

# Anatomical characters and identification of Formosan woods with critical remarks from the climatic point of view, with 300 micrographs

Kanehira, Ryozo

Bureau of Productive Industries Government of Formosa Forest Experiment Station : Director

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## CHAPTER III.

## ANALYTICAL KEY TO THE FORMOSAN WOODS.

- I) Non-porous woods . . . . . Gymnosperms: Conifers.<sup>1)</sup>
- II) Porous woods . . . . . Dicotyledons.
- 1) Without true vessels . . . . . *Trochodendron aralioides*.
- 2) With true vessels.
- A) Ring-porous woods; largest pores localized in a distinct ring or band in early wood.
- a<sub>1</sub>) Either broad rays or compound (or aggregate) rays present.
- a<sub>2</sub>) Broad rays present . . . . . *Quercus dentata*, *Q. variabilis*.
- b<sub>2</sub>) Compound rays present.
- a<sub>3</sub>) Compound rays very scarce . . . . . *Castanopsis Kawakamii*.
- b<sub>3</sub>) Compound rays fairly numerous . . . . . *Castanopsis taiwaniana*.
- b<sub>1</sub>) Neither broad rays nor compound rays present.
- a.) Pith rays homogeneous or nearly homogeneous.
- a<sub>3</sub>) Maximum diameter of pores more than 250 $\mu$ .
- a<sub>4</sub>) Pith rays 1 or 2 cells wide . . . . . *Kalbreuteria formosana*.
- b<sub>1</sub>) Pith rays up to 4-12 cells in width.
- a<sub>5</sub>) Metatracheal bands in regular tangential lines  
. . . . . *Platycaarya strobilacca*.
- b<sub>5</sub>) Metatracheal bands not arranged in regular tangential lines.
- a<sub>6</sub>) Late wood pores grouped.
- a<sub>7</sub>) Late wood pores in circular groups; diameter of fibers up to 30 $\mu$ ; pith rays up to 4 cells in width . . . . . *Melia Azedarach*.
- b<sub>7</sub>) Late wood pores arranged diagonally or tangentially; diameter of fibers less than 20 $\mu$ ; pith rays more than 6 cells in width.
- a<sub>8</sub>) Pores arranged diagonally or tangentially;

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1) See p. 232.

- wall of fibers up to  $2-4\mu$  thick; pith rays up to 6 cells in width. . . . .  
 .. .. . *Ulmus Uyematsui*, *U. parviflora*.
- b<sub>3</sub>)** Pores arranged mostly in tangential lines; wall of fibers  $4-5\mu$  thick; pith rays up to 8 cells wide .. .. . *Zelkova formosana*.
- b<sub>3</sub>)** Late wood pores scattered.
- a<sub>7</sub>)** Paratracheal parenchyma elongating tangentially.
- a<sub>1</sub>)** Wood fibers septate; pith rays 1-4 cells wide .. .. . *Sapindus Mukorossi*.
- b<sub>3</sub>)** Wood fibers non-septate; pith rays 1-8 cells wide .. .. . *Gleditschia formosana*.
- b<sub>7</sub>)** Paratracheal parenchyma not elongating tangentially.
- a<sub>3</sub>)** Wood fibers septate .. .. *Phellodendron Wilsonii*.
- b<sub>3</sub>)** Wood fibers non-septate.
- a<sub>3</sub>)** Pith rays up to 6 cells in width .. ..  
 .. .. . *Broussonetia papyrifera*.
- b<sub>9</sub>)** Pith rays more than 9 cells in width.
- a<sub>10</sub>)** Diameter of fibers  $25-50\mu$ . .. .. .  
 .. .. . *Evodia meliaeifolia*.
- b<sub>10</sub>)** Diameter of fibers  $15-30\mu$  .. .. .  
 .. .. *Ailanthus cacodendron* var. *Tanakai*.
- b<sub>3</sub>)** Maximum diameter of pores less than  $220\mu$ .
- a<sub>4</sub>)** Terminal parenchyma absent; pith rays more than 8 cells in width .. .. *Elaeagnus Thunbergii*, *E. glabra*.
- b<sub>4</sub>)** Terminal parenchyma present; pith rays up to 6 cells in width.
- a<sub>5</sub>)** Small vessels without spirals .. .. *Fraxinus insularis*.
- b<sub>5</sub>)** Small vessels with spirals .. .. .  
 .. .. . *Ehretia macrophylla*, *E. acuminata*.
- b<sub>2</sub>)** Pith rays heterogeneous.
- a<sub>3</sub>)** Diameter of pores more than  $250\mu$ .
- a<sub>4</sub>)** Pith rays uniseriate .. .. . *Mallotus japonicus*.

- b<sub>4</sub>)** Pith rays polyseriate.
- a<sub>5</sub>)** Metatracheal parenchyma in regular tangential lines  
 .. .. . *Reevesia formosana*.
- b<sub>5</sub>)** Metatracheal parenchyma not arranged in regular tangential lines.
- a<sub>3</sub>)** Paratracheal parenchyma elongating tangentially.
- a<sub>7</sub>)** Diameter of wood fibers 20–25 $\mu$ , wall 3 $\mu$  thick  
 .. .. . *Cordia Myxa*.
- b<sub>7</sub>)** Diameter of wood fibers 25–40 $\mu$ , wall 2 $\mu$  thick  
 .. .. . *Paulownia Kawakamii*, *P. Mikado*.
- b<sub>6</sub>)** Paratracheal parenchyma not elongating tangentially.
- a<sub>7</sub>)** Small vessels with spirals; diameter of fibers  
 14–16 $\mu$  .. .. . *Celtis sincensis*.
- b<sub>7</sub>)** Small vessels without spirals; diameter of fibers  
 20–25 $\mu$ .. .. . *Rhus succedanea*, *R. javanica*.
- b<sub>3</sub>)** Diameter of pores less than 240 $\mu$ .
- a<sub>1</sub>)** High rays present .. *Elæagnus Oldhami*, *E. morrisonensis*.
- b<sub>4</sub>)** High rays absent.
- a<sub>5</sub>)** Pith rays up to 12 cells in width.. .. *Celtis nervosa*.
- b<sub>5</sub>)** Pith rays less than 7 cells in width.
- a<sub>3</sub>)** Horizontal resin ducts present .. *Pistacia formosana*.
- b<sub>3</sub>)** Horizontal resin ducts absent.
- a<sub>7</sub>)** Late wood pores abruptly diminish in size.
- a<sub>8</sub>)** Pith rays 1–5 cells wide .. .. .  
 .. .. . *Gilibertia pellucidopunctata*.
- b<sub>8</sub>)** Pith rays 1–3 cells wide .. *Sassafras randaiensis*.
- b<sub>7</sub>)** Late wood pores gradually diminish in size.
- a<sub>8</sub>)** Wood fibers septate; pith rays up to 7 cells  
 wide .. .. . *Aralia spinosa*.
- b<sub>8</sub>)** Wood fibers non-septate; pith rays 1–4 cells wide.
- a<sub>9</sub>)** Paratracheal parenchyma conspicuous in  
 cross section .. *Olerodendron trichotomum*.
- b<sub>9</sub>)** Paratracheal parenchyma not conspicuous

in cross section . . . . *Nauclea taiwaniana*.

**B)** Pores evenly distributed.

a<sub>1</sub>) Perforation of vessels always scalariform.

a<sub>2</sub>) Pith rays homogeneous . . . . . *Alnus formosana*.

b<sub>2</sub>) Pith rays heterogeneous.

a<sub>3</sub>) High rays present.

a<sub>4</sub>) Broad rays present . . . . . *Fagus Hayatae*.

b<sub>4</sub>) Broad rays absent.

a<sub>5</sub>) Maximum number of pores per square mm. more than 200 and up to 400 . . . . .

*Vaccinium bracteatum*, *V. caudatifolium*, *V. randaiense*.

b<sub>5</sub>) Maximum number of pores per square mm. 40-110.

a<sub>3</sub>) Water extraction of wood chips exhibits a distinct fluorescence . . . . . *Hydrangea chinensis*, *H. integra*, *H. Kawakamii*, *H. longifolia*.

b<sub>3</sub>) Water extraction of wood chips does not exhibit distinct fluorescence.

a<sub>7</sub>) Wood fibers septate . . . . .

. . . . . *Deutzia pulchellum*, *D. taiwanensis*.

b<sub>7</sub>) Wood fibers non-septate.

a<sub>8</sub>) Maximum diameter of fibers up to 20 $\mu$ . . . . .

. . . . . *Ceriops Candolleana* var. *Sasakii*.

b<sub>8</sub>) Maximum diameter of fibers usually more than 25 $\mu$ .

a<sub>9</sub>) Wall of fiber-tracheids usually 5-7 $\mu$  thick, without spirals . . . . . *Ternstroemia japonica*, *Anneslea fragrans* var. *lanceolata*.

b<sub>9</sub>) Wall of fibers usually 2-4 $\mu$  thick, sometimes with spirals. . *Viburnum luzonicum*, *V. odoratissimum*, *V. melanophyllum*, *V. propinquum*.

c<sub>6</sub>) Maximum number of pores per square mm. less than 25.

a<sub>6</sub>) Vessels with scalariform bordered pits where they are in contact with each other.

a<sub>7</sub>) Diameter of fibers 25-40 $\mu$ , wall 3-4 $\mu$  thick.

- a<sub>8</sub>) Wood fibers septate; pith rays up to 8 cells  
in width . . . . . *Osmoxylon kotoensis*.
- b<sub>8</sub>) Wood fibers non-septate; pith rays up to 4  
cells in width . . *Saurauja tristyla* var. *Oldhami*.
- b<sub>7</sub>) Diameter of fibers 20–25 $\mu$ , wall 5–10 $\mu$  thick . .  
. . . . *Bruguiera cylindrica*, *Rhizophora mucronata*.
- b<sub>3</sub>) Vessels with bordered pits where they are in con-  
tact with each other . . . . . *Meliosma*  
*callicarpæfolia*, *M. rhoifolia*, *M. rigida*, *M. squamulata*.
- b<sub>3</sub>) High rays absent.
- a<sub>4</sub>) Vessels nearly always with spirals.
- a<sub>5</sub>) Fiber-tracheids nearly always with spirals.
- a<sub>3</sub>) Pith rays more than 3 cells in width . . *Symplocos*  
*arisanensis*, *S. confusa*, *S. cratægoïdes*, *S. criobo-*  
*tryæfolia*, *S. leishanensis*, *S. kotoensis*, *S. micro-*  
*sepala*, *S. modesta*, *S. morrisonicola*, *S. nerifolia*,  
*S. nokoensis*, *S. risekiensis*, *S. spicata* var. *acuminata*.
- b<sub>3</sub>) Pith rays 1 or 2 cells wide . . *Stachyurus himalaicus*
- b<sub>5</sub>) Fibers without spirals.
- a<sub>6</sub>) Maximum number of pores per square mm. more  
than 350 . . . . . *Rhododendron*  
*formosanum*, *R. Morii*, *R. pseudo-chrysanthum*  
*R. rubro-pilosum*, *R. rubro-punctatum*, *R. Tunakai*.
- b<sub>6</sub>) Maximum number of pores per square mm. 180–250.
- a<sub>7</sub>) Diameter of fibers 12–20 $\mu$ , wall 2–3 $\mu$  thick; pith  
rays 1–4 cells wide . . *Pieris ovalifolia*, *P. taiwanensis*.
- b<sub>7</sub>) Diameter of fiber-tracheids 20–30 $\mu$ , wall 3–6 $\mu$   
thick; pith rays 1 or 2 cells wide . . . . .  
. . . . . *Adinandra formosana*, *A. lasiostyla*.
- c<sub>3</sub>) Maximum number of pores per square mm. 45–130.
- a<sub>7</sub>) Vertical resin ducts may occur; number of pores  
per square mm. 110–130; pith rays 1 or 2  
cells wide . . . . . *Liquidambar formosana*.

- b**<sub>7</sub>) Resin ducts absent; number of pores per square mm. 45-60; pith rays 1-5 cells wide . . .  
 . . . . . *Michelia Compressa*.
- b**<sub>4</sub>) Vessels without spirals.
- a**<sub>6</sub>) Pith lamellated . . . . .  
 . . . . . *Daphniphyllum glaucescens*, *D. membranaceum*.
- b**<sub>6</sub>) Pith solid.
- a**<sub>6</sub>) Metatracheal parenchyma arranged in tangential lines.
- a**<sub>7</sub>) Number of pores per square mm. 2-4 . . .  
 . . . . . *Myristica heterophylla*.
- b**<sub>7</sub>) Maximum number of pores per square mm. more than 14.
- a**<sub>8</sub>) Diameter of fibers 20-30 $\mu$ , wall 2-5 $\mu$  thick;  
 pith rays up to 4 or 5 cells in width . .  
 . . . . . *Styrax formosanum*,  
*S. kotoensis*, *S. Matsumurae*, *S. suberifolium*.
- b**<sub>8</sub>) Diameter of fibers 12-18 $\mu$ , wall 4-6 $\mu$  thick;  
 pith rays 1-3 cells wide.
- a**<sub>9</sub>) Metatracheal parenchyma arranged in regular tangential lines . . *Distylium racemosum*.
- b**<sub>9</sub>) Metatracheal parenchyma irregularly arranged . . . . *Buxus microphylla* var. *sinica*.
- b**<sub>5</sub>) Metatracheal parenchyma usually absent; if present only 2 or 3 cells connected in tangential lines.
- a**<sub>7</sub>) Pith rays more than 5 cells in width.
- a**<sub>8</sub>) Wood contains flavone . . . . .  
 . . . . . *Myrica rubra*, *M. adenophora* var. *Kusanoi*.
- b**<sub>8</sub>) Wood does not contain flavone.
- a**<sub>9</sub>) Number of pores per square mm. 300-400  
 . . . . . *Perrottetia arisanensis*.
- b**<sub>9</sub>) Number of pores per square mm. 20-60.
- a**<sub>10</sub>) Libriform fibers are the principal element of the wood . . . . *Cornus longipetiolata*.

- b**<sub>10</sub>) Fiber-tracheids are the principal element of the wood . . . . . *Turpinia arguta*.
- b**<sub>7</sub>) Pith rays less than 4 cells in width.
- a**<sub>8</sub>) Tracheid-fibers are the principal element of the wood . . . . . (*Ternstroemiaceæ*)  
*Cleyera ochmacea*, *Eurya japonica*, *E. strigilosa*, *Gordonia axillaris*, *Schinus Noronhæ*,  
*Thea salicifolia*, *T. transuokocensis*, *T. slinkocensis*.
- b**<sub>8</sub>) Libriforum fibers are the principal element of the wood.
- a**<sub>9</sub>) Wood fibers septate . . . . . *Illicium Anisatum*.
- b**<sub>9</sub>) Wood fibers non-septate.
- a**<sub>10</sub>) Pith rays 1 or 2 cells wide . . . . .  
. . . . . *Eustigma oblongifolium*.
- d**<sub>10</sub>) Pith rays 1-4 cells wide . . . . .  
. . . . . *Distylium formosanum*.
- b**<sub>1</sub>) Perforation of vessels simple sometimes with some tendency to scalariform.
- a**<sub>2</sub>) Pith rays homogeneous or nearly homogeneous.
- a**<sub>3</sub>) Pith rays 1 or 2 cells wide.
- a**<sub>4</sub>) Maximum number of pores per square mm. less than 10.
- a**<sub>5</sub>) Vessels with spirals; fibers septate . . . . . *Pometia pinnata*.
- b**<sub>5</sub>) Vessels without spirals; fibers non-septate.
- a**<sub>6</sub>) Metatracheal parenchyma present, one cell wide in radial direction . . . . . *Sapium sebiferum*, *S. discolor*.
- b**<sub>6</sub>) Metatracheal parenchyma usually absent . . . . .  
. . . . . *Erythrophloeum Fordii*.
- b**<sub>4</sub>) Maximum number of pores per square mm. more than 12-45.
- a**<sub>5</sub>) Vessels with spirals . . . . . *Nephelium Longana*.
- b**<sub>5</sub>) Vessels without spirals.
- a**<sub>3</sub>) Metatracheal parenchyma present.
- a**<sub>7</sub>) Number of pores per square mm. 25-35; metatra-



- cheal parenchyma irregularly distanced from each other . . . . . *Murraya exotica*.
- b<sub>7</sub>) Number of pores per square mm. 12-23; metatracheal parenchyma regularly distanced from each other . . . . . *Aglaiia formosana*, *A. elliptifolia*.
- b<sub>3</sub>) Metatracheal parenchyma absent.
- a<sub>7</sub>) Fibers septate; ray cells all upright . . . . .  
 . . . . . *Melastoma candidum*.
- b<sub>7</sub>) Fibers non-septate; ray cells procumbent . . . . .  
 . . . . . *Capparis formosana*.
- b<sub>3</sub>) Pith rays more than 3 cells in width.
- a<sub>4</sub>) Pith rays more than 8 cells in width . . . . .  
 . . . . . *Erythrina indica*, *E. corallodendron*.
- b<sub>4</sub>) Pith rays less than 5 cells in width.
- a<sub>5</sub>) Vessels with spirals *Acer duplicato-serratum*, *A. Kawakamii*, *A. morrisonense*, *A. oblongum*, *A. Oliverianum* var. *Nakaharai*, *A. rubescens*, *A. taiton-montanum*.
- b<sub>5</sub>) Vessels without spirals.
- a<sub>3</sub>) Metatracheal parenchyma usually absent, if present not in regular tangential lines.
- a<sub>7</sub>) Wood fibers septate . . *Vitex heterophylla*, *V. Negundo*.
- b<sub>7</sub>) Wood fibers non-septate.
- a<sub>8</sub>) Paratracheal parenchyma absent . . . . .  
 . . . . . *Acalypha indica*.
- b<sub>8</sub>) Paratracheal parenchyma conspicuous, usually elongating tangentially.
- a<sub>9</sub>) Diameter of fibers 25-40 $\mu$  . . *Hernandia peltata*.
- b<sub>9</sub>) Diameter of fibers 10-25 $\mu$  . . . . . *Leucæna glauca*, *Acacia Farnesiana*, *Albizia procera*.
- b<sub>3</sub>) Either metatracheal or terminal parenchyma present.
- a<sub>7</sub>) Maximum number of pores per square mm. less than 10.
- a<sub>8</sub>) Pith lamellated; metatracheal parenchyma in

- regular tangential lines . . . *Juglans formosana*.
- b<sub>8</sub>) Pith solid; metatracheal parenchyma not in regular tangential lines.
- a<sub>9</sub>) Diameter of fibers 20–25 $\mu$ ; pith rays 1–10 cells high; tyloses not conspicuous . . . . .  
 . . . . . *Tournefortia argentea*.
- b<sub>9</sub>) Diameter of fibers 10–15  $\mu$ ; pith rays 10–60 cells high; tyloses very conspicuous . . . . .  
 . . . . . *Cudrania javanensis*.
- b<sub>7</sub>) Maximum number of pores per square mm. 12–16.
- a<sub>8</sub>) Metatracheal parenchyma in regular tangential lines . . . *Pongamia glabra*, *Desmodium umbellata*.
- b<sub>8</sub>) Terminal parenchyma present . . . . .  
 . . . *Zanthoxylum ailanthoides*, *Crataeva religiosa*.
- c<sub>7</sub>) Maximum number of pores per square mm. 18–60.
- a<sub>8</sub>) Water extraction of wood chips exhibits a distinct fluorescence . . . . .  
 . . . . . *Evodia triphylla*, *Fagaria integrifoliola*.
- b<sub>8</sub>) Water extraction of wood chips does not exhibit fluorescence . . . *Clausena lunulata*, *C. euclrestifolia*.
- b<sub>2</sub>) Pith rays heterogeneous.
- a<sub>3</sub>) Pith rays 1 or 2 cells wide.
- a<sub>4</sub>) Maximum number of pores per square mm. less than 20.
- a<sub>5</sub>) Metatracheal parenchyma absent.
- a<sub>6</sub>) Horizontal resin ducts present . . . *Buchanania arborescens*.
- b<sub>6</sub>) Horizontal resin ducts absent.
- a<sub>7</sub>) Septate fibers arranged in tangential bands . . . . .  
 . . . . . *Astronia formosana*.
- b<sub>7</sub>) Fibers non-septate . . . . . *Paliurus ramosissimus*.
- b<sub>6</sub>) Metatracheal parenchyma present.
- a<sub>6</sub>) Horizontal resin ducts present . . . *Euphorbia Tirucalli*.
- b<sub>6</sub>) Horizontal resin ducts absent.
- a<sub>7</sub>) Boundary walls of two vessels very thick; pith

- rays usually arranged in horizontal series . . .  
 . . . . *Diospyros discolor*, *D. eriantha*, *D. Kusanoi*, *D. Morrisiana*, *D. Sasakii*, *Maba buxifolia*.
- b**<sub>7</sub>) Boundary walls of two vessels rather thin; pith rays not arranged in horizontal series.
- a**<sub>8</sub>) Metatracheal parenchyma usually one row in radial direction . . . . *Mallotus philippinensis*, *M. cochinchinensis*, *Engelhardtia formosana*.
- b**<sub>8</sub>) Metatracheal parenchyma more than two cells wide in radial direction.
- a**<sub>9</sub>) Metatracheal parenchyma irregularly distanced from each other.
- a**<sub>10</sub>) Metatracheal parenchyma distinct in cross section; wood fibers non-septate . . . .  
 . . . . . . . . *Calophyllum Inophyllum*.
- b**<sub>10</sub>) Metatracheal parenchyma not distinct in cross section; wood fibers septate . . . . . . . .  
 . . . . . . . . . . *Lagerstrœmia subcostata*.
- b**<sub>9</sub>) Metatracheal parenchyma regularly distanced from each other.
- a**<sub>10</sub>) Wood fibers septate . . . . *Fagraea Sasakii*.
- b**<sub>10</sub>) Wood fibers non-septate . . . . . . . .  
 . . . . . . . . *Dysoxylum Cumingianum*.
- b**<sub>1</sub>) Maximum number of pores per square mm. 22-70.
- a**<sub>5</sub>) Vessels with scalariform bordered pits where they are in contact with each other. . *Blastus cochinchinensis*.
- b**<sub>5</sub>) Vessels with bordered pits where they are in contact with each other.
- a**<sub>6</sub>) Wood fibers septate.
- a**<sub>7</sub>) Wall of fibers 3 $\mu$  thick . . . . *Allophylus timorensis*.
- b**<sub>7</sub>) Wall of fibers 4-5 $\mu$  thick . . . . *Dodonœa viscosa*.
- d**<sub>6</sub>) Wood fibers non-septate.
- a**<sub>7</sub>) Wood parenchyma in short metatracheal bands,

- not conspicuous in cross section; uniseriate  
ray cells very long vertically .. *Nauclea truncata*.
- b<sub>7</sub>) Metatracheal parenchyma conspicuous on cross section.
- a<sub>8</sub>) Metatracheal parenchyma more than 2 cells  
in width .. .. . *Acronychia laurifolia*
- b<sub>8</sub>) Metatracheal parenchyma one cell wide in  
radial direction.
- a<sub>9</sub>) Wall of fibers 5-7 $\mu$  thick .. .. .  
.. .. . *Sideroxylon lukiense*.
- b<sub>9</sub>) Wall of fibers 3-4 $\mu$  thick .. *Psidium Guajava*.
- c<sub>4</sub>) Maximum number of pores per square mm. more than 150.
- a<sub>6</sub>) Wood yellowish white; vessels with spirals in general;  
short metatracheal bands absent .. *Euonymus Mi-*  
*yakei*, *E. pellucidifolia*, *E. Spraguei*, *E. batakensis*.
- b<sub>6</sub>) Wood reddish brown; vessels without spirals; short  
metatracheal bands present .. .. .  
.. .. *Stranvæsia nitakayamensis*, *Photinia serrulata*.
- b<sub>3</sub>) Pith rays more than 3 cells in width.
- a<sub>4</sub>) Maximum number of pores per square mm. less than 10.
- a<sub>6</sub>) Metatracheal parenchyma in regular tangential lines.
- a<sub>3</sub>) Wood fibers septate.
- a<sub>7</sub>) Pith rays more than 5 cells in width .. ..  
*Ficus Beecheyana*, *F. Harlandi*, *F. insularis*,  
*F. nervosa*, *F. retusa*, *F. vasculosa*, *F. Wightiana*.
- b<sub>7</sub>) Pith rays less than 3 cells in width .. .. .  
.. .. . *Chisocheton tetrapetalus*.
- b<sub>3</sub>) Wood fibers non-septate.
- a<sub>7</sub>) Metatracheal parenchyma one cell wide in radial  
direction.
- a<sub>8</sub>) Maximum diameter of pores up to 350 $\mu$ ; wall  
of fibers 3-5 $\mu$  thick .. *Bombax malabaricum*.
- b<sub>8</sub>) Maximum diameter of pores up to 200 $\mu$ , wall  
of fibers 2 $\mu$  thick .. *Pterospermum formosanum*.

- c<sub>5</sub>) Maximum diameter of pores up to  $170\mu$ ; wall of fibers  $3-4\mu$  thick . . . . *Heritiera littoralis*.
- b<sub>7</sub>) Metatracheal parenchyma 3-8 cells wide in radial direction . . . . . *Barringtonia speciosa*.
- b<sub>5</sub>) Metatracheal parenchyma absent; paratracheal parenchyma elongating tangentially.
  - a<sub>3</sub>) High rays present . . . *Sterculia platanifolia*, *S. luzonica*.
  - b<sub>3</sub>) High rays absent.
    - a<sub>7</sub>) Terminal parenchyma present.
      - a<sub>8</sub>) Maximum diameter of pores up to  $300\mu$ ; wall of fibers  $2\mu$  thick; pith rays 1-3 cells wide . . . . . *Mangifera indica*.
      - b<sub>8</sub>) Maximum diameter of pores up to  $250\mu$ ; wall of fibers  $3\mu$  thick; pith rays 1-7 cells wide . . . . . *Beilschmiedia erythrophloia*.
      - c<sub>8</sub>) Maximum diameter of pores up to  $150\mu$ ; wall of fibers  $8-4\mu$  thick, pith rays 1-4 cells wide . . . . . *Fraxinus formosana*.
    - b<sub>7</sub>) Terminal parenchyma absent.
      - a<sub>8</sub>) Wood contains flavone . . . . *Artocarpus incisa*.
      - b<sub>8</sub>) Wood does not contain flavone . . *Terminalia Cattappa*, *Semecarpus vernicifera*, *Ormosia formosana*.
- c<sub>5</sub>) Metatracheal parenchyma absent; paratracheal parenchyma not elongating tangentially.
  - a<sub>6</sub>) High rays present . . . . . *Scaevola Koenigii*.
  - b<sub>6</sub>) High rays absent.
    - a<sub>7</sub>) Maximum diameter of pores up to  $200\mu$ ; wall of fibers  $1-2\mu$  thick . . . . . *Trema orientalis*.
    - b<sub>7</sub>) Maximum diameter of pores up to  $120\mu$ ; wall of fibers  $2\frac{1}{2}-3$  thick . . *Macaranga dipterocarpifolia*.
- b<sub>1</sub>) Maximum number of pores per square mm. 11-40.
  - a<sub>5</sub>) Pores evenly distributed; metatracheal parenchyma absent, paratracheal parenchyma cells large and

- conspicuous in cross section; perforation of vessels simple but sometimes with some tendency to scalariform; secretory cells often occur . . . .  
 (*Laurineæ*) *Actinodaphne citrata*, *A. pedicellata*, *Cinnamomum Camphora*, *C. Camphora* var. *nominale*, *C. Kanehirai*, *C. longicarpum*, *C. micranthum*, *C. pseudo-Loureirii*, *C. randaiense*, *C. reticulatum*, *Cryptocarya chinensis*, *C. Konishii*, *Lindera akaensis*, *L. communis*, *L. Oldhami*, *Litsea dolichocarpa*, *Machilus Kusanoi*, *M. suffrutescens*, *Phoebe formosana*, *Tetradenia acuminatissima*, *T. aurata*, *T. Konishii*.
- b<sub>6</sub>)** Pores evenly distributed; metatracheal parenchyma may occur; paratracheal parenchyma not conspicuous in cross section; perforation of vessels always simple; secretory cells rarely occur.
- a<sub>6</sub>)** High rays present.
- a<sub>7</sub>)** Pith rays up to more than 10 cells in width.
- a<sub>8</sub>)** Vessels with simple pits where they are in contact with each other; wall of fibers 7-8 $\mu$  thick . . . . . *Gonocaryum diospyrosifolium*.
- b<sub>8</sub>)** Vessels with scalariform bordered pits where they are in contact with each other; wall of fibers 4-5 $\mu$  thick . . . . . *Leea sambucina*.
- b<sub>7</sub>)** Pith rays less than 7 cells in width.
- a<sub>9</sub>)** Wall of fibers 8-10 $\mu$  thick . . . . . *Garcinia multiflora*.
- b<sub>9</sub>)** Wall of fibers less than 3 $\mu$  thick.
- a<sub>10</sub>)** Pith rays up to 7 cells in width . . . . .  
 . . . . . *Coriaria intermedia*.
- b<sub>10</sub>)** Pith rays less than 4 cells in width.
- a<sub>10</sub>)** Diameter of fibers 20-30 $\mu$  . . . . .  
 . . . . . *Hibiscus mutabilis*.
- b<sub>10</sub>)** Diameter of fibers 12-15 $\mu$  . . . . . *Debregeasia edulis*.
- b<sub>6</sub>)** High rays absent.

- a<sub>7</sub>) Large cystolith-like structure present . . . . .  
 . . . . . *Champereia manillana*.
- b<sub>7</sub>) Cyst absent.
- a<sub>8</sub>) Metatracheal parenchyma in regular tangential lines.
- a<sub>9</sub>) Metatracheal parenchyma up to 5-7 cells in width.
- a<sub>10</sub>) Wall of fibers 2-3 $\mu$  thick . . . . .  
 . . . . . *Celtis philippinensis*, *Evodia Roxburghiana*.
- b<sub>10</sub>) Wall of fibers 3-4 $\mu$  thick . . . . .  
 . . . . . *Chisocheton kusukusense*.
- c<sub>10</sub>) Wall of fibers 7-12 $\mu$  thick . . . . .  
 . . . . . *Timonius arboreus*.
- b<sub>9</sub>) Metatracheal parenchyma 1-3 cells wide.
- a<sub>10</sub>) Wood fibers septate . . . *Elretria formosana*.
- b<sub>10</sub>) Wood fibers non-septate.
- a<sub>11</sub>) Wall of fibers 2 $\frac{1}{2}$ -3 $\frac{1}{2}$  $\mu$  thick . . . . .  
 . . . . . *Palaquium formosana*.
- b<sub>11</sub>) Wall of fibers 5-7 $\mu$  thick . . . . .  
 . . . . . *Eugenia kashotensis*.
- b<sub>8</sub>) Terminal parenchyma present.
- a<sub>9</sub>) Pith rays up to 10 cells in width . . . . .  
 . . . . . *Celtis formosana*.
- b<sub>9</sub>) Pith rays less than 5 cells in width.
- a<sub>10</sub>) Paratracheal parenchyma conspicuous in cross section . . . . .  
 . . . . . *Linociera Cumingiana*, *Cordia Kanehirai*.
- b<sub>10</sub>) Paratracheal parenchyma not conspicuous in cross section.
- a<sub>11</sub>) Ripple marks present . . . *Hibiscus tiliaceus*.
- b<sub>11</sub>) Ripple marks absent . . *Kleinkovia Hospita*.
- c<sub>3</sub>) Metatracheal parenchyma usually absent; if present very irregularly arranged.

- a<sub>9</sub>)** Wood fibers septate.
- a<sub>10</sub>)** Wall of fibers up to  $8\mu$  in thickness.
- a<sub>11</sub>)** Number of pores per square mm. 30-40  
 .. .. . *Glochidion Fortunei*.
- b<sub>11</sub>)** Number of pores per square mm. 8-14  
 .. .. . *Bischoffia javanica*.
- b<sub>10</sub>)** Wall of fibers less than  $4\mu$  in thickness.
- a<sub>11</sub>)** Tyloses conspicuous; diameter of pores  
 70-200 $\mu$ ; pith rays 1-8 cells wide..  
 .. .. . *Morus acidosa*.
- b<sub>11</sub>)** Tyloses not conspicuous; diameter of  
 pores 100-300 $\mu$ ; pith rays 1-4 cells  
 wide .. .. . *Canarium album*.
- c<sub>11</sub>)** Tyloses not conspicuous; diameter of  
 pores 50-100 $\mu$ ; pith rays 3-6 cells  
 wide .. .. . *Cesalpinia Sappan*.
- b<sub>9</sub>)** Wood fibers non-septate.
- a<sub>10</sub>)** Pith rays more than 5 cells in width.
- a<sub>11</sub>)** Wall of fibers 4-5 $\mu$  thick .. .. .  
 .. .. . *Morinda citrifolia*.
- b<sub>11</sub>)** Wall of fibers 2-4 $\mu$  thick .. .. .  
*Marlea begoniifolia, Pipturus aspera,*  
*Maoutia setosa, Premna integrifolia.*
- b<sub>10</sub>)** Pith rays less than 4 cells in width.
- a<sub>11</sub>)** Wood contains flavone.. *Premna formosana*.
- b<sub>11</sub>)** Wood does not contain flavone.
- a<sub>12</sub>)** Paratracheal parenchyma conspicu-  
 ous in cross [section, often elon-  
 gating tangentially.
- a<sub>13</sub>)** Wall of fibers 3 $\mu$  thick .. .. .  
 .. .. . *Acacia confusa*.
- b<sub>13</sub>)** Wall of fibers 2 $\mu$  thick.. *Wikstroë-*  
*mia indica, Stereospermum sinicum.*



- b<sub>12</sub>) Paratracheal parenchyma inconspicuous.
  - a<sub>13</sub>) Maximum diameter of pores up to 200 $\mu$  . . . . *Macaranga Tanarius*.
  - b<sub>13</sub>) Maximum diameter of pores less than 150 $\mu$ .
    - a<sub>14</sub>) Wall of fibers 4 $\mu$  thick . . . .  
 . . . . *Decaspermum paniculatum*.
    - b<sub>14</sub>) Wall of fibers 2 $\mu$  thick . . *Grewia piscatorum, Averrhoa Carambola*.
- c<sub>1</sub>) Maximum number of pores per square mm. 45-90.
  - a<sub>5</sub>) High rays present. . *Rapanea nerifolia, Ardisia Sieboldi*.
  - b<sub>5</sub>) High rays absent.
    - a<sub>6</sub>) Stone cells present . . . . *Avicennia officinalis*.
    - b<sub>6</sub>) Stone cells absent.
      - a<sub>7</sub>) Wood fibers septate.
        - a<sub>8</sub>) Wall of fibers 4-8 $\mu$  thick . . . . *Scolopia crenata*
        - b<sub>8</sub>) Wall of fibers 2-3 $\mu$  thick.
          - a<sub>9</sub>) Ray cells mostly upright . . *Antidesma kotcensis*.
          - b<sub>9</sub>) Ray cells mostly procumbent . . . .  
 . . . . *Callicarpa formosana*.
      - b<sub>7</sub>) Wood fibers non-septate.
        - a<sub>8</sub>) Metatracheal parenchyma conspicuous in cross section . . . . *Eugenia sinensis*.
        - b<sub>8</sub>) Metatracheal parenchyma generally absent, if present 2 or more cells connecting tangentially.
          - a<sub>9</sub>) Maximum diameter of pores more than 100 $\mu$ .
            - a<sub>10</sub>) Pith rays up to 7 cells in width . . . .  
 . . . . *Euscaphis japonica*.
            - b<sub>10</sub>) Pith rays up to 4 cells in width . . . .  
 . . . . *Casearia Merrilli, Idesia polycarpa*.
          - b<sub>9</sub>) Maximum diameter of pores less than 85 $\mu$ .
            - a<sub>10</sub>) Pith rays up to 8 cells in width . . . .  
 . . . . *Chomeia corymbosa*.

- b<sub>10</sub>) Pith rays up to 4 cells in width . . . . .  
     . . . . . *Wendlandia glabrata*,
- c<sub>10</sub>) Pith rays less than 3 cells in width.
  - a<sub>11</sub>) Wood yellowish white . . . . .  
     . . . . . *Diplospora viridiflora*.
  - b<sub>11</sub>) Wood reddish . . *Cotoneaster taiwanensis*,  
     *Malus formosana*, *Photinia daphniphylloides*.
- d<sub>4</sub>) Maximum number of pores per square mm. more than 100.
  - a<sub>5</sub>) Pith rays more than 5 cells in width.
    - a<sub>3</sub>) Vessels with spirals.
      - a<sub>7</sub>) Pith lamellated; wood fibers non-septate . . . . .  
     . . . . . *Prinsepia scandens*.
      - b<sub>7</sub>) Pith solid; wood fibers septate . . . . .  
     . . . . . *Echinocarpus dasycarpus*.
    - b<sub>3</sub>) Vessels without spirals . . . . . *Gardenia florida*.
  - b<sub>5</sub>) Pith rays less than 4 cells in width.
    - a<sub>3</sub>) Vessels with spirals.
      - a<sub>7</sub>) Short metatracheal bands present . . . . .  
     . . . . . *Eriobotrya deflexa*.
      - b<sub>7</sub>) Short metatracheal bands absent . . . . .  
     . . . . . *Elæocarpus decipiens*, *E. japonicus*.
    - b<sub>3</sub>) Vessels without spirals . . . . . *Raphirolepis indica*.
- C) Pores arranged radially or diagonally.
  - a<sub>1</sub>) Broad rays present . . . . . *Quercus amygdalifolia*, *Q. brevicaudata*, *Q. castanopsisifolia*, *Q. dodonicefolia*, *Q. gilva*, *Q. glauca*, *Q. hypophæa*, *Q. Jungkalmii*, *Q. Kawakamii*, *Q. Konishii*, *Q. longinux*, *Q. Morii*, *Q. pachyloma*, *Q. pseudomyrsinefolia*, *Q. sessilifolia*, *Q. shansuiensis*, *Q. stenophylloides*, *Q. tarokoensis*, *Q. ternaticupula*, *Q. tomentosicupula*, *Q. uraina*.
  - b<sub>1</sub>) Compound rays present . . *Carpinus Kawakamii*, *C. rankanensis*.
  - c<sub>1</sub>) Neither broad rays nor compound rays present.
    - a<sub>2</sub>) Pith rays homogeneous.
    - a<sub>3</sub>) Pith rays 1-4 cells wide . . . . . *Casuarina equisetifolia*.

- b<sub>3</sub>) Pith rays uniseriate. . *Castanopsis formosana*, *C. subacuminata*.
- b<sub>2</sub>) Pith rays heterogeneous.
- a<sub>3</sub>) Perforation of vessels scalariform.
- a<sub>4</sub>) Wood fibers septate . . . . . *Heptapleurum arboricolum*, *H. octophyllum*, *H. racemosum*, *Fatsia polycarpa*.
- b<sub>4</sub>) Wood fibers non-septate.
- a<sub>5</sub>) Vessels with scalariform bordered pits where they are in contact with each other . . *Itea chinensis* var. *subserrata*.
- b<sub>5</sub>) Vessels with bordered pits where they are in contact with each other . . . . *Alniphyllum pterospermum*.
- b<sub>3</sub>) Perforation of vessels simple.
- a<sub>4</sub>) Pith rays 1 or 2 cells wide.
- a<sub>5</sub>) Terminal parenchyma present.
- a<sub>6</sub>) Vessels with spirals . . . . . *Daphne arisanensis*.
- b<sub>6</sub>) Vessels without spirals.
- a<sub>7</sub>) Number of pores per square mm. 120-150 . . . . . *Ligustrum Iboti*.
- b<sub>7</sub>) Number of pores per square mm. 40-100 . . . . . *Salix babylonica*, *S. Kusanoi*, *S. Warburgii*.
- b<sub>5</sub>) Terminal parenchyma absent.
- a<sub>3</sub>) Metatracheal parenchyma in regular tangential lines . . . . . *Excoecaria Agallocha*.
- b<sub>3</sub>) Metatracheal parenchyma absent . . . . . *Gelonium aequoreum*, *Pemphis acidula*, *Lumnitzera racemosa*.
- b<sub>4</sub>) Pith rays more than 3 cells in width.
- a<sub>5</sub>) Fibers with spirals . . *Ilex asprella*, *I. formosana*, *I. Hanccana*, *I. Kusanoi*, *I. rotunda*, *I. transarisanensis*.
- b<sub>5</sub>) Fibers without spirals.
- a<sub>5</sub>) Terminal parenchyma conspicuous.
- a<sub>7</sub>) Vessels with spirals . . . . . *Prunus punctata*.
- b<sub>7</sub>) Vessels without spirals.
- a<sub>8</sub>) Wood contain flavone . . . . *Prunus campanulata*.
- b<sub>8</sub>) Wood does not contain flavone . . *Bridelia tomentosa*.

- b<sub>6</sub>) Metatracheal parenchyma present.
- a<sub>7</sub>) Wall of fibers 7–9 $\mu$  thick .. .. *Randia racemosa*.
- b<sub>7</sub>) Wall of fibers 2–2 $\frac{1}{2}$  $\mu$  thick .. *Excoecaria Kawakamii*.
- c<sub>5</sub>) Metatracheal parenchyma absent.
- a<sub>7</sub>) Maximum number of pores per square mm. more than 150.
- a<sub>8</sub>) Vessels with spirals .. .. .
- .. .. . *Pittosporum Tobira*, *P. oligocarpum*.
- b<sub>7</sub>) Vessels without spirals.
- a<sub>9</sub>) Wood fibers septate .. *Pentapanax castanopsisicola*.
- b<sub>9</sub>) Wood fibers non-septate .. .. .
- .. .. . *Psychotria elliptica*.
- b<sub>7</sub>) Maximum number of pores per square mm. less than 75.
- a<sub>8</sub>) Wood fibers septate.
- a<sub>9</sub>) Vessels with spirals .. *Oreopanax formosana*.
- b<sub>9</sub>) Vessels without spirals.
- a<sub>10</sub>) Diameter of fibers 14–18 $\mu$  .. .. .
- .. .. . *Pittosporum viburnifolium*.
- b<sub>10</sub>) Diameter of fibers 18–25 $\mu$  .. .. .
- .. *Callicarpa kotaensis*, *Homalium fagifolium*.
- b<sub>9</sub>) Wood fibers non-septate .. .. .
- .. *Pittosporum formosanum*, *Croton Cumingii*
- D) Pores arranged in flame-like groups.
- a<sub>1</sub>) High rays present.
- a<sub>2</sub>) Pith rays 3–7 cells wide .. .. . *Mahonia morrisonensis*.
- b<sub>2</sub>) Pith rays 5–25 cells wide .. .. . *Berberis Kawakamii*
- b<sub>1</sub>) High rays absent.
- a<sub>2</sub>) Pith rays 1 or 2 cells wide.
- a<sub>3</sub>) Water extraction of wood chips exhibits a distinct fluorescence .. .. . *Skimmia arisanensis*.
- b<sub>3</sub>) Water extraction of wood chips does not exhibit fluorescence .. .. . *Osmanthus lanceolatus*.

- b<sub>2</sub>)** Pith rays more than 3 cells in width.
- a<sub>3</sub>)** Short metatracheal bands present .. .. .  
 .. .. . *Elretea longiflora*, *E. glaucescens*.
- b<sub>3</sub>)** Short metatracheal bands absent.
- a<sub>4</sub>)** Diameter of fibers 15–25 $\mu$ .. .. *Otherodendron illiciifolium*.
- b<sub>4</sub>)** Diameter of fibers 9–18 $\mu$ ;
- a<sub>5</sub>)** Terminal parenchyma present .. .. .  
 .. .. . *Osmanthus obovatifolius*.
- b<sub>5</sub>)** Terminal parenchyma absent .. .. .  
 .. .. . *Rhamnus formosana*, *R. oiwakensis*.
- E)** Pores arranged in tangential lines.. .. .  
 .. .. . *Helicia formosana*, *H. cochinchinensis*.