PALAEOBOTANICAL STUDIES ON THE LOWER GONDWANA STRATA WITH PARTICULAR REFERENCE TO COAL BEARING BEDS IN CHANDRAPUR DISTRICT, MAHARASHTRA STATE, INDIA*

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ABSTRACT

The results obtained from palaeo-palynological investigation of coal samples from six coal seams of more than 0.5 meters thickness, collected from bore core D 97, have been incorporated in this paper. The bore core samples analysed here come from coal prospecting area near Padmapur, Chandrapur District, Maharashtra State.

A fairly rich and diversified microflora was recovered from these coal samples. Some of the predominant microspore genera recovered are *Retusotriletes*, *Parasaccites*, *Striatopodocarpites*, *Scheuringipollenites*. Generally, it was found that the bisaccate miospores were abundant in coal seam D1, D3, D4 and D5, whereas the triletes were dominant in coal seams D2 and D6.

INTRODUCTION

In spite of the occurrence of productive coal seams in Chandrapur District, except the possible exception of earlier palaeo-palynological works (AGASHE & CHITNIS, 1971, 1972; ANAND-PRAKASH & KHARE, 1974), no detailed palaeo-palynological work has been done on the coal seams occurring in this area. Hence, a comprehensive research scheme on the palynological analysis of coal bearing beds of Chanda coalfield (Chandrapur District) has been undertaken by us and in the present account palynological analysis of coal samples taken from coal seams found in bore hole No. D 97, drilled by the Directorate of Geology and Mining in Durgapur area, is incorporated.

MATERIAL AND METHODS

The Directorate of Geology and Mining (DGM), Government of Maharashtra has been drilling for coal prospecting in Durgapur area since 5 years. So far they have drilled 136 bore holes out of which we have collected coal samples from 11 bore holes. The material used in the present investigation comes from the bore hole D 97 drilled by the DGM, 5 Kms N. E. of Chanda township (Text-fig. 1). This was drilled upto 112.00 metres. The complete core taken from this bore has brought to light 6 coal seams which are more than 0.5 metres thick. These coal seams have been labelled here from bottom to top as D1, D2, D3, D4, D5 and D6 (Text-fig. 2). Depending on the thickness of the coal seams several samples were collected. These coal samples were macerated as per standard procedure of BHARADWAJ (1962). However, it was necessary to make a slight modification for our samples. We found that the maceration with 45% nitric acid for a period of 3 days, was appropriate. After the maceration was complete, the macerate was sieved through sieve Nos. 150 and 300.

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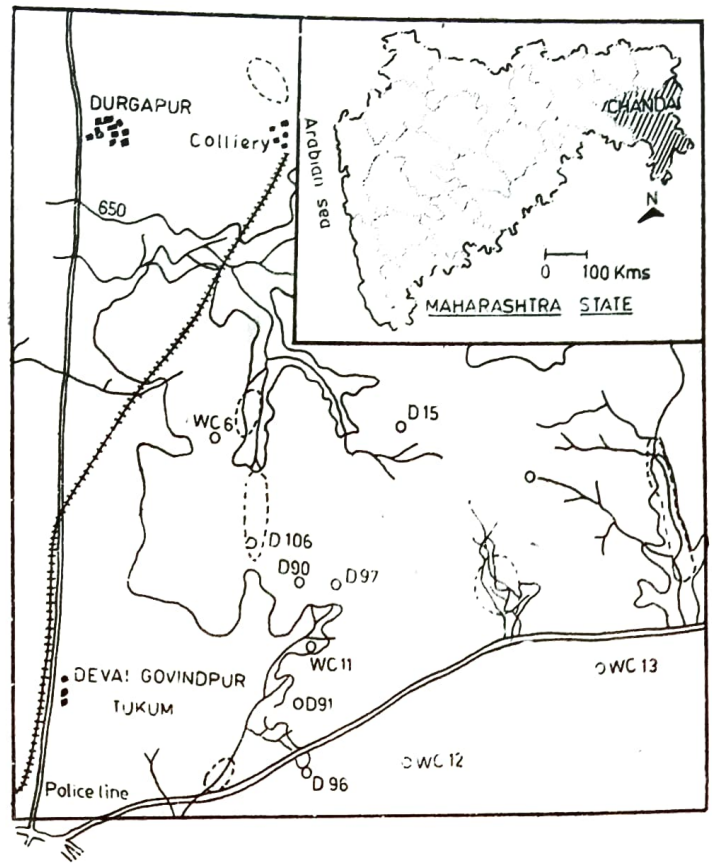


Fig. 1. Part enlargement of toposheet No. 55/ P 8 & 56 M/6 showing some of the sites of bore holes in Durgapur block and a map of Maharashtra State to show the location of Chanda District (Inset).

OBSERVATION

The qualitative analysis of coal samples was carried on by screening about 45 slides per sample which were prepared by macerating the coal samples. The identification and classification of miospores was done upto the generic level by referring the works of Potonie' (1956, 58), Potonie' and Kremp (1954), Bharadwaj (1962, 64), Tiwari (1965), Jansonius and Hills (1976) and Kar and Bose (1976).

The palaeo-palynological analysis of coal samples carried on so far has brought to light a large number of spores and pollen indicated in the following list :

Leiotriletes Naumova, 1939 ex Ishchenko, 1952
Callumispora Bharadwaj & Srivastava, 1969
Retusotriletes Naumova, 1953
Calamospora Schopf, Wilson & Bentall, 1944
Apiculatisporis Potonie' & Kremp, 1954
Cyclogranisporites Potonie' & Kremp, 1954
Lophotriletes Naumova, 1939 ex Ishchenko, 1952
Acanthotriletes Naumova 1939 ex Potonié & Kremp, 1954
Microbaculispora Bharadwaj, 1962
Cyclobaculisporites Bharadwaj, 1955
Horriditriletes Bharadwaj & Salujha, 1964
Microfoveolatispora Bharadwaj, 1962
Indotriradites Tiwari, 1964
Cirratriradites Wilson & Coe, 1940
Laevigatosporites Ibrahim, 1933
Nuskoisporites Potonie' & Klaus

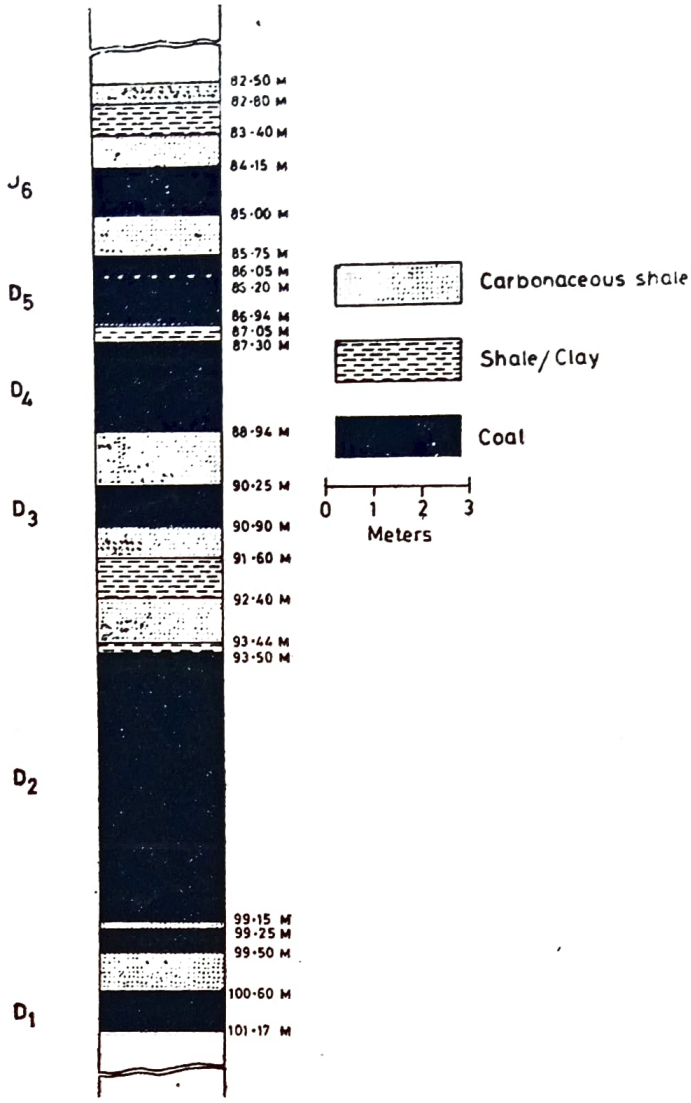


Fig. 2. Lithology of Bore Hole D 97

Table 1—Showing percentage frequency of miospore groups in samples of bore hole No. D 97.

Coal Seams	D1	D2	D3	D4	D5	D6
Miospore Groups						
Triletes	13	62	20	27	25	35
Zonates					7	14
Monoletes	4			7	14	3
Monosaccates	24	6	23	10	6	6
Bisaccates	57	28	52	52	48	19
Monocolpates			3			20
Polyplicates	2	4	2	4		4

Table 2—Showing the percentage frequency of miospore genera in coal samples of Bore Hole No. D 97.

Coal Seams	D1	D2	D3	D4	D5	D6
MIOSPORE GENERA						
Leiotriletes	2	5	4			5
Callumispora	3	2	2	7	3	5
Retusotriletes	3	4	2		2	
Calamospora		4	4	3	3	5
Apiculatisporis			2	2		7
Cyclogranisporites		9	4	4	3	4
Lophotriletes		10		2	2	
Acanthotriletes		13		3		
Microbaculispora		2	2	3	4	3
Cycloboculisporites	2	2				
Horriditriletes		10				3
Microfoveolatispora	3	1		3	8	3
Indotriradites					7	12
Cirratriradites						2
Latosporites	4			7	14	3
**Laevigatosporites*						
Nuskoisporites	2		6	1		
Densipollenites	3		5	2	3	
Parasaccites	5	6	7	5		3
**Crucisaccites*						
**Caheniasaccites*						
**Divarisaccus*						
Plicatipollenites	4			1	3	3
Virkkipollenites	2		5			
**Rugasaccites*						
Potonieisporites	8			1		
**Sahnites*						
**Barakarites*						
Faunipollenites		2	4	12	2	5
Kosankeisporites	2					
Striatopodocarpites	19	7	8	8	7	3
Lahirites			8	1	2	2
Lunatisporites	3	3	3	4		
Striatites	2	6	11	6	10	3
Hindipollenites			3	2	2	3
Verticipollenites	2	2	5	4	7	
Strotersporites	4					
**Corisaccites*						
Vesicaspora	8			4	3	
**Limitisporites*						
Illinites	3	2			5	
Scheuringipollenites	8	6	6	6	7	
Ibisporites	2		2	2	3	3
Platysaccus	2					
Primuspollenites	2		2	3		
**Striapollenites*						
Gnetaceaepollenites						4
Welwitschiapites	2	4	2	4		
Ginkgocycadophytus			2			
Kingiacolpites			1			20

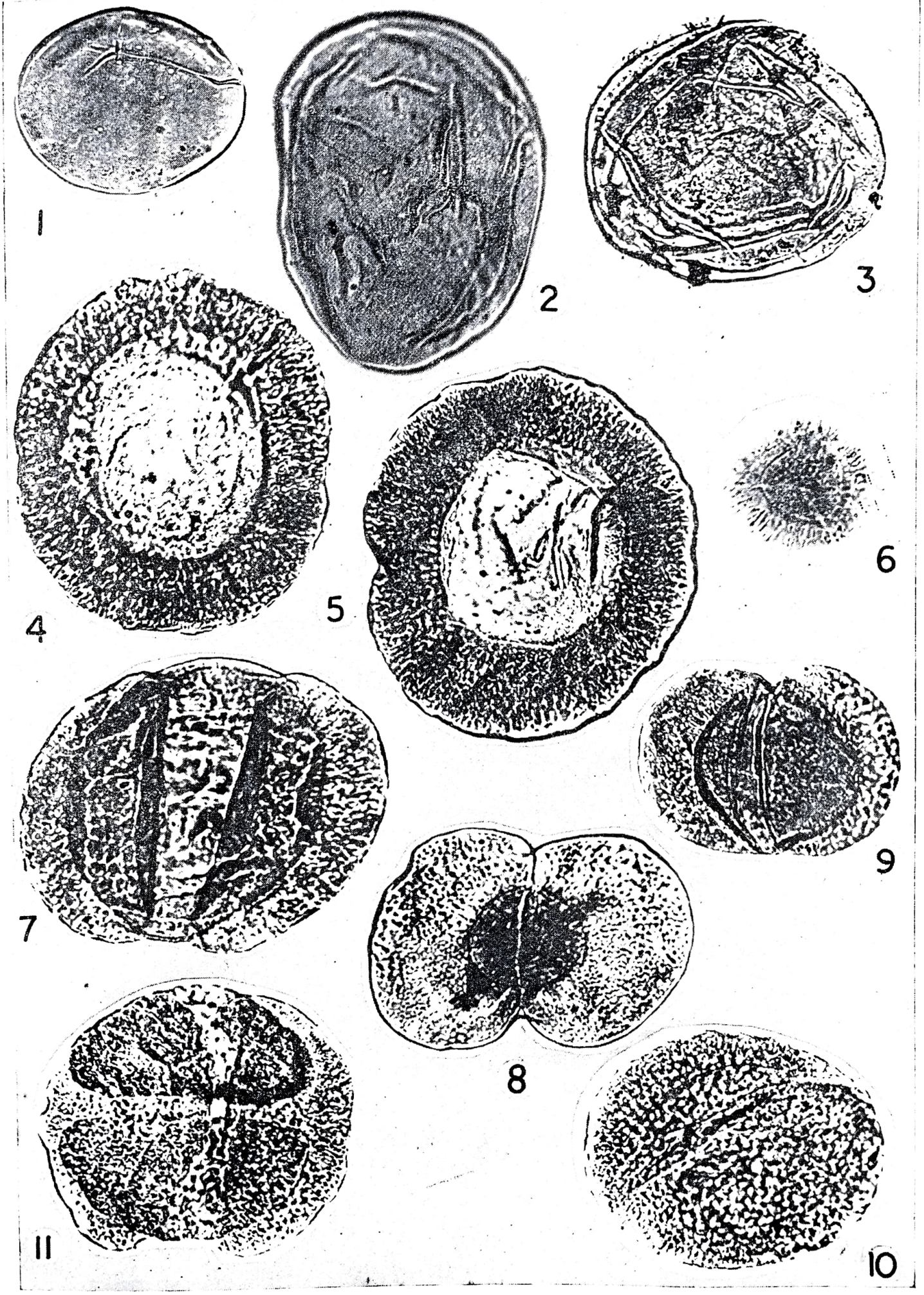
*Less than 1%.

Densipollenites Bharadwaj, 1962
Parasaccites Bharadwaj & Tiwari, 1964
Crucisaccites Lele & Maithy, 1964
Caheniasaccites Bose & Kar, 1966
Divarisaccus Venkatachala & Kar, 1966
Plicatipollenites Lele, 1964
Virkkipollenites Lele, 1964
Rugasaccites Lele & Maithy, 1969
Potonieisporites Bharadwaj, 1954
Sahnites Pant 1954
Barakarites Bharadwaj & Tiwari
Faunipollenites Bharadwaj, 1962
Striatopodocarpites Sedova, 1956
Kosankeisporites Bharadwaj, 1956
Lahirites Bharadwaj, 1962
Lunatisporites Leschik, 1956
Striatites Pant, 1955
Hindipollenites Bharadwaj, 1962
Verticipollenites Bharadwaj, 1962
Strotersporites Wilson, 1962
Corisaccites Venkatachala & Kar, 1966
Limitisporites Leschik, 1956
Illinites Kosanke, 1950
Vesicaspora Schemel, 1951
Ibisporites Tiwari, 1968
Scheuringipollenites Tiwari, 1973
Platysaccus Naumova 1939 ex Potonié & Klaus, 1954
Primuspollenites Tiwari, 1964
Striapollenites Bharadwaj, 1962
Distriatites Bharadwaj, 1962
Gnetaceaepollenites Thiergart, 1938
Welwitschiapites Bolkhovitina 1953 ex Potonie', 1958
Ginkgocycadophytus Samoilovich, 1953
Kingiacolpites Tiwari & Moiz, 1971.

It is clear from the above list that as many as 48 miospores have been recovered from various coal samples of bore hole D 97.

DISCUSSION

The group-wise frequency of miospores in coal samples of bore hole D 97 shows a very interesting pattern (Histograms 1 & 2). The coal seam D1 is characterised by dominance of bisaccates (57%) and subdominance of monosaccates (24%). The triletes (13%) follow next in the order of predominance in this seam. In the coal seam D 2 the trend of predominance of miospore group is just the reverse of what has been in the coal seam D1. Here, triletes representing 62% are predominant and bisaccates (28%) are subdominant, whereas monosaccates are merely represented by 6%. The relative abundance of different miospore groups in the coal seem D3 is more or less on the same lines as in D1. In coal seam D4, bisaccates still dominate (52%) and triletes (27%) subdominate, they are followed by monosaccates (10%), monoletes (7%) and polyplicates (4%).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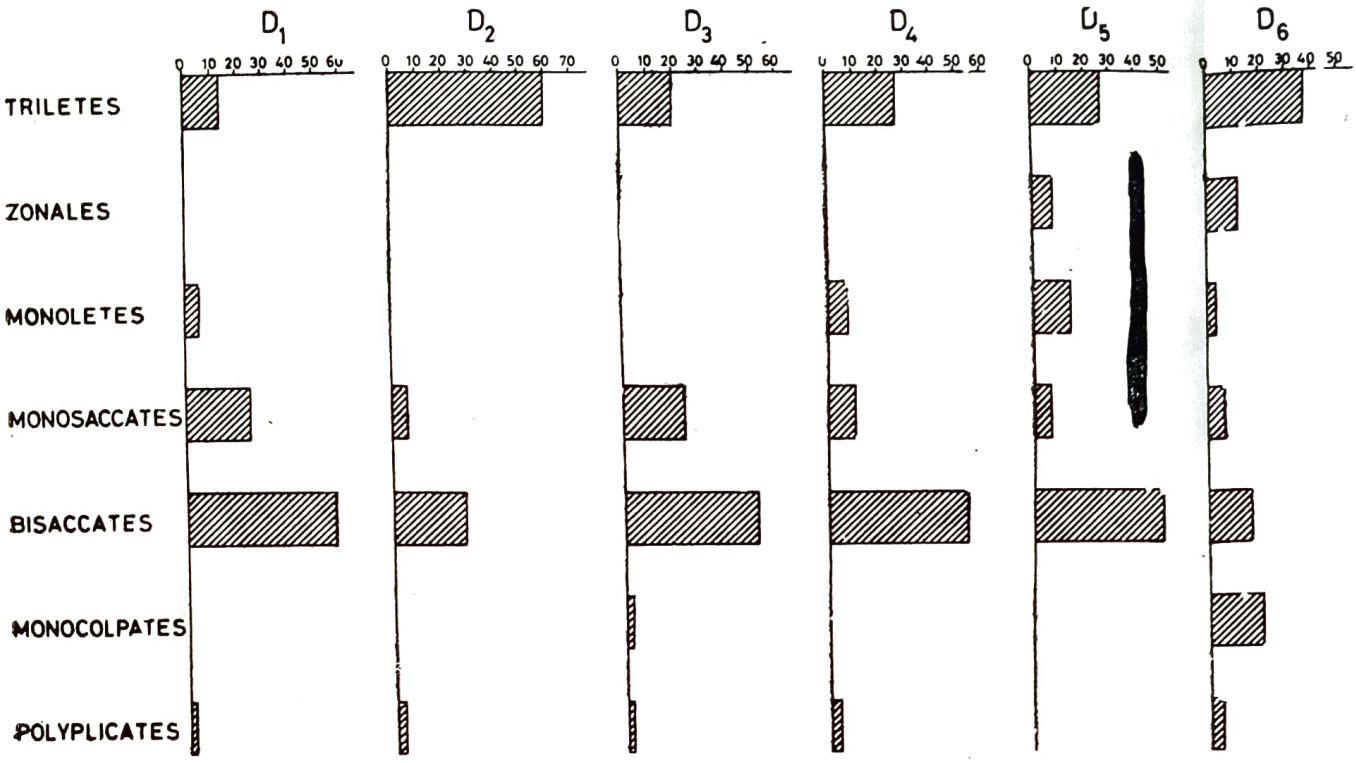
In coal seam D5, the same trend of dominance of bisaccates (48%) and subdominance by triletes (25%) continues. Next in the order of predominance are the monoletes (14%) followed by zonates (7%) and monosaccates (6%). In the uppermost seam i.e. D6, the triletes are predominant in total population (35%), similar to that of coal seam D2. However, here monocolpates (20%) subdominate instead of bisaccates (19%). They are followed by zonates (14%), monosaccates (6%), polyplicates (4%) and monoletes (3%) in the order of abundance.



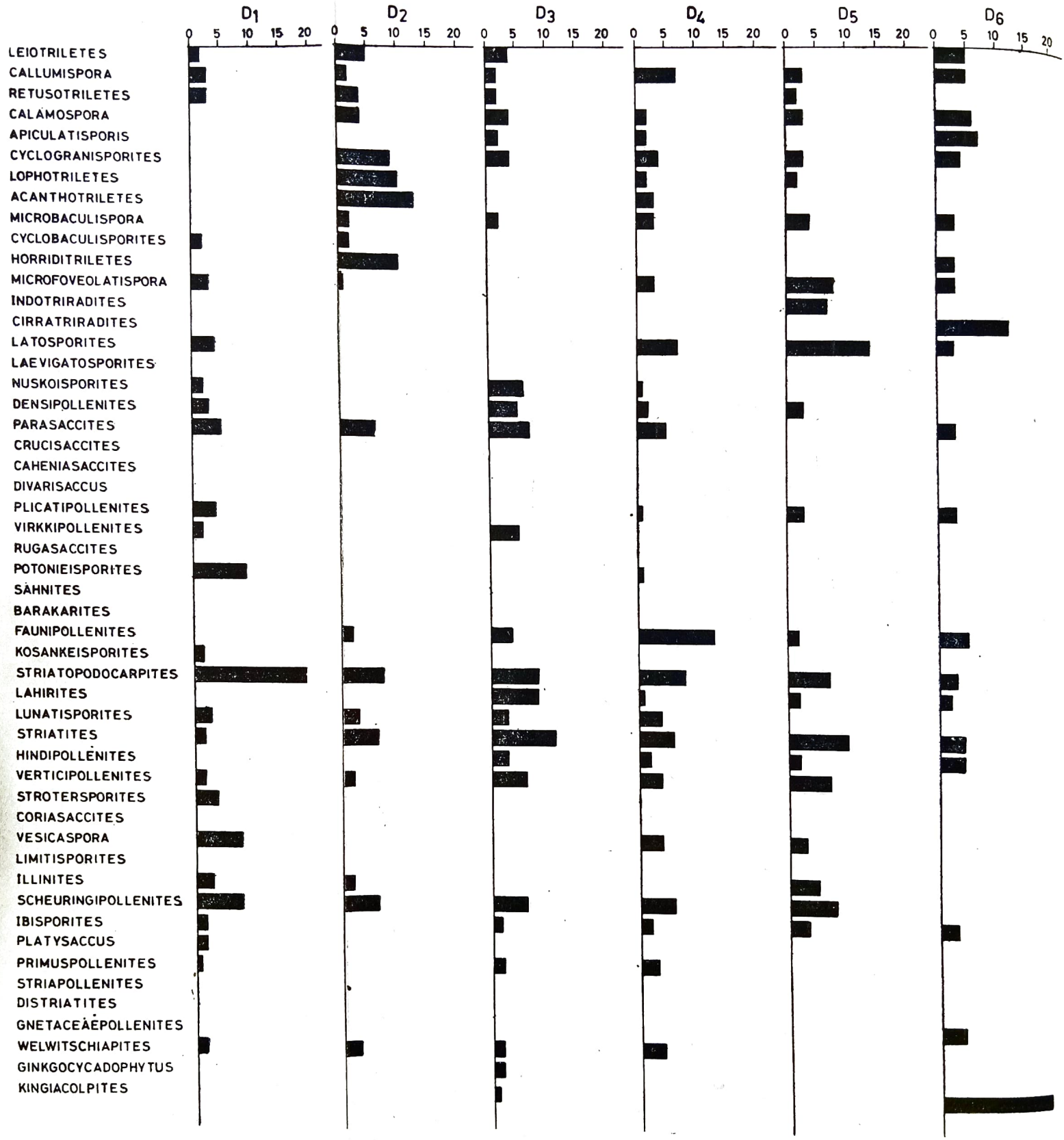
COMPARATIVE HISTOGRAM SHOWING PERCENTAGE OF MIOSPORE GROUPS IN SAMPLES OF BORE HOLE D97

Histogram 1

Thus, the critical analysis of the occurrence of different groups of miospores in the coal seams of bore hole No. D 97 indicates predominance of bisaccate grains in coal seams D1, D3, D4 and D5. In contrast to this, it is the triletes which dominate the miospore population in coal seams D2 and D6.

The monosaccate pollen are encountered in all the coal seams but their percentage frequency is far less than the other groups of miospores. *Parasaccites* is the only monosaccate pollen which occurs in 5 out of 6 coal seams in bore hole D 97 and is represented by 5% in D1 and D4, 6% in D2 and 7% in D3, whereas in D6 it is represented by 3% of the total population. The other significant monosaccate pollen is *Densipollenites* which is represented in all coal seams except D2 and D6. In D1, it is represented by 3 percent, in D3 by 5 percent, in D4 by 2 percent and in D5 by 3 percent of the total population.

Taking into consideration the miospore assemblages, both group-wise as well as genera wise, all the coal seams of the bore hole D 97 probably belong to the Barakar Formation of the Gondwana System. A slight deviation in the miospore assemblages in coal seams D2 and D6 from the other coal seams such as D1, D3, D4 and D5 probably reflects the local climatic fluctuations. However, these conclusions regarding the Geological Age and Paleo-climate of the coal seams investigated here will be confirmed and



COMPARATIVE HISTOGRAM ILLUSTRATING THE PERCENTAGE FREQUENCY OF MIOSPORE GENERA OF BORE HOLE-D97

Histogram 2

compared with the coal seams from other bore holes in the Durgapur area, the paleopalynological analysis of which is in progress.

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EXPLANATION OF PLATE 1

(Some of the common and well preserved miospores recovered from coal samples of bore hole No. D 97. All photomicrographs magnified × 400).

Figs.

1. *Callumispora* Bharadwaj & Srivastava 1969. Slide No. A 49.
2. *Calamospora* Schopf, Wilson & Bentall. Slide No. Rp 1.
3. *Verrucosisporites* Ibrahim 1933. Side No. A 54.
4. *Parasaccites* Bharadwaj & Tiwari 1964. Slide No. RP2.
5. *Plicatipollenites* Lele 1964. Slide No. A 47.
6. *Cirratriradites* Wilson & Coe. 1940. Slide No. A 56.
7. *Striatopodocarpites* Sedvoa 1956. Slide No. A 41.
8. *Striatites* Pant 1955. Slide No. RP 1.
9. *Lunatisporites* Leschick 1956. Slide No. A 41.
10. *Scheuringipollenites* Tiwari 1973. Slide No. A 54.
11. *Corisaccites* Venkatachala & Kar 1966. Slide No. U 10.