CHAPTER IV

Results

The 1A core section (Fig. 3) from intramontane peat bog (Ang-Kha) of Doi Inthanon, Chiang Mai Province, was investigated. The obtained palynological studies and photographs (by LM and SEM) were deposited at Professor Kasin Suvatabhandhu Herbarium, BCU. These pollen grains and spores extracted from peat core were identified under light microscope and scanning electron microscope. The results of pollen and spore counting in percentage were given in appendix.

1) The lithological details of deposit column (Fig. 4)

The lithological investigations of peat core were presented. The depth of coring from peat surface was recorded in centrimetres. From topmost subsamples, the peat deposits are the brownish black which consisted of clay, peat and fragmented roots. In the middle layer of peat core about 50-145 cm depth are black which was highly water content and consisted of clay and peat. In the bottom layer of this core are saprorite or granite wash.

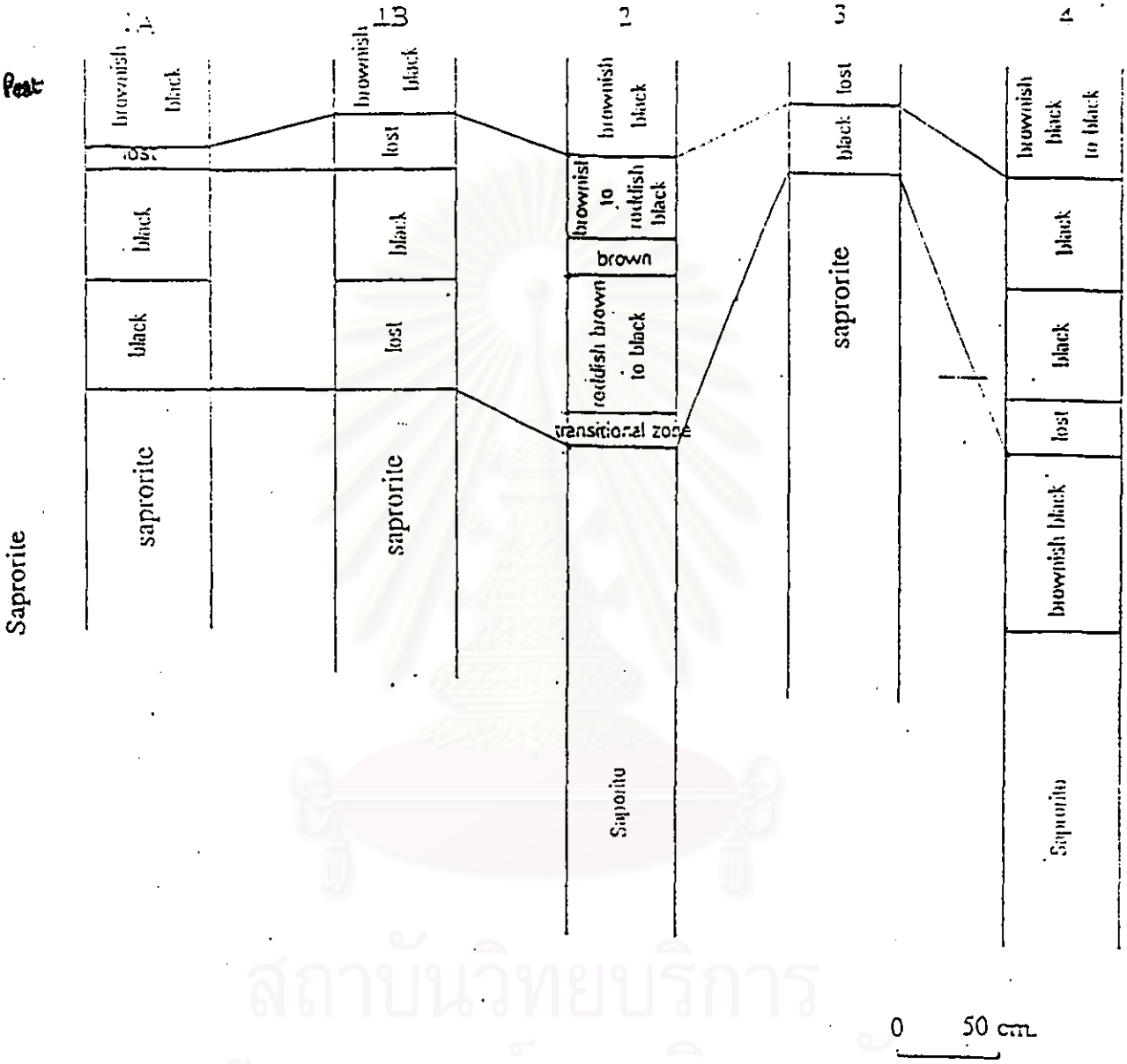


Fig. 4 Stratigraphic column of core samples : (**1A**) Ang-Kha 1A, (**1B**) Ang-Kha 1B, (**2**) Ang-Kha 2, (**3**) Ang-Kha 3, (**4**) Ang-Kha 4.

2) Pollen and spore descriptions

Spore and pollen morphology was given in short precise descriptions based on distinguished characters. The descriptions were followed the terminology of Erdtman (1969); Moore and Webb (1978); Moore, Webb and Collinson (1991); Faegri, Iversen and Waterbolk (1964) and Tryon and Lugardon (1991).

Spore and pollen descriptions of present plants around the Ang-Kha peat bog

Spore descriptions of pteridophytes:

Lycopodium clavatum L.

Grains 20-25 μ ; nearly spheroidal or nearly spheroidal; trilete arm; reticulate proximal face, distal face ridge. (pl.1, a ; pl.2, e-f)

Selaginella minutifolia Spring

Microspores: 30-40 μ ; slightly flattened; trilete arm; verrucate. (pl.1, c ; pl.2, c-d)

Megaspore: 200-250 μ ; tetrahedral-globose; trilete arm; broken reticulate.(pl.1, b ; pl.2, a-b)

Hymenophyllum polyanthos (Sw.) Sw.

Grains 60-80 μ ; spheroidal; trilete arm; papillate distal face.(pl.1, d)

Hymenophyllum exsertum Wall.

Grains 50-60 μ ; spheroidal; trilete arm; densely papillate surface.(pl. 1, e)

Dennstaedtia scabra (Wall. ex Hook.) Moore

Grains 25-40 μ ; triangular; trilete arm with coarsely ridge.(pl.1, f ; pl.4, d-f)

Pteris aspericaulis Wall. ex Ag.

Grains 40-50 μ ; tetrahedral; trilete arm; low rugate proximal face, coarsely rugate on distal face.(pl.1, g ; pl.4, i-j)

Ptris wallichina Ag.

Grains 40-50 μ ; tetrahadral; trilete arm; proximal face with low flange, partly fused tubercles, prominently rugate distal face.(pl.1, h-i ; pl.4, g-h)

Ophioglossum petiolatum Hook.

Grains 30-40 μ ; globose; trilete arm; low tuberculate.(pl.1, j)

Microlepia trapeziformis (Roxb.) Kuhn

Grains 30-35 μ ; tetrahedral-globose; trilete arm; finely reticulate with rodlets.(pl.3, a-b ; pl.6, c-d)

Microlepia firma Mett. ex Kuhn

Grains 40-45 μ ; tetrahedral-globose; trilete arm; prominently lobed, surface detail of fused rodlets.(pl.3, c-d : pl.6, a-b)

Oleandra wallichii (Hook.) Presl

Grains 35-40 μ ; ellipsoidal; trilete arm; low papillate folds.(pl.3, e)

Plagiogyria communis Ching

Grains 40-45 μ ; tetrahedral, depressed between prolonged angles; plain surface.(pl.3, f ; pl.4, a-c)

Pteris vittata Linn.

Grains 50-60 μ ; tetrahedral; trilete arm; partly fused tubercles, prominently rugate distal face.(pl.3, g)

Polystichum tenggerense Rosenst.

Grains 45-55 μ ; ellipsoidal; monolete arm; fenestrate cristae surface. (pl.3, h-i ; pl.8, d-e)

Vittaria forrestina Ching

Grains 50-60 μ ; ellipsoidal; monolete arm; plain surface.(pl.3, j ; pl.9, d)

Araiostegia faberiana (C. Chr.) Ching

Grains 55-65 μ ; ellipsoidal; monolete arm; verrucate surface.(pl.5, a,b ; pl.8, m-o)

Drynaria bonii Christ

Grains 40-45 μ ; ellipsoidal; shortly monolete arm; plain surface with echinate procession.(pl.5, c-d)

Dryopteris neoassamensis Ching

Grains 25-35 μ ; ellipsoidal; monolete arm; coarsely fold surface.(pl.5, e ; pl.6, e-g)

Polystichum semifertile (Clarke) Ching

Grains 50-60 μ ; ellipsoidal; monolete arm; fenestrately cristae fold surface.(pl.5, f-g ; pl.8, l)

Vittaria flexuosa Fe'e

Grains 60-70 μ ; ellipsoidal; longly monolete arm; plain surface.(pl.5, h ; pl.9, c)

Nephrolepis cordifolia (L.) Presl

Grains 18-25 μ ; ellipsoidal; monolete arm; fused tuberculate on distal face.(pl.5, i ; pl.8, i-j)

Acrophorus stipellatus Moore

Grains 35-45 μ ; ellipsoidal; monolete arm; long fold surface.(pl.5, j ; pl.8, p-q)

Asplenium normale Don

Grains 30-35 μ ; ellipsoidal; monolete arm; echinate cristae surface. (pl.7, a ; pl.2, g-j)

Asplenium ensiforme Hook.&Grev.

Grains 40-45 μ ; ellipsoidal; monolete arm; prominent perforate wings (perine).(pl.7, b ; pl9, a-b)

Diplazium muricatum (Mett.) v.A.v.Ros.

Grains 40-45 ; ellipsoidal; monolete arm; fold surface.(pl.7, c ; pl.8, a)

Asplenium unilaterale Lamk.

Grains 35-40 μ ; ellipsoidal; monolete arm; cristate wings.(pl.7, d)

Oleandra wallichii (Hook.) Presl

Grains 40-50 μ ; ellipsoidal; monolete arm; low papillate fold surface. (pl.7, e; pl.8, b)

Crypsinus oxylobus (Wall. ex Kunze) Sledge

Grains 50-55 μ ; ellipsoidal; monolete arm; plain surface.(pl.7, f ; pl.8, f-h)

Polypodium amoenum Mett.

Grains 37-48 μ ; ellipsoidal; monolete arm; verrucate perine.(pl.7, g)

Pollen descriptions of seed plants:

Hymenopogon parasiticus Wall.

Grains tricolporate; oblate-spheroidal to prolate, 30-35 μ; exine reticulate.(pl.12, a,b)

Photinia nussia Kalkm.

Grains tricolporate; prolate to suboblate, 20-25 μ; amb: semi-angular; exine striate.(pl.12, c-d)

Fabaceae

Grains tricolporate; subspheroidal, 25-30 μ; amb: semi-circular; exine reticulate.(pl.12, e ; pl.11, a-e)

Myrsine semiserruta Wall.

Grains hexa-zonocolporate, 20-30 μ; exine psilate (LM).(pl.12, f,g)

Polygala karensium Kurz

Grains subspheroidal, 40-50 μ ; hetero polar; colpi 20-24 furrows; exine granulate(pl.12, h,i)

Urticaceae

Grains 2-7 pantoporate; subspheroidal, 15-20 μ ; exine granulate. (pl.12, j)

Pinus kesiya Royle ex Godon

Grains vesiculate, 45-55 μ..(pl.10, a ; pl.13, a-c)

Pinus merkusii Jungh. & de Vriese

Grains vesiculate, 40-45 μ.(pl.10, b ; pl.13, d-f)

Vaccinium sp.

Grains tetrahedral tetrads, overall diametre 30-35 μ; individual grain with tricolporate and psilate exine (LM).(pl.10, c-d ; pl.13, l-m)

Agapetes sp.

Grains tetrahedral tetrad, overall diametre 25-30 μ; individual grain with tricolporate; psilate exine with margo; polar fields accute.(pl.10, e : pl.13, i-j)

Rhododendron sp.

Grains tetrahedral tetrad rarely decussete tetrahedral, overall diametre 40-50 μ; individual grain with tricolporate; psilate exine with margo.(pl.10, f-g ; pl.13, g-h)

Polygonum chinense L.

Grains tricolpate spheroidal 35-45 μ; amb: sub-circular; exine with baculate processes, luminar 6 μ.(pl.10, i ; pl.15, g-h)

Polygonum plebejum R.Br.

Grains colpate, 25-25 μ ; amb: semi-circlular; exine psilate (LM). (pl.10, j-k ; pl.15, j-m)

Pantago sp.

Grains pantoporate, 15-21 μ; amb: circular; exine, verrucate with psilate.(pl.14, a ; pl.15, q-r)

Rubus sp.

Grains tricolporate; prolate to subprolate, 34-55 μ; amb: circular; exine psilate.(pl.14, b ; pl.11, n)

Castanopsis sp.

Grains tricolporate, 20-25 μ; amb: circular; exine psilate (LM).(pl.14, c,d ; pl.15, e-f)

Cynoglossum sp.

Grains tricolporate, 5-9 μ; amb: circular in equatorial view depressed oblong, exine psilate (LM).(pl.14, e ; pl.11, i-j)

Quercus brandisiana Kurz

Grains tricolporate; spheroidal to subspheroidal, 20-25 μ; amb: circular; exine psilate (LM). (pl.14, f-g ; pl.11, k-m)

Quercus kerrii Craib.

Grains tricolporate; spheroidal to subspheroidal, 20-25 μ; amb: circular; exine psilate (LM).(pl.14, h-i ; pl.11, f-g)

Schima wallichii Korth.

Grains tricolporate with margo; oblate to oblate-spheroidal, 34-40 μ; amb: circular; exine reticulate.(pl.15, a-d)

Descriptions of spores and pollen grains from peat deposits (1A)

Selaginella Type

Microspores: 30-40 μ ; slightly flattened; trilete arm; verrucate.(pl.16, a ; pl.17, b)

Plagiogyria communis Type

Grains 40-45 μ ; tetrahedral shape, depressed between prolonged angles; plain surface.(pl.16, b ; pl.17, b-c)

Polypodium Type

Grains 37-48 μ ; ellipsoidal; monolete arm; verrucate perine.(pl.16, c)

Crupsinus Type

Grains 50-55 μ ; ellipsoidal; monolete arm; plain surface.(pl.16, d-e)

Asplenium Type

Grains 35-50 μ ; ellipsoidal; monolete arm; cristate perine.(pl.17, a)

Pinus Type

Grains vesiculate, 45-55 μ..(pl.16, f,g ; pl.17, g-h)

Cyperaceae Type

Grains 3 aperturate (lacunae) ; oboval to rectangular, 20-25x25-35 μ; exine psilate (LM).(pl.16, h ; pl.18, d-f)

Graminae Type

Grains monoporate pore with annulus; spheroidal, 20-80 μ; exine psilate (LM).(pl.16, i-j ; pl.18, a-b)

Myrtaceae Type

Grains tricolporate; oblate to oblate-spheroidal, 30-40 μ; amb: triangular; exine granulate.(pl.19, a-b ; pl.20, f-j)

Engelhardtia Type

Grains triporate; oblate to oblate-spheroidal, 15-20 μ; amb: triangular; exine granulate.(pl.19, c-d ; pl.20, d-e)

Betula Type

Grains triporate, slit shaped pore; oblate-spheroidal to oblate, 20-25 μ; amb: triangular to subcircular with convex sides; exine psilate (LM).(pl.19, e ; pl.20, a-c)

Vaccinium Type

Grains tetrahedral tetrads, overall diametre 30-35 μ; individual grain with tricolporate and psilate exine (LM).(pl.19, f-g ; pl.20, p)

Agapetes Type

Grains tetrahedral tetrad, overall diametre 25-30 μ; individual grain with tricolporate; psilate exine with margo; polar fields accute.(pl.19, h ; pl.20, o)

Rhododendron Type

Grains tetrahedral tetrad or rarely decussete tetrad, overall diametre 40-50 μ; individual grain with tricolporate; psilate exine with margo, polar fields rather flattened.(pl.17, i-j ; pl.20, n)

Magnolia Type

Grains monocolpate; boat-shaped by equartorial view, 30x60 μ; exine verrucate. (pl.21, a; pl.23, a-b)

Polygonum chinense Type

Grains tricolpate, spheroidal 35-45 μ; amb: semi-circular; exine with baculate processes, luminar 6 μ.(pl.21, b ; pl.23, m-p)

Polygonum plebejum Type

Grains tricolpate, 25-25 μ ; amb: semi-circlular; exine psilate (LM). (pl.21, c ; pl.23, c)

Legume Type

Grains tricolporate; with or without margo colpi elongate with acute ends, oblate to oblate-spheroidal, 30-80 μ ; exine reticulate.(pl.21, d ; pl.20, l-m)

Rubus Type

Grains tricolporate; prolate to subprolate, 34-55 μ; amb: circular; exine psilate (LM).(pl.21, e ; pl.18, c&g)

Rosaceae Type

Grains tricolporate; oblate to oblate-spheroidal, 20-35 μ; amb: semi-circular; exine striate.(pl.21, f ; pl.20 k)

Quercus Type

Grains tricolporate; spheroidal to subspheroidal, 15-25 μ; amb: circular; exine finely verrucate.(pl.21, g-j ; pl.23, j-l)

Rubiaceae Type

Grains 5-6-colporate; spheroidal to subspheroidal, 15-25 μ; amb: circular; exine psilate (LM).(pl.22, a-b ; pl.20, r-s)

Schima wallichii Type

Grains tricolporate with margo and operculum ; oblate to oblate-spheroidal, 34-40 μ; amb: circular; exine reticulate.(pl.22; c-d ; pl.23, d-g)

Araceae Type

Grains non-apertulate; subspheroidal to spheroidal, 15-20 μ; amb: circular; exine, psilate with scattered echinate procession.(pl.22, e ; pl.23, h-i)

Key to the deposited grains in peat core 1A

1a Grains united (tetrad).....2

1b Grains single (monad).....4

2a Without margo.....*Vaccinium* Type

2b With margo.....3

3a Polar fields accute.....*Agapetes* Type

3b Polar fields not accute but rather flattened.....*Rhododendron* Type

4a Grains without aperture.....5

4b Grains with aperture.....6

5a With bladders (vesiculate) from the body of grains.....*Pinus* Type

5b Without bladders, exine with scattered echinate processions.....Araceae Type

6a With perine as shield of grains.....7

6b Without perine as shield of grains.....11

7a With one three-branched, slit-like aperture in shape of a Y (trilete).....8

7b With one slit aperture (monolete arm).....9

8a Grains : slightly flattened.....*Selaginella* Type

8b Grains : tetrahedral shape, depressed between prolonged angles.....*Plagiogyria communis* Type

9a Grains : monolete with plains surface.....*Crypsinus* Type

9b Grains : monolete with sculpturing surface.....10

10a Grains : monolete with cristate perine.....*Asplenium* Type

10b Grains : mopnolete with verrucate perine.....*Polypodium* Type

11a Aperture pori only.....12

11b Aperture either colpi only, or a mixture of pori and copi.....14

12a With one porus and annulus.....Graminae Type

12b With more than one porus.....13

13a Triporate with round shaped pores.....*Engelhardtia* Type

13b Triporate with slit shaped pores.....*Betula* Type

14a With colpi only.....15

14b With a porus and a colpus combined in each aperture.....19

15a With colpus, grains boat-shaped in
equatorial view.....*Magnolia* Type

15b With more than one colpus.....16

16a With 5-6 colpate or 5-6 colporate.....Rubiaceae Type

16b With 3 colpate or 3 lacunae.....17

17a Grains oboval to rectangular shape.....Cyperaceae Type

17b Grains spheroidal shape.....18

18a With baculate processes.....*Polypodium chinense* Type

18b With granulate (SEM) or psilate (LM).....*Polypodium plebejum* Type

19a Tricolporate with triangular amb.....Myrtaceae Type

19b Tricolporate without triangular amb.....20

20a With striate sexine.....Rosaceae Type

20b Without striate sexine..... 21

21a With psilate sexine (LM).....*Rubus* Type

21b Without psilate sexine (LM).....22

22a With finely verrucate sexine.....*Quercus* Type

22b With reticulate sexine.....23

23a With narrow colpi and with or without margo.....Legume Type

23b With broaden colpi, margo and operculum present.....*Schima wallichii* Type

Plate 1

a, *Lycopodiun clavatum* L.

b-c, *Selaginella minutifolia* Spring

b, megaspore; c, microspore

d, *Hyminophyllum polyanthus* (Sw.) Sw.

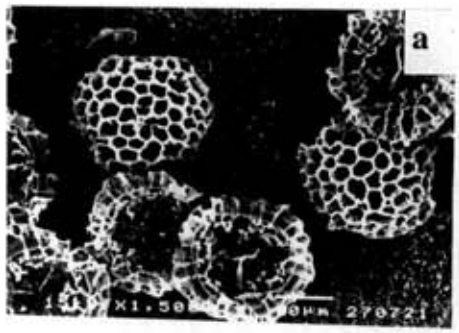
e, *Hyminophyllum exertum* Wall.

f, *Dennsteadtia scabra* (Wall. ex Hook.) Moore

g, *Pteris aspericaulis* Wall. ex Ag.

h-i, *Pteris wallichina* Ag.

j, *Ophioglossum petiolatum* Hook.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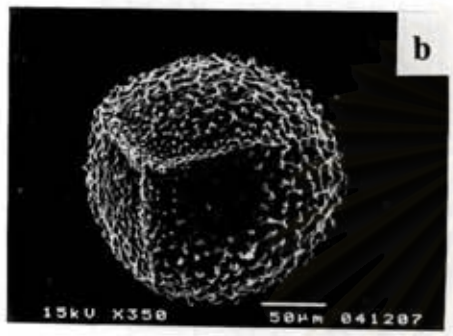
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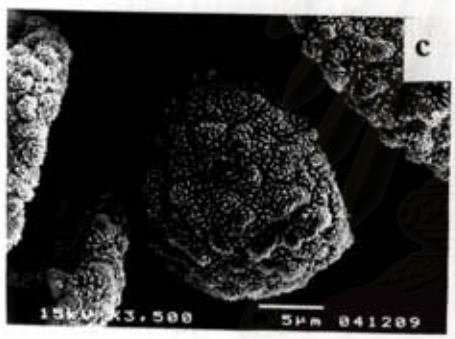
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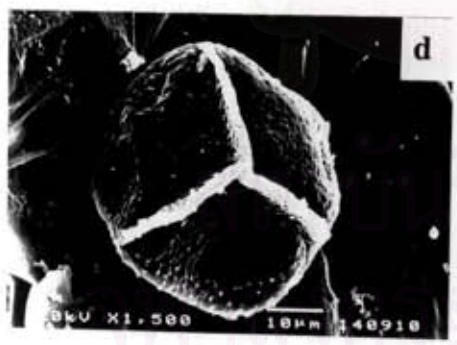
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e
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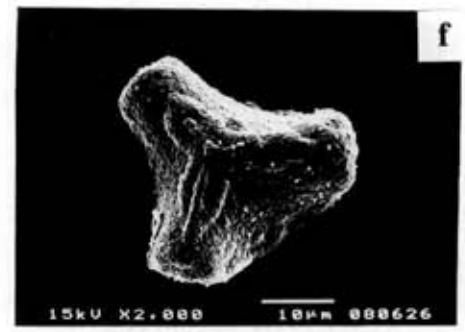
10µm 240012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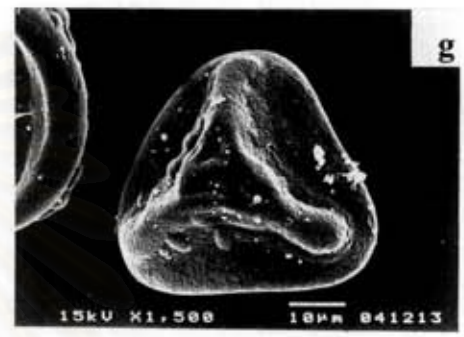
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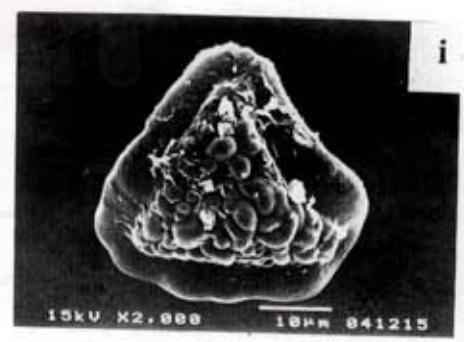
10µm 041214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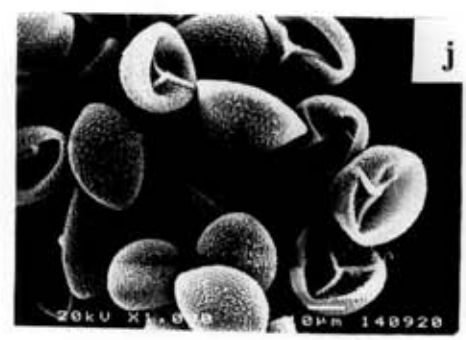
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Plate 2

a-d, *Seleginella minutifolia* Spring

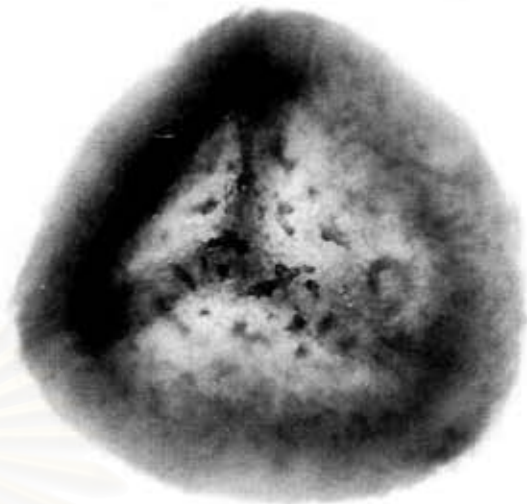
a-b, megaspore

c-d, microsspore

e-f, *Lycopodium clavatum* L.

g-j, *Asplenium normale* Don

a



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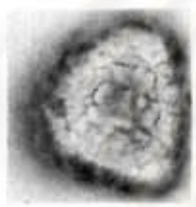


d

e

f

g

h

i

j

Plate 3

a-b *Microlepia trapeziformis* (Roxb.) Kuhn

c-d, *Microlepia firma* Mett. ex Kuhn

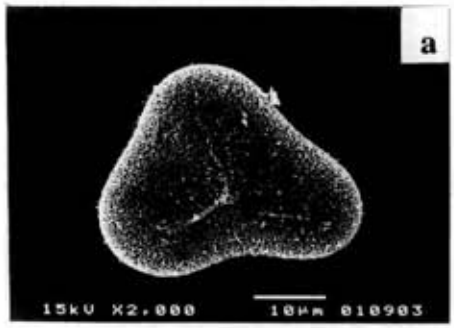
e, *Oleandra wallichii* (Hook.) Presl

f, *Plagiogyria communis* Ching

g, *Pteris vittata* L.

h-i, *Polystichum tenggareng* Rosenst.

j, *Vittaria forrestiana* Ching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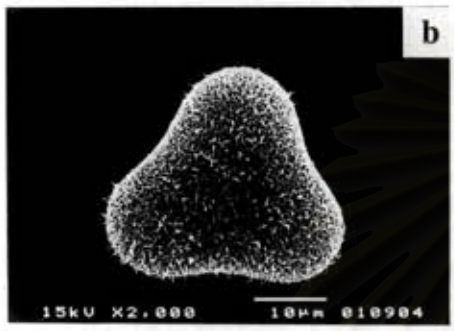
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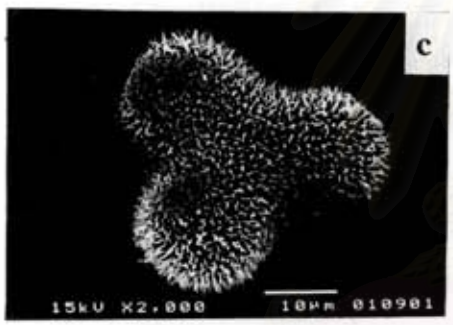
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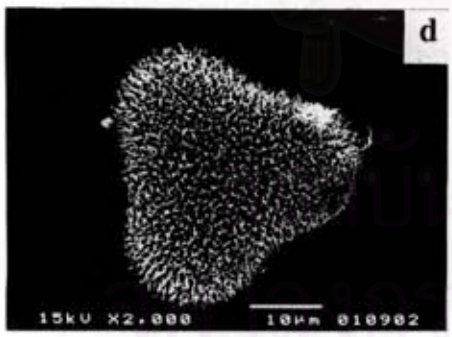
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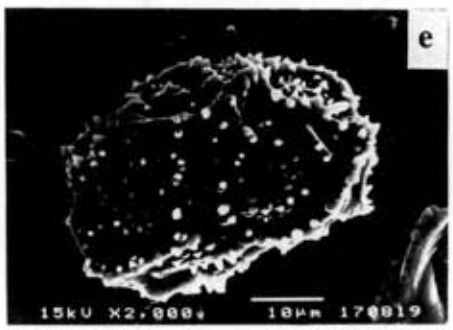
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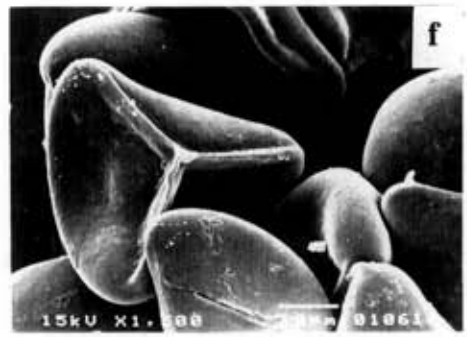
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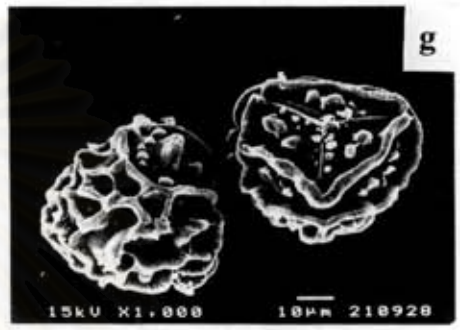
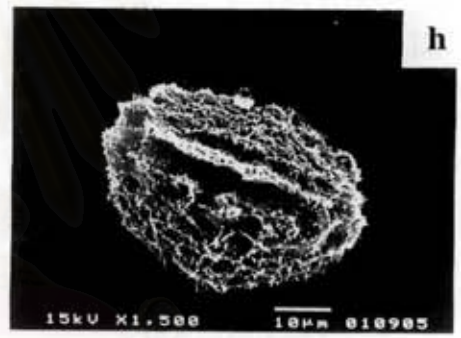

g
15kV X1,000 10µm 210928


h
15kV X1,500 10µm 010905


i
15kV X1,500 10µm 010906

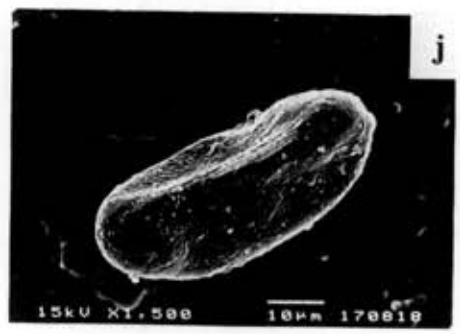

j
15kV X1,500 10µm 170810

Plate 4

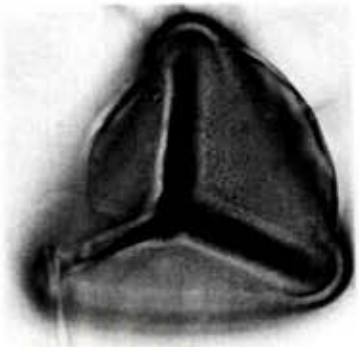
a-c, *Plagiogyria communis* Ching

d-f, *Denntaetia scabra* (Wall. ex Hook.) Moore

g-h, *Pteris wallichiana*

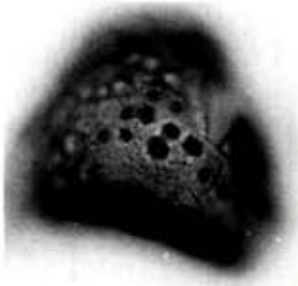
i-j, *Pteris aspericaulis* Wall. ex Ag.

a

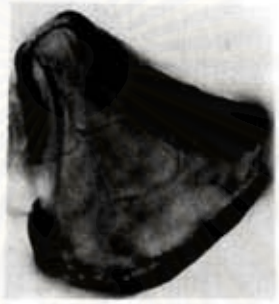


b

c



d

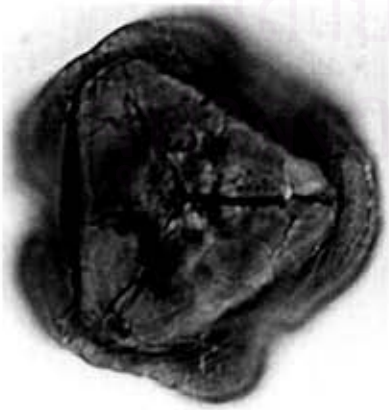


e

f

g

i



h

j

Plate 5

a-b, *Araiostegia faberiana* (C. Chr.) Ching

c-d, *Drynaria bonii* Christ

e, *Dryopteris neosamensis* Ching

f-g, *Polystichum semifertile* (Clarke) Ching

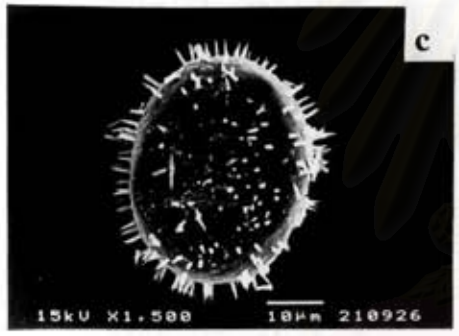
h, *Vittaria flexuosa* Fee

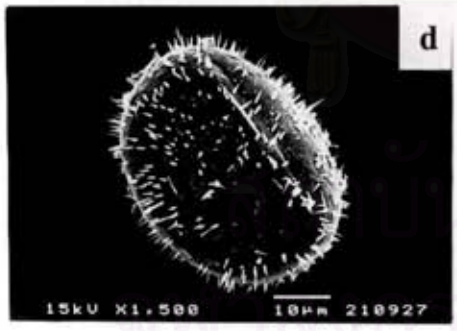
i, *Nepholepis cluadiforia* (L.) Presl

j, *Acroporus stipellatus* Moore


a
15kV X2,000 10µm 010910


b
15kV X2,000 10µm 010909


c
15kV X1,500 10µm 210926


d
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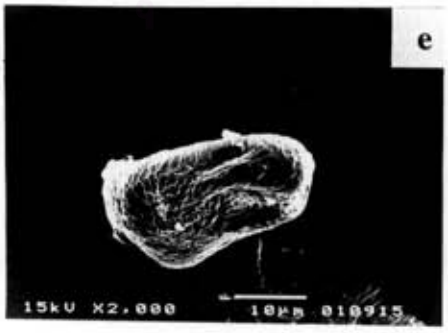
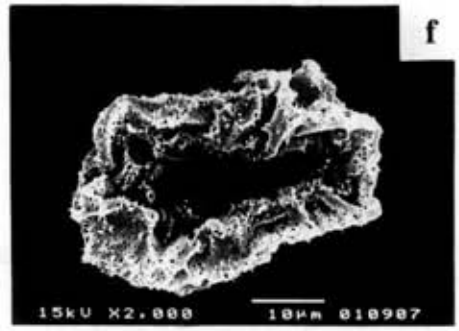

e
15kV X2,000 10µm 010915


f
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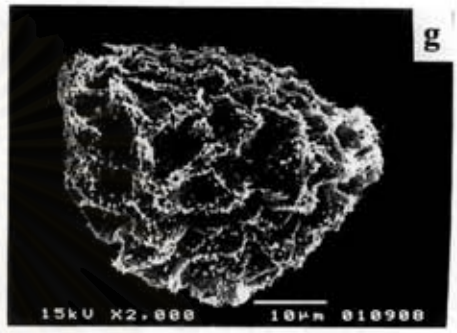

g
15kV X2,000 10µm 010908


h
15kV X1,000 10µm 170817


i
15kV X3,500 5µm 010918

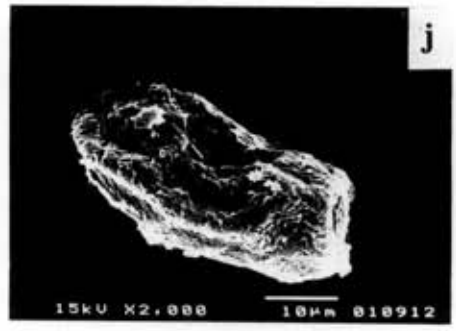

j
15kV X2,000 10µm 010912

Plate 6

a-b, *Microlepia firma* Mett. ex Kuhn

c-d, *Microlepia trapeziformis* (Roxb.) Kuhn

e-g, *Dryopteris neoassamensis* Ching

a

c

b

d

e

f

g

Plate 7

a, *Asplenium normale* Don

b, *Asplenium ensiforme* Hook. & Grev.

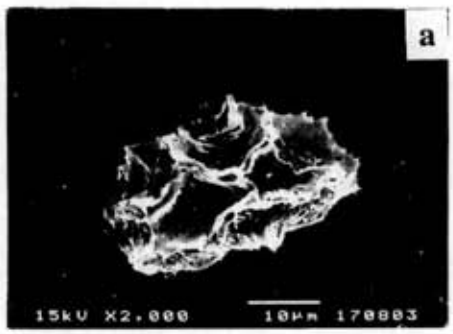
c, *Diplazium muricatum* (Mett.) v.A.v.Ros.

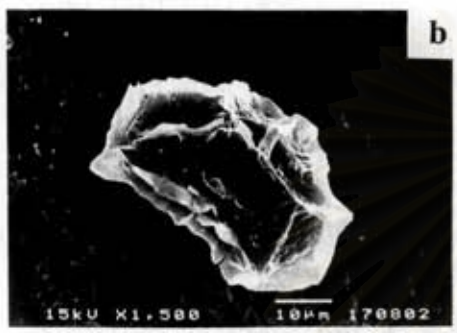
d, *Asplenium unilateraea* Lamk.

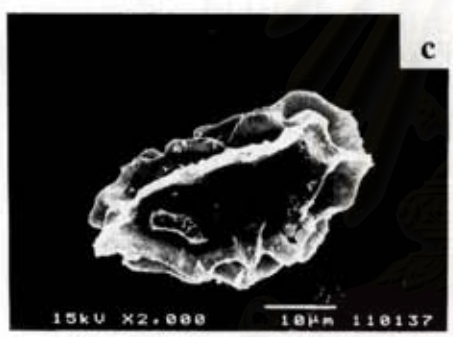
e, *Oleandra wallichii* (Hook.) Presl

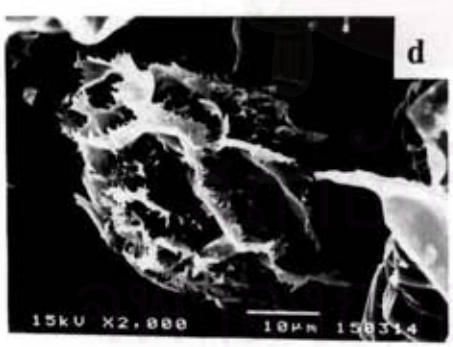
f, *Crypsinus oxylobus* (Wall. ex Kunze) Sledge

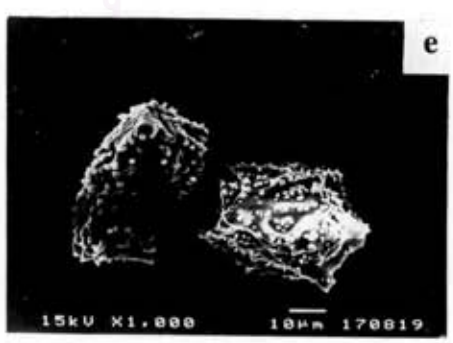
g, *Polypodium anoenum* Mett.

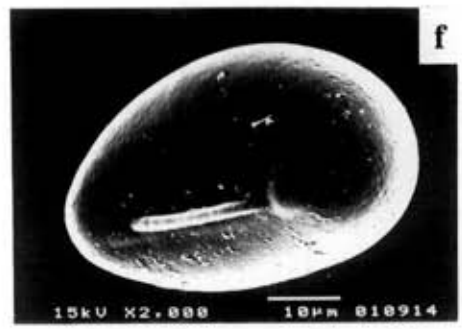

a
15kV X2,000 10µm 170803


b
15kV X1,500 10µm 170802


c
15kV X2,000 10µm 110137


d
15kV X2,000 10µm 150314


e
15kV X1,000 10µm 170819


f
15kV X2,000 10µm 010914


g
15kV X2,000 10µm 010916

Plate 8

a, *Diplazium muricatum* (Mett.) v.A.v.Ros.

b, *Oleandra wallichii* (Hook.) Presl

d-e, *Polystichum tenggerense* Rosenst.

f-h, *Crypsinus oxylobus* (Wall. ex Kunz) Sledge

i-j, *Nephrolepis cordifolia* (L.) Presl

l, *Polystichum semifertile* (Clarke) Ching

m-o, *Araiostegia faberiana* (C. Chr.) Ching

p-q, *Acrophorus stipellatus* Moore

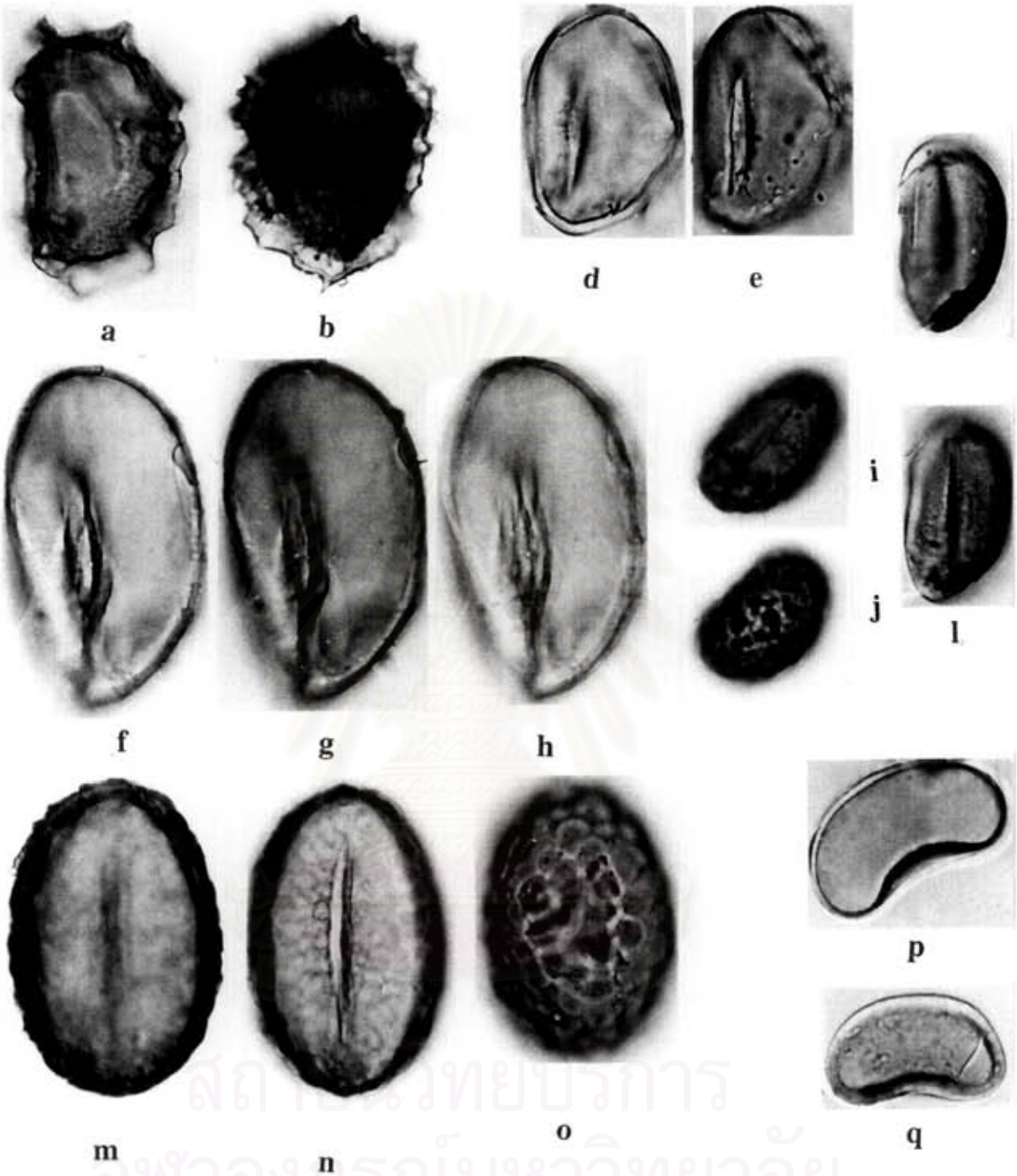
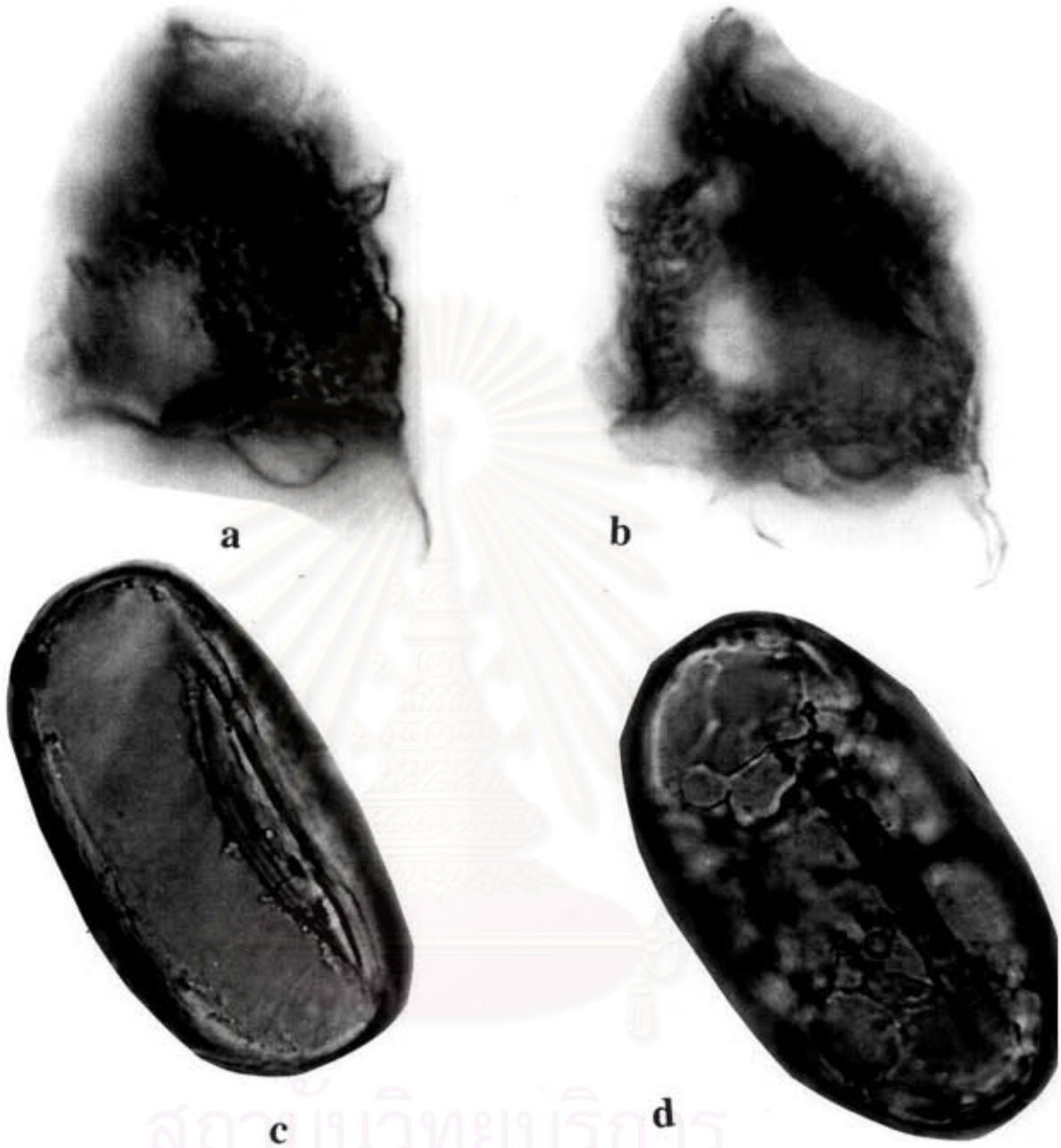


Plate 9

a-b, *Asplenium ensiforme* Hook. & Grev.

c, *Vittaria flexuosa* Fee

d, *Vittaria forrestina* Ching



a b c d

Plate 10

a, *Pinus kesiya* Royle ex Godon

b, *Pinus merkusii* Jungh. & de Vriese

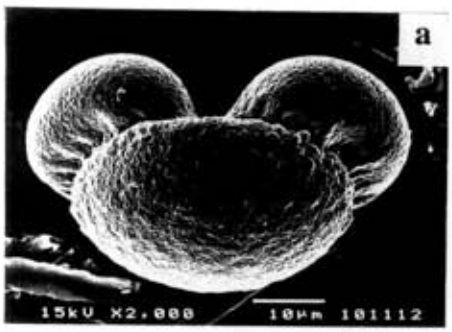
c-d, *Vaccinium* sp.

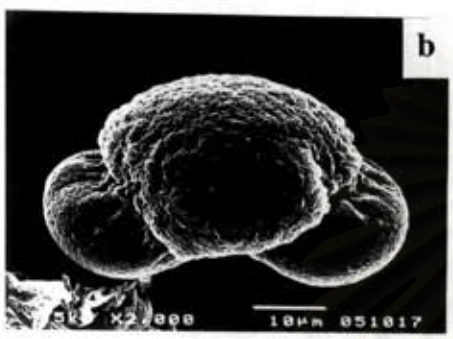
e, *Agapetes* sp.

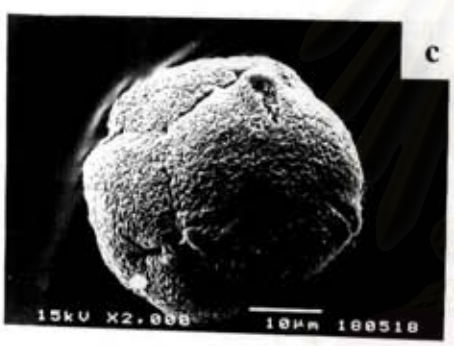
f-g, *Rhododendron* sp.

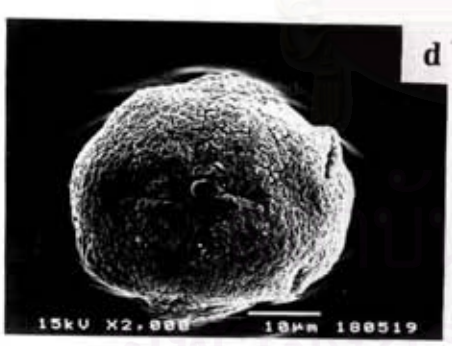
i, *Polygonum chinense* L.

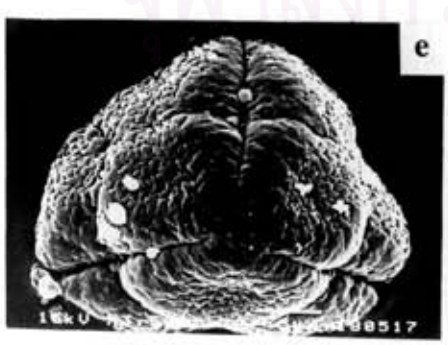
j-k, *Polygonum plebejum* R.Br.

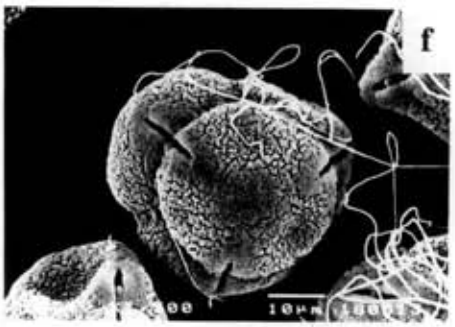

a
15kV X2,000 10µm 101112

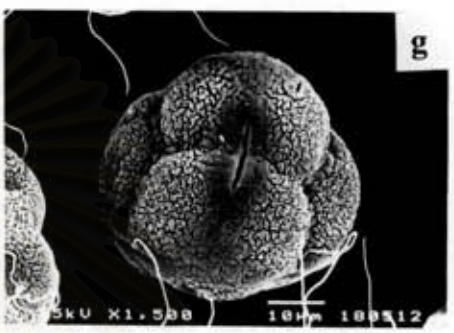

b
10µm 051017

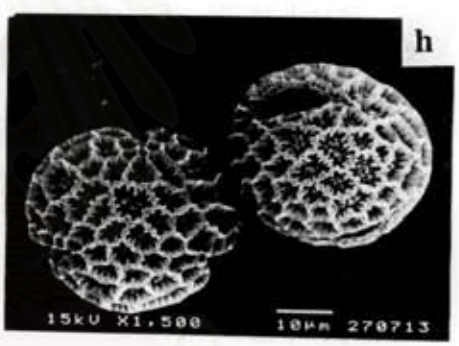

c
15kV X2,000 10µm 100518

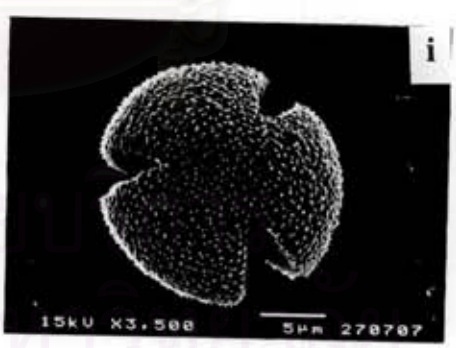

d
15kV X2,000 10µm 100519


e


f


g


h
15kV X1,500 10µm 270713


i
15kV X3,500 5µm 270707

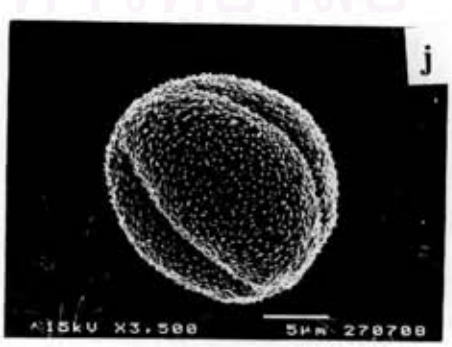

j
15kV X3,500 5µm 270708

Plate 11

a-e, Legume

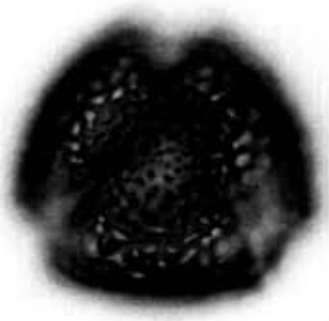
f-g, *Quercus kerrii* Craib.

h, *Hyperculinar* sp.

i-j, *Cynoglossum* sp.

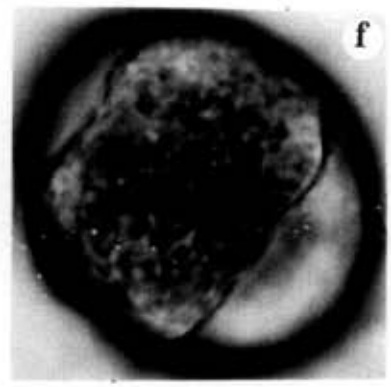
k-m, *Quercus brandisiana* Kurz

n, *Rubus* sp.



a

b



f

c

d

e

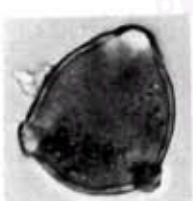
g

h

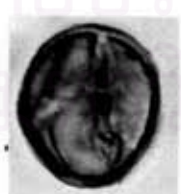
i

j

n



k



m

Plate 12

a-b, *Hymenopogon parasiticus* Wall.

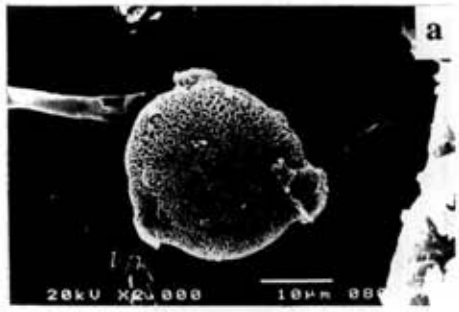
c-d, *Photinia nussia* Kalkm.

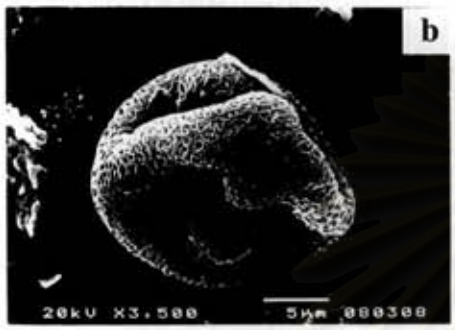
e, Fabaceae

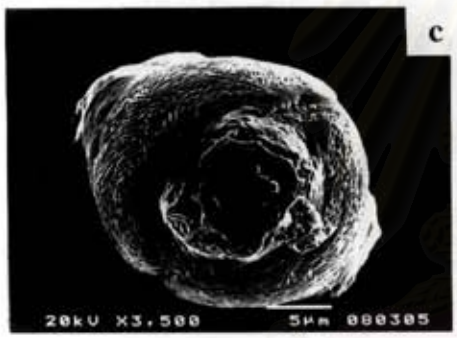
f-g, *Myrsine semiserruta* Wall.

h-i, *Polygala karensium* Kurz

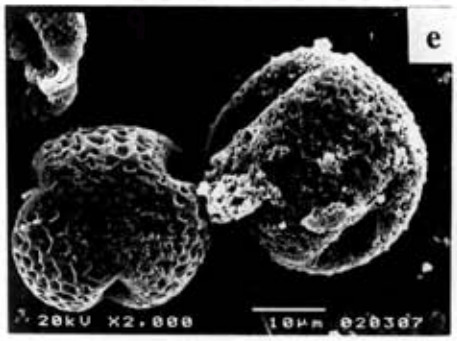
j, Urticaceae


a
10µm

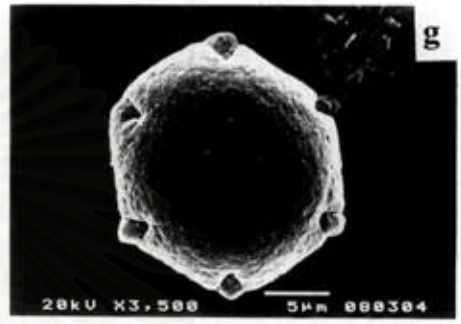

b
20kV X3,500
5µm 080308


c
20kV X3,500
5µm 080305

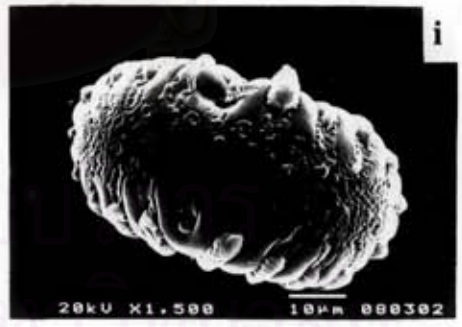

d
20kV X3,500
5µm 080306


e
20kV X2,000
10µm 020307


f
5µm 080303


g
20kV X3,500
5µm 080304


h
20kV X1,500
10µm 080301


i
20kV X1,500
10µm 080302

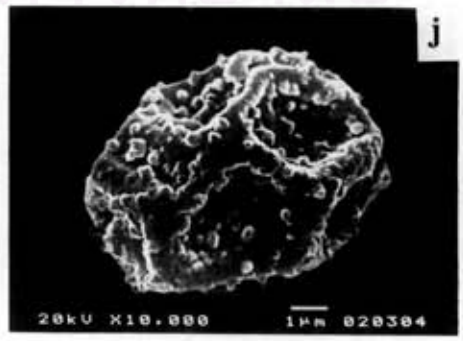

j
20kV X10,000
1µm 020304

Plate 13

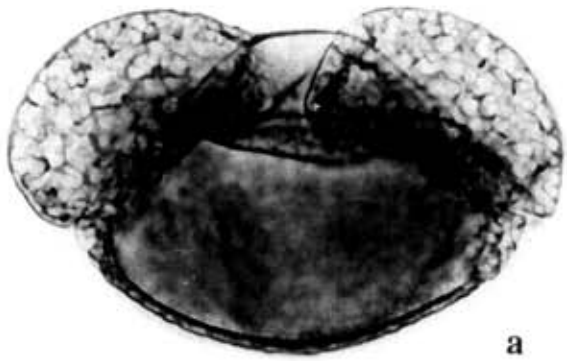
a-c, *Pinus kesiya* Royle ex Godon

d-f, *Pinus merkusii* Jungh. & de Vriese

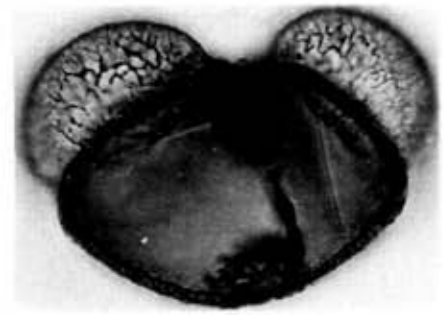
g-h, *Rhododendron* sp.

i-j, *Agapetes* sp.

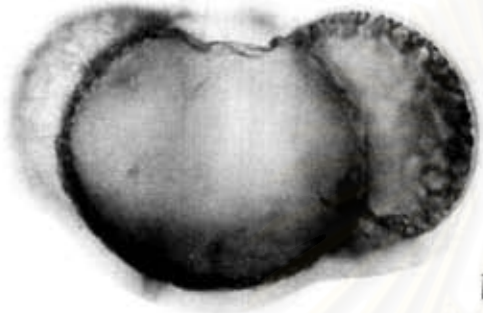
l-m,*Vaccinium* sp.



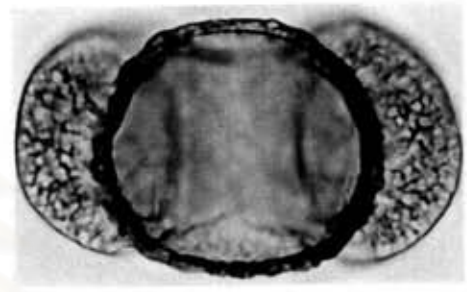
a



d

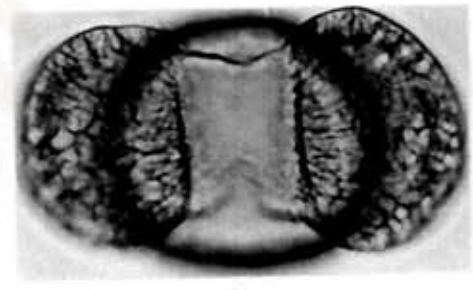


b

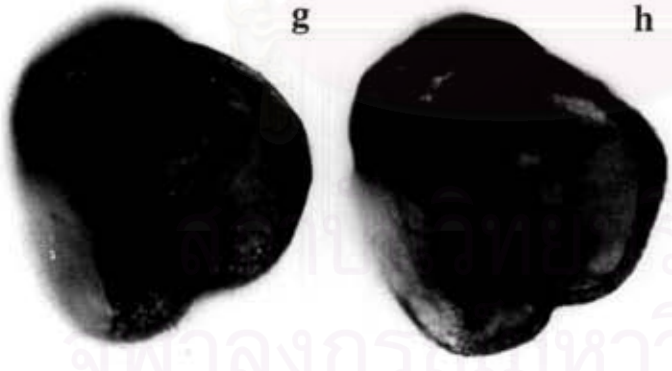


e

c

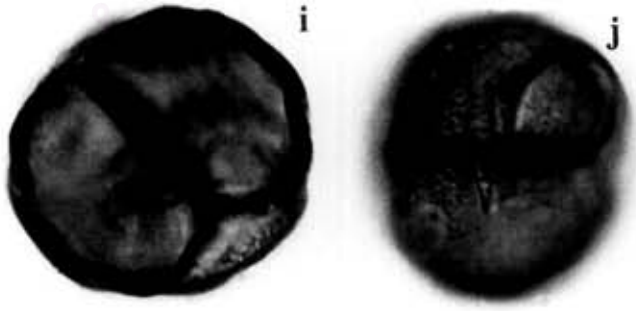


f

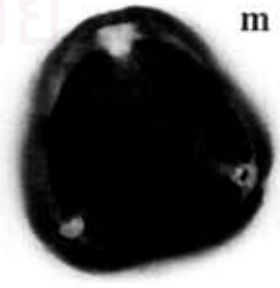


g h

l



i j



m

Plate 14

a, *Pantago* sp.

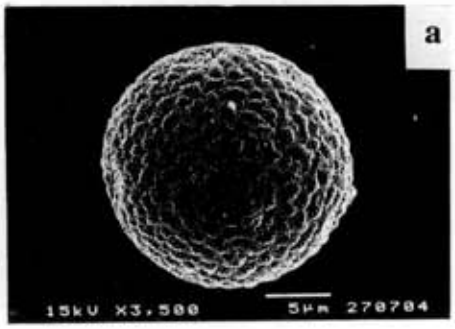
b, *Rubus* sp.

c-d, *Castanopsis* sp.

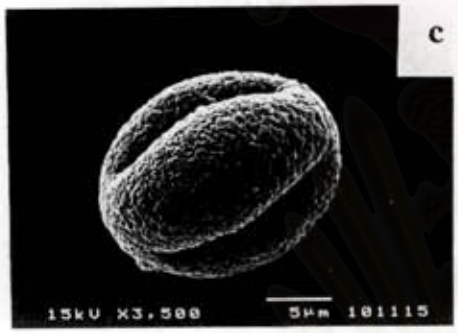
e, *Cynoglossum* sp.

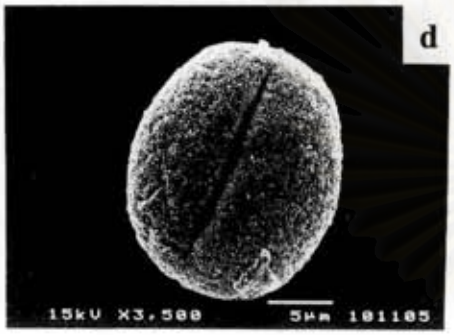
f-g, *Quercus brandisiana* Kurz

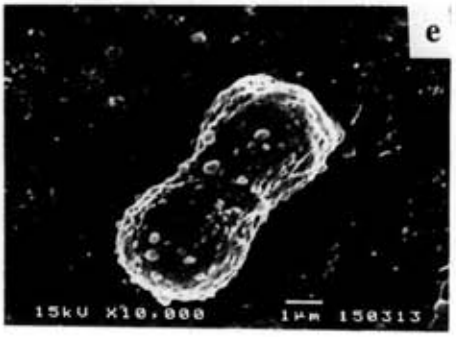
h-j, *Quercus kerrii* Craib.


a
15kV X3,500 5µm 270704


b
15kV X3,500 5µm 270705

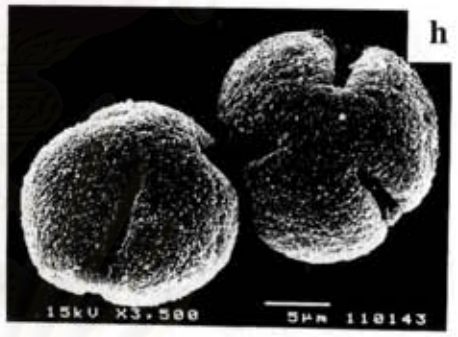

c
15kV X3,500 5µm 101115

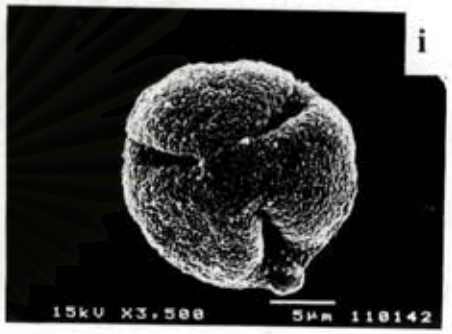

d
15kV X3,500 5µm 101105


e
15kV X10,000 1µm 150313


f
15kV X3,500 5µm 110140


g
15kV X3,500 5µm 110139


h
15kV X3,500 5µm 110143


i
15kV X3,500 5µm 110142

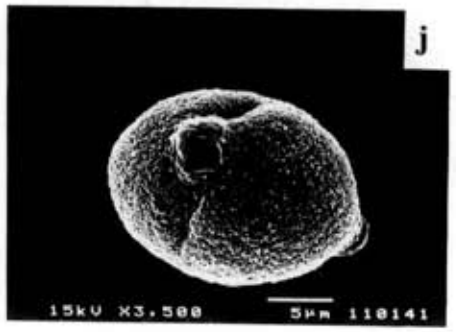

j
15kV X3,500 5µm 110141

Plate 15

a-d, *Schima wallichii* Korth.

e-f, *Castanopsis* sp.

g-i, *Polygonum chinense* L.

j-m, *Polygonum plebejum* R.Br.

n-p, *Lithocapus* sp.

q-r, *Pantago* sp.

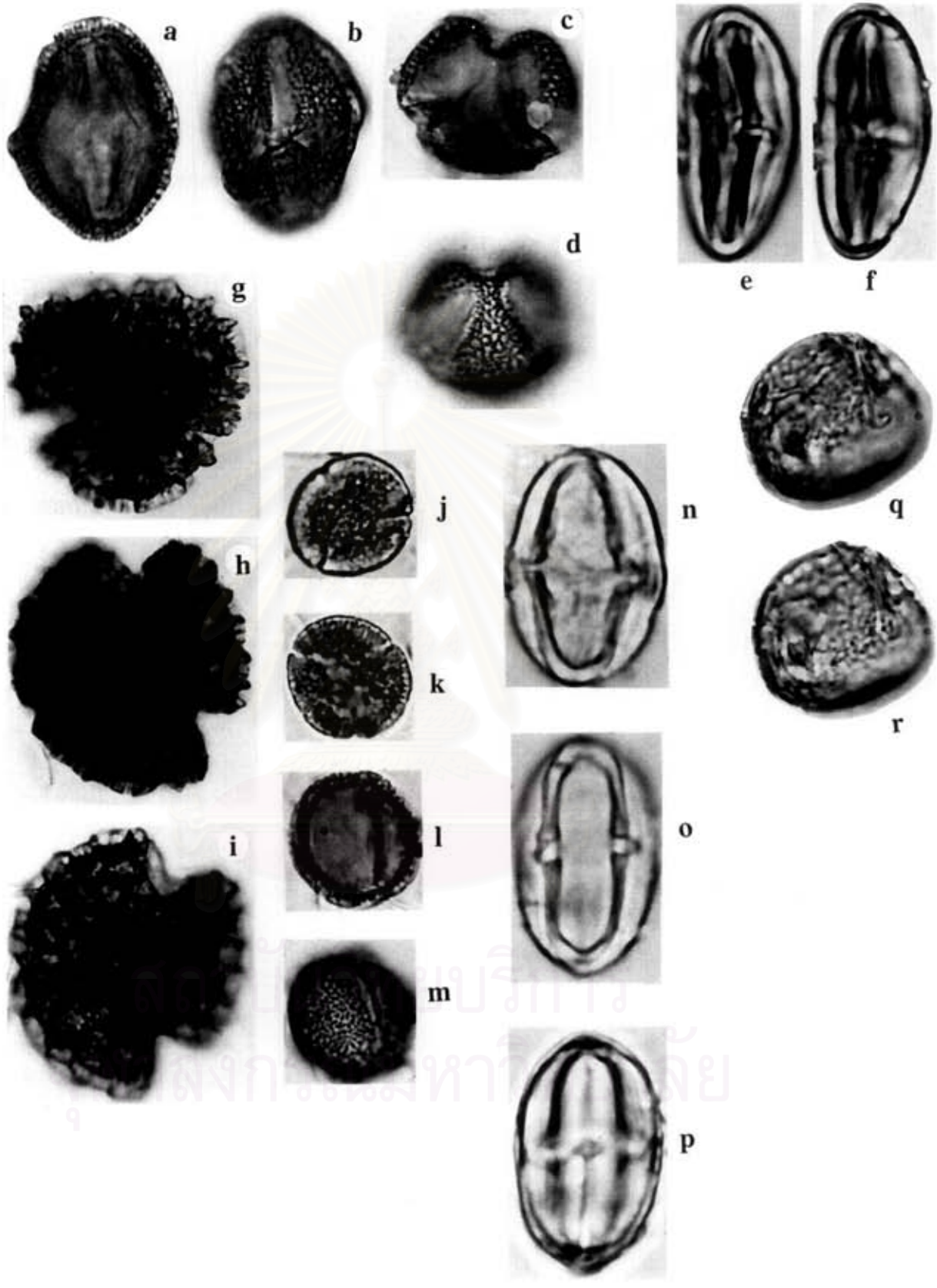

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r

Plate 16

a, *Selaginella* sp.

b, *Plagiogyria communis* Ching

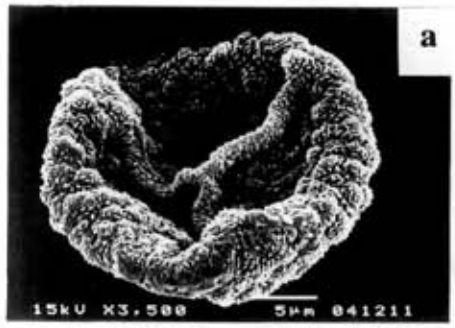
c, *Polypodium* sp.

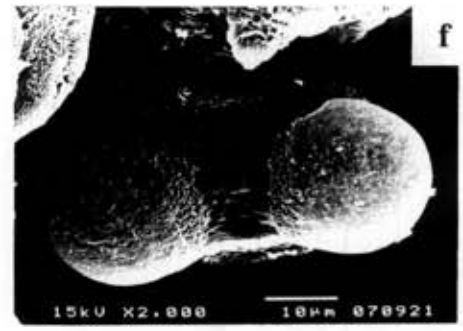
d-e, *Crypsinus* sp.

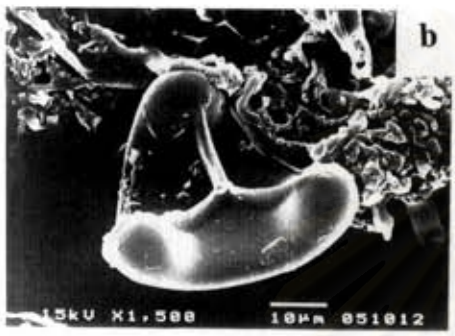
f-g, *Pinus* sp.

h, Cyperaceae

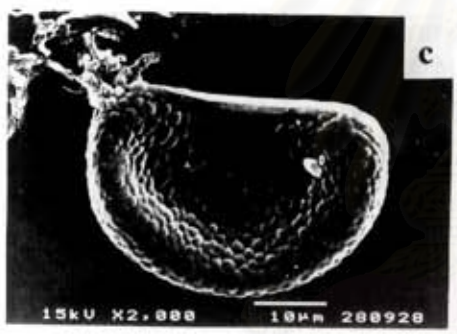
i-j, Graminae

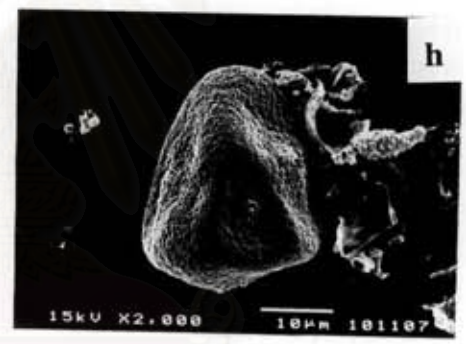

a
15kV X3,500 5µm 041211


f
15kV X2,000 10µm 070921


b
15kV X1,500 10µm 051012

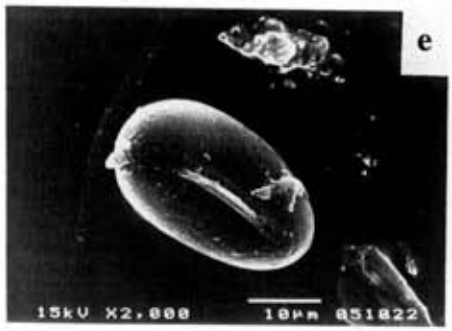

g
15kV X2,000 10µm 100509


c
15kV X2,000 10µm 200920


h
15kV X2,000 10µm 101107


d
5µm 261002


i
15kV X3,500


e
15kV X2,000 10µm 051022

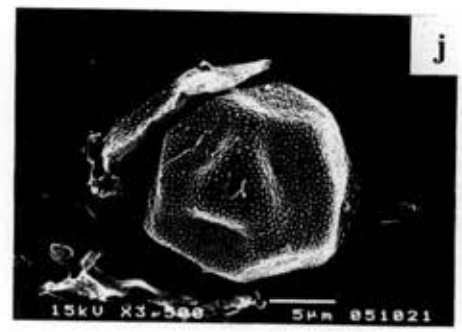

j
5µm 051021

Plate 17

a, *Asplenium* sp.

b-c, *Plagiogyria communis* Ching

d, *Polypodium* sp.

e, *Crypsinus* sp.

f, *Selaginella* sp.

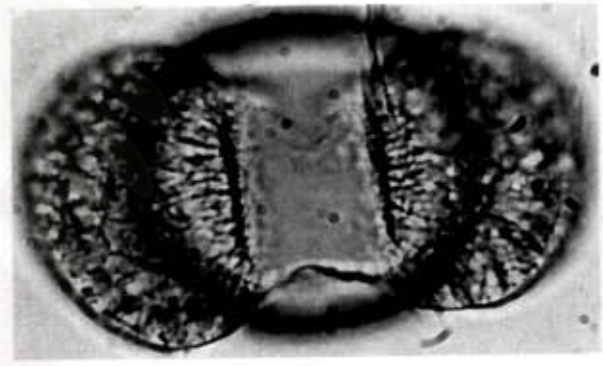
g-h, *Pinus* sp.

a

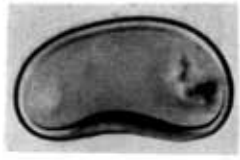
b

c

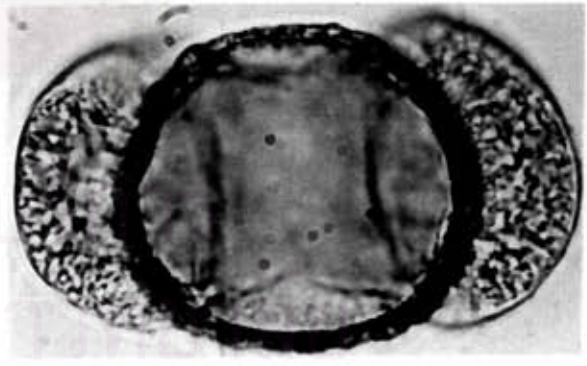
d



g



e



h

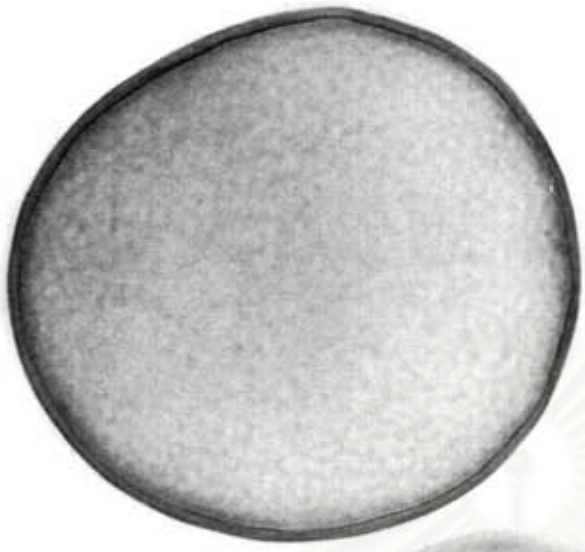
f

Plate 18

a-b, Graminae

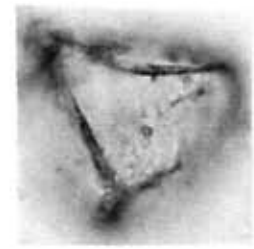
c and g, *Rubus* sp.

d-f, Cyperaceae

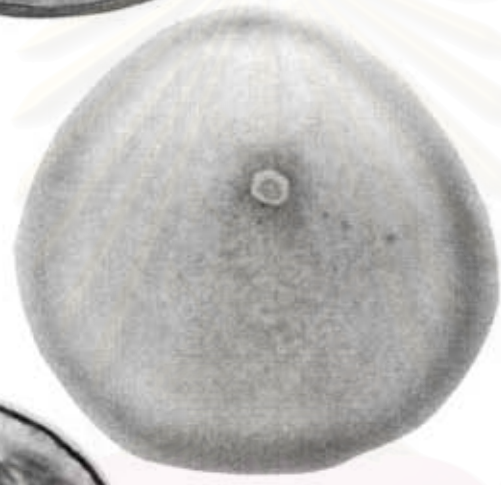


a

d



e



b

f

c

g

Plate 19

a-b, Myrtaceae

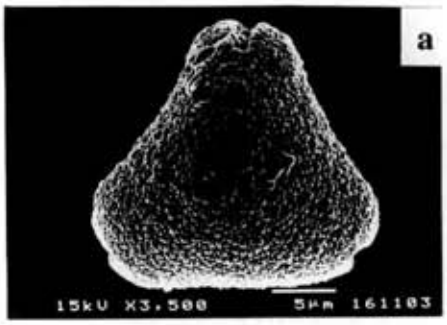
c-d, *Engelhardtia* sp.

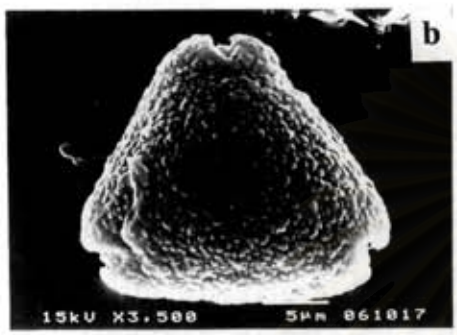
e, *Betula* sp.

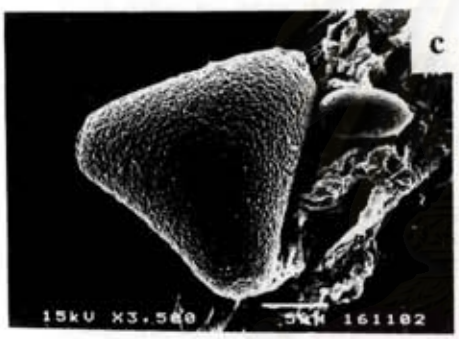
f-g, *Vaccinium* sp.

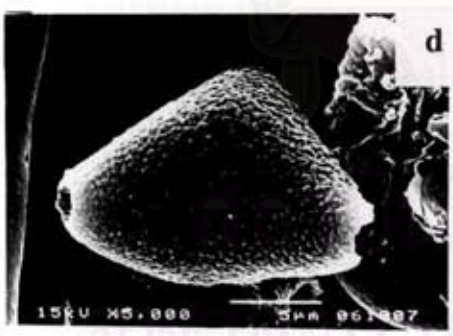
h, *Agapetes* sp.

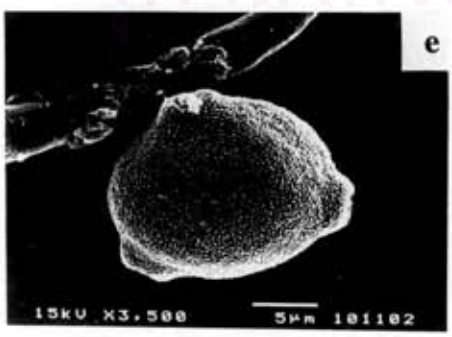
j, *Rhododendron* sp.

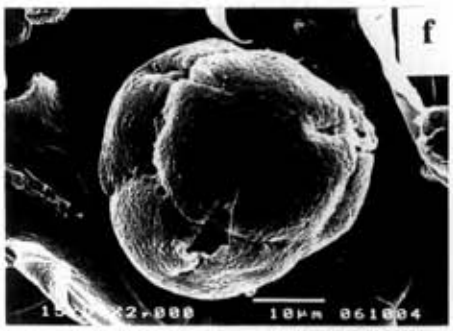

a
15kV X3,500 5µm 161103

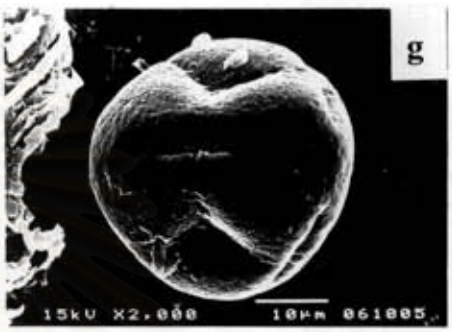

b
15kV X3,500 5µm 061017

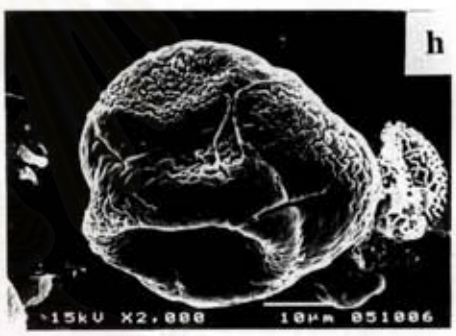

c
15kV X3,500 5µm 161102


d
15kV X5,000 5µm 061007


e
15kV X3,500 5µm 101102


f
10µm 061004


g
15kV X2,000 10µm 061005


h
15kV X2,000 10µm 051006


i
15kV X2,000 10µm 101113


j
15kV X2,000 10µm 051005

Plate 20

a-c, *Betula* sp.

d-e, *Engelhardtia* sp.

f-j, Myrtaceae

k, Rosaceae

l-m, Legume

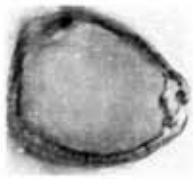
n, *Rhododendron* sp.

o, *Agapetes* sp.

p, *Vaccinium* sp.

r-s, Rubiaceae

a

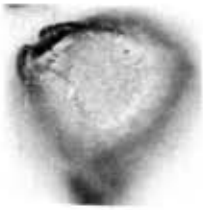


b

c

d

e



f

g

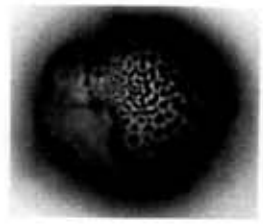
h

l

i

j

k

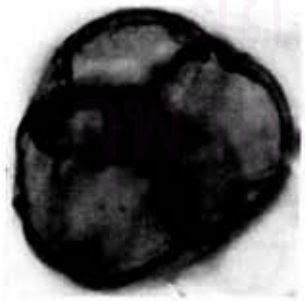


m

n

p

r



o

q

s

Plate 21

a, *Magnolia* sp.

b, *Polygonum chinense* L.

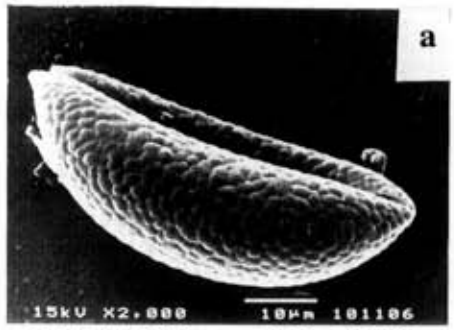
c, *Polygonum plebejum* R.Br.

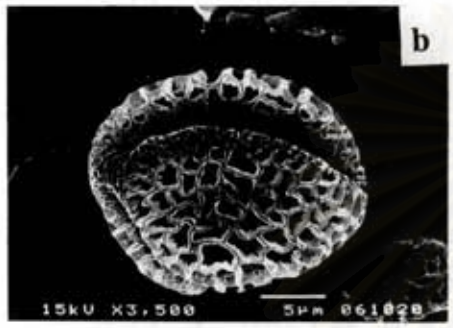
d, Legume;

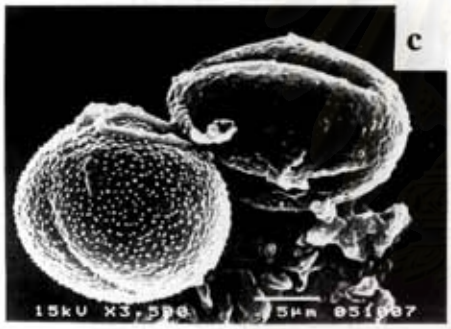
e, *Rubus* sp.

f, Rosaceae

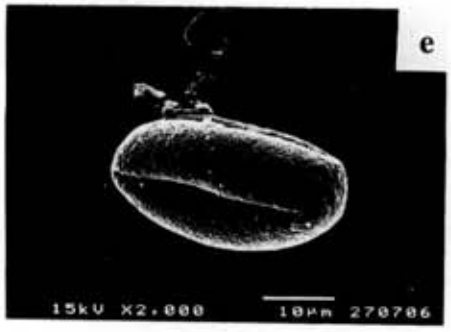
g-j, *Quercus* sp.


a
15kV X2,000 10µm 181106


b
15kV X3,500 5µm 061028

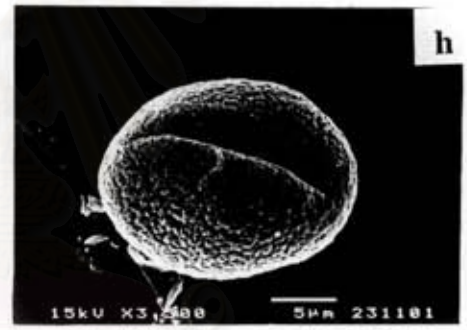

c
15kV X3,500 5µm 051107

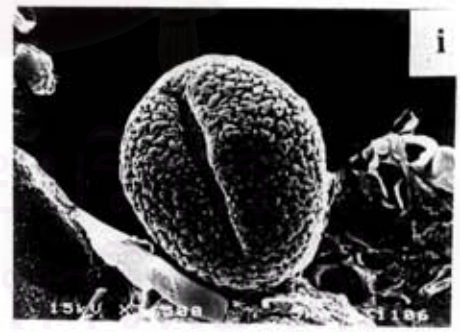

d
15kV X2,000 10µm 280932


e
15kV X2,000 10µm 270706


f
15kV X5,000 5µm 211103


g
X3,500 5µm 280923


h
15kV X3,500 5µm 231101


i

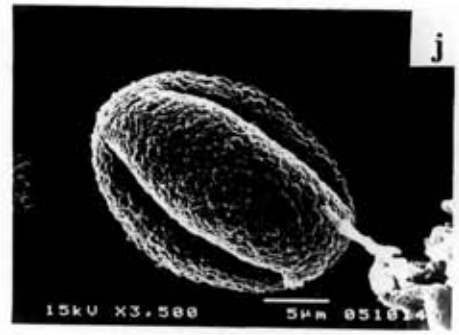
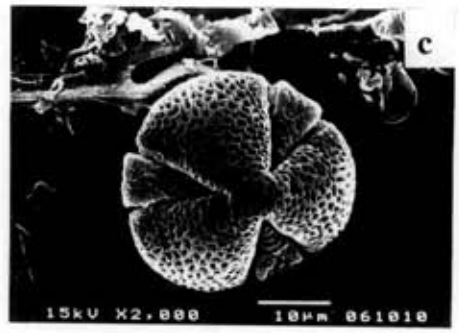

j
15kV X3,500 5µm

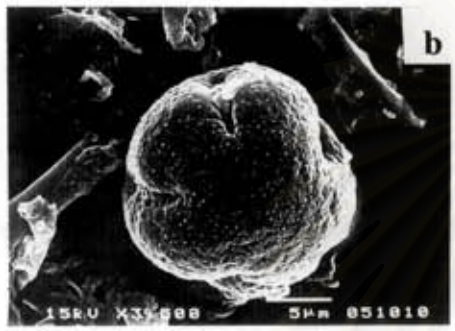
Plate 22

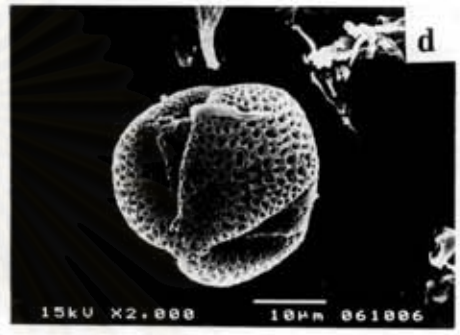
a-b, Rubiaceae

c-d, *Schima wallichii* Korth

e, Araceae







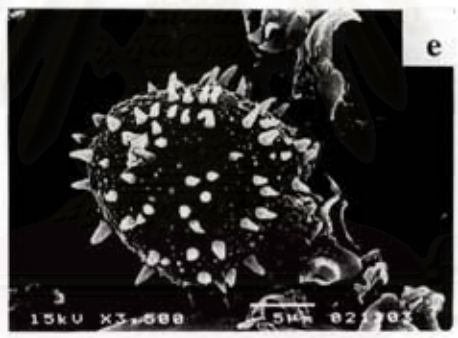


Plate 23

a-b, *Magnolia* sp

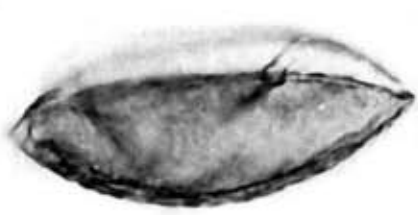
c, *Polygonum plebejum* R. Br.

d-g, *Schima wallichii* Korth.

h-i, Araceae

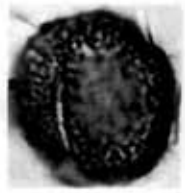
j-l, *Quercus* sp.

m-p, *Polygonum chinense* L.

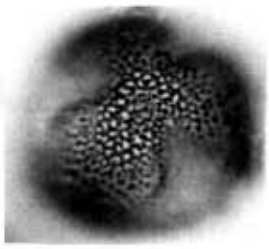


a

b



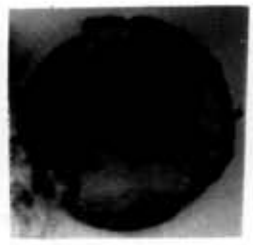
c



d

e

f



g

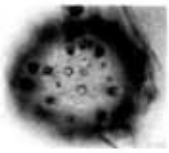
h

j

k

m

n



i

l

o

p

3) Macroremains found in peat core 1A

The graminae and cyperaceae remains other than pollen found in the top layer (0-20 cm depth) of peat deposits (Pl. 24). In addition, tissues of higher plants (Pl. 25) and leaf-like organ of mosses (Pl. 25) are also found.

However, no macroremains could be found in the middle (deeper than 30 cm depth) nor the bottom layer (about 150 cm depth) of this core.

Other remains found in peat core 1A

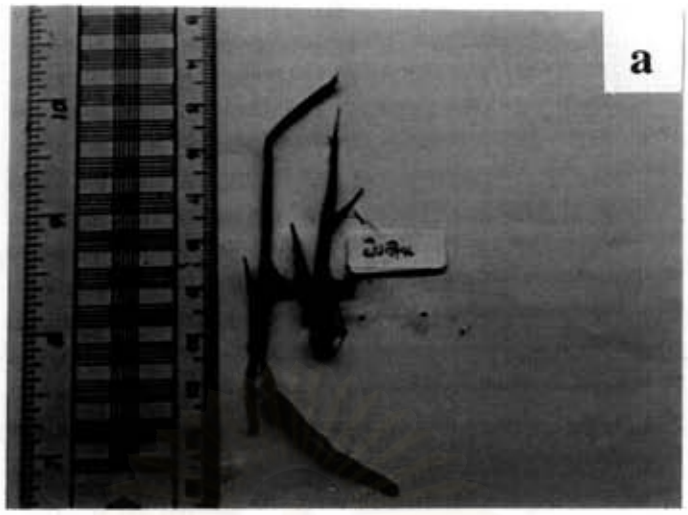
The other remains, which could be found under light microscope when the peat samples were sieved without acetolysis method, were identified as algae and fungi. The algae are *Stauronesis* sp. (Pl. 25) and *Lyngbya* sp. (Pl. 25). The fungi (Pl. 25) and *Lyngbya* sp. were only found in the upper layer of peat deposits whereas *Stauronesis* sp. could be found in every layer of the same deposits.

Plate 24

a, Macroremains on surface of peat deposits.

b, Macroremains in 10 centrimetres depth.

c, Macroremains in 20 centrimetres depth.


a


b
10 cms


c
20 cms

Plate 25

a, *Stenronesis* sp., a fresh water algae.

b, *Lyngbya* sp., a fresh water algae.

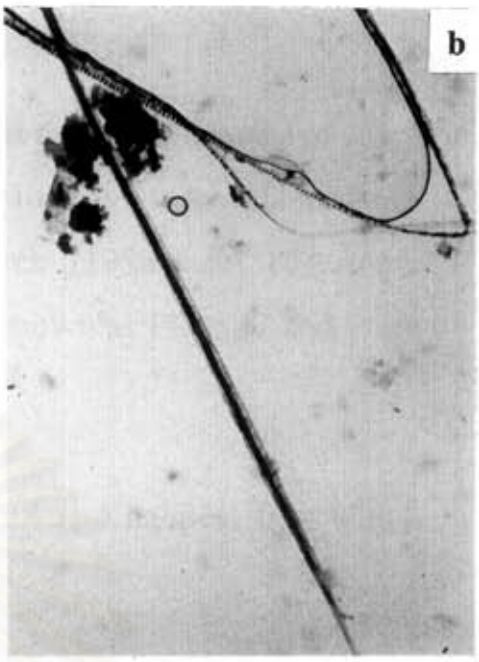
c, Plant tissue remain of flowering plant.

d, Leaf remain of flowering plant.

e, Leaf-like organel remain of moss.

f-h, Fungal remains, spores.


a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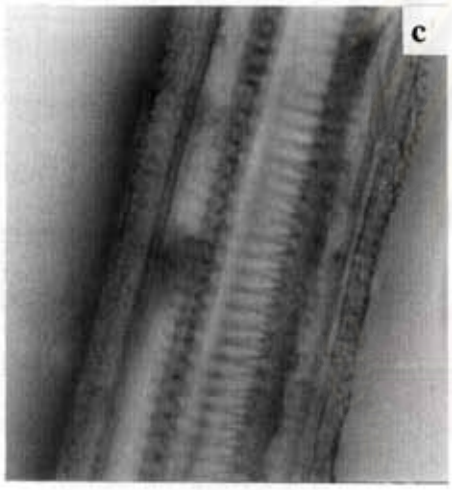
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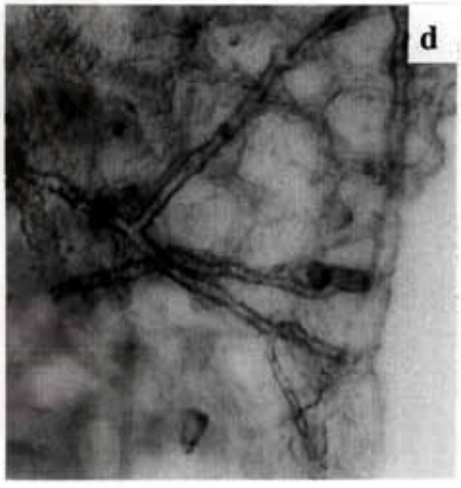
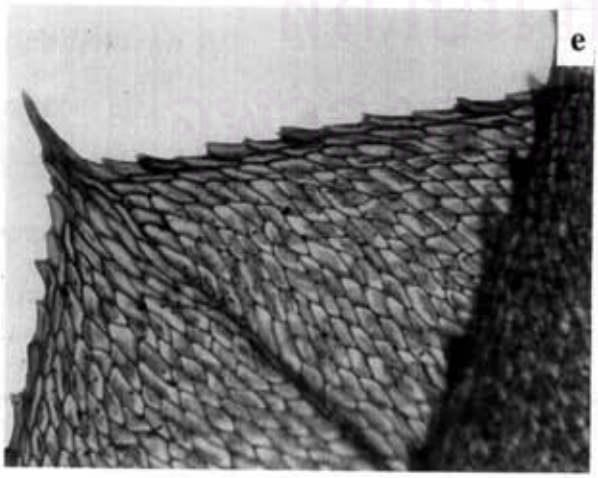
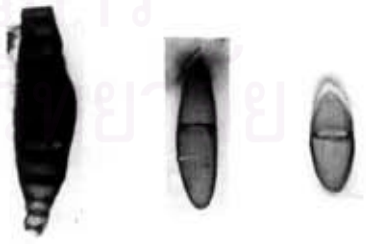

d


e


f
g
h

4) The present plants around the sampling site

The location (Pl. 26) and some plants around the sampling site of Ang-Kha peat bog of Doi Inthanon were surveyed. Morover, these plants were identified and compared with Suntisuk's research (1988) and Koyama's checklist (1986). Some distinguished plants were shown as Plate 27 and Plate 28.

Table 2 List of distinguished plants are around Ang-Kha peat bog which were surveyed by auther.

Names	Habits and Habitats
Sphagnum moss	Terrestial
Lycopodium clavatum L.	Herb, terrestial
Plagiogyria communis Ching	Herb, terrestial
Cyperaceae	Aquatic herb
Urticaceae	Herb
Pinus sp.	Tree
Cynoglossum sp.	Herb
Polygonum chinense L.	Aquatic herb
Polygonum plebejum R.Br.	Aquatic herb
Rhododendron sp.	Shrub
Agapetes sp.	Shrub
Vaccinium sp.	Shrub
Hypericum sp.	Shrub
Schima wallichii Korth.	Tree

Plate 26

a, The central part of sampling peat bog.

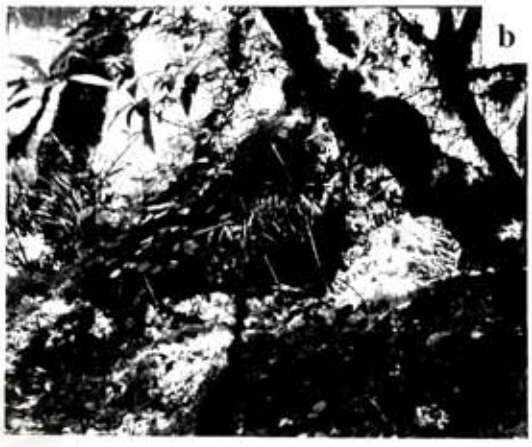
b, Sphagnum mosses under the shade of *Rhododendron* sp.

c, Sphagnum mosses and Cyperaceae.

d, Epiphytes on the tree trunk.

e, Trees around the sampling site.


a


b


c


d


e

Plate 27

a, Sphagnum mosses.

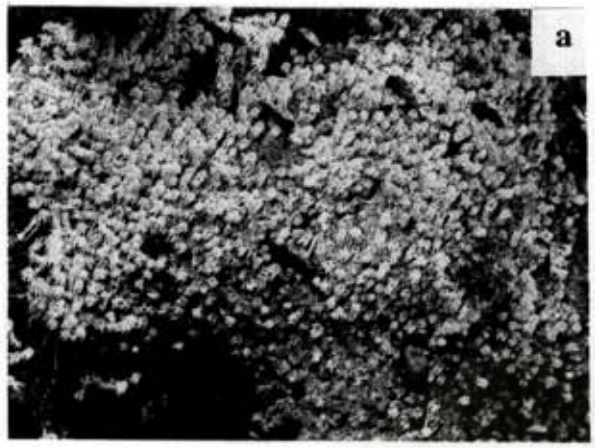
b, *Pinus* sp.

c, Cyperaceae.

d, *Cynoglossum* sp.

e, Urticaceae.

f, *Lycopodium clavatum* L.


a


b


c


d


e


f

Plate 28

a, *Polygonum chinense* L.

b, *Polygonum plebejum* R.Br.

c, *Rhododendron* sp.

d, *Hypericum* sp.

e, *Agapetes* sp.

f, *Vaccinium* sp.

g, *Schima wallichii* Korth.


a


b


d


c


g


e


f

5) Pollen diagrams and interpretations

The results of palynological investigations of the intramontane peat bog core were presented in the form of pollen diagrams. Figure 5 shows the percentage of grains of lowland, temperate, upper montane rain forest, pteridophyte and unidentified plants found. The pollen zones could be determined in six zones, based mainly on the increasing and/or declining of grains in the deposits. These pollen zones made it posible to reconstruct the past environment and plant community of the sampling area.

Figure 6 shows the pollen grains and spores in summation. The summation of deposited grains shows that pollen grains were found sparsely in the deepest layers but densely on the top layers. In contrast, spores were found abundantly in the deepest layers but scantily on the top layers.

Figure 7 shows three major groups of pollen grains and spores of pteridophyte, gymnosperms and angiosperm. There are high fluctuations of gymnosperms diagram.

Figure 8 and Figure 9 present the division of pollen summary into six zones as Figure 1. Figure 8 shows the pollen summation of three groups of trees, small trees and shrubs, and herbs. There are defined as woody plants of more than 7 metres in hight. The small trees and shrubs are definned as woody plants of 7 metres or shorter leight. Herbs are characterised as non-woody plants of annual or biennial existence. Figure 9 shows the summary of pollen grains of plants in lowland, temperate and upper montane rain forest areas. *Polygonum chinense* L., *Polygonum plebejum* R.Br., Graminae, *Rubus*, Cyperaceae and Araceae indicate the characteristics of the composite vegetations of lowland. While *Betula, Engerthadia, Rhododendron,*

Vaccinium, Agapetes, Pinus, Magnolia and Rosaceae are typical temperate plants. By definition, Myrtaceae, Rubiaceae, *Quercus, Schima wallichii* Korth. and Leguminosae are distinguished as upper montane rain forest plants.

Figure 10 shows all spores of pteridophytes in percentage which included *Plagiogyria communis* Ching, *Selaginella, Polypodium, Asplenium* and *Crypsinus,* were reported as being dominant in deposits of Ang-Kha peat bog at peak of Doi Inthanon, Chiang Mai Province, by Poungtaptim and Pyramarn (1998). All spores of these pteridophytes are dominant in the bottom layer of this core.

Figure 11 shows percentages of all pollen grains and pteridophyte spores found in peat deposits of 1A core, which can be devided into six climatic zones. Zone I (1-16 cm depth) contains the dominant pollen grains of *Polygonum chinense* Linn., *Polygonum plebejum* R. Br., *Schima wallichii* Korth., Myrtaceae, *Rhododendron, Vaccinium, Agapetes, Quercus,* Rubiaceae as well as Araceae. Zone II (16-25 cm depth) shows the increasing of grains of *Betula, Rhododendron, Agapetes, Quercus*, grass and unidentified grains. Zone III (25-100 cm depth) is rich in pollen grains of *P. chinense* Linn., *P. plebejum* R. Br. , *Betula*, Myrtaceae, *Rhododendron, Vaccinium, Agapetes, Schima wallichii* Korth., *Quercus* as well as Rubiaceae. Zone IV (100-111.5 cm depth) shows the dominant grains of *P. chinense* Linn., *P. plebejum* R. Br. , Myrtaceae, *Schima wallichii* Korth., Rubiaceae, Leguminosae, Graminae, Cyperaceae and unidentified pollen grains. Zone V (111.5-113.5 cm depth) shows that *P. chinense* Linn., *P. plebejum* R. Br. , *Schima wallichii* Korth., Myrtaceae, *Rhododendron, Vaccinium, Quercus*, Graminae, Rubiaceae, Leguminosae and Cyperaceae pollen grains are dominant as well as pteridophyte spores are still dominant. Zone VI (131.5-152 cm depth) shows

that it contained low concentration of spores and pollen grains which is less than the other zones, but pollen grains of *Schima wallichii* Korth. and *Quercus* are highly quantitative grains of all plants found in this zone.

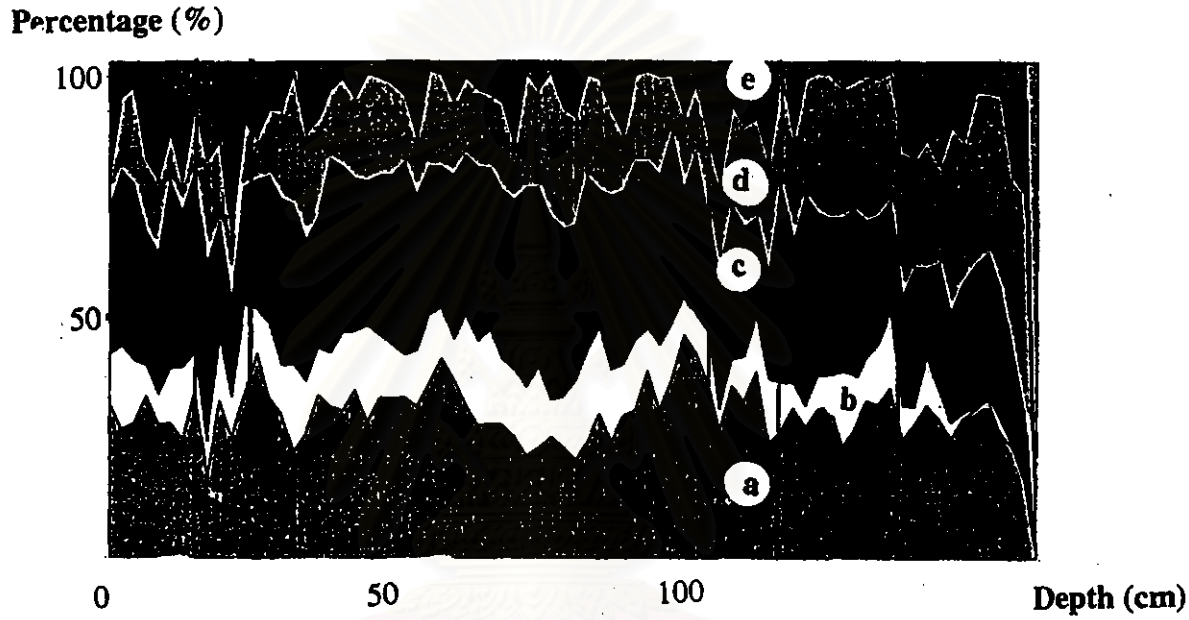


Fig. 5 Diagram of spore and pollen sum. Total summary of grain counting of peat core 1A shown in a percentage diagram. The total diagram is in 100 percent sum. The grains of lowland plants (a), temperate plants (b), upper montane rain forest plants (c), pteridophytes (d) and unidentified plants (e). The pollen diagram is divided into six climatic zones (I-VI) according to the fluctuation of the deposited grains of temperate plants.

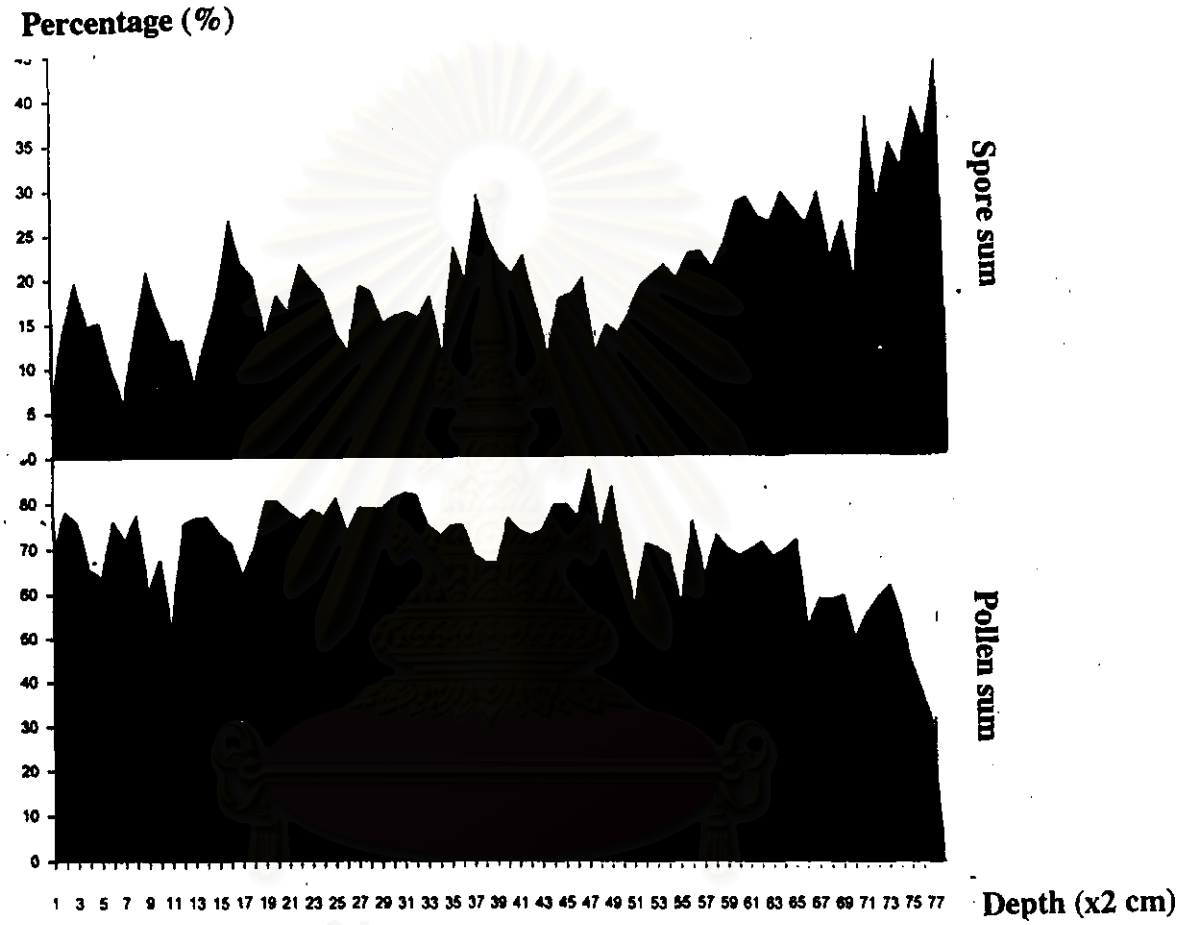


Fig. 6 A total summary of grain counting of peat core-1A shown in a percentage diagram. The chart refers to total spore counting. The lower chart refers to total pollen counting.

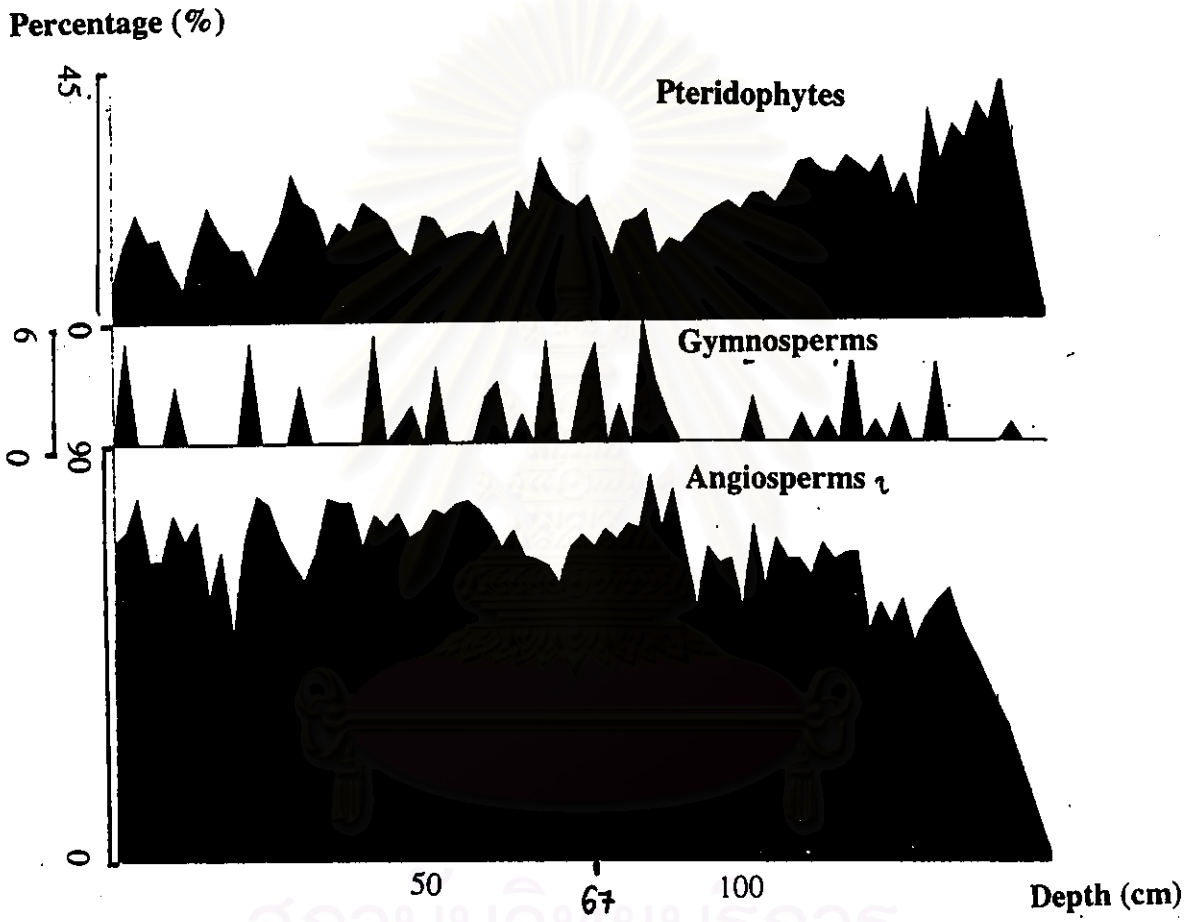


Fig. 7 Total summary of grain counting presented in 3 groups of plants, angiosperms, gymnosperms and pteridophytes, shown in a percentage diagram.

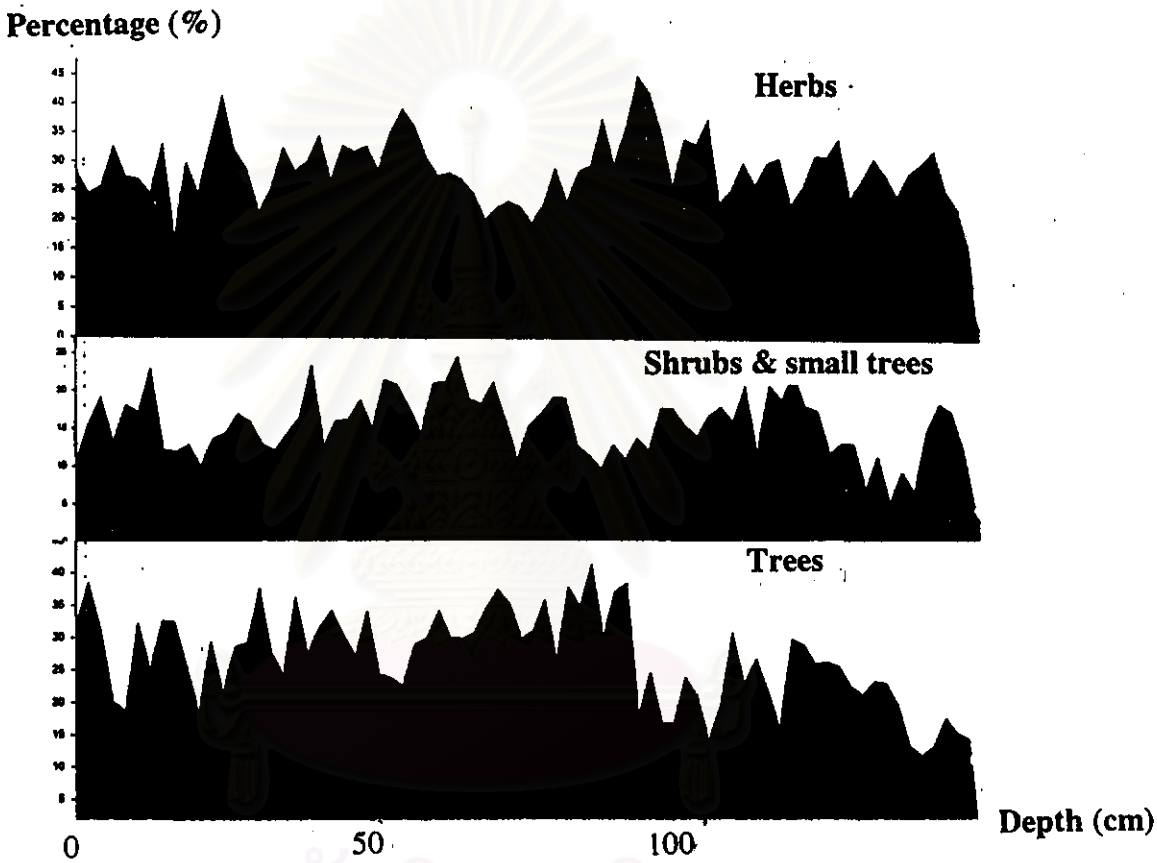


Fig. 8 Total summary of pollen counting classified according to different habits shown in percentage diagram.

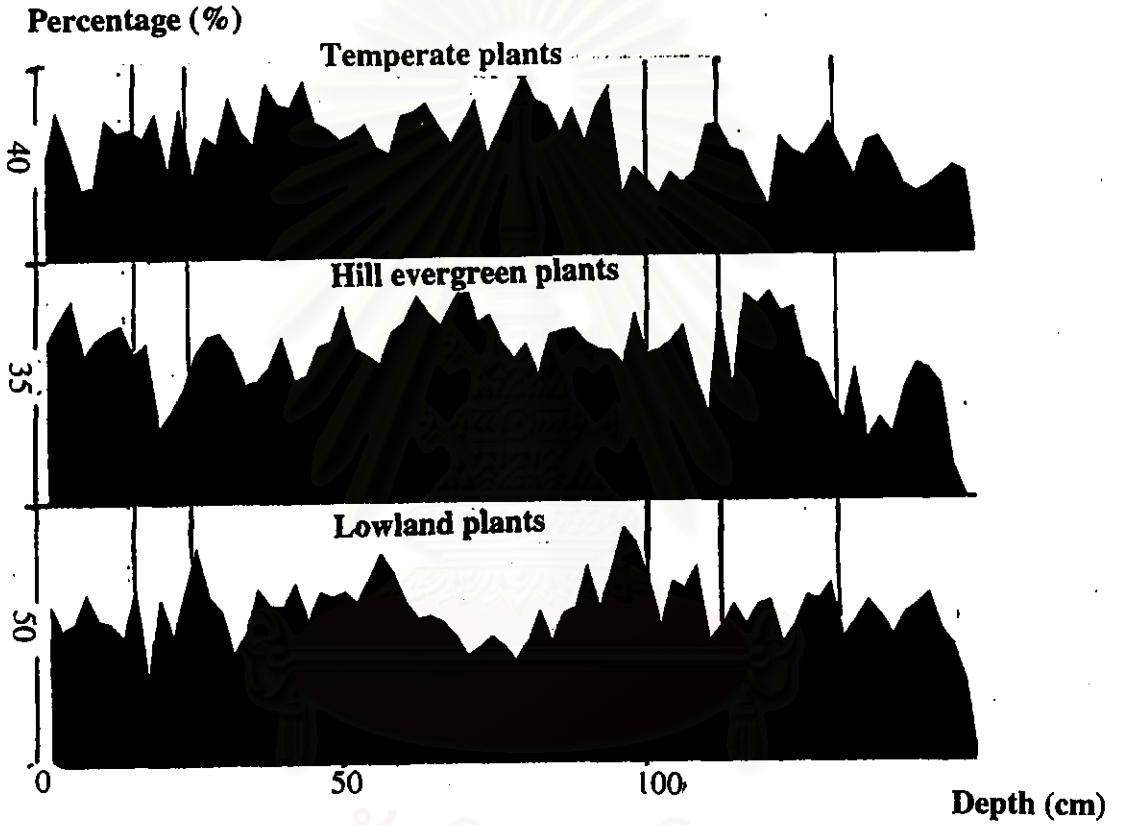


Fig. 9 A percentage diagram of total summary of pollen counting classified by vegetational type into lowland plants, hill evergreen plants and temperate plants.

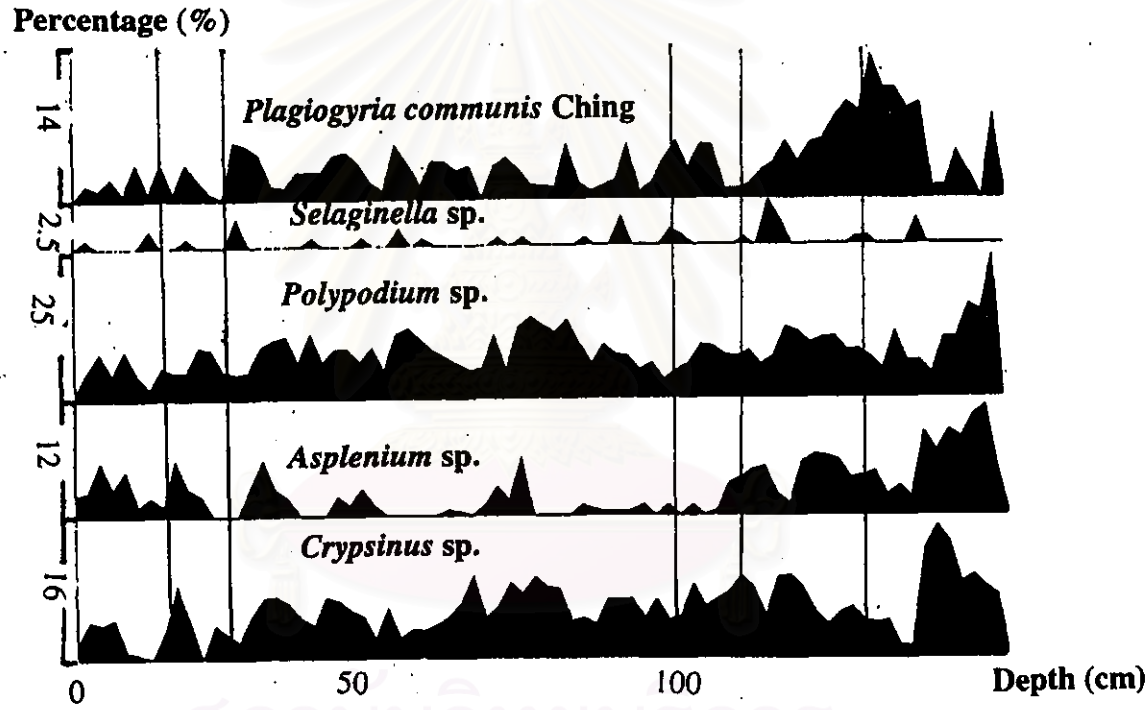


Fig. 10 A percentage diagram of total summary of spore counting classified by distinguishing in between the species of pteridophytes.

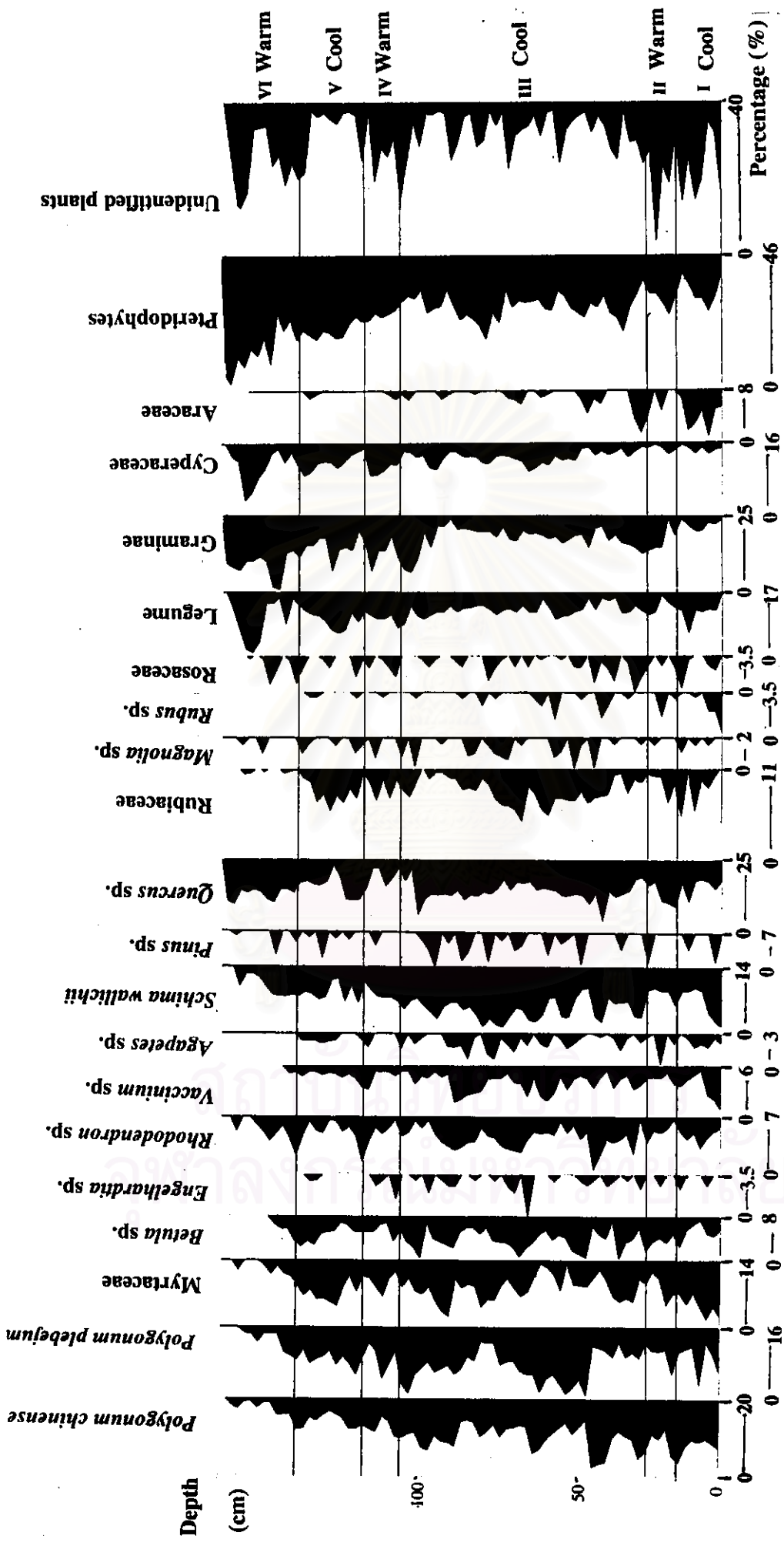


Fig. 11 A percentage diagram of all spores and pollen counting found in the peat core 1A