

Gymnospermic Pollen Grains in Coal and Associated Sediments of Sonda Coal Field, Thatta, Sindh, Pakistan.

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Abstract

In the present investigation some gymnosperm pollen grains have been described from different strata of Sonda coalfield, Sindh, Pakistan. The pollen grains isolated and identified from different strata are viz.: *Callialasporites dampieri*; *Gnetaceapollenites steevesi*; *Inaperturopollenites magnus*; *I. rugulatus*; *I. dubius*; *Monosulcites crescentus*; *Taxodiaceapollenites distichiforme* (non-coal bearing strata) and *Corisaccites altus* (coal bearing strata).

Key words: Grains, Strata, Coal bearing, Non-coal bearing

Introduction

Gymnosperms are one of the primitive groups of higher plants. There is extensive literature that reveals the presence of similar types of gymnosperm pollen grains in a wide range of geological periods. For example, *Callialasporites dampieri* has a vast range of occurrence from Mesozoic (Mesozoic sediments of northern and southern hemisphere) to Jurassic era (rocks of Rajmahal hills, Sehara Jabalpur series and Umia series of India respectively, Sah and Jain, 1965; Dev, 1961; Singh, *et al.*, 1964). The pollen grains once described and considered dissimilar have later on considered similar and were placed as one genus. For instance, the above-mentioned species has once been considered *Tasugaepollenites* (Dev, 1961) later described as *Zonalepollinites* (Thomson and Pflug, 1953) has now been placed in another genus *Callialasporites* (Sah and Jain, 1965).

Sahito and Nizamani, (1988), has presented a little information about microfossils of Sonda Coal field. Their findings were based on coal bearing material. However owing to the paucity of information about non-coal bearing zone (associated sediments) different strata of associated sediments were included in the present investigation.

The present work emphasise the comparative range of occurrence of pollen grains and the slight variations in size and shape that has been observed in the isolated material of Sonda coal field (Bara formation). It is also an attempt to elucidate the information about different coal bearing and non-coal bearing strata (associated sediments) that might help in bridging up the missing links of depositional conditions of coalfields in Sindh.

Materials and Methods

The Sonda coal- field (District Thatta) is about 60 km. South of Hyderabad, Sindh, Pakistan. The Sonda coal is greyish black in colour. The samples were obtained from bore hole no. DH.18.

These samples was macerated following Schultz's (1928) method. Each sample measuring 50 to 60 g, was broken into grain size and washed thrice with boiling distilled water to eliminate the external contamination. The washed material was treated with sufficient quantity of nitric acid in a fuming chamber and the reaction was activated with potassium chlorate reagent. The material was then neutralised with 200 ml of 10% sodium hydroxide solution. After 30 minutes about a litre distilled water was added and left the material to settle. The upper layer of water was removed and distilled water was filled again. This process was repeated several times till the material and water appeared clean. A small quantity of material was centrifuged at 1000 rpm with 5 minutes interval to get further clean material.

The centrifuged material was chlorinated (3 ml of glacial acetic acid + 3 drops of concentrated hydrochloric acid + 5 drops of saturated sodium chloride). Finally it was thoroughly washed with distilled water again and centrifuged. The slides were prepared from the centrifuged material following Kisser's (1935) standard technique for microscopic study.

Results and Discussion

Associated sediments.

1. *Callialasporites dampieri*, (Balme) Dev, (1961), Pl. 1. Fig. 1. Depth 567 m.

Pollen grains brown in colour, circular to sub-circular 45x46.5 µm in size. Prosaccus completely encircling

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the central body and slightly three lobed saccus 7.5- 8 μm wide possessing radial folds which give it a frilled appearance Alete or a very faint undulating Y mark sign is seen, which extends from pole to equator Exine two layered granulose.

Affinity: Podocarpaceae.

Remarks: The present specimen is smaller in size than that described by Tiwari *et al.*, (1983) from Palaeozoic and Mesozoic Tethyan sequence of Mall Johar, Kumaon, Himalaya, Gondwana, India.

2. Gnetaceapollenites steevesi, Jansonius (1962), Pl.1. Fig.2. Depth 700 m.

Pollen grains golden brown in colour, oval spindle shaped, 21x45.5 μm in size. Longitudinal ends distinctly tapering to pointed ends, ribs more or less fused near longitudinal ends. Two of ribs may be more pronounced prominently, surrounding wider groove than between other ribs. Exine moderately thick.

Affinity: Ephedraceae.

Remarks: The present specimen is larger in size than that described by Jansonius, (1962), reported it from Permian and Triassic sediments, peace river area, Western Canada.

3. Inaperturopollenites magnus. Thomson and Pflug, 1953.

Pl.1. Fig.3. Depth 177,7m.

Pollen grains brown in colour, spherical to ellipsoidal, 28.5x25.1 μm in size, inaperturate. Exine 1.2 μm thick psillate.

Affinity: Abietaceae.

Remarks: It shows close resemblance with living genus Larix. The present specimen is smaller in size than that described by Norton and Hall (1969) from Hell Creek Formation (upper Cretaceous and lower Tertiary), Montana, USA.

4. Inaperturopollenites rugulatus, Norton and Hall (1969), Pl.1. Fig4. Depth 177.7m,

Pollen grains brown in colour, spherical and 42x58 μm in size, Inaperturate, Exine 1.5-1.8 μm thick psilate. The characteristic feature of pollen grain is the dark thickened ridges over the surface of the grain wall. The ridges are irregularly arranged and appear like folds.

Affinity: Abietaceae.

Remarks: The present specimen is smaller in size than that described by Norton and Hall (1969) from Upper Cretaceous, Hell Creek Formation, Montana, USA.

5. Inaperturopollenites dubius, (R.Pot). Ven. Pl. 1. Fig. 5. Depth 587 m.

Pollen grain dark brown in colour, ovoidal 26x53 μm in size. Inaperturate, Exine 1.2 μm thick psilate. The grain wall appears as dark thickened folds over the surface of the grain.

Affinity: Cupressaceae.

Remarks: The present specimen is slightly larger in size than that described by Thomson and Pflug (1953)

from Tertiary sediments, North western, Krefield, Germany.

6. Monosulcites crescentus, Norton (1969). Pl. 1. Fig. 6. Depth 700. M.

Pollen grain light yellow in colour, oval spindle shaped 58.5-25 x 57-18 μm in size. Monosulcate, single furrow on the distal face delimited by two longitudinal slightly crescentic folds extending full length of the grain and in contact at their extremities. Exine very thin 0.75 μm in size granulated. Due to the thinness of the exine the grain often split at one end.

Affinity: Gymnospermae.

Remarks: The present specimen is larger in size than that described by Norton and Hall (1969), reported from Upper Cretaceous and Lower Tertiary of Hell Creek Formation, Montana U.S.A.

7. Taxodiaceapollenites distichiforme (Simpson) Srivastava, n. Comb (1975). Pl. 1. Fig. 7. Depth. 433 m.

Pollen grain light brown in colour, globose 64.4x 84 μm in size grain usually split into two equal halves up to $\frac{3}{4}$ pollen length, rest of the portion of grain attached at one end. Sexine granulose 0.75 μm thick; ligula is discernible as a semicircular mark on the Exine. Exine 0.75 μm thick.

Affinity: Taxodiaceae.

Remarks: The present specimen is larger in size with discernible ligula relative to that described by Srivastava (1975) reported from Maastrichtian, Interbasaltic Lignites, Mull of Scotland.

Coal bearing zone.

8. Corisaccites alutas, Venkatachalla *et al.*, (1968). Pl. 1. Fig. 8. Depth 492 and 1528 m.

Pollen grains golden brown in colour, disaccate slightly diploxytonoid, circular to oval, 58.5 x 66 μm in size, surface psilate. Sacci oval elliptical and unequal 21-24 x 34.5-55.5 μm in size and separated from each other by longitudinal elongate curved corpus. Exine 1.5 μm thick, psilate.

Affinity: Coniferae.

Remarks. The present specimen is slightly smaller in size but resembles closely with that described by Balme (1970) from Permian and Triassic strata of salt range and Surghar range, West Pakistan.

Discussion.

In the present investigation almost all gymnospermic pollen grains were found from non-coal bearing strata except one (*Corisaccites alutas*) that was found from coal bearing strata. The following gymnospermic grains recorded from non-coal bearing and coal bearing strata: *Callialasporites dampieri*, *Gnetaceapollenites steevesi*, *Inaperturopollenites magnus*, *I. rugulatus*, *I. dubius*, *Monosulcites crescentus*, *Taxodiaceapollenites distichiforme* and *Corisaccites alutas*.

The above mentioned taxa have already been mentioned by various workers from different places and of different geological formations. The present findings coincide with those reports, for example, *Callialasporites dampieri*, have been reported to be widely distributed in the Mesozoic sediments of northern and southern hemisphere. Sah and Jain (1965) reported it from Jurassic rocks of Rajmahal hills of India. Dev (1959) described it from Sehora Jabalpur series, India. Venkatchala *et al.*, (1968) have reported the same species from upper Jurassic of Bhuj Western India. Balme (1957) has reported it from Jurassic cretaceous and Eocene of W. Australia. Whereas Tiwari *et al.*, (1983) reported it from Palaeozoic- Mesozoic, Tethyan sequence, Gondwanas, India. Similarly Jansonius (1962) reported *Gnetaceaepollenites steevensi*, from Permian and Triassic sediments of Peace River, W. Canada. Norton and Hall (1969) reported *Inaperturopollenites magnus* and *I. rugulates*, and *Monosulcites crescentus*, from Upper Cretaceous and Lower Tertiary, Hell Creek Formation, Montana, USA. Likewise, *Taxodiaceapollenites distichiforme* has been reported from Maastrichtian, *Interbasaltic lignites*, of Scotland, UK, Srivastava (1975).

Balme (1957) has also reported *Corrisaccites* in coal bearing strata from Permian and *Triassic strata* in the salt range and surghar range of Pakistan.

In view of the above mentioned record of different workers, the present assemblage of Sonda Coal field shows a wide range of occurrence in different geological periods and formations. The non- coal bearing and coal bearing strata of Sonda field come under Pleistocene- Miocene and Palaeocene geological periods. As regards the gymnosperm pollens it appears that the material is transported from upland to the depositional site.

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