

PERMIAN MIOSPORES IN THE MIOCENE SEDIMENTS OF KUTCH, GUJARAT

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ABSTRACT

Permian miospores belonging to the Lower Gondwana, comprising the genera *Cannanoropollis*, *Potonieisporites*, *Caheniasaccites*, *Platysaccus* and *Lahirites*, have been recovered in the Khari Nadi Formation (Miocene) of Kutch. These reworked fossils are well preserved but found in small number along with the Tertiary genera, viz. *Striatriletes*, *Lycopodiumsporites*, *Cyathidites*, *Palmaepollenites*, *Malvacearumpollis*, etc. The implication of the Permian palynological fossils in the Upper Tertiary sediments has been discussed.

INTRODUCTION

The presence of older palynological fossils in comparatively younger sediments is quite common in India. Earlier workers due to lack of sufficient data could not detect these fossils and described them along with others which truly represent the sediments. POTONIE' AND SAH (1961) instituted *Cannanoropollis* from the Upper Tertiary lignites of Cannanore, Kerala. Same type of pollen grains were reported later by LELE (1964) as *Virkkipollenites* from the Talchir (Lower Permian) of India. This created a nomenclatural problem and had been discussed by VENKATACHALA AND KAR (1969). Similarly, SUKH-DEV (1961) recorded many Lower Gondwana palynomorphs from the Jabalpure Formation (Lower Cretaceous) of Madhya Pradesh and also proposed a new genus viz. *Sehorisporites*. BHARADWAJ (1962) while working on the *Sporae dispersae* of Raniganj Formation instituted *Densipollenites* which appears to be very similar to *Sehorisporites* Sukh-Dev (1961).

As the data on the dispersed spores of the various lithological formations of India accumulated, later workers could easily detect the reworked palynomorphs from the younger sediments. The redeposited Permian pollen in the Upper Jurassic sediments of Kutch is known. DUTTA (1979) recorded the recycled Permian pollen in Upper Cretaceous rocks of Jaintia Hills, Meghalaya and traced the Singrimari exposure of Meghalaya as the source rock.

SAXENA (personal communication) recorded typical Mesozoic miospores, viz. *Impardecispora* Venkatachala, Kar & Raza (1969), *Contignisporites* Dettmann (1963), *Boseisporites* (Sukh-Dev) Bharadwaj & Kumar (1972), etc. from the Matanomadh Formation (Palaeocene) of Kutch along with characteristic Palaeocene palynoflora.

DUTTA AND SINGH (in press) recorded a good percentage of Permian striate bisaccate pollen grains in some samples of the Siwalik rocks of the Lesser Himalayas, Kameng District, Arunachal Pradesh.

PALYNOLOGY

The present paper deals with the occurrence of Permian palynological fossils in the Khari Nadi Formation (Miocene) of Kutch, Gujarat. This formation, according to BISWAS AND RAJU (1971, 1973) is exposed in the cliffs of Khari Nadi between $23^{\circ} 25' 45''$: $68^{\circ} 49' 40''$ and $23^{\circ} 23'$: $68^{\circ} 48'$. The basal bed consists of bluish-grey claystone and occasionally yields dicotyledonous leaf impressions and other fossils. The upper bed com-

prises red, yellow and variegated siltstone. The fauna indicates an age from Chattian to Aquitanian.

While working on the palynostratigraphy of the Khari Nadi Formation, the author recovered some Permian pollen grains along with typical Upper Tertiary miofloral assemblage. At first, these pollen grains were thought to be contaminated in the laboratory. Thorough precaution was taken and the samples were chemically processed several times; but every time the Permian palynofossils were obtained. It may be mentioned here that these fossils occurred only in the basal claystone bed of the formation.

The Permian pollen grains comprise monosaccates, non-striate and striate bisaccates. Monosaccates are represented by *Cannanoropollis obscurus* (Lele) Bose & Maheshwari (1968), *Caheniasaccites ovatus* Bose & Kar (1966), *Potonieisporites* sp. and cf. *Divarisaccus* Venkatachala & Kar (1966). *Platysaccus* sp. and *Verticipollenites* sp. represent non-striate and striate bisaccates respectively. Most of these pollen grains are well preserved and they are frequently found amongst *Striatriletes* (van der Hammen) Kar (1979), *Lycopodiumsporites* Thiergart ex Delcourt & Sprumont (1955), *Cyathidites* Couper (1953), *Podocarpidites* (Cookson) Potonie' (1958), *Palmaepollenites* Potonie' (1951), *Malvacearumpollis* Nagy (1962), etc.

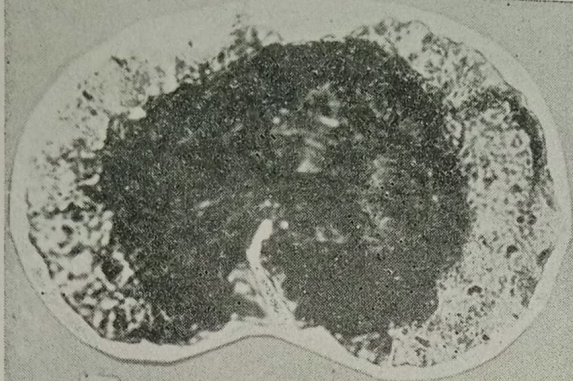
DISCUSSION

The presence of Permian pollen grains in the Miocene sediments of Kutch is rather difficult to explain as in Kutch and its immediate adjacent regions there is no exposure of Lower Gondwana sediments. The oldest rock in Kutch according to Biswas (1971) is the Precambrian granite exposed in Merudo Hill and also in Nagar Parker area in Sind. The oldest sedimentary rocks exposed in western and eastern Kutch, in the opinion of Biswas (1971), are represented by Kaladongar and Khadir formations respectively. Both of them are Bathonian to Oxfordian in age. Some of the geologists of the Oil and Natural Gas Commission, Dehra Dun, suspect the presence of Upper Triassic sediments in the sub-surface of Banni and adjacent areas, but so far no such outcrop has been detected.

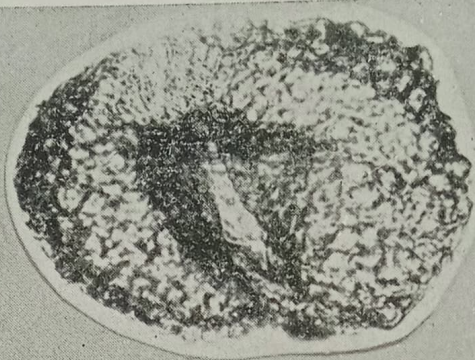
So, from the present state of our knowledge it seems that these Permian fossils came either from Rajasthan or Salt Range of West Pakistan where there are good Permian exposures. In Rajasthan, Badhaura Formation of Permian age rests on the Bap boulder bed. On the age of the latter bed, there is recently much controversy (see LUKOSE & MISHRA, 1974; MUKHOPADHYAY & GHOSH, 1976; DICKINS & SHAH, 1977; PAREEK & SINHA, 1978); but most of the geologists equate this with the Talchir Boulder Bed. The Badhaura Formation is characterised by yellowish, brownish, ill-sorted, highly fossiliferous sandstones and clays and according to PAREEK AND SINHA (1978) is Sakmarian-Artinskian in age. The Lathi Formation (Liassic) lies unconformably over the Badhaura Formation and consists of sandstones, ferruginous siltstones with plenty of gymnospermous fossil woods.

The Permian sediments are very well developed in Salt Range. The Nilawan Group of Lower Permian age, according to KUMMEL AND TEICHERT (1966, 1970), consists of Tobra Formation at its base which is equivalent to Talchir-in-India. This is overlain by Warcha Sandstone (Speckled Sandstone) and is easily distinguished by its presence of *Eurydesma*. The next in the ascending order is the Sardi Formation. The Zaluch Group of Upper Permian in age is divisible into three: (i) Amb Formation (Lower Productus Limestone), (ii) Wargal Formation (Middle Productus Limestone) and (iii) Chidru Formation (Upper Permian Limestone). The latter is overlain by Mianwali Formation (Lower Triassic).

It seems more likely that the Permian palynomorphs in the Miocene sediments of Kutch came from Rajasthan than Salt Range because the former is nearer to Kutch and it has little topographical barrier. According to PAREEK AND SINHA (1978) lithological,



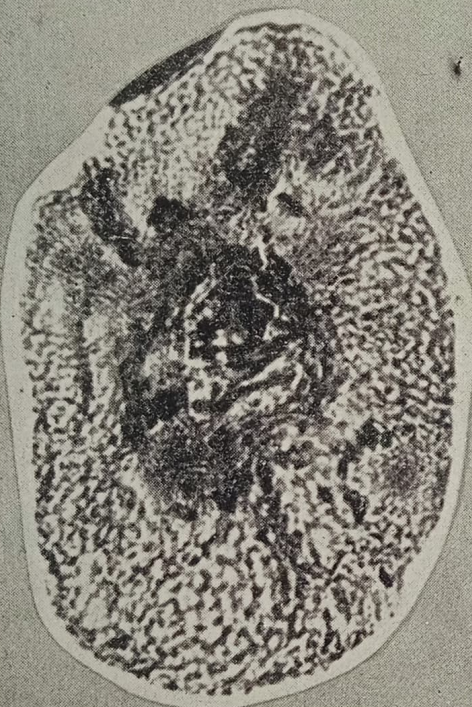
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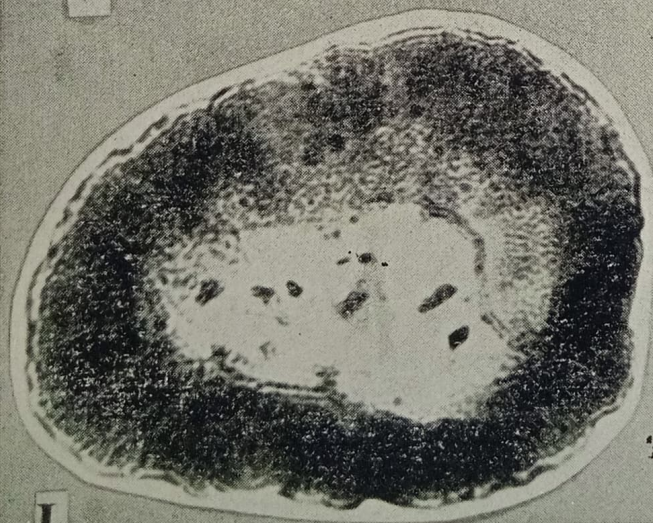
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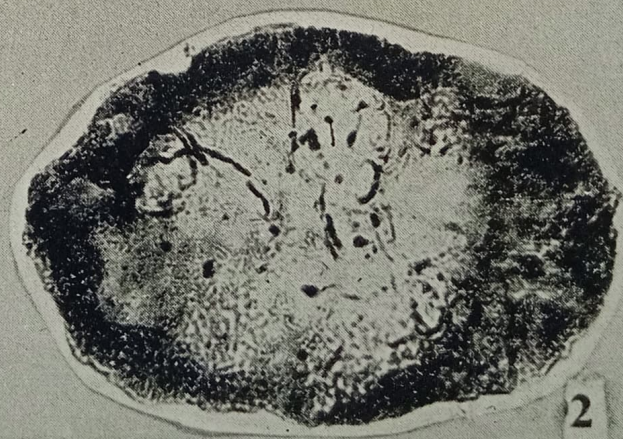
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biostratigraphical and palaeogeographical studies indicate that Kutch and the lower Indus basin of Sind was continuous and formed part of a large and extensive spread of the Tertiary sediments. The western part of Rajasthan was a part of shelf. Due to tectonic uplifting, Rajasthan escaped Upper Tertiary marine transgression but the Permian sediments represented by Badhaura Formation faced erosion and was redeposited in the Miocene sediments of Kutch. The presence of Bap Boulder Bed in Rajasthan and equivalent Tobra Formation in Salt Range suggests the existence of glacial condition in western India and Pakistan. Perhaps, these glacials radiated from the Aravalli Hills during Talchir and later witnessed deposition of Permian sediments. These were eventually turned into elevated land due to tectonic activity and faced extensive post Permian erosion.

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EXPLANATION OF PLATE-1

(All photomicrographs are enlarged *ca.* ×500)

- Fig. 1. cf. *Divarisaccus* Venkatachala & Kar. Slide no. 5984/6.
- Fig. 2. *Caheniasaccites ovatus* Bose & Kar. Slide no. 6187/4.
- Fig. 3. *Cannanoropollis obscurus* (Lele) Bose & Maheshwari. Slide no. 5983/3.
- Fig. 4. *Potonieisporites* sp. A. Slide no. 5984/13.
- Fig. 5. *Potonieisporites* sp. B. Slide no. 5984/21.
- Fig. 6. *Verticypollenites* sp. Slide no. 6187/8.
- Fig. 7. *Platysaccus* sp. Slide no. 5988/6.