

FURTHER OBSERVATIONS ON THE GENUS *DANDOTIASPORA* SAH, KAR & SINGH, 1971

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ABSTRACT

The genus *Dandotiaspora* Sah, Kar & Singh, 1971 is a dominant form in the Lower Eocene assemblages of India. It has been considered a marker fossil for Lower Eocene sediments. This paper deals with the taxonomic resolution of the various species described under this genus. A new approach dealing with the development of various morphographic characters within the genus, as envisaged from the present study, has been suggested.

सारांश

प्रजाति डेन्डोटियास्पोरा साह, कर एवं सिंह पर अतिरिक्त प्रेक्षण—हरिपाल सिंह, रामयश सिंह एवं सतीश चन्द्र साह

भारत के अधर ईओसीन समुच्चयों में डेन्डोटियास्पोरा साह, कर एवं सिंह एक प्रमुख प्रजाति है। इसे अधर ईओसीन अवसदों के लिए चिह्नक जीवाश्म माना गया है। इस शोध-पत्र में इस प्रजाति के अन्तर्गत वर्णित विभिन्न जातियों का वर्गीकीय विभेदन प्रस्तुत किया गया है। इस अध्ययन से परिकल्पित इस प्रजाति के विभिन्न आकृतिवर्णक गुणों के परिवर्धन से संबंधित एक नवीन दृष्टिकोण भी व्यक्त किया गया है।

INTRODUCTION

THE genus *Dandotiaspora* was originally instituted by Sah *et al.* (1971) to include the pteridophytic spores possessing the characters—“Spores triangular-subcircular in polar view, trilete rays extending half equator. Exine laevigate, sometime intrastriated, exine thickened on distal side of spores opposite to haptotypic mark”. They described five species under the genus, viz., *Dandotiaspora dilata* Sah *et al.*, *D. plicata* Sah *et al.*, *D. telonata* Sah *et al.*, *D. pseudoauriculata* Sah *et al.* and *D. densicarpa* Sah *et al.* According to these authors the following species, viz., *D. dilata*, *D. plicata*, *D. telonata* and *D. pseudoauriculata* are mainly characterized by the presence of globular thickening, folds, continuous exi-

nal thickenings and pseudoauricular structures on the distal side of the spores, opposite the triradiate suture respectively. *Dandotiaspora densicarpa* is stated to be distinct in having an inner body within the spore. Quantitative analytical studies (Sah *et al.*, 1971) have clearly shown that all the five species of *Dandotiaspora* exhibit marked dominance in different stratigraphic intervals of the Lower Eocene sediments of Assam, Gujarat, Rajasthan and Central India.

In the opinion of Sah *et al.* (1971), the disposition of exinal thickenings on distal side of the spores opposite the triradiate mark is the main character on the basis of which various species have been delimited. The appearance of crescent-shaped folds (or thickenings) on distal side of the spores opposite the Y-rays at their ends represents

the initial development of distinctive morphology in this genus (Sah *et al.*, 1971, p. 60) as is the case in *Dandotiaspora plicata*. Further extension of these thickenings or folds has been assumed to be responsible for the globular thickenings in *D. dilata*. A continuous exinal thickening (on the same side) all along the trilete mark is the characteristic of *D. telonata*. In the fourth species, *D. pseudoauriculata*, Sah *et al.* (1971) believe that the globular thickenings so characteristic of *Dandotiaspora dilata* shift to the apices of the spores. But in *Dandotiaspora densicorpa* the exinal thickness becomes more prominent in the central part of the spore appearing as a central body.

During the course of the present study, it has been observed that the disposition of distal exinal thickenings opposite the triradiate mark, as stated by Sah *et al.* (1971), is not correct. Also, the terms folds and thickenings have been very loosely applied which often convey confusing meaning. In fact, all the exinal thickenings, in general, are associated with the triradiate mark or sometimes extend to the apices of the spore wall.

Realizing the crucial stratigraphic value of this genus, extensive morphological studies were further undertaken. In order to substantiate our observations all the original slides of Sah *et al.* (1971) were planned to be re-examined. Unfortunately, the slides were not available for study. In the absence of the original slides, the present authors were left with no other alternative but to examine the palynological preparations of the Tura Formation to which the original slides belonged. These slides were available with one of us (R. Y. S.). The photographs of original specimens illustrated in a paper by Sah *et al.* (1971) were also restudied thoroughly. The present critical study of the genus is based on the availability of palynological preparation from the same area. In view of this it has been possible to establish lecto-holotypes in some cases.

Genus — *Dandotiaspora* Sah, Kar & Singh, 1971
emend.

Type Species—*Dandotiaspora dilata* (Mathur) Sah, Kar & Singh, 1971.

Remarks—An extensive study carried out on a large number of specimens belong-

ing to the genus *Dandotiaspora* reveals that there is no exinal or globular thickening on the distal side or spores as stated by Sah *et al.* (1971). All these thickenings and other related features are indisputably restricted to the proximal surface of the exine and are mostly associated with the haptotypic characters. The triradiate mark in *D. dilata* is thick and raised along the full length. The exinal thickening which is intimately associated with the labra gradually dilates into semicircular globules at the ray-ends. Vimal (1952, p. 138, pl. 7, figs 9, 10) who described such type of spores for the first time from the Dandot Lignite of Pakistan, seems to have rightly observed that, "Triradiate mark very clear and each mark has on its two sides a thick area (in pl. 5, fig. 9). Each scar dilates into a thick rounded area dark in colour". Similarly, Mathur (1966, p. 38) described *Psilatriteles dilatus* the present holotype of *Dandotiaspora* in perfect agreement to our observations. Therefore, morphologic characters of the genus as described by Sah *et al.* (1971) are incorrect. According to the generic diagnosis of *Dandotiaspora*, triradiate rays extend up to half equator but the illustrations of various species given by Sah *et al.*, (1971) and our observations show that they extend up to 3/4 or more than 3/4 of the equator. Organizationally, this genus closely compares with *Biretisporites* (Delcourt & Sprumont) Delcourt, Dettmann & Hughes, 1963. However, *Biretisporites* (Delcourt & Sprumont) Delcourt, Dettmann & Hughes, 1963 differs from *Dandotiaspora* by its triangular to subtriangular outline and uniform elevated lips which are upturned extensions of the proximal exine. *Matonisporites* Couper, 1958 though a thick-walled spore like *Dandotiaspora*, possesses a triradiate scar which is surrounded by a distinct margo. The revised diagnosis of the genus *Dandotiaspora* is, therefore, now as follows:

Emended Generic Diagnosis — Spores subtriangular to subcircular in polar view. Trilete mark prominent, raised extending usually more than 3/4 radius, labra raised, thick, straight to sinuous enclosing the Y-mark. Exine variably thickened along the Y-mark or near ray-ends, approximating the apices rarely delineating a central body.

Dandotiaspora dilata (Sah, Kar & Singh, 1971) emend.

Pl. 1, figs 1, 3-6, 8-9, 11, 14, 15

Junior synonyms:

1971 *D. plicata* Sah, Kar & Singh

1971 *D. pseudoauriculata* Sah, Kar & Singh

Emended Diagnosis — Spores triangular, 55-98 μ , trilete, Y-rays straight, extending more than 3/4 spore radius, bifurcating at tips. Y-mark enclosed within the elevated lips. Exinal thickening intimately associated with the abnormally thick labra, raised terminating as semicircular to globular like feature at the ray-ends. Exine 2-5 μ thick, laevigate.

Remarks — In order to examine fool proof specimens of *Dandotiaspora plicata* and *D. pseudoauriculata*, now the junior synonyms of *D. dilata*, many specimens were examined. Unfortunately, we did not come across any specimen illustrating the diagnostic characters of the above mentioned species as stated by Sah *et al.* (1971). On the other hand, there were numerous spores assignable to *Dandotiaspora dilata* and *D. telonata* preserved in different modes of compression. The specimens of *D. dilata* compressed under different modes of compression exhibit different disposition of the thickenings which have generally been misunderstood for the institution of more species than necessary. Since these thickenings are associated with haplotypic characters, various configurations under proximo-distal and proximo-lateral compressions are possible. The observed range of variability relating to these intimately associated morphographic characters is illustrated in Pl. 1, figs 1-15. It has been observed that the globular thickening at the ray-end quite often loops over backwards resulting in the formation of a semi-circular thickening which appears crescent-shaped. This situation is usually possible in proximo-distal compression and compares with the forms described under the junior synonym *D. plicata*. With this reason, this species has been merged with *D. dilata*.

Some specimens of *D. dilata* in lateral compression appear to exhibit false auriculae at the apices. These, in fact, correspond

to the thickenings at the ray-ends which when viewed in proximo-distal condition remain indistinguishable from those in *D. dilata* (Pl. 1, figs 3, 9). *D. pseudoauriculata* has also been merged with *D. dilata*.

Dandotiaspora telonata (Sah, Kar & Singh, 1971) emend.

Pl. 1, figs 2, 12, 13

Lectoholotype — Pl 1, fig. 13; Slide no. 5334/23.

Emended Diagnosis — Spores triangular-subcircular, 48-90 μ , trilete, Y-rays straight, extending 3/4 radius, bifurcating at tips. Y-mark enclosed with in thickened and raised labra. Exine 2-3 μ thick, sometimes more thickened near apices, laevigate, sometimes intrapunctate in proximal view.

Comparison — *Dandotiaspora telonata* resembles *D. dilata* in shape and size but is distinguished from the later in having a continuous raised and thickened labra.

Dandotiaspora densicarpa (Sah, Kar & Singh, 1971) emend.

Pl. 1, figs 7, 10

Lectoholotype — Pl. 1, fig. 7; Slide no. 5332/14.

Emended Diagnosis — Spores subtriangular-subcircular, 70-106 μ , trilete, Y-rays straight, lips thin, sometimes elevated. Y-mark extending more than 3/4 radius. Tips of laesura surrounded by semicircular thickenings. Exine 2-6 μ thick, more thickened in central region simulating an inner body.

Comparison — This species differs from *Dandotiaspora telonata* and *D. dilata* in possessing a centrally thickened area.

Remarks — Dispersed spores assignable to *Dandotiaspora densicarpa* are found in very low frequency in the type material. Considering its relationship with the other species of the genus *Dandotiaspora* the present species appears to be an aberrant form.

DEVELOPMENTAL CHARACTERISTICS

Palaeocene sediments of India have been found to be exceptionally rich in *Dandotia-*

spora dilata and *D. telonata*. The occurrence of *D. densicorpa* is very low in numbers. While strata belonging to Lower Eocene exhibit a marked dominance of *D. dilata*. Detailed studies of the morphological variations within the different species of the genus have clearly demonstrated that these species possess a close morphological relationship with one another. The morphological relationship of the three species, i.e. *D. telonata*, *D. dilata* and *D. densicorpa* is discussed below:

1. In *Dandotiaspora telonata*, triradiate suture is enclosed within the uniformly elevated lips. The thickness at the tips of the ray-ends is also mostly uniform. By virtue of these morphographic characters *D. telonata* resembles the genus *Biretisporites* (Delcourt & Sprumont) Delcourt, Dettmann & Hughes, 1963 which is known from the older sediments.

The morphological characters in *D. dilata* exhibit two important changes, (i) reduction of exinal thickness along the Y-rays

from the apex to the 3/4 of the Y-ray, and (ii) concentration of the exinal thickening in the form of globular features. These morphological developmental features make this species very distinct and easily recognizable.

2. In association with *D. telonata*, some spores possessing a central thickening (*D. densicorpa*) are noticeable. Since these spores occur in very low numbers in the material studied, we feel that this morphological character may represent a specialized development of the thickening.

3. The spores assignable to *D. dilata* in which semicircular thickenings are confined to the laesural tips occur in abundance in Lower Eocene. The predominance of their population in Lower Eocene sediments alone may indicate the maximum phase for the development of the genus. Keeping in view the above discussion, it seems reasonable to assume that the genus *Dandotiaspora* may be considered as a spore-complex.

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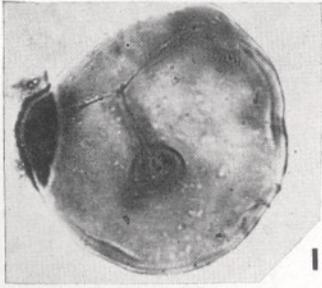
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EXPLANATION OF PLATE

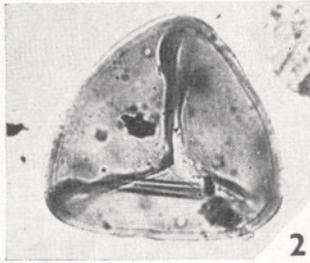
(All magnifications. × ca. 500)

PLATE 1

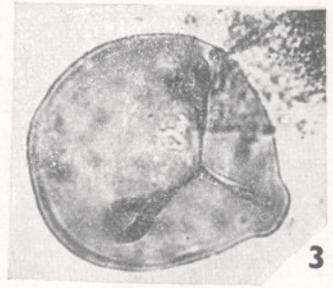
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3. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5331/6.
4. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5331/4.
5. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5332/10.
6. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5333/21.
7. *D. densicorpa* Sah, Kar & Singh, 1971 emend.; Slide no. 5332/14 (Lecto-holotype).
8. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5331/2.
9. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5332/12.
10. *D. densicorpa* Sah, Kar & Singh, 1971 emend.; Slide no. 5331/5.
11. *D. dilata* Sah, Kar & Singh, 1971 emend. Slide no. 5332/11.
12. *D. telonata* Sah, Kar & Singh, 1971 emend. Slide no. 5333/20.
13. *D. telonata* Sah, Kar & Singh, 1971 emend.; Slide no. 5334/23 (Lecto-holotype).
14. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5331/7.
15. *D. dilata* Sah, Kar & Singh, 1971 emend.; Slide no. 5332/16.



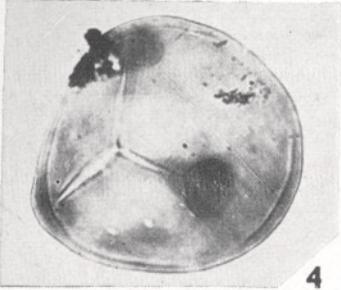
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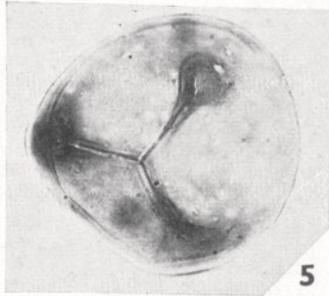
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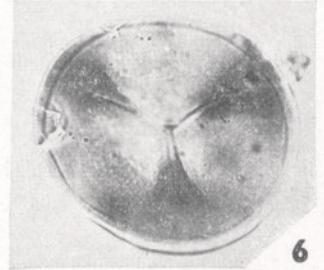
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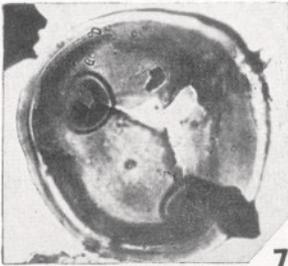
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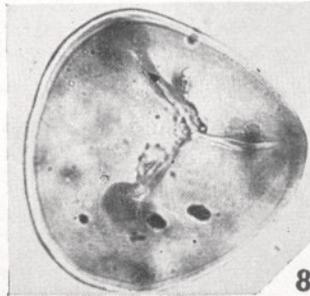
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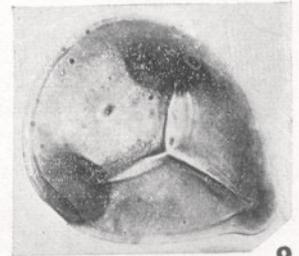
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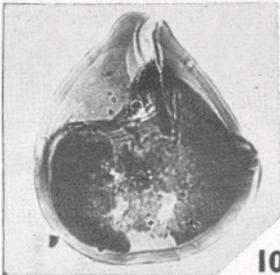
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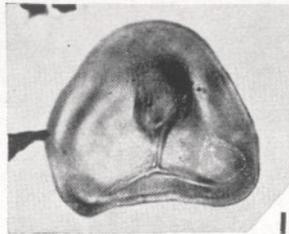
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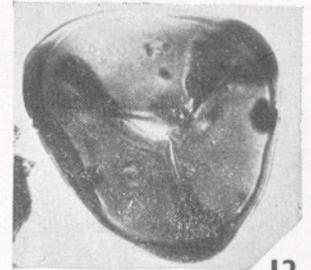
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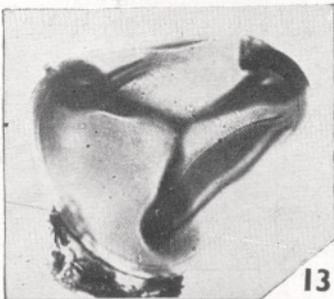
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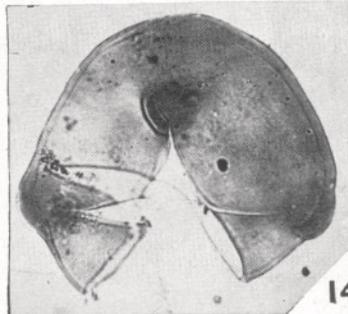
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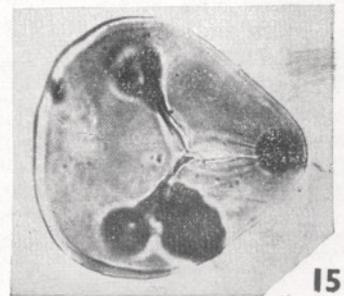
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