

PALYNODATING OF COAL-BEARING STRATA NEAR KUNDA PAHARI, PACHWARA COALFIELD, RAJMAHAL BASIN, JHARKHAND, INDIA

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ABSTRACT

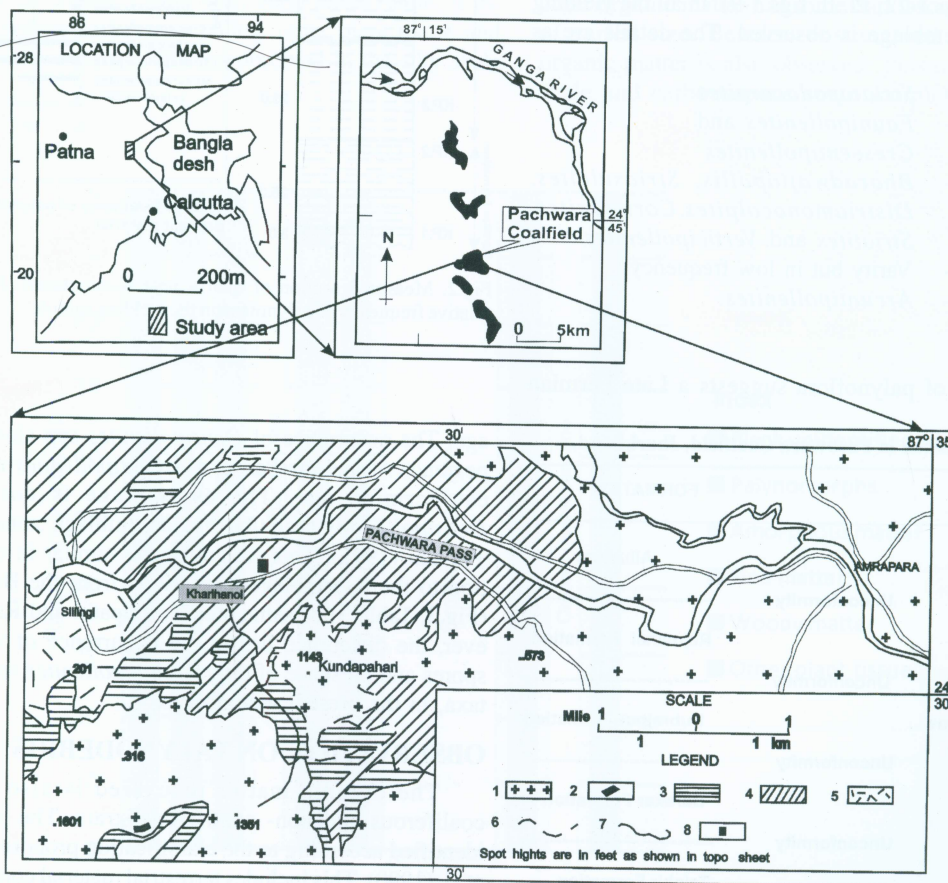
The palynological analysis, of carbonaceous lithofacies from a quarry near Kundapahari, Pachwara Coalfield, Rajmahal Basin reveals presence of *Densipollenites magnicarpus* Palynozone correlatable with the palynoassemblage from Raniganj Formation of Damodar Basin. A Late Permian age is indicated for the strata presently studied. The samples, mainly arenaceous, from Dubrajpur Formation are barren of spores.

Keywords: Palynodating, Palynofacies, Permian, Rajmahal Basin, India

INTRODUCTION

The Rajmahal Coalfields form a group of detached Barakar basins aligned more or less in a north-south stretch covering an area of about 208 sq.km. The principal exposures of the Damuda rocks from north to south are - Hura, Chuperbhita, Pachwara, Mahugarhi, Brahmani and Birbhum coalfields. All

are bounded to the west against Archeans by a north-south fault and capped by Rajmahal Traps to the east. The Pachwara Coalfield lies in the central part of Rajmahal Basin. The coal measure representing Barakar Formation rests directly on Precambrian rocks and are overlain by Dubrajpur Formation or Rajmahal Traps. They lie in the Bansloi river valley basin (Raja Rao 1987). The coal exploration in this coalfield has proved



- | | | | |
|--------------------|----------------------|----------------------------|---------------------------------|
| 1. Basalt | } Rajmahal Formation | 3. Dubrajpur Formation | 4. Barakar Formation |
| 2. Inter trappeans | | 5. Archean granite complex | 6. Inferred contact |
| | | 7. Observed contact | 8. Location of measured section |

Fig. 1. Lithostratigraphic map of part of Pachwara Coalfield, Jharkhand showing samples location.

existence of ten coal seams. All the seams are considered to be within the Barakar Formation (Sengupta et al., 1993). The sub-surface strata in the Borehole RJP-49 drilled near the Chirudih Village have shown presence of Late Permian palynoflora in the upper part of conventionally identified Barakar Formation and Early Triassic palynoflora in the Dubrajpur Formation (Tripathi and Ray 2005). In sequel to the palynodating of coal bearing sediments the palynological study was done in the samples from a quarry near Kundapahari in Pachwara Coalfield. The general geological succession in Pachwara Coalfield is as given in Table 1.

MATERIAL AND METHODS

The present material is from a quarry near Kundapahari (Fig.1). This section is approximately 5 m thick. The basal contact is not exposed. The section (Fig.2) starts with the coaliferous strata and is 0.28 m thick. Here no plant mega fossils are seen. The coal bearing strata is overlain by the ferruginous sandstone and thin shale bands. In this part also no mega fossils are observed. The fine argillaceous facies (Table-2) were processed for the recovery of spore and pollen.

PALYNOLOGICAL OBSERVATION

The yield of spore –pollen in most of the samples is rare but rich in other black organic matter. Only one sample has common yield of palynomorphs which permitted the quantitative analyses. The other samples were analysed for the qualitative composition of the palynoflora. The preservation of palynomorphs is fair to good (Pl. I, figs.1-12; Pl. II, figs.1-9). In all the yielding samples only one assemblage is observed. The details are as given below

- Dominant taxa - *Striatopodocarpites*
- Subdominant taxa - *Faunipollenites* and *Crescentipollenites*
- Other taxa - *Bharadwajipollis*, *Striasulcites*, *Distriamonocolpites*, *Corisaccites*, *Striatites* and *Verticipollenites*
- Triletes - Varsity but in low frequency
- Marker taxa - *Arcuatipollenites*

PALYNODATING

The composition of palynoflora suggests a Late Permian

Table 1: Geological succession in Pachwara Coalfield, Jharkhand.

AGE	FORMATION
Recent to sub - recent	Alluvium
-----	Unconformity
E.Cretaceous	Rajmahal Formation
-----	Unconformity
E.Triassic to E.Cretaceous	Dubrajpur Formation
-----	Unconformity
Early Permian	Barakar Formation
-----	Unconformity
Early Permian	Talchir Formation
-----	Unconformity

P r e c a m b r i a n

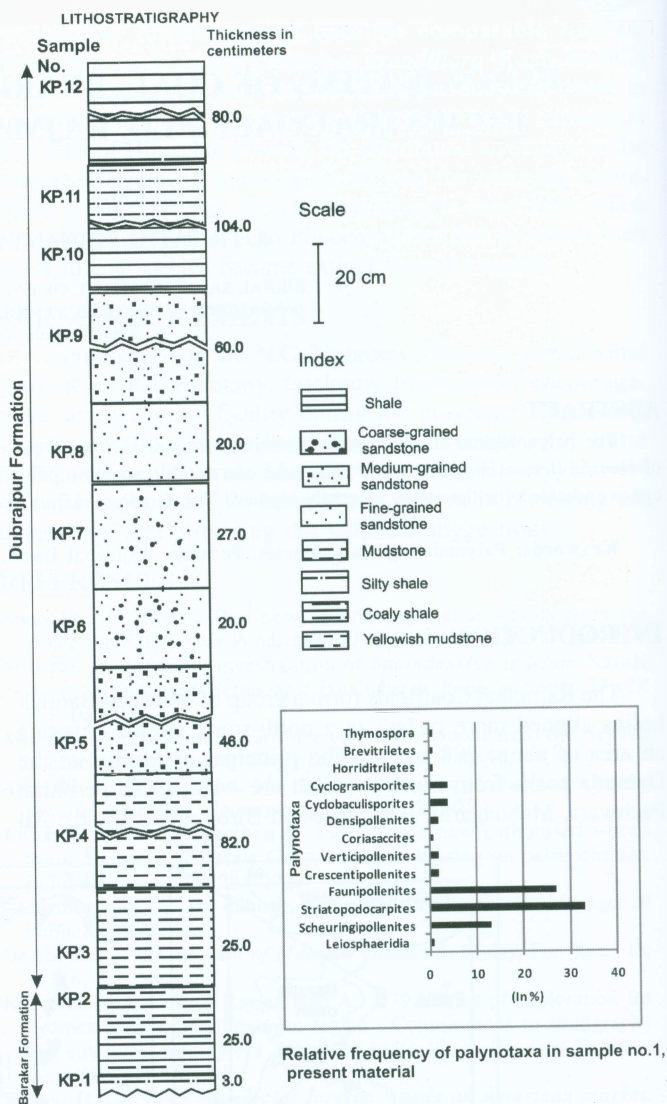


Fig.2. Measured section of quarry near Kundapahari, Jharkhand showing relative frequency of palynotaxa in the yielding sample.

age. The occurrence of *Densipollenites* spp along with the appearance of age marker taxa *Arcuatipollenites* indicates the latest Permian age. The assemblage is correlatable with *Densipollenites magnicarpus* assemblage zone of Tiwari and Tripathi (1992). This assemblage is similar in overall composition to the Assemblage-I described from the Borehole RJP- 49 (Fig.3, Table 3) of same area by Tripathi and Ray (2005). However, the difference lies in the occurrence of variety of trilete spores and presence of only *Arcuatipollenites* sp., an age marker taxa, in the present assemblage.

OBSERVATION ON PALYNODEBRIS

The organic matter recovered is also studied in the coaliferous and non- coaliferous strata. The palynodebris are identified according to the classification proposed by Van Bergen et al. (1990). This includes terrestrial material comprising of spore, pollen, wood, cuticle, other plant tissues, and fresh water algae; marine algae, microforum tests and structure less organic matter. The composition of palynodebris in the present study shows

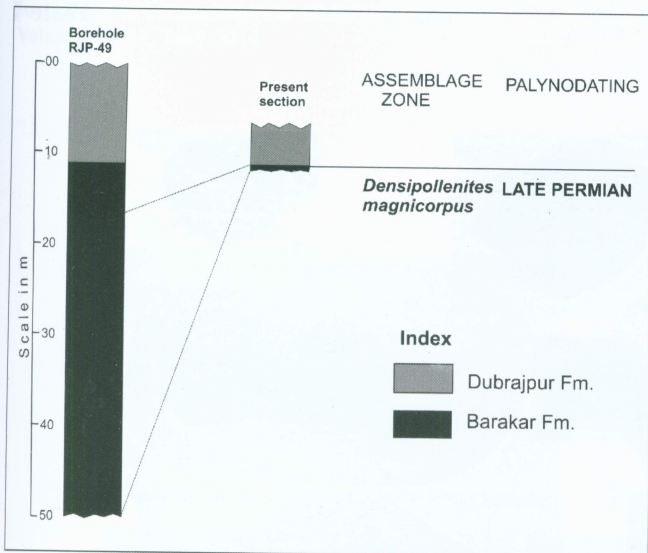


Fig. 3. Correlation of surface and sub surface palynoflora.

that all the samples are rich in terrestrial matter. The marine algae or microforam is totally absent. The amorphous matter is very low in quantity. The black unidentifiable matter, wood, other plant tissues and fine organic matter is better represented than spore and pollen. In all, five palynofacies could be identified (Plate III, Table 2).

Unit-I

This is rich in organic matter with good preservation. It includes golden yellow spores and pollen, other plant tissue and black to brown wood pieces. This is observed in the silty shale sample.

Table 2: Yield of spore and pollen, and palynofacies unit in samples from quarry near Kundapahari, Pachwara Coalfield, Rajmahal Basin, Jharkhand.

S.no.	Sample no.	Lithology	Remarks	Palynofacies unit
1	KP-1	Silty shale	Palynomorphs very rich, organic matter rich	Unit I
2	KP-2	Coaly shale	Palynomorphs rare, organic matter rich	Unit II
3	KP-3	Carbonaceous Shale	Palynomorphs absent, organic matter rich	
4	KP-4	Yellowish mudstone	Palynomorphs absent, organic matter rich	Unit III
5	KP-5	Yellowish coarse grained Sst	Palynomorphs absent, organic matter rich	Unit IV
6	KP-6	Fine grained Sst.	Palynomorphs very rare, organic matter rich	Unit V
7	KP-7	Yellowish Sst.	Palynomorphs absent, organic matter rare	Poor yield
8	KP-8	Yellowish Sst.	Palynomorphs absent, organic matter rare	
9	KP-9	Ferruginous Sst.	Palynomorphs absent, organic matter rare	
10	KP-10	Shale	Palynomorphs very rare, organic matter rich	Unit V
11	KP-11	Silty shale	Palynomorphs absent, organic matter rich	Unit III
12	KP-12	Shale	Palynomorphs absent, organic matter rich	Unit III

Unit-II

In this palynofacies, the palynomorphs are very rare. The other organic matter has some dark brown to black wood pieces of varied size. Besides, unstructured light yellow to brown organic matter is also observed. This unit is recorded in coaly shale and carbonaceous shale samples.

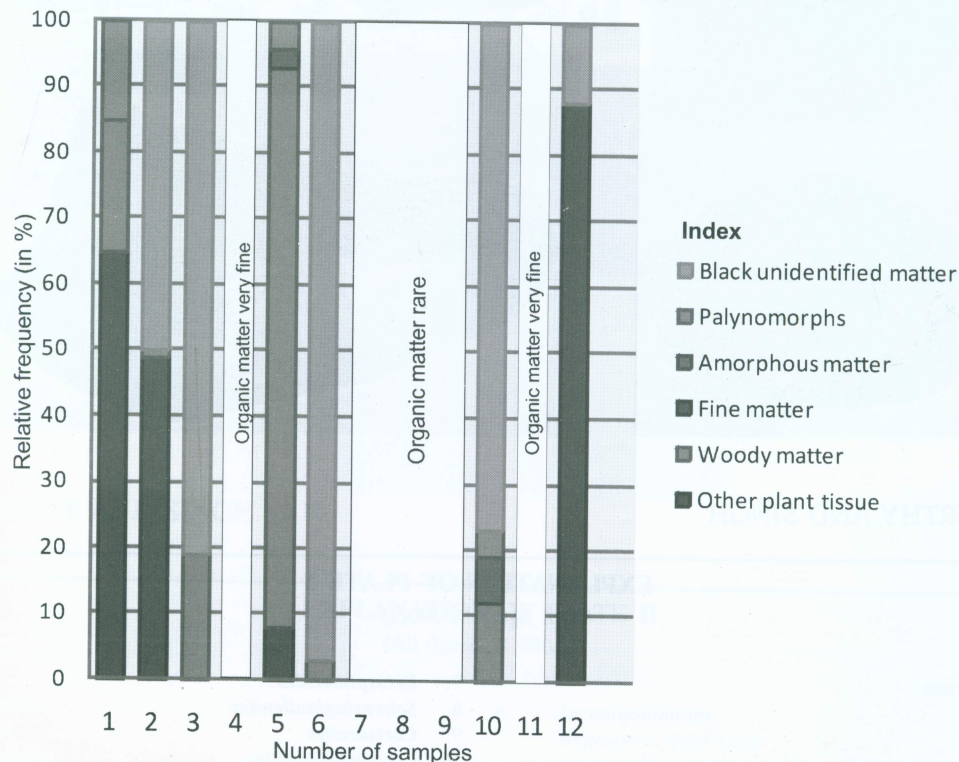
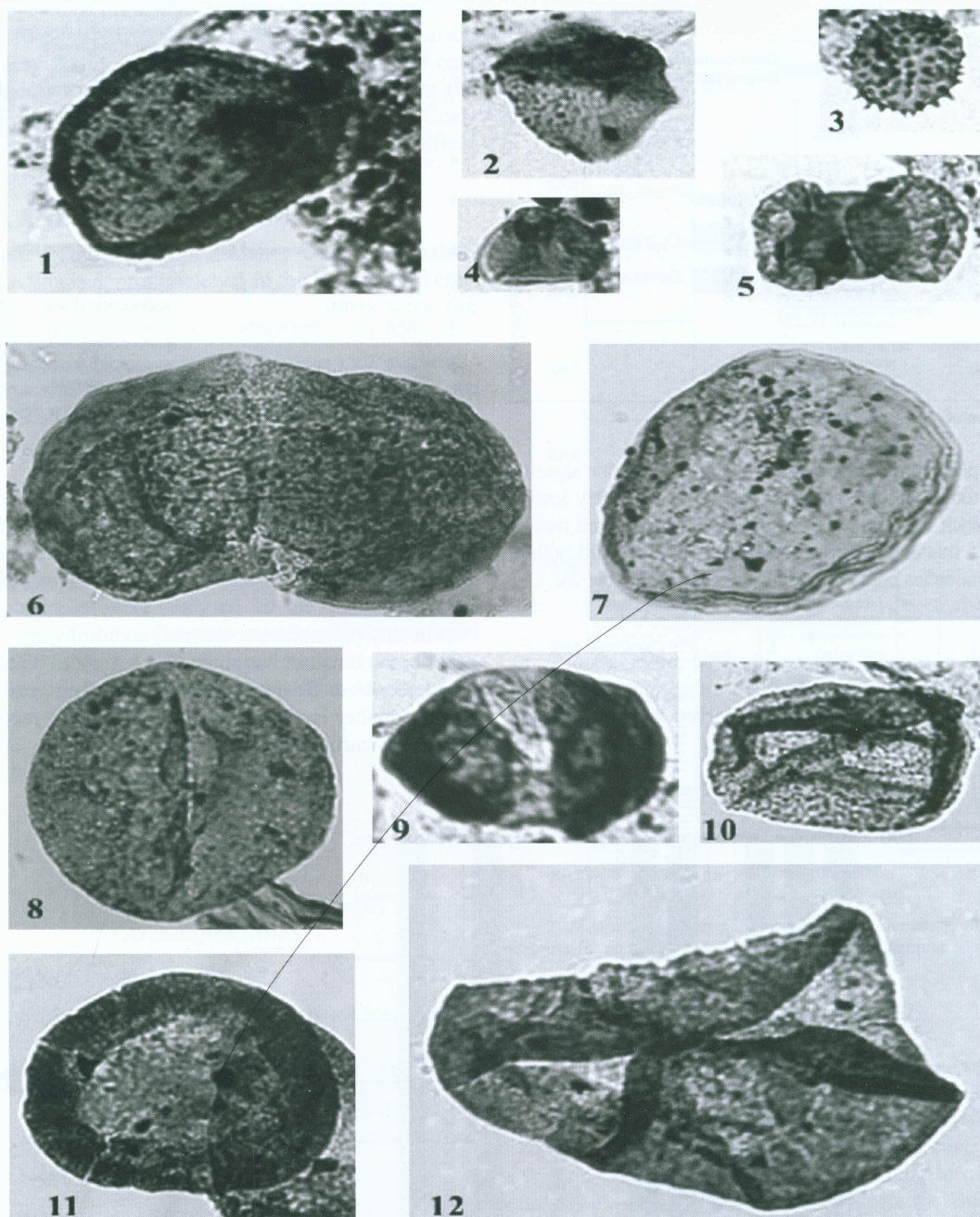


Fig. 4. Relative occurrence of dispersed organic matter in the studied samples from Kundapahari, Pachwara Coalfield, Rajmahal Basin, Jharkhand.



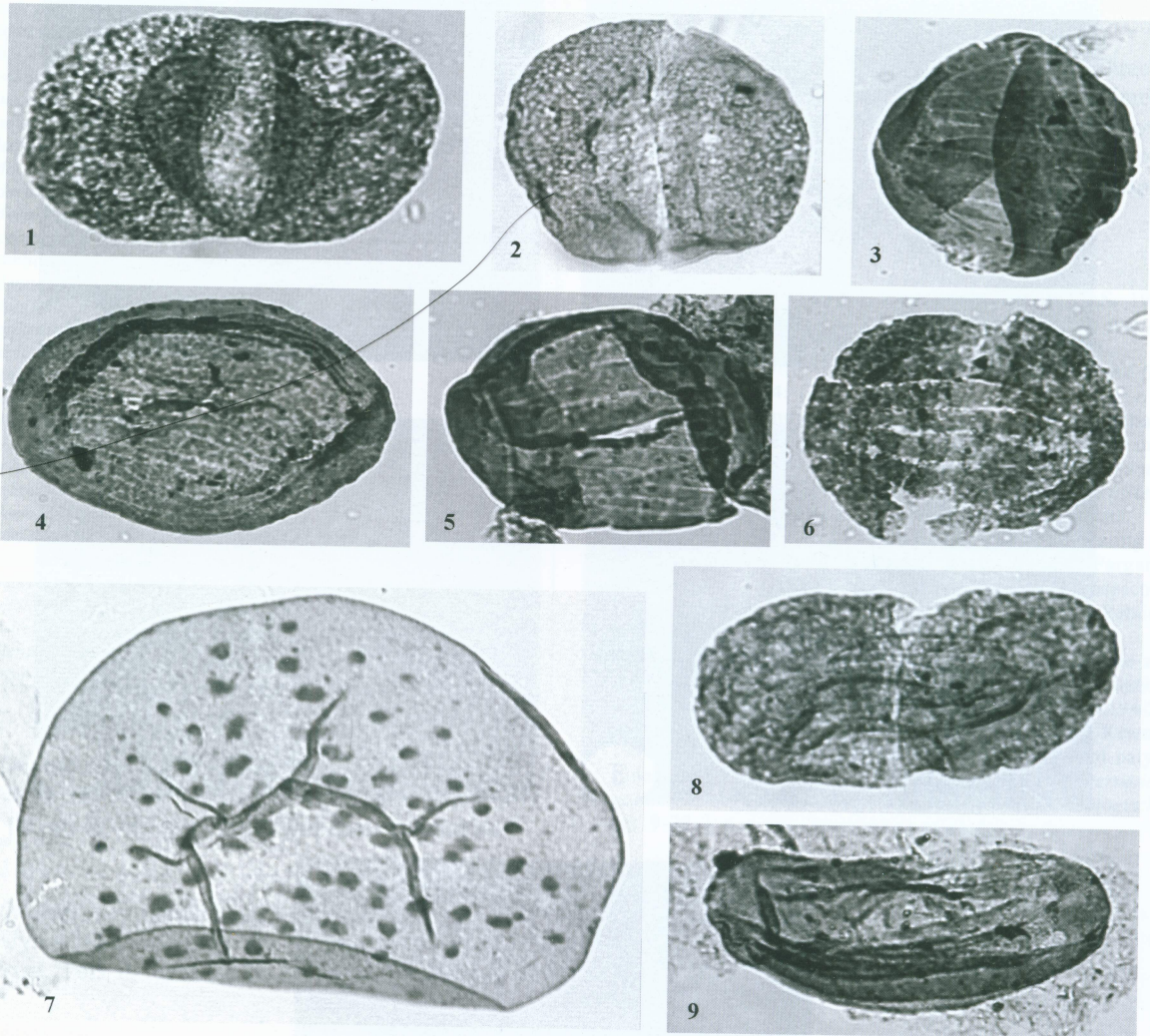
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EXPLANATION OF PLATE I

(All figures X 500ca)

1. *Cyclobaculisporites*
2. *Horriditriletes*
3. *Brevitriletes*
4. *Microbaculispora*
5. *Verticopollenites*
6. *Striatopodocarpites*

7. *Leiosphaeridia*
8. *Scheuringipollenites*
9. *Corisaccites*
10. *Cyclogranisporites*
11. *Parasaccites*
12. *Densipollenites*

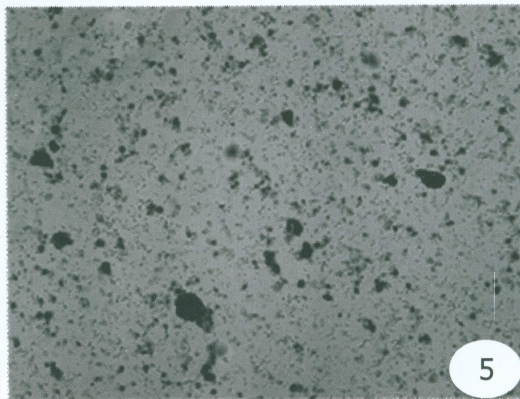
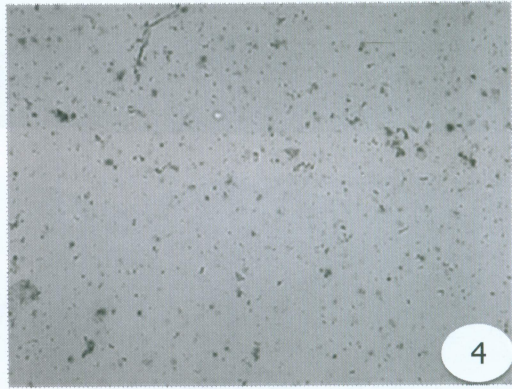
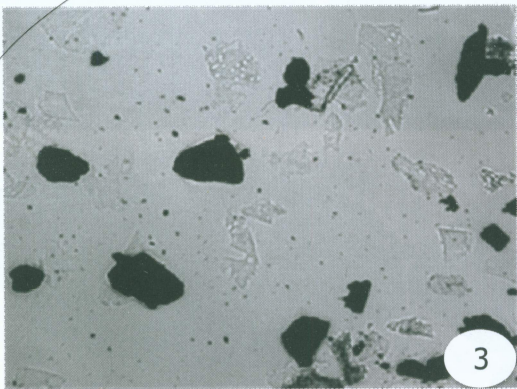
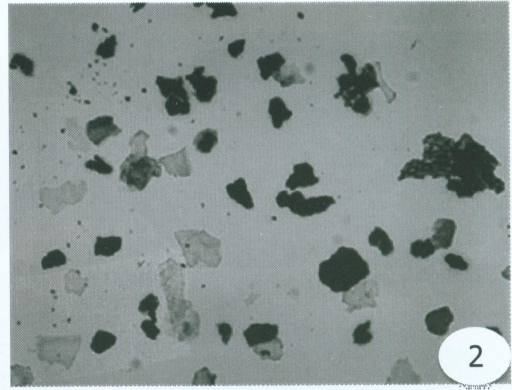
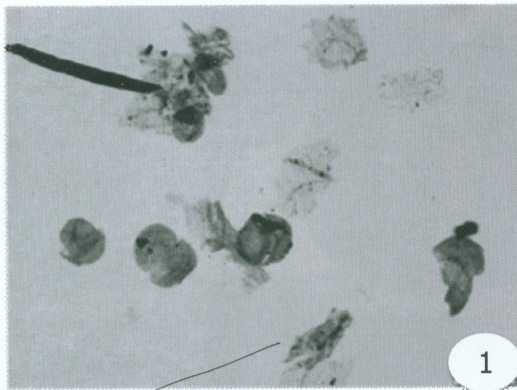


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EXPLANATION OF PLATE II

(All figures X 500ca)

- | | |
|-------------------------------|--------------------------------|
| 1. <i>Crescentipollenites</i> | 6. <i>Arcuatipollenites</i> |
| 2. <i>Faunipollenites</i> | 7. <i>Megaspore</i> inner body |
| 3. <i>Distriamonocolpites</i> | 8. <i>Striatopodocarpites</i> |
| 4. <i>Bharadwajipollis</i> | 9. <i>Praecolpatites</i> |
| 5. <i>Striasulcites</i> | |



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EXPLANATION OF PLATE III

Fig.1 Unit-I, rich in golden yellow spore and pollen, rare wood pieces.

Fig.2 Unit-II, has some dark brown to black wood pieces and unstruc

Fig.3

Fig.4

Fig.5

tured light yellow to brown organic matter.

Unit-IV, rich in black woody matter.

Unit-III, fine, very light yellow, unidentifiable organic matter.

Unit-V, rich in black unidentifiable matter.

Table 3: Occurrence of palynotaxa in present study and Assemblage-I of Borehole RJP-49, Pachwara Coalfield, Rajmahal Basin.

Palynotaxa	Present studies	Assemblage-I (Tripathi & Roy 2006)
<i>Brevitrites unicus</i>	+	
<i>Cyclobaculisporites indicus</i>	+	
<i>Cyclobaculisporites minutus</i>	+	
<i>Cyclogranisporites gondwanensis</i>	+	
<i>Horriditrites rampurensis</i>	+	
<i>Thymospora gondwanensis</i>	+	
<i>Bharadvajiapollis striatus</i>	+	
<i>Corisaccites alutas</i>	+	
<i>Distriamonocolpites circularis</i>	+	
<i>Striasulcites tectus</i>	+	
<i>Microbaculispora tentula</i>	+	+
<i>Faunipollenites varius</i>	+	+
<i>Striatopodocarpites decorus</i>	+	+
<i>Striatopodocarpites diffusus</i>	+	+
<i>Striatopodocarpites magnificus</i>	+	+
<i>Striatites communis</i>	+	+
<i>Striatites tentulus</i>	+	+
<i>Verticipollenites debilis</i>	+	+
<i>Verticipollenites gibbosus</i>	+	+
<i>Crescentipollenites fuscus</i>	+	+
<i>Densipollenites densus</i>	+	+
<i>Densipollenites invisus</i>	+	+
<i>Densipollenites magnicarpus</i>	+	+
<i>Arcuatipollenites</i> sp.	+	+
<i>Alisporites asansoliensis</i>		+
<i>Alisporites damudicus</i>		+
<i>Alisporites landianus</i>		+
<i>Distriamonosaccites</i> sp.		+
<i>Falcisporites stabilis</i>		+
<i>Gondisporites raniganjensis</i>		+
<i>Horriditrites curvibaculosus</i>		+
<i>Inaperturopollenites nebulosus</i>		+
<i>Kamthisaccites</i> sp.		+
<i>Krempipollenites indicus</i>		+
<i>Lundbladispota reticulatus</i>		+

Unit - III

This palynofacies has only fine, very light yellow colour organic matter. Here also nothing is identifiable. This is recorded in the mudstone, silty shale and shale lithofacies.

Unit - IV

Here the sample is rich in black unidentifiable woody matter. The palynomorphs are rare. The very light yellow colour matter is rare. This is recorded in coarse-grained sandstone sample.

Unit - V

The organic matter here is very rich in black unidentifiable matter, the palynomorphs are rare. This is observed in the fine-grained sandstone and shale.

It is inferred that the mudstone, silty, coaly shale and carbonaceous shale having palynofacies Unit-I. Unit-II and Unit-III have been deposited in low to moderate energy condition. The fine - grained sandstone and shale lithofacies having palynofacies Unit-V has been deposited in low to high energy conditions. Palynofacies Unit-IV represented in the coarse-grained sandstone has been deposited in high energy condition. The brownish black to black colour organic matter may be the result of oxidation during transportation (Pocock et al 1988).

CONCLUSIONS

1. *Densipollenites magnicarpus* palynozone is identified in the coaliferous strata and Late Permian age is indicated.

2. Material from the Dubrajpur Formation is devoid of spore-pollen.
3. Present assemblage from outcrop at Kundapahari is correlative with Assemblage - I of Borehole RJP - 49, recorded from the coaliferous part of the lithologically identified Barakar Formation.
4. The sediments have been deposited in intermittent low to high-energy condition.

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