ABSTRACT

The present paper consists of palynological investigation of a Raniganj exposure near Lungatoo, in Hazaribagh district, Bihar, India. 34 dispersed spore-pollen genera and 47 species have been recovered from the material and only the new species have been systematically described. The histograms have been drawn to show the distribution of different spore-pollen genera in the assemblage and have been compared with the other known Indian Upper Permian assemblages.

INTRODUCTION

The material for the present investigation was collected from a Raniganj exposure near the bend of the river running across Lungatoo—Burkagaon village about two miles north, north-east of Burkagaon Police Station (see Text-Fig. 1). The outcrop is exposed on the west side of the river and its lithology is as follows:

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium</td>
<td>2'-3'</td>
</tr>
<tr>
<td>Massive, coarse grained, micaceous sandstone</td>
<td>28'-30'</td>
</tr>
<tr>
<td>Micaceous, greyish, buff coloured shale (C2A)</td>
<td>1'</td>
</tr>
<tr>
<td>Massive, compact, sandstone</td>
<td>3'</td>
</tr>
<tr>
<td>Carbonaceous, compact shale (C2B)</td>
<td>6'</td>
</tr>
<tr>
<td>Massive, coarse grained sandstone</td>
<td>8'-6&quot;</td>
</tr>
<tr>
<td>Micaceous, dark-greyish, loose shale intergrading into sandstone (C2C)</td>
<td>1'-6&quot;</td>
</tr>
<tr>
<td>Micaceous sandstone with sandy shale</td>
<td>1'-9&quot;</td>
</tr>
<tr>
<td>Micaceous shale occasionally with fine clay (C3D)</td>
<td>2'-2&quot;</td>
</tr>
<tr>
<td>Light-dark brown, ferruginous shale with compact sandy nature</td>
<td>2'-3&quot;</td>
</tr>
<tr>
<td>Compact carbonaceous shale with plant impressions (C3E)</td>
<td>8'-10&quot;</td>
</tr>
<tr>
<td>Yellow, reddish yellow, ferruginous, compact silt-stone</td>
<td>4&quot;</td>
</tr>
</tbody>
</table>

Shale, upper part compact, carbonaceous, lower part micaceous (C3F) | 8'-1'-2"
Fine grained sandstone | 2'-4"
Compact, carbonaceous shale with micaceous particles (C3G) | 2'-2'-5"
Fine grained sandstone | 2'-5"
Compact, carbonaceous shale (C3H) | 2'
Carbonaceous shale with occasional ferruginous partings (C3I1-C3I3) | 5'-6'
Medium grained sandstone | 2'
Carbonaceous shale with interspersed bands of sandy shale (C3J1-C3J4) | 4'
Coarse grained, micaceous sandstone | 4'
Carbonaceous shale (C3K) | 2'
Fine grained sandstone | 1'
Carbonaceous shale (C3L) | 1'
Buff-coloured, micaceous shale (C3M) | 6'
Fine grained sandstone | 1'
Carbonaceous shale (C3N) | 3'
Fine grained sandstone (lense) | 1'
Carbonaceous shale, rich in mica (C3O) | 3'-8'
Buff-coloured shale (C3P) | 1'-1'-5'
Coarse grained, massive sandstone | 4'
Carbonaceous shale (total thickness unknown), exposed (C3Q) | 1'-1'-5'

About 20-30 grams of material was treated with commercial Nitric acid (40%) for 3-10 days. When the material was fully macerated it was further treated with Potassium hydroxide solution (5%) for 3-5 minutes. Siliceous elements in the macerates were dissolved with Hydrofluoric acid (40%) by standing the material for 3-7 days. The residues were washed several times in water and was centrifuged and dried on cover glass with Polyvenyl alcohol. The cover glass was finally mounted in
Text-fig. 1 — Location of the exposure from where the material was collected.

Systematic Palynology

The species of the dispersed spore-pollen genera recovered from the present material.
have been systematically arranged as follows:

Anteturma — *Sporites* H. Potonié, 1893
Turma — *Triletes* (Reinsch) Potonié & Kremp, 1954
Subturma — *Azonotriletes* Luber, 1935
Infraturma — *Laevigati* (Bennie & Kidston) Potonié, 1956

Genus *Punctatisporites* (Ibrahim)
Potonié & Kremp, 1955

Species recorded here:

Infraturma — *Apiculati* (Bennie & Kidston)
Potonié, 1956

Genus *Apiculatisporis* Potonié & Kremp, 1956

Species recorded here:

Genus *Cyclogranisporites* Potonié & Kremp, 1954

Species recorded here:

Genus *Cyclobaculisporites* Bharadwaj, 1955

Species recorded here:

Genus *Lophotrliteles* (Naumova) Potonié & Kremp, 1954

Species recorded here:

1. *Anapiculatisporites* Potonié & Kremp, 1954

Species recorded here:

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**TEXT-Fig. 2** — Lithology of the exposure.
THE PALAEOBOTANIST

**Genus* Plicatipollenites* Lele, 1964
Species recorded here:

**Genus* Virkkipollenites* Lele, 1964
Species recorded here:

**Genus* Monosaccireticuloidi* Tiwari, 1965
**Genus* Barakarites* Bharadwaj & Tiwari, 1964
Species recorded here:

**Genus* Thymospora* (Kosanke) Wilson & Venkatachala, 1963
Species recorded here:
1. *Thymospora raniganjensis* sp. nov. (Pl. 1, Fig. 7).
  
  **Holotype**—Pl. 1, Fig. 7. Size 22 × 18 μ.
  
  **Type Locality**—Lungatoo, North Karanpura basin, Bihar; Raniganj Stage (Permian).

  **Diagnosis**—Spores oval, 18-27 μ × 22-41 μ, exine verrucose, verrucae well developed, 2-4 μ long. Monolete extending three-fourths along the longitudinal axis.

  **Description**—Spores mostly oval, sometime subcircular or bean shaped; exine 1.5-2 μ thick, verrucose, verrucae 2-4 μ long, closely placed, evenly distributed. Monolete mostly well developed, sometime obscured by sculptural elements, generally not extending more than three-fourths longitudinally.

  **Comparison**—*Thymospora thiessenii* (Kosanke) Wilson & Venkatachala (1963) is comparable to the present species in size range but is distinguished by its nature of sculptural elements. *T. gondwanensis* Bharadwaj & Saluja (1964) is distinguished by its subcircular shape and comparatively smaller size of the verrucae.

  **Remarks**—*Thymospora* sp. described by Venkatachala and Kar (1968a) from the Barakar exposures near Badam, North Karanpura basin seems to belong to the present species.

**Anteturma**—*Pollenites R. Potonié, 1931

**Turma**—*Saccites* Erdtman, 1947

**Subturma**—*Monosaccites* (Chitailey) Potonié & Kremp, 1954

**Infraturma**—*Apertacorpus* Lele, 1964

**Genus* Leavigatosporites* (Ibrahim)
Schopf, Wilson & Bentall, 1944

Species recorded here:

**Genus* Punctatosporites* Ibrahim, 1933
Species recorded here:

**Genus* Thymospora* (Kosanke) Wilson & Venkatachala, 1963
Species recorded here:
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**Genus* Plicatipollenites* Lele, 1964
Species recorded here:

**Genus* Virkkipollenites* Lele, 1964
Species recorded here:

**Genus* Monosaccireticuloidi* Tiwari, 1965
**Genus* Barakarites* Bharadwaj & Tiwari, 1964
Species recorded here:

**Genus* Divarissaccus* Venkatachala & Kar, 1966a
Species recorded here:

**Genus* Potoniésporites* (Bhardwaj) Bharadwaj, 1964
Species recorded here:
1. *Potoniésporites raniganjensis* sp. nov. (Pl. 1, Figs. 8-9).

  **Holotype**—Pl. 1, Fig. 9. Size 110 × 54 μ, central body 72 × 54 μ.

  **Type Locality**—Lungatoo, North Karanpura basin, Bihar; Raniganj Stage (Permian).

  **Diagnosis**—Monosaccate, oval-elliptical, central body strongly horizontally oval, granulose—laevigate, monolete not extending more than half of central body, semilunar folds present on each side. Saccus intrareticulate.

  **Description**—Pollen grains mostly oval with slight constriction in one side of the lateral sides in some specimens, 54-60 μ × 96-110 μ. Central body dense, 50-54 μ × 70-72 μ, exine 1.5-2 μ thick, mostly granulose, grana ± 5 μ, more or less closely placed. Monolete ill developed, surrounding semilunar folds present on both sides in most of the specimens. Proximal attachment of saccus to central body equatorial, distally saccus enclosing the central body completely. Saccus coarsely intrareticulate, mesh-size 1.5-2.5 μ.

  **Comparison**—*Poloniésporites concinnus* Tiwari (1965), *P. triangulatus* Tiwari (1965)
Text Fig. 3 — Distribution of the various spore-pollen genera recovered from the present material.
and *P. barreli* Tiwari (1965) are distinguished from the present species by their larger size, subcircular-oval shape and in the absence of strongly horizontally oval central body.

**Infruturma — Aletiscacti Leschik, 1956**

**Genus Densipollenites Bharadwaj, 1962**

Species recorded here:

**Subturma — Disaccites Cookson, 1947**

**Infruturma — Podocarpoiditi** Potonié, Thomson & Thiergart, 1950

**Genus Cuneatisporites Leschik, 1955**

Species recorded here:

**Infruturma — Disaccmonoletes Klaus, 1963**

**Genus Limitisporites Leschik, 1956**

Species recorded here:

**Infruturma — Striatitii (Pant) Bharadwaj, 1962**

**Genus Striatites (Pant) Bharadwaj, 1962**

Species recorded here:

**Genus Verticipollenites Bharadwaj, 1962**

Species recorded here:

**Genus Lahiritites Bharadwaj, 1962**

Species recorded here:

**Genus Hindipollenites Bharadwaj, 1962**

Species recorded here:

**Genus Strotersporites Wilson, 1962**

Species recorded here:

**Genus Striatoarceites (Zoricheva & Sedova) Sedova, 1956**

Species recorded here:

**Genus Harnipollenites Wilson, 1962**

Species recorded here:

**Genus Corisaccites Venkatachala & Kar, 1966b**

Species recorded here:

**Genus Sulcatisporites (Leschik) Bharadwaj, 1962**

Species recorded here:

**Subturma — Polysaccites Cookson, 1947**

**Genus Trochosporites Wilson, 1962**

Species recorded here:

**Turma — Plicates (Naumova) Potonié, 1960**

**Subturma — Polytypicites Erdtman, 1952**

**Genus Ephedripites Bolkhovitina, 1953**

Species recorded here:
Genus *Gnetaceae pollenites* Thiergart, 1938

Species recorded here:

Genus *Welwitschiapites* Bolkovitina, 1953

Species recorded here:

Subturma — *Monocolpites* Iversen & T roels-Smith, 1950

Subturma — *Intories* (Naumova) Potonié, 1958

Genus *Ginkgocycadophytus* Samoilovich, 1953

Species recorded here:

Subturma — *Striacolpites* Bose & Kar, 1966

Infaturma — *Monostriocolpites* Bose & Kar 1966

Genus *Fusacolpites* Bose & Kar, 1966

Species recorded here:

Infaturma — *Distriocolpites* Bose & Kar, 1966

Genus *Decussatisporites* Leschik, 1955

Species recorded here:

*Incertae Sedis*

Genus *Guttulapollenites* (Goubin)
Venkatachal, Goubin & Kar, 1967

Species recorded here:
1. *Guttulapollenites hannahicus* (Goubin)
Venkatachal, Goubin & Kar, 1967.

**DISCUSSION**

*Palynological composition* — The present palynological assemblage comprises 34 spore-pollen genera representing trilete, monolet, monosaccate, bisaccate, polysaccate, polyccic and monocollate pollen. In all the eight samples counted here (*Text-Figs. 3 & 4*) there is an overwhelming dominance of bisaccate pollen contributing 68.96 percent. Among them, the striae bisaccate genera like *Strotersporites*, *Striatolpiceites*,

![Distribution of the different spore-pollen groups in the assemblage.](image)
Striatites and Laherites are more frequent than the nonstriate ones. Monosaccate pollen grains except in one sample (C3O) are fairly well represented (5–20 per cent). Densitopollenites is most common while Plicatipollenites, Virkipollenites, Barakarites, Divariscus and Potomicaspores are rare. Trilete spores are not very common and they do not represent more than 9 per cent in any of the samples studied here. Apiculatisporis, Cyclocuscopisporis and Lophotriletes are generally met within the count. Monolete spores are rare and their contribution varies from 0.4 per cent in the assemblage. Among them Leucitogasporites seems to be more frequent than Punctatosporites and Thymospora. Polyplacite pollen are also rare (0.5 per cent) and represented by Ephedrites, Gnetaceapollenites, Watzchachiapites and Guttulapollenites. Monocolpate pollen do not come within the count though Ginkgoecycadophytes, Fusacolpites and Decussisporites have been recovered.

Palynological comparison — A comparison of the present palynological composition with that of the Raniganj Coalfield described by Bharadwaj (1962), Bharadwaj and Saluja (1964, 1965a, 1965b) and Saluja (1965) shows that the genera like Eu- punctatosporites, Ricaspores, Indospora and Gondisporites are conspicuous by their absence in the material studied here. Moreover, the trilete spores in the various seams studied by them are very well represented both in quality as well as quantity while they are insignificant in the present assemblage. The bisaccate pollen in both the assemblages are quite dominant and most of the genera are common. Mention may, however, be made here that the bisaccate pollen are absolutely dominant in the present assemblage (as high as 96 per cent) while they have not been recorded in such prolific percentage in the Raniganj Coalfield. Monosaccate pollen grains are also found comparatively in less number in the latter while the monolette spores provide a far better representation.

These facts perhaps point out that the present assemblage does not closely resemble with that of the Raniganj assemblage of the Raniganj Coalfield studied by Bharadwaj et al. (l.c.). The present assemblage, however, approximates in the percentage frequency of the spore-pollen genera histogramed by Bharadwaj, Sah and Tiwari (1965) from the Barren Measures Succession of Jharia Coalfield, Bihar. Mention may, however, be made here that the genera like Leio- triletes, Gondisporites, Indotriulares, Rhizomaspora and Vesicaspora recorded by them are not found in the present material.

From these comparisons it appears that the palynological composition of the section at Longatoo closely resembles the Barren Measures Succession (l.c.) than that of the Raniganj Coalfield (Raniganj Stage) of the Lower Gondwanas of India. It may be possible that this represents the lowermost part of the Raniganj Stage.

ACKNOWLEDGEMENT

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REFERENCES


**EXPLANATION OF PLATE**

(All photomicrographs are enlarged ca. × 500)

**PLATE 1**


7. *Thymospora ranigunjensis* sp. nov. Slide no. 2448.


