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Eocene Tiliaceous Palynomorphs of Taiwan

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ABSTRACT: Four species of the form genus *Tiliaepollenites*, representing the fossil grains of the dicotyledon genus *Tilia*, obtained from Eocene sediments from the offshore of the Keelung area in northern Taiwan are reported. Three new species are described.

KEY WORDS : Eocene, Tiliaceous palynomorphs, Taiwan area, Taxonomy.

INTRODUCTION

The tree-genus *Tilia* is wide-ranging in Northern Temperate region, with the southernmost of its 45 known species (Mabberley, 1987) inhabiting in south Mexico. There is no indigenous *Tilia* species in Taiwan. Because the pollen grains of *Tilia* species are so characteristic that fossil grains with *Tilia* affinity can readily be assigned to *Tiliaepollenites*, the form genus created for the fossil pollen grains of *Tilia*. *Tiliaepollenites* has a continuous geological record since the Paleocene (Muller, 1981). In Taiwan area, *Tiliaepollenites* grains occurred in small amount in a few Oligocene, Miocene, Pliocene, and many Pleistocene formations (Huang, 1980, 1988; Huang and Tsou, 1984; Huang and Huang, 1984; Liew, 1979; Shaw, 1990, 1992). However, nobody has identified *Tiliaepollenites* grains from the Wurm Glacial sediments of this area.

My palynological investigation of Eocene sedimentary rocks in Taiwan area began in 1988. A total of eighteen Eocene cores from the offshore of the Keelung area, northern Taiwan, was sent to the Chinese Petroleum Corporation Micropaleontological Laboratory for my investigation. During the work, many interesting palynomorphs were identified. And this paper about tiliaceous palynomorphs represents the second report of this still on-going work. The final report about the palynology of these cores will address on the Eocene fossil flora of the same area.

The taxonomic treatment of Tertiary palynomorphs has been much debated for a long time (Faegri, *et al*., 1964; Huang and Chen, 1967; Boulter, 1979). In this paper, I adopt the form-generic name.

MATERIALS AND METHODS

1. Department of Research and Collection, National Museum of Prehistory Planning Bureau, Taitung 950, Taiwan, Republic of China.

Core samples from the OK-1 well (Fig. 1) from the offshore of the Keelung area in northern Taiwan were made available to the author. A total of eighteen side wall cores was prepared by the Chinese Petroleum Corporation Micropaleontological Laboratory for a palynological study.

The extraction of fossil palynomorphs was made by using the method of Shaw (1990), including the treatment of 10% KOH for dissolution of humic material. Heavy metal solution of $ZnCl_2$ was for floatation (S. G. 1.8-2.2) and also 30% of HCl, 52% of HF were used for maceration of the laterite pebble samples, which were collected from the exploration well.

Microphotographs were taken with a Zeiss Axiophot microscope equipped with an automatic camera using Kodacolor Gold (ASA 100) film. For fossil identification, the standard references used by Jansonius and Hills (1976), Huang (1980), Sung and Tsao (1978), Zhu *et al.* (1985) were adopted. The fossil slides are catalogued and stored at the Micropaleontology Laboratory, Chinese Petroleum Corporation.

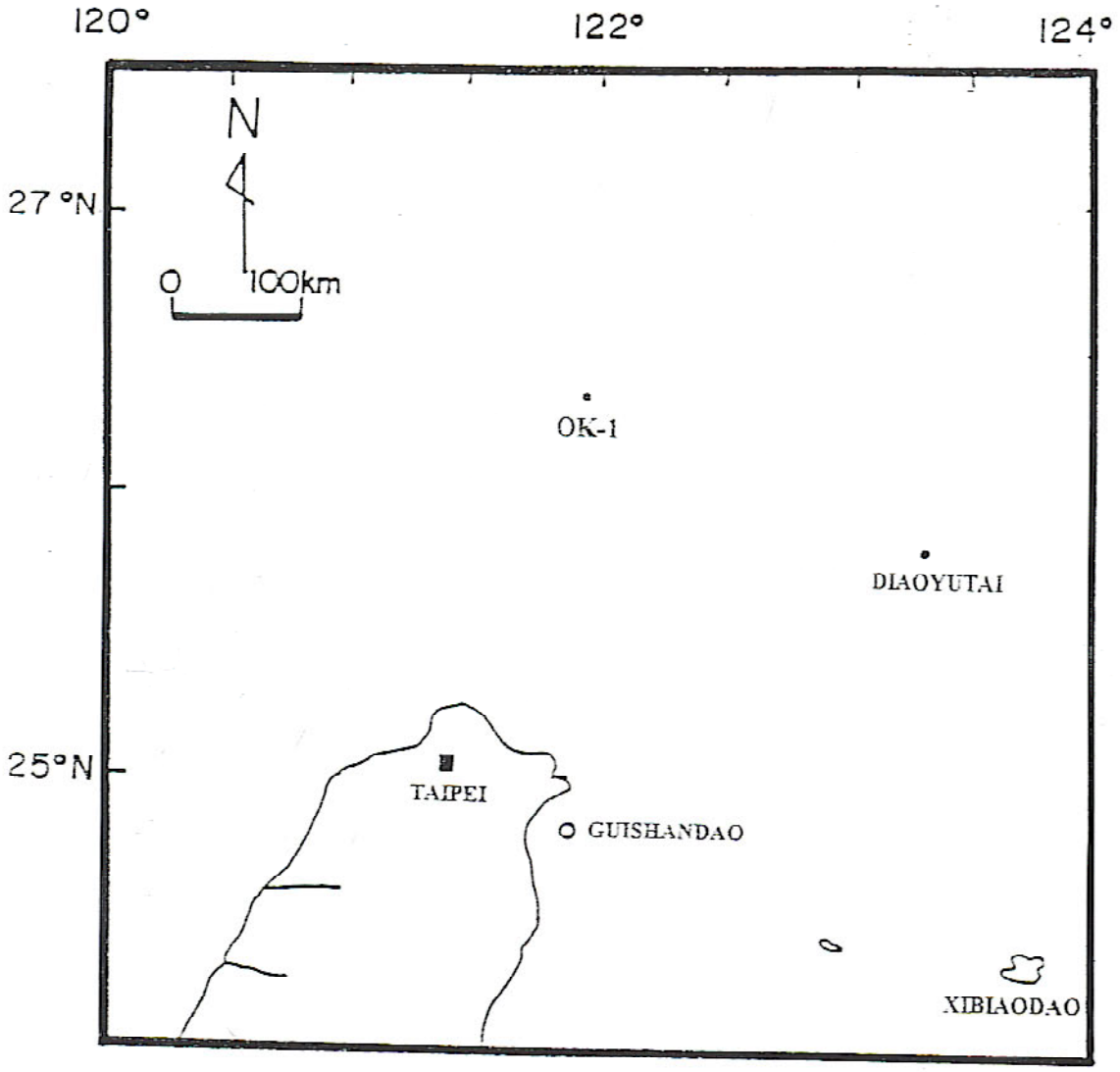

Fig. 1. Locality map of OK-1 well in the offshore of the Keelung area in northern Taiwan.

RESULT

Tiliaepollenites are distributed sporadically in the Eocene, Oligocene, Miocene, Pliocene, and Pleistocene formations, but disappeared at Wurm glaciation of Taiwan. Four taxa of *Tiliaepollenites* appear in the Eocene formation in the offshore of the Keelung area in northern Taiwan. In the process of continually building up the knowledge of the Eocene microflora of Taiwan, this paper reports four taxa of the Eocene fossil tiliaceous palynomorphs. Three new species are described from the OK-1 well.

SYSTEMATIC TAXONOMIC TREATMENT

Class Dicotyledonae
Order Malvales
Family Tiliaceae

Genus 1. TILIAEPOLLENITES Potonié 1931.
Type species: *Tiliaepollenites indubitabllis Pot* .

Emended diagnosis by Pot. 1960: Lenticular pollen, amb circular to rounded triangular; the germinals not in the corners, but in the middle of the sides; they may somewhat protrude, vestibulum distinct, exine more or less thickened around exopore; exine on outline smooth to rough; the coumellae so arranged that in top view they produce an infrareticulate pattern.

Key to Species of Tiliaepollenites

1. Grains more than 27μm in width; pore crassimarginate, about 2-4μm thick.
   2. Grains amb circular; 33-47μm in width ..... 1. *T. formosensis*
   2. Grains amb circular; 27-31μm in width ..... 3. *T. taiwanensis*
1. Grains less than 27μm in width; pore crassimarginate, about 1-1.5μm thick.
   3. Grains amb circular ..... 2. *T. pengchiahsuensis*
   3. Grains amb triangular ..... 4. *T. speciosus*

1. **Tiliaepollenites formosensis** Shaw **sp. nov.** Pl. 1; Figs. 1-3

Grains 3-porate; amb circular; about 33-47μm wide; pore crassimarginate, about 3-4μm thick; surface view reticulate; lateral view scabrate; exine 1.5μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, the side wall core of the 1788 m)

Holotype: Slide OK-1 1788-bl-(1); Pl. 1; Figs 1, 2; film P15-30-32, P15-31-33; CPC Micropaleontology Lab.

Taxonomic affinity: This species and the other three species described in this section are similar to the extant species of *Tilia* of Tiliaceae.

Note:This species is named after the Formosa island, the type locality.

2. **Tiliaepollenites pengchiahsuensis** Shaw **sp. nov.** Pl. 1; Figs. 7-11

Grains 3-porate; amb circular; about 19-23μm wide; pore crassimarginate, about 1-1.5 μm thick; surface view reticulate; lateral view scabrate; exine 1μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, the side wall core of the 1365 m)

Holotype: Slide OK-1 1365-(1); Pl. 1 Figs. 7-9; film P14-0-1, P14-1-2, P14-2-3; CPC Micropaleontology Lab.

Note: This species is named after the Pengchiahsu Basin of the type locality.

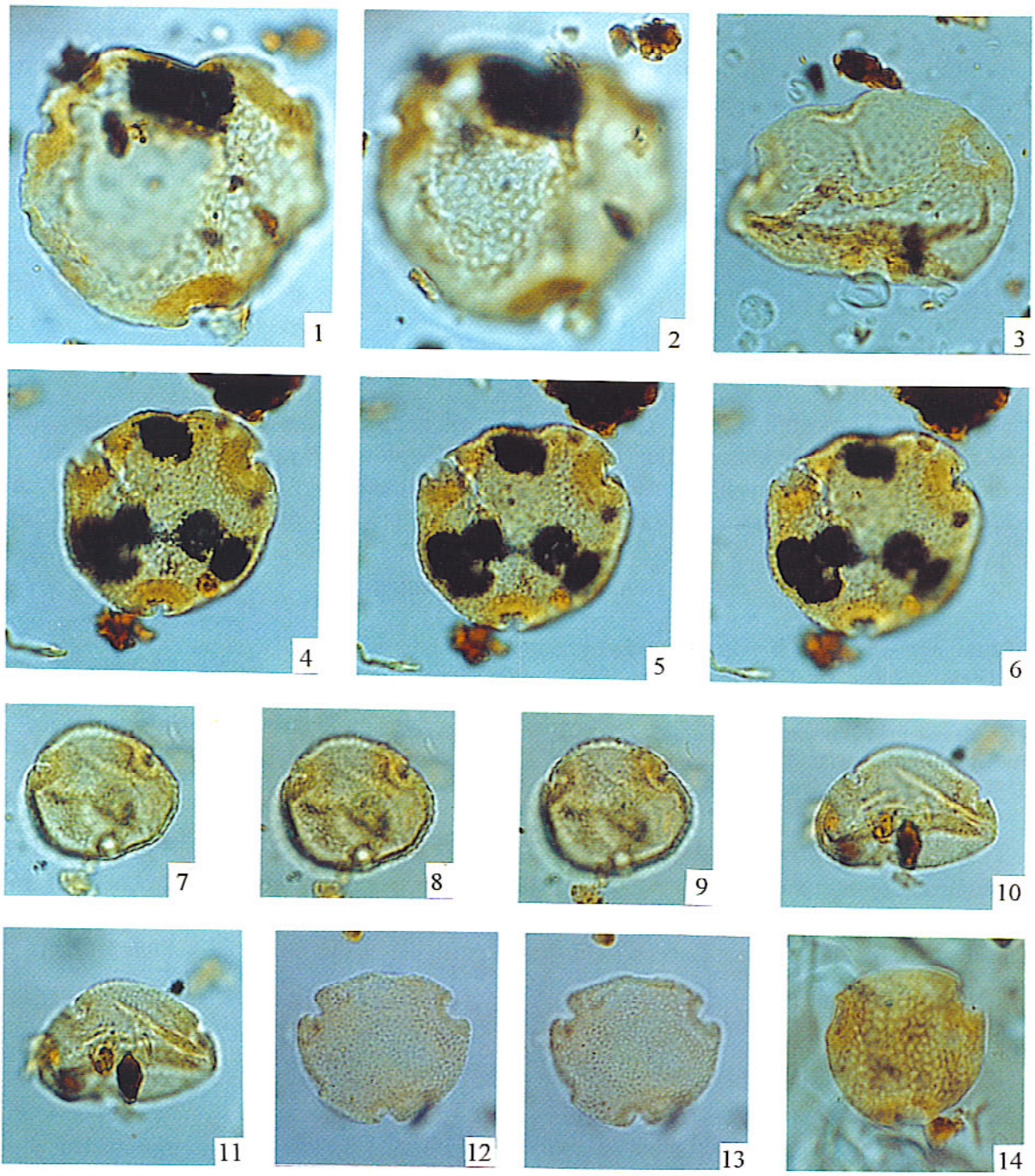

Plate 1. Figs. 1-3. *Tiliaepollenites formosensis* Shaw *sp. nov.* (Film P15: 30-32, P15: 31-33, P4: 36-38). Figs. 4-6. *Tiliaepollenites taiwanensis* Huang (Film P4: 24-27, P4: 25-28, P4: 26-29). Figs. 7-11. *Tiliaepollenites pengchiahsuensis* Shaw *sp. nov.* (Film P14: 0-1, P14: 1-2, P14: 2-3, P15: 17-19, P15: 18-20). Figs. 12-14. *Tiliaepollenites speciosus* Shaw *sp. nov.* (Film S6: 36,S6-37, P4: 30-32). (All figures, x1150)

3. **Tiliaepollenites taiwanensis** Huang in Taiwania 25: 99, Pl. 6, figs. 1-15 Pl. 1; Figs. 4-6

Grains 3-porate; amb circular to round triangular; about 27-31μm wide; pore crassimarginate, about 2-2.5μm thick; surface view reticulate; lateral view scabrate; exine 1 μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, the side wall core of the 1768 m)

Selected slide: OK-1 1768-bl-(1); Pl. 1; Figs. 4-6; film P4-24-27, P4-25-28, P4-26-29; CPC Micropaleontology Lab.

4. **Tiliaepollenites speciosus** Shaw **sp. nov.** Pl. 1; Figs. 12-14

Grains 3-porate; amb round triangular; about 21-26μm wide; pore crassimarginate, about 1-1.5μm thick; surface view reticulate; lateral view scabrate; exine 1μm thick.

Stratigraphic occurrence: Eocene (OK-1 well, the side wall core of the 1669 m)

Holotype: Slide OK-1 1669-(4); Pl. 1; Figs. 12, 13; film S6-36, S6-37; CPC Micropaleontology Lab.

Note: This species is named after the speciosus shape of the pollen.

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台灣始新統之椴樹科化石花粉

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摘　　要

本文於台灣基隆北方海域始新世地層中，描述並發現被子植物椴樹科花粉化石 *Tiliaepollenites* 形態屬，共計四個形態種，其中三種為新種。

關鍵詞:始新世地層、椴樹科化石花粉、台灣、分類。

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