EARLY JURASSIC SPOROMORPHS FROM DATTA FORMATION, SALT RANGE, PAKISTAN

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ABSTRACT: *Samples from Datta Formation of Early Jurassic period, Nammal Gorge, Salt Range, Pakistan were palynologically processed which revealed the occurrence of very complex and diverse palynoflora including a large number of trilete spores together with the other microfloral groups i.e. monoletes, monosaccates, bisaccates, colpates and sulcates. Trilete species viz. Leiotriletes gracilis, Leiotriletes congoensis, Granulatisporites livingstonensis,Granulatisporites sp.cf.G.pallidus, Punctatisporites orbicularis and Punctatisporites kankakeensis are described in this paper along with the botanical affinities.*

INTRODUCTION

Pre-Toarcian deposits in Pakistan constitute Datta Formation which is represented mainly by continental sediments (sandy and clayey) grading into marine beds (calcareous and argillaceous) **[1, 2, 3]**. Its thickness ranges from 6m (Chak Dalla) to 400m (Sheikh Budin area) and it varies greatly in color, i.e. red, maroon, pink, grey, green and white. Formation is considered to be of Early Jurassic as its overlying sediments (Shinawri Formation) have revealed characteristic Early Toarcian Fauna **[4]**. Published record covering the palynological aspects of Datta Formation includes Sah **[5]**, Jain and Sah **[6]**, Masood and Bhutta **[7]**, Masood *et al* **[8]** and Masood **[9]**.

Present investigation partly highlights the results of an ongoing Ph.D project of the author under the supervision of Prof. (R) Dr. Khan Rass Masood, at the Department of Botany, University of the Punjab. Although considerably rich palynoflora was recovered from three sections of the Datta Formation in the Western Salt Range, here only some selected miospores are described with main emphasis on the systematics and botanical affinities so as to highlight the glimpse of the vegetation that prevailed in the Salt Range, during Early Jurassic times.

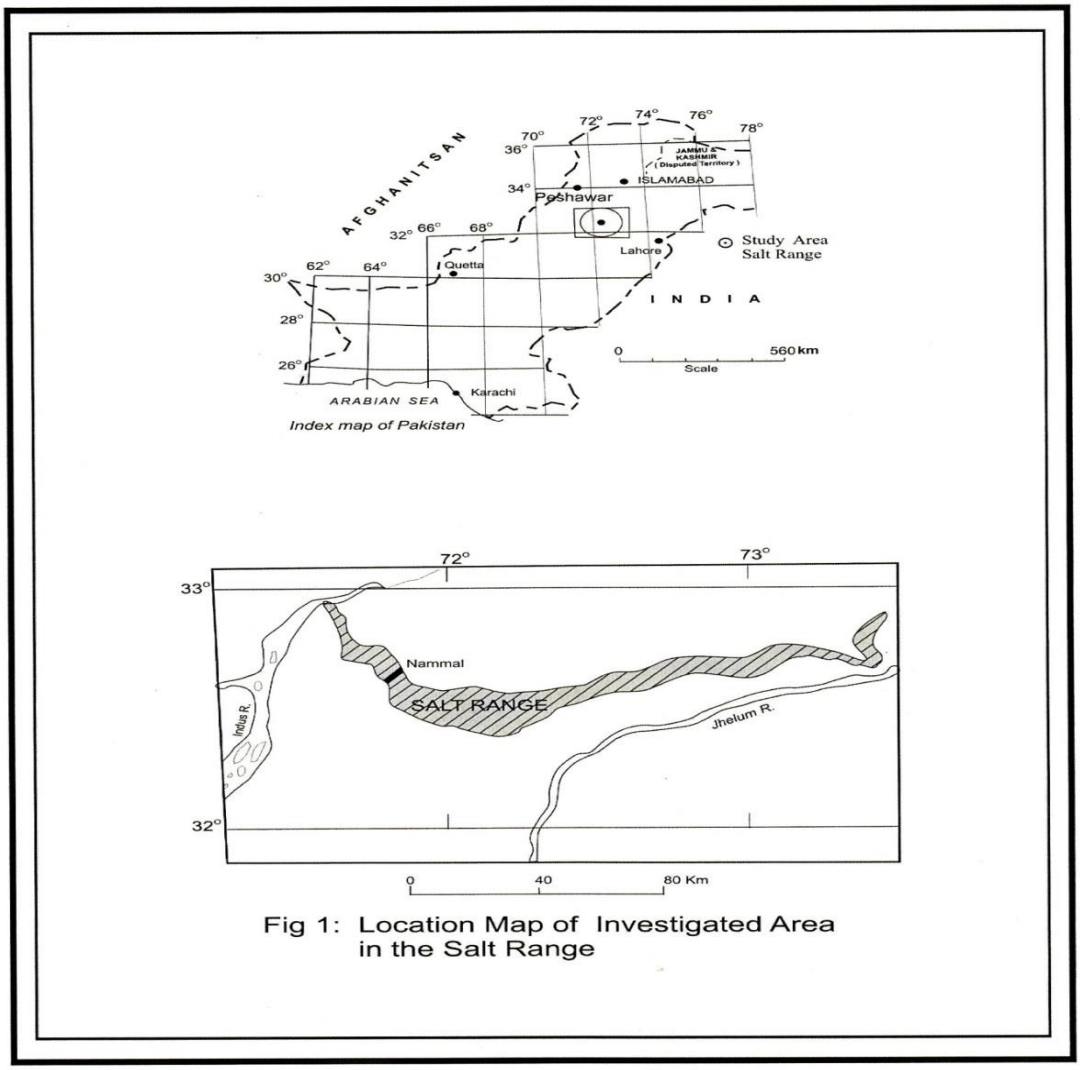


Fig 1: Location Map of Investigated Area in the Salt Range

Details of remaining palynomorphs shall be published in a series of publications soon after the completion of the Ph.D project. This paper deals with the systematic description and botanical affinities of only few trilete spores viz. *Leiotriletes gracilis, Leiotriletes congoensis, Granulatisporites livingstonensis, Granulatisporites* sp. cf. *G. pallidus, Punctatisporites orbicularis* and *Punctatisporites kankakeensis.* Hopefully this work will open the new vistas and will help to unravel the mysteries of plant evolution. It will also help to establish the evolutionary history of the vegetation in the studied area.

MATERIALS AND METHODS

Rock samples, collected from the Nammal Gorge Section (Fig. 1), Salt Range Pakistan were processed following the standard palynological techniques **[10,11]** with minor modifications where necessary. In general, samples were washed, crushed and demineralized using analar grade 50% HCl and HF respectively **[12]** followed by oxidation and heavy liquid separation **[13]**. Permanent mounts in glycerin jelly were prepared **[10]**, catalogued and housed in the Palaeopalynology Research Laboratory, Department of Botany, University of the Punjab, Lahore.

SYSTEMATIC PALYNOLOGY

This part of paper deals with the systematic description of palynoflora according to the turmal system of classification (modified after Potonie **[14]** and Dettmann **[15]**. Possible Botanical affinities of each palynotaxon have also been provided.

Anteturma SPORITES Potonie 1893 **[16]**

Turma TRILETES (Reinsch) Dettmann 1963 **[15]**

Suprasubturma ACAVATITRILETES Dettmann 1963 **[15]**

Subturma AZONATI (Luber) Dettmann 1963 **[15]**

Infraturma LAEVIGATI (Bennie & Kidson) Potonie 1956 **[14]**

Genus *LEIOTRILETES* (Naumova, 1939) Ischenko 1952 **[17]**

Type Species: *Leiotriletes sphaerotriangulatus* Potonie and Kremp 1954 **[18]**

Leiotriletes gracilis Imgrund 1960 **[19]**

Fig. 2.1

Description: Trilete, amb broadly triangular, angles rounded, sides slightly convex, lete distinct, arms of lete extending upto 2/3rd of radii, labrum distinct, exine smooth/laevigate, 1 µm thick

Possible Botanical Affinities: Filicales **[20]**

Leiotriletes congoensis Kar and Bose 1967 **[21]**

Fig. 2.2

Description: Trilete, amb broadly triangular, angles rounded, sides straight to slightly convex, lete distinct, arms of lete extending upto the angles, labrum distinct, exine laevigate to infrapunctate, 1.5 µm thick

Possible Botanical Affinities: Filicales **[20]**

Genus *PUNCTATISPORITES* (Ibrahim) Potonie & Kremp 1955 **[22]**

Type Species: *Punctatisporites punctatus* (Ibrahim) Potonie & Kremp 1955 **[22]**

Punctatisporites orbicularis Kosanke 1950 **[23]**

Fig. 2.5

Description: Trilete, amb oval to circular, lete distinct, arms of lete extending upto 2/3rd of radius, exine infrpunctate, 1.5 µm thick

Possible Botanical Affinities: Osmundaceae **[24]**

Punctatisporites kankakeensis Peppers 1970 **[25]**

Fig. 2.6

Description: Miospore, trilete, amb circular, lete distinct, arms of lete extending upto 1/3rd of radius, exine infrapunctate, 2 µm thick

Possible Botanical Affinities: Osmundaceae **[24]**

Infraturma APICULATI (Bennie & Kidson) Potonie 1956 **[14]**

Subinfraturma GRANULATI Dybova & Jachowitz 1957 **[26]**

Genus *GRANULATISPORITES* Ibrahim 1933 **[27]**

Type Species: *Granulatisporites granulatus* Ibrahim 1933 **[27]**

Granulatisporites livingstonensis Pepper 1970 **[25]**

Fig. 2.3

Description: Trilete, amb triangular, angles rounded, sides straight to concave, lete distinct, labra massive, arms of lete extending upto angles, contact area indistinct, exine infragranulate, upto 2µm thick.

Possible Botanical Affinities: Dicksoniaceae **[28]**

Granulatisporites* sp. cf. *G. pallidus Kosanke 1950 **[23]**

Fig. 2.4

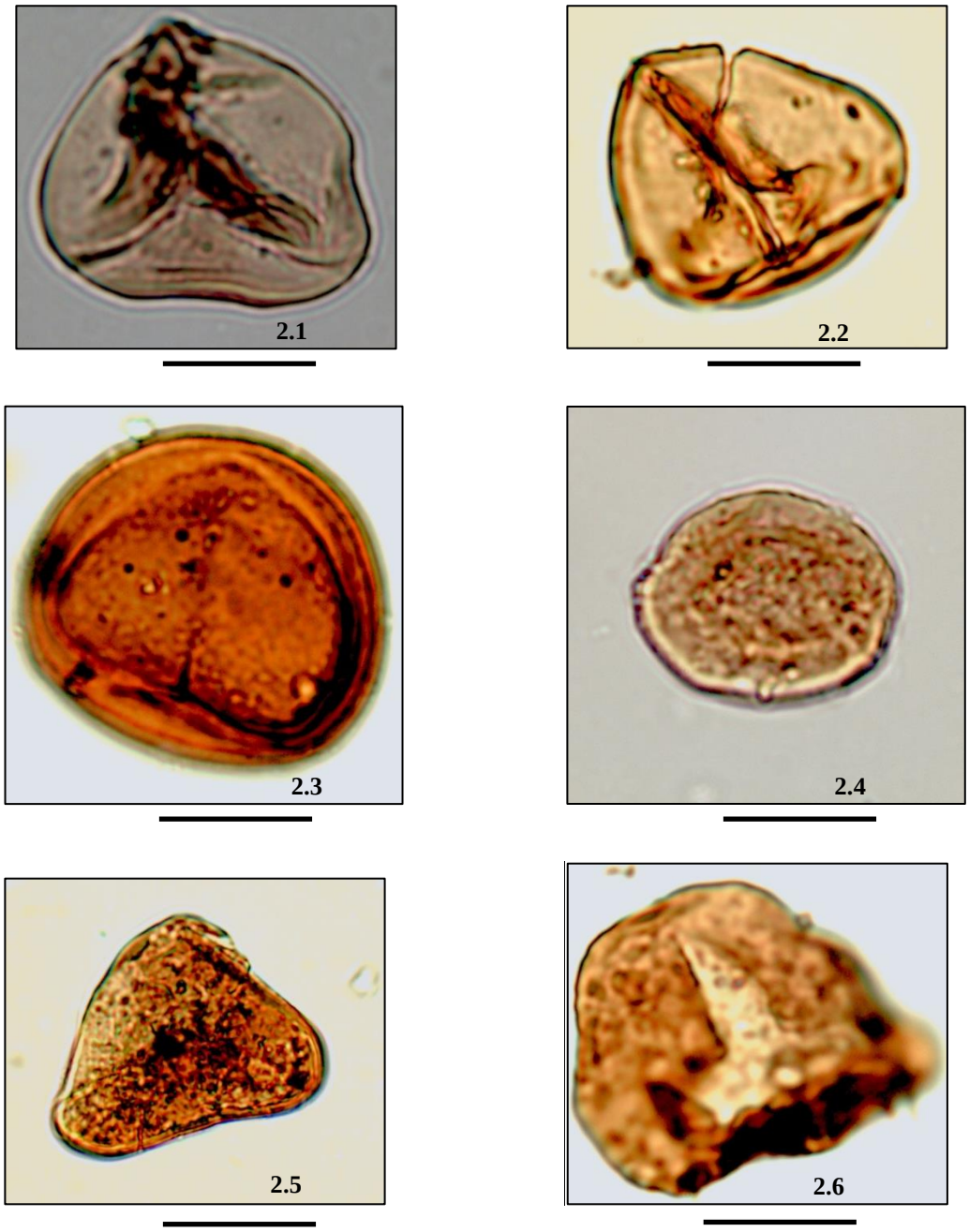
Description: Trilete, amb broadly triangular, angles rounded, sides slightly concave, lete distinct, arms of lete extending upto 2/3rd of radii, commissure open, contact area indistinct, exine infragranulate, 1.5 µm thick

Possible Botanical Affinities: Dicksoniaceae **[28]**

RESULTS AND DISCUSSIONS:

The recovered palynoflora from the studied outcrop comprised trilete spores dominating the assemblage with subordinate proportion of monoletes, monosaccates, bisaccates, colpates and sulcates. The quantitative and qualitative analyses of the samples revealed prevalence of diversified plant communities during the depositional phase of Datta Formation (Early Jurassic). Described here are three genera of azonotriletes, which were either laevigate (*Leiotriletes*), granulate or punctate (*Granulatisporites* and

Figure-2



SCALE BAR = 20 µm

(2.1) ***Leiotriletes gracilis*** Imgrund 1960

(2.2) ***Leiotriletes congoensis*** Kar and Bose 1967

(2.3) ***Punctatisporites orbicularis*** Kosanke 1950

(2.4) ***Punctatisporites kankakeensis*** Peppers 1970

(2.5) ***Granulatisporites livingstonensis*** Pepper 1970

(2.6) ***Granulatisporites* sp. cf. *G. pallidus*** Kosanke 1950

Punctatisporites). The possible affinities of these genera point towards the presence of the members of Filicales (mainly Dicksoniaceae) and Osmundaceae **[20, 24, 28]**. On a broader spectrum, it can be deduced that the plants belonging to the order Filicales were true ferns, either herbaceous or arborescent and sometimes the climbers **[29]**. Family Dicksoniaceae represented arborescent tree ferns **[30]** while, on the other hand members belonging to family Osmundaceae were mostly herbaceous. Both families are extant. Based on the present day distribution and habitat of

these groups, it can be tentatively suggested that the plants were living in terrestrial to subaquatic, temperate and tropical or subtropical environments **[30]** and the climate was warm to warm humid at various topographic levels during the deposition of the Datta Formation in the Salt Range.

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