

# BISACCATE POLLEN FROM CHHIDRU FORMATION, WESTERN SALT RANGE, PAKSTAN.

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**ABSTRACT:** The type section of Chhidru Formation (Chhidru Gorge) was selected for present study. A very diverse palynoflora was recovered. Present paper deals with only few bisaccate pollen viz "Protohaploxylinus goraiensis, Protohaploxylinus varius, Protohaploxylinus limpidus, Protohaploxylinus amplus, Protohaploxylinus microcorpus, Striatopodocarpites raniganjensis, Striatopodocarpites cancellatus, Striatopodocarpites rarus, Striatopodocarpites pantii, Striatoabieites elongatus, Striatoabieites multistriatus, Striatoabieites striatus, Lunatisporites novialensis, Lunatisporites pellucidus, Guttulapollenites hannonicus and Hamiapollenites bullaeformis. These palynomorphs were thoroughly explained and their affinities were also carefully worked out and were tentatively linked with gymnosperms.

**Keywords:** Bisaccate pollen, Chhidru formation, salt range, palynomorphs

**Running Title:** Bisaccate Pollen From Chhidru Formation

## INTRODUCTION

The Chhidru Formation, Western Salt Range, Pakistan represents not only the termination of late Permian period, but also the end of Paleozoic era. This part of the salt range owes its existence because of the Himalayan collision [1]. Chhidru Formation is present in both Trans Indus and Cis Indus regions[2]. Salt Range is full of evidence reflecting part of geological and biological events and represents one of the best section to study such events. Lot of work has been done all over the world on the rocks of Permian age [3, 4, 5, 6, 7, 8, 9, 10]. Recently, based on the Palynological evidence, the Gondwana Carboniferous- Permian of Nilawah Group of the Salt Range, Pakistan have been correlated with middle to upper part of Al Khalata Formation of Oman and Unayzah B Member of Saudia Arabia [11]. The Present study deals with the palynological survey including identification and description of Palynomorphs from the Chhidru Formation, present at top most of the Zaluch Group (Late Permian).

## MATERIALS AND METHODS

Rock samples from Chhidru Formation, Chhidru gorge, (32° 32' 36" N, 71° 46' 25" E), Western Salt Range Pakistan were collected and processed according to the standard processing techniques [12, 13]. Different grades of HCl and HF (20 %–50% each) were used for the removal of carbonate and silicates after physical disaggregation (compact samples only). Pyrites and organic matter was loosened using 20% HNO<sub>3</sub>. Ultimately, palynomorphs were oxidized by 2% KOH and separated on density gradient basis by employing heavy liquid separation [14]. All the spores/pollen were photographed and their dimensions were measured. Canada Balsam was used as the mounting medium. Coordinates of each slide were noted and slides were cataloged in the micro Palaeontology laboratory, Department of Botany, university of the Punjab, Lahore, Pakistan.

## RESULTS AND DISCUSSION

The pollen recovered during present work were described in alphabetic order and their affinities were suggested according to Looy et al., [15] which showed that these palynomorphs represent gymnosperms.

**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 [16]. Balme [10] also isolated such pollen from Amb, Wargal and Chhidru Formations of the Permian age and early Triassic strata (Mianwali Formation) Salt Range, Pakistan. Guttulapollenites hannonicus has been reported by Hart [17] from the upper Permian South Africa

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

**Type species:** Hamiapollenites saccatus Wilson, 1962

**H. bullaeformis** (Samoilovich) Jansonius, 1962

Balme [10] recovered Hamiapollenites insolitus from the Amb Formation (Salt Range). The present sporomorph however differs significantly from Hamiapollenites insulatus in having much broader and rounded corpus and small less distally inclined sacci. This is the first record of this genus from the Chhidru Formation

**Genus LUNATISPORITES** (Leschik) Klaus, 1963

**Type Species:** Lunatisporites acutus Leschik, 1956

**L. novialensis** (Leschik) Foster, 1974

Although Lunatisporites novialensis was quiet abundant to common in the Chhidru Formation, very few complete specimens 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 only under oil immersion objective.

**L. pellucidus** (Goubin) Balme, 1970

Pollen of this type had always been a characteristic component of early and middle Triassic sediments in most Gondwanaland countries [10, 18, 19, 20]. Perhaps it is the first report of this taxon from Permian of Pakistan

**Genus:** PROTOHAPLOXYLINUS Samoilovich, 1953

**Type species:** Protohaploxylinus latissimus (Lubur) Samoilovich, 1953

**P. amplus** Balme & Hennelly, 1955

Early Permian (Artinskian) sediments of Australia are also rich in Protohaploxylinus amplus [21].

**P. goraiensis** Pötonie & Lele (1961)

One of the main synthetic features of Protohaploxylinus goraiensis as mentioned by Pötonie and Lele [22] is the narrow cappula and poorly defined corpus [10]. Hart [17] while

recombining the species restructured it to forms with 7-8 taenae. The Chhidru sporomorph seems more close to the Hart's interpretation than that of Pötonie and Lele [22].

***P. limpidus*** Balme & Hennelly, 1955

Specimens of *Protohaploxylinus limpidus* are slightly smaller in size than those originally described by Balme and Hennelly [23]. This taxon has abundantly been reported from the early to late Permian sediments of Africa, Australia, Russia, India and Madagascar [10].

***P. microcorpus*** Schaarschmidt, 1954

Although *Protohaploxylinus microcorpus* was common to rare in the Chhidru Formation, (Salt Range), it has rarely been reported, from the late Permian (Dzulfian) sediments of Europe.

***P. varius*** (Bharadwaj) Balme, 1970

The morphographic and systematic status of *Protohaploxylinus varius* have been thoroughly discussed by Balme [10]. *Faunipollenites* was erected by Bharadwaj [24] to include taeniate haploxylinoid pollen with a poorly defined corpus and intraretiolate cappa, but this was rejected by Hart [17]. Balme [10] accepted Hart's view and stressed on undertaking more detailed critical morphographic comparison between *Faunipollenites varius* and all the previously reported sporomorphs of this type. Nevertheless Balme [10] treated *Faunipollenites varius* as the synonym of *Protohaploxylinus varius*.

**Genus STRIATOABIEITES** Zorichova & Sedova ex Sedova emend. Hart, 1964

**Type species:** *Striatoabieites brickii* Sedova, 1956

***S. elongatus*** (Luber & Valtz) Hart, 1964

Its morphology of sacchi in the present sporomorph is not clear due to bad preservation.

***S. multistriatus*** Balme & Hennelly, 1955

Balme & Hennelly [23] originally assigned to *Striatoabieites multistriatus*, a rather wide range of forms and two of them should be assigned to *Vittatina* rather than to *Striatoabieites*.

***S. striatus*** (Luber & Valtz) Hart, 1964

It is distinguished from *Striatoabieites multistriatus* by its less number of taenae on cappa and strongly distally inclined sacchi.

**Genus STRIATOPODOCARPITES** Samoilovich emend. Hart, 1964.

**Type species:** *Striatopodocarpites tojmensis* Sedova, 1956

***S. cancellatus*** Balme & Hennelly, 1955

Despite the fact that *Striatopodocarpites cancellatus* is widespread it has been rarely observed in the Permian sediments of the Gondwanaland countries [10]. In the presently studied Chhidruan assemblages, it constituted the most conspicuous elements among the bisaccate population. Hill & Woods [25] and Virkki [26] recorded similar forms from the Pali beds, Rewa and they are also known from the Raniganj Coal measures [24]. In Africa *Striatopodocarpites cancellatus* occurs in lower Permian strata in Tanzania [27] and also in the early Karoo deposits in the Orange Free State [28]. Balme & Playford [29] reported *S. cancellatus* in upper Permian sediments from the Aery Formation, Prince Charles Mt. East Antarctica.

***S. pantii*** (Jansonius) Balme, 1970

Jansonius [30] described pollen of similar morphology from lower Triassic of Canada identifying it as *Striatites* Samoilovitch var. *Pantii*. But these specimens tend to be

interrupted by wedge shaped or oblique taenae. These pollen had not been properly identified until thoroughly examined by Playford [19] and Balme [10].

***S. raniganjensis*** (Bharadwaj) Hart, 1964

*Striatopodocarpites octostriatus* from the lower Permian of Tanganyika is a similar form but in the Chhidruan specimen the taenae are not as widely spaced as in Hart's [16] specimen.

***S. rarus*** (Bharadwaj & Salujha) Balme, 1970

Pollen identical to *Striatopodocarpites rarus* have been reported from in the Permian of Iraq [31]. The presently isolated Chhidruan specimen is however distinct in having circular corpus, which is more thick and dark brown in color making detection or identification of taenae rather difficult even under oil immersion objective.

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