Pentoxylales in Antarctica ? Needs a reconsideration

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The first evidence of the Pentoxylales in Antarctica based on the study of imprints of *Taeniopteris* like leaves and seed cones resembling *Carnoconites* has been challenged. The Pentoxyleae from India was instituted on permineralised material and the plant organs had distinct anatomical characters.

Key-words—Imprints, Extinct Leaves, Pentoxylales Cones, Antarctica, Doubtful.

INTRODUCTION

SAHNI (1948) established a new group of Jurassic gymnosperms - The Pentoxyleae from the Rajmahal Hills, India on the basis of investigations carried out by Rao (1943) and Srivastava (1945) on permineralised silicified cherts collected from Nipania. The group includes stems (*Pentoxylon sahnii* and *Nipanioxylon guptai*), leaves (*Nipaniophyllumraoi*) and seed cones (*Carnoconites compactum* and *C. laxum*) Vishnu Mittre (1953) discovered the microsporangiate fructification *Sahnia nipaniensis* from the same chert. Since then a number of papers have been published on the pentoxylean material collected from many localities in the Rajmahal Hills (Vishnu Mittre 1957, Sharma 1969, 1975, 1997, 2002; Bose *et al.* 1985; Srivastava & Banerji 2000). Harris (1962) reported *Taeniopteris* like leaves and seed cones of *Carnoconites* from New Zealand. Dauglas (1969), White (1981) and Drinnan and Chambers (1983) described leaves of *Taeniopteris,* seed cones of *Carnoconites* and microsporangiate fructification of *Sahnia* from Australia. However, the New Zealand and Australian materials differ significantly in morphology and size from the Indian one and may be not exactly the pentoxylean material.

Recently Cesari *et al.* (1998) have published a paper with the title "First evidence of Pentoxylales in Antarctiea" The material includes the leaves like *Taeniopteris* and seed bearing cones identified as *Carnoconites.* In the present paper the relationship of Antarctic material with the Pentoxyleae is challenged and a reconsideration suggested.

OBSERVATION AND DISCUSSION

The Pentoxyleae is characterised by:

1. Preservation as permineralised material.
2. Distinction of main stem and foliage bearing short shoots.
3. Polystelic vasculature, each has well developed excentric secondary xylem, more towards the pith. Endarch cortical bundles originate from xylem of centrifugal side. Wood rays uniseriate, 1-8 cells in height. Uniseriate contiguous bordered pits on radial walls of tracheids. Pits in cross-field 1-2, large, circular.
4. Leaf *Taeniopteris* type but midrib has 3-8 diploxylic bundles in a row. Stomata haplocheilic.
5. Male cone terminal on a short shoot. Microsporophylls radial, simple or branched bearing large ballon shaped microsporangia in rows. Pollen grains monosulcate.
6. Seed cones pedicellate, terminal or lateral on an apical peduncle to a short shoot. Seeds attached directly to cone axis, arthotropus, integument non-vascularised and heterogeneous, and nucellus free without pollen chamber.

The imprints of the Antarctic material do not show any anatomical characters. *Taeniopteris* sp. described by Cesari *et al.* (1998) is 1.8 mm to 13 mm in width. None of the known specimens of *Nipaniophyllum* from the Rajmahal Hills is as narrow as 1.8 mm and some of the lateral veins divide only once and not twice, unlike *Taeniopteris* sp. from Antarctica. The important character of pentoxylean leaf i.e. 3-8 diploxylic bundles in a row in the midrib of the leaf

remains unknown and as such it is not proper to correlate the Antarctic material with the *Nipaniophyllum* of the Pentoxyleae.

The seed cones of Antarctica are identified as a new species of *Carnoconites. C. llambiani* Cesari et al. (1998). The cones are arranged spirally along the main axis and the apical one is inserted directly on the main axis. Neither a similar arrangement nor a direct attachment or insertion of the cone to the main axis is seen in any specimen of *Carnoconites* from the Rajmahal Hills, India (Srivastava 1945; Sahni 1948; Mittre 1953; Sharma 1997, 2002; Sharma et al. 1987; Bose *et al.*, 1984, 1985).

Cesari *et al.* (1998, p. 738) write about the seed cone *Carnoconites compactus* "In transverse section the organ is elliptical with an acute apex". Whereas, the fact is that the cones are distinctly circular in cross-section and bear radiospermic seeds (Srivastava 1945; Sahni 1948, Sharma 2000, Sharma et al. 1987).

There are three basic interpretations about the attachment of cones to the short shoot. Sahni (1948) believed that from the upper end of the peduncle arose 5-6, simple or dichotomised pedicels each terminating into a cone. Vishnu Mittre (1953) considered lateral attachments of the simple pedicels to the peduncle. Bose *et al.* (1985), Crane (1985) and Srivastava and Banerji (2000) described origin of a number of pedicels from the terminal end of a short shoot. Hundreds of cones were shown originating on a short shoot. None of these interpretations coincides with the Antarctic material of *C. llambiani.*

Neither in morphology nor in size the seed cones of *Carnoconites llambiani* Cesari *et al.* (1998) are identical to the pentoxylean seed cones known from India. Secondly the orthotropus position of ovules/ seeds, heterogeneous nature of integument and free position of nucellus are not visible in antarctic material. As such it is advisable not to assign the seed cone like bodies of Antarctic rocks to the taxon *Carnoconites* Srivastava of Pentoxyleae.

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