MONOSACCATE POLLEN FROM EARLY TRIASSIC STRATA (MIANWALI FORMATION) WESTERN SALT RANGE, PAKISTAN.

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ABSTRACT: *The Early Triassic strata being represented by Miawali Formation, Western Salt Range, Pakistan contains palyoflora. Rock samples were collected from stratigraphically measured section of the Mianwali Formation exposed at the Nammal Gorge, Western Salt Range, Pakistan. The Mianwali Formation is divisible into three members viz; Katwai, Mittiwali and Narmia respectively, representing predominantly marine environment of deposition. Rock samples were carefully processed for palynological analysis. This paper reports the occurance of Monosaccate pollen presumably of Gymnospermic origin, viz; Potoniesporites balmei, Cordaitina gunyalensis, Plicatipollenites gondwanensis and Playfordiaspora annulata.*

INTRODUCTION

Mianwali Formation represents a great wedge of varied facies consisting of marl, limestone, sandstone, siltstone and dolomite. Easily accessible sections are located in Nammal, Zaluch and Chhiddru Gorges respectively [1].The underlying formation at Nammal Gorge is late Permian in age and is Chhiddru Formation. Mianwali Formation is lithologically divided into three members i.e., Katwai, Mittiwali and Narmia in ascending order [2]. Rock samples were collected from Nammal Gorge Section, Western Salt Range, Pakistan, (Long 71° 47′ 50″ Lat 32° 39′ 27″) which is 107m thick . The extent of preservation is good and morphological characters can be helpful in palaeoclimatic interpretations at that time[3]. The main objective of the present investigation is to describe monosaccates. Monosaccates, which have their affininties wth Gangamopterids, an extinct group of seed ferns. As far is Early Triassic palynology is concerned a very limited work is available. So the present paper would be a source of information to the plant scientists.

MATERIALS AND METHODS

Rock samples(30 g each) from Mianwali Formation were macerated using standard techniques [4,5] including physical disaggregation and treatment with analar grades of 50% of Hydrochloric, Hydrofloric and Nitric acids followed by 1% KOH treatment and heavy liquid separation. Finally after sieving strew mounts slides were prepared using Canada Balsam as mounting medium.

Relative frequencies of various species were expressesed as follows:-

Abundant above 25%, Dominant above 15% but less than 25%, Frequent above 10% but less than 15%, Rare above 5% but less than 10% and Very rare less than 5% Furthermore sample code was employed in the following manner:-

NGK Nammal Gorge Katwai, NGM Nammal Gorge Mittiwali and NGN Nammal Gorge Narmia. While the numbers 1, 2, 3 etc. represent the sample numbers oblique slide no. While the numbers like 46/19 –S1 means sample no oblique slide no and S1 is the stage 1.

The dimensions are based on specimens preserved in polar view, the values given on right side represent the maximum breadths or heights, similarily the values on the left side represent the minimum breadths or lengths while the values in the parenthesis represent the average figures of breadths or lengths.

RESULTS AND DISCUSSION

Potonieisporites balmei (Hart) Segroves, 1969

Pl. 1 Fig. 1

Occurrence: Nammal Gorge: Mittiwali member abundant to frequent.

Dimensions: (14 Specimens) Total Breadth = 120 (159) 181 µm.

Total Height = 94 (109) 141µm.

Corpus Breadth = 58 (82) 103 µm.

Corpus Height = 52 (76) 90µm.

Maximum Breadth of Saccus = 45 – 60 µm.

Description: Pollen grain, monosaccate, bilaterally symmetrical, overall amb oval or oblong oval, corpus circular in polar view or sub circular or rhomboidal, the proximal face associated with a sharp, slightly curved (angular) monolete mark with thin labra, exine of corpus laevigate to infra punctate, on the distal side the attachment zone of the saccus is indicated by two folds which are faintly discernable in the figured specimen due to poor preservation, exoexine of saccus intrareticulate up to 2 µm thick, muri 1.5-2 µm wide, lacuni 3 x 5 µm wide, saccus distally inclined, surrounding the central body equatorially, the lateral continuation of the saccus is usually broad, marginal limbus poorly developed.

Remarks: Balme [6] expressed some reservations regarding recognition of various species of the *Potonieisporites* particularly in the absence of detailed illustration of the type species. Balme [6] found rich and highly diversified assemblage of *Potonieisporites* from Amb Formation (Permian – Artinskian) Salt Range, Pakistan, exhibiting great range of variations with respect to the morphology of corpus, monolete mark and saccus, and regarded them to be belonging to the same population of *Potonieisporites novicus* Bharadwaj. Recovery of *Potonieisporites* from the Mianwali Formation has thus extended the range of occurrence of this taxon.

Collection: NGM-31/9

Possible affinities: Pteridospermales

Cordaitina gunyalensis (Pant and Srivastava) Balme, 1970

Pl. 1 Fig. 2.

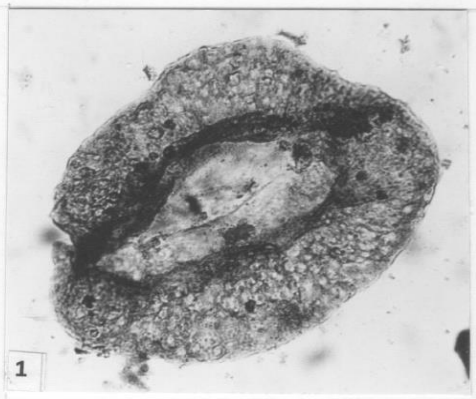
Occurrence: Nammal Gorge: Mittiwali member common.

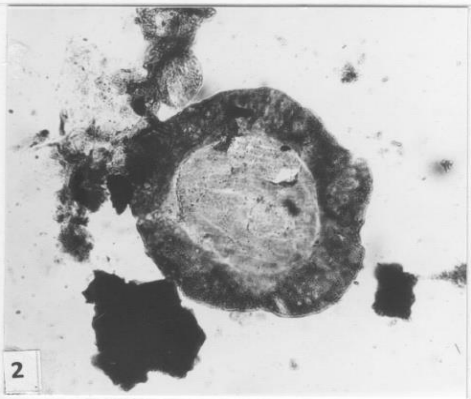
Dimensions: Total Diameter = 132 (129) 140 µm.

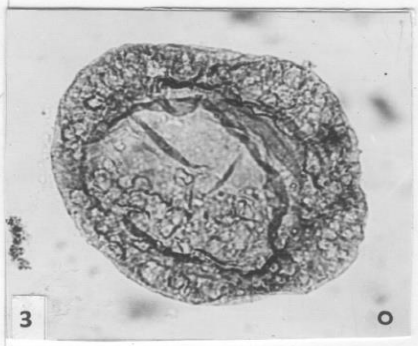
Corpus Diameter = 82 (87) 110µm.

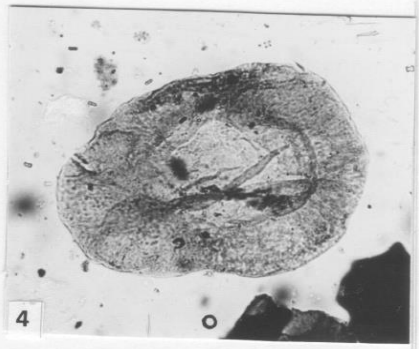
Maximum Width of Saccus = 20 (25) 31µm.

PLATE 1









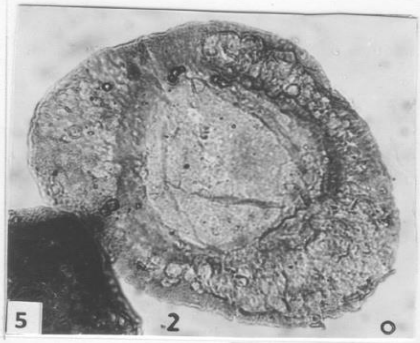


Fig 1: ***Potoniesporites balmei*** **(Hart) Segroves, 1969**

Fig 2: ***Cordaitina gunyalensis*** **(Pant and Srivastava) Balme, 1970**

Fig 3-5: ***Plicatipollenites gondwanensis***

(Balme and Hennelly) Lele, 1964

Fig 6: ***Playfordiaspora annulata*** **Tiwari and Rana, 1980**

Scale bar corresponds to 30 µm in Fig 1,2 and 6 and to 50 µm in Fig 3,4 and 5.

Description: Pollen grain, monosaccate, overall amb sub circular to elliptical, corpus ill defined, trilete mark distinct or indistinct, saccus attachment sub equatorial on both sides, exine of central body infra punctate to infra granulate, width of saccus uniform, or may be distorted or greatly compressed due to post preservational hazards, the exine of corpus gradually merges into exoexine of saccus leaving no clear cut line of demarcation, exoexine of saccus crumbled into radial folds, narrow zones of proximal and distal sides overlap, the exo exine of saccus is more compact, heavily built and dark in color than the exine of central body.

Remarks: Pant and Srivastava [7] reported monosaccate pollen (*Perisaccus gunyalensis* Pant and Srivastava) with identical morphographic features from Triassic Sediments of the Salt Range. Balme [6]proposed a new combination and treated them as *Cordaitina gunyalensis.* As indicated by Balme [6]Pant and Srivastava gave no precise stratigraphic horizon for the original population of *Cordaitina gunyalensis,* it probably came from the Landa Member of the Tredian Formation. Same taxon was also recorded by Iqbal [8] from Landa Member, Tredian Formation (Middle Triassic) Western Salt Range, Pakistan.

Collection: NGM-37/13, 46/19-S1

Possible affinities: Pteridospermales

Plicatipollenites gondwanensis (Balme and Hennelly) Lele, 1964

Pl. 1 Fig. 3-5

Occurrence: Nammal Gorge: Mittiwali member common to frequent.

Dimensions: (52 Specimens) Total Diameter = 142 (158) 190µm.

Corpus Diameter = 62 (79) 92µm.

Maximum Width of Saccus = 24 (35) 45µm.

Description: Pollen grain, monosaccate, amb of corpus circular to sub circular conforming perfectly to the overall amb, exine of corpus thin, trilete mark absent with numerous plications.

Remarks: It differs from *Plicatipollenites indicus* Lele, in having large size and more sharply developed intexinal folds along the distal root of saccus.

Collection: NGM-42/12, 90/2, 28/1

Possible affinities: Pteridospermales (Gangamopterid).

Playfordiaspora annulata Tiwari and Rana, 1980

Pl. 1 Fig. 6

Occurrence: Nammal Gorge: Narmia member abundant.

Dimensions: (33 Specimens) Total Diameter = 71 (85) 98µm.

Corpus Diameter = 42 (51) 60µm.

Description: Pollen grain, apparently monosaccate, corpus distinct, overall amb circular to sub circular, amb of central body strictly corresponding to the overall amb, this taxon is characterized by a flange like unfirmly broad extension of exoexine, which being thin and delicate may sometimes be partly or fully lost during maceration process, flange thin 1 µm, more or less translucent with a very fine regular and distinct reticulum, lumina are less than 1 µm in diameter with fine muri and squarish to hexagonal lumina, exine of central body infrapunctate to infragranulate, more dense and dark colored, trilete mark indistinct, attachment of exoexine to central body is sub equatorial.

Remarks: Whether or not *Playfordiaspora* is a monosaccate genus is yet to be established. I have followed the generic diagnosis of *Playfordiaspora* as given by Jansonius and Hills [9]. *Playfordiaspora annulata* is a characteristic Middle Triassic miospore of Indian [10] and Pakistani [8] Gondwana Sediments. Its recovery from Mianwali Formation has extended its stratigraphic range of.

Collection: NMG-94/2

Possible affinities: Pteridospermales (?).

Early triassic period was a period of recovery phase of a number of plant groups. Among different plant groups Pteridosperms were also trying to coope with the environment as shown by their morphographic features like radial monosaccate construction helpful in floating of pollen during dispesal , leathery saccus construction and saccus enclosing the corpus from all sides for the protection of microgametophte .

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