FURTHER OBSERVATIONS ON BIVESICULATE POLLEN FROM PERMIAN STRATA (CHHIDRU FORMATION), WESTERN SALT RANGE PAKISTAN

Muhammad Zia- ul- Rehman, Farhat Rass Masood, Faheem Arshad and Tahira Malik
Department of Botany, University of the Punjab, Lahore, Pakistan.
Corresponding Author: *Muhammad Zia Ul Rehman*

ABSTRACT: *Rock samples from the Permian Chhidru Formation, Chhidru Gorge (Type Locality) Western Salt range, Pakistan were collected and palynologically processed. Ten bivesiculate pollen form genera viz.; Lunatisporites novialensis, L.pellucidus, Guttulapollenites hannonicus, Hamiapollenites bullaeformis, Corisaccites alutas, Lueckisporites virkkiae, L.singhii, Scheuringipollenites maximus, S.ovatus and Klausipollenites schaubergeri were identified. The possible affinities of the palynomorphs were suggested to be Gymnospermic.*

INTRODUCTION

During the past few decades palaeopalynology has emerged as a significant inter disciplinary field and scientist all over the world has used it for oil and gas exploration [1, 2], to estimate the exact age of oil deposits [3], indicate oil source rocks [4, 5, 6], correlate data on regional bases [7], to establish palaeovegetation [8, 9, 10], determine the age of rocks [11], resolve systematic palynostratigraphy, palaeoclimatology and evolution [12, 13, 14, 15, 16, 17, 18, 19] and many other fields of Geology and Biology.

Salt Range Pakistan is one of the reference marine strata of the world [20] and Chidru Formation represents the termination of Permian rock system in Western Salt Range, Pakistan. The present study deals with palynological analysis of rock samples from type locality (Chhidru gorge).

MATERIALS AND METHODS

The sampling in the field was carried out according to the procedure devised by Masood *et al.*, [21]. Standard preparatory techniques as suggested by Doher [22], Phipps and Playford [23], Traverse [1], Masood *et al.* [24, 21] and Grey [25] were employed. 50 gm of each each sample were subjected to bulk maceration. For removal of water soluble minerals, decantation was made by distilled water. Carbonates and silicates were removed by treating the samples with HCl and HF respectively. Finally the samples were oxidized with 1-2% KOH solution. The samples were consequently centrifuged using $ZnCl_2$ solution having specific gravity of 1.975 to separate the palynomorphs from mineral matrix [1, 2]. The material was neutralized and permanent glass slides using Canada balsam as mounting medium were prepared. Microphotographs were taken and data was resolved in technical terms.

RESULTS AND DISCUSSION

The palynomorphs genera recovered during present investigation are described in the following section according to turma system [1].

Anteturma SPORITES H. Potonie, 1893
Turma TRILETES (Reinsch) Dettman, 196
Sub turma DISACCITES Cookson, 1947
Infraturma STRIATITI Pant, 1954
Genus *LUNATISPORITES* (Leschik) Klaus, 1963
Type Species: *Lunatisporites acutus* Leschik
L. novialensis (Leschik) Foster

Although *Lunatisporites novialensis* was quiet abundant to common in the presently studied samples of the Chhidru Formation, very few complete specimesn were available for detailed morphographic comparison. Even in moderately preserved specimens the taenae were partly or totally corroded and could only be identified by their faint outline detectable under oil immersion objective.

L.pellucidus (Goubin) Balme

Pollen of this type had always been a characteristic component of early and middle Triassic sediments in most Gondwanaland countries [26, 27, 28].it is the first report of this genus from Chhidru Formation.

Genus: *GUTTULAPOLLENITES* Goubin, 1965
Type Species: *Guttulapollenites hannonicus* Goubin, 1965
G. hannonicus Goubin, 1965

This taxon occurs in abundance in the upper Permian of Madagascar [29]. Balme [13] also isolated it from Amb, Wargal and Chhidru Formations of the Permian age and early Triassic strata (Mianwali Formation) Salt Range, Pakistan.

Genus: *HAMIAPOLLENITES* Wilson emend. Tschudy & Kosanke, 1966

The status of genus *Hamiapollenites* has been discussed in detail by Balme [13] and present study is indicative of its occurrence in Chhidru Formation.

Type species: ***Hamiapollenites saccatus*** Wilson
H. bullaeformis (Samoilovich) Jansonius

Balme [13] recovered *Hamiapollenites insolitus* (Bharadwaj & Salujha) Balme, from the Amb Formation (Salt Range). The present sporomorph however differs significantly from *Hamiapollenites insulatus* by its much broader and rounded corpus and small, less distally inclined sacci. This is the first record of this genus in the Chhidru Formation, Pakistan.

Infraturma ALETIDISACCITES (Leschik) Pötonie, 1958
Genus: *CORISACCITES* Venkatachala & Kar, 1966
Type Species: *Corisaccites alutas* Venkatachala & Kar, 1966
C. alutas Venkatachala & Kar, 1966

Balme [13] discussed the status of this taxon in detail. *Corisaccites alutas* is a miospore of unique morphology which has mostly been recorded from the lower Permian deposits. Virrki [7] recorded it from two horizons from the Warchha Formation in Kathwai (Eastern Salt Range, Pakistan).

Genus: *LUECKISPORITES* Pötonie & Klaus, 1954
Type Species: *Lueckisporites virkkiae* Pötonie & Klaus, 1954
L. virkkiae Pötonie & Klaus

Sporomorphs assignable to *Lueckisporites virkkiae* were not found in good state of preservation. The exoeine of sacci and cappa was ruptured to a varying degree making the absolute

identification difficult. The polar cleft on face of the cappa was so much compressed that the two halves of cappa overlap. Since the dimensions and morphology of the margins of the cleft are major tools for reliable identification upto species level, because of the non-availability of these two important traits. Species level identification was not possible.

L.singhii Balme

Lueckisporites singhii was originally recovered by Balme [13] from Amb, Wargal and Chhidru Formations (Salt Range, Pakistan). Balme distinguished it from *Lueckisporites virkkiae* Becouse of its polar proximal cleft, which, in the former species is poorly defined, rather ragged and wedge shaped, so that the cappula is seldom completely or sharply divided.

Genus: *SCHEURINGIPOLLENITES* Tiwari, 1974

Type Species: *Scheuringipollenites maximus* Tiwari, 1974

S.maximus (Hart) Tiwari

Scheuringipollenites maximus was found to be an important constituent of Chhidru Formation. Backhouse [12] recovered it from the Early Permian of Collie Basin of Australia.

S.ovatus Balme & Hennelly

Balme [13] distinguished *Scheuringipollenites ovatus* by its longitudinally elongate corpus which although indistinct is always discernable and its fine uniform saccus interreticulum. This taxon also occur in very low frequently (rare to very rare) in the Amb and Wargal Formations, [14] Salt Range Pakistan.

Genus: *KLAUSIPOLLENITES* Jansonius, 1962

Type species: *Klausipollenites schaubergeri* (Pötonie & Klaus) Jansonius, 1962

K.schaubergeri (Pötonie & Klaus) Jansonius, 1962

Klausipollenites schaubergeri is an important constituent of Chhidruan palynoflora. It was also recorded by Balme from Chhidru Formation at Kathwai member of early Triassic (Mianwali Formation) of the Salt Range

REFERENCES

[1]Traverse, A. (1988). Palaeopalynology, Unwin Hymen USA, pp. 580.

[2]Traverse, A. (2007). Palaeopalynology, Springer Science & Business Media, (2007) Science , pp. 813.

[3]de Jersey, N.J. (1965). Plant microfossils in some Queensland crude oil samples. *Geological Survey of Queensland*, Publication, 329.

[4]Teichmuller, M. and Ottenjahn, K (1977). Liptinite and lipoide Stoffe in einem Erodlmuttergestein. Erdol Kohle **30**: 387-98.

[5]De-xin, J. and Hui-qui, Y. (1980). Petroleum spore-pollen assemblages and oil source rock of Yumen oil bearing region in Gansu: *Acta Botanica Sinica*, **22**(3): 280-285.

[6]Jiang, D. (1984). Pollen and spores from crude oil of Talimu Basin, China. Poster display at American *Association of Stratigraphical Palynology 17th Annual Meeting, Arlington, Virginia*

[7]Virkki, C. (1946). Spores from the Lower Gondwanas of India and Australia. *Proc. Nat. Acad. Sci. India*, **15**(4-5): 93-176 (1945).

[8]Lele, K.M. (1966). Studies in the Talchir flora of India-4. Quest for the early traces and subsequent development of the Glossopteris flora in the Talchir Stage. *Symp. Floristics Stratigr. Gondwanaland* (1964), p.85-97. Birbal Sahni Institute of Palaeobotany, Lucknow.

[9]Sah, S.C.D. (1955). Plant microfossils from a Jurassic Shale of Salt Range, West Punjab (Pakistan): *Palaeobotanist*, **4**: 60-7.

[10]Sitholey, R.V. (1943). On *Psygmophyllum haydeni* Seward. *J. Indian Bot. Sci*., **22**: 183-190.

[11]Venkatachala, B.S. and Kar, R.K. (1968). Palynology of Kathwai Shales, Salt Range, West Pakistan-1. Shales 25ft above the Talchir Boulder bed. *Palaeobotanist* **16**: 156-166.

[12]Backhouse J. (1988). Trilete spores from the Collie Basin, Western Australia. *Association of Australians Palaeontologcal Memoir*, **5**: 53-752.

13[]Balme, B.E. (1970). Playnology of Permian and Triassic strata in the Salt Range and Surghar Range, West Pakistan. *In*: Kumel, B., Teichert, C. (Eds.), Stratigraphic Boundary Problems – Permian and Triassic of West Pakistan. University of Kansas Special Publication, **4**: 305-453.

[14]Claver, C.R., Clarke, M.J. and Truswell, E.M. (1984). The stratigraphy of a late Palaeozoic borehole section at Douglas river, eastern Tasmania: a synthesis of marine macro-invertebrate and palynological data. *Paper Proceedings of Royal Society*, Tasmania, **118**: 137-161.

[15]Tiwari, R.S. and Vijaya (1992). Permo-Triassic boundary on the Indian peninsula. *In* Sweet WC *et al.* (editors) – *Permo-Triassic events in the Eastern Tetbys*: 37-45. Cambridge University Press, Cambridge.

[16]Césari, S. N. and Gutierrez, P.R. (2000). Upper Paleozoic Palynostratigraphy of Argentina: Palynostratigraphy of upper Paleozoic sequences in Central-Western Argentina. *Palynology*, **24**: 113-146.

[17]Wang, J. (2004). Exceptionally well preserved sporangia of the Permian Petrified Noeggerathialean strobilus *Discinites sinensis* Wang. *International Journal of Plant Sciences*, **166**(6): 135-144.

[18]Vajda-Santivanez, V. and McLoughlin, S. (2007). Palynofloristic extinction and recovery patterns across the Cretaceous-Paleogene boundary – a tool for unraveling the causes of the end-Permian mass-extinction. *Review of Paleobotany and Palynology*, 144**(1-2)**: 99-112.

[19]Galfetti, T., Hochuli, P.A., Brayard, A., Bucher, H., Weissert, H. and Vigran, H. (2007). Smithian-Spathian boundary event: Evidence for global climatic change in the wake of the end-Permian biotic crisis. *Geology*, **35**(4):291-294.

[20]Pakistani-Japanese Research Group (P.J.R.G.), (1985). *Stratigraphy and correlation of the marine Permian-Lower Triassic in the Surghar Range and Salt Range, Pakistan.* Kyoto Univ., 25 p.

[21]Masood, K. R., Khalid, A. N., Qureshi, K. A. and Hussain, Z. (1995). Further observations on Fossil Fungi (VA Mycorrhizae) from the Permian of Salt

Range, Pakistan. *Pakistan Journal of Geology*, **3**(2): 7-10.

[22]Doher, L.I. (1980). Palynomorphs preparation procedures currently used in palaeontology and stratigraphy Laboratories *U.S. Geological Survey, U.S.G.S. Pub.,* **830**: 1- 29.

[23]Phipps, G. and Playford, G. (1984). Techniques for extraction of palynomorphs from sediments. *Pap. Dept. Geol., Univ., Queensland,* **11**(1): 1-33.

[24]Masood, K. R. and Qureshi, K. A., (1993). Trilete palynomorphs from Early Permian Sediments (Dandot Formation), Central Salt Range, Pakistan. *Pakistan Journal of Geology,* **2**(1): 67-76.

[25]Grey, K. (1999). A modified palynological preparation technique for the extraction of large Neoproterozoic Acanthomorph Acritarchs and other acid-insoluble microfossils. Department of Minerals and Energy, Geological Survey of Western Australia. Report, 1999/10, pp. 23.

[26]Balme, B. E. (1963). Plant microfossils from the Lower Triassic of Western Australia. *Palaeontology,* **6**: 12-40.

[27]Playford, G. (1965). Plant microfossils from Triassic sediments near Poatina, Tasmania: *Jour. Geol. Soc. Australia.* **12**: 173-210.

[28]Evans, P.R. (1966). Mesozoic stratigraphic palynology in Australia: *Australian Oil & Gas Journal*, **12**: 58-63.

[29]Goubin, N. (1965). Description et reparition des principaux pollenites Permiens, Triasiques et Jurassiques des sondages du Basin de Morondava (Madagascar): *Revue Inst. Francaise Petrole,* **20** (10): 1415-1461.