5 \mu \), indistinct, reticuloid striations; sacci distally inclined forming a distinct, narrow, sometimes wide sulcus; zone of saccus attachment being usually thickened.

**Description** — Pollen grains are bilateral in overall shape. Holotype measures 92 \( \times \) 55 \( \mu \). Central body is distinct, vertically oval, usually having lateral acute ends. It ranges from 26 \( \times \) 36 \( \mu \) - 45 \( \times \) 65 \( \mu \) in size and is 34 \( \times \) 42 \( \mu \) in holotype. Proximal reticuloid striations are always ill-defined never forming distinct polygonal areas which are apparently \( \pm 1-5-2 \mu \) in size. Indistinct, irregular marginal rim is sometimes present around central body. Sacci are diploxy­lonoid, distally inclined forming a narrow to wide, 1-10 \( \mu \) broad sulcus. The zone of saccus attachment is often thickened but sometimes thickening absent.

**Comparison** — *Primuspollenites ovatus* sp. nov. has a smaller size range as compared to all the species described by Tiwari (1965). Moreover, the present species can be further distinguished from other species of *Primuspollenites* by its ill defined reticuloid striations.

*Primuspollenites sp.*

**Pl. 4, Fig. 55**

**Description** — Pollen grain is small, bilateral, 40 \( \times \) 22 \( \mu \) in size. Central body is thick, circular 20 \( \mu \) in size. Small reticuloid striations are present over the proximal face, forming 1-3 \( \mu \) broad polygonal areas. Central body exine is structured. Sacci are diploxy­lonoid, finely intrareticulate and distally inclined forming a distinct, \( \pm 3 \mu \) wide sulcus.
Comparison — The very small size of *Primuspollenites* sp. makes it different from all the other described species of the genus.

**Genus — Rhizomaspora** Wils., 1962

**Genotype — Rhizomaspora radiata** Wilson, 1962

*Rhizomaspora singula* Tiw., 1965

Pl. 4, Fig. 56

**Remarks** — The holotype of *R. singula* Tiw., 1965 appears to possess a central body with very big, distinct, radiating reticuloid striations which in case of my specimens are smaller and do not show a radial arrangement. However, in other morphographic characters my specimens compare very closely with the original description of Tiwari (1965). The arrangement of reticuloid striations has not been considered as an important character hence the specimens from the present assemblage have been included in *R. singula*.

*Rhizomaspora* sp. d.

*R. fimbriata* Tiw., 1965

Pl. 4, Fig. 57

**Description** — Pollen grain is bilateral, 125 X 70 μ in size. Central body is thick, circular, 57 X 55 μ in size and proximally bears 5 horizontal striations, which in the middle form 18 polygonal areas; exine is structured. 1 thick, 5 μ wide, frilled rim is present around the central body. Sacci are medium and imperfect intrareticulation, diploxylonoid and zone of saccus attachment are diffused but wide.

**Remarks** — *R. fimbriata* Tiw., 1965 differs from presently described specimen in having ill defined, smaller, polygonal area. However, in other morphographic characters it compares closely with the holotype.

**Infraturma — Podocarpoideiti** Pot., Thoms. & Thierg., 1950

**Genus — Platysaccus** (Naum.) Pot. & Kl., 1954

**Genotype — Platysaccus papilionis** Potonie & Klaus, 1954

*Platysaccus* sp. A

Pl. 4, Fig. 58

**Description** — Pollen grains are bilaterally oval. Size ranges from 92 X 67 μ-123 X 85 μ. Central body is distinct, ± circular, measuring ± 34-47 μ. Exine is mostly laevigate. Sacci are diploxylonoid, broadly connected on lateral sides. Proximally the saccus is equatorially attached, but distally it is inclined forming a narrow and straight sulcus. Sacci intrareticulation is medium sized.

**Remarks** — *Platysaccus papilionis* Pot. & Kl. possesses a dense central body without any lateral continuations of the sacci. *P. leschikii* Hart, 1960 has a vertically oval central body and a narrow distal sulcus. *P. ovatus* Maithy, 1965 also possesses a dense vertically oval central body. Only few specimens have been found in the present assemblage, hence, described here as *Platysaccus* sp. A.

*Platysaccus* sp. B

Pl. 4, Fig. 59

**Description** — Pollen grains are bilaterally oval. Size range from 76 X 52 μ-100 X 62 μ. Central body is distinct, ± subcircular, measuring 40-45 μ. Exine is thick and microverrucose. Sacci are diploxylonoid, lateral continuations are narrow or absent; distally the sacci are inclined forming an ill defined broadly biconvex sulcus. Sacci intrareticulation is medium.

**Remarks** — *Platysaccus* sp. A differ from *P. sp. B* in having a circular central body with broad lateral continuations of the sacci and a narrow, straight sulcus. The present species is also very meagre in occurrence.

**Genus — Cuneatisporites** Lesch., 1955

**Genotype — Cuneatisporites radialis** Leschik, 1955

*Cuneatisporites* sp.

Pl. 5, Fig. 60

**Description** — Pollen grains are bilaterally oval in overall shape. Size ranges from 80 X 52 μ-135 X 87 μ. Central body is distinct, vertically oval to rhomboid, measuring 40 X 50 μ-60 X 87 μ. Exine is thick, fine microreticulate. Sacci are diploxylonoid, distally inclined forming a distinct, ± straight, 6-8 μ wide sulcus. Sacci are medium intrareticulate.

**Remarks** — *Cuneatisporites exigus* Salujha, 1965 has got vertically oval central body with a thin marginal rim. *C. sp. A* of
Tiwari (1965) possesses vertically oval central body with acute lateral ends and a narrow sulcus with narrow thickening along the zone of distal saccus attachment. C. sp. B of Tiwari (1965), although possesses ± rhomboidal central body, differs in having distal zone of saccus attachment associated with vertical semilunar folds.

Infraturma — Striatisit Pant, 1954

Genus — Lueckisporites Pot. & Kl., 1963

Genotype — Lueckisporites virkii Pot. & Kl., 1954

Remarks — While examining a number of pollen grains from the present assemblage, it was found that distally the central body is very thin and laevigate but proximally it bears two ± reniform, thick, taeniae, in which the intrareticulation is of the same nature as in the sacci. The thinner wall of the central body is often lost during the course of maceration. Thus, the taeniae which are attached only to central body and not to the sacci assume different shapes as soon as central body is lost.

Genus Corisaccites Venkat. & Kar, 1966 represents presumably such specimens of Lueckisporites in which the thinner wall of the central body is lost and what Venkatachala and Kar (1966b) describe as a central body (divided into two parts) actually represents the two proximal taeniae.

Lueckisporites singrauliensis sp. nov.

Pl. 5, Figs. 61, 62

Holotype — Pl. 5, Fig. 61; Slide No. 4134

Locus typicus — Bore hole No. NCSJ-4, Sample No. 112.

Diagnosis — Bilateral pollen grains. Size ranging from 69×65 μ-90×90 μ. Central body small, exine thin, laevigate, proximally bearing two ± reniform taeniae. Sacci diploxylonoid, proximally equatorially attached, distally inclined forming a straight and narrow sulcus. Sacci as well as taeniae finely intrareticulate.

Description — Pollen grains are bilateral, disaccate with notched lateral sides. Holotype measures 87×60 μ. Central body is distinct, very thin, small circular to subcircular in overall shape, 36×40 μ-52×52 μ in size; in holotype it measures 44×39 μ. Exine is thin, laevigate, two almost equal taeniae are present over the proximal face. Size of both the taeniae is equal to that of the central body. Sacci are diploxylonoid, subspherical; proximally equatorially attached but distally inclined forming a distinct, narrow and mostly straight sulcus. Sacci and taeniae are finely intrareticulate.

Comparison — Lueckisporites virkii (Pot. & Kl.) Leschik, 1954 has got a wider, ill defined sulcus, bigger central body and smaller body-sacci ratio. L. microgranulatus Klaus, 1963 possesses reniform taeniae, leaving a horizontally biconvex space over the central body and a wide sulcus. L. globosus Klaus, 1963 has vertically oval central body with smaller taeniae so as to have lateral empty spaces over central body. L. parvus Klaus, 1963 is smaller in size, sacci and taeniae appears to be of the same size. L. junior Klaus, 1963 is distinctively monosaccoid and distal sulcus appears to be ill defined.

Lueckisporites crassus sp. nov.

Pl. 5, Figs. 63, 64

1965 — Lueckisporites sp., Tiwari, Pl. 13, Fig. 119.

Holotype — Pl. 5, Fig. 63; Slide No. 4136

Diagnosis — Subcircular to bilateral pollen grains. Size ranging from 48×42 μ-88×70 μ. Central body thin, laevigate; proximally bearing two ± equal taeniae, coarse intrareticulate and leathery; sacci ± diploxylonoid; distal sulcus straight, wide to narrow; sacci coarse intrareticulate, intrareticulation of the same nature as of proximal taeniae; meshes and muri indistinct.

Description — Circular to bilateral pollen grains, mostly being subcircular with two opposite notches. Holotype measures 66×50 μ in size. Central body is thin, laevigate, circular to subcircular in overall shape, 38×40 μ-70×68 μ in size, in holotype it measures 40×50 μ. The body bears two reniform, ± equal taeniae over the proximal face. Usually both the taeniae are 2-7 μ apart from each other. ± 3 μ thick zone in usually present around the outer margin of each taeniae. The exine taeniae is thick and coarse intrareticulate. Sacci are usually slightly taller than the central body. Proximally the sacci are equatorially attached but distally nearer to the pole. The zone of saccus attachment is well defined on both the faces. Sulcus is distinct, ± straight, 5-20 μ wide. Sacci are coarse intrareticulate, usually the intrareticulation is of the same nature as in the taeniae; muri
and meshes are ill defined forming irregular coarse reticulation.

Comparison — *Lueckisporites crassus* sp. nov. compares favourably with *L. parvus* Klaus, 1963 in its overall shape, but the latter species has smaller size range and the size of taeniae and sacci is ± same. Other species of *Lueckisporites* differ from present species in having distinctly bilateral symmetry and thicker central body.

*Lueckisporites* sp.

*Pl. 5, Fig. 65*

**Description** — Pollen grain is bilateral, notched on both the lateral sides; 100×70 μ in size. Exine is thin and laevigate. Proximally central body bears two, ± equal taeniae; each taenia is frilled at its lateral end. Sacci are distinctly diplloxylonoid, more than a hemisphere; proximal attachment is equatorial but distally inclined forming a 5-28 μ wide, biconvex sulcus. Sacci exine is mediumly thick; fine intrareticulate with distinct muri and meshes.

**Remarks** — This specimen differs from all the known species of the genus *Lueckisporites* in having a bigger body — sacci ratio and a distinct biconvex sulcus.

*Genus — Taeniaesporites* (Lesch.) Klaus, 1963

*Genotype — Taeniaesporites krauseli* Leschik, 1955

**Taeniaesporites** sp.

*Pl. 5, Fig. 66*

**Description** — Pollen grains are bilaterally oval, 98×57 μ-130×60 μ in size. Central body is distinct, horizontally oval, measuring 66×50 μ-90×45 μ. Proximal face bears 4 horizontally extended exoexinal bands. Each band has mediumly intramicroreticulate exine. Sacci are usually diplloxylonoid and proximally equatorially attached; distally inclined and forming a distinct, ± straight, 20-22 μ wide sulcus. Sacci intrareticulate is of medium size.

**Remarks** — *Taeniaesporites* sp. compares favourably with *T. ortisei* Klaus, 1963 in its horizontally oval central body, number of taeniae and a straight wide sulcus. The number of such specimens recovered from present assemblage was less, hence they are described here as *Taeniaesporites* sp.

*Genus — Schizopollis* Venkat. & Kar, 1964

*Genotype — Schizopollis woodhousei* Venkatachala & Kar, 1964

**Remarks** — The exine of central body is intrapunctate in the presently studied specimens. A re-examination of the type material and genotype also reveals that the central body exine is micropunctate and not granulose sculptured as described by Venkatachala and Kar (1964).

*Schizopollis extremus* Venkat. & Kar, 1964

*Pl. 5, Fig. 67*

**Remarks** — The specimens compare very closely with the original description of the species except for the size, which is bigger in the presently studied specimens.

*Schizopollis distinctus* sp. nov.

*Pl. 5, Figs. 68-70*

**Holotype** — *Pl. 5, Figs. 68, 69; Slide No. 4138*

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 61+62

**Diagnosis** — Bilaterally oval pollen grains; known size 65×70 μ to 105×70 μ. Central body outline distinct, proximally bearing horizontal striations (a few branched), striations not reaching the body margin and ends joining those of the adjacent ones forming a ring like pattern; exine micropunctate, puncta restricted in arrangement. Sacci haploxylonoid, proximally equatorially attached; distally inclined and forming a distinct sulcus. The saccus base along the zone of saccus attachment convoluted due to variation in the extent of blowing up, giving varied appearances to pollen grains.

**Description** — Disaccoid pollen grains with horizontally or vertically oval overall shape. Holotype measures 84×64 μ. Central body outline is distinct, usually horizontally oval, sometimes vertically oval; measuring 46×65 μ-80×82 μ in overall size; in holotype it is 66×68 μ. Proximal horizontal striations are distinct, 8-11 in number (a few are branched) and do not reach upto the body margin, usually converge to form a ring like pattern. Exine between striations is intramicropunctate, puncta restricted in arrangement. Sacci are usually haploxylonoid, occasionally
SINHA — SPORAE DISPERSAE FROM JHINGURDAH SEAM

Diploxylonoid. Proximal attachment of sacci is equatorial, but distally inclined forming up to 15 μ wide, distinct but irregular sulcus. Sacci convoluted at and near the zone of saccus attachment giving varied appearance to pollen grains. Sacci exine is thick and coarse intramicropunctate.

**Comparison** — Schizopollis woodehousei Venkat & Kar, 1964 and Schizopollis disaccoides Venkat. & Kar, 1964 are characterized by a distinct central body with proximal reticuloid strations and an ill defined sulcus and hence, differ from the present species. S. extremus Venkat. & Kar, 1964 although possesses distinct horizontal strations is monosaccoid in appearance. All the more, the present species is distinguished by its distinct disaccoid shape, converging horizontal strations with restrictedly arranged puncta and coarse intrapunctate sacci.

Schizopollis jhingurdahiensis sp. nov.

**Holotype** — Pl. 5, Fig. 71, Slide No. 4140

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 121.

**Diagnosis** — Bilateral pollen grains; 60 μ-105 μ × 75 μ in size. Central body thick, subcircular, proximally bearing horizontal striations, which in the centre give rise to distinct, ± polygonal areas; exine micropunctate. Sacci usually diploxylonoid, leathery, thick, finely intrapunctate; sacci slightly convoluted at the well defined distal zone of the saccus attachment.

**Description** — Pollen grains are bilateral. Holotype measures 105 μ × 75 μ. Central body is distinct, thick walled, circular to subcircular in shape, 41 μ × 45 μ-60 μ × 55 μ in the holotype it measures 60 μ × 55 μ. Proximally it bears horizontal striations, which in the centre form ± polygonal areas. Exine is micropunctate on both the faces; usually puncta are restrictedly arranged. Rim around the central body is absent. Sacci are usually diploxylonoid, thicker than the central body, leathery, finely intrapunctate, extrema lineamenta (outer margin of sacci) is smooth; zone of saccus attachment is irregular, usually forming a distinct, broad to narrow sulcus; sacci are slightly convoluted at or near the place of saccus attachment on the distal face.

**Comparison** — Schizopollis jhingurdahiensis sp. nov. differs from S. extremus in being typically disaccoid in nature. S. woodehousei and S. disaccoides are though ± disaccoid in appearance, have saccus convolutions more pronounced and the reticuloid striations are ill defined. S. distinctus sp. nov. possesses distinctly circumscribed horizontal striations and ± diploxylonoid sacci with more pronounced convoluted sacci along the zone of saccus attachment. The present species is characterized by strations forming reticuloid pattern in the centre of the body and comparatively less convoluted sacci along or near the zone of saccus attachment.

Schizopollis sp.

**Description** — Pollen grain is bilateral, disaccoid; 78 × 60 μ in size. Central body is distinct, horizontally oval, 64 μ × 54 μ in size. Proximal striations are distinct, 11 in number; horizontal striations are connected by many vertical partitions, forming a ± reticuloid pattern, exine is intramicropunctate. Sacci are diploxylonoid and proximally ± equatorially attached. Distally sacci are inclined forming a distinct, ± 15 μ wide sulcus. Sacci base is convoluted forming many lobed sacci.

**Remarks** — The specimen differs from all the known species of the genus Schizopollis in having distinct horizontal striations with many vertical interconnections. Similarly organized pollen grains have also been noted in the type material of the genus from North Karanpura Coalfield.

**Genus** — Striatites (Pant) Bharad., 1962

**Genotype** — Striatites sewardii (Virkki) Pant, 1955

Striatites parvus Tiw., 1965

**Remarks** — Specimens compare with the holotype in all the morphographical characters.

Striatites tentulus Tiw., 1965

**Remarks** — Some of the specimens are smaller in size as compared to the original diagnosis. However, in other morphographic characters the present specimens compare closely with the holotype.
Remarks — The reticuloid striations are better developed in the present specimens than in the type material of Tiwari (1965).

**Striatites barakarensis** sp. nov.

**Holotype** — PI. 6, Figs. 77, 78

**Locus typicus** — Bore hole No. NCSJ-H, Sample No. 72.

**Diagnosis** — Bilateral pollen grains. Size range 60×40 μ-112×75 μ. Central body ± rhomboid with a distinct marginal rim. Horizontal striations 7-11, without any vertical partitions; exine microverrucose. Sacci diploxylonoid, distally inclined, forming a ± straight and narrow sulcus.

**Description** — Pollen grains are bilaterally oval in overall shape. Holotype measures 93×55 μ. Central body is distinct, ± circular to rhomboidal measuring 22×24-30 μ with equatorial rim around the body. Proximal striations are distinct, 5-8 in number, unbranched and without vertical partitions. Exine is microverrucose. Sacci are diploxylonoid, pitcher-shaped with a narrow neck. Proximally equatorially attached to central body, but distally inclined forming a narrow and straight sulcus, zones of saccus attachment not full length to central body. Sacci are fine intrareticulate.

**Genus — Lahirites** Bharad., 1962

**Genotype** — *Lahirites raniganjensis* Bharadaj, 1962

**Lahirites rarus** Bharad. & Sal., 1964

**Remarks** — The specimens compare favourably with those of Bharadwaj and Salujha (1964), except that a few specimens are slightly larger in size.

**Lahirites rotundus** Bharad. & Sal., 1964

**Remarks** — Present specimen resembles with the holotype, in most of the morphographic characters.

**Lahirites reticuloidus** sp. nov.

**Holotype** — PI. 6, Figs. 82, 83

**Locus typicus** — Bore hole No. NCSJ-3, Sample No. 106.

**Diagnosis** — Bilateral pollen grains. Size ranging from 60×55 μ-88×55 μ. Central body distinct, thick walled, ± subcircular, measures 45×45 μ-55×48 μ; proximal striations distinct, 5-8 in number, vertical partitions many, exine uniformly micropunctate. Sacci diploxylonoid, distal attach-
Description — Pollen grains are bilaterally oval in overall shape. Holotype measures 80 × 73 μ. Central body is distinct, slightly dense, big, ± subcircular, 50 × 45 in holotype. Proximal horizontal striations are distinct, 5-8 in number, usually a few are branched, vertical partitions many, more pronounced in the middle, forming ± reticuloid pattern. Exine is uniformly micropunctate. Sacci are diploxylonoid, ± hemispherical, distally sacci coming closer to each other forming a narrow ill defined sulcus. Sacci are fine intrapunctate to intrareticulate.

Comparison — Lahirites raniganjensis, the genotype, differs from the present species in having a comparatively small central body, less vertical partitions and a distinctly broad sulcus. Among the species described by Bharadwaj and Saluja (1964), L. singularis, L. parvus, and L. incertus differ from L. reticuloidus sp. nov., in having a distinct, broad marginal equatorial rim around the central body, apart from the other differences. L. parvus lacks vertical partitions in between the horizontal striations and L. rotundus has lesser number of vertical partitions and the equatorial rim is defined on two lateral ends. L. bokaroensis Tiw., 1965 has a bigger central body and horizontal striations are without vertical partitions. L. fractus Tiw., 1965 has a smaller central body with many vertical partitions and a distinct marginal rim. L. rhombicus Maithy, 1965 possesses a denser central body and the horizontal striations lack vertical partitions.

Lahirites barakarensis sp. nov.

Holotype — Pl. 6, Fig. 86; Slide No. 4146
Locus typicus — Bore hole No. NCSJ-4, Sample No. 8.
Diagnosis — Bilateral pollen grains; size range 71 × 54 μ-116 × 66 μ. Central body rhomboid to subcircular, marginal rim absent; 4-10 horizontal striations, many zig-zag irregular partitions forming a reticuloid pattern in between the horizontal striations; sacci diploxylonoid, distal sulcus ± straight narrow and well defined, sacci exine medium intrareticulate.

Description — Pollen grains are bilaterally oval in overall shape. Holotype measures 87 × 55 μ. Central body is distinct, ± rhomboid to subcircular, measuring 40 × 47 μ-65 × 60 μ; marginal rim is well defined. Proximal striations are 6-10 in number, a few striations are branched, vertical partitions are absent. Sacci are diploxylonoid; distal attachment is inclined forming a distinct, straight, usually wide, 2-10 μ sulcus. Sacci intrareticulations are medium.

Comparison — Present species can be compared with L. singularis Bharad. & Sal., 1965b as both of them possess a ± rhomboid to subcircular central body with a distinct marginal rim. However, the latter possesses vertical partitions which are absent in the former. Among the others species of Bharadwaj and Saluja (1965b), L. rarus has ± subcircular body without a marginal rim; L. incertus and L. rotundus have horizontal striations with vertical partitions. L. parvus has ± circular central body with a distinct rim and restrictedly arranged puncta. L. bokaroensis Tiw., 1965 as well as L. rhombicus Maithy, 1965 lacks the marginal rim around the central body. L. fractus Tiw., 1965 has horizontal striations with many vertical partitions.

Lahirites singraulensis sp. nov.

Pl. 6, Figs. 84, 85

Holotype — Pl. 6, Fig. 84, Slide No. 4150
Locus typicus — Bore hole No. NCSJ-4, Sample No. 81.
Diagnosis — Bilateral pollen grains. Size range 70 × 54 μ-132 × 75 μ; central body ± rhomboid with a distinct marginal rim; 5-11 proximal horizontal striations without any vertical partitions; exine uniformly micropunctate. Sacci diploxylonoid; distal sulcus wide, straight and distinct; sacci medium intrareticulate.

Description — Pollen grains are bilaterally oval in overall shape. Holotype measures 105 × 65 μ. Central body is distinct, ± rhomboid to subcircular, measuring 28 × 36 μ-58 × 52 μ. Marginal rim is usually absent, proximal striations are distinct, 4-10 in number, a few are branched. In between the horizontal striations many zig-zag partitions are present forming a reticuloid pattern. Sacci are diploxylonoid, proximal attachment is equatorial, distally inclined forming a ± straight and narrow sulcus. Sacci intrareticulation is medium.
Comparison — Present species can be distinguished from other species of *Lahirites* in having a ± rhomboid to subcircular central body with reticuloid pattern in between the horizontal striations. *Lahirites reticuloidus* differs from *L. barakarensis* sp. nov. in having many vertical partitions in between horizontal striations forming more pronounced reticuloid pattern in the centre of the body which is markedly denser too. *L. fractus* Tiw., 1965 possesses many vertical partitions and a distinct marginal rim. *Lahirites bokaroensis* Tiw., 1964, *L. parvus* Bharad. & Salujha, 1964 and *L. rhombicus* Maithy, 1965 lack partitions in between the horizontal striations. *L. rhombicus*, *L. incertus*, *L. rotundus* are characterized by the presence of few vertical partitions in between the horizontal striations thus differ from the present species.

*Lahirites rhombicus* Maithy, 1965 var. 
*junior var. nov.*

*Holotype* — Pl. 6, Fig. 88; Slide No. 4152.

*Locus typicus* — Bore hole No. NCSJ-4, Sample No. 68.

*Diagnosis* — Bilateral pollen grains. Size range 73×45 μ-112×78 μ. Central body thin, ± rhomboid, bearing 5-9 horizontal striations without any vertical partition, rim around central body absent. Exine finely micropunctate. Sacci diploxylonoid, distally inclined forming a distinct and wide sulcus, zones of saccus attachment being thickened.

*Description* — Pollen grains are bilaterally oval in overall shape. Holotype measures 100×65 μ. Central body is distinct, ± rhomboid, measuring 28×35 μ-50×60 μ; marginal rim is absent, in holotype it measures 40×36 μ. Proximal horizontal striations 5-9 in number; a few are rarely branched, vertical partitions are absent. Exine is finely, uniformly micropunctate. Sacci are diploxylonoid, proximally equatorially attached to central body, but distally it covers the body; sulcus is ill defined. Sacci appear to be intrapunctate.

*Comparison* — In the absence of distinct sacci these specimens differ from the genus *Lahirites*. In the absence of sufficient number of specimens a detailed study in the morphographic characters was not possible. Hence, these specimens have been provisionally placed under the genus *Lahirites*.

*Genus* — *Lunatisporites* (Leschik) Bharad., 1962

*Genotype* — *Lunatisporites acutus* Leschik, 1955
**Lunatisporites barakarensis** sp. novo

Holotype — Pl. 7, Fig. 93; Slide No. 4152

Locus typicus — Bore hole No. NCSJ-4, Sample No. 1.

Diagnosis — Bilateral pollen grains; size range 80 × 47 μ-167 × 110 μ. Central body vertically oval with narrow lateral ends. Exine thin, fine microreticulate; proximally bearing 5-8 horizontal striations. Sacci diploxylonoid, distal sulcus biconvex, Sacci intrareticulation medium.

Description — Pollen grains are bilateral in overall shape. Holotype measures 113 × 75 μ. Central body outline is distinct, vertically oval with narrow lateral ends; 40 × 40 μ-85 × 100 μ in size, in holotype it measures 60 × 55 μ. Exine is thin, fine microreticulate. The proximal horizontal striations are distinct, 5-8 in number, reaching up to the margins of the body. Sacci are diploxylonoid, notched on both the lateral sides, lateral continuations are very narrow. Distal attachment of sacci is full length, accompanied with semilunar folds in the body. Sulcus is biconvex, 8-23 μ wide. Sacci intrareticulation is medium sized.

Comparison — Lunatisporites fuscus Bharad., 1962 differs from present species in having a mediumly thick, horizontally oval central body with deeply grooved horizontal striations. Moreover, the sacci are also slightly thicker in the former and laterally join by narrow to wide ledges. L. notabilis Tiw., 1965 has a narrow sulcus with the secondary folds running along the zone of saccus attachment forming a dumb-bell shaped area. L. korbaensis Tiw., 1965 is distinguished by circular-rhomboid shape of the body, narrow, well defined sulcus and laterally continuous sacci.

Genus — Striatopodocarpites (Soritsch. & Sed.) Bharad., 1962

Genotype — Striatopodocarpites antiquus (Leschik) Potonie, 1958

Striatopodocarpites magnificus Bharad. & Sal., 1964

Pl. 7, Fig. 95

Remarks — In many specimens the number of horizontal striations is lesser as compared to the specimens of Bharadwaj and Salujha (1964).

Striatopodocarpites labrus Tiw., 1965

Holotype — Pl. 7, Fig. 96

Remarks — The present specimens compare closely with S. labrus in all the morphographical characters.

Striatopodocarpites crassus Tiw., 1965

Pl. 7, Fig. 97

Remarks — These specimens differ from the holotype of Striatopodocarpites crassus in having a slightly biconcave sulcus and a bigger size range, but for which they compare well with the holotype.

Striatopodocarpites brevis sp. novo

Pl. 6, Figs. 91, 92

Holotype — Pl. 6, Fig. 91; Slide No. 4154

Locus typicus — Bore hole No. NCSJ-4, Sample No. 122.

Diagnosis — Bilateral pollen grains. Size range from 45 × 28 μ-60 × 35 μ. Central body distinct, subcircular to oval. Proximal striations distinct, 3-6 in number; saccus proximally equatorially attached, distally inclined forming a wide sulcus.

Description — Pollen grains are bilateral. Holotype measures 56 × 40 μ. Central body is distinct, subcircular to oval in overall shape, 20 × 28 μ-35 × 40 μ in size. Proximal attachments are distinct, 3-6 in number, a few are branched, reaching up to the margin of the body. Sacci are usually slightly diploxylonoid. Proximal attachment of sacci is equatorial while distally it is inclined forming usually a straight and 5-7 μ wide sulcus. Sacci intrareticulation is fine.

Comparison — Present species can be distinguished from the other described species of the genus Striatopodocarpites by its smaller size. Even S. venustus Bharad. & Sal., 1965b which has also small size (66-74 μ) is bigger than the present species. The sulcus is also wider in S. venustus being 12-17 μ.

Striatopodocarpites ovalis sp. novo

Pl. 7, Figs. 98, 99

Holotype — Pl. 7, Fig. 98; Slide No. 4119

Locus typicus — Bore hole No. NCSJ-4, Sample No. 106.

Diagnosis — Bilateral; 58 × 62 μ-100 × 77 μ size; central body vertically oval with
acute lateral ends; 6-8 distinct proximal horizontal striations, exine fine microreticulate; sacci diploxylonoid; distal sulcus narrow and straight.

Description — Pollen grains are bilateral in overall shape. Holotype measures 58×62 μ. Central body is distinct, vertically oval with mostly acute lateral ends, measuring 34×45 μ-45×62 μ; exine is finely microreticulate. Proximal striations are distinct, 4-9 in number, usually an incomplete rim is present around the body. Sacci are distinctly diploxylonoid, ± subcircular with a wider sulcus, thus, differing from the present species. S. magnificus Bharad. & Sal., 1964 is bigger in size and the central body is ± subcircular with a wider sulcus. S. decorus Bharad. & Sal., 1964 although possesses rhomboid central body, its lateral ends are broad. S. diffusus Bharad. & Sal., 1964 is characterized by a thick central body with a diffused outline.

The present species can be distinguished from the other species by its vertically oval central body with acute lateral ends and a narrow, distinct sulcus.

**Striatopodocarpites subcircularis** sp. nov.  
**Pl. 7, Figs. 100, 101**

**Holotype** — Pl. 7, Fig. 100; Slide No. 4125  
**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 126.

**Diagnosis** — Pollen grains bilateral, size range 90×59 μ-110×80 μ; central body subcircular, proximally bearing 4-8 horizontal striations; exine fine microreticulate; sacci diploxylonoid, distally inclined forming a distinctly narrow slit like sulcus; sacci exine medium intrareticulate.

**Description** — Pollen grains are bilateral and notched on both the lateral sides. Holotype measure: 100×55 μ. Central body is distinct, ± subcircular, 50×45 μ-70×60 μ in size. Proximal striations are distinct, 5-8 in number, sometimes a few are branched; vertical partitions are absent; exine is fine microreticulate. Sacci are diploxylonoid, ± hemispherical; proximal attachment is equatorial but distally the sacci are inclined leaving a straight, ± 2 μ wide saccus free area over the body. Sacci intrareticulation is medium.

**Comparison** — Among the species described by Tiwari (1965), S. labrus has a distinct rim around the central body" and S. crass has a bigger size range and a wider sulcus, thus, differing from the present species. S. magnificus Bharad. & Sal., 1964 is bigger in size and the central body is ± subcircular with a wider sulcus. S. decorus Bharad. & Sal., 1964 although possesses rhomboid central body, its lateral ends are broad. S. diffusus Bharad. & Sal., 1964 is characterized by a thick central body with a diffused outline.

The present species can be distinguished from the other species by its vertically oval central body with acute lateral ends and a narrow, distinct sulcus.

**Genus — Faunipollenites** Bharadwaj, 1962

**Genotype** — Faunipollenites varius Bharadwaj, 1962

**Remarks** — After Faunipollenites had been instituted by Bharadwaj in 1962, Hart (1964, 1965) included this genus as a synonym of Protohaploxypinus (Samoil.) Hart, 1964, of which the genotype is P. latissimus (Luber & Valtz) Samoil., 1953. The description of P. latissimus given by Hart (1964) based upon his examination of the type material does not state positively the ill defined outline of the central body in it. Hart's figure of P. latissimus (HART, 1965; Fig. 53) shows a well defined outline of the central body and so also do all the other species of Protohaploxypinus illustrated by him (HART, 1965, Figs. 54-67). In this respect Faunipollenites tends to differ from the genotype of Protohaploxypinus significantly. Even otherwise Protohaploxypinus has been described from a different floral province than that of Faunipollenites. As such, this geographical and floral disparity may not be of much consequence taxonomically but in view of the growing realization that the Angara flora and Gondwana flora though superficially similar in their members are at total variance when details are considered. The absence of an ill defined central body in Protohaploxypinus as compared to its presence in Faunipollenites is significant. Unfortunately the paper of Luber and Valtz (1941) illustrating the diplotype of the genus (LUBER & VALTZ, 1941, PL. 13, Fig. 221) is not accessible to me. Hence, it is difficult to decide if Hart's figure of the genotype species is a correct representation to avoid any further confusion it is preferable to maintain Faunipollenites for the description of Indian species of the genus.
Faunipollenites varius Bharad, 1962
Pl. 7, Fig. 102

Remarks — Presently described specimens compare well in all the morphographic characters with the holotype.

Faunipollenites parvus Tiw., 1965
Pl. 7, Fig. 103

Remarks — The specimens resemble F. parvus in all the morphographical characters.

Faunipollenites perexiguus Bharad, & Sal., 1965
Pl. 7, Fig. 104

Remarks — The specimens compare with the holotype in overall shape but differ by having lesser, ill defined horizontal stria tion in the central body.

Faunipollenites singrauliensis sp. novo
Pl. 7, Figs. 105, 106

Holotype — Pl. 7, Fig. 105; Slide No. 4160
Locus typicus — Bore hole No. NCSJ-4, Sample No. 126.

Diagnosis — Horizontally oval, bilateral pollen grains. Size 64×50 μ-100×70 μ. Central body ill defined, proximally bearing well defined horizontal stria tions, 5-10 in number. Sac ci haploxylonoid, zone of distal saccus attachment diffused, a median vertical groove or slit present.

Description — Pollen grains are bilaterally oval. Holotype measures 95×67 μ. Central body outline is ill defined, apparently ± subcircular in shape, exine is finely microreticulate. Sac ci are haploxylonoid, proximal attachment is equatorial, distally it is inclined; zone of saccus attachment is ill defined. A median, vertical slit or groove is present, occasionally a fold along the groove may be present. Sac ci are medium intramicrosticulate.

Comparison — Faunipollenites varius Bharad. 1962 is characterized by the presence of an ill defined, broad sulcus. F. parvus Tiw., 1965 is smaller in size and F. perexiguus Bharadwaj & Sal., 1965 is ± subcircular in overall shape. The new species can be distinguished from other species of genus Faunipollenites by the presence of a median, vertical slit or a groove combined with ill defined zones of saccus attachment.

Infraturma — Rectistriati Bharad., 1962
Genus — Distriatites Bharad., 1962

Genotype — Distriatites bilateralis Bharadwaj, 1962

Remarks — The genera Distriatites Bharad., 1962 and Hamia pollenites Wils., 1962 are similar in important morphographical characters such as the occurrence of horizontal striations on the body proximally and vertical striations distally. Both the genera are dissacate and haploxylonoid. The only difference known is that in the genotype of Distriatites the sacci are only slightly smaller than the central body in height. This difference being minor as well as quantitative, for practical purposes the two genera are synonymous. Unfortunately, both the genera were published simultaneously in February 1962, hence, none can be considered as a synonym of the other. Some authors seem to think that Hamia pollenites has a priority over Distriatites following Hart (1966) who dated Bharadwaj’s publication as 1963. Hart (1964) considered Distriatites as a monstrosity while regarding Hamia pollenites as a normal genus. Evidently, misreporting and lack of critical evaluation of facts, has led to some confusion. In view of the stalemate I prefer to use the genus Distriatites for the spores of Gondwana continents, till the two authors agree to a joint proposal regarding the two genera.

Distriatites distinctus sp. novo
Pl. 8, Figs. 107, 108

Holotype — Pl. 8, Fig. 107; Slide No. 4165
Diagnosis — Pollen grains bilateral, bisaccate; size 110×55 μ-30×50 μ; central body outline distinct, oval to subcircular, proximally as well as distally bearing a number of horizontal and vertical striations respectively; sac ci haploxylonoid but ± equal in length to central body, zone of saccus attachment usually distinct, ± 90 μ wide.

Description — Pollen grains are bilateral and normally bisaccate. Holotype measures 105×62 μ. Central body outline is distinct and oval to subcircular in shape; exine is thin, finely microreticulate, proximally bearing 6-15 horizontal striations, distally 4-5 vertical striations present at right angles to the proximal ones. Sac ci are haploxylonoid, ± equal in length to the
central body, distal zone of sacci attachment are subequatorial and well defined, leaving a ± 50 μ wide saccus free area. Sacci are medium intrareticulate.

Comparison.—As compared to D. bilateris, D. distinctus, is normally smaller in size and has comparatively more striations proximally and less distally.

**Distriatites indicus** sp. nov.

*Pl. 8, Figs. 109, 110*

1964 — *Distriatites* sp., Tiwari, *Pl.* 7, Fig. 162

**Holotype** — *Pl.* 8, Fig. 110; Slide No. 4169

**Locus typicus** — Bore hole No. NCSJ-4, Sample No. 114.

**Diagnosis** — Pollen grains bilateral, bisaccate; size 90×68 μ-125×70 μ. Central body outline distinct to diffuse, vertically elongated with rounded or ± beaked lateral ends; proximally as well distally bearing a number of horizontal and vertical striations respectively; sacci haploxylonoid, distal zones of sac attachment ± diffuse, saccus free area ± 65 μ wide.

**Description** — Miospores are bilateral, bisaccate. Holotype measures 125×70 μ. Central body outline is distinct to diffuse; shape is vertically oval to subcircular, lateral ends are pointed or rounded, usually one pole is beaked, 50×65 μ-78×84 μ in size. Exine is thin, fine microreticulate, sometimes micropunctate. The body bears proximally 7-11 horizontal striations and distally 4-6 vertical striations at right angles to proximal ones. Sacci are markedly haploxylonoid, height being less than that of the body and are subequatorially attached to the central body distally. Zones of saccus attachment are usually not clear; no distinct sulcus is seen, the area being striated. Sacci intrareticulation is fine to medium. The place of saccus attachment on each of the lateral side is characterized by dents or shallow notches.

Comparison — *Distriatites bilateralis* Bharad., 1962 is characterized by the presence of ± 7 striations on both the faces. *D. insolitus* Bharad. & Sal., 1964 is distinctly diploxylonoid and has only upto 25 μ distal saccus free area. The present species is distinguished by the presence of distinctly haploxylonoid sacci and 7-11 proximal, 4-6 distal striations. Although *D. indicus* sp. nov. is ± of the same size as *D. distinctus*, it differs in having vertically oval central body with protruding lateral ends, ill defined sulcus and by the presence of two notches at each of the lateral sides.

**Infraturma** — *Disaccimoleti* Klaus, 1963

**Genus** — *Illinites* (Kos.) Pot. & Kl. in Pot. & Kr., 1954

**Genotype** — *Illinites unicus* Kosanke, 1950

*Illinites hennellyi* (Hart, 1960) comb. nov.

*Pl. 8, Fig. 111*

1960 — *Vestigisporites hennellyi* Hart, 1960; *Pl.* 2, Fig. 23

1960 — *Vestigisporites disectus* Hart, 1960; *Pl.* 2, Fig. 28

1965 — *Illinites delasaucei*, Tiwari, 1965; *Pl.* 6, Figs. 163, 164

**Holotype** — *Vestigisporites hennellyi*, Hart, 1960; *Pl.* 2, Fig. 23

**Remarks** — Tiwari (1965) described some specimens as *Illinites delasaucei* (Pot. & Kr.) Grebe & Schw., 1962 which appear to be different from the holotype. Moreover, *I. delasaucei* is a species of Northern Hemisphere. *Vestigisporites hennellyi* Hart, 1960 an existing species, resembles very closely with the present specimens and with the specimens of Tiwari referred to *Illinites delasaucei*. Hence, the specimens described by Tiwari (1965; *Pl.* 7, Figs. 163, 164) are transferred to *Illinites hennellyi* (Hart) comb. nov., *Vestigisporites hennellyi* Hart, 1960 and *Vestigisporites disectus* Hart, 1960 are also transferred to *I. hennellyi* as they do not show any significant deviation.

**Infraturma** — *Disacciatrileti* (Leschik) Pot., 1958

**Genus** — *Vesicaspora* (Schemel) Wils. & Venk., 1963

**Genotype** — *Vesicaspora wilsonii* Schemel. 1951

*Vesicaspora distincta* Tiw., 1965

**Remarks** — Distinct central body along with wide sulcus make the present specimens quite comparable to the holotype.

*Vesicaspora ovata* (Balme & Henn.) Wils. & Venkat., 1963

*Pl.* 8, Fig. 112

**Remarks** — Bharadwaj 1962 had put this species in *Sulcatisporites*. But with the
later restudy of *Vesicaspora* by Wilson and Venkatachala (1963) such pollen grains should be preferably described under *Vesicaspora*.

**Vesicaspora brevis** sp. nov.

*Holotype* — Pl. 8, Figs. 113, 114

*Locality* — Vesicaspora brevis. Vesicaspora brevis — Bore hole No. NCSJ-4, Sample No. 83.

**Diagnosis** — Bilaterally oval; size 31×22 μ-42×26 μ; central body well defined; sacci distally inclined forming an ill defined sulcus, sacci continuing on two lateral sides.

**Description** — Miospores are bilaterally oval in overall shape. Holotype measures 38×36 μ. Central body is ill defined, outline being diffuse, apparently vertically oval, 16×19 μ-28×32 μ in size; exine is finely microreticulate. The sacci are distally inclined forming a ± diffuse sulcus, straight or oblique edged, 4-6 μ wide when straight, 1-12 μ when oblique, sacci laterally connected, less than a hemisphere, exine finely intrareticulate.

**Comparison** — Present species differs from *Vesicaspora wilsonii* Pant and *V. indica* Tiw., 1965 in being distinctly smaller in size. *V. distincta* Tiw., 1965 is also larger in size along with a distinct central body. The present species is characterized by its smaller size and ill defined central body.

**Genus — Sulcatisporites** (Leschik) Bharad., 1962

**Genotype** — *Sulcatisporites interpositus* Leschik, 1955.

*Sulcatisporites maximus* (Hart) Singh, 1964

*Pl. 8, Fig. 115*

**Remarks** — The specimens from present assemblage compare closely with the holotype.

*Sulcatisporites barakarensis* Tiw., 1965

*Pl. 8, Fig. 116*

**Remarks** — The specimens studied here are quite comparable with the holotype in all the morphographical characters.
Comparison — The species described here differs from *Ibisporites diplosaccus* Tiw., 1968 by having an indistinct central body and narrow furrow like sulcus.

Subturma — *Monocplates* Ivers. & Troels-Smith, 1950
Infraturma — *Intortes* (Naum.) Pot., 1958

Genus — *Vittatina* (Luber) Tschudy & Kos., 1966

Genotype — *Vittatina subsaccata* Samoilovich, 1953.

*Vittatina africana* Hart, 1966

Pl. 8, Fig. 120

Remarks — The specimens described by Hart (1966) as *V. africana* resemble the present specimens in their general organization.

*Vittatina sp.*

Pl. 8, Fig. 121

Description — Pollen grains are bilateral and oval. Size ranges from 25 X 46 μ-64 X 48 μ, 12-15 horizontal striations are present on the proximal surface, exine is thin, intrapunctate.

Remarks — The present pollen grains do not compare with any of the known species. The number of such specimens were less and their correct taxonomic position could not be assessed.

Genus — *Ginkgocycadophytus* Samoil., 1953

Genotype — *Ginkgocycadophytus caperatus* (Luber) Samoilovich, 1953.

cf. *Ginkgocycadophytus* sp.

Pl. 8, Fig. 122

Description — Pollen grains are elongated with narrow ends. Size ranges from 56 X 34 μ-72 X 40 μ. Folded along the direction of longer axis, nature of colpus is not defined. Exine is thin, fine and negative sculptured.

Remarks — Present specimens resemble with cf. *Ginkgocycadophytus* sp. of Tiwari (1965) in the ill defined nature of colpus due to folding. However, it is very likely that these specimens are normal species of *Ginkgocycadophytus*.

*Ginkgocycadophytus* sp.

Pl. 8, Fig. 123

Description — Pollen grains are elongated with narrow, rounded ends. Size ranges from 34 X 22 μ-44 X 28 μ. Colpus is narrow in the middle, 5-10 μ wide towards ends. Exine is finely microgranulose.

Remarks — As the number of such specimen was less, a detailed morphographic study and comparison could not be made.

Genus — *Distriamonocolpites* Bharad. & Sinha, 1969a


*Distriamonocolpites circularis* sp. nov

Pl. 8, Fig. 124

Holotype — Pl. 8, Fig. 124; Slide No. 4105.

*Locus typicus* — Bore hole No. NCSJ-4, Sample No. 13.

Diagnosis — Pollen grains subcircular, size ranging from 75 X 83 μ-140 X 115 μ. Colpus distinct, ± biconcave. Exine thick, inatramicropunctate; proximally bears 6-11 distinct horizontal striations, distal striations faint, 2-4 μ in number.

Description — Pollen grains are ± sub-circular in overall shape. Holotype measures 100 X 108 μ. Colpus is distinct, biconcave, extending from one lateral end to the other, narrower in the middle and broadens towards the lateral ends, 5-35 μ wide. Exine is thick, finely intrapunctate; ± 2 μ thick along the edge of colpus and outer exine of the pollen grain. Proximal striations are distinct, 6-11 in number. Striation ends are joined by vertical connections forming a closed ring. Distal striations are 2-4 in number, one or two on either side of colpus, faint running along the direction of colpus.

Comparison — *Distriamonocolpites ovalis* sp. nov. differ from present species in having a distinctly oval overall shape.

REFERENCES


EXPLANATION OF PLATES

(All photomicrographs magnified 500 x)

PLATE 1

1. Leiotriletes brevis sp. nov., Holotype; Slide No. 4093.
2. L. brevis sp. nov., Slide No. 4093.
5. cf. Planisporites sp. A, Slide No. 4095.
11. H. pseudoseptatus sp. nov. Slide No. 4099.
12. H. pseudoseptatus sp. nov., Holotype. Slide No. 4100.
15. B. jhingurdahiensis sp. nov., Holotype; Slide No. 4102.
16. B. jhingurdahiensis sp. nov. Slide No. 4102.
17. B. crassus sp. nov. Slide No. 4103.
18. B. crassus sp. nov., Holotype. Slide No. 4103.
19. B. baculatus sp. nov., Holotype. Slide No. 4104.
20. B. baculatus sp. nov. Slide No. 4105.
22. Microbaculispora bokaroensis Tiw. Slide No. 4106.
23. M. indica sp. nov., Holotype. Slide No. 4107.
24. M. indica sp. nov. Slide No. 4107.
26. P. tuberculatus sp. nov. Slide No. 4109.
27. P. subtilis sp. nov., Holotype. Slide No. 4110.
28. P. subtilis sp. nov. Slide No. 4112.

PLATE 2

29. Latosporites colliensis (Belm. & Henn.) Bharad. Slide No. 4111.
32. Parasaccites filiformis Tiw. Slide No. 4114.
33. P. bilateralis Tiw. Slide No. 4115.
34. P. singrauliensis sp. nov., Holotype. Slide No. 4116.
35. P. singrauliensis sp. nov. Slide No. 4117.
36. P. irregularis sp. nov. Slide No. 4118.
37. P. irregularis sp. nov., Holotype. Slide No. 4119.

PLATE 3

40. P. irregularis sp. nov., Holotype. Slide No. 4121.
41. P. irregularis sp. nov. Slide No. 4120.
42. Tubercisaccites jhingurdahiensis sp. nov., Holotype. Slide No. 4121.
43. T. jhingurdahiensis sp. nov. Slide No. 4122.
44. Divarisaccus stregeri Bose & Kar. Slide No. 4123.
45. Streimonsaccites sp. Slide No. 7124.

PLATE 4

46. Korobpollenites sp. Slide No. 4125.
47. Primuspollenites singrauliensis sp. nov., Holotype. Slide No. 4126.
48. P. singrauliensis sp. nov. Slide No. 4126.
49. P. distinctus sp. nov., Holotype. Slide No. 4127.
50. P. distinctus sp. nov. Slide No. 4127.
51. P. brevicorpus sp. nov., Holotype. Slide No. 4128.
52. P. brevicorpus sp. nov. Slide No. 4131.
53. P. ovatus sp. nov., Holotype. Slide No. 4129.
54. P. ovatus sp. nov. Slide No. 4132.
55. Primuspollenites sp. Slide No. 4130.
56. Rhizomaspora singula Tiw. Slide No. 4125.
58. Platysaccus sp. A. Slide No. 4132.
59. Platysaccus sp. B. Slide No. 4133.

PLATE 5

60. Canaitisporites sp. Slide No. 4105.
61. Lueckisporites singrauliensis sp. nov., Holotype. Slide No. 4134.
62. L. singrauliensis sp. nov. Slide No. 4136.
63. Lueckisporites crassus sp. nov., Holotype. Slide No. 4136.
64. L. crassus sp. nov. Slide No. 4136.
65. Lueckisporites sp. Slide No. 4136.
66. Tenuisporites sp. Slide No. 4139.
68. S. distinctus sp. nov., Holotype. Proximal view. Slide No. 4138.
69. S. distinctus sp. nov., Holotype, Distal view. Slide No. 4138.
70. S. distinctus sp. nov. Slide No. 4139.
71. S. jhingurdahiensis sp. nov., Holotype. Slide No. 4140.
72. S. jhingurdahiensis sp. nov. Slide No. 4141.
73. Schizopolis sp. Slide No. 4143.
74. Striatites parvus Tiw. Slide No. 4141.
75. S. ventralis Tiw. Slide No. 4142.
76. S. reticuloidus Tiw. Slide No. 4143.

PLATE 6

77. Striatites barakaharensis sp. nov., Holotype. Slide No. 4144.
78. S. barakaharensis sp. nov. Slide No. 4145.
80. Lahirites rarus Bharad. & Sal. Slide No. 4147.
81. L. rotundus Bharad. & Sal. Slide No. 4148.
82. *L. reticuloidus* sp. nov., Holotype. Slide No. 4147.
83. *L. reticuloidus* sp. nov. Slide No. 4149.
84. *L. singrauliensis* sp. nov., Holotype. Slide No. 4150.
85. *L. singrauliensis* sp. nov. Slide No. 4151.
86. *L. barakarensis* sp. nov., Holotype. Slide No. 4146.
87. *Lahirites barakarensis* sp. nov. Slide No. 4152.
89. *Lahirites* sp. Slide No. 4159.
90. cf. *Lahirites* sp. Slide No. 4153.
91. *Striatopodocarpites brevis* sp. nov., Holotype. Slide No. 4154.
92. *S. brevis* sp. nov. Slide No. 4155.

**PLATE 7**
93. *Lunatisporites barakarensis* sp. nov., Holotype. Slide No. 4152.
94. *L. barakarensis* sp. nov. Slide No. 4156.
96. *S. labrus* Tiw. Slide No. 4158.
98. *S. ovalis* sp. nov., Holotype. Slide No. 4119.
99. *S. ovalis* sp. nov. Slide No. 4159.
100. *S. subcircularis* sp. nov., Holotype. Slide No. 4125.
101. *S. subcircularis* sp. nov. Slide No. 4160.
105. *F. singrauliensis* sp. nov., Holotype. Slide No. 4160.
106. *F. singrauliensis* sp. nov. Slide No. 4164.

**PLATE 8**
108. *D. distinctus* sp. nov. Slide No. 4168.
109. *D. indicus* sp. nov. Slide No. 4166.
110. *D. indicus* sp. nov., Holotype. Slide No. 4169.
111. *Illinites henneleyi* (Hart) comb. nov. Slide No. 4167.
113. *V. brevis* sp. nov. Slide No. 4169.
114. *V. brevis* sp. nov., Holotype. Slide No. 4094.
117. *S. minutus* sp. nov., Holotype. Slide No. 4172.
118. *Ibisporites jhingurdaensis* sp. nov. Holotype. Slide No. 4171.
119. *I. jhingurdaensis* sp. nov. Slide No. 4170.
120. *Vittatina africana* Hart. Slide No. 4155.
121. *Vittatina* sp. Slide No. 4102.
122. cf. *Ginkgocycadophytus* sp. Slide No. 4093.
123. *Ginkgocycadophytus* sp. Slide No. 4172.
124. *Distriamonocolpites circularis* sp. nov., Holotype. Slide No. 4105.
VEENA SINHA - PLATE 8

THE PALAEOBOTANIST, VOL. 19

107 108 109 111
112 110 113 114
117 123 116
120 118 119
115 122 124

B. S. J. F
LIBRARY
Acc. No. 41029