

PALYNOLOGY OF THE DECCAN INTERTRAPPEAN BEDS OF RAJAHMUNDRY DISTRICT, ANDHRA PRADESH

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ABSTRACT

Palynological studies of the Deccan Intertrappean beds from the village Kotta-Bommuru, Rajahmundry District have yielded some fungal spores and angiospermous pollen. These are represented by 7 genera belonging to 12 species. Three new species of fungal spores have been described.

Key-words — Palynology, Fungal spores, Deccan-Intertrappean beds, Early Eocene (India).

सारांश

राजाहमंड्री जनपद (आंध्र प्रदेश) की दक्खन अन्तर्द्वीपी संस्तरों का परागाणविक अध्ययन — कृष्ण अम्बवानी

राजाहमंड्री जनपद में कोट्टा-बोम्मरु गाँव की दक्खन अन्तर्द्वीपी संस्तरों के परागाणविक अध्ययन से कुछ कवकीय बीजाणु एवं आवृतबीजी परागकण उपलब्ध हुए हैं। ये सात प्रजातियों की 12 जातियों से निरूपणीय हैं। कवकीय बीजाणुओं की तीन नई जातियाँ भी वर्णित की गई हैं।

INTRODUCTION

LITTLE work has so far been done on the study of the mioflora from the Deccan Intertrappean Series of India. Earlier workers have carried out studies on the Deccan Intertrappean mioflora mostly found within the infected parts of the plants embedded in the chert. Sahni and Rao (1943) reported perithecia attached to septate mycelium by preparing thin sections. Rare attempts have been made to study the mioflora by maceration. Shukla and Chitale (1948) recovered fungal zygosporangia resembling Mucorales. Chitale (1950, 1951, 1957) recorded some fungal and pteridophytic spores as well as gymnospermous and angiospermous pollen grains from the Deccan Intertrappean cherts of Mohgaon Kalan, Chhindwara District, Madhya Pradesh. The fungal spores mainly belong to Mucoraceae, Microthyriaceae and Pleosporaceae, whereas the pteridophytic spores show affinities with Gleicheniaceae, Lycopodiaceae and Polypodiaceae. The gymnospermous pollen comprise monosaccates and disaccates, while the angio-

spermous pollen are represented by the families Gramineae, Ericaceae and Betulaceae.

Dwivedi (1959) described fossil rust spores infecting the fruit of *Enigmocarpon parijai*. Lakhanpal, Dayal and Jain (1967) discovered fungal sporangia belonging to Lagerhemiales from the Deccan Intertrappean beds of Mohgaon Kalan. In 1968, Mahabale described some well-preserved two-celled fossil fungal spores as *Diploidia* from the cherts of the Deccan Intertrappean Series. Chitale and Sheikh (1969, 1971) reported the fungal fructifications from the Deccan Intertrappean Series of Mohgaon Kalan and a fossil fungus resembling *Helminthosporium*. Chitale and Patil (1972) described Deuteromycetous fungus in association with a dicotyledonous wood from the Deccan Intertrappean beds of Mohgaon Kalan. Trivedi and Verma (1973) described a fossil fungus *Stagonospora intertrappea* and Paradkar (1974) recovered fungal spores consisting of conidia and monosulcate grains in an infected leaf from the same beds.

The present paper deals with the palynological investigations of the Deccan Inter-

trappean calcareous clay. Thirty palynological samples were collected from the roadside section exposed about 2.5 km south-east of Rajahmundry near the village Kotta-Bommuru (81°48'O"N: 10°58"5"E). The section is about 6 m thick and its base is made up of a 1.5 m thick gravel bed which is followed by thin pink-brown clay bands. Though all the samples were processed but only 5 samples yielded a poor assemblage of spores and pollen. The systematic description of the recovered assemblage is as follows.

SYSTEMATIC DESCRIPTION

FUNGAL SPORES

Genus — *Inapertisporites* (van der Hammen) Sheffy & Dilcher, 1971

Inapertisporites trivedii sp. nov.

Pl. 1, figs 1, 2

Holotype — Pl. 1, fig. 1, size 125 × 65 μm, slide no. 6068/3.

Type Locality — Kotta-Bommuru Village, Rajahmundry District, Andhra Pradesh.

Horizon & Age — Deccan Intertrappean Series; Early Eocene.

Diagnosis — Grains non-aperturate, golden yellow in colour; shape oval to elongated size 125 × 65–64 × 55 μm; spore wall folded, punctate, discontinuous striations present.

Description — Fungal spores subcircular to subtriangular, oval to elongated in shape, size varies from 125 × 65–64 × 55 μm. Spore wall with many irregular folds, punctate and striated, striations discontinuous on the surface of the grain, ± 1 μm thick and 2–3 μm long.

Comparison — The present species differs from the following species of *Inapertisporites*, *I. minutus* van der Hammen (1954), *I. elongatus* Rouse (1962), *I. vulgaris*, *I. circularis*, *I. ovalis*, *I. subcapsularis*, *I. reticulatus*, *I. longissimus*, *I. subovoideus*, *I. obscurus*, *I. nodulus*, *I. disciformis*, *I. irregularis*, *I. obpyriformis*, *I. subcurvatus*, *I. scabridus* and *I. pulvinatus* Sheffy & Dilcher (1971) in having larger size as well as striations on the spore wall.

The species is named in honour of Prof. B. S. Trivedi.

Inapertisporites cystoides sp. nov.

Pl. 1, figs 3, 4

Holotype — Pl. 1, fig. 3, size 60 μm, slide no. 6070/3.

Type Locality — Kotta-Bommuru Village, Rajahmundry District, Andhra Pradesh.

Horizon & Age — Deccan Intertrappean Series; Early Eocene.

Diagnosis — Fungal body/cyst dark brown, non-aperturate, circular to oval in shape, size 66–60 μm in diameter, spore wall very thick ± 4.5 μm, laevigate or punctate.

Description — Fungal body with cyst-like covering, dark brown in colour; circular to slightly oval in shape; size varies from 66–60 μm diameter. Spore wall very thick ± 4.5 μm, laevigate to punctate.

Comparison — The present species resembles *Inapertisporites circularis* Sheffy & Dilcher (1971) but differs in having larger size and a very thick spore wall.

Inapertisporites sp. 1

Pl. 1, figs 5, 6

Description — Fungal spores dark brown in colour, body mostly circular and thick-walled, size varies from 48–52 μm in diameter, spore wall more or less papillate or pseudoreticulate in surface view, mesh size ± 2.5 μm wide, papillae thin ± 2 μm long.

Remarks — The present species differs from *Inapertisporites cystoides* in having thin papillate out growth on the spore wall.

Inapertisporites sp. 2

Pl. 1, figs 7, 8

Description — Fungal spore with folded spore wall; subtriangular in shape, size about 48 × 36 μm, spore wall thin about 1 μm, punctate, puncta small less than 1 μm.

Remarks — The present species resembles with *Inapertisporites kedvesii* Elsik (1968) except in the spore wall thickness and having larger size.

Inapertisporites sp. 3

Pl. 1, fig. 9

Description — Fungal spore inaperturate, oval in shape, size 96 × 72 μm, spore wall

slightly thicker about $1.5 \mu\text{m}$, laevigate/punctate, folds present.

Comparison — The present species differs from the other known species of laevigate *Inapertisporites* in considerably larger size.

Genus — *Dicellaesporites* (Elsik) Sheffy & Dilcher, 1971

Dicellaesporites popovii Elsik, 1968

Pl. 1, fig. 10

Description — Fungal spore dark brown in colour, spore appears to be 3-celled, $30 \times 16 \mu\text{m}$ in size, the basal cell larger $15 \mu\text{m}$, middle cell $10 \mu\text{m}$ and the apical cell $5 \mu\text{m}$ in size. Spore wall mediumly thick about $1 \mu\text{m}$, laevigate. The basal cell shows attachment scar.

Genus — *Multicellaesporites* (Elsik) Sheffy & Dilcher 1971

Multicellaesporites prakashii sp. nov.

Pl. 1, fig. 11

Holotype — Pl. 1, fig. 11, size $80 \times 20 \mu\text{m}$, slide no. 6075/1.

Type Locality — Kotta-Bommuru Village, Rajahmundry District, Andhra Pradesh.

Horizon & Age — Deccan Intertrappean Series; Early Eocene.

Diagnosis — Tetracellate spore $80 \times 20 \mu\text{m}$, individual cells spherical $\pm 20 \mu\text{m}$ diameter, arranged along the longer axis with 3 dark septa, spore wall laevigate $\pm 1.5 \mu\text{m}$ thick. Spores dark brown in colour.

Description — Tetracellate spore, size varies up to $80 \times 20 \mu\text{m}$, cells arranged along the longer axis (with 3 dark septa) individual spore spherical in shape, $\pm 20 \mu\text{m}$ in size, exine laevigate and $1.5 \mu\text{m}$ thick. Spores dark brown in colour.

Comparison — Among the large number of species of *Multicellaesporites*, the present species resembles *M. allomorphus* Sheffy & Dilcher, 1971 in shape and 4-celled body but differs from it in being bigger in size and having thicker spore wall with spherical cells.

The specific name is given in the honour of Dr U. Prakash.

Genus — *Monoporisporites* (van der Hammen) Sheffy & Dilcher, 1971

Monoporisporites ovalis Sheffy & Dilcher, 1971

Pl. 1, fig. 12

Description — Fungal spore dark brown/black in colour; oval in shape, $18 \times 12 \mu\text{m}$ size with a faint longitudinal slit-like opening.

Monoporisporites stoverii Elsik, 1968

Pl. 1, fig. 13

Description — Fungal spore black in colour, opaque with a single aperture, circular in shape, $18 \mu\text{m}$ in size; spore wall laevigate to finely pitted, $\pm 0.5 \mu\text{m}$ thick.

FUNGAL REMAIN TYPE-1

Pl. 1, fig. 14

Description — Germinating spore, hypha coming out from the main body, $16 \times 10 \mu\text{m}$ in size, oval in shape, swollen at both the ends, about $180 \mu\text{m}$ long. The hypha produces a small branch at the apical end.

FUNGAL REMAIN TYPE-2

Pl. 1, fig. 15

Description — Hyphae with circular to oval spores, brown in colour, non-aperturate; each spore measures about $13 \times 15 \mu\text{m}$ in size; spore wall laevigate.

ANGIOSPERMOUS POLLEN

Anteturma — *Variagerminantes* Potonié, 1970

Turma — *Aletes* Ibrahim, 1933

Subturma — *Azonaletes* (Luber) Potonié & Kremp, 1954

Infraturma — *Tuberini* Pant, 1954

Genus — *Nonaperturipites* Biswas, 1962

Nonaperturipites sp.

Pl. 1, figs 16, 17

Description — Pollen grains oval to sub-circular in shape, size $142-112 \mu\text{m}$, inaperturate, exine thick about $3 \mu\text{m}$, verrucate

or gammate forming pseudoreticulum in surface view, gammae evenly distributed, verrucae/gammae $\pm 2-4 \mu\text{m}$ high.

Remarks — The present species resembles with *Nonaperturipites berryi* Biswas (1962) except having larger size and bigger varrucae/gammae.

Turma — *Plicates* (Naumova) Potonié, 1960
Subturma — *Tryptches* (Naumova) Potonié, 1960

Genus — *Tricolpopollenites* (Pflug & Thomson) in Thomson & Pflug, 1953

Tricolpopollenites microhenrici Thomson & Pflug, 1953
Pl. 1, fig. 19

Description — Pollen grains more or less triangular in polar view, polar axis equal or slightly longer than equatorial axis, tricolpate, isocolpate, size of the grain $\pm 20 \mu\text{m}$; exine $\pm 1 \mu\text{m}$ thick, laevigate.

Subturma — *Polyptyches* (Naumova) Potonié 1960

Infraturma — *Stephenocolpati* (van der Hammen) Potonié 1970

Genus — *Psilastephanocolpites* Leidelmeier, 1966

Psilastephanocolpites maia Leidelmeier, 1966
Pl. 1, fig. 18

Description — Pollen grains oval in equatorial view, $80 \times 52 \mu\text{m}$ in size, tetracolpate, colpi running up to $3/4$ of the longer axis, exine about $1 \mu\text{m}$ thick, laevigate/scabrate and thin.

Remarks — The present species is comparable with *Psilastephanocolpites maia* almost in all characters except slight variation in size.

DISCUSSION

The palynological assemblage recovered from the Deccan Intertrappean beds of Kotta-Bommuru is poor. The fungal spores are represented by nine species belonging to four genera, while the angiospermous pollen are represented by three species belonging to three genera.

Earlier, the palynological studies on the Deccan Intertrappean beds of Mohgaon Kalan, Chhindwara District carried out by Chitale (1950, 1951, 1957) show the presence of some fungal fruiting bodies and fungal hyphae, as well as some thallophytic spores. Later in (1951), she recovered a good assemblage of pteridophytic spores, and gymnospermous as well as angiospermous pollen grains. Among them the pteridophytic spores constituted aletes, monoletes and triletes; gymnospermous pollen are represented by monosaccates and disaccates whereas the angiospermous pollen grains are shared by *Monoporites* (Graminidites), *Monoporites* (Typhidites), *Monosulcites* (Palmidites), *Tricolpidites* (Rhamnacidites) and *Tricolporites* (Myrtacidites). Chitale (1957) recovered some microthyriaceous fruiting bodies and spores of Pleosporaceae and Mucoraceae. Pteridophytic spores of the families Gleicheniaceae and Lycopodiaceae were also frequent in this assemblage. Monocotyledonous as well as dicotyledonous pollen grains belonging to the families Gramineae, Ericaceae, Tiliaceae and Betulaceae were also recorded.

The present palynological assemblage does not compare with the above assemblages and the differences between these assemblages may be due to (i) the disparity in the stratigraphical horizons, and the difference in the lithology, (ii) the difference in the depositional environment and floral composition at that time, and (iii) considerable distance between the two areas.

In the present palynological assemblage it has been observed that the miospores mainly belong to inaperturate type of fungal spores, whereas the angiospermous pollen grains are scanty. Absence of bryophytic and pteridophytic spores as well as gymnospermous pollen with a poor percentage of angiospermous pollen grains in the present assemblage leads to presume a poor vegetational growth in this area. However, presence of *Nonaperturipites*-type of pollen grains indicate that there might have been some localised water logged areas at places to justify its growth.

The present palynological assemblage is poor to be employed in the palynostratigraphical studies and more data are necessary to build up a complete palynological succession of this area.

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EXPLANATION OF PLATE

- 1, 2. *Inapertisporites trivedii* sp. nov., slide nos. 6068/3 (Holotype) & 6069/1.
- 3, 4. *Inapertisporites cystoides* sp. nov., slide nos. 6069/2 & 6070/3 (Holotype).
- 5, 6. *Inapertisporites* sp. at different focii, slide no. 6071/1.
- 7, 8. *Inapertisporites* sp. 2, slide nos. 6069/1 & 6072/2.
9. *Inapertisporites* sp. 3, slide no. 6073/1.
10. *Dicellaesporites popovii* Elsik, slide no. 6074/3.
11. *Multicellaesporites prakashii* sp. nov., slide no. 6075/1 (Holotype).
12. *Monoporisporites ovalis* Sheffy & Dilcher, slide no. 6078/1.
13. *Monoporisporites stoverii* Elsik, slide no. 6076/1.
14. Fungal remain Type-1, slide no. 6077/3.
15. Fungal remain Type-2, slide no. 6078/1.
- 16, 17. *Nonaperturipites* sp., slide no. 6079/1.
18. *Psilastephanocolpites maia* Leidelmeyer, slide no. 6070/1.
19. *Tricolpopollenites microhenrici* Thomson & Pflug, slide no. 6080/1.

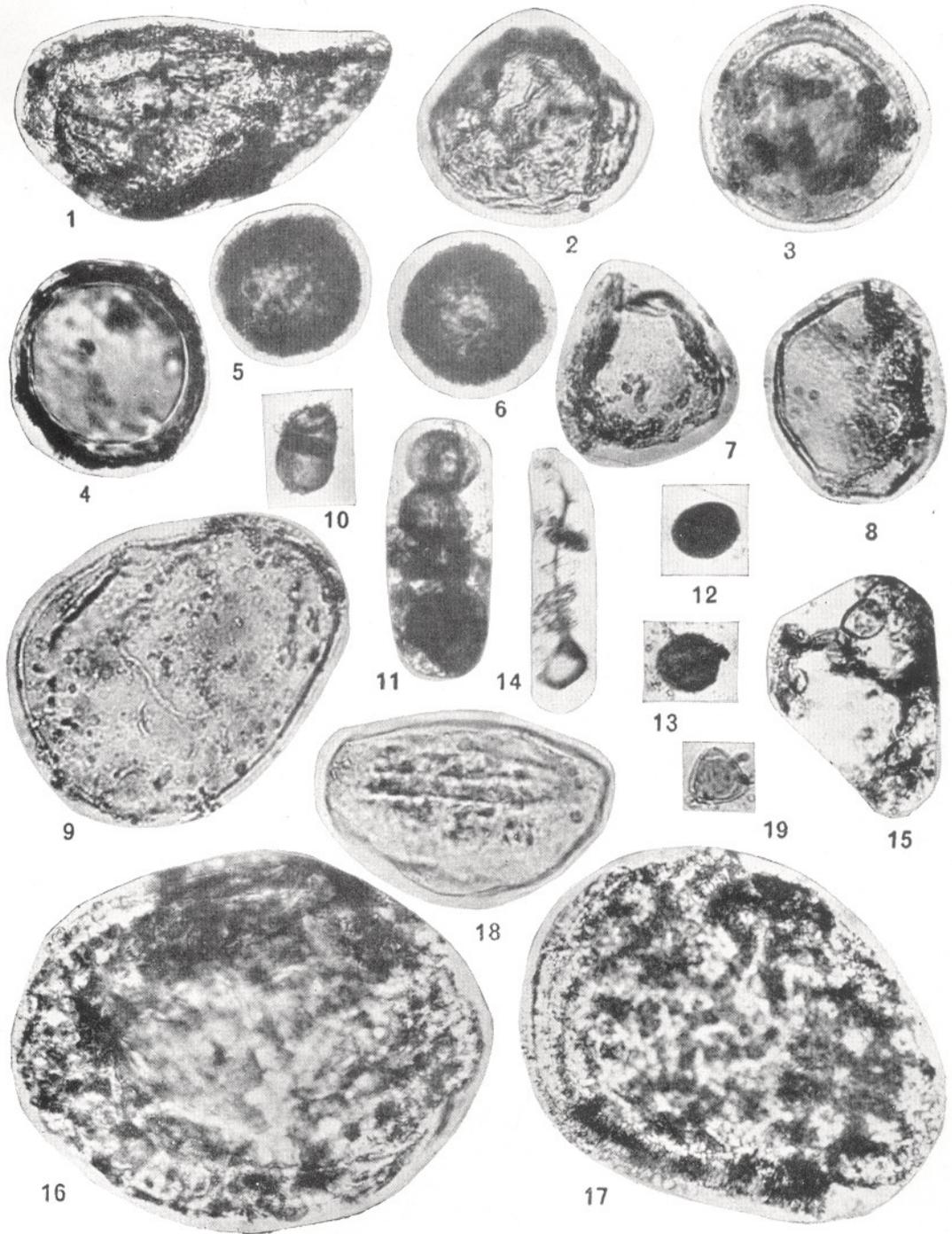


PLATE 1