2. UPPER CRETACEOUS POLLEN GRAINS FROM EGYPT III.

M. KEDVES

Cell Biological and Evolutionary Micropaleontological Laboratory of the Department of Botany of the J.A. University, H-6701, P.O. Box 993, Szeged, Hungary

Abstract

The following form-genera are presented in this contribution from the investigated Senonian sediments of Egypt: *Retitricolpites* (VAN DER HAMMEN 1956) VAN DER HAMMEN and WIJMSTRA 1964, *Dettmannaepollenites* n. fgen., *Psilatricolpites* (VAN DER HAMMEN 1956) BURGER 1970, *Cupuliferoidaepollenites* R. POTONIÉ 1960, *Retibrevitricolpites* VAN HOEKEN-KLINKENBERG 1966, *Tricolporoidites* PACLTOVÁ 1971, *Polycolpopollenites*, TREVISAN 1967, *Polycolpites* COUPER 1953, *Retitricolporites* (VAN DER HAMMEN 1956) VAN DER HAMMEN and WIJMSTRA 1964.

New taxa: *Retitricolpites salardae* n. fsp., *R. sowunmiae* n. fsp., *R. jardinei* n. fsp., *R. magloirae* n. fsp., *Dettmannaepollenites intrabaculatus* n. fsp., *Psilatricolpites khargaensis* n. fsp., *Retibrevitricolpites aegypticus* n. fsp., *Tricolporoidites pacltovae* n. fsp., *Retitricolporites farafraensis* n. fsp., *R. aegypticus* n. fsp., *R. kirchheimerii* n. fsp., *R. rakosii* n. fsp., *R. elsikii* n. fsp., *R. lachkarii* n. fsp.

Key words: Palynology, fossil, *Angiospermatophyta*, Upper Cretaceous, Egypt.

SUBTURMA: *TRIPTICHES* (~*TRIPTICHA* NAUM. 1937)

Form-genus: *Retitricolpites* (VAN DER HAMMEN 1956) VAN DER HAMMEN and WIJMSTRA 1964

Tricolpate pollen grains with a reticulate surface.

1. *Retitricolpites salardae* n. fsp.
(Plate 2.1., figs. 1-4)

Diagnosis: Amb generally ellipsoidal or secondarily deformed. Surface finely reticulate, the lumen of the reticuli is 0.2-0.4 μm, with the same muri width. The exine is 0.8-1.1 μm on the sides, and sometimes a little thicker (1.5 μm) at the poles. The infratectal layer is thicker than the tectum and the foot layer, T/I/F = 1/1.5/1. The furrows are long but in general do not reach the poles or they are asymmetrical. Around the furrows there are 2.0-2.5 μm wide cavernes.

Polar axis: 24 μm; 20-29 μm.

Holotype: Plate 2.1., figs. 1,2, slide: Farafra-6-2-2-2; cross-table number: 12.2/101.2.

Locus typicus: Farafra, Maestrichtian, Nubia Sandstone.

Stratum typicum: clayey brown coal.

Derivatio nominis: In honour of Dr. M. SALARD CHEBOLDAEFF investigator of the Pre-Quaternary sporomorphs of Africa.

Differential diagnosis: The very finely reticulate surface, and the characteristic cavernes around the furrows separates this fsp. within this genus.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) infrequent, Farafra (11) infrequent, Kharga (1-39) infrequent, Kharga (1-28) infrequent.

2. *Retitricolpites minutus* (BRENNER 1963) n. comb.
(Plate 2.1., figs. 5,6)

Syn.: 1963 *Tricolpites minutus* BRENNER, p. 93, pl. 40, figs. 5,6.
1967 *Cornaceoipollenites minutus* (BRENNER) NORRIS, p. 107, pl. 17, figs. 7-11.
1971 *Cupuliferoipollenites minutus* (BRENNER) SINGH, p. 194, pl. 29, figs. 8,9.
1973 *Tricolpites minutus* (BRENNER) DETTMANN, p. 12,13, pl. 4, figs. 1-4.

Description: Amb ellipsoidal, surface finely reticulate. The lumen of the reticuli is 0.2-0.3 μm, muri width is 0.2 μm generally. The exine is 0.5-0.6 μm thick, the tectum, infratectum and foot layer have the same thickness. The furrows are very narrow (0.2 μm) and do not reach the poles.

Polar axis: 16 μm; 14-20 μm.

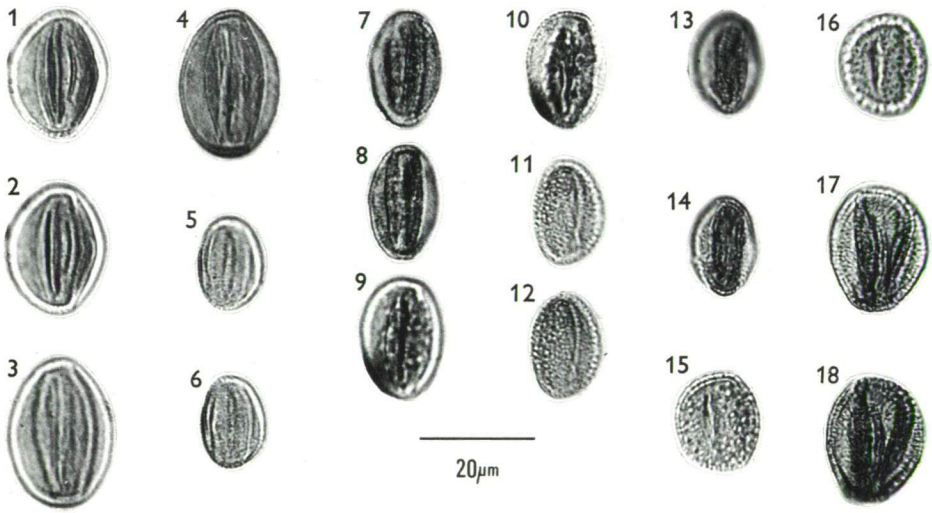

Plate 2.1.

1,2. *Retitricolpites salardae* n. fsp., slide: Farafra-6-2-2-2, cross-table number: 12.2/101.2.
3,4. *Retitricolpites salardae* n. fsp., slide: Farafra-6-2-2-3, cross-table number: 20.8/113.0.
5,6. *Retitricolpites minutus* (BRENNER 1963) n. comb., slide: Farafra-6-2-2-1, cross-table number: 6.6/103.6.
7,8. *Retitricolpites sowunmiae* n. fsp., slide: Abu Minquar-4-3-2, cross-table number: 16.8/116.9.
9,10. *Retitricolpites sowunmiae* n. fsp., slide: Abu Minquar-4-3-5, cross-table number: 14.4/103.1.
11,12. *Retitricolpites prosimilis* NORRIS 1967, slide: Farafra-6-2-2-3, cross-table number: 10.9/113.8.
13,14. *Retitricolpites prosimilis* NORRIS 1967, slide: Kharga-1-39-2, cross-table number: 19.3/120.0.
15,16. *Retitricolpites fragosus* HEDLUND and NORRIS 1968, slide: Farafra-6-2-2-3, cross-table number: 6.8/112.6.
17,18. *Retitricolpites variabilis* (BURGER 1970) n. comb., slide: Abu Minquar-4-3-3, cross-table number: 20.9/106.3.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (11) infrequent, Kharga (1-39) common, Kharga (1-28) dominant, Maestrichtian, fm. indet.: Oweina (1) infrequent.

3. *Retitricolpites sowunmiae* n. fsp.
(Plate 2.1., figs. 7-10)

Diagnosis: Amb ellipsoidal. Surface finely reticulate, the mesh of the reticuli is 0.3-0.5 μm. The exine is 1.5-2.3 μm thick, the three ectexine layers are of equal thickness, T/I/F = 1/1/1. The furrows are narrow (0.3 μm) and generally reach the poles. Around the furrows there are 2-3 μm wide cavernes.

Polar axis: 20 μm; 18-22 μm.

Holotype: Plate 2.1., figs. 7,8, slide: Abu Minquar-4-3-2, cross-table number: 16.8/116.9.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. M.A. SOWUNMI investigator of the palynomorphs of Africa.

Differential diagnosis: The thinner exine of the new fsp. separates it from *R. maledictus* GONZÁLEZ GUZMÁN 1967, and *R. promiscuus* LAING 1975.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) frequent, Farafra (6-2-1) infrequent, Kharga (1-39) infrequent, Kharga (1-28) infrequent.

4. *Retitricolpites prosimilis* NORRIS 1967
(Plate 2.1., figs. 11-14)

Description: Amb ellipsoidal. Surface reticulate, the lumen of the reticuli is 0.4-0.6 μm, muri width is about 0.3 μm. The exine is 0.7-0.9 μm thick, the infratectal layer is a little thicker than the tectum and the foot layer, T/I/F = 1/1.5/1. The furrows are long, but do not reach the poles; its width is 0.2 μm. Around the furrows there are cavernes that are 0.3 μm in width.

Polar axis: 18 μm; 17-20 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) infrequent, Kharga (1-39) infrequent.

5. *Retitricolpites fragosus* HEDLUND and NORRIS 1968
(Plate 2.1., figs. 15,16)

Description: Amb circular to ellipsoidal, surface reticulate, the mesh of the reticuli is 0.4-1.8 μm, the muri width is 0.3 μm. The exine is 1.5-2.0 μm thick, the infratectum is a little thicker than the tectum and the foot layer. The furrows are short and do not reach the poles; generally its length is 3/4 of the polar axis. Around the furrows there are small cavernes 0.2-0.3 μm in width.

Polar axis: 18 μm; 16-20 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (11) infrequent.

6. *Retitricolpites variabilis* (BURGER 1970) n. comb.
(Plate 2.1., figs. 17,18)

Syn.: 1970 *Tricolpites variabilis* BURGER, p. 8, pl. l, figs. 1,4.

Description: Amb elliptical, surface reticulate. The lumen of the reticuli is 0.4-0.6 μm, the muri width of 0.3 μm. The exine is 1.0-1.3 μm thick; the infratectal layer is thicker than the tectum and the foot layer T/I/F = 1/1.5/1.8. The furrows are 0.2 μm wide, asymmetrical; around the furrows there are 0.3-0.4 μm wide cavernes.

Polar axis: 22 μm; 20-26 μm.

Occurrences and frequency in the samples investigated from Egypt: Coniacian-Santonian: Abu Rauwash (70-1-7-1) common, Maestrichtian, Nubia Sandstone: Farafra (6-2-1) infrequent. Abu Minquar (4-3) common.

7. *Retitricolpites heteroreticulatus* BOLTENHAGEN 1976
(Plate 2.2., figs. 1-4)

Description: Amb ellipsoidal or secondarily deformed. Surface reticulate, the lumen of the reticuli is 1.0-1.8 μm. Muri width is 0.2-0.4 μm. The exine is 1.5-2.0 μm thick, the infratectum is a little thicker than the tectum and the foot layer, T/I/F = 1/1.5/1. The furrows do not reach the poles: around them there are 4-5 μm wide cavernes.

Polar axis: 32 μm; 26-42 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-1) infrequent, Abu Minquar (4-3) infrequent, Kharga (1-39) infrequent.

8. *Retitricolpites jardinei* n. fsp.
(Plate 2.2., figs. 5-10)

Diagnosis: Amb ellipsoidal. Surface reticulate, the mesh of the reticuli is 0.3-0.5 μm, muri width is 0.2 μm. The exine is 2.5-3.0 μm thick, the infratectum is a little thicker than the tectum and the foot layer; T/I/F = 1/1.5/1. The furrows are asymmetrical, the middle furrow is shorter than the outer one but generally they do not reach the poles. Around the furrows, there are 3-4 μm wide cavernes.

Polar axis: 42 μm; 34-55 μm.

Holotype: Plate 2.2., figs. 5,6, slide: Abu Minquar-4-3-8, cross-table number: 4.8/104.3.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. S. JARDINÉ.

Differential diagnosis: The thicker exine separates it from *R. gigantoreticulatus* (JARDINÉ and MAGLOIRE 1965) n. comb. (syn.: 1965 *Tricolpites gigantoreticulatus* JARDINÉ and MAGLOIRE, p. 216, pl. 11, figs. 4,6,7). *Tricolpites tienabaensis* JARDINÉ and MAGLOIRE 1965 sometimes have a reticulate-rugulate or vermiculate surface.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-1) common, Abu Minquar (4-3) infrequent, Kharga (1-39) infrequent, Kharga (1-28) infrequent.

Plate 2.2.

9. *Retitricolpites magloirae* n. fsp.
(Plate 2.2., figs. 11-14)

Diagnosis: Amb ellipsoidal. Surface reticulate, the lumen of the reticuli is 0.5-2.0 μm, muri width is 0.4 μm. The exine is 2.5-3.0 μm thick, the tectum is the thickest between the ectexine layers, T/I/F = 1.5-2/1/1. The furrows are asymmetrical and do not reach the poles.

Polar axis: 53 μm; 48-58 μm.

Holotype: Plate 2.2., figs. 11,12, slide: Abu Minquar-4-3-1, cross-table number: 19.2/114.4.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. L. MAGLOIRE investigator of the Senonian sporomorphs of Africa.

Differential diagnosis: The very great size (55-70 μm) of *R. giganteus* (JARDINÉ and MAGLOIRE 1965) n. comb. (syn.: 1965 *Tricolpites giganteus* JARDINÉ and MAGLOIRE, p. 215, pl. 11, figs. 1-3) from the Turonian and the Lower Senonian of Senegal separates it from *R. magloirae* n. fsp.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) infrequent, Abu Minquar (4-3) infrequent, Kharga (1-39) infrequent.

Form-genus: *Dettmannaepollenites* n. fgen.

Form-genus type: *Dettmannaepollenites intrabaculatus* n. fgen. et fsp.
(Plate 2.2., figs. 15-20)

Diagnosis: Tricolpate pollen grains with characteristic free standing infratectal elements in the aperture margin. The exine is tectate imperforate.

Form-genus type: Plate 2.2., figs. 15,16, slide: Abu Minquar-4-3-3, cross-table number: 20.7/115.7.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. M.E. DETTMANN, excellent investigator of the Mesozoic sporomorphs.

Plate 2.2.

1,2. *Retitricolpites heteroreticulatus* BOLTENHAGEN 1976, slide: Abu Minquar-4-3-8, cross-table number: 11.2/101.3.
3,4. *Retitricolpites heteroreticulatus* BOLTENHAGEN 1976, slide: Abu Minquar-4-3-4, cross-table number: 11.4/105.0.
5,6. *Retitricolpites jardinei* n. fsp., slide: Abu Minquar-4-3-8, cross-table number: 4.8/104.3.
7,8. *Retitricolpites jardinei* n. fsp., slide: Abu Minquar-4-3-10, cross-table number: 5.3/115.9.
9,10. *Retitricolpites jardinei* n. fsp., slide: Farafra-6-2-2-1, cross-table number: 19.6/102.2.
11,12. *Retitricolpites magloirae* n. fsp., slide: Abu Minquar-4-3-1, cross-table number: 19.2/114.4.
13,14. *Retitricolpites magloirae* n. fsp., slide: Farafra-6-2-1-10, cross-table number: 12.0/102.8.
15,16. *Dettmannaepollenites intrabaculatus* n. fgen. et fsp., slide: Abu Minquar-4-3-3, cross-table number: 20.7/115.7.
17,18. *Dettmannaepollenites intrabaculatus* n. fgen. et fsp., slide: Abu Minquar-4-3-3, cross-table number: 6.8/109.8.
19,20. *Dettmannaepollenites intrabaculatus* n. fgen. et fsp., slide: Abu Minquar-4-3-7, cross-table number: 14.4/116.4.

Differential diagnosis: The imperforate tectum separate well, from *Phimopollenites* DETTMANN 1973.

1. *Dettmannaepollenites intrabaculatus* n. fsp.
(Plate 2.2., figs. 15-20, Text-fig. 2.1.)

Diagnosis: Amb ellipsoidal. Surface scabrate. The exine is 1.3-2.0 μm thick, the infratectum is a little thicker than the tectum and the foot layer. Structure finely intrabaculate. The furrows are 0.2 μm wide in the middle, and 1.5-2.5 μm at their ends and do not reach the poles. The apertural free infratectal elements are very characteristic, 2.0-3.0 μm long, and generally with 1.5 μm basis diameter.
Polar axis: 31 μm; 24-36 μm.
Holotype, locus typicus, stratum typicum see previously.
Derivatio nominis: From the exine structure.
Occurrence and frequency in the samples investigated from Egypt: Lower Campanian: Duwi infrequent; Maestrichtian, Nubia Sandstone: Farafra (6-2-1) infrequent, Abu Minquar (4-3) common, Kharga (1-39) frequent, Kharga (1-28) common.

Form-genus: *Psilatricolporites* (VAN DER HAMMEN 1956) PIERCE 1961

Psilate tricolporate pollen grains (JANSONIUS and HILLS, 2233)

1. *Psilatricolpites pannosus* (DETTMANN and PLAYFORD 1968) BURGER 1970
(Plate 2.3., figs.1-4)

Description: Amb ellipsoidal, surface smooth. The exine is 1.5-2.0 μm thick, the tectum, infratectal layer and the foot layer are equal in thickness, T/I/F = 1/1/1. The fine structure of the infratectal layer is not discernible by optical microscope, probably granular. Furrows narrow and in general reach the poles, around the furrows, there are 1.5-2.0 μm wide, thin and do not so typical cavernes.
Polar axis: 22 μm; 18-23 μm.
Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-1) common, Farafra (11) infrequent, Abu Minquar (4-3) infrequent, Kharga (1-39) infrequent.

2. *Psilatricolpites khargaensis* n. fsp.
(Plate 2.3., figs. 5,6)

Diagnosis: Amb ellipsoidal, surface psilate. The exine is 1.5-2.2 μm thick, the infratectal layer is the thickest between the ectexine layers. Structure probably granular. The furrows are short, and do not reach the poles. Around the furrows, there are characteristic, 1.5-1.8 μm wide cavernes.
Polar axis: 20 μm; 18-24 μm.
Holotype: Plate 2.3., figs. 5,5, slide: Kharga-1-28-1, cross-table number: 12.7/115.8.
Locus typicus: Kharga, Maestrichtian, Nubia Sandstone.
Stratum typicum: aleurite.
Derivatio nominis: From Kharga.

Differential diagnosis: The shorter furrows and the characteristic cavernes clearly separates this species from *P. pannosus* (DETTMANN and PLAYFORD 1968) BURGER 1970.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Kharga (1-28) common.

Form-genus: *Cupuliferoidaepollenites* R. POTONIÉ 1960

Small psilate tricolpate pollen grains. It should be emphasized, that is many cases it is not easy to distinguish *Psilatricolpites* from *Cupuliferoidaepollenites*. POTTER (1976) published SEM pictures of these pollen grains. The tectum is perforated, based on the SEM data.

1. *Cupuliferoidaepollenites quisqualis* (R. POTONIÉ 1934) R. POTONIÉ 1960, *Fagaceae* v. *Leguminosae*
(Plate 2.3., figs. 7-10)

Description: Tricolpate pollen grains, amb ellipsoidal, surface smooth. The exine is 0.6-0.8 μm thick, the three layers of the ectexine are of equal thickness, T/I/F = 1/1/1. The furrows generally do not reach the poles.

Polar axis: 12 μm; 11-13 μm.

Occurrence and frequency in the samples investigated from Egypt: Coniacian-Santonian: Abu Rauwash (70-1-7-2) infrequent, Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) common, Farafra (11) common, Kharga (1-39) dominant, Kharga (1-28) frequent.

2. *Cupuliferoidaepollenites liblarensis* (THOMSON, in POTONIÉ, THOMSON and THIERGART 1950) R. POTONIÉ 1960, *Fagaceae* v. *Leguminosae*
(Plate 2.3., figs. 11,12)

Description: Amb elongated, ellipsoidal, surface smooth or scabrate. The exine is 0.6-0.8 μm thick, the infratectal layer is a little thicker than the tectum and the foot layer T/I/F = 1/1.5/1. Structure finely intrabaculate. The furrows generally reach the poles.

Polar axis: 17 μm; 16-18 μm.

Occurrence and frequency in the samples investigated from Egypt: Lower Campanian: Duwi common, Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) common, Farafra (11), Kharga (1-39) frequent, Kharga (1-28) common.

Form-genus: *Retibrevitricolpites* VAN HOEKEN-KLINKENBERG 1966

Brevitricolpate, reticulate pollen grains.

1. *Retibrevitricolpites aegypticus* n. fsp.
(Plate 2.3., figs. 13-16)

Diagnosis: Amb circular, surface reticulate or perforate. The lumen is 0.3-0.5 μm in diameter, muri width is 0.3 μm. The exine is 0.5-0.7 μm, the three ectexine layers are of equal thickness, T/I/F = 1/1/1. The fine structure of the infratectal layer is not discernible by optical microscope. The furrows are 4-6 μm long.

Diameter: 19 µm; 17-20 µm.

Holotype: Plate 3.2., figs. 13,14, slide: Abu Minquar-4-3-6, cross-table number: 9.4/106.4.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: From Egypt.

Differential diagnosis: *R. triangulus* VAN HOEKEN-KLINKENBERG 1966 is triangular, and the lumina of the reticulum are 1 µm, *R. bendeensis* JAN DU CHÊNE, ONYIKE and SOWUNMI 1978 is larger (35 µm), and the muri width and the diameter of the lumina of the reticulum measure 1 µm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Abu Minquar (4-3) infrequent, Kharga (1-28) common, Maestrichtian, fm. indet.: Oweina (1) infrequent.

Form-genus: *Tricolporoidites* PACLTOVÁ 1971

This is an important form-genus, which include the intermediate forms between tricolpate and tricolporate type. It has been demonstrated in several cases, that these characteristic features may occur in one single recent species. However the form varieties of the *angiosperm* pollen grains are not so well elaborated, and for this reason, the form-genera are necessary.

Plate 2.3.

1,2. *Psilatricolpites pannosus* (DETTMANN and PLAYFORD 1968) BURGER 1970, slide: Abu Minquar-4-3-4, cross-table number: 10.1/107.6.
3,4. *Psilatricolpites pannosus* (DETTMANN and PLAYFORD 1968) BURGER 1970, slide: Farafra-6-2-1-4, cross-table number: 20.2/104.5.
5,6. *Psilatricolpites khargaensis* n. fsp., slide: Kharga-1-21-1, cross-table number: 12.7/115.8.
7,8. *Cupuliferoidaepollenites quisqualis* (R. POTONIÉ 1934) R. POTONIÉ 1960, Fagaceae v. Leguminosae, slide: Farafra-6-2-2-4, cross-table number: 9.9/112.7.
9,10. *Cupuliferoidaepollenites quisqualis* (R. POTONIÉ 1934) R. POTONIÉ 1960, Fagaceae v. Leguminosae, slide: Farafra-6-2-2-1, cross-table number: 10.7/102.7.
11,12. *Cupuliferoidaepollenites liblarensis* (THOMSON, in POTONIÉ, THOMSON and THIERGART 1950) R. POTONIÉ 1960, Fagaceae v. Leguminosae, slide: Farafra-6-2-2-2, cross-table number: 12.8/108.5.
13,14. *Retibrevitricolpites aegypticus* n. fsp., slide: Abu Minquar-4-3-6, cross-table number: 9.4/106.4.
15,16. *Retibrevitricolpites aegypticus* n. fsp., slide: Abu Minquar-4-3-10, cross-table number: 10.6/110.3.
17,18. *Tricolporoidites pacltovae* n. fsp., slide: Abu Minquar-4-3-1, cross-table number: 4.1/105.3.
19,20. *Tricolporoidites pacltovae* n. fsp., slide: Abu Minquar-4-3-6, cross-table number: 9.2/118.3.
21,22. *Polycolpopollenites* fsp., slide: Farafra-6-2-1-9, cross-table number: 3.4/101.6.
23,24. *Polycolpites* fsp., slide: Kharga-1-39, cross-table number: 17.1/109.2.
25,26. *Retitricolporites ecommoyensis* LAING 1975, slide: Farafra-6-2-2-1, cross-table number: 8.3/105.6.
27,28. *Retitricolporites ecommoyensis* LAING 1975, slide: Farafra-6-2-1-1, cross-table number: 20.8/108.8.
29,30. *Retitricolporites farafraensis* n. fsp., slide: Farafra-6-2-2-1, cross-table number: 5.1/106.9.
31,32. *Retitricolporites farafraensis* n. fsp., slide: Farafra-6-2-2-5, cross-table number: 11.1/112.8.
33,34. *Retitricolporites aegypticus* n. fsp., slide: Farafra-6-2-2-4, cross-table number: 12.1/117.1.
35,36. *Retitricolporites aegypticus* n. fsp., slide: Farafra-6-2-2-7, cross-table number: 5.4/108.2.
37,38. *Retitricolporites kirchheimerii* n. fsp., slide: Farafra-6-2-2-1, cross-table number: 6.8/117.9.
39,40. *Retitricolporites rakosii* n. fsp., slide: Abu Minquar-4-3-1, cross-table number: 14.4/118.1.
41,42. *Retitricolporites rakosii* n. fsp., slide: Farafra-6-2-2-1, cross-table number: 17.3/100.2.
43,44. *Retitricolporites elsikii* n. fsp., slide: Abu Minquar-4-3-2, cross-table number: 4.5/115.3.
45,46. *Retitricolporites lachkarii* n. fsp., slide: Abu Minquar-4-3-3, cross-table number: 6.2/106.1.
47,48. *Retitricolporites lachkarii* n. fsp., slide: Farafra-6-2-2-3, cross-table number: 8.3/108.2.
49,50. *Retitricolporites ogowensis* BOLTENHAGEN 1976, slide: Abu Minquar-4-3-3, cross-table number: 18.4/112.4.


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Plate 2.3.

1. *Tricolporoidites pacltovae* n. fsp.
(Plate 2.3., figs. 17-20)

Diagnosis: Isodiametric pollen grains, surface finely reticulate, the lumen of the reticuli and the muri width is in general 0.2 μm. The exine is 1.0-1.3 μm thick, the infratectal layer is thicker than the tectum and the foot layer, T/I/F = 1/2/1. The furrows are narow with "Cyrillaceae morphology". These are 2.0-2.3 μm wide, with the characteristic cavernes around the furrows. No characteristic endoapertures but there are sometimes thinnings on the inner exine layer.

Polar axis: 18 μm; 17-22 μm.

Holotype: Plate 3.2., figs. 17,18, slide: Abu Minquar-4-3-1, cross-table number: 4.1/105.3.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. B. PACLTOVÁ.

Differential diagnosis: The form-species *T. bohemicus* PACLTOVÁ 1971, *T. minutus* PACLTOVÁ 1971, and *T. subtilis* PACLTOVÁ 1971 are smaller. The sculpture of *T. minimus* is similar to our new species, but the exine is very thick.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Abu Minquar (4-3) infrequent, Kharga (1-39) common.

SUBTURMA: *POLYPTICHES* (~ *POLYPTICHA* NAUMOVA 1937) R. POTONIÉ 1960

Form-genus: *Polycolpopollenites* TREVISAN 1967

The number of the colpi of these pollen grains are greater that three.

1. *Polycolpopollenites* fsp.
(Plate 2.3., figs. 21,22)

Description: Amb elliptical, surface smooth or scabrate. The exine is 0.6-0.8 μm thick, the infratectal layer is a little thicker than the tectum and the foot layer; T/I/F = 1/1.5/1. The number of the furrows are 4, in general, and do not reach the poles.

Polar axis: 31 μm; 30-33 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-1) infrequent.

Form-genus: *Polycolpites* COUPER 1953

The number of the colpi are greater than six. This characteristic feature separates this genus from the previous form-genus.

1. *Polycolpites* fsp.
(Plate 2.3., figs. 23,24)

Description: Amb ellipsoidal. Surface finely reticulate to foveolate, the mesh of the reticuli is 0.15-0.25 μm, muri width is 0.2 μm. The exine is 2.0-2.5 μm thick, sometimes thicker at the poles (3.0-3.5 μm): its structure is not discernible by optical microscope.

The infratectal layer is irregular and the thickest between the ectexine layers, T/I/F = 1/2/1. The number of the furrows is 10, in general, and do not reach the poles.

Polar axis: 45 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Kharga (1-39) infrequent.

SUBTURMA: *PTYCHOTRIPORITES* (~ *PTYCHOTRIPORINA* NAUMOVA 1937) R. POTONIÉ 1960

Form-genus: *Retitricolporites* (VAN DER HAMMEN 1956) VAN DER HAMMEN and WIJMSTRA 1964

Tricolporate, reticulate pollen grains.

1. *Retitricolporites ecommoyensis* LAING 1975
(Plate 2.3., figs. 25-28)

Description: Amb ellipsoidal. Surface very finely reticulate, the mesh of the reticuli is 0.2 μm, the muri are 0.15 μm in width. The exine is 0.6-0.8 μm thick, the infratectal layer is a little thicker than the tectum and the foot layer. The furrows are long but do not reach the poles. Around the furrows there are 1 μm wide cavernes. The endopores are sometimes not clearly discernible, sometimes these pollen grains are poroidate, but generally the size of the endoaperture is 1.5-2.0 μm.

Polar axis: 14 μm; 12-16 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrictian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) infrequent, Maestrichtian, fm. indet.: Oweina (3) infrequent.

2. *Retitricolporites farafraensis* n. fsp.
(Plate 2.3., figs. 29-32)

Diagnosis: Amb ellipsoidal. Surface very finely reticulate, the mesh of the reticuli and the muri width is 0.15-0.25 μm. The exine is 0.5-0.7 μm thick, the tectum, infratectum and the foot layer are of equal thickness, T/I/F = 1/1/1. The furrows do not reach the poles and converge in the direction of the polar area. Around the furrows there are cavernes with 1.5 μm maximal width near the endopores; the cavernes become narrower. The endopores are tiny and circular, 0.3-0.5 μm in diameter.

Polar axis: 19 μm; 16-20 μm.

Holotype: Plate 2.3., figs. 29,30, slide: Farafra-6-2-1, cross-table number: 5.1/106.9.

Locus typicus: Farafra, Maestrichtian, Nubia Sandstone.

Stratum typicum: clayey brown coal.

Derivatio nominis: From Farafra.

Differential diagnosis: *R. medius* GONZÁLEZ GUZMÁN 1967 is larger (21-35 μm) and its polar area is small.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Abu Minquar (4-3) infrequent.

3. *Retitricolporites aegypticus* n. fsp.
(Plate 2.3., figs. 33-36)

Diagnosis: Amb ellipsoidal, sometimes circular. Surface finely reticulate, the lumen of the reticuli is 0.3-0.4 μm, the muri width is 0.2-0.3 μm. The exine is 1.6-2.2 μm thick, the infratectum is a little thicker than the tectum and the foot layer, T/I/F = 1/1.5-2/1. The furrows are convergent in the polar direction and in general reach them. The width of the caverne is 1.5-1.8 μm and it is not present in the endoapertural region. Endoaperture narrow and meridionally elongated, 0.8-2.5 μm in size.

Polar axis: 18 μm; 13-19 μm.

Holotype: Plate 2.3., figs. 33,34, slide: Farafra-6-2-2-4, cross-table number: 12.1/117.1.

Locus typicus: Farafra, Maestrichtian, Nubia Sandstone.

Stratum typicum: clayey brown coal.

Derivatio nominis: From Egypt.

Differential diagnosis: The thicker exine, and the convergent furrows in the polar direction separates this species from *R. farafraensis* n. fsp.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) common, Maestrichtian, fm. indet.: Oweina (3) infrequent.

4. *Retitricolporites kirchheimerii* n. fsp.
(Plate 2.3., figs.37,38)

Diagnosis: Amb circular to elliptical. Surface reticulate, the lumen of the reticuli is 0.3-0.4 μm, the muri width is 0.2-0.3 μm. The exine is 0.6-0.8 μm thick, the three ectexine layers are equal in thickness, T/I/F = 1/1/1. The furrows are parallel with the ambitus and generally reach the poles. The cavernes are 2.0-2.5 μm in width, the endoapertures are narrow, meridionally oriented, short furrows; 0.5 x 4-5 μm.

Polar axis: 17 μm; 16-19 μm.

Holotype: Plate 2.3., figs. 37,38, slide: Farafra-6-2-2-1, cross-table number: 6.8/117.9.

Locus typicus: Farafra, Maestrichtian, Nubia Sandstone.

Stratum typicum: clayey brown coal.

Derivatio nominis: In honour of Prof. Dr. F. KIRCHHEIMER pioneer of African Senonian palynology.

Differential diagnosis: The endoapertures, the meridionally oriented furrows separates this species from *R. aegypticus* n. fsp. The lumina of *R. craceus* GONZÁLEZ GUZMÁN 1967 are 1 μm, which is larger than those of the new fsp.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Abu Minquar (4-3) infrequent, Kharga (1-28) common.

5. *Retitricolporites rakosii* n. fsp.
(Plate 2.3., figs. 39-42)

Diagnosis: Amb ellipsoidal, surface reticulate, the mesh of the reticuli is 0.6-1.1 μm, the muri width is 1.0 μm. The exine is 1.5-2.0 μm thick, the tectum, infratectum, and the foot layer are equally thick. The furrows generally reach the poles, the cavernes are 1.5-2.0 μm in width. Endopores meridionally oriented short colpi: 0.3 x 2.0-3.0 μm.

Polar axis: 21 μm; 20-23 μm.

Holotype: Plate 2.3., figs. 39,40, slide: Abu Minquar-4-3-1, cross-table number: 14.4/118.1.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. L. RÁKOSI excellent investigator of the Lower Tertiary palynomorphs.

Differential diagnosis: *R. potoniei* KEDVES 1978 is larger (28-34 μm) and the endoapertures are meridionally oriented furrows. *R. finitus* GONZÁLEZ GUZMÁN 1967 is also larger: 27-35 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) common, Abu Minquar (4-3) infrequent, Kharga (1-34) infrequent, Kharga (1-28) infrequent.

6. *Retitricolporites elsikii* n. fsp.
(Plate 2.3., figs. 43, 44)

Diagnosis: Amb ellipsoidal, but a little larger meridionally. Surface finely reticulate, the lumina of the reticulum measure about 0.3-0.5 μm, the muri width is 0.2 μm. The exine is 0.7-0.9 μm thick, the tectum, infratectum and the foot layer are of equal thickness. Structure finely intrabaculate. The furrows are narrow and long but generally do not reach the poles. The cavernes are meridionally 3.0-3.5 μm wide, and become narrower in the polar direction. The endoapertural area is prominent. Endopore circular, with a diameter of 3-4 μm.

Polar axis: 23 μm; 20-25 μm.

Holotype: Plate 2.3., figs. 43,44, slide: Abu Minquar-4-3-2, cross-table number: 4.5/115.3.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. W.C. ELSIK, excellent investigator of the Lower Tertiary sporomorphs.

Differential diagnosis: *R. andreanszkyi* KEDVES 1978 is larger (26-32 μm) and the lumina of the reticulum are 0.5-1.0 μm these characteristic features separate it from the new form-species.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-1) infrequent, Abu Minquar (4-3) infrequent, Kharga (1-39) infrequent.

7. *Retitricolporites lachkarii* n. fsp.
(Plate 2.3., figs. 45-48)

Diagnosis: Amb ellipsoidal. Surface reticulate. The lumina of the reticulum measure about 0.6-1.4 μm in diameter. The muri are about 0.3 μm. The exine is 0.8-2.8 μm thick, the tectum, infratectum and the foot layer are equal. Structure intrabaculate. The furrows are long, but generally do not reach the poles, and bend in the direction of the poles. The cavernes are 2-3 μm wide in the endoapertural region, and are about 1.5 μm wide at their ends. The endopori are ellipsoidal, 1.5-2.0 x 3.0 μm in size.

Polar axis: 27 μm; 21-32 μm.

Holotype: Plate 2.3., figs. 45,46, slide: Abu Minquar-4-3-3, cross-table number: 6.2/106.1.

Locus typicus: Abu Minquar, Maestrichtian, Nubia Sandstone.

Stratum typicum: coaly clay.

Derivatio nominis: In honour of Dr. G. LACHKAR.

Differential diagnosis: The ellipsoidal endopore, and the thicker exine separates this taxon from R. elsikii n. fsp.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Farafra (6-2-2) infrequent, Farafra (6-2-1) infrequent, Abu Minquar (4-3) common, Kharga (1-39) common, Kharga (1-28) infrequent.

8. *Retitricolporites ogowensis* BOLTENHAGEN 1976
(Plate 2.3., figs. 49,50)

Description: Amb ellipsoidal. Surface reticulate, the lumina of the reticulum measure from 1.0-1.5 μm in size and the muri width is 0.5 μm. The exine is 2.0-2.5 μm thick, the infratectal layer is a little thicker than the tectum and the foot layer, T/I/F = 1/1.5/1. The furrows are asymmetrical, and generally do not reach the poles. Cavernes are 4-5 μm wide in the endoapertural region, and about 2.0 μm at their ends. Endopore is large and circular, 4.0-5.0 μm in diameter.

Polar axis: 42 μm; 38-50 μm.

Occurrence and frequency in the samples investigated from Egypt: Maestrichtian, Nubia Sandstone: Abu Minquar (4-3) infrequent.

Remark. - The slides are deposited in the Cell Biological and Evolutionary Micropaleontological Laboratory of the Dept. of Botany of the J.A. University, Szeged, Hungary.

To be continued

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