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Characterisation of the xylem of 352 conifers

L. García Esteban[1]*, P. de Palacios de Palacios[1], A. Guindeo Casasús[1] and F. García Fernández[2]

[1] *Universidad Politécnica de Madrid. Cátedra de Tecnología de la Madera. ETS Ingenieros de Montes. Ciudad Universitaria. 28040 Madrid. Spain*

[2] *Asociación de Investigación Técnica de las Industrias de Madera y Corcho. C/ Flora, 3. 28013 Madrid. Spain*

Abstract

Following the traditional methods of preparation and description of wood at microscopy level, 352 descriptions of the woods of conifers were made.

For the characterisation of each wood a multiple entry key was prepared, with a total of 81 features divided into four groups: tracheids with 29 features, axial parenchyma with 8, wood rays with 37 and resin canals with 7.

Key words: anatomy, wood, identification.

Resumen

Caracterización del xilema de 352 coníferas

Siguiendo los métodos tradicionales de preparación y descripción de la madera a nivel microscópico, se han realizado 352 descripciones de maderas de coníferas.

Para la caracterización de cada madera se ha elaborado una clave de múltiple entrada con un total de 81 caracteres dividida en cuatro grupos: traqueidas con 29 caracteres, parénquima axial 8, radios leñosos 37 y canales resiníferos 7.

Palabras clave: anatomía, madera, identificación.

Introduction

The uniformity of the xylem of conifers places this vegetal group among those that present most difficulties when it comes to making an identification. When undertaking identification of the wood of conifers, the first obstacle to overcome is delimiting which large group the wood belongs to, e.g. with or without canals, with or without ray tracheids, etc.

The tool that best responds to this initial placement is without a doubt the multiple entry key. Philipps (1948), proposed the first list of features with which any conifer wood could be characterised using a key of this type. He based it on 36 features divided into 6 groups, bringing about a radical change in the process of identification. Although the simplicity of the features chosen made it difficult for users to identify conifers at the species level, its use has allowed, and continues to allow, the placement of the wood within the large groups of conifers. It lacks measurements and only uses counting for the number of epithelial cells in the resin canals and the number of pits per cross field. The last group, containing three features, is reserved for the density and hardness of the wood.

After this contribution, there have been other multiple entry keys, which in addition to including the description of features, also include a data base with the descriptions of the wood of conifers based on the particular key (LaPasha, 1986; García Esteban *et al.*, 2002; Heiss, 2003).

In a manner parallel, or even subsequent to the first placement, dichotomic keys provide a fundamental tool for the process of identification, either in terms of families, genera, species of a specific geographical region, and so on. (e.g. Castellarnau, 1880; Jacquiot, 1955; Greguss, 1955; Peraza, 1964; García Esteban and Guindeo, 1988; Schweingruber, 1990).

Finally, specific studies of comparative anatomy and the separation of species of conifers anatomically very close to each other can be used to determine species. (e.g. Castellarnau, 1883; Visscher and Jagels, 2003; Wiedenhoeft *et al.*, 2003).

* Corresponding author: lgesteban@montes.upm.es

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The recent publication of IAWA Committee (2004), with its list of the features of the woods of conifers, will unify the dispersion of identification keys and will be a compulsory reference document with which all keys will have to concur.

The present work, in addition to characterising the xylem of 352 woods of conifers, proposes an open identification key of 81 features.

Materials and Methods

The materials used in this study came from samples from our own wood collection and from the collections of the following centres: Jodrell Kew Botanic Garden; Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria Madrid. Spain; U.S. Forest Products Laboratory, Madison Wisconsin. USA; Wood Research Institute Kyoto University, Kyoto. Japan; National Museum of Natural History. Smithsonian Institution. Botany Department, Washington. USA; Landbouw-universiteit. Department of Forestry, Wagenigen. Holland; Papua New Guinea Forest Research Institute, Papua New Guinea; Universiteit Utrecht. Department of Plant Ecology and Evolutionary Biology, Utrecht. Holland.

The preparation of the microscopic slides followed the traditional methods of softening, cutting, staining and mounting.

The descriptions were made according to the following multiple entry key. For features that correspond to the IAWA Committee (2004), a code has been included below.

Axial tracheids

AT1. *Well-defined growth rings.* IAWA 40. The structural differences between earlywood cells, which show thin walls and wide lumen, and latewood cells, of thick walls and small lumen, establish the differentiation between the growth rings. This is a common feature in **Araucariaceae, Cupressaceae** and **Podocarpaceae.** It is not an excluding feature as its presence only determines the location of the species in a zone with marked periods of vegetative activity and rest.

AT2. *Slightly-defined growth rings.* IAWA 41. The similarity between earlywood and latewood cells makes differentiation between growth rings very difficult. As with the previous feature, its presence conforms to the location of the species in sites where the vegetative period is not interrupted abruptly.

AT3. *Axial tracheids of circular section.* The transverse section of the axial tracheids defines a section with a circular shape. Non-excluding feature.

AT4. *Axial tracheids of polygonal section.* The transverse section of the axial tracheids defines a section with a polygonal shape. It must not be considered an excluding feature in terms of genus but it should be considered so in terms of species, as some genera such as *Araucaria* have both types of section.

AT5. *Resinous axial tracheids.* IAWA 48. These are normal tracheids but they have resin inside. Their access is through the cross-field pits. In microscopic slides they appear with a reddish or black colour in the cross section. This feature has been included in the key in spite of the fact that it has no analytical value because of its constant presence in genera such as *Araucaria* and *Agathis.*

AT6. *Intercellular spaces present.* IAWA 53. This is the space between two or more axial tracheids. It is a feature associated to circular section tracheids, although it is also present in polygonal section tracheids *(Juniperus, Tetraclinis,* etc*).* At least 12 genera present abundant intercellular spaces. Excluding feature.

AT7. *Spiral thickenings present in all the axial tracheids.* IAWA 62. This is a very important analytical feature as its origin is genetic. It is a thickening produced in the secondary wall of the tracheids which develops in the form of a spiral. All the genera of the **Taxaceae** family (*Taxus, Torreya, Amentotaxus* and *Nothotaxus*), with the exception of the *Austrotaxus* genus, have spiral thickenings. Other genera such as *Pseudotsuga, Cephalotaxus, Acmopyle* and *Austrocedrus* also have them. Excluding feature.

AT8. *Spiral thickenings present, but not in all the axial tracheids.* IAWA 63-64. Some genera such as *Larix* or *Pseudotsuga* do not present these thickenings in all the tracheids, but thickenings may appear in a random manner in the whole ring or be confined to either earlywood or latewood. Excluding feature.

AT9. *Bordered pits present on the tangential walls of the axial tracheids.* This is an important analytical feature, as some species do not have it. Its presence indicates a greater degree of evolution of the species. Excluding feature.

AT10. *Uniseriate bordered pits on the radial walls of the axial tracheids.* IAWA 44. The pits are arranged on the radial walls of the tracheids, in both earlywood and latewood, in rows of one series. Excluding feature.

AT11. *Biseriate bordered pits on the radial walls of the axial tracheids.* IAWA 45. The pits are located in pairs on the radial walls along the tracheids, normally in

earlywood, and may also be present simultaneously in uniseriate rows on the tracheids of both earlywood and latewood. This feature only exists in tracheids of large lumen in earlywood, and is not found in the wood near the pith. It is a useful feature for differentiating the sapwood of **alerce** from that of **picea**. Excluding feature.

AT12. *Triseriate or multiseriate bordered pits on the radial walls of the axial tracheids.* IAWA 45. These only appear on the radial face of the axial tracheids and are normally found in the tracheids of earlywood, while the pits form uniseriate rows simultaneously on latewood. For some genera this feature has a fundamental analytical value as it is always present, as is the case of the *Araucaria*, *Agathis, Taxodium* and *Sequoia* genera, among others. Excluding feature.

AT13. *Polygonal bordered pits on the radial walls of the axial tracheids.* IAWA 47. The projection of the pit chamber is a polygon, normally hexagonal. It usually appears in multiseriate formations. This a very important analytical feature as it is exclusive to the genera *Araucaria* and *Agathis.* Excluding feature.

AT14. *Bordered pits with included elliptic aperture.* The projection of the aperture of the chamber appears on the pit as a scratched oval or elliptic border within the greater diameter of the chamber. Non-excluding feature. It is included in the key as it provides information on some provenances.

AT15. *Bordered pits with extended elliptic aperture.* Analytical feature present in some conifer genera. The projection of the aperture of the chamber appears on the pit as a scratched oval or elliptic border which extends beyond the greater diameter of the chamber. Non-excluding feature. It is included in the key as it provides information on some provenances.

AT16. *Pits present borders with radial striation.* This is an infrequent feature which must be observed on the radial section of the axial tracheids. Pits presenting borders with radial striation, like other features, including the trabecula, must not be considered a differentiating feature, but their repeated appearance in some samples, depending on the provenance, means that this feature must be included in the identification key.

AT17. *Scalloped torus.* IAWA 57-58. Exclusive feature of the *Cedrus* genus. In order to observe this feature, magnification over x400 is required. It must be observed on the radial face of the axial tracheids. Excluding feature.

AT18. *Callitroid thickenings.* IAWA 71. Analytical feature which differentiates the *Callitris* genus from the rest of the conifer genera. It must be observed on the radial wall of the axial tracheids. It is a thickening of the secondary wall associated with the bordered pits, located on the external face of the pit chamber. Excluding feature.

AT19. *Bars of Sanio.* Unlike the callitroid thickening, the bars of Sanio or crassulae are thickenings in the primary wall and the middle lamella. They are associated with the bordered pits and they must be observed on the radial wall of the axial tracheids. They have the appearance of bars surrounding the pits. They are located on both uniseriate and biseriate pits, although they are more numerous on biseriate pits. They are considered a differentiating analytical feature of the genera which have them.

AT20. *Trabecula.* Structure with the shape of a cylindrical bar crossing the lumen of the tracheids from one tangential wall to another. When present it generally appears in series and always at the same height. Its origin is not completely defined and cannot be considered as having analytical value, but it is included for information purposes. Non-excluding feature.

AT21. *Crystals present in axial tracheids.* Although this feature serves no analytical purpose due to its random presence, it is included for information purposes as crystals have been found in few conifer species. These may appear as a result of an irregular procedure in the preparation of the samples.

AT22. *Number of tracheids per* $mm^2 < 2{,}000$. This is the number of tracheids present in one mm^2 measured on an area comprising both earlywood and latewood. This should not be considered a differentiating feature. In spite of the fact that the wood of conifers maintains the number of tracheids between the defined limits, this feature should be used with caution due to the occasional modification of light in the tracheids depending on how favourable the conditions of the site are. However, their presence allows for the exclusion of large groups. In this way a *Microbiota* will never be in this group but it will be in the AT24 feature.

AT23. *Number of tracheids per* mm^2 *from 2,000 to 4,000.*

AT24. *Number of tracheids per* $mm^2 > 4{,}000$.

AT25. *Bordered pit diameter on the tangential walls of the axial tracheids* $< 5\ \mu m$. The diameter referred to is the exterior diameter of the pit chamber located on the axial tracheids of earlywood. Excluding feature.

AT26. *Bordered pit diameter on the tangential walls of the axial tracheids* $\geq 5\ \mu m$. Excluding feature.

AT27. *Bordered pit diameter on the radial walls of the axial tracheids* $< 10\ \mu m$. Excluding feature.

AT28. *Bordered pit diameter on the radial walls of the axial tracheids from 10 to 15 μm.* Excluding feature.

AT29. *Bordered pit diameter on the radial walls of the axial tracheids > 15 μm.* Excluding feature.

Axial parenchyma

P1. *Axial parenchyma absent or scarce.* This feature must be reserved for woods without axial parenchyma, or for when their presence is so scarce that the woods can be considered to lack them. Excluding feature. It is very important as an initial element of differentiation of the large groups of conifers of the southern hemisphere and some genera of the northern hemisphere (*Juniperus, Cupressus, Tetraclinis*) from the rest of the conifers.

P2. *Axial parenchyma with smooth transverse walls.* IAWA 76. This feature can be observed in both the tangential section and the radial section. Excluding feature.

P3. *Axial parenchyma with nodular transverse walls.* IAWA 78. This is a differentiating feature, as the genera which have these nodules always have them. They can be observed in both the tangential section and the radial section. In the case of the **Taxodiaceae**, the nodules are a good differentiating feature in terms of genus.

P4. *Axial parenchyma with crystals.* IAWA 123. This must not be considered a differentiating feature, but due to its repeated presence in some species it is included.

P5. *Axial parenchyma with resin.* When the axial parenchyma contains resin, the resin turns a reddish colour in the microscopic slide when safranine is used. It can be observed in both the tangential section and the radial section. Excluding feature. It should be used with care to avoid confusion with the presence of resinous tracheids.

P6. *Diffuse axial parenchyma present.* IAWA 73. The parenchyma cells are diffuse on the entire growth ring, both in earlywood and latewood. This type of parenchyma may be present at the same time as the terminal or metatracheal parenchyma on the same wood. Excluding feature.

P7. *Metatracheal axial parenchyma present.* IAWA 74. The parenchyma is grouped in strips or bands and is located on both earlywood and latewood. The width of the bands is variable, but in general the number of cells in the width is greater in the metatracheal parenchyma than in the terminal parenchyma. It is a very important excluding feature for the recognition of some species belonging to the *Juniperus, Cupressus, Tetraclinis* and *Fokienia* genera, etc.

P8. *Terminal axial parenchyma present.* IAWA 75. This type of parenchyma is present on the limit of the growth ring at the end of latewood. It is usually made up of parenchyma cells lined up from 1 to 3 rows wide. It is a very important excluding feature for the recognition of some species belonging to the *Juniperus, Cupressus, Tetraclinis* and *Fokienia* genera, etc.

Rays

R1. *Uniseriate rays.* IAWA 107. All conifer wood has uniseriate rays of varying height, but this feature has been included in order to differentiate those woods which contain partially biseriate rays. Non-excluding feature.

R2. *Partially biseriate rays.* IAWA 108. There are some conifer genera which habitually have a small biseriate part in their uniseriate rays. In order to establish whether their presence is occasional or constant, the whole tangential section of the preparation must be observed. When their presence is occasional the number is very low. Non-excluding feature.

R3. *Multiseriate rays.* IAWA 110. This feature must be reserved for those genera which contain physiological radial resin canals. They have a fusiform appearance in the tangential section, and the number of cells normally found on the edge of the radial canal on each side of the widest part is from 1 to 3. Excluding feature.

R4. *Ray height from 1 to 15 cells.* IAWA 102-103. This feature must be assigned to those woods in which the majority of the wood rays are from 1 to 15 cells high, although occasionally some of them may exceed the upper limit. Excluding feature. Very important for identifying some of the **Cupressaceae** species.

R5. *Ray height from 16 to 30 cells.* IAWA 104. As in the previous case, this feature is assigned to those woods in which the majority of the rays are from 16 to 30 cells high, although occasionally a small number of them may be either above or below these limits. Excluding feature.

R6. *Ray height over 30 cells.* IAWA 105. This feature must be assigned to those woods which contain a large number of very high rays, with 30 being considered as the threshold. It should be noted that woods which

have this type of rays also possess rays with a small number of cells. The number of long rays, however, is somewhat greater than these. Excluding feature. Very important for excluding some species of the *Abies* genus.

R7. *Number of rays per mm² < 70.* The number of rays per mm² is counted on the tangential section, with a number of measurements taken.

R8. *Number of rays per mm² from 70 to 100.* Excluding feature.

R9. *Number of rays per mm² > 100.* Excluding feature.

R10. *Ray tracheids without spiral thickenings.* Excluding feature. The majority of conifers with tracheids in the wood rays do not have spiral thickenings, but their presence in species of the *Cathaya, Larix, Picea* and *Pseudotuga* genera makes this feature a very important entry in the identification key.

R11. *Ray tracheids with spiral thickenings.* IAWA 69-70. The existence of this feature is of great analytical importance as it is only present in the *Pseudotsuga* and *Cathaya* genera, and in some species of the *Larix* and *Picea* genera.

R12. *Dentate ray tracheids.* IAWA 82-83. This is a very important analytical feature for differentiating between genera. It must be observed in the radial section. Excluding feature.

R13. *Dentate ray tracheids with the height of the dentations < 2.5 µm.* IAWA 82. Excluding feature.

R14. *Dentate ray tracheids with dentations up to the centre of the lumen.* IAWA 82. Excluding feature.

R15. *Dentate ray tracheids with dentations throughout the lumen.* IAWA 83. Sometimes the dentations present in the ray tracheids appear in continuous formations occupying the entire lumen of the tracheids as a result of thickenings between them. When this happens they are termed reticulate dentations. They are characteristic of some species of the *Pinus* genus. Excluding feature.

R16. *Ray parenchyma with smooth axial walls.* IAWA 85. Excluding feature.

R17. *Ray parenchyma with nodular axial walls.* IAWA 86. This is a differentiating feature as some genera always have these nodules, such as *Abies* and *Juniperus*.

R18. *Ray parenchyma with unpitted horizontal walls.* IAWA 87. Excluding feature. To be used in terms of species but not in terms of genus.

R19. *Ray parenchyma with pitted horizontal walls.* IAWA 88. This is also a differentiating feature as the genera which have these nodules always have them. To be used in terms of species but not in terms of genus.

R20. *Ray parenchyma with crystals.* IAWA 122. Although this feature does not have an analytical nature due to its random presence, it is included for information purposes as crystals have been found in few conifer genera (*Abies, Cedrus, Picea, Larix* and *Pseudolarix).*

R21. *Window-like cross field pits.* IAWA 90. Excluding feature.

R22. *Pinoid cross field pits.* IAWA 91. Excluding feature.

R23. *Piceoid cross field pits.* IAWA 92. Excluding feature.

R24. *Cupressoid cross field pits.* IAWA 93. Excluding feature.

R24a. *Araucaroid cross field pits.* IAWA 95. Excluding feature.

R25. *Taxodioid cross field pits.* IAWA 94. Excluding feature.

R26. *1 to 2 pits per cross field.* IAWA 97. Excluding feature.

R27. *3 to 4 pits per cross field.* Excluding feature.

R28. *More than 4 pits per cross field.* Excluding feature.

R29. *Cross field pit diameter from 2 to 6 µm.* Excluding feature.

R30. *Cross field pit diameter from 6 to 11 µm.*

R31. *Cross field pit diameter from 11 to 15 µm.*

R32. *Cross field pit diameter > 15 µm.*

R33. *Crystals present in ray tracheids.* Although this feature serves no analytical purpose due to its random presence, it is included for information purposes as crystals have been found in few conifer species. These may appear as a result of an irregular procedure in the preparation of the samples.

R34. *Ray parenchyma with resin.* Very important excluding feature due to the permanent presence of this feature in many species from the southern hemisphere.

R35. *Marginal ray tracheids.* The position occupied by the tracheids within the ray is marginal, that is, it is on the upper and/or lower extremes of the ray. Non-excluding feature. Species which present this feature do not present the following one, although the inverse may occur.

R36. *Alternate ray tracheids.* These are located alternately between the rows of the radial parenchyma. Non-excluding feature.

R37. *Indentures.* IAWA 89. The indenture (term used by **Peirce** in 1936) is observed on the radial section and refers to the depression observed in some

conifer woods between the transverse wall (horizontal) and the axial or terminal wall of a ray parenchyma cell. This is a particularly interesting feature in the case of **Cupressaceae** and **Taxodiaceae.** They do not occur in **Araucariaceae**. Magnification of at least ×500 is needed in order to observe them. Excluding feature.

Resin canals

RC1. *Resin canals absent.* This feature is applied when no physiological resin canals are observed in the cross section. Also included here are those samples which present resin canals of a traumatic nature, which differ from the former in that they are only present sporadically, not occurring in the previous or following growth rings. The traumatic axial channels tend to be arranged in short tangential series and to form all kinds of cists. The radial traumatic canals are sometimes abnormally wide, with several dozen epithelial cells per canal. Excluding feature.

RC2. *Thin-walled epithelial cell resin canals.* IAWA 117. The thickness of the wall is so slight that when microscopic slides are prepared the cells break or disappear *(Pinus)*. Excluding feature. Very important for the exclusion of some species (*Picea, Cathaya, Larix* genera).

RC3. *Thick-walled epithelial cell resin canals.* IAWA 116. The thickness of the walls is such that once the microscopic slide has been prepared the walls can be seen clearly. Excluding feature.

RC4. *Number of epithelial cells in the axial resin canals < 9.* This is an excluding feature due to its repeated presence in observations carried out on species with thick cells.

RC5. *Number of epithelial cells in the axial resin canals > 9.*

RC6. *Axial resin canal diameter > 60 μm.* The average diameter of the resin canals is measured on the cross section and includes the thickness of the epithelial cells. Non-excluding feature, influenced by the conditions of the site. It is included because it allows for the exclusion of some species which have the following feature (*Pinus canariensis* and *P. oocarpa*).

RC7. *Axial resin canal diameter < 60 μm.*

Results (see table 1)

Table 1

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Abies alba Mill.	1, 4, 8, 9, 10, 23, 26, 28, 29	1, 3, 6	1, 4, 7, 17, 19, 20, 23, 25, 26, 30, 37	1
Abies amabilis Douglas ex J. Forbes	1, 4, 9, 10, 11, 19, 24, 26, 27, 28	1	1, 4, 9, 17, 19, 20, 25, 26, 29, 37	1
Abies balsamea (L.) Mill	1, 4, 9, 10, 11, 21, 22, 23, 26, 28, 29	1, 3, 4, 6	1, 2, 4, 7, 17, 19, 20, 23, 26, 29, 30, 37	1
Abies bracteata (D. Don) A. Poit.	1, 4, 9, 10, 11, 19, 23, 26, 29	1, 3, 6	1, 2, 4, 7, 17, 19, 24, 29, 30, 34, 37	1
Abies cephalonica Loudon	1, 4, 8, 9, 10, 11, 16, 19, 24, 26, 27, 28	3, 6	1, 2, 4, 9, 17, 19, 23, 26, 29, 30, 37	1
Abies chensiensis Tiegh.	1, 4, 9, 10, 21, 24, 26, 28	3, 4, 6	1, 2, 4, 8, 16, 19, 23, 26, 29, 30, 37	1
Abies cilicica (Antoine & Kotschy) Carrière	1, 4, 9, 10, 23, 26, 27, 28	3, 6	1, 4, 9, 17, 19, 23, 26, 29, 30, 37	1
Abies concolor (Gordon) Lindl. ex Hildebr.	1, 4, 9, 10, 24, 26, 28	1	1, 4, 7, 17, 19, 20, 23, 26, 29, 30, 37	1
Abies fabri (Mast.) Craib	1, 4, 9, 10, 24, 26, 28	2, 3, 8	1, 2, 4, 9, 17, 19, 23, 26, 29, 30, 34, 37	1
Abies firma Siebold & Zucc.	1, 4, 10, 11, 19, 24, 26, 27, 28	1	1, 2, 4, 7, 17, 19, 20, 23, 26, 29, 34, 37	1
Abies forrestii Coltm.-Rog.	1, 4, 6, 9, 10, 26, 28, 29	1, 2, 5, 6	1, 4, 17, 19, 22, 26, 30, 34, 37	1
Abies fraseri (Pursh) Poir.	1, 4, 9, 10, 24, 26, 28	3, 6	1, 4, 7, 8, 17, 19, 23, 26, 29, 30, 37	1
Abies grandis (Douglas ex D. Don) Lindl.	1, 4, 9, 10, 23, 26, 28, 29	1, 2, 3, 6	1, 2, 4, 7, 17, 19, 23, 26, 29, 30, 37	1
Abies guatamalensis Rehder, J. Arnold Arbor.	1, 4, 9, 10, 11, 19, 22, 26, 29	1	1, 4, 5, 7, 17, 19, 20, 23, 26, 30, 34, 37	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Abies guatamalensis Rheder var. jaliscana Martínez	1, 4, 10, 11	1	16, 18, 25, 26, 27, 37	1
Abies holophylla Maxim	1, 4, 9, 10, 11, 19, 24, 26, 27, 28	1	1, 4, 9, 17, 19, 20, 23, 26, 29, 30, 34, 37	1
Abies homolepis Siebold & Zucc. var. umbellata (Mayr) E. H. Wilson	1, 4, 9, 10, 24, 26, 28	1, 2	1, 4, 9, 17, 19, 23, 25, 26, 29, 37	1
Abies kawakamii (Hayata) T. Ito	1, 4, 9, 10, 23, 24, 26, 28	1	1, 4, 7, 17, 19, 23, 26, 29, 30, 37	1
Abies koreana E. H. Wilson	1, 4, 6, 9, 10, 23, 24, 26, 28,	3, 6	1, 4, 8, 17, 19, 23, 26, 29, 37	1
Abies lasiocarpa (Hook.) Nutt.	1, 4, 9, 10, 20, 22, 23, 26, 28, 29	1	1, 4, 5, 7, 17, 19, 23, 25, 26, 29, 30, 37	1
Abies magnifica A. Murray bis	1, 4, 9, 10, 24, 26, 27, 28	1, 3, 4, 6	1, 4, 8, 17, 19, 23, 26, 29, 35, 37	1
Abies nephrolepis (Trautv. ex Maxim.) Maxim.	1, 4, 9, 10, 14, 16, 21, 24, 26, 27, 28	1	1, 4, 9, 17, 19, 23, 26, 29, 30, 34, 37	1
Abies nordmaniana (Steven) Spach	1, 4, 9, 10, 21, 24, 26, 27, 28	1, 3, 6	1, 4, 9, 17, 19, 23, 26, 29, 37	1
Abies numidica de Lannoy ex Carrière	1, 4, 9, 10, 14, 24, 26, 28	1, 2, 3, 4, 8	1, 4, 9, 17, 19, 23, 25, 26, 29, 30, 37	1
Abies pindrow (Royle ex D. Don) Royle	1, 4, 6, 9, 10, 24, 26, 27, 28	1	1, 4, 7, 17, 19, 23, 26, 29, 37	1
Abies pinsapo Boiss.	1, 4, 9, 10, 21, 24, 26, 27, 28	1, 3, 4, 6	1, 4, 9, 17, 19, 23, 26, 29, 30, 37	1
Abies procera Rehder	1, 4, 9, 10, 20, 23, 26, 28, 29	1	1, 2, 4, 5, 7, 17, 19, 23, 26, 29, 30, 37	1
Abies religiosa (Kunth) Schltdl. & Cham.	1, 4, 7, 9, 10, 11, 16, 19, 22, 26, 29	1, 2	1, 2, 7, 17, 19, 20, 23, 26, 27, 30, 34, 37	1
Abies sachalinensis (F. Schmidt) Mast.	1, 4, 9, 10, 11, 16, 19, 24, 26, 29	1	1, 4, 7, 17, 19, 23, 26, 27, 29, 34, 37	1
Abies sibirica Ledeb.	1, 4, 9, 10, 24, 26, 28	1, 3, 5, 6	1, 4, 8, 9, 17, 19, 23, 26, 29, 37	1
Abies spectabilis (D. Don) Spach	1, 4, 6, 9, 10, 23, 26, 29	1, 3, 6	1, 2, 4, 7, 17, 19, 23, 26, 29, 30, 37	1
Abies veitchii Lindl.	1, 3, 4, 9, 10, 21, 24, 26, 28	1, 2, 3, 4, 6	1, 4, 9, 17, 19, 23, 26, 33, 37	1
Acmopyle pancheri (Brongn. & Gris) Pilg. in Engler & Prantl	1, 4, 7, 9, 10, 23, 26, 28	2, 5, 6, 7	1, 4, 8, 9, 16, 18, 25, 26, 30, 31, 34	1
Actinostrobus acuminatus Parl.	1, 4, 9, 10, 11, 14, 24, 26, 28	2, 5, 6	1, 4, 8, 9, 16, 18, 24, 26, 27, 28, 29, 30, 34	1
Actinostrobus pyramidalis Miq. in Lehmann	1, 4, 9, 10, 11, 24, 26, 28	2, 5, 6	1, 4, 8, 16, 18, 24, 26, 27, 28, 30, 34	1
Afrocarpus daweii (Stapf) C. N. Page	2, 4, 6, 10, 11	2, 5, 6	1, 16, 18, 24, 26, 34	1
Afrocarpus falcatus (Thunb.) C. N. Page	1, 4, 9, 10, 11, 23, 26, 27, 28	2, 7, 8	1, 4, 9, 16, 18, 24, 26, 30	1
Afrocarpus gracilior (Pilg.) C. N. Page	2, 4, 9, 10, 11, 14, 22, 26, 28	2, 5	1, 4, 9, 16, 18, 24, 26, 30, 31, 34	1
Afrocarpus mannii (Hook. f.) C. N. Page	2, 4, 9, 10, 22, 26, 28, 29	2, 6	1, 4, 9, 16, 18, 24, 26, 30,	1
Afrocarpus usambarensis (Pilg.) C. N. Page	2, 4, 9, 10, 11, 19, 22, 26, 29	2, 5, 6	1, 4, 9, 16, 18, 24, 26, 30, 31, 34	1
Agathis australis (D. Don) Loudon	1, 4, 9, 10, 11, 12, 13, 14, 20, 22, 26, 27	1	1, 4, 7, 16, 18, 24a, 27, 28, 30, 31, 34	1
Agathis celebica (Koord.) Warb.	2, 3, 4, 6, 9, 10, 11, 12, 13, 22, 26, 27	1	1, 4, 7, 16, 18, 24a, 26, 27, 28, 30, 34	1
Agathis dammara (Lamb.) Rich. & A. Rich.	2, 3, 4, 9, 10, 11, 13, 14, 23, 26, 27	1	1, 4, 8, 16, 18, 24a, 26, 27, 30, 34	1
Agathis labillardieri Warb.	2, 4, 10, 13, 22, 28, 29	1	1, 4, 7, 16, 18, 24a, 26, 27, 30, 34	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Agathis lanceolata (Lindl. ex Sebert & Pancher) Warb.	1, 4, 9, 10, 11, 12, 13, 22, 26, 29	1, 2, 5, 6	1, 2, 4, 7, 16, 18, 24a, 28, 30, 31, 34	1
Agathis microstachya J. F. Bailey & C. T. White	2, 4, 8, 9, 10, 11, 12, 13, 14, 22, 26, 28	1, 2, 5, 6	1, 2, 4, 5, 7, 16, 18, 24a, 26, 27, 30, 34	1
Agathis moorei (Lindl.) Mast.	2, 4, 6, 9, 10, 11, 13, 15, 23, 26, 28, 29	1, 5, 6	1, 2, 4, 7, 16, 18, 24a, 27, 30, 31, 34	1
Agathis ovata (C. Moore ex Veillard) Warburg	1, 3, 4, 5, 9, 10, 11, 13, 22, 26, 28	1, 5, 6	1, 4, 8, 16, 18, 24a, 26, 27, 28, 30	1
Agathis philippinensis Warb.	1, 4, 9, 10, 11, 12, 13, 14, 22, 26, 29	1, 2	1, 4, 7, 16, 18, 24a, 27, 31, 34	1
Agathis robusta (C. Moore ex F. Muell.) F. Muell.	2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 20, 23, 26, 27, 28	1, 2, 5, 6	1, 4, 9, 16, 18, 24a, 26, 27, 28, 30, 34	1
Agathis vitiensis (Seem.) Benth. & Hook.	2, 4, 9, 10, 11, 13, 14, 22, 26, 28	1, 2, 5, 6	1, 4, 5, 7, 16, 17, 18, 24a, 27, 28, 30, 34	1
Amentotaxus argotaenia (Hance) Pilg. var. argotaenia	2, 4, 8, 10, 28	2, 3, 5, 6	1, 4, 16, 18, 24, 26, 30, 34, 37	1
Araucaria angustifolia (Bertol.) Kuntze	2, 4, 9, 10, 11, 14, 20, 22, 26, 28,	1	1, 4, 7, 16, 18, 24a, 26, 27, 28, 30	1
Araucaria araucana (Molina) K. Koch	1, 3, 4, 9, 10, 11, 22 23, 26, 27, 28, 29	1	1, 4, 7, 8, 16, 18, 24a, 26, 27, 28, 29, 30	1
Araucaria bidwillii Hook.	2, 4, 10, 11, 13, 22, 28	1, 2, 6	1, 2, 4, 7, 16, 18, 24a, 26, 27, 28, 29, 30, 31, 34	1
Araucaria columnaris (J. R. Forst) Hook.	2, 4, 9, 10, 11, 13, 22, 26, 28, 29	1	1, 4, 7, 16, 18, 24a, 26, 27, 30, 31	1
Araucaria cunninghamii Aiton ex D. Don var. papuana Lauterb.	2, 3, 4, 9, 10, 11, 13, 22, 28	1	1, 4, 7, 16, 18, 24a, 27, 28, 30	1
Araucaria cunninghamii Aiton ex D. Don in Lambert	1, 4, 9, 10, 11, 12, 13, 20, 23, 26, 28	1	1, 4, 7, 16, 18, 24a, 27, 28, 30, 34	1
Araucaria heterophylla (Salisb.) Franco	1, 4, 10, 11, 13, 22, 28	1	1, 4, 7, 16, 18, 24a, 26, 27, 29, 34	1
Araucaria humboldtensis J. Buchholz	2, 3, 4, 9, 10, 11, 14, 22, 26, 28,	1	1, 4, 7, 16, 18, 24a, 26, 27, 30	1
Araucaria hunsteinii K. Schum.	1, 3, 10, 11, 12, 13, 22, 28, 29	2, 6	1, 2, 4, 5, 7, 16, 18, 24a, 26, 27, 30, 31, 34	1
Araucaria montana Brongn. & Gris.	2, 3, 4, 5, 9, 10, 11, 12, 13, 22, 26, 28	1	1, 4, 7, 16, 18, 24a, 28, 30, 31	1
Araucaria muelleri (Carrière) Brongn. & Gris	2, 4, 5, 9, 10, 11, 13, 14, 20, 23, 26, 28	1	1, 4, 7, 16, 18, 24a, 27, 28, 30, 34	1
Araucaria rulei F. Muell.	1, 4, 5, 9, 10, 11, 13, 23, 26, 27, 28	1	1, 4, 7, 16, 18, 24a, 26, 27, 28, 29, 30	1
Araucaria subulata Vieill.	2, 4, 9, 10, 11, 13, 14, 22, 26, 27, 28	1	1, 4, 7, 16, 18, 24a, 28, 30	1
Athrotaxis laxifolia Hook.	1, 4, 9, 10, 22, 26, 28	2, 5, 6	1, 4, 8, 16, 17, 18, 24, 26, 29, 34	1
Athrotaxis selaginoides D. Don	1, 4, 9, 10, 11, 20, 22, 26, 28	2, 5, 8	1, 2, 4, 7, 16, 18, 23, 26, 30,	1
Austrocedrus chilensis (D. Don) Pic. Serm. & Bizarri.	1, 4, 9, 10, 20, 22, 26, 28	2, 5, 6	1, 2, 4, 7, 16, 18, 24, 26, 29, 34	1
Austrotaxus spicata R. H. Compton.	2, 4, 9, 10, 15, 23, 26, 28	2, 3, 5, 6	1, 4, 8, 16, 18, 24, 26, 30, 34	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Callitris columellaris F. Muell.	2, 4, 9, 10, 11, 16, 18, 23, 26, 28, 29	2, 3	1, 4, 7, 16, 18, 19, 23, 24, 26, 30	1
Callitris oblonga Rich. & A. Rich. in A. Richard (ed.)	2, 4, 9, 10, 14, 24, 26, 27	2, 3, 6	1, 2, 4, 9, 16, 18, 23, 24, 26, 29	1
Callitris preissii Miq. in Lehmann	2, 4, 9, 10, 14, 18, 22, 23, 26, 29	2	1, 2, 4, 7, 16, 18, 24, 26, 27, 30	1
Callitris rhomboidea R. Br. ex Rich. & A. Rich. in A. Richard (ed.)	2, 4, 9, 10, 11, 14, 16, 19, 22, 26, 29	2, 5, 6	1, 4, 5, 7, 16, 18, 23, 24, 26, 30, 34	1
Callitris sulcata (Parl.) Schltr.	2, 3, 4, 9, 10, 11, 14, 22, 26, 28, 29	2, 5	1, 4, 7, 16, 18, 24, 26, 30, 31	1
Callitris verrucosa (A. Cunn. ex Endl.) F. Muell	2, 4, 9, 10, 18, 23, 26, 28,	2, 5, 7, 8	1, 4, 7, 16, 18, 24, 26, 30, 34	1
Calocedrus decurrens (Torr.) Florin	1, 4, 9, 10, 24, 26, 27, 28	3, 5, 6, 7	1, 2, 4, 9, 17, 19, 24, 26, 27, 29, 37	1
Calocedrus formosana (Florin) Florin	1, 4, 9, 10, 23, 26, 28	3	1, 2, 4, 8, 17, 19, 24, 26, 29, 30	1
Calocedrus macrolepis Kurz.	2, 4, 9, 10, 23, 26, 27, 28	3	1, 4, 9, 16, 18, 19, 24, 26, 29, 30, 37	1
Cathaya argyrophylla Chun & Kuang	2, 7, 10, 29	1, 3, 8	1, 2, 3, 4, 11, 12, 13, 17, 18, 23, 26, 27, 28, 35	3, 4, 6, 7
Cedrus atlantica (Endl.) Manetti ex Carrière	1, 4, 9, 10, 11, 17, 23, 26, 28, 29	2, 3, 6	1, 4, 7, 10, 17, 19, 23, 26, 27, 29, 30, 35, 37	1
Cedrus brevifolia (Hook. f.) A. Henry in Elwes & Henry	1, 4, 9, 10, 17, 22, 26, 28, 29	1, 3, 6	1, 2, 4, 7, 10, 17, 19, 23, 26, 27, 29, 30, 33, 35, 37	1
Cedrus deodara (Roxb.) G. Don in Loudon	1, 4, 9, 10, 17, 23, 26, 28, 29	3, 6	1, 2, 4, 7, 10, 17, 19, 23, 25, 26, 29, 30, 33, 35, 37	1
Cedrus libani A. Rich. in Bory	1, 3, 4, 9, 10, 17, 24, 26, 27, 28	3, 6	1, 2, 4, 8, 9, 10, 17, 19, 23, 26, 29, 30, 35, 37	1
Cephalotaxus fortunei Hook.	1, 4, 7, 10, 23, 24, 28	2, 3, 6	1, 2, 4, 9, 16, 19, 24, 26, 29, 30, 37	1
Cephalotaxus harringtonii (Knight ex J. Forbes) K Koch var. harringtonii.	1, 4, 7, 10, 24, 27	2, 5, 6	1, 2, 4, 9, 16, 18, 23, 26, 29, 30, 34, 37	1
Cephalotaxus harringtonii (Knight ex J.Forbes) K. Koch	2, 4, 6, 7, 10, 14, 23, 27	2, 5, 6	1, 4, 9, 16, 19, 24, 26, 30, 37	1
Cephalotaxus oliveri Mast.	1, 3, 4, 7, 9, 10, 23, 26, 28	1	1, 2, 4, 7, 16, 19, 24, 26, 29, 30, 37	1
Chamaecyparis formosensis Matsum.	1, 4, 9, 10, 22, 26, 28,	2, 3, 6	1, 2, 4, 7, 16, 18, 24, 25, 26, 29, 30	1
Chamaecyparis lawsoniana (A. Murray bis) Parl.	1, 3, 6, 9, 10, 24, 26, 27, 28	2, 3, 5, 8	1, 2, 4, 9, 16, 17, 18, 24, 25, 26, 29	1
Chamaecyparis nootkatensis (D. Don) Spach	1, 4, 9, 10, 20, 24, 26, 27, 28	2, 3, 5, 8	1, 4, 9, 16, 19, 24, 26, 29, 30	1
Chamaecyparis obtusa (Siebold & Zucc.) Endl.	1, 4, 9, 10, 24, 26, 27, 28	3, 5, 8	1, 2, 4, 7, 16, 18, 19, 24, 26, 29, 30, 37	1
Chamaecyparis pisifera (Siebold & Zucc.) Endl.	1, 4, 9, 10, 24, 26, 27, 28	2, 3	1, 4, 9, 16, 18, 19, 24, 26, 27, 29, 37	1
Chamaecyparis thyoides (L.) Britton	1, 4, 9, 10, 22, 26, 29	2, 3, 5, 8	1, 4, 8, 16, 18, 24, 26, 27, 29, 30, 37	1
Cryptomeria japonica (Thunb. ex L. f.) D. Don	1, 4, 9, 10, 23, 26, 28,	2, 3, 5, 7, 8	1, 4, 5, 7, 16, 18, 24, 25, 26, 30, 34	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Cunninghamia lanceolata (Lamb.) Hook.	1, 4, 9, 10, 11, 22, 26, 28	2, 3, 6	1, 2, 4, 8, 9, 16, 18, 25, 26, 27, 29, 30	1
Cupressus arizonica Greene	2, 4, 9, 10, 14, 23, 26, 27, 28	2, 3, 5, 6	1, 2, 4, 9, 16, 17, 19, 24, 26, 29, 30, 37	1
Cupressus arizonica Greene var. stephensonii (C. B. Wolf) Little	1, 3, 4, 6, 9, 10, 24, 25, 26, 27,	2, 5, 6, 7	1, 4, 8, 16, 17, 19, 24, 26, 29, 30	1
Cupressus bakeri Jeps.	1, 4, 8, 9, 10, 23, 26, 28	3, 5, 6	1, 2, 4, 7, 17, 18, 24, 26, 30, 34, 37	1
Cupressus duclouxiana Hickel in Camus	1, 4, 9, 10, 24, 26, 27, 28	2, 5, 6	1, 2, 4, 9, 16, 17, 18, 19, 24, 26, 27, 29, 30, 37	1
Cupressus dupreziana A. Camus	2, 4, 9, 10	1, 2, 5, 6	1, 16, 18, 24, 26, 37	1
Cupressus funebris Endl.	1, 4, 10, 24, 27, 28, 29	2, 3, 6	1, 4, 8, 17, 19, 24, 26, 27, 29, 30	1
Cupressus goveniana Gordon	1, 4, 9, 10, 23, 26, 28	2, 3, 6	1, 2, 4, 8, 16, 17, 19, 24, 26, 30, 34, 37	1
Cupressus goveniana Gordon var. abramsiana (C. B. Wlof) Little.	1, 4, 9, 10, 24, 26, 28	2, 5, 6	1, 4, 8, 16, 18, 20, 24, 26, 29, 37	1
Cupressus goveniana Gordon var. goveniana	1, 3, 4, 9, 9, 10, 23, 26, 27	2, 3, 5, 6	1, 2, 4, 7, 16, 19, 24, 26, 29, 34, 37	1
Cupressus guadalupensis S. Watson	1, 4, 9, 10, 23, 24, 26, 27, 28	2, 5, 7, 8	1, 4, 8, 17, 18, 24, 26, 29, 30, 34, 37	1
Cupressus lusitanica Mill var. benthamii (Endl.) Carrière	1, 4, 9, 10, 20, 24, 26, 28, 29	3, 5, 7, 8	1, 2, 4, 5, 9, 17, 18, 24, 26, 29, 30, 34, 37	1
Cupressus lusitanica Mill var. lusitanica	2, 4, 6, 9, 10, 22, 28, 29	1, 3, 6	1, 2, 4, 16, 17, 18, 24, 26, 27, 37	1
Cupressus macnabiana A. Murray bis	1, 4, 9, 10, 24, 26, 28	2, 3, 5, 6, 7	1, 4, 8, 16, 17, 19, 24, 26, 29, 37	1
Cupressus macrocarpa Hartw. ex Gordon	2, 4, 9, 10, 24, 26, 27, 28	2, 3, 5, 7, 8	1, 2, 4, 9, 16, 17, 19, 24, 26, 29, 30, 37	1
Cupressus sempervirens L.	1, 3, 4, 9, 8, 9, 10, 14, 24, 26, 27, 28	2, 5, 7, 8	1, 2, 4, 9, 16, 17, 19, 24, 26, 30, 34, 37	1
Cupressus torulosa D. Don in Lambert	2, 4, 9, 10, 23, 26, 27, 28	3, 6	1, 2, 4, 8, 17, 19, 24, 26, 30, 37	1
Dacrycarpus dacrydioides (A. Rich.) de Laub.	2, 4,10, 11, 14, 22, 28, 29	2, 6	1, 2, 4, 5, 6, 7, 8, 16, 18, 24, 26, 30	1
Dacrycarpus imbricatus (Blume) de Laub. var. imbricatus	2, 4, 9, 10, 11, 23, 26, 28	1, 2, 5	1, 2, 4, 9, 16, 18, 24, 26, 30	1
Dacrydium araucarioides Brongn. & Gris	2, 4, 9, 10, 23, 26, 28, 29	2, 6	1, 4, 8, 9, 16, 18, 24, 26, 30	1
Dacrydium balansae Brongn. & Gris	2, 4, 9, 10, 11, 22, 26, 27	2, 6	1, 2, 4, 5, 7, 16, 18, 24, 26, 29, 30	1
Dacrydium cupressinum Sol. ex G. Forst.	2, 4, 9, 10, 14, 22, 26, 29	2, 5, 6	1, 4, 5, 7, 16, 18, 24, 26, 30, 31	1
Dacrydium elatum (Roxb.) Wall. ex Hook.	2, 4, 9, 10, 11, 20, 22, 26, 29	1, 2, 5, 6	1, 4, 8, 9, 16, 18, 24, 26, 31	1
Diselma archeri Hook. f.	1, 4, 10, 24, 28	2, 3, 5, 6, 7	1, 4, 9, 16, 17, 19, 24, 26, 29, 34, 37	1
Falcatifolium taxoides (Brongn. & Gris) de Laub.	2, 4, 10, 23, 28, 29	2, 6	1, 2, 4, 8, 16, 18, 24, 26, 30, 31	1
Fitzroya cupressoides (Molina) I. M. Johnst.	1, 4, 9, 10, 22, 26, 28, 29	2, 3, 5, 6, 7,	1, 4, 7, 17, 19, 24, 26, 27, 30, 34, 37	1
Fokienia hodginsii (Dunn) A. Henry & H. H. Thomas	1, 4, 9, 10, 11, 20, 24, 26, 27, 28	2, 3, 5, 6, 7	1, 2, 4, 7, 16, 18, 19, 24, 26, 29, 30, 37	1
Glyptostrobus pensilis (Stauton ex D. Don) K. Koch	1, 4, 9, 10, 11, 19, 20, 23, 26, 28	3, 5, 6	1, 4, 5, 8, 16, 18, 24, 25, 26, 27, 30, 34	1
Juniperus angosturana R. P. Adams	1, 4, 9, 10, 23, 28, 29	1, 6	1, 2, 4, 17, 19, 24, 26, 27, 37	1
Juniperus ashei J. Buchholz	1, 4, 6, 9, 10, 23, 26, 28	2, 3, 5, 6	1, 4, 8, 9, 17, 19, 24, 26, 29, 34, 37	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Juniperus bermudiana L.	1, 4, 9, 10, 24, 26, 27, 28	2, 3, 5, 6	1, 4, 8, 9, 17, 19, 24, 26, 29, 30, 34, 37	1
Juniperus californica Carrière	1, 4, 5, 9, 10, 24, 26, 28	2, 3, 6	1, 4, 9, 17, 18, 24, 26, 29, 30, 37	1
Juniperus cedrus Webb & Berthel.	1, 4, 9, 10, 23, 28	2, 5, 6	1, 4, 8, 9, 16, 18, 20, 24, 26, 27, 30, 34, 37	1
Juniperus chinensis L.	1, 4, 9, 10, 24, 26, 27, 28	3, 5, 6, 7	1, 4, 8, 17, 19, 24, 26, 27, 30, 34, 37	1
Juniperus communis L.	1, 4, 6, 9, 10, 24, 25, 26, 28	2, 3, 5, 6	1, 2, 4, 8, 9, 17, 19, 24, 26, 30, 37	1
Juniperus convallium Rehder & E. H. Wilson in Sargent	1, 4, 6, 9, 10, 24, 26, 27, 28	3, 5, 6	1, 4, 9, 17, 19, 24, 26, 27, 29, 30, 37	1
Juniperus deppeana Steud.	1, 4, 6, 9, 10, 24, 26, 28	2, 3, 5, 6	1, 2, 4, 9, 17, 19, 24, 26, 29, 30, 37	1
Juniperus drupacea Labill	1, 4, 9, 10, 24, 26, 27, 28	2, 5, 6	1, 4, 9, 17, 19, 24, 26, 29, 30, 37	1
Juniperus excelsa M.-Bieb.	1, 4, 6, 9, 10, 24, 26, 27	2, 3, 6	1, 4, 9, 17, 18, 19, 24, 26, 29, 37	1
Juniperus excelsa M.-Bieb. subsp. excelsa	1, 4, 9, 10, 24, 26, 27	2, 3, 5, 7, 8	1, 4, 9, 17, 19, 24, 26, 29, 34, 37	1
Juniperus foetidissima Willd.	1, 4, 6, 9, 10, 24	2, 3, 5, 6	1, 2, 4, 9, 17, 19, 24, 26, 27, 29, 34, 37	1
Juniperus formosana Hayata	1, 4, 6, 9, 10, 24, 26, 27, 28	2, 3, 5, 6	1, 4, 7, 8, 17, 19, 24, 26, 29, 30, 37	1
Juniperus horizontalis Moench	1, 4, 9, 10, 24, 26, 27, 28	2, 3, 6	1, 4, 9, 17, 19, 24, 26, 27, 29, 30, 37	1
Juniperus komarovii Florin	1, 4, 6, 9, 10, 24, 26, 27, 28	2, 3, 5, 6, 7	1, 2, 4, 9, 17, 19, 24, 26, 27, 29, 37	1
Juniperus monosperma (Engelm.) Sarg.	1, 4, 6, 9, 10, 14, 24, 26, 27, 28	2, 3, 5, 7, 8	1, 4, 9, 17, 19, 24, 26, 29, 30, 37	1
Juniperus occidentalis Hook.	1, 4, 9, 10, 22, 23, 26, 28, 29	2, 3, 5, 6, 7	1, 2, 4, 7, 16, 17, 19, 24, 26, 29, 30, 37	1
Juniperus oxycedrus L.	1, 4, 9, 10, 14, 24, 26, 27, 28	3, 7, 8	1, 4, 8, 9, 17, 19, 24, 26, 29, 30, 34, 37	1
Juniperus oxycedrus L. subsp. macrocarpa (Sibth. & Sm.) Neilr.	1, 4, 9, 10, 24, 26, 27, 28	2, 3, 6	1, 4, 9, 17, 19, 24, 26, 30, 37	1
Juniperus phoenicia L.	1, 4, 9, 10, 14, 24, 26, 27, 28	2, 3, 6,	1, 4, 8, 9, 17, 19, 24, 26, 29, 30, 34, 37	1
Juniperus pinchotii Sudw.	1, 4, 6, 9, 10, 23, 26, 28	1, 3, 6, 7	1, 4, 9, 17, 19, 24, 26, 29, 30, 37	1
Juniperus pingii W. C. Cheng ex Ferré	1, 4, 6, 9, 10, 24, 26, 27, 28	3	1, 4, 9, 17, 18, 19, 24, 26, 29, 37	1
Juniperus procera Hochst. ex Endl.	1, 4, 6, 9, 10, 24, 26, 27, 28	2, 3, 6	1, 4, 9, 16, 17, 19, 24, 26, 27, 29, 37	1
Juniperus przewalskii Kom.	1, 4, 6, 9, 10, 24, 26, 27	2, 3, 6	1, 4, 9, 17, 19, 24, 26, 27, 29, 37	1
Juniperus pseudosabina Fisch. & C. A. Mey.	1, 4, 6, 9, 10, 23, 26, 27, 28	1	1, 4, 8, 17, 19, 24, 26, 29,	1
Juniperus recurva Buch.-Ham. ex D. Don	1, 4, 6, 9, 10, 23, 26, 28	3, 5, 6	1, 4, 8, 17, 19, 24, 26, 29, 37	1
Juniperus rigida Siebold & Zucc.	1, 4, 6, 9, 10, 23, 26, 28, 29	2, 3, 5, 6	1, 4, 8, 16, 17, 18, 19, 24, 26, 29, 30, 37	1
Juniperus sabina L.	1, 4, 9, 10, 24, 26, 27, 28	2, 3, 5, 6	1, 4, 9, 17, 19, 24, 26, 29, 30, 34, 37	1
Juniperus saltuaria Rehder & E. H. Wilson in Sargent	1, 3, 4, 6, 9, 10, 24, 26, 27	2, 3, 5,	1, 2, 4, 9, 17, 19, 24, 26, 27, 29, 37	1
Juniperus scopulorum Sarg.	1, 4, 9, 10, 23, 26, 28,	2, 3, 5, 7, 8	1, 4, 8, 17, 19, 24, 26, 29, 37	1
Juniperus squamata Buch.-Ham. ex D. Don in Lambert	1, 4, , 9, 10, 14, 24, 26, 27, 28	2, 3, 5, 6	1, 4, 9, 17, 19, 24, 26, 29, 37	1
Juniperus thurifera L.	1, 3, 4, 6, 9, 10, 24, 26, 27, 28	2, 3, 5, 7, 8	1, 4, 9, 16, 17, 19, 24, 26, 27, 29, 30	1
Juniperus tibetica Kom.	1, 4, 9, 9, 10, 24, 26, 28	2, 3, 5, 7, 8	1, 2, 4, 9, 17, 19, 24, 26, 29, 30, 37	1
Juniperus virginiana L.	1, 4, 6, 9, 10, 16, 23, 25, 26, 28	2, 3, 5, 6, 7	1, 4, 9, 16, 17, 19, 24, 26, 29, 34, 37	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Juniperus virginiana L. var. silicicola (Small) E. Murray	1, 4, 9, 10, 24, 26, 28,	2, 3, 5, 6	1, 2, 4, 7, 8, 16, 17, 19, 24, 26, 29, 37	1
Keteleeria davidiana (Bertrand) Beissn.	1, 3, 4, 9, 10, 11, 22, 23, 26, 28, 29	2, 3, 6	1, 2, 4, 7, 17, 19, 23, 26, 29, 30, 37	1
Keteleeria fortunei (A. Murray bis) Carrière	1, 4, 9, 10, 11, 14, 19, 23, 26, 28, 29	1, 3, 6	1, 2, 4, 7, 8, 17, 19, 23, 26, 29, 37	3, 4, 7
Lagastrobos franklinii (Hook. f.= Quinn	1, 4, 9, 9, 10, 22, 23 26, 29	2, 6	1, 4, 7, 16, 18, 25, 26, 32	1
Larix decidua Mill.	1, 4, 9, 10, 11, 20, 23, 26, 28, 29	1, 3, 6	1, 2, 3, 4, 8, 10, 17, 18, 19, 23, 25, 27, 29, 30, 35, 37	3, 5, 7
Larix gmelinii (Rupr.) Kuzen.	1, 4, 9, 10, 11, 19, 20, 22, 26, 29	1, 3, 6	1, 3, 4, 7, 10, 17, 18, 23, 27, 30, 34, 36, 37	3, 4, 7
Larix kaempferi (lamb.) Carrière	1, 4, 9, 10, 11, 19, 23, 26, 28, 29	1, 3, 6	1, 3, 4, 7, 10, 17, 18, 23, 26, 27, 29, 30, 34, 36, 37	3, 4, 7
Larix laricina (Du Roi) K. Koch	1, 4, 9, 10, 11, 24, 26, 28, 29	1, 3, 6	1, 3, 7, 10, 12, 13, 17, 19, 23, 27, 29, 30, 35, 37	3, 5, 7
Larix lyallii Parl.	1, 4, 9, 10, 11, 23, 26, 28, 29	1, 3, 6	1, 3, 4, 7, 11, 17, 19, 23, 27, 28, 29, 30, 35, 37	3, 5, 7
Larix occidentalis Nutt.	1, 4, 8, 9, 10, 11, 19, 22, 26, 29	1, 3, 6	1, 3, 4, 7, 10, 12, 14, 17, 19, 23, 28, 29, 30, 35, 37	3, 5, 6
Larix potaninii Batalin	1, 4, 9, 10, 23, 26, 28, 29	3	1, 2, 3, 4, 5, 7, 11, 12, 13, 17, 19, 23, 25, 26, 29, 35, 37	3, 7
Larix sibirica Ledeb.	1, 4, 9, 10, 24, 26, 28	1, 2, 3, 6	1, 2, 3, 4, 7, 10, 17, 19, 25, 27, 29, 30, 35, 37	3, 5, 7
Libocedrus austrocaledonica Brongn. & Gris	2, 4, 9, 9, 10, 14, 23, 26, 28	2, 5, 6	1, 4, 7, 16, 18, 24, 26, 30, 31,	1
Libocedrus bidwilii Hook.	1, 4, 9, 10, 11, 19, 23, 25, 26, 27, 28	2, 3, 5, 6	1, 4, 7, 16, 18, 24, 26, 27, 29, 34	1
Libocedrus plumosa (D. Don) Sarg.	1, 4, 9, 9, 10, 16, 19, 23, 26, 27, 28	2, 5, 6	1, 4, 9, 16, 18, 24, 26, 27, 29, 30, 34	1
Manoao colensoi (Hook.) Molloy	2, 4, 9, 10, 14, 20, 23, 26, 28	1	1, 4, 8, 9, 16, 18, 25, 26, 32,	1
Metasequoia glyptostroboides Hu & W. C. Cheng	1, 4, 9, 10, 11, 19, 20, 22, 26, 29	2, 3, 5, 6	1, 2, 4, 5, 7, 16, 18, 19, 25, 26, 31	1
Microbiota decussata Kom.	1, 4, 9, 10, 14, 24, 26, 28	2, 3, 5, 7, 8	1, 4, 8, 16, 18, 19, 24, 26, 29, 30	1
Microcachrys tetragona (Hook.) Hook. f.	1, 4, 9, 10, 11, 20, 23, 26, 28,	1, 5, 6	1, 2, 4, 8, 9, 16, 18, 25, 26, 30, 31, 34	1
Nageia wallichiana (C. Presl) Kuntze	2, 4, 9, 10, 11, 22, 26, 29	2, 5, 6	1, 4, 7, 16, 18, 25, 26, 30, 31, 32, 34	1
Neocallitropsis pancheri (Carrière) de Laub.	2, 3, 4, 9, 9, 10, 11, 15, 19, 22, 26, 28, 29	1, 2, 5, 6	1, 4, 7, 16, 18, 24, 26, 30, 31	1
Papuacedrus papuana (F. Muell.) H. L. Li	2, 4, 7, 10, 11	3, 5, 6	1, 2, 4, 16, 24, 26, 34	1
Phyllocladus hypophyllus Hook.	2, 3, 4, 10, 11, 28, 29	2, 5, 6	1, 4, 16, 18, 24, 26	1
Picea abies (L.) H. Karst.	1, 4, 6, 8, 9, 10, 11, 19, 24, 26, 28	1	1, 2, 3, 4, 7, 10, 12, 13, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea asperata Mast.	1, 3, 4, 8, 9, 10, 24, 26, 28, 29	1	1, 2, 3, 4, 8, 10, 12, 13, 17, 19, 23, 26, 27, 29, 35, 37	3, 5, 7

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Picea brachytyla (Franch.) E. Pritz	1, 4, 6, 7, 9, 10, 24, 26, 27, 28	1	1, 4, 8, 11, 12, 13, 17, 19, 23, 26, 29, 35, 37	3, 5, 7
Picea breweriana S. Watson	1, 4, 7, 9, 10, 23, 26, 27, 28	1	1, 2, 3, 4, 8, 10, 17, 19, 23, 26, 27, 29, 35, 37	3, 5, 7
Picea engelmannii Parry ex. Engelm.	1, 4, 8, 9, 10, 16, 24, 26, 27, 28	1	1, 2, 3, 4, 9, 10, 17, 19, 20, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea glauca (Moench) Voss var. albertiana (S. Br.) Sarg.	1, 4, 9, 10, 22, 26, 28, 29	1	1, 2, 3, 4, 7, 10, 12, 13, 17, 19, 20, 23, 26, 27, 29, 35, 37	3, 5, 7
Picea glauca (Moench) Voss.	1, 4, 8, 9, 10, 24, 26, 28	1, 2, 3	1, 3, 4, 9, 10, 12, 13, 17, 19, 20, 23, 26, 29, 37	3, 5, 7
Picea glehnii (F. Schmidt) Mast.	1, 4, 8, 9, 10, 24, 26, 27, 28, 29	1	1, 4, 8, 10, 12, 13, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea jezoensis (Siebold & Zucc.) Carrière	1, 4, 9, 10, 11, 14, 16, 20, 22, 26, 28	1, 2	1, 3, 4, 9, 10, 17, 19, 23, 26, 29, 30, 34, 37	3, 4, 7
Picea koraiensis Nakay	1, 4, 10, 11, 19, 22, 29	1	1, 3, 4, 7, 10, 17, 19, 23, 28, 30, 35, 37	3, 4, 6
Picea likiangensis (Franch.) E. Pritz.	2, 4, 8, 9, 10, 14, 22, 23, 26, 28,	1	1, 2, 3, 4, 8, 11, 12, 13, 17, 19, 23, 27, 29, 30, 35, 37	3, 5, 6, 7
Picea mariana (Mill.) Britton & al.	1, 4, 9, 10, 11, 14, 23, 26, 28, 29	1	1, 2, 3, 4, 5, 7, 10, 12, 13, 17, 19, 20, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea maximowiczii Regel ex Mast.	1, 4, 9, 10, 24, 26, 28	1	1, 2, 3, 4, 9, 10, 12, 13, 17, 19, 23, 27, 28, 29, 30, 35, 37	3, 5, 7
Picea morrisonicola Hayata	1, 4, 8, 9, 10, 24, 26, 28	1	1, 2, 3, 4, 5, 9, 10, 12, 13, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea neoveitchii Mast.	1, 4, 7, 9, 10, 11, 22, 26, 29	1	1, 3, 4, 7, 11, 12, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea obovata Ledeb.	1, 4, 8, 9, 10, 11, 24, 26, 28	1	1, 2, 3, 4, 9, 10, 12, 13, 16, 17, 19, 20, 23, 26, 27, 29, 35, 37	3, 5, 7
Picea omorica (Pancic) Purk.	1, 4, 8, 9, 10, 20, 24, 26, 28, 29	1	1, 2, 3, 4, 7, 10, 12, 13, 17, 19, 23, 27, 29, 30, 35, 37	3, 5, 7
Picea orientalis (L.) Link	1, 4, 8, 9, 10, 11, 24, 26, 29	1	1, 2, 3, 4, 5, 7, 10, 12, 13, 17, 19, 23, 26, 29, 30, 35, 37	3, 5, 6
Picea pungens Engelm.	1, 4, 8, 9, 10, 24, 26, 28	1	1, 2, 3, 4, 9, 10, 12, 13, 17, 19, 23, 27, 29, 30, 35, 37	3, 5, 7
Picea rubens Sarg.	1, 4, 8, 9, 10, 23, 26, 29	1	1, 3, 4, 7, 10, 17, 19, 23, 26, 29, 35, 37	3, 5, 7
Picea schrenkiana Fisch. & C. A. Mey.	1, 4, 8, 9, 10, 24, 26, 27, 28, 29	1	1, 2, 3, 4, 9, 10, 12, 13, 17, 19, 23, 26, 27, 29, 35, 37	3, 7
Picea sitchensis (Bong.) Carrière	1, 4, 8, 9, 10, 24, 26, 28, 29	1	1, 2, 3, 4, 8, 10, 12, 13, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 5, 7
Picea smithiana (Wall.) Boiss.	1, 4, 8, 9, 10, 24, 26, 28, 29	1	1, 2, 3, 4, 8, 10, 12, 15, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 7
Picea spinulosa (Griff.) A. Henry	1, 4, 7, 10, 22, 28, 29	1	1, 3, 4, 7, 8, 16, 17, 18, 19, 23, 26, 27, 29, 34, 37	3, 7
Picea torano (Siebold ex K. Koch) Koehne	1, 4, 9, 10, 24, 26, 27, 28	1, 3, 6	1, 2, 3, 4, 8, 10, 12, 13, 17, 19, 23, 26, 29, 30, 35, 37	3, 7

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Picea wilsonii Mast.	1, 4, 7, 9, 10, 24, 26, 28	1, 3, 8	1, 2, 3, 4, 9, 10, 12, 13, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 7
Pilgerodendron uviferum (D. Don) Florin	1, 4, 9, 9, 10, 11, 14, 22, 26, 28, 29	2, 3, 5, 6	1, 2, 4, 7, 8, 16, 17, 19, 24, 26, 29, 30	1
Pinus albicaulis Engelm.	1, 4, 8, 9, 10, 11, 23, 26, 29	1	1, 3, 4, 8, 9, 10, 17, 19, 21, 26, 32, 36	3, 4, 6
Pinus aristata Engelm.	1, 4, 8, 9, 10, 11, 23, 26, 28	1	1, 3, 4, 7, 10, 17, 19, 22, 23, 26, 27, 29, 36	2, 6
Pinus arizonica Engelm. in Rothrock	1, 4, 10,	1	1, 3, 16, 18, 22, 26, 27, 36	2
Pinus arizonica Engelm. var. cooperi (C. E. Blanco) Farjon	1, 4, 10, 20	1	1, 3, 16, 18, 22, 26, 27	2
Pinus armandii Franch.	1, 4, 8, 9, 10, 20, 26, 29	1	1, 3, 4, 10, 17, 19, 22, 26, 31, 32, 35	2, 6
Pinus attenuata Lemmon	1, 4, 9, 10, 23, 26, 29	1	1, 3, 4, 5, 9, 10, 12, 14, 16, 18, 19, 22, 26, 27, 28, 30, 36	2, 6
Pinus ayacahuite Ehrenb. ex Schltdl.	1, 4, 9, 10, 11, 16, 19, 22, 26, 29	1	1, 3, 4, 7, 10, 16, 18, 21, 26, 31, 32, 34, 35	2, 6
Pinus balfouriana Balf. in Murray	1, 4, 9, 10, 16, 20, 22, 26, 29	1	1, 2, 3, 4, 5, 6, 7, 10, 12, 13, 17, 19, 20, 22, 23, 26, 27, 29, 36	2, 6
Pinus banksiana Lamb.	1, 4, 9, 10, 11, 23, 26, 29	1	1, 2, 3, 4, 7, 10, 12, 14, 16, 17, 18, 19, 22, 26, 27, 28, 30, 31, 32, 36	2, 6
Pinus brutia Ten.	1, 4, 9, 10, 24, 26, 27	1	1, 3, 4, 7, 10, 12, 13, 17, 19, 22, 26, 27, 30, 36,	2, 6
Pinus bungeana Zucc. ex Endl.	1, 4, 9, 10, 26, 28	1	1, 3, 4, 10, 12, 13, 17, 19, 22, 26, 27, 29, 35	2, 6
Pinus canariensis C. Sm. in Buch	1, 4, 6, 8, 9, 10, 11, 19, 24, 26, 29	2, 6	1, 3, 4, 7, 10, 12, 13, 16, 17, 18, 19, 22, 26, 27, 30, 34, 36	2, 6
Pinus caribaea Morelet	1, 4, 8, 10, 11, 19, 29	1, 2	1, 2, 3, 4, 5, 6, 10, 12, 15, 16, 17, 18, 19, 22, 26, 27, 28, 29, 30, 31, 32, 35	3, 5, 6
Pinus cembra L.	1, 4, 8, 9, 10, 11, 23, 26, 29	1	1, 3, 4, 7, 10, 16, 18, 21, 26, 32, 36	3, 4, 6
Pinus cembroides Zucc.	1, 4, 9, 10, 23, 26, 29	1	1, 2, 3, 4, 5, 7, 10, 17, 19, 22, 23, 26, 27, 29, 30, 36	2, 6
Pinus clausa (Chapm. ex Engelm.) Sarg.	1, 4, 9, 10, 11, 23, 26, 29	1	1, 3, 4, 5, 7, 10, 12, 15, 16, 18, 19, 22, 26, 27, 28, 30, 31, 32, 36	2, 6
Pinus contorta Douglas ex Loudon	1, 4, 8, 9, 10, 23, 26, 28, 29	1	1, 3, 4, 7, 10, 12, 15, 17, 18, 21, 26, 31, 36	2, 6
Pinus coulteri D. Don	1, 4, 9, 10, 11, 23, 26, 29	1	1, 3, 4, 9, 10, 12, 14, 16, 18, 19, 22, 26, 27, 30, 31, 32, 36	2, 6
Pinus densiflora Siebold & Zucc.	1, 4, 10, 22, 28, 29	1	1, 3, 4, 7, 10, 12, 14, 16, 18, 21, 26, 30, 31, 32, 34, 35	2, 6, 7
Pinus devoniana Lindl.	1, 4, 7, 10, 11, 16, 19, 22, 29	1	1, 3, 7, 10, 12, 15, 16, 18, 22, 27, 32, 34, 36	2, 6
Pinus douglasiana Martínez	2, 4, 9, 10, 11, 19, 22, 26, 29	1, 2, 5, 6	1, 3, 7, 10, 12, 13, 14, 16, 18, 22, 26, 32, 34, 36	2, 6
Pinus durangensis Martínez	1, 4, 10	1	1, 3, 10, 12, 16, 18, 22, 26, 27, 36	2

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Pinus echinata Mill.	1, 4, 8, 9, 10, 11, 19, 22, 26, 29	1	1, 3, 4, 5, 7, 10, 12, 15, 16, 18, 19, 22, 26, 27, 31, 32, 36	2, 6
Pinus elliottii Engelm.	1, 4, 9, 10, 20, 22, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 19, 22, 26, 27, 30, 31, 36	2, 6
Pinus engelmannii Carrière	1, 4, 10,	1	1, 3, 10, 12, 16, 18, 22, 26, 27, 36	2,
Pinus flexilis E. James	1, 4, 8, 9, 10, 24, 26, 28, 29	1	1, 3, 4, 8, 10, 16, 17, 19, 21, 26, 31, 32, 36	2, 6
Pinus flexilis E. James var. reflexa Engelm. in Rothrock	1, 4, 10, 11, 19	1	1, 3, 16, 18, 21, 26, 35	2
Pinus gerardiana Wall. ex D. Don in Lambert	1, 4, 9, 10, 26, 28, 29	1	1, 3, 4, 10, 12, 13, 16, 17, 18, 19, 22, 23, 27, 30, 34, 35, 37	2, 6
Pinus glabra Walter	1, 4, 9, 10, 11, 14, 22, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 18, 22, 26, 27, 30, 31, 32, 36	2, 6
Pinus greggii Engelm. ex Parl. in Candolle	1, 4, 10	1	1, 3, 8, 9, 10, 12, 16, 18, 22, 26, 27, 36	2
Pinus halepensis Mill.	1, 4, 9, 10, 11, 14, 19, 20, 23, 26, 28, 29	1	1, 3, 4, 7, 10, 12, 16, 17, 18, 19, 22, 26, 30	2, 6
Pinus hartwegii Lindl.	1, 4, 10, 11, 19, 22, 29	1, 2, 6	1, 3, 4, 7, 10, 12, 14, 16, 18, 22, 26, 31, 32, 35	3, 4, 6
Pinus heldreichii H. Christ	1, 4, 9, 10, 24, 26, 28, 29	1	1, 2, 3, 4, 5, 8, 10, 12, 13, 16, 17, 18, 19, 22, 26, 30, 36	2, 6
Pinus herrerae Martínez	1, 4, 10, 11, 19,	1	1, 3, 16, 18, 22, 26, 27, 28,	2
Pinus jeffrey Balf. in Murray	1, 4, 8, 9, 10, 20, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 18, 22, 26, 30, 31, 36,	2, 6
Pinus kesiya Royle ex Gordon	1, 3, 4, 9, 10, 19, 26, 28, 29	3, 5, 6	1, 4, 10, 12, 14, 16, 18, 21, 26, 30, 31, 35	6
Pinus koraiensis Siebold & Zucc.	1, 4, 7, 9, 10, 19, 22, 26, 29	1	1, 3, 4, 7, 10, 16, 18, 21, 26, 32, 34, 36	3, 4, 6
Pinus lambertiana Douglas	1, 4, 9, 10, 11, 14, 22, 26, 29	1	1, 3, 4, 5, 7, 10, 17, 19, 22, 26, 32, 36	2, 6
Pinus latteri Mason	1, 4, 9, 10, 26, 28, 29	1	1, 2, 3, 4, 10, 12, 13, 17, 18, 19, 21, 26, 30, 31, 32, 35	2, 6
Pinus lawsonii Roezl ex Gordon	1, 4, 7, 10, 11, 19, 20, 22, 29	1, 2, 5, 6	1, 3, 4, 7, 10, 12, 14, 16, 18, 22, 26, 31, 32, 34, 36	2, 6
Pinus leiophylla Schiede & Schltdl. & Cham. var. chihuahuana (Engelm.) Shaw.	1, 4, 10, 29	1	1, 3, 4, 10, 12, 13, 16, 18, 22, 26, 27, 30, 31, 36	2, 6
Pinus leiophylla Schiede ex Schltdl. & Cham.	1, 4,10, 22, 29	1	1, 3, 4, 7, 10, 12, 14, 16, 18, 22, 26, 31, 36	2, 6
Pinus lumholtzii B. L. Rob. & Fernald	1, 4,10, 11, 29	1	1, 3, 4, 5, 10, 12, 14, 16, 18, 22, 26, 27, 29, 30, 31, 32, 35	2, 6
Pinus massoniana Lamb.	1, 4, 10, 11, 19, 22, 29	1	1, 3, 4, 7, 10, 12, 14, 16, 18, 21, 26, 32, 35	2, 6
Pinus maximinoi H. E. Moore	1, 4, 10, 11, 19	1	1, 3, 10, 12, 14, 16, 18, 22, 26, 27, 35	2
Pinus merkusii Jungh. & de Vriese in Vriese	1, 4, 10, 11, 19, 29	1	1, 2, 4, 10, 16, 18, 21, 26, 27, 32, 35	2, 6
Pinus monophylla Torr. & Frém. in Frémont	1, 4, 8, 9, 10, 23, 26, 28	1	1, 3, 4, 7, 10, 16, 17, 19, 22, 26, 29, 36	3, 4, 6

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Pinus montezumae Lamb.	1, 4, 10, 11, 19, 22, 29	1, 2, 6	1, 3, 4, 7, 10, 12, 15, 16, 18, 22, 26, 27, 28, 30, 31, 36	2, 6
Pinus monticola Douglas ex D. Don in Lambert	1, 4, 9, 10, 23, 26, 28,	1	1, 3, 4, 7, 10, 16, 17, 19, 21, 26, 30, 31, 32, 36	2, 6
Pinus mugo Turra	1, 4, 6, 7, 9, 10, 23, 26, 29	1	1, 3, 4, 7, 10, 16, 17, 18, 19, 21, 26, 32, 36	2, 6
Pinus mugo Turra subsp. uncinata (Ramond ex DC.) Domin	1, 3, 9, 10, 22, 26, 29	1	1, 3, 4, 7, 10, 12, 13, 16, 18, 21, 26, 32, 36	2, 6
Pinus muricata D. Don	1, 4, 8, 9, 10, 22, 26, 29	1	1, 2, 4, 7, 10, 12, 14, 16, 17, 18, 19, 22, 26, 27, 30, 31, 36	2, 6
Pinus nelsonii Shaw	1, 4, 9, 10, 23, 28,	1	1, 3, 4, 17, 19, 23, 26, 27, 28	2, 6
Pinus nigra J. F. Arnold	1, 4, 9, 10, 23, 26, 28,	1	1, 3, 4, 7, 10, 12, 13, 16, 17, 18, 19, 21, 26, 30, 36	2, 6
Pinus occidentalis Sw.	1, 4, 9, 10, 11, 26, 29	1	1, 2, 3, 4, 5, 10, 12, 15, 16, 17, 18, 19, 22, 23, 26, 27, 30, 31, 32, 36, 37	2, 6
Pinus palustris Mill.	1, 4, 9, 10, 11, 19, 22, 26, 29	1	1, 3, 4, 5, 7, 10, 12, 15, 16, 18, 19, 22, 26, 27, 28, 30, 31, 32, 36	2, 6
Pinus parviflora Siebold & Zucc.	1, 4, 9, 10, 11, 19, 22, 26, 29	1	1, 3, 4, 7, 10, 16, 17, 18, 19, 21, 26, 31, 32, 34, 35	3, 4, 6
Pinus patula Schiede ex Schltdl. & Cham.	1, 4, 10, 11, 29	1	1, 3, 4, 5, 10, 12, 13, 16, 18, 22, 26, 27, 29, 30, 31, 32, 36	2, 6
Pinus peuce Griseb.	1, 4, 8, 9, 10, 23, 26, 29	1	1, 3, 4, 7, 10, 16, 17, 19, 21, 26, 32, 36	3, 4, 6
Pinus pinaster Aiton	1, 3, 4, 9, 10, 11, 19, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 14, 16, 17, 18, 19, 22, 26, 30, 34, 36	2, 6
Pinus pinceana Gordon	1, 4, 9, 10, 22, 29	1	1, 2, 3, 4, 17, 19, 23, 26, 27	2, 6
Pinus pinea L.	1, 4, 9, 9, 10, 11, 19, 22, 26, 29	1	1, 3, 4, 7, 10, 12, 13, 16, 17, 19, 22, 23, 26, 29, 30, 36	2, 6
Pinus ponderosa Douglas ex C. Lawson	1, 4, 9, 10, 22, 26, 29	1	1, 2, 3, 4, 5, 7, 10, 12, 15, 17, 18, 19, 22, 26, 30, 31, 36	2, 6
Pinus pseudostrobus Lindl.	1, 4, 8, 10, 11, 19, 22, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 18, 22, 26, 30, 31, 36	2, 6
Pinus pseudostrobus Lindl. var. apulcensis (Lindl.) Shaw	1, 4, 10, 11, 19,	1	1, 3, 7, 16, 18, 22, 29	2
Pinus pumila (Pall.) Regel in Kuester & al.	1, 4, 8, 9, 10, 26, 28, 29	1	1, 3, 4, 10, 16, 17, 18, 19, 22, 26, 30, 31, 32, 35	2, 6
Pinus pungens Lamb.	1, 4, 9, 10, 11, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 17, 18, 19, 22, 26, 29, 30, 31, 32, 36	2, 6
Pinus quadrifolia Parl. ex Sudw.	1, 4, 9, 10, 11, 14, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 14, 17, 19, 22, 26, 30, 36	3, 4, 6
Pinus radiata D. Don	1, 4, 9, 10, 11, 22, 26, 29	1	1, 2, 3, 4, 7, 10, 12, 13, 16, 18, 19, 22, 26, 30, 36	2, 6
Pinus resinosa Aiton	1, 4, 9, 10, 22, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 14, 16, 18, 21, 26, 31, 32, 36	2, 6

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Pinus rigida Mill.	1, 4, 9, 10, 11, 19, 23, 26, 29	1	1, 2, 3, 4, 7, 10, 12, 15, 16, 17, 18, 19, 22, 26, 30, 31, 32, 36	2, 6
Pinus sabiniana Douglas ex D. Don in Lambert	1, 4, 9, 10, 11, 22, 26, 29	1	1, 3, 4, 5, 7, 10, 12, 13, 16, 18, 19, 22, 26, 27, 29, 30, 31, 32, 36	3, 4, 6
Pinus serotina Michx.	1, 4, 9, 10, 11, 19, 20, 22, 26, 29	1	1, 3, 4, 5, 7, 10, 12, 15, 16, 18, 19, 22, 26, 27, 30, 31, 36	2, 6
Pinus strobiformis Engelm. in Wislizenus	1, 4, 10,	1	1, 3, 10, 16, 18, 21, 26, 35	2
Pinus strobus L.	1, 4, 9, 10, 11, 23, 26, 28, 29	1	1, 3, 4, 7, 10, 17, 19, 21, 26, 32, 36	2, 6
Pinus strobus L. var. chiapensis	1, 4, 9, 10, 22, 29	1	1, 3, 4, 17, 19, 21, 22, 26	2, 6
Pinus sylvestris L.	1, 4, 9, 10, 14, 22, 23, 26, 29	1	1, 2, 3, 4, 7, 10, 12, 14, 16, 18, 21, 26, 32, 36	2, 6
Pinus tabuliformis Carriére	1, 4, 9, 10, 11, 22, 26, 29	1, 2,	1, 2, 3, 4, 7, 10, 12, 13, 16, 18, 21, 26, 30, 31, 32, 36	2, 6
Pinus taeda L.	1, 4, 9, 10, 11, 19, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 17, 18, 19, 22, 26, 27, 31, 32, 36	2, 6
Pinus tecunumanii Eguiluz & J. P. Perry	1, 4, 10, 11, 16, 19, 22, 29	1	1, 3, 4, 7, 11, 12, 16, 18, 22, 26, 27, 30, 31, 34, 35, 37	2, 6
Pinus teocote Schiede ex Schltdl. & Cham.	1, 4, 10, 29	1	1, 4, 10, 12, 14, 16, 17, 18, 22, 26, 27, 28, 30, 35	2, 6
Pinus thunbergii Parl. in Candolle	1, 4, 10, 11, 22, 28, 29	1, 5, 6	1, 3, 4, 7, 10, 17, 19, 21, 27, 30, 34, 36	3, 4, 6
Pinus torreyana Parry ex Carrière	1, 4, 9, 10, 22, 26, 29	1	1, 2, 3, 4, 7, 10, 12, 15, 16, 18, 19, 22, 26, 30, 31, 32, 36	2, 6
Pinus virginiana Mill.	1, 4, 9, 10, 23, 26, 29	1	1, 3, 4, 7, 10, 12, 15, 16, 18, 19, 22, 26, 27, 31, 32, 36	2, 6
Pinus wallichiana A. B. Jacks.	1, 4, 6, 9, 10, 26, 28, 29	1	1, 2, 3, 4, 10, 17, 19, 21, 22, 26, 30, 31, 32	2, 6
Podocarpus bracteatus Blume	2, 4, 9, 10, 22, 26, 29	2, 5, 6, 7	1, 4, 7, 16, 18, 24, 26, 31, 34	1
Podocarpus coriaceus Rich. & A. Rich. in A. Richard (ed.)	2, 4, 9, 10, 22, 26, 28, 29	2, 5, 6	1, 4, 9, 16, 18, 24, 26, 30, 31	1
Podocarpus cunninghamii Colenso	1, 4, 9, 10, 23, 26, 27, 28,	2, 5, 7, 8	1, 9, 16, 18, 24, 26, 34	1
Podocarpus elatus R. Br. ex Endl.	2, 4, 9, 10, 11, 14, 19, 23, 26, 27, 28, 29	2, 5, 6	1, 2, 4, 8, 16, 18, 24, 26, 30, 31, 34	1
Podocarpus elongatus (Aiton) L´Herit. ex Pers.	2, 3, 4, 9, 10, 14, 24, 26, 28,	1, 2, 6	1, 4, 9, 16, 18, 24, 26, 30	1
Podocarpus glomeratus D. Don in Lambert	2, 4, 9, 10, 24, 26, 28, 29	2, 5, 6	1, 4, 9, 16, 18, 24, 26, 30	1
Podocarpus henkelii Stapf ex Dallim. & A. B. Jacks.	2, 4, 9, 10, 11, 14, 19, 20, 22, 26, 29	2, 5, 6	1, 4, 5, 9, 16, 18, 19, 23, 26, 30, 31, 34	1
Podocarpus latifolius (Thunb.) R. Br. ex Mirb.	2, 3, 4, 9, 10, 14, 24, 26, 28, 29	2, 3, 6	1, 2, 4, 9, 16, 18, 24, 26, 30	1
Podocarpus longifoliolatus Pilg. in Engler	1, 3, 4, 9, 10, 11, 14, 23, 26, 28, 29	2, 5, 6	1, 2, 4, 8, 16, 18, 24, 26, 30, 31	1
Podocarpus macrophyllus (Thunb.) Sweet	1, 4, 9, 10, 11, 14, 19, 23, 26, 28	2, 3, 5, 6	1, 2, 4, 5, 9, 16, 18, 24, 26, 30, 34, 37	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Podocarpus milanjianus Rendle	2, 4, 9, 9, 10, 24, 26, 28, 29	2, 5, 6	1, 2, 4, 9, 16, 18, 24, 26, 30, 31	1
Podocarpus nakaii Hayata, Icon. Pl. Formos.	1, 4, 9, 10, 11, 22, 26, 29	2, 5, 6	1, 4, 8, 16, 18, 24, 26, 30, 34	1
Podocarpus neriifolius D. Don in Lambert	2, 3, 4, 9, 10, 11, 22, 26, 29	2, 5, 6	1, 4, 8, 16, 18, 19, 24, 26, 30, 31, 34	1
Podocarpus oleifolius D. Don in Lambert	2, 4, 9, 10, 11, 22, 26, 29	2, 5, 6	1, 4, 8, 16, 18, 24, 26, 29, 30	1
Podocarpus rumphii Blume.	2, 3, 9, 10, 22, 26, 29	2, 5, 6	1, 4, 5, 7, 16, 18, 24, 26, 31, 34	1
Podocarpus spinulosus (Sm.) R. Br. ex Mirb.	2, 4, 10, 11, 22, 28, 29	2, 5, 6	1, 4, 9, 16, 18, 24, 26, 34	1
Podocarpus totara G. Benn. ex D. Don in Lambert	2, 3, 4, 9, 10, 11, 12, 22, 26, 29	2, 6	1, 4, 5, 6, 7, 16, 18, 24, 26, 30, 31	1
Prumnopitys andina (Poepp. ex Endl.) de Laub.	2, 4, 9, 10, 11, 24, 26, 28, 29	2, 3, 6	1, 4, 9, 16, 18, 24, 26, 30, 31	1
Prumnopitys ferrugenoides (R. H. Compton) de Laub.	2, 4, 9, 10, 11, 14, 23, 26, 29	2, 5	1, 4, 9, 16, 18, 24, 26, 30, 31	1
Prumnopitys taxifolia (Banks & Sol. ex D. Don) de Laub.	1, 3, 4, 9, 10, 11, 22, 26, 28, 29	1	1, 2, 4, 7, 16, 18, 24, 26, 31, 32	1
Pseudolarix amabilis (J. Nelson) Rehder	1, 4, 6, 9, 10, 11, 13, 23, 26, 28, 29	1, 3, 6	1, 2, 4, 8, 10, 17, 19, 23, 26, 27, 29, 30, 36, 37	1
Pseudotaxus chienii (W. C. Cheng) W. C. Cheng	1, 3, 4, 9, 7, 9, 10, 24, 26, 28	1	1, 4, 9, 16, 17, 19, 24, 26, 27, 29, 34	1
Pseudotsuga macrocarpa (Vasey) Mayr	1, 4, 7, 9, 10, 23, 26, 28, 29	1, 3, 6	1, 2, 3, 4, 7, 11, 17, 19, 23, 26, 27, 29, 30, 35, 37	3, 4, 7
Pseudotsuga menziesii (Mirb.) Franco	1, 4, 7, 9, 10, 23, 26, 28, 29	1, 3, 6	1, 2, 3, 4, 8, 10, 17, 19, 23, 26, 27, 29, 30, 34, 35, 37	3, 4, 7
Pseudotsuga sinensis Dode	1, 4, 7, 9, 10, 19, 22, 26, 29	1	1, 2, 3, 4, 7, 11, 17, 19, 20, 23, 27, 30, 34, 36	3, 4, 7
Retrophyllun minor (Carrière) C. N. Page	1, 4, 9, 10, 11, 12, 14, 19, 22, 26, 28	2, 6	1, 2, 4, 5, 7, 16, 18, 24, 26, 27, 30, 31	1
Saxegothaea conspicua Lindl.	2, 4, 9, 10, 11, 23, 24, 26, 27, 28	2, 5, 6, 7	1, 4, 9, 16, 19, 24, 26, 29, 30, 34, 37	1
Sciadopitys verticillata (Thunb.) Siebold & Zucc.	1, 4, 9, 10, 22, 23, 26, 27, 28	1	1, 4, 7, 16, 18, 21, 26, 32	1
Sequoia sempervirens (D. Don) Endl.	1, 4, 9, 10, 11, 20, 22, 26, 29	3, 5, 8	1, 2, 4, 5, 7, 16, 17, 18, 19, 24, 25, 26, 30, 35	1
Sequoiadendron giganteum (Lindl.) J. Buchholz	1, 4, 9, 10, 11, 19, 20, 23, 26, 29	2, 3, 5, 6, 8	1, 2, 4, 5, 7, 16, 18, 19, 24, 25, 26, 30, 34	1
Taiwania cryptomeroides Hayata	1, 4, 9, 10, 24, 26, 28	1, 2, 5, 6	1, 2, 4, 7, 16, 18, 23, 26, 30, 34	1
Taxodium distichium (L.) Rich.	1, 4, 9, 10, 11, 22, 26, 28	2, 3, 5, 6, 7	1, 2, 4, 5, 7, 16, 18, 19, 24, 25, 26, 30	1
Taxodium distichium (l.) Rich. var. imbricatum (Nutt.) Croom.	1, 4, 9, 10, 11, 19, 23, 26, 28	2, 3, 5, 6, 7	1, 4, 8, 16, 18, 19, 24, 25, 26, 30	1
Taxodium mucronatum Ten.	1, 4, 7, 9, 10, 11, 22, 26, 28	3, 5, 6	1, 4, 7, 16, 18, 25, 26, 27, 30, 31	1
Taxus baccata L.	1, 4, 7, 9, 10, 14, 23, 26, 28	1	1, 2, 4, 8, 16, 19, 24, 26, 30, 37	1
Taxus brevifolia Nutt.	1, 3, 4, 7, 9, 10, 23, 26, 28	1	1, 4, 8, 9, 16, 19, 24, 26, 29, 37	1

Table 1. (continued)

Specie	Axial tracheids (AT)	Axial parench. (P)	Rays (R)	Resin canals (RC)
Taxus chinensis (Pilg.) Rehder	1, 3, 4, 7, 9, 10, 11, 22, 26, 29	1	1, 4, 7, 8, 16, 19, 24, 26, 27, 29, 37	1
Taxus chinensis (Pilg.) Rehder var. mairei (Lemèe & Lèv.)	1, 4, 7, 9, 10, 24, 26, 28	1	1, 2, 4, 9, 16, 19, 24, 26, 27, 29, 30, 37	1
Taxus cuspidata Siebold & Zucc.	1, 4, 7, 9, 10, 11, 22, 26, 29	1	1, 4, 5, 7, 16, 18, 19, 24, 26, 29, 30, 37	1
Taxus floridana Nutt. ex Chapm.	1, 4, 6, 7, 9, 10, 23, 26, 28, 29	1	1, 4, 8, 9, 16, 18, 19, 24, 25, 26, 30, 37	1
Taxus wallichiana Zucc.	2, 4, 7, 9, 10, 22, 23, 26, 28	1	1, 4, 9, 16, 18, 19, 24, 26, 29, 30, 37	1
Tetraclinis articulata (Vahl) Mast.	1, 4, 9, 10, 11, 14, 19, 22, 26, 28, 29	2, 5, 7, 8	1, 2, 4, 9, 16, 18, 23, 24, 26, 27, 30, 31, 34	1
Thuja koraiensis Nakai	1, 4, 6, 9, 10, 20, 24, 26, 27	2	1, 4, 9, 16, 17, 18, 19, 24, 26, 29,	1
Thuja occidentalis L.	1, 4, 9, 10, 11, 24, 26, 27, 28	1, 2, 6	1, 2, 4, 8, 16, 17, 18, 19, 24, 25, 26, 27, 29, 30, 34, 37	1
Thuja plicata Donn ex D. Don in Lambert	1, 4, 9, 10, 11, 24, 26, 27, 28,	2, 3, 5, 6	1, 4, 8, 16, 19, 25, 26, 30, 37	1
Thuja standishii (Gordon) Carrière	1, 4, 9, 10, 11, 22, 25, 26, 28	1, 3, 5, 8	1, 4, 8, 9, 16, 17, 19, 24, 26, 29, 30, 34, 37	1
Thujopsis dolabrata (Thunb. ex L. f.) Siebold & Zucc	1, 4, 9, 10, 11, 19, 20, 24, 26, 27, 28	2, 5, 6, 7	1, 2, 4, 7, 16, 19, 24, 26, 27, 29, 30, 34	1
Torreya californica Torr.	2, 4, 6, 7, 9, 10, 14, 20, 23, 26, 28	1, 2, 3, 5, 6	1, 4, 8, 16, 19, 24, 26, 29, 37	1
Torreya grandis Fortune ex Lindl.	1, 4, 7, 9, 10, 23, 26, 27, 28	1, 2, 3, 6	1, 4, 8, 16, 18, 19, 24, 26, 27, 28, 29, 34, 37	1
Torreya nucifera (L.) Siebold & Zucc.	1, 4, 7, 9, 10, 11, 22, 26, 28	2, 3, 6	1, 4, 7, 16, 18, 19, 24, 26, 27, 29, 34, 37	1
Torreya taxifolia Arn.	1, 4, 7, 9, 10, 11, 14, 22, 26, 28, 29	1	1, 4, 5, 7, 16, 19, 24, 27, 28, 29, 37	1
Tsuga canadensis (L.) Carrière	1, 4, 9, 10, 11, 19, 23, 26, 28, 29	1, 3, 6, 7	1, 4, 7, 10, 17, 19, 23, 24, 26, 27, 29, 34, 35, 37	1
Tsuga chinensis (Franch.) E. Pritz.	1, 4, 8, 10, 11, 19, 22, 28, 29	6	1, 4, 7, 10, 17, 19, 23, 26, 29, 34, 35, 37	1
Tsuga diversifolia (Maxim.) Mast.	1, 4, 9, 10, 11, 23, 26, 28, 29	3, 6	1, 2, 4, 7, 10, 17, 19, 23, 27, 29, 30, 35, 37	1
Tsuga dumosa (D. Don) Eichler in Engler & Prantl	1, 4, 6, 9, 10, 23, 26, 28	1, 3, 6,	1, 2, 4, 8, 10, 17, 19, 23, 26, 27, 29, 30, 35, 37	1
Tsuga heterophylla (Raf.) Sarg.	1, 4, 9, 10, 22, 26, 28, 29	1, 3, 6	1, 2, 4, 7, 10, 17, 19, 23, 26, 29, 30, 34, 37	1
Tsuga mertensiana (Bong.) Carrière	1, 4, 9, 10, 23, 26, 28, 29	1, 3, 6	1, 2, 4, 8, 10, 17, 19, 23, 26, 29, 35, 37	1
Widdringtonia nodiflora (L.) Powrie	2, 4, 6, 9, 10, 22, 23, 26, 28	2, 6	1, 2, 4, 7, 16, 18, 23, 24, 26, 29, 30,	1
Widdringtonia schwarzii (Marloth) Mast.	2, 4, 9, 9, 10, 11, 20, 22, 26, 28, 29	2, 5, 6, 7	1, 2, 4, 5, 7, 16, 18, 23, 24, 26, 29, 30	1
Widdringtonia whytei Rendle	2, 4, 6, 9, 10, 24, 26, 28, 29	2	1, 4, 7, 16, 18, 24, 26, 30	1

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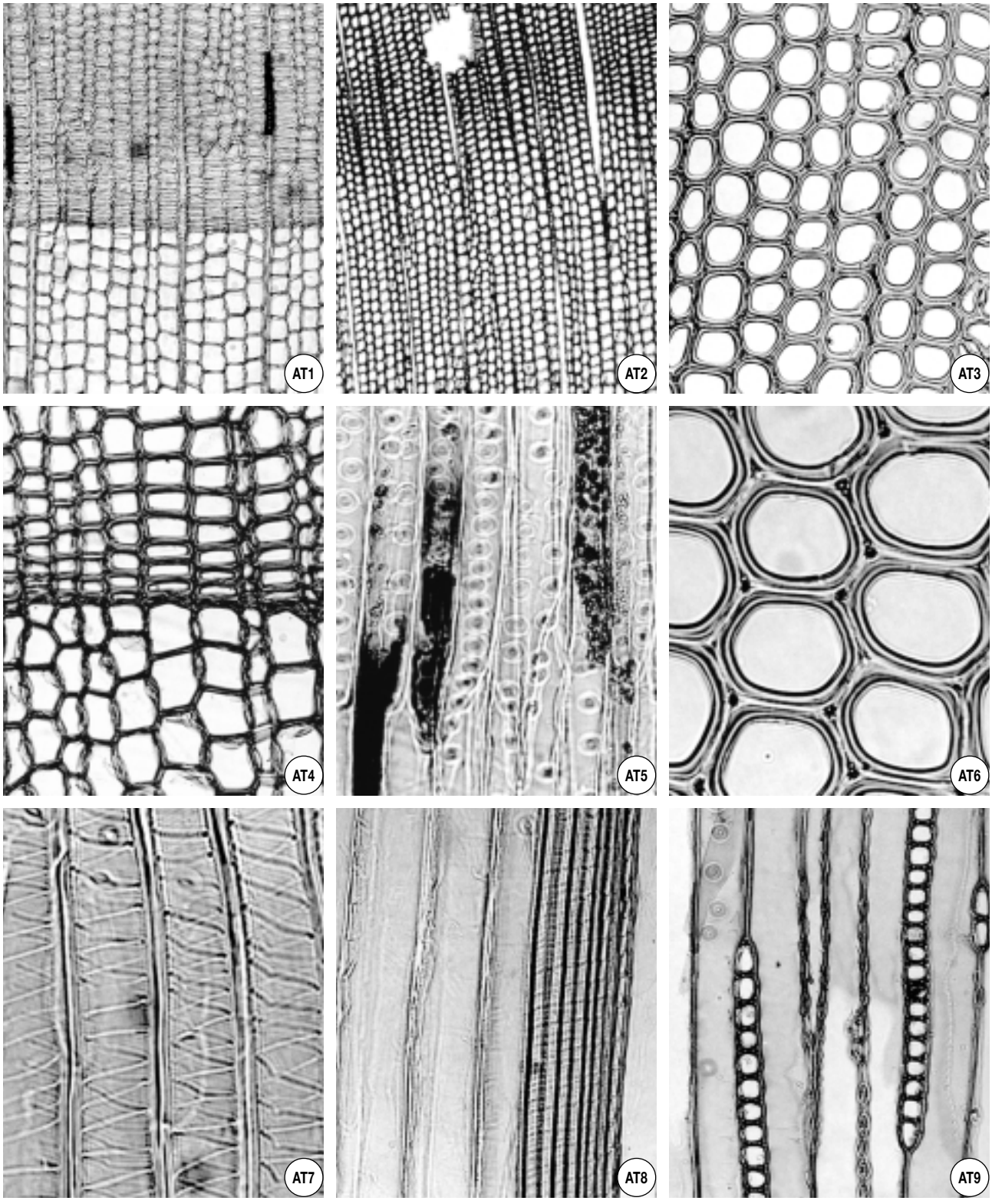
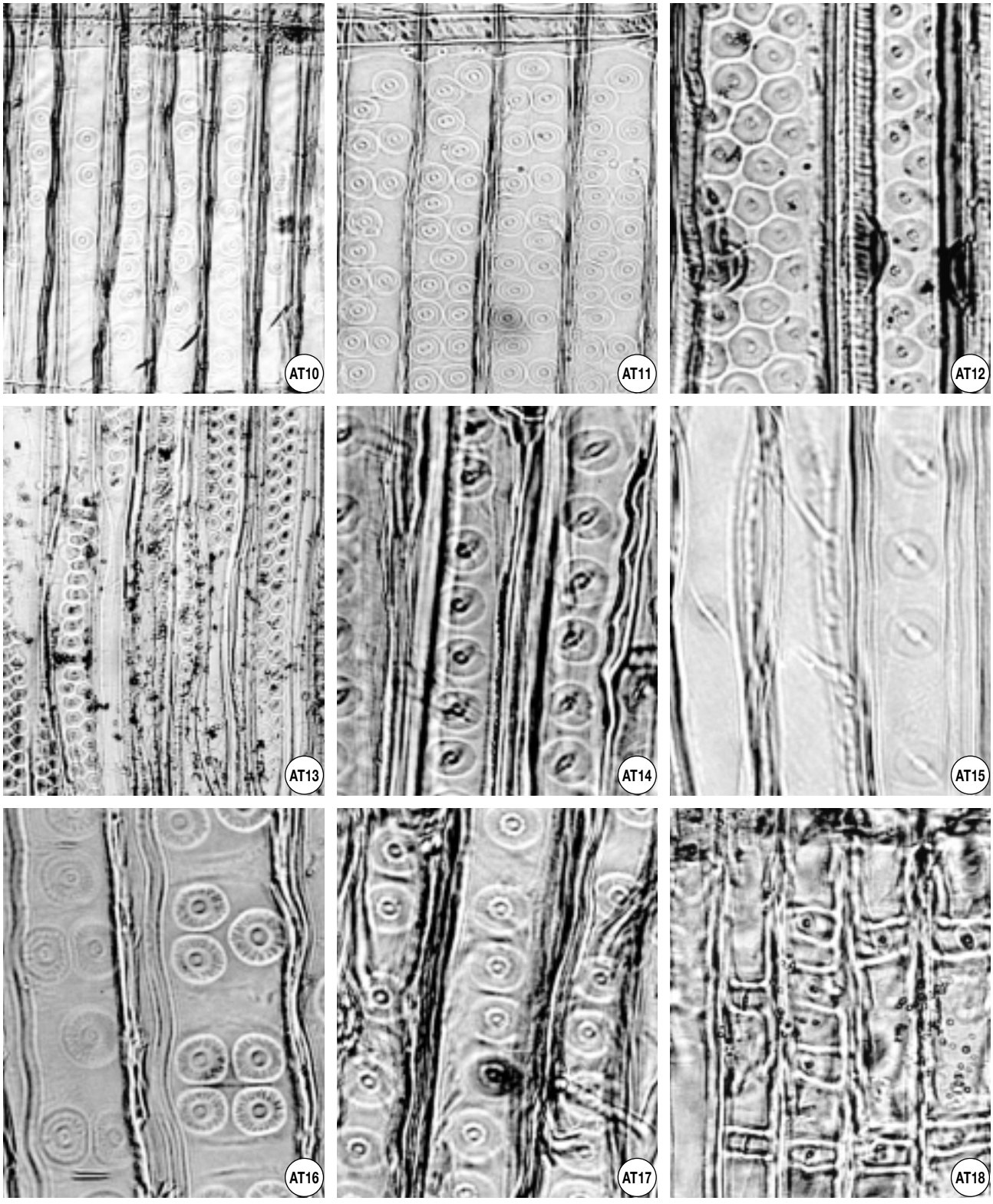
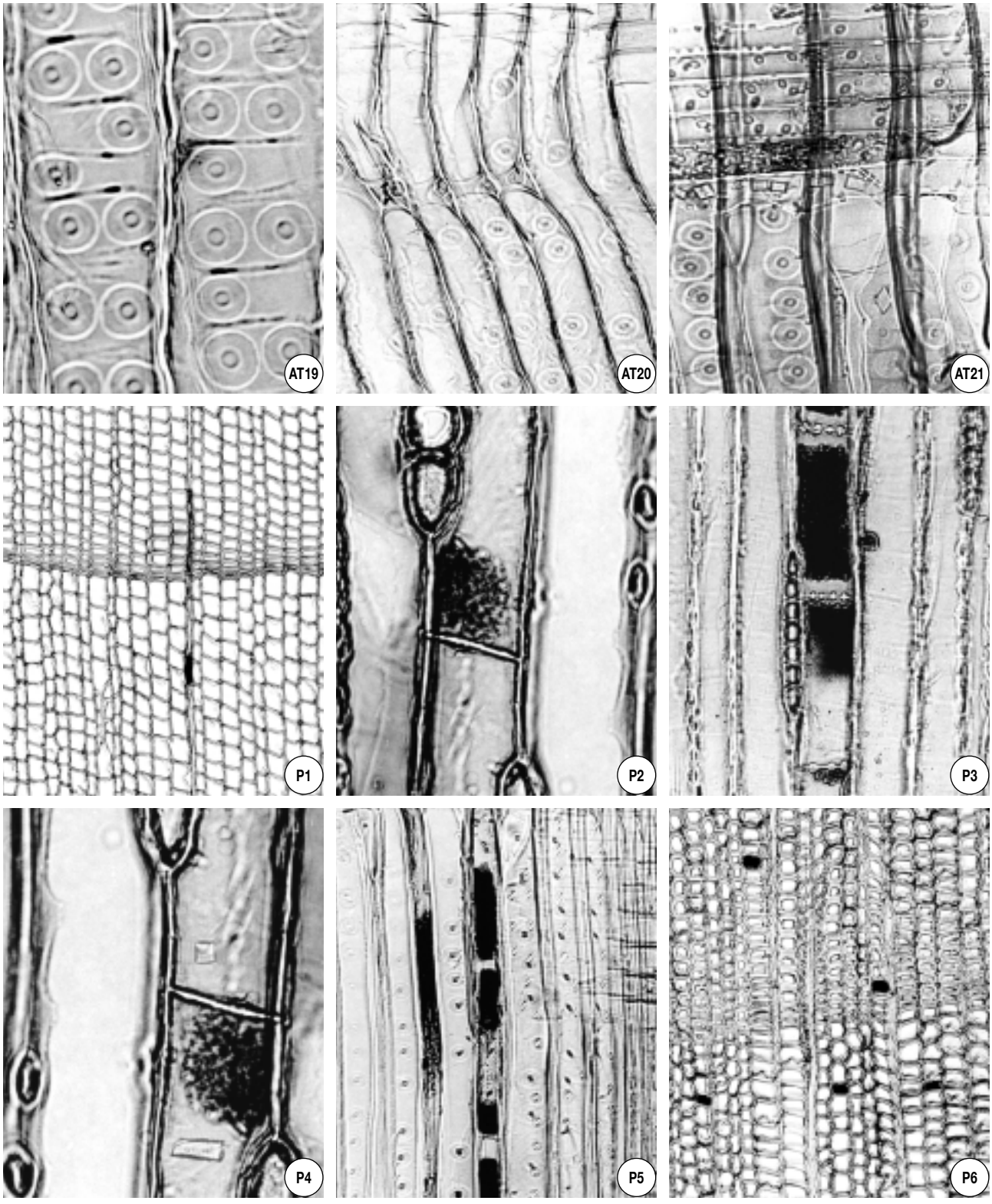


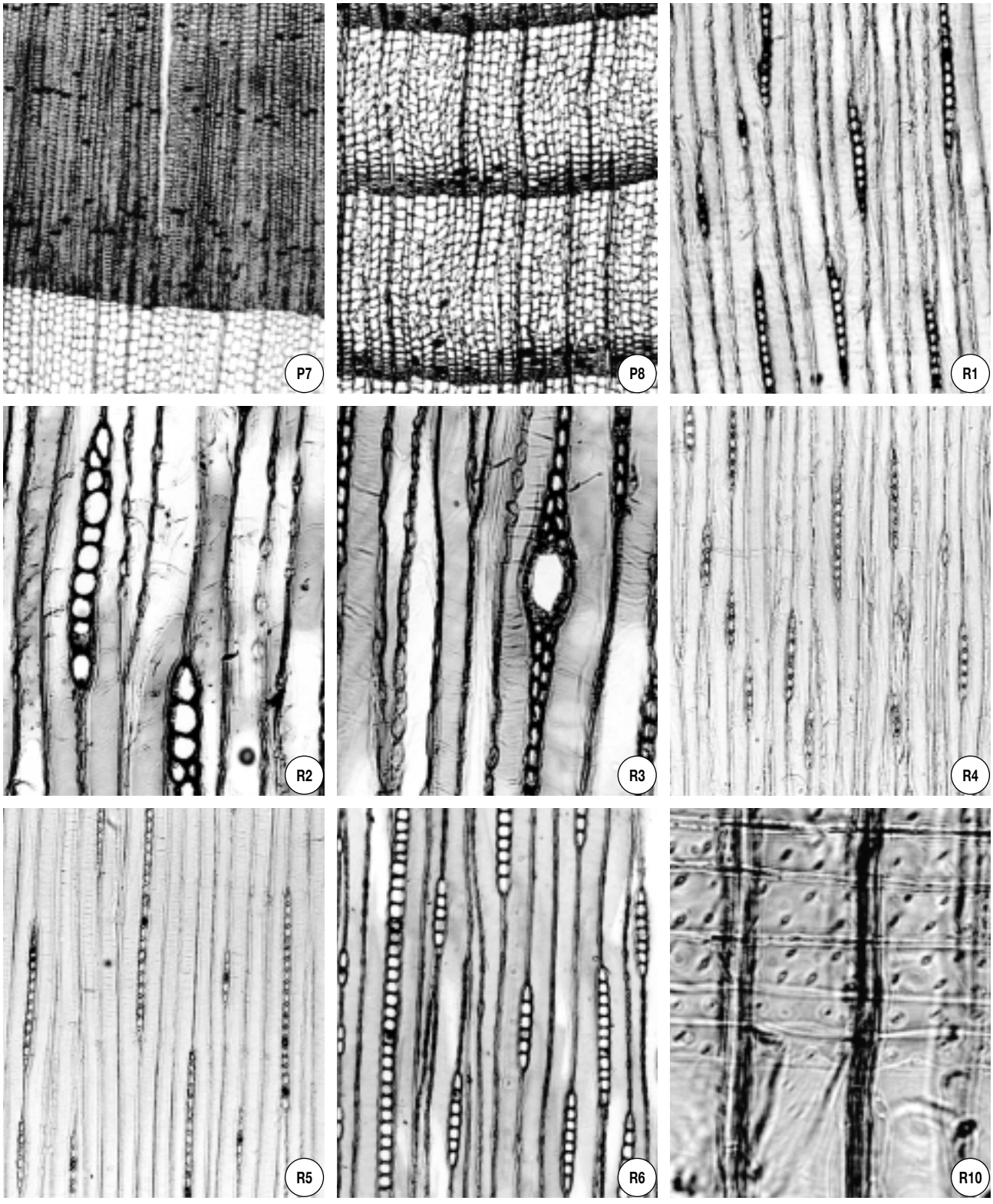
Axial Tracheids. AT1: well-defined growth rings. AT2: slightly-defined growth rings. AT3: axial tracheids of circular section. AT4: axial tracheids of polygonal section. AT5: resinous axial tracheids. AT6: intercellular spaces present. AT7: spiral thickenings present in all the axial tracheids. AT8: spiral thickenings present, but not in all the axial tracheids. AT9: bordered pits present on the tangential walls of the axial tracheids.



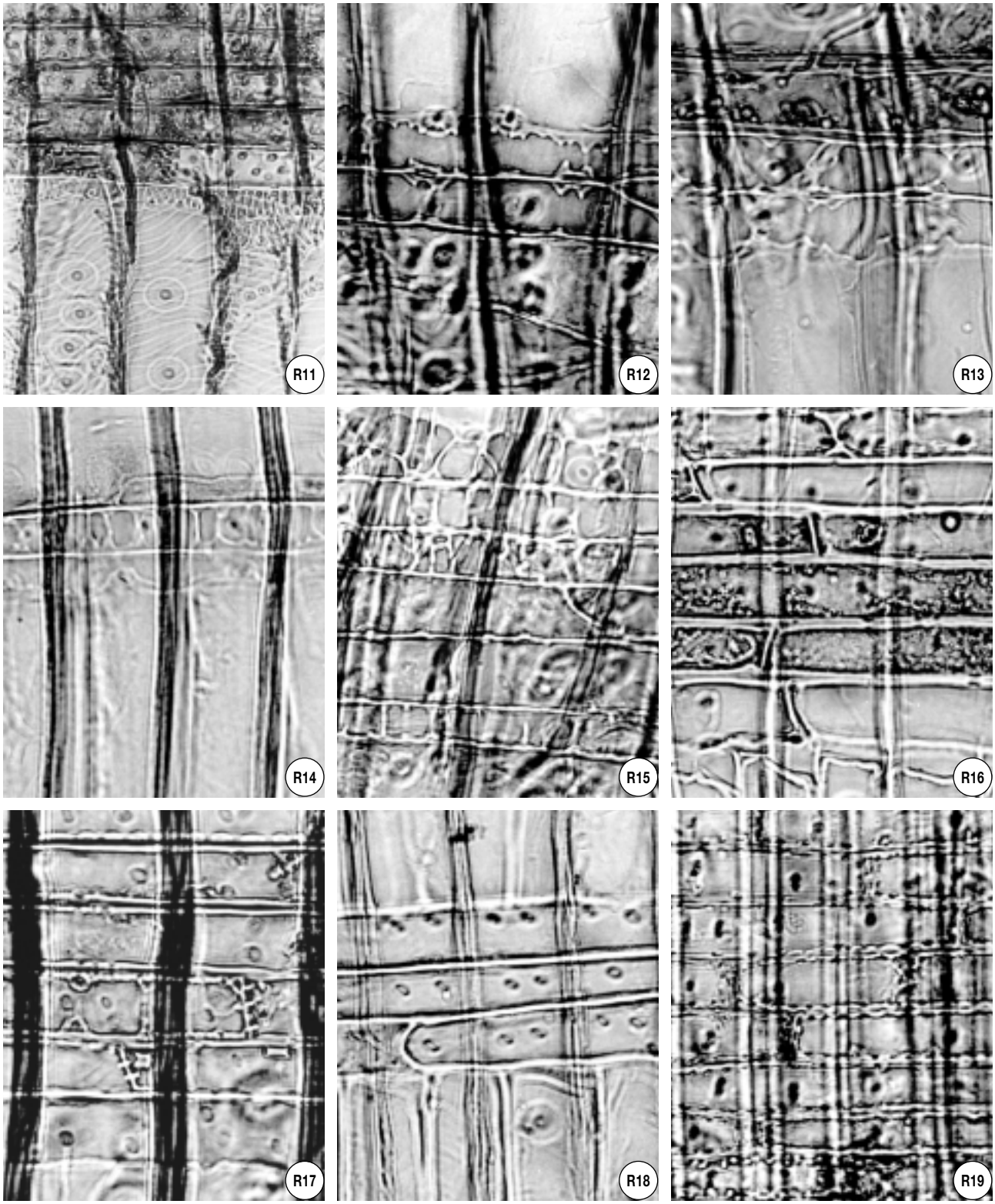
AT10: uniseriate bordered pits on the radial walls of the axial tracheids. AT11: biseriate bordered pits on the radial walls of the axial tracheids. AT12: triseriate or multiseriate bordered pits on the radial walls of the axial tracheids. AT13: polygonal bordered pits on the radial walls of the axial tracheids. AT14: bordered pits with included elliptic aperture. AT15: bordered pits with extended elliptic aperture. AT16: pits present borders with radial striation. AT17: scalloped torus. AT18: callitroid thickenings.



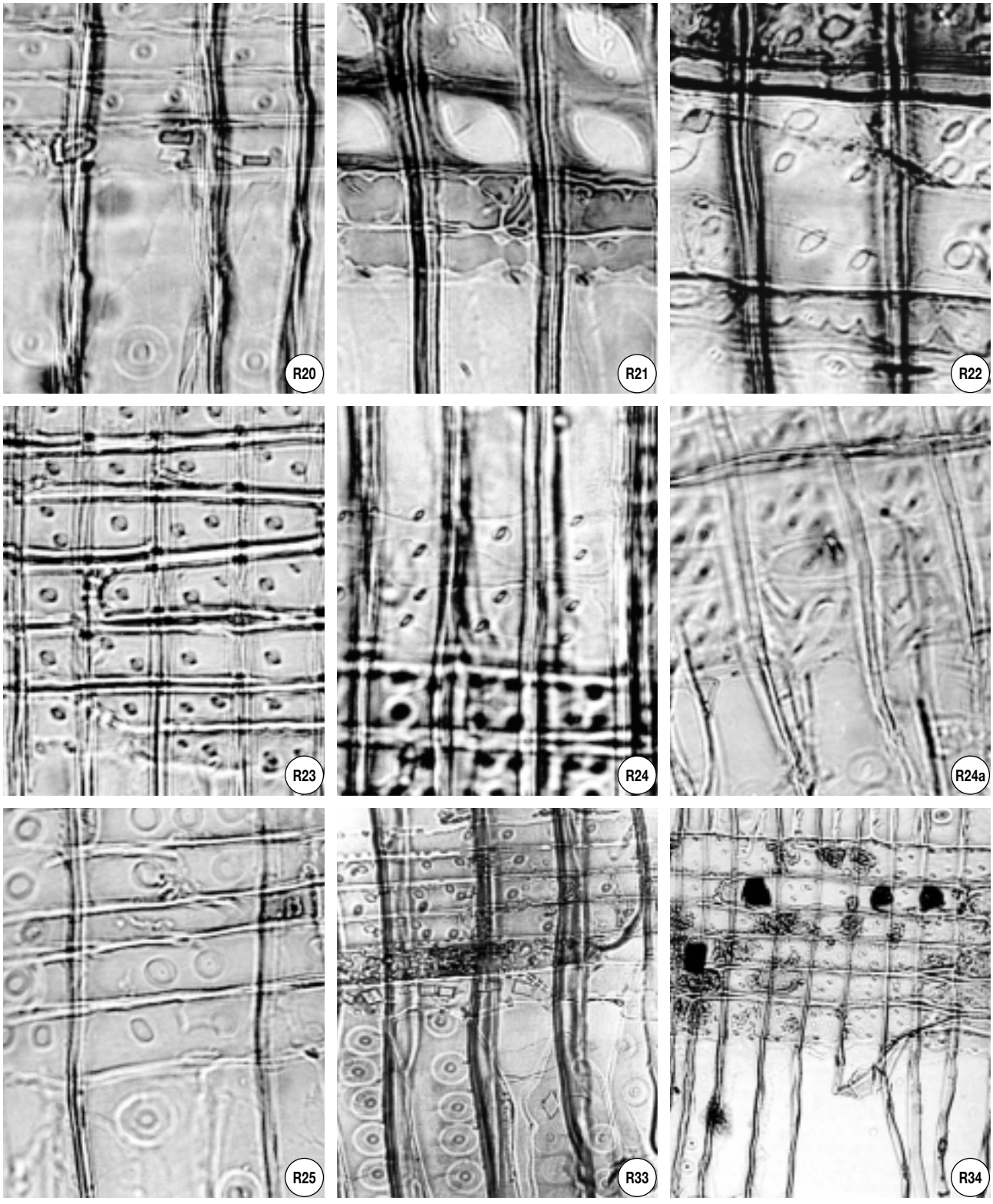
AT19: bars of Sanio. AT20: trabecula. AT21: crystals present in axial tracheids. **Axial parenchyma.** P1: axial parenchyma absent or scarce. P2: axial parenchyma with smooth transverse walls. P3: axial parenchyma with nodular transverse walls. P4: axial parenchyma with crystals. P5: axial parenchyma with resin. P6: diffuse axial parenchyma present.



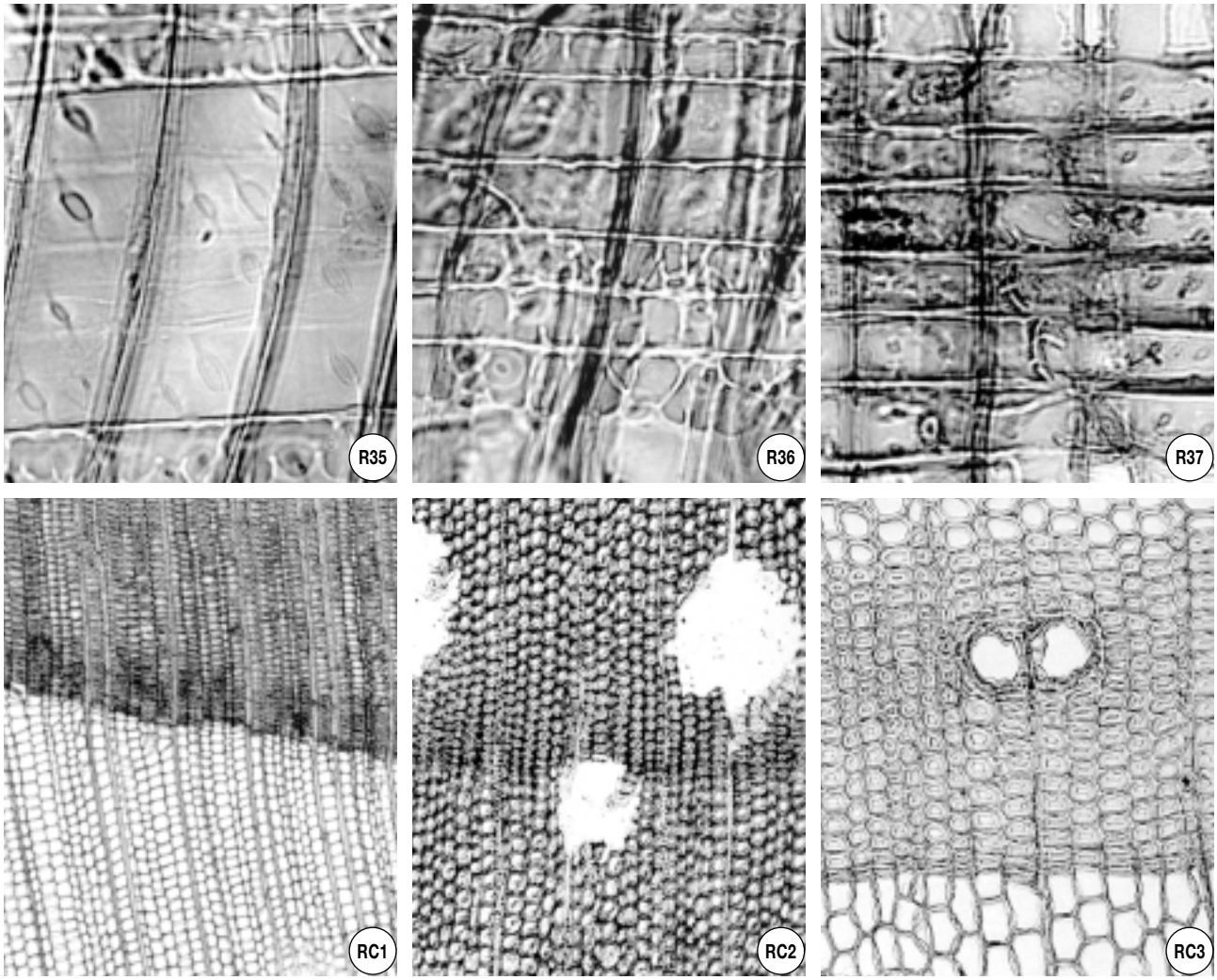
P7: metatracheal axial parenchyma present. P8: terminal axial parenchyma present. **Rays.** R1: uniseriate rays. R2: partially biseriate rays. R3: multiseriate rays. R4: ray height from 1 to 15 cells. R5: ray height from 16 to 30 cells. R6: ray height over 30 cells. R10: ray tracheids without spiral thickenings.



R11: ray tracheids with spiral thickenings. R12: dentate ray tracheids. R13: dentate ray tracheids with the height of the dentations <2.5 µm. R14: dentate ray tracheids with dentations up to the centre of the lumen. R15: dentate ray tracheids with dentations throughout the lumen. R16: ray parenchyma with smooth axial walls. R17: ray parenchyma with nodular axial walls. R18: ray parenchyma with unpitted horizontal walls. R19: ray parenchyma with pitted horizontal walls.



R20: ray parenchyma with crystals. R21: window-like cross field pits. R22: pinoid cross field pits. R23: piceoid cross field pits. R24: cupressoid cross field pits. R24a: araucaroid cross field pits. R25: taxodioid cross field pits. R33: crystals present in ray tracheids. R34: ray parenchyma with resin.



R35: marginal ray tracheids. R36: alternate ray tracheids. R37: indentures. **Resin canals.** RC1: resin canals absent. RC2: thin-walled epithelial cell resin canals. RC3: thick-walled epithelial cell resin canals.