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# Palynoflora recorded from Makardhokada area, Nagpur District, Maharashtra

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**ABSTRACT**

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Makardhokada area is located at a distance of about 7 km west of Umrer Mine, and as such represents the western extension of the Umrer Coalfield, Nagpur District, Maharashtra. Subsurface explorations for coal exploitation have revealed the existence of a number of coal seams in this area. Palynological investigations have been taken up on the sub-surface sediments collected from Bore hole No. MR-157, drilled near Makardhokada Township, to understand the palynofloral contents of these sediments for palynodating. The palynoflora is characterized by the dominance of *Striatopodocarpites* followed by *Faunipollenites, Lahirites, Arcuatipollenites*, *Rhizomaspora, Crescentipollenites, Verticipollenites, Navalesporites,* etc. which suggests the existence of Late Permian sediments (= Raniganj Formation) in Makardhokada area.

**Key-words**—Raniganj Formation, Makardhokada, Nagpur, Maharashtra, India.

## महाराष्ट्र में नागपुर जिले के मकरधोकड़ा क्षेत्र से अभिलेखित परागाणुवनस्पतिजात

सुरेखा ए. कालकर, स्मिता डी. भूते एवं ओमप्रकाश एस. सराटे

**सारांश**

मकरधोकड़ा क्षेत्र उमरेर खान के लगभग 7 कि.मी. पश्चिम की दूरी पर स्थित है और महाराष्ट्र में नागपुर जिले के उमरेर कोयला क्षेत्र के पश्चिमी विस्तार को निरूपित करती है। कोयला उपयोग हेतु उपपृष्ठीय खननों से इस क्षेत्र में कई कोयला सीमों की विद्यमानता प्रकट हुई है। परागाणविक अन्वेषणों को परागाणु आंकड़े हेतु इन अवसादों के परागाणु वनस्पतिजात अवशेषों को समझने के लिए मकरधोकड़ा शहरीकरण के निकट ड्रिल किए गए वेध-छिद्र संख्या एम.आर-157 से एकत्रित उपपृष्ठीय अवसादों पर किया गया है। परागाणु वनस्पतिजात को *स्ट्रियाटोपोडोकार्पाइटीज* के साथ-साथ *फॉनीपोलेनाइटीज, लाहीराइटीज, आर्कुएटीपोलेनाइटीज, राइजोमास्पोरा, क्रिसेंटीपोलेनाइटीज, वर्टीसीपोलेनाइटीज, नवलेस्पोराइटीज,* इत्यादि की प्रमुखता द्वारा लक्षणित किया गया है जिससे मकरधोकड़ा क्षेत्र में अंतिम पर्मियन अवसादों (= रानीगंज शैलसमूह) की विद्यमानता प्रस्तावित होती है।

**संकेत-शब्द**—रानीगंज शैलसमूह, मकरधोकड़ा, नागपुर, महाराष्ट्र, भारत।

## INTRODUCTION

UMRER Coalfield demonstrates a semi-elliptical basinal structure indicating an outlier of Chanda Wardha Basin (Raja Rao, 1982). The Coalfield covers smaller area of about 5 sq km on the western side of Umrer town, marked between 20º50' and 20º52'50" latitudes and 79º16'00" and 79º 18'30" longitudes. The Coalfield is mostly occupied by plain areas except for few depressions, that exists along the course of the Amb river and its tributaries, which are mostly seasonal streams. The exposures of the metamorphic rocks present around Umrer contain quartz-mica schists and phyllites. The Talchir Formation, however, is characterized by the presence of light green fine-grained sandstones along with shales. The overlying Barakar Formation has attained the maximum thickness of 200 m. The top part (25 m) is occupied by coarse-grained sandstones with a prominent grey coloured carbonaceous shale band. The middle part, however, contains alternate sequence of shale, sandstone and coal horizons. The basal part is devoid of coal seams and contains coarse-grained grey sandstones along with alternate grey and carbonate shale bands. There exists a distinct unconformity between the Barakar and the overlying Kamthi formations. Kamthi Formation however, is represented by reddish brown ferruginous sandstone and light yellow to greenish shale sequence. The sediments of the Lameta Formation occur as isolated patches, mainly comprised by hard sandstones which are calcareous in nature (Fig. 1).

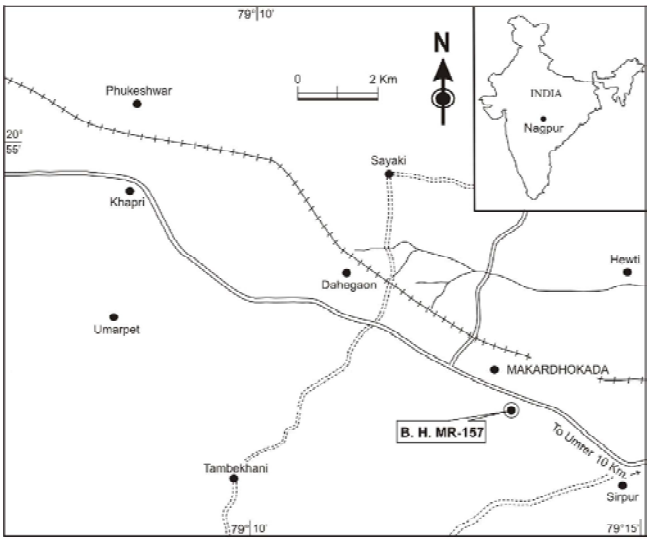


Fig. 2—Location map of Bore hole No. MR-157, Makardhokada area, Nagpur District, Wardha Valley Coalfield, Maharashtra (Courtesy, DGM, Nagpur).

| Age | Group/Formation | Lithology |
|---|---|---|
| Recent | – | Black soil, migratory and derived from Deccan Trap. |
| Cretaceous | Lameta | Limestones and sandstones. |
| | --------Unconformity-------- | |
| Upper Permian – Lower Triassic | Kamthi | Reddish brown sandstones, yellowish and brown shales. |
| | --------Unconformity-------- | |
| Lower Permian | Barakar | Coarse-grained sandstones, carbonaceous shales and coal seams. |
| Upper Carboniferous-Lower Permian | Talchir | Greenish shales with occasional bands of sandstone. |
| | --------Unconformity-------- | |
| Archaean | Metamorphics | Schists and phyllites. |

Fig. 1—General stratigraphic succession of the Umrer Coalfield as given by Raja Rao (1982).

## BORE HOLE DETAILS

Makardhokada area is a small township located at a distance of about 34-40 km south-west of Nagpur and is well connected by road via Umrer. The site of collection, i.e. Bore hole No. MR-157 is situated at about 7 km west of Umrer Mine. Makardhokada area however, is bound by latitudes 20º51'20" to 20º53'39" and longitudes 79º12'16" to 79º15'12". The samples

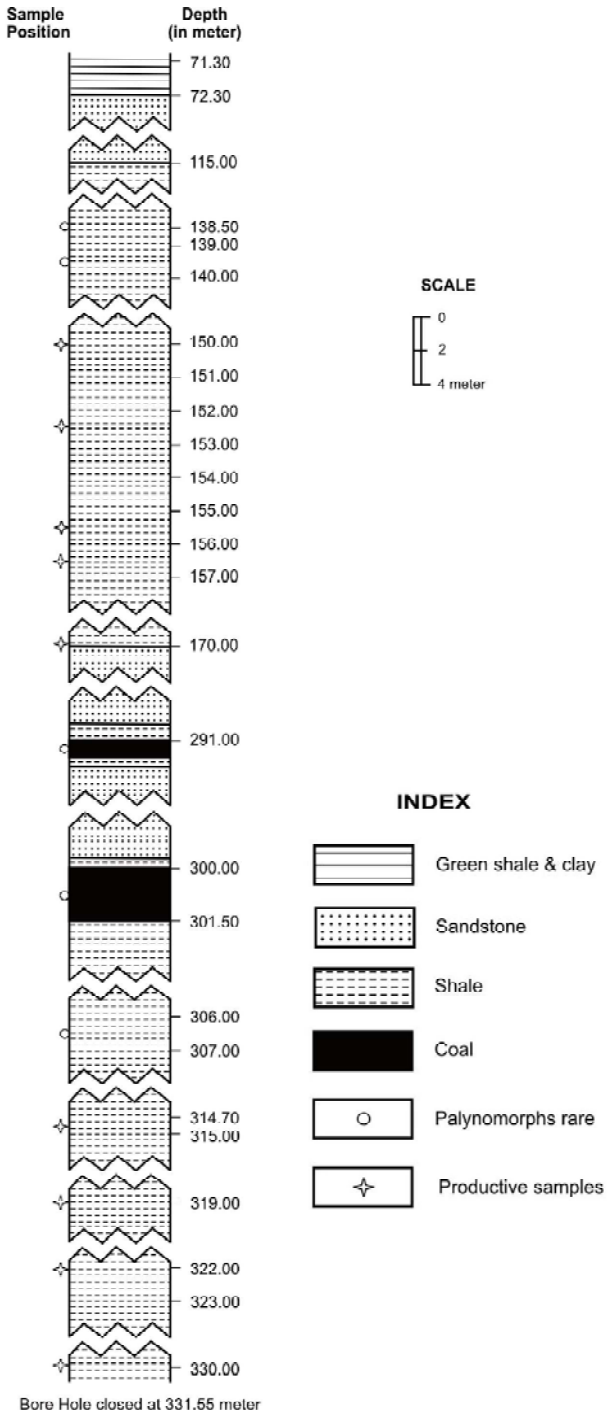


Fig. 3—Lithological details of the samples collected from Bore hole No. MR-157, Makardhokada area, Nagpur District, Maharashtra (Courtesy, DGM, Nagpur).

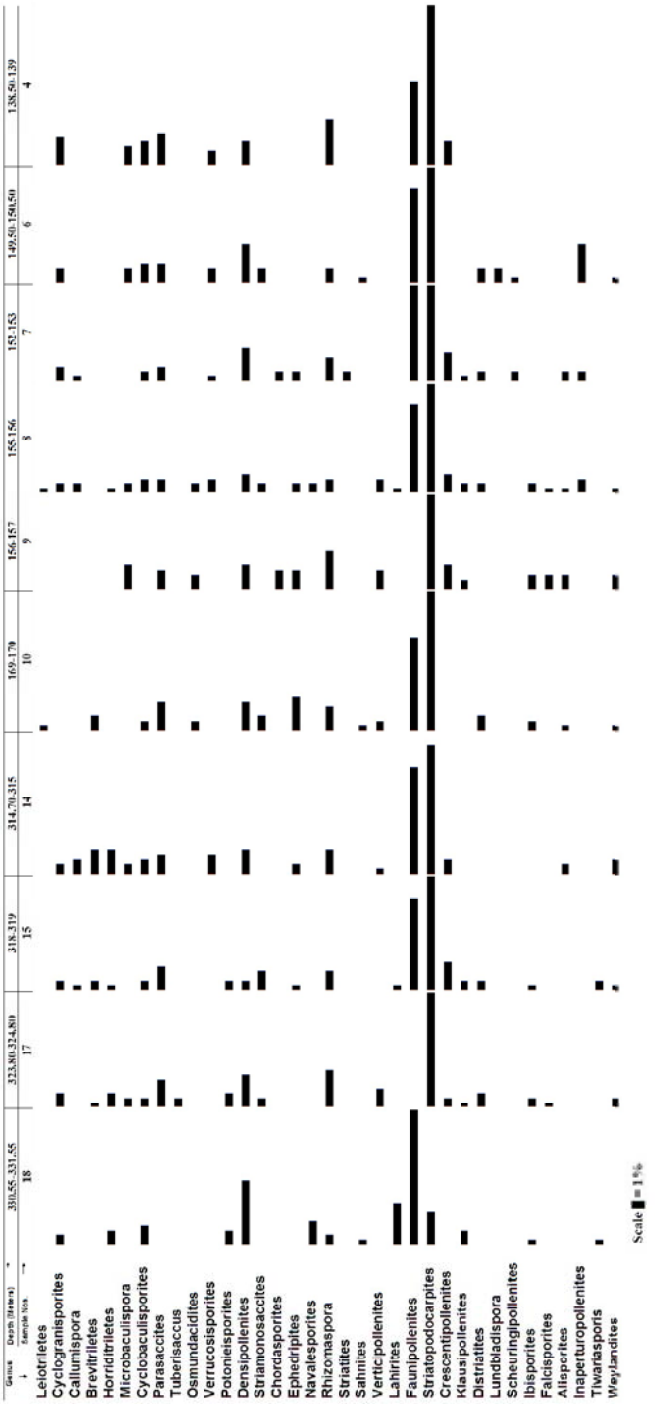


Fig. 4—Frequency distribution of the palynoflora recorded from Bore hole No. MR-157, Makardhokada area, Nagpur District, Maharashtra.

representing coal, grey shale, carbonaceous shale, green shale, etc. have been collected for the present investigations (Figs 2, 3).

## PALYNOASSEMBLAGE

The palynofloral assemblage recorded from the sub-surface sediments of Bore hole No. MR-157 from Makardhokada area (Pl. 1.1-16) at the depth range of 330.55 to 331.55 m denotes dominant association of *Faunipollenites* (45%) followed by *Densipollenites* (14%), *Lahirites* (9%), *Arcuatipollenites* (6%), *Navalesporites* (5%) and *Cyclobaculisporites* (4%). However, *Horriditriletes, Potonieisporites, Klausipollenites, Rhizomaspora* and *Cyclogranisporites* are recorded between 2 and 3 % only. At the depth range between 323.80 and 324.80 m *Striatopodocarpites* (33%) is dominant along with *Arcuatipollenites* (13%). *Rhizomaspora* (8%), *Densipollenites* (7%) and *Parasaccites* (6%) follow the order of relative dominance. Besides, *Verticipollenites, Cyclogranisporites, Horriditriletes, Potonieisporites* and *Distriatites* have been recorded with frequency range between 3% and 4%. *Microbaculispora, Cyclobaculisporites, Tuberisaccus, Striamonosaccites, Crescentipollenites* and *Ibisporites* are recorded to be 2% each. *Brevitriletes, Klausipollenites* and *Falcisporites* (1% each) are sparsely distributed. The palynoflora at the depth of 318 to 319 m also exhibits the dominance of *Striatopodocarpites* (29%); however, *Faunipollenites* (20%) is sub-dominant. *Arcuatipollenites* (10%) follows the order of dominance. In addition, *Crescentipollenites, Parasaccites, Striamonosaccites* and *Rhizomaspora* are also recorded between the frequencies of 4% and 6%. *Cyclogranisporites, Brevitriletes, Cyclobaculisporites, Potonieisporites, Densipollenites, Klausipollenites, Distriatites* and *Tiwariasporis* are recovered with the frequencies of 2% each and *Callumispora, Horriditriletes, Ephrepites, Lahirites, Ibisporites* and *Weylandites* have scanty distribution with the frequency of 1% each. Similar trend of palynofloral association is witnessed between 314.70 and 315 m and 169 and 170 m depths with slight variation in the distribution pattern of the associating palynomorphs. However, at the depth range of 156 to 157 m *Striatopodocarpites* (36%) is dominant, whereas, *Rhizomaspora* and *Arcuatipollenites* with the values of 8% each sub dominate the palynoassemblage. *Microbaculispora, Densipollenites* and *Crescentipollenites* (5% each), followed by *Parasaccites, Chordasporites, Ephedripites* and *Verticipollenites* 4% each, besides, *Osmundacidites, Ibisporites, Falcisporites, Alisporites* and *Weylandites* which are recorded to be 3%. This trend of the palynofloral dominance, i.e. *Striatopodocarpites* (23 to 27%) followed by *Faunipollenites* (18 to 23%) has also been observed at the depth range of 155 to 156 m, 152 to 153 m, 149.50 to 150.50 m and 138.50 to 139 m. *Arcuatipollenites* and *Rhizomaspora* (10% each), besides, *Parasaccites* (7%), *Cyclogranisporites* (6%) and *Microbaculispora* (4%), have shown increasing trend of their frequency distribution at the above mentioned depth range (Figs 4, 5).

## COMPARISON

The palynoflora recovered from the Makardhokada area is assigned to Late Permian age. This assemblage has closer affiliation with the palynoflora recorded from Kuling shale of Malla Johar area,

**PLATE 1** →

1. *Horriditriletes elegans*
2. *Inapeturopollenites dubius*
3. *Callumispora tenuis*
4. *Indotriradites sparsus*
5. *Parasaccites obscurus*
6. *Rhizomaspora singulata*
7. *Faunipollenites singrauliensis*
8. *Faunipollenites circumstriatus*
9. *Striatopodocarpites diffusus*
10. *Striatopodocarpites subcircularis*
11. *Scheuringipollenites tentulus*
12. *Verticipollenites mineosus*
13. *Weylandites obsecurus*
14. *Distriatites distinctus*
15. *Lahirites rarus*
16. *Tiwariasporis flavatus*

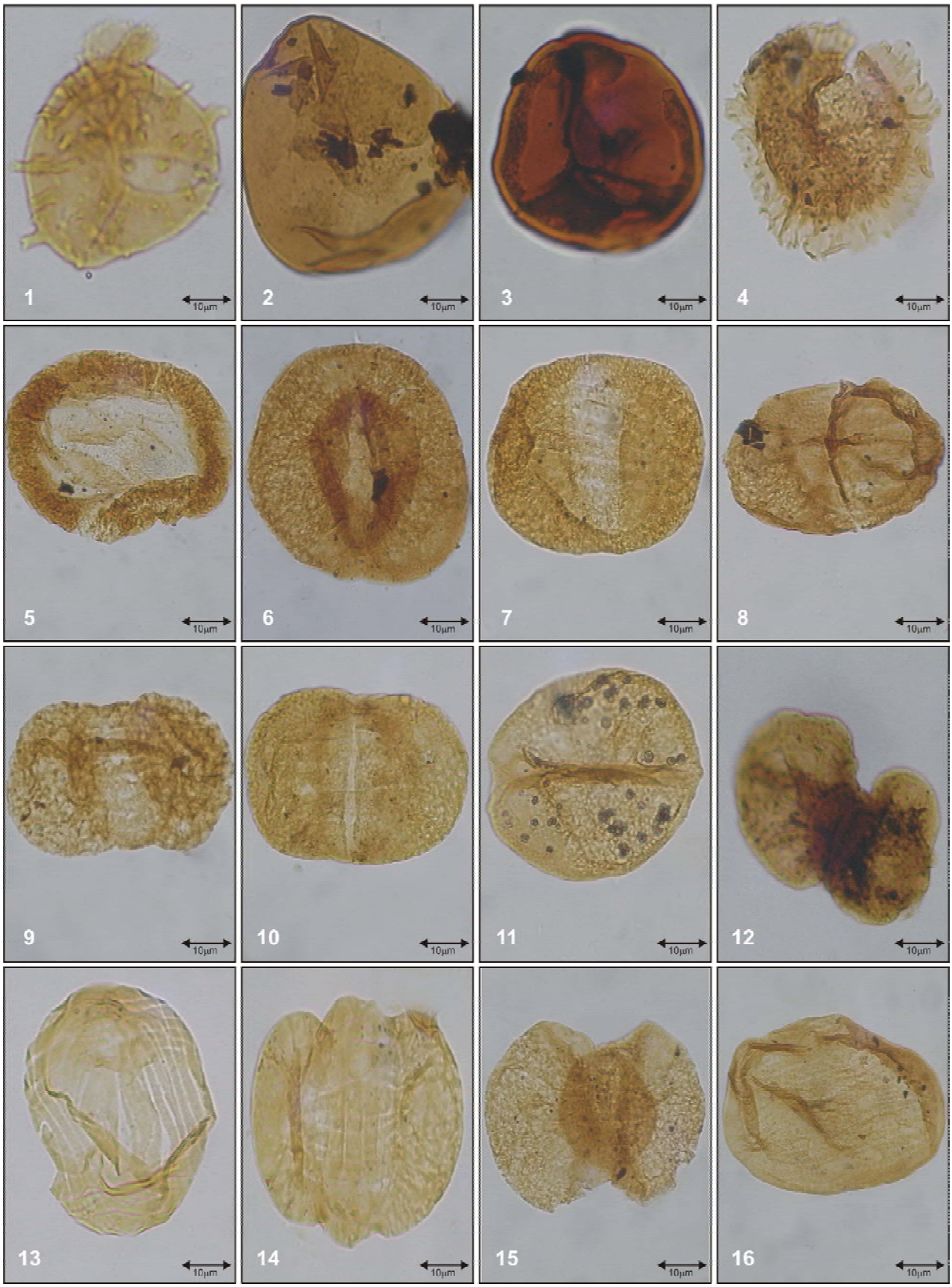
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**PLATE 1**

| Genus ↓ | Depth → (Meters) | 330.55-331.55 | 323.80-324.80 | 318-319 | 314.70-315 | 169-170 | 156-157 | 155-156 | 152-153 | 149.50-150.50 | 138.50-139 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample → Nos. | 18 | 17 | 15 | 14 | 10 | 9 | 8 | 7 | 6 | 4 |
| *Leiotriletes* | | | | | | 1 | | 1 | | | |
| *Cyclogranisporites* | | 2 | 3 | 2 | 2 | | | 2 | 3 | 3 | 6 |
| *Callumispora* | | | | 1 | 3 | | | 2 | 1 | | |
| *Brevitriletes* | | | 1 | 2 | 5 | 3 | | | | | |
| *Horriditriletes* | | 3 | 3 | 1 | 5 | | | 1 | | | |
| *Microbaculispora* | | | 2 | | 2 | | 5 | 2 | | 3 | 4 |
| *Cyclobaculisporites* | | 4 | 2 | 2 | 3 | 2 | | 3 | 2 | 4 | 5 |
| *Parasaccites* | | | 6 | 5 | 4 | 6 | 4 | 3 | 3 | 4 | 7 |
| *Tuberisaccus* | | | 2 | | | | | | | | |
| *Osmundacidites* | | | | | | 2 | 3 | 2 | | | |
| *Verrucosisporites* | | | | | 4 | | | 3 | 1 | 3 | 3 |
| *Potonieisporites* | | 3 | 3 | 2 | | | | | | | |
| *Densipollenites* | | 14 | 7 | 2 | 5 | 6 | 5 | 4 | 7 | 8 | 5 |
| *Striamonosaccites* | | | 2 | 4 | | 3 | | 2 | | 3 | |
| *Chordasporites* | | | | | | | 4 | | 2 | | |
| *Ephedripites* | | | | 1 | 2 | 7 | 4 | 2 | 2 | | |
| *Navalesporites* | | 5 | | | | | | 2 | | | |
| *Rhizomaspora* | | 2 | 8 | 4 | 5 | 5 | 8 | 3 | 5 | 3 | 10 |
| *Striatites* | | | | | | | | | 2 | | |
| *Sahnites* | | 1 | | | | 1 | | | | 1 | |
| *Verticipollenites* | | | 4 | | 1 | 2 | 4 | 3 | | | |
| *Lahirites* | | 9 | | 1 | | | | 1 | | | |
| *Faunipollenites* | | 45 | | 20 | 23 | 20 | | 19 | 23 | 20 | 18 |
| *Striatopodocarpites* | | 1 | 33 | 29 | 28 | 35 | 36 | 23 | 27 | 23 | 27 |
| *Crescentipollenites* | | | 2 | 6 | 3 | | 5 | 4 | 6 | | 5 |
| *Klausipollenites* | | 3 | 1 | 2 | | | 2 | 2 | 1 | | |
| *Distriatites* | | | 3 | 2 | | 3 | | 2 | 2 | 3 | |
| *Arcuatipollenites* | | 6 | 13 | 10 | | | 8 | 6 | 7 | 9 | 10 |
| *Lundbladispora* | | | | | | | | | | 3 | |
| *Scheuringipollenites* | | | | | | | | | 2 | 1 | |
| *Ibisporites* | | 1 | 2 | 1 | | 2 | 3 | 2 | | | |
| *Falcisporites* | | | 1 | | | | 3 | 1 | | | |
| *Alisporites* | | | | | 2 | 1 | 3 | 1 | 2 | | |
| *Inaperturopollenites* | | | | | | | | 3 | 2 | 8 | |
| *Tiwariasporis* | | 1 | | 2 | | | | | | | |
| *Weylandites* | | | 2 | 1 | 3 | 1 | 3 | 1 | | 1 | |

Fig. 5—Frequency distribution of the palynoflora recorded from Bore hole No. MR - 157, Makardhokada area, Nagpur District, Maharashtra.

Kumaon Himalaya (Tiwari *et al.*, 1984). Tripathi and Bhattacharya (2001) also recorded similar palynoflora from Talcher Coalfield, Orissa.

It is also closely comparable with the palynoflora known from Sukha-Tawa Section, (Bharadwaj *et al.*, 1978) and the Bijori sediments of Satpura Gondwana Basin, Madhya Pradesh (Sarate & Patil, 1994). The palynofloral assemblage is assigned to Raniganj Formation (Late Permian) in Irai Valley sub-basin, Tatapani-Ramkola Coalfield (Srivastava & Kar, 2001) and the sediments exposed at the Sehra Nala Section of Son Graben, Madhya Pradesh (Tiwari & Ram-Awatar, 1990) also belong to the same age.

The palynofloral assemblages recorded from various localities of the Godavari Valley Coalfield, Andhra Pradesh, particularly the assemblage zone I recorded from Mailaram area (Srivastava & Jha, 1990) contain *Faunipollenites* in dominance along with the younger elements, indicating Permo-Triassic affinity. The palynoassemblage of study area compares closely with these findings. Similarly, assemblage zone III of the Bhopalpalli area (Srivastava & Jha, 1998) and the palynoassemblage III recorded from Sattupalli area, (Srivastava & Jha, 1994) has also shown the dominance of *Faunipollenites* and therefore, has similarity with the study area. Palynoassemblages recorded by Srivastava and Jha (1986) from the Kamthi sediments of Chelpur area and Bharadwaj *et al.* (1986) from Kamthi Formation of Ramagundam area also compares well with present study.

Srivastava and Bhattacharyya (1996) recorded *Faunipollenites* and *Striatopodocarpites* dominant palynofloral assemblage from Bazargaon area near Nagpur District, Maharashtra. which is also closely comparable with the palynoflora recorded from Makardhokada area.

## CONCLUSION

In the present investigation palynoassemblage recorded from Makardhokada area shows overall dominant association of *Striatopodocarpites* and *Faunipollenites*. The prominent associated sub-dominant taxa are *Cyclobaculisporites, Cyclogranisporites, Scheuringipollenites, Parasaccites* and *Striamonosaccites*. The assemblage also demonstrates the consistent presence of *Klausipollenites, Chordasporites, Navalesporites, Lundbladispora, Palyfordiaspora*, etc.

Hence, the palynoflora recorded from Makardhokada area can be considered to represent the middle part of the Raniganj Formation (= Late Permian).

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## REFERENCES

Bharadwaj DC, Tiwari RS & Anand-Prakash 1978. Permo-Triassic palynostratigraphy of Bijori Formation (Upper Permian) in Satpura Gondwana Basin, India. Palaeobotanist 25: 70-78.

Bharadwaj DC, Srivastava SC, Ramanamurthy BV & Jha N 1986. Palynology of Kamthi Formation from Ramagundam – Mantheni area, Godavari Graben, Andhra Pradesh. Palaeobotanist 35: 318-330.

Raja Rao CS 1982. Coal resources of Tamil Nadu, Andhra Pradesh, Orissa and Maharashtra. Bulletin of Geological Survey of India, Ser. A, No. 45. Coalfields of Maharashtra, Wardha Valley Coalfield : 62-73.

Sarate OS & Patil GV 1994. Palynostratigraphy of the Bijori sediments, Satpura Basin, India. Geophytology 23: 197-207.

Srivastava SC & Bhattacharyya AP 1996. Permian Triassic palynofloral succession from Bazargaon, Nagpur District, Maharashtra. Palaeobotanist 43: 10-15.

Srivastava SC & Ratan Kar 2001. Palynological dating of some Permian outcrops from Irai Valley Tatapani-Ramkola Coalfield, M.P. India. Proceedings of the National Seminar on Recent Advances in Geology of Coal and Lignite Basins of India, Calcutta (5-7th December, 1997). Geological Survey of India, Special Publication No. 54: 97-102.

Tiwari RS & Ram-Awatar 1990. Palynodating of Nidpur beds, Son Graben, Madhya Pradesh. Palaeobotanist 38: 105-121.

Srivastava SC & Jha N 1986. Palynology of Kamthi Formation from Chelpur area, Godavari Graben, Andhra Pradesh, India. Palaeobotanist 35: 342-346.

Srivastava SC & Jha N 1990. Permian–Triassic palynofloral transition in Godavari Graben. Palaeobotanist 38: 92-97.

Srivastava SC & Jha N 1994. Palynological dating of the Lower Gondwana sediments in Sattupalli area, Chintalapudi sub-basin, Andhra-Pradesh. Palaeobotanist 42: 169-173.

Srivastava SC & Jha N 1998. Palynology of Lower Gondwana sediments in Bhopalpalli area, Godavari Graben. Journal of the Palaeontological Society of India 43: 41-48.

Tiwari RS, Singh V, Kumar S & Singh IB 1984. Palynological studies of the Tethys Sequence in Malla Johar area, Kumaon Himalaya, India. Palaeobotanist 32: 341-367.

Tripathi A & Bhattacharya D 2001. Palynological resolution of Upper Permian Sequence in Talcher Coalfield, Orissa, India. Proceedings of the National Seminar on Recent Advances in Geology of Coal and Lignite Basins of India, Calcutta (5-7th December, 1997). Geological Survey of India, Special Publication, No. 54: 59-68.