

## A NEW SEED-BEARING PLANT ORGAN FROM THE KAMTHI FORMATION OF ORISSA, INDIA

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### ABSTRACT

*Khania dhenkanalensis*, a new type of seed-bearing gymnospermous fructification, probably belonging to *Glossopteris*, is established. The genus *Khania* is characterized by a slender, elongated axis to which seed-like bodies are attached oppositely and in two definite rows. It differs from other fructifications so far known from the southern hemisphere.

### INTRODUCTION

A large number of female fructifications with definite seeds or seed-like bodies are assigned to *Glossopteridales*. Some of them are either directly attached to *Glossopteris* leaves or are found in their association. Feistmantel<sup>1</sup> reported *Dictyopteridium* which is covered with oval to circular scars. There are different interpretations regarding its morphology, but it is a definite seed-bearing organ. Zeiller<sup>2</sup> described *Ottokaria bengalensis* which also is an undoubted seed-bearing fructification. Plumstead<sup>3-5</sup> described some new genera of reproductive organs. The well-known seed-bearing organs described by her are *Scutum*, *Cistella*, *Lanceolatus*, *Pluma*, *Hirsutum*, etc. Surange and Chandra<sup>6,7</sup> instituted two new genera *Partha* and *Denkania* with seed-like bodies. *Senotheca*<sup>8</sup> is again a seed-bearing organ attached or associated with *Glossopteris* leaves. Lacey *et al*<sup>9</sup> described *Mooia*, *Rusangea*, *Rigbya* and certain new types of seeds from Upper Permian of Mooi River District of Natal, S. Africa. Thomas<sup>10</sup> instituted *Lidgettonia* for certain cupulate type of fructifications from S. Africa. We have *Austroglossa* Holmes<sup>11</sup> and *Isodictyopteridium* Rigby<sup>12</sup> from Australia and *Derbyella* White<sup>13</sup> and *Dolianitia* Millan<sup>14</sup> from Brazil and Argentina respectively.

From Madagascar only one fructification, i.e. *Elatra* Appert<sup>15</sup> is reported. Chandra and Surange<sup>16-18</sup> instituted cone-like genera *Plumsteadiostrobus*, *Jambadoostrobus* and *Venustostrobus* bearing definite seeds. Chandra<sup>19</sup> instituted *Utkalia*, bearing seed-like bodies on definite branches. *Wankiea* is another seed-bearing genus from S. Africa, instituted by Lacey and Huard-Moine<sup>20</sup>.

Genus—*Khania* gen. nov.

Type species—*Khania dhenkanalensis* gen. et sp. nov.

Figures—1-3

Diagnosis: Unbranched stalked fructification; slender axis bearing seed-like bodies which are attached to the axis in two opposite rows on small stalks without any scale or bract, seeds marked with vertical grooves.

Holotype—BSIP Museum specimen number 35938.

Horizon—Kamthi Formation, Upper Permian.

Locality—Near Handapa village, Hinjrida Ghati, Dhenkanal District, Orissa.

The genus is named after late Mr A. M. Khan of Geological Survey of India, who made important contributions to study the Handapa flora.

### DESCRIPTION

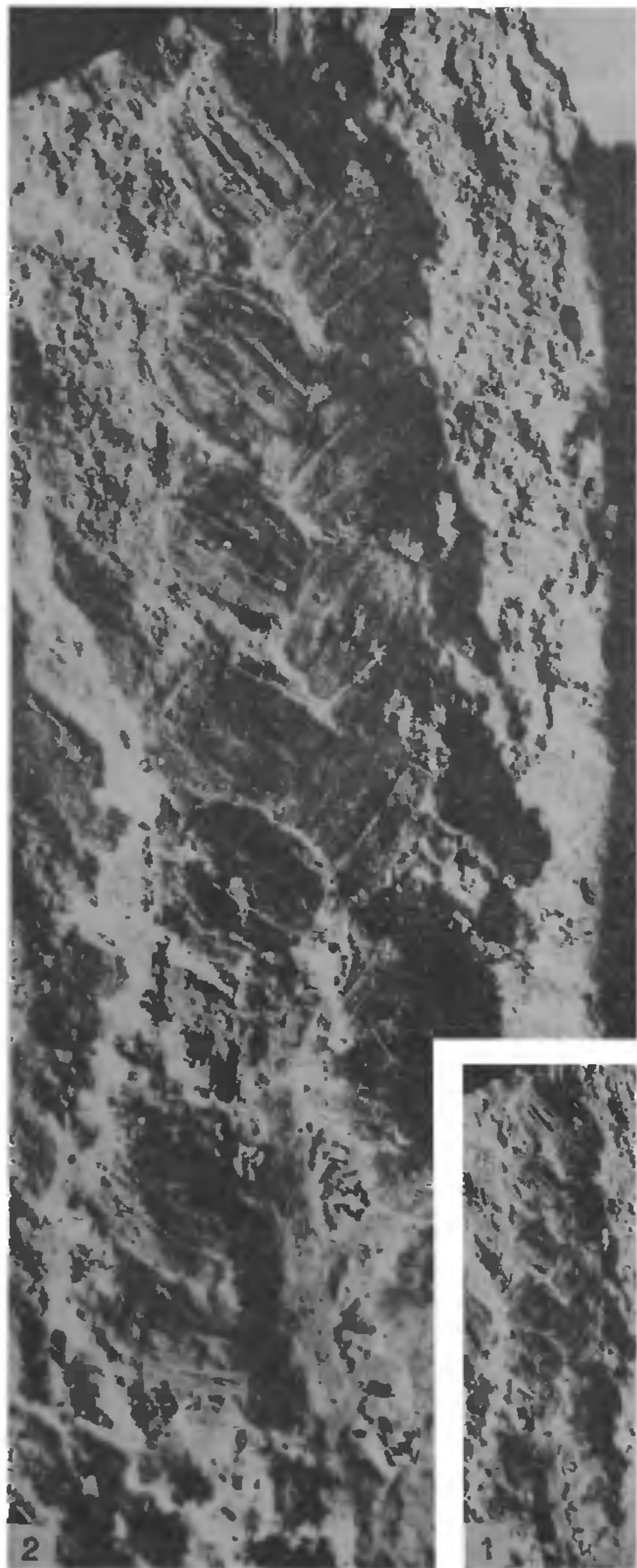
There are two specimens in the collection in the form of impressions on a buff-coloured hard, fine-grained clayey shale. The complete specimen measures 3.8 cm in length. The axis is narrow measuring 0.1 cm in breadth and 4 cm in length. The seed-like bodies are without wings and are 0.3 cm long and 0.2 cm broad without any scale or bract between them. These are attached on the slender axis on a small protuberance or stalk. The seed-like bodies are marked with vertical grooves. In some of the seeds one can definitely see the micropylar end. These seed-like bodies are exactly similar to those found in detached condition on the shales elsewhere. These bodies are too big in size, fewer in number with the external morphological appearance more like seeds. Since no details of morphological and anatomical structures are known, we are little hesitant to call them definite seeds or ovules.

### DISCUSSION

From the southern hemisphere we have two kinds of female fructifications. One type bears definite



seeds whose morphological details are well known. It includes genera like *Jambadostrobus*, *Ottokaria*, *Plumsteadioostrobus*, etc. The other type includes



Figures 1 and 2. *Khania dhenkanalensis* gen. et sp. nov., a new seed-bearing plant organ from the Kamthi Formation (Upper Permian) of India. 1 and 2. Complete specimen showing attachment of seed-like bodies on the main axis. The upper part of the specimen has got twisted so that the exact manner of seed attachment is not seen in that part ( $\times 2$  & 6).

female fructifications bearing seed-like or ovule-like bodies whose morphological and anatomical details are not known. Inclusion under the second category is merely on the basis of their external morphology and seed-like appearance.

It is now well recognized that glossopterids possessed three distinct types of reproductive structures which could well represent the three distinct orders under the class Glossopteridopsida. In the first type we have ovules which are variously attached to fertile scales or megasporophylls as in *Partha*, *Lidgettonia*, *Mooia* or *Denkania*. The second type has many ovules in strobilar-like structures; in other words the ovules have aggregated in a cone-like structure as in *Scutum*, *Plumsteadioostrobus*,

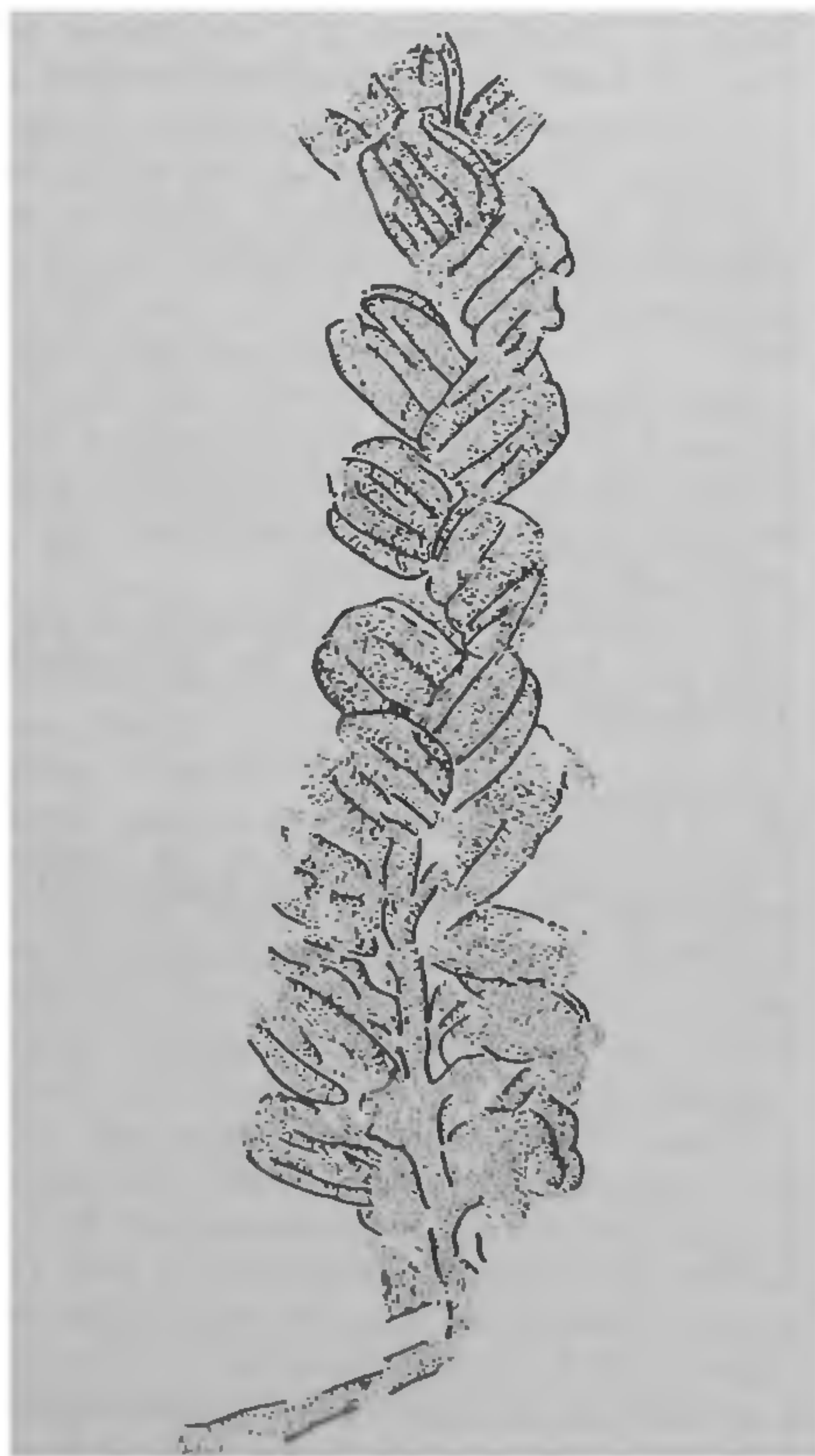


Figure 3. Line drawing of the Holotype specimen. Attachment of seeds to the main axis is shown in the lower part while the upper half portion has got twisted ( $\times 4$ ).



*Jambadostrobis* or *Ottokaria*. In the third type, we have ovules attached to the fertile axis which may be branched or unbranched as in *Wankiea* or *Utkalia*.

The new genus *Khania* falls under this third category where ovules or seed-like bodies are attached directly on the fertile axis. Therefore, there are only two fructifications, *Wankiea* and *Utkalia* comparable to some extent with *Khania*. *Wankiea bondii* is a seed-bearing fructification consisting of longitudinally striated axis bearing branches of at least two orders probably pinnately arranged. The ultimate branchlet form lateral clusters where each one of the 4–6 branchlet ends in a ovate seed-like body. The manner of seed attachment is not clear to us but it is felt that the seeds were possibly borne on a peltate expansion or the seed-like extensions of the branchlet. The seeds of *W. bondii* are smooth and ovate. *K. dhenkanalensis* is a very distinct form from *W. bondii* in having unbranched fertile axis and the seeds with longitudinal striations. There are no clusters of seeds or peltate expansions as is reported in *Wankiea*. *Utkalia dichotoma* is a dichotomously branched fructification. Each branch gives out mostly alternate branches on either side which repeatedly dichotomize, and each ultimate branch bearing a single terminal seed-like body. *Khania* is not a branched fructification and neither seeds are attached on the ultimate branches. Instead the seeds are attached directly on the axis on a very small stalk or a protuberance.

Thus it is evident that *K. dhenkanalensis* is a distinct and different type of new glossopteridean fructification.

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