8. HIGH TEMPERATURE EFFECT ON RECENT POLLEN GRAINS OF TILIA CORDATA MILL. AND TILIA PLATYPHYLLOS SCOP.

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Abstract

The LM morphological alterations were investigated as a consequence of the high temperature on 200 °C during 10 minutes, 1 hour, 5 and 10 hours. The observed alterations have not touched the basic morphological characteristic features of these pollen grains.

Key words: Palynology, recent, *Tilia*, high temperature effect, LM.

Introduction

The pollen morphology of the genus *Tilia* is interesting in evolutionary point of view. The short colpi and the peculiar endannulus are of early type, cf. ERDTMAN (1954), ERDTMAN, PRAGLOWSKI and NILSSON (1963), etc. TEM data from recent pollen grain, by CHAMBERS and GODWIN (1961). The first ultrastructure data from fossil pollen grain, (*Intratriporopollenites microreticulatus* MAI 1961), by KEDVES and PÁRDUTZ, in 1970. The reticulate surface is also one earlier sculpture type. The sporopollenin of the ectexine of *Tilia platyphyllos* SCOP. is very easily soluble in diethylamine. Morphological alterations were also observed after partial dissolution in merkaptoethanol and alcohols (KEDVES et al. 1998). These characteristic features stimulated us to continue different kinds of experiments on the pollen grains of this genus. The alteration in consequence of the high temperature as it was established in several previous papers may be important in taxonomic from an evolutionary point of view.

The aim of this paper is to establish the qualitative and the quantitative alterations of the pollen grains of two species of this genus: *T. cordata, T. platyphyllos.*

Materials and Methods

Tilia cordata MILL., collected by D. TOMBÁCZ and J. SASHALMI in Szeged (cultivated) on the 28.05.1999.
Experiment No.: T-9-41. - Fresh pollen grain (Plate 8.1., figs. 1-3)
Experiment No.: T-9-42. - Heated pollen grains, length of time 10 minutes, 200 °C (Plate 8.1., figs. 4-6)
Experiment No.: T-9-43. - Heated pollen grains, length of time 1 hour, 200 °C (Plate 8.1., figs. 7-9)
Experiment No.: T-9-44. - Heated pollen grains, length of time 5 hours, 200 °C (Plate 8.1., figs. 10-12)

Experiment No.: T-9-45. - Heated pollen grains, length of time 10 hours, 200 °C (Plate 8.1., figs. 13-15)
Tilia platyphyllos SCOP., collected by J. SASHALMI and D. TOMBÁCZ in Szeged (cultivated) on the 28.05.1999.
Experiment No.: T-9-46. - Fresh pollen grain (Plate 8.1., figs. 16-18)
Experiment No.: T-9-47. - Heated pollen grains, length of time 10 minutes, 200 °C (Plate 8.1., figs. 19-21)
Experiment No.: T-9-48. - Heated pollen grains, length of time 1 hour, 200 °C (Plate 8.1., figs. 22-24)
Experiment No.: T-9-49. - Heated pollen grains, length of time 5 hours, 200 °C (Plate 8.1., figs. 25-27)
Experiment No.: T-9-50. - Heated pollen grains, length of time 10 hours, 200 °C (Plate 8.1., figs. 28-30)
The samples were mounted in glycerine-jelly hydrated at 39.6%.

Results

Qualitative results

Tilia cordata MILL. (Plate 8.1., figs. 1-15)

The alteration of the pollen grain after 10 minutes of heating is similar to the pollen grains of *T. platyphyllos* SCOP. partially dissolved merkaptoethanol during 90, 210, 270 and 330 days, and methanol 30, 90, 150, 210, 270, 330 days, and ethanol 30, 90, 150, 210, 330 days, and n-propanol 210 days, and n-butanol 210, 270 days, and finally i-amyl alcohol 90,150, 210, 270, 330 days. After 1 hour of heating the intine and the protoplasm began dark and burned. Worth mentioning is that the granular swelled protoplasm reached the inner surface of the ectexine.

Tilia platyphyllos SCOP. (Plate 8.1., figs. 16-30)

According to the previous species, the alterations to the pollen grains are similar after 10 minutes of heating. After 1 hour of heating the intine and the protoplasm began dark and burned also. The alterations are similar or maybe identical to *T. cordata*.

Quantitative results

Experiment number	Time of heating	Size (µm, %)							Dominant size (µm)	Average (µm)
		25	27.5	30	32.5	35	37.5	40		
T-9-41	0	1	0.5	12	23	**41.5**	21	1	35	34.28
T-9-42	10 min.					24.5	**50.5**	25	37.5	37.53
T-9-43	1 hour		0.5	2.5	7	**31.5**	**41**	17.5	35; 37.5	36.58
T-9-44	5 hours				21	**34.5**	**30.5**	14	35; 37.5	35.95
T-9-45	10 hours			3.5	18	**39.5**	**34**	5	35; 37.5	35.48
T-9-46	0			5.5	27	**35**	**30.5**	2	35; 37.5	34.93
T-9-47	10 min.			1.5	3	19.5	**43.5**	**32.5**	37.5; 40	37.58
T-9-48	1 hour					20.5	**41.5**	24.5	37.5	38.27
T-9-49	5 hours				12.5	18.5	**43**	18.5	37.5	37.25
T-9-50	10 hours			1.5	16.5	**31**	**43.5**	7.5	35; 37.5	35.97

Tilia cordata MILL.

After 10 minutes of heating the size of the pollen grains increased in a remarkable manner. After 1 hour the greatest part of the pollen grains was larger than the fresh ones. This was the same after 5 and 10 hours of heating. No remarkable diminishing appeared during this kind of experiment.

Tilia platyphyllos SCOP.

The greatest diameter of the fresh pollen grains was identical to the pollen grains of the previous species after 5 hours of heating. The swelling was remarkable after 10 minutes of heating.

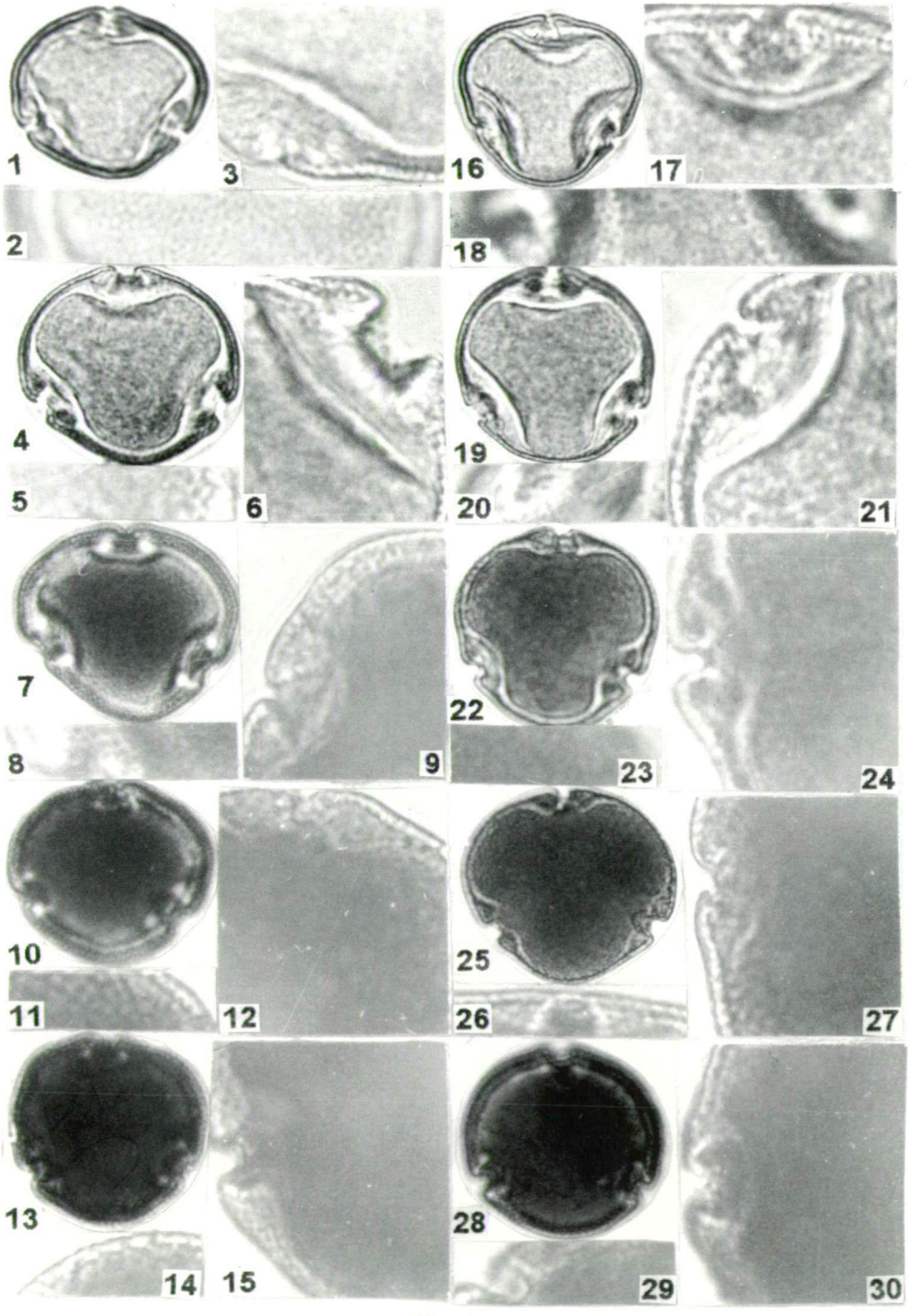
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Plate 8.1.

Plate 8.1.

1-15. - *Tilia cordata* MILL., recent
1-3. - Fresh pollen grain.
4-6. - Heated pollen grain during 10 minutes.
7-9. - Heated pollen grain during 1 hour.
10-12. - Heated pollen grain during 5 hours.
13-15. - Heated pollen grain during 10 hours.
Magnification: 1, 4, 7, 10, 13 1000x, 2, 3, 5, 6, 8, 9, 11, 12, 14, 15 2500x.
16-30. - *Tilia platyphyllos* SCOP.
16-18. - Fresh pollen grain.
19-21. - Heated pollen grain during 10 minutes.
22-24. - Heated pollen grain during 1 hour.
25-27. - Heated pollen grain during 5 hours.
28-30. - Heated pollen grain during 10 hours.
Magnification: 16, 19, 22, 25, 28 1000x., 17, 18, 20, 21, 23, 24, 26, 27, 29, 30 2500x.

Discussion and Conclusions

Based on the results of the previous experiments on the pollen grains of the genus *Tilia* we can point out the following:

1. There are similarities in the secondary LM morphology after different kinds of experimental treatments: The heated pollen grains at 200 °C was similar to several partially dissolved pollen grains with alcohols.

2. The resistance to X-ray (KEDVES and KÁROSSY, 1998) irradiation is interesting in comparison to the solubility in diethylamine. The solubility in diethylamine of the wall may occur at different taxa.

3. The alteration of the diameter of the heated pollen grains during different lengths of time represent another type of alteration, which was observed in several spores and pollen grains in previous investigations of the Laboratory.

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