

On the presence of Late Palaeocene in the subsurface of Bikaner District, Rajasthan

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Palynological investigation of bore hole (BH 125) drilled around Bikaner, Rajasthan has revealed that the assemblage at the basal part of the bore core (181.4-117.3m) comprises *Dandotiaspora dilata*, *Lycopodiumsporites speciosus*, *Matanomadhiasulcites maximus* and many species of polycolpate pollen. On this basis, a Late Palaeocene age has been ascribed to the assemblage which was hitherto not postulated.

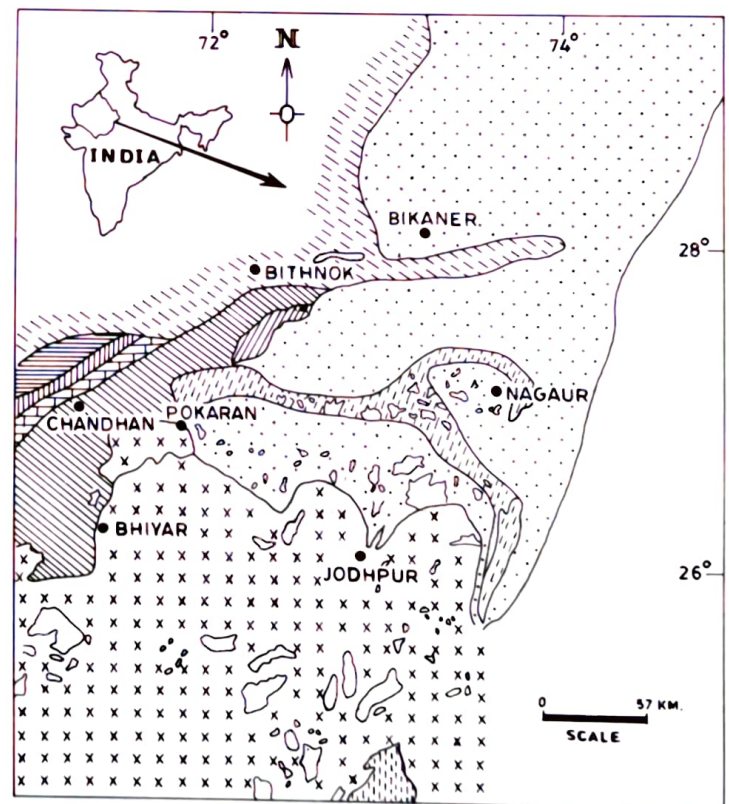
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INTRODUCTION

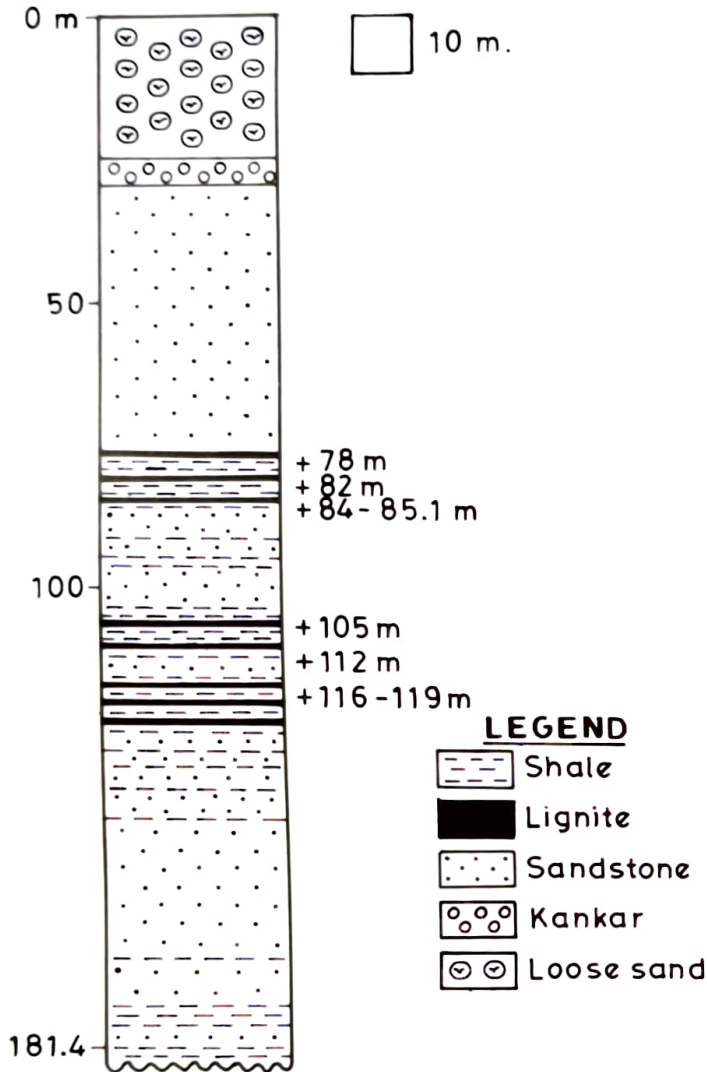
THE Mesozoic and Tertiary rocks are well developed in western parts of Rajasthan around Jaisalmer and Bikaner. The Mesozoic rocks are exposed generally in the form of ridges and are valued as the building materials. The Tertiary sediments, on the other hand, are inconspicuous and found only in the vicinity of Jaisalmer and Kolayat as low elevated mounds. The Multani Mitti or the Fuller's earth is mined from the Tertiary sediments commercially from very early times. The occurrence of lignite at Palana near Bikaner was also known and was exploited successfully for a long time. The deposition of these sediments occurred in a regressive phase. The recent quest for lignite in this area witnessed drilling activities by the Geological Survey of India (GSI) and the Mineral Exploration Corpn. Lt. (MECL). This resulted in the finding of lignite in many areas around Kuchaur-Benia, Bithnok, Ranjitpurwa and Kolayat. It was revealed that lignite is deposited in a wide area and in many places it is economically exploitable. The lignite-bearing and the underlying sediments were generally thought to be of Early Eocene in age. Some of these bore hole cores supplied by the MECL to us for palynological investigation was instrumental in detecting the Palaeocene rocks in the subsurface.

The bore hole core No. BH 125 is about 181.4m deep drilled by the MECL at Bithnok area and was studied for palynological fossils. Bithnok (27° 8' Lat. and 72° 4' Long.) is about 50 km west of Kolayat in Bikaner District (Map 1 & Text-fig.1).

The lithology comprises sandstone and shale with occasional presence of lignite. The lowermost unit (181.4m-175m) consisting of grey shale is overlain by carbonaceous shale (174m-125m) with thin bands of sandstone. The lignitic bands are found in between (125m-116.2m) within the



Map 1. Geological map of the area (after Shrivastava, 1971).



Text-fig. 1. Litholog of the bore hole core no. BH 125.

carbonaceous shale. The carbonaceous shale with lignitic layers and sandstone occur between 116.2m-77m. The rest part of the bore hole core (77m-0m) consists of thick bed of earthy sandstone, kankar and blown sands.

The palynofossil were recoverd at the depth of 119m, 118m, 117m, 116m, 105m, 84m, and 82m. All the slides have been deposited at the Repository of the Birbal Sahni Institute of Palaeobotany, Lucknow.

GEOLOGY

Das Gupta (1977) published the stratigraphy of the west Rajasthan shelf, it contains a number of sedimentary basins separated from each other by basement ridges. The Bikaner-Nagaur Basin has five exposed formations of Tertiary Period, overlying Proterozoic and Precambrian rocks. The Bikaner-Nagaur Basin is bounded to the S and SW by the Pokaran-Nachna uplift, to the east by the western spurs of the Aravalli mountains and to the north by the subsurface Delhi-Saragoda ridge. The North Bikaner High divides the basin into two subbasins, the Nagaur subbasin to the east and the Bikaner subbasin to the west. Both these subbasins are further differentiated into number of highs and lows.

Shrivastava (1971) put forward the following rock stratigraphic classification for the Cenozoic rocks of the basin:

Quaternary

Mar Formation- Dirty white, brown, ferruginous, medium to coarse grained, gritty and conglomeratic, current bedded sand with minor variegated shale and clay (105.10m thick).

Tertiary

Jogira Formation - Nummulitic yellow limestone, marl test beds, foraminiferal limestone and grey to yellow Fuller's earth (160.06m thick).

Palana Formation- Variegated clays, interbedded nummulitic limestone and marls with dark to grey sticky clays and minor sandstones, lignite at places (120.12m thick).

Das Gupta (1977) correlated the lignite bearing Palana Formation with the Thumbli Member of the Akli Formation in the Barmer basin. He also

Plate 1

(All photomicrographs enlarged ca x 1000 unless otherwise mentioned).

Fig 1 *Proxapertites cursus* van Hoeken-Klinkenberg Sl. no. 11857, V29/1, Figs. 2,3 *Retidiporocolpites excellensus* Kar Sl. nos. 11858, P31/1, 11859, L27, Figs. 4,6 *Lycopodiumsporites spectiosus* Datta & Sah Sl. nos. 11859, 033/4; 11860, D4/2, Fig. 5 *Spinizonocolpites echinatus* Muller Sl. no. 11861, T47, Figs. 7,8 *Dandotiaspora dilata* Sah, Kar & Singh Sl. nos. 11862, R24 (ca x 630 times); 11863, Q14/3, Figs.

9,10 *Matanomadhiasulcites kutchensis* Kar Sl. no. 11864, T13/2; T23 (ca x 630 times), Fig. 11 *Pluricolumellatepollis pachyexinus* Kar Sl.no. 11865, L4, Fig. 12 *Neocouperipollis kutchensis* Venkatachala & Kar Sl. no. 11866, W7/1, Fig. 13: 13 *Ocimumpollenites indicus* Kar Sl. no. 11865, B18/2

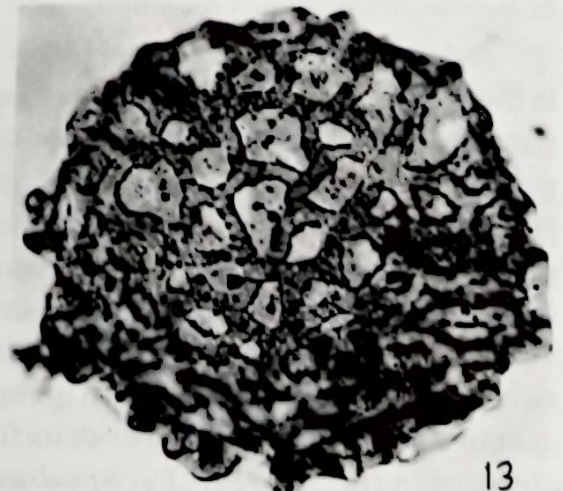
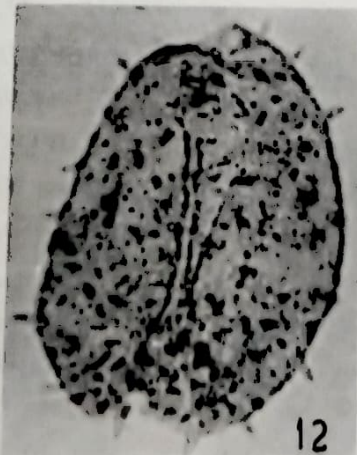
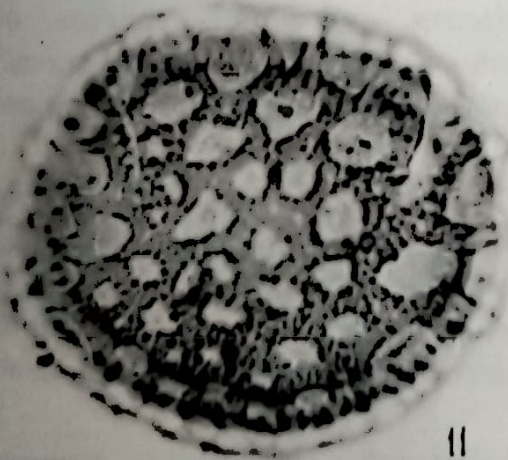
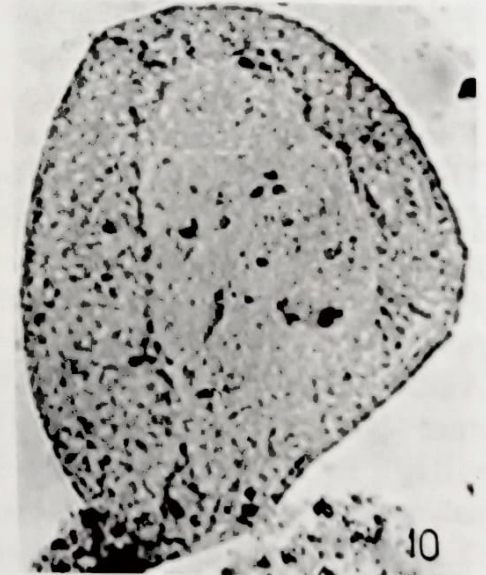
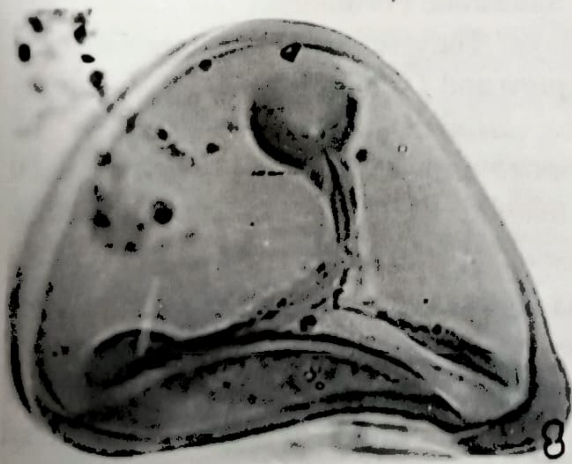
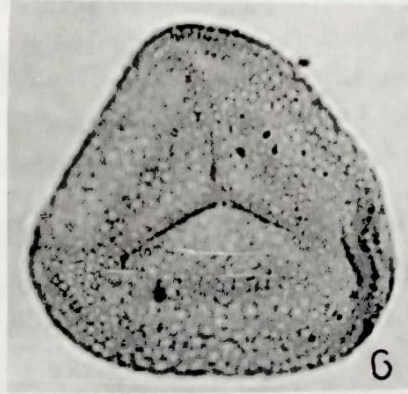
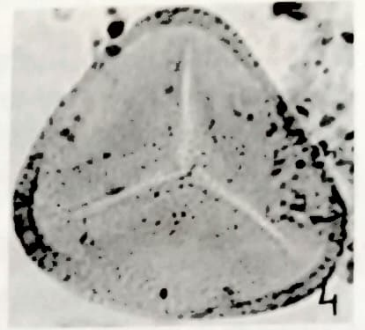
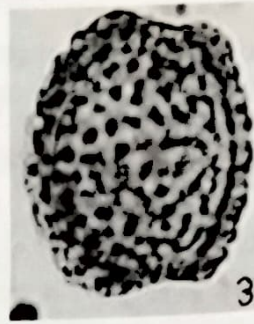
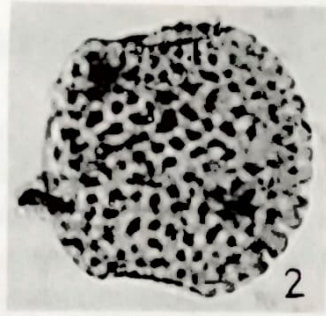
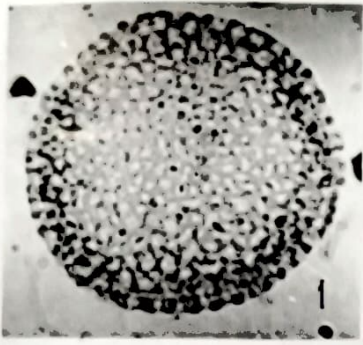


PLATE 1

introduced Kolayat Formation for a sequence of impure bentonitic clay and a bioclastic limestone containing *Assilina daviesti*, *A. granulosa* etc. lying above the Palana Formation.

PALYNOLOGY

Palynological records on the Tertiary succession of Rajasthan are few and they have been described from the Barmer Sandstone and Palana lignite. Bose (1949, 1952) described plant fossils, Jain, Kar and Sah (1973) and Tripathi (1993) worked on palynofossil from the Barmer area. The palynoassemblage shows abundance of angiospermic pollen followed by pteridophytic spores. The Palana sediments were initially investigated by Rao and Misra (1949) and Rao and Vimal (1950, 1952). Detailed palynological work on Palana sediments of Rajasthan was carried out by Sah and Kar (1974). They have reported 44 genera and 67 species. Kar (1995a, 1995b, 1996) described a rich palynological assemblage recovered from a bore hole core No. K12 drilled by the MECL at Kuchaur-Benia area in Bikaner District, Rajasthan. The assemblage is characterized by the presence of *Ocimumpollenites indicus*, *Pluricolumellatepollis pachyexinus*, *Pachymonoletasporites superbus*, *Piladiporocolpites caratinii*, *Psiladiporocolpites pachyexinus*, *Retidiporocolpites excellensus* etc. Ambwani and Singh (1966) studied the bore core No. RGBH-33/14 drilled at Raneri village in Bikaner District. Some common palynotaxa are *Lycopodiumsporites palaeocenicus*, *Dandotiaspora dilata*, *Proxapertites cursus* and *Matanomadhiasulcites maximus*.

A rich palynological assemblage was obtained in the present investigation from the bore hole core samples (BH 125) comprising pteridophytic spores, gymnospermic and angiospermic pollen. The pteridophytic spores are well represented while the gymnospermic pollen is rare and is contributed by *Cycas* only. The angiospermic pollen are quite common. In all, sixty samples were macerated and 18 samples yielded spores and pollen grains. About 39 genera and 51 species were identified. Of the pteridophytic spores, *Lycopodiumsporites*,

Todisporites, *Dandotiaspora*, *Schizaeoisporites* are common.

Angiospermic pollen are dominated by *Proxapertites*, *Neocouperipollis*, *Spinizonocolpites*, *Matanomadhiasulcites*, *Psiladiporocolpites*, *Piladiporocolpites*, *Retidiporocolpites*, *Palmaepollenites* and *Tricolpites*. Besides many polycolpate pollen such as *Ocimumpollenites* and *Pluricolumellatepollis* are also common.

DISCUSSION

The presence of *Dandotiaspora dilata* together with various species of *Lycopodiumsporites* between 181.4 m-117.3m depth is very characteristic. From 117.3 m onwards the above mentioned species are not found in the bore hole core and the assemblage is mostly dominated by polycolpate genera like *Ocimumpollenites* and *Pluricolumellatepollis* etc. Dutta and Sah (1974), Kar and Kumar (1986) studied the sediments of Lakadong Sandstone Formation (Late Palaeocene) of Meghalaya. They reported the dominance of *Dandotiaspora* and *Lycopodiumsporites* in the assemblage. Some common species of *Dandotiaspora* and *Lycopodiumsporites* are *D. dilata*, *D. telonata*, *D. plicata*, *L. parvireticulatus*, *L. palaeocenicus* and *L. speciosus* etc.

Saxena (1978, 1980) and Kar (1985) observed the frequent occurrence of different species of *Dandotiaspora* in Matanomadh Formation (Late Palaeocene), Kutch, Gujarat. Kar (1985) divided this formation into five palynological cenozones; of these *D. dilata* Cenozone is dominated by *D. dilata*, *D. plicata* and some species of *Lycopodiumsporites*, *Todisporites*, *Proxapertites* etc. *Lycopodiumsporites* is also present but it is not found in significant percentage.

Kar (1992) observed that the association of *Dandotiaspora* and *Lycopodiumsporites* is characteristic of Late Palaeocene. *Lycopodiumsporites* is also abundant in Palaeocene but its contribution significantly decreases in Early Eocene sediments of India.

So, in all probability the sediments between

181.4m- 117.3m in the present bore hole core also belong to Late Palaeocene.

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