PALYNOLOGICAL EVIDENCE OF PTERIDOPHYTIC PLANT COMMUNITIES IN LATE PERMIAN (DZULFIAN) PERIOD, WESTERN SALT RANGE, PAKISTAN

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ABSTRACT: Chidru Formation belongs to Permian Zaluch Group and is well exposed in the Salt Range, Pakistan. Palynological study from the topmost ten beds (51-60m from the base) at the type locality (Chidru Gorge Section) was carried out which revealed a substantial proportion of pteridophytic spore assemblages in addition to pollen and spores of other plant groups. Present paper deals with the identification of trilete and monolete miospore including Calamospora, Punctatisporites, Lophotriletes, Densoisporites, Laevigatosporites and Lunulasporites. Recovered palynomorphs are systematically described and discussed along with their possible plant affinities. The palynoflora suggested the existence of shade loving Pteropsids, Sphenopsids and Lycopsids in considerable numbers. Shallow marine environment has been suggested during the deposition of Chidru Formation.

INTRODUCTION

Late Permian (Dzulfiian) sediments of the Salt Range were given the name Chidru Formation by Dunbar [1]. The lower contact with Wargal Limestone is transitional whereas the upper contact with the Mianwali Formation of Triassic age is sharp and is marked by a paraconformity [2]. Its lithology varies from calcareous sandstone and few sandy limestones with minor amounts of feldspar, muscovite, biotite and iron oxide [3]. Chidru Nala (Lat. 32°31’N; Long. 71 ° 48’E) is said to be the type locality of the Formation where its total thickness reaches up to 64 meters [4]. Despite of its immense importance, no significant botanically oriented palynological work has yet been published pertaining to the miospore assemblages from the type locality. The available literature in this respect is of Virkki [5], Balme [6] and Rehman and Masood [7]. Present study deals with the palynological analysis of the topmost section (51m-60m above the base) of Chidru Formation. 06 miospore genera were recovered out of which 04 genera belonged to trilete spores while 02 genera belonged to monolete spores. Microflora from comparatively non-productive samples (CC53 and CC55) had an insignificant preservation to be incorporated in the results of present study. The recovered palynomorphs are technically described under the section of systematic palynology.

MATERIALS AND METHODS

The sampling in the field was carried out according to the stratigraphic procedures devised by Masood et al.,[8]. Ten samples (51m – 60m above the base) were taken from the type section of the Formation, at an interval of 01m. Standard preparatory techniques as suggested by Doher [9], Phipps and Playford [10], Traverse [11], Masood [12], Masood et al., [13, 14] and Grey [15] were employed to the samples. The samples were washed thoroughly with water to remove any surface contamination. Samples were crushed in pestle and mortar and small fragments were subjected to the reactivity test [5] to guess their predominant mineral composition using 50% of each HCl, HF and HNO3 [9] Water soluble minerals were removed by decantation with distilled water. Carbonates and silicates removal was carried out by treating with HCl and HF respectively. The humic acid layer was further removed by 1% KOH. Samples were centrifuged after mixing with a ZnCl2 solution having specific gravity (S.G.) of 1.975 . The supernatant was separated, neutralized and permanently mounted on glass slides using glycerin jelly as the mounting medium.

SYSTEMATIC PALYNOLOGY

Great caution was taken while identifying the palynomorphs. The terminology used in the description of miospores was taken from Kremp [16] and Pötter [17]. The possible plant affinities were adapted from the Looy et al., [18, 19]and Bharadwaj [20].

Anteturma SPORITES Pötter, 1893
Turma TRILETES (Reinsch) Dettmann, 1956
Suprasubturma ACAVATIRILETES Dettmann, 1963
Subturma AZONOTRILETES (Luber) Pötter, 1963
Infraturma LAEVIGATI (Bennie & Kidson) Pötter, 1956
Genus CALAMOSPORA Schopf (in Schopf, Wilson & Bentall), 1944
Type Species: Calamospora hartungiana Schopf, Wilson & Bentall, 1944
C. hartungiana Schopf, Wilson & Bentall, 1944
Pl. 1 Fig. 1-3
Dimension: Equatorial Diameter = 59µm
Description: Miospore, trilete, amb circular to sub-circular, highly variable due to folding, Y-mark distinct, rays extending up to 2/3 of the radius, exine variously folded, laevigate, about 1µm thick.
Possible Affinities: Equisetales.

Infraturma APICULTI (Bennie & Kidson) Pötter, 1956
Subinfraturma GRANULATI Dybova & Jachowicz, 1957
Genus PUNCTATISPORITES (Ibrahim) Pötter & Kremp, 1955
Type Species: Punctatisporites punctatus (Ibrahim) Pötter & Kremp, 1955
P. vermiculatus Kosanke, 1950
Pl. 1 Fig. 4, 5
Dimension: Equatorial Diameter = 175µm
Description: Miospore, trilete, amb circular, Y-mark well developed, rays extending up to 2/3 of the radius with curvatures imperfectae, contact area well developed, distinct, exine thin at contact area, punctate, upto 2µm thick.
Possible Affinities: Pteridophytic.

p. gretensis Balme & Hennelly, 1956
Pl. 1 Fig. 6, 7

May-June
**Dimension:** Equatorial Diameter = 87.5μm  
**Description:** Miospore, trilete, amb broadly triangular, Y-mark distinct, well developed, labra thick, raised, rays extending up to one half of the radius, exine punctate, up to 2μm thick.

### PLATE-1

Fig 1-3. *Calamospora hartungiana* Schopf, Wilson & Bentall.  
Kosanke  
Fig 4, 5. *Punctatisporites vermiculatus*  
Kosanke  
Fig 6, 7. *Punctatisporites gretensis* Balme & Hennelly, Fig 8. *Lophotriletes* sp.  
Fig 9. *Densoisporites complicatus*  
Balme

### PLATE-2

Fig 1-2. *Laevigatosporites callosus* Balme  
Fig 3-4. *Lunulasporites vulgaris* Wilson

**Possible Affinities:** Pteridophytic.  
**Infraturma NODATI** Dybova & Jachowicz, 1957  
**Genus LOPHOTRILETES** Naumova ex Pòtonie & Kremp, 1954  
**Type Species:** *Lophotriletes gibbosus* Ibrahim, 1933  
*Lophotriletes* sp.  
Pl.1 Fig. 8  
**Dimension:** Equatorial Diameter = 45μm  
**Description:** Miospore, trilete, amb circular to sub-circular to broadly triangular, Y-mark distinct, reaching up to the radius, exine punctate to vermiculate, up to 2μm thick.

**Possible Affinities:** Pteridophytic.  
**Suprasubturma** LAMINATITRILETES Smith & Butterworth, 1967  
**Subturma** ZONOLAMINATITRILETES Smith & Butterworth, 1967  
**Infraturma CINGULATI** Smith & Butterworth, 1967  
**Genus DENSOISPORITES** Weyland & Krieger, 1953  
**Type Species:** *Densoisporites velatus* Weyland & Krieger, 1953  
*D. complicatus* Balme  
Pl.1 Fig. 9
Further observations on Fossil..., they occurred almost in all...iletes...ermian of Salt...e and Surghar Range, West...ayford, G. (2013) and two (02) palynomorph...y and stratigraphy...iet, A.H. and Jan, Q.M. (1997). Geology and Tectonics of Pakistan, Graphic publishers Karachi.

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