

Palynological dating of Supra-Barakar formations in Son Valley Graben

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The Pali Formation was so far considered to be barren of coal. Recently a one meter thick coal seam has been reported in the Middle Pali in the subsurface. Palynological analysis of this coal-bearing stratum has revealed the presence of palynotaxa, viz., *Densipollenites*, *Faunipollenites*, *Striatopodocarpites*, *Striatites* and *Scheuringipollenites*. Strata supposed to be younger to Pali in the outcrop have yielded the genera—*Gondisporites*, *Densipollenites* and *Striatopodocarpites*. It shows that these beds are of Late Permian age. At the same time, some taxa, like *Lundbladispora*, *Playfordiaspora*, *Guttulapollenites*, *Satsangisaccites* and *Nidipollenites* are also present in this assemblage giving it a younger aspect, i.e., Early Triassic. It is, therefore, suggested that these sediments were deposited during Permian/Triassic time probably closer to Early Triassic.

Key-words—Palynology, Supra-Barakar, Son Valley, Early Triassic (India).

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सारांश

सोन घाटी द्रोणिका में बराकार-उपरिशाथी शैल-समूहों का परागाणविक कालनिर्धारण

राम-अवतार

पाली शैल-समूह अभी तक कोयले से विहीन समझा जाता था। अभी हाल में मध्य पाली में एक उपसतह में एक मीटर मोटी कोयले की सीम मिली है जिसके परागाणविक विश्लेषण से *डेन्सिपोलिनाइडिस*, *फौनीपोलिनाइडिस*, *स्ट्रुआटोपोडोकार्पाइडिस*, *स्ट्रुआटाइडिस* एवं *शयोरिंगीपोलिनाइडिस* नामक वर्गों की उपस्थिति व्यक्त हुई है। इस दृश्यांश से पाली से अल्पायु के स्तरों में *गोन्डिस्पोराइडिस*, *डेन्सिपोलिनाइडिस* एवं *स्ट्रुआटोपोडोकार्पाइडिस* नामक प्रजातियाँ उपलब्ध हुई हैं। इससे यह व्यक्त होता है कि ये संस्तरों अनन्तितम परमी की हैं। साथ ही साथ इस समुच्चय में *लुन्ब्लाडिस्पोरा*, *प्लेफोर्डियास्पोरा*, *गुट्टुलापोलिनाइडिस*, *सत्संगीसेक्काइडिस* एवं *निदिपोलिनाइडिस* नामक कुछ अन्य वर्गक भी मिले हैं जिससे इसकी प्रारम्भिक त्रिसंधी आयु इंगित होती है। अतएव यह प्रस्तावित किया गया है कि ये अवसाद परमी/त्रिसंधी काल में, सम्भवतया प्रारम्भिक त्रिसंधी में निक्षेपित हुए थे।

THE age of Pali and Parsora formations in the Son Graben has been a debatable matter since long. On the basis of floral and faunal assemblage, the Pali Formation has been dated as Late Permian to Early Triassic (Feistmantel, 1882; Chatterjee & Roy Chowdhury, 1974). Similarly, the age of Parsora Formation in the Johilla Coalfield has been considered to be Late Permian to Early Jurassic (Feistmantel, 1882; Cotter, 1917; Seward, 1932; Fox, 1931; Lele, 1964; Shah *et al.*, 1971).

The occurrence of spore and pollen assemblages in the Pali (in bore-core), and the overlying strata (in outcrop)—earlier considered as Parsora Formation—in Johilla Coalfield is significant. Palynological assemblages from the Middle Pali Formation in bore-core JHL-27A and from outcrops pertaining to the youngest Pali Formation, earlier mapped as Parsora (Tiwari & Ram-Awatar, 1986, 1987), have given important clues for the age of these beds.

Lately, a number of bore-holes have been drilled by the Geological Survey of India in this region. Based on the subsurface data, it has been proved that Pali Formation (total thickness 1,500 m) is divisible into three lithological units, viz., Upper, Middle and Lower Pali.

The Parsora Formation, overlying the Pali Formation, has been variously named in the past, such as, Mahadevas (Hughes, 1881), Transitional bed (Feistmantel, 1882), Supra-Barakar (Hughes, 1884), Parsora Bed (Cotter, 1917), Parsora Group (Sahni & Rao, 1956) and Parsora Stage (Lele, 1964).

The Parsora rocks are characterised by coarse-grained sandstone, violet claystone, sandy claystone; mudstones are mottle in shades of violet, lilac and red, which vary in thickness from a few centimeter to as much as 7 meters. The sandstone are well-bedded and highly crossed-stratified.

PALYNOLOGICAL ASSEMBLAGE

Palynological assemblage from Pali—Palynology of bore-hole JHL-27A has been reported by Tiwari and Ram-Awatar (1986, pp. 252, 255).

Palynological Assemblage from outcrop—Earlier this area was mapped under Parsora Formation. Tiwari and Ram-Awatar (1987, p. 106) have recorded the pollen and spores which it is now believed that these taxa are not from Parsora Bed but from the Upper Pali. Important taxa are illustrated on plates 1 and 2.

Age of assemblage

From histogram 1 in Tiwari and Ram-Awatar (1986), it appears that in palynological Assemblage-A (Pali Formation), the striate-disaccate, i.e., *Faunipollenites*, *Striatopodocarpites*, *Labirites* and *Striatites* are dominant elements, alongwith non-striate disaccates. Therefore, the Pali Assemblage

broadly compares with that of Raniganj Formation (Bharadwaj & Tiwari, 1977). The Late Permian age for this bed is further supported by the presence of indicator taxa illustrated on Plate 1.

The palynological Assemblage-B, recovered from the out-crop samples exposed between Dargaon and Salaia villages contains a variety of palynofossils. The dominating elements are *Densipollenites*, *Gondisporites*, *Striatopodocarpites*, *Faunipollenites*, *Crescentipollenites* which qualify these beds to be of Late Raniganj age (Bharadwaj, Tiwari & Anand-Prakash, 1979). In addition to the above taxa, the genera like *Lundbladispora*, *Falcisporites*, *Navalesporites*, *Guttulapollenites*, *Alisporites*, *Nidipollenites* and *Satsangisaccites* are also present which are definite indicators of still younger aspect, i.e., Early Triassic, for the bed. Therefore, the affinity with Late Permian on one hand and early phase of Triassic on other is evident, which makes it clear that it has a Permo/Triassic transitional aspect (Maheshwari & Banerji, 1975; Bharadwaj & Tiwari, 1977; Rana & Tiwari, 1980).

CONCLUSION

The palynoflora found in the subsurface, i.e., Pali Formation, is closely comparable to that of Raniganj Formation. The beds exposed in the north, beyond in the Johilla River Section on the Railway Bridge (Sample no. C7 & C7/1; Tiwari & Ram-Awatar, 1987, map 1) contain a palynoflora which has Permo-Triassic transitional aspect. These outcrop beds were earlier grouped in the Parsora Formation (Jhingran, 1980), but recent field studies have revealed that the Pali Formation has been repeated near Dargaon Village along Johilla River (Dr N. D. Mitra, pers. Comm. 1988). The lithological characteristics of the samples investigated for palynological studies also suggest their affinity with the Pali Formation, because they are black

PLATE 1

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All photomicrographs are enlarged Ca × 500 unless otherwise mentioned; Leitz Microscope no. 636107.

1. *Distriatites bilateralis* Bharadwaj, 1962
2. *Scheuringipollenites barakarensis* Tiwari, 1973
3. *Brachysaccus* sp. Mädlar, 1964
4. *Parasaccites distinctus* Tiwari, 1965
5. *Callumispora paliensis* Tiwari & Ram-Awatar (in press)
6. *Microbaculispora tentula* Tiwari, 1965
7. *Brevitriletes communis* Bharadwaj & Srivastava emend. Tiwari & Singh, 1981
8. *Microfoveolatispora trisina* (Balme & Hennelly) Bharadwaj, 1962
9. *Faunipollenites varius* Bharadwaj, 1962
10. *Striatites subtilis* Bharadwaj & Salujha, 1964
11. *Ginkgocycadophytus novus* Srivastava, 1970
12. *Lunatisporites pellucidus* Maheshwari & Banerji, 1975
13. *Crescentipollenites fuscus* (Bharadwaj) Bharadwaj, Tiwari & Kar, 1974
14. *Laevigatosporites colliensis* (Balme & Hennelly) emended Venkatachala & Kar, 1968
15. *Osmundacidites senectus* Balme, 1963
16. *Sabnites gondwanensis* Pant emended. Tiwari & Singh, 1984
17. *Rhizomaspora indica* Tiwari, 1965
18. *Densipollenites indicus* Bharadwaj, 1962
19. *Parasaccites korbaensis* Bharadwaj & Tiwari, 1964

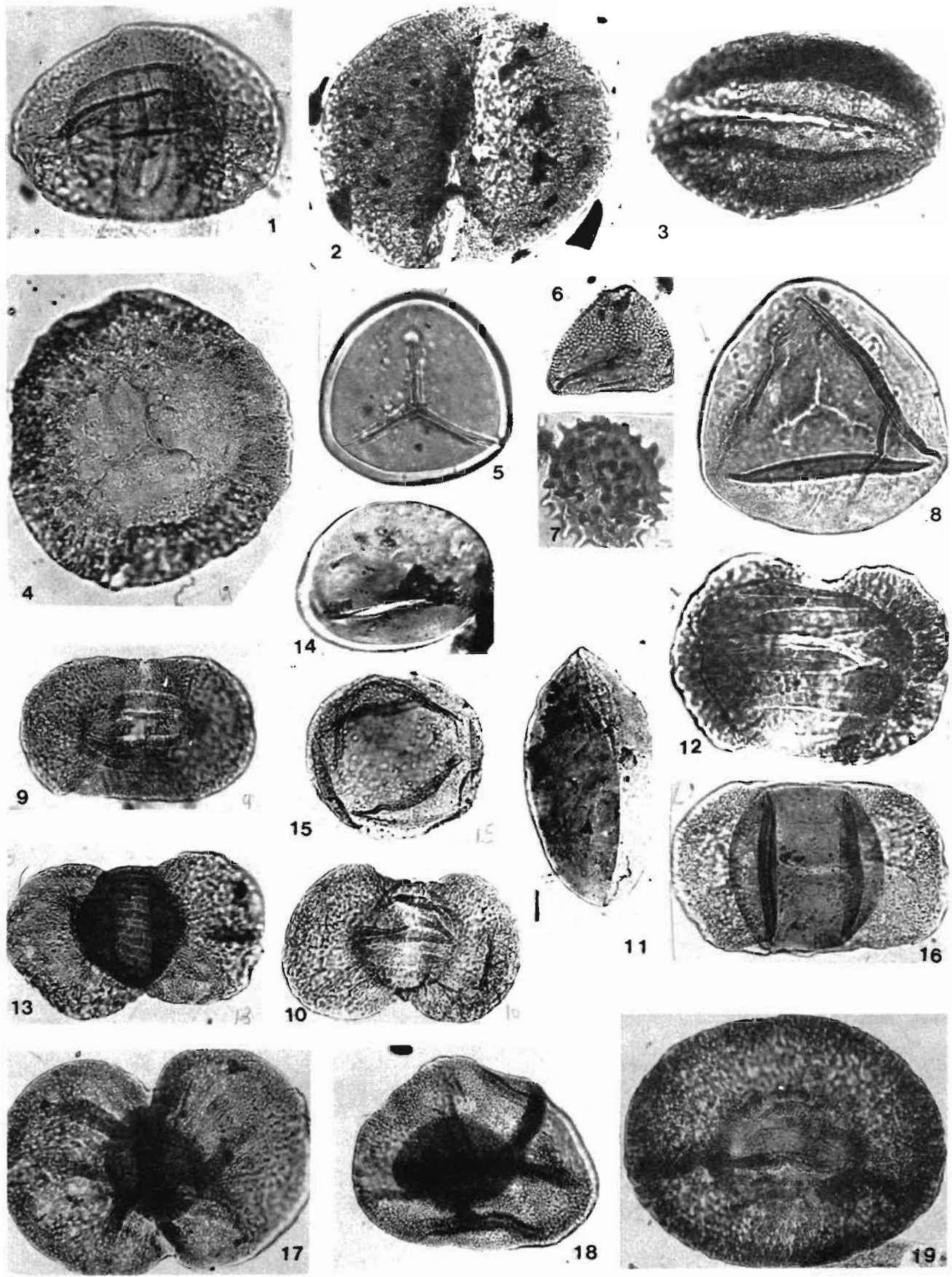


PLATE 1

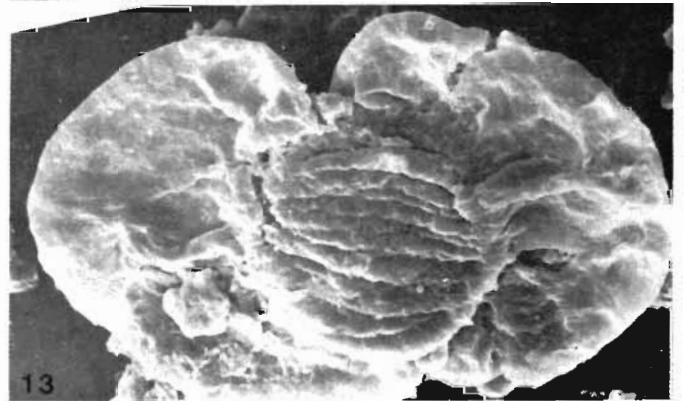
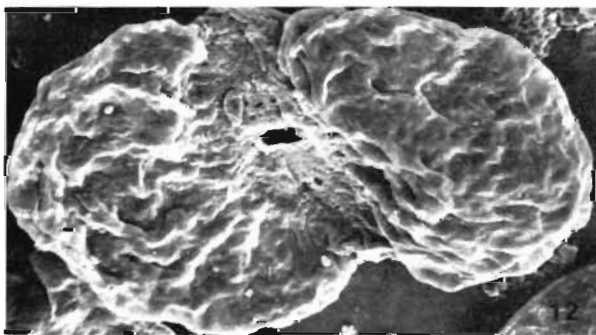
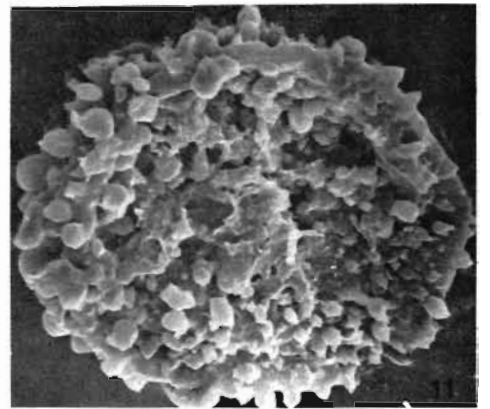
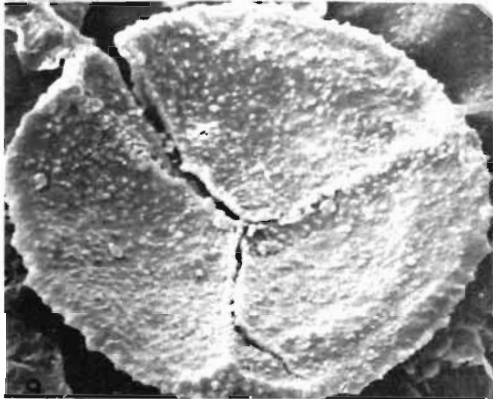
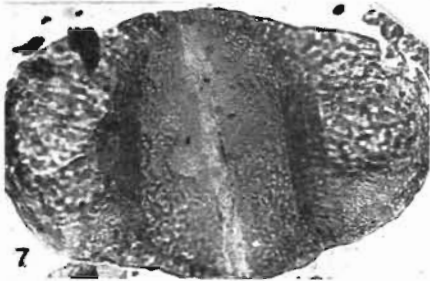
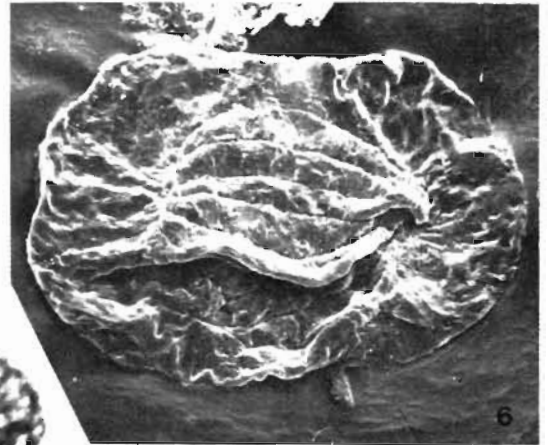
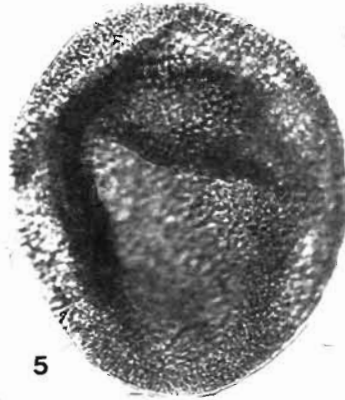
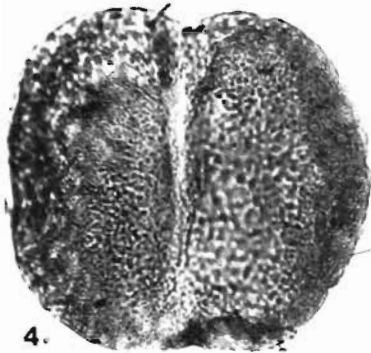
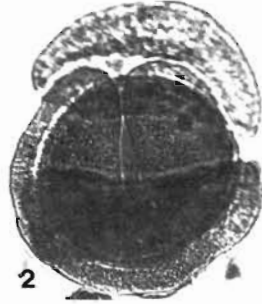
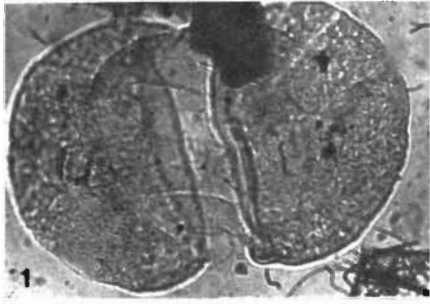


PLATE 2

micaceous shale, and not violet, red ferruginous, coarse-grained sandstone typical of Parsora. The spores and pollen found in these outcrops also support their affinity with Pali Assemblage, although a younger aspect is evident.

This implies that the Pali Formation could be equated with the Barren Measures in the lower part, the Raniganj in the middle part and the Raniganj/Panchet in the upper part. The so-called Parsora in the Johilla River Section, near Dargaon and Salaia across the rail bridge in the north, has an affinity with Pali and represents a Permo/Triassic transitional flora. However, more detailed study of this succession as well as that of typical Parsora is required for precise dating.

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PLATE 2

All photomicrographs are enlarged Ca × 500 unless otherwise mentioned

1. *Lunatisporites* sp. Maheshwari & Banerji, 1975
2. *Lueckisporites* Potonié & Klaus, 1963
3. *Labirites rarus* Bharadwaj & Salujha, 1965
4. *Scheuringipollenites barakarensis* (Tiwari) Tiwari, 1973
5. *Densipollenites magnicarpus* Tiwari & Rana, 1981
6. *Faunipollenites varius* Bharadwaj, 1962
7. *Satsangisaccites nidpurensis* Bharadwaj & Srivastava, 1969
8. *Falcisporites stabilis* Balme, 1970
9. *Lundbladispora brevicula* Balme, 1963
10. *Weylandites indicus* Bharadwaj & Srivastava, 1969
11. *Osmundacidites senectus* Balme, 1963
12. *Nidipollenites monoletus* Bharadwaj & Srivastava, 1969
13. *Striatites* sp. Bharadwaj, 1962