<table>
<thead>
<tr>
<th>項目</th>
<th>内容</th>
</tr>
</thead>
<tbody>
<tr>
<td>タイトル</td>
<td>一部水系の土壌の研究 : 一部水系の土壌の研究 : 一部水系の土壌の研究</td>
</tr>
<tr>
<td>著者</td>
<td>KATO, Hiroyuki; KISHIMA, Tsuneo</td>
</tr>
<tr>
<td>引用</td>
<td>木材研究 [京都大学木材研究所報告] 36: 55-60</td>
</tr>
<tr>
<td>出版年月</td>
<td>1965-12</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://hdl.handle.net/2433/52979">http://hdl.handle.net/2433/52979</a></td>
</tr>
<tr>
<td>タイプ</td>
<td>Departmental Bulletin Paper</td>
</tr>
<tr>
<td>テキストバージョン</td>
<td>publisher</td>
</tr>
<tr>
<td>出版機関</td>
<td>京都大学</td>
</tr>
</tbody>
</table>

このページの内容は、一部水系の土壌の研究に関するものです。著者はKATO, HiroyukiとKISHIMA, Tsuneoです。引用された文献は、木材研究 [京都大学木材研究所報告] 36: 55-60です。出版年月は1965年12月です。URLはhttp://hdl.handle.net/2433/52979です。タイプはDepartmental Bulletin Paperです。
Some Morphological Observations of Tyloses

Hiroyuki Kato* and Tsuneo Kishima*

加藤弘之*・貴島恒夫*：チロースの形態について

In hardwoods, vessels play a main role of liquid penetration into them, and the vessel penetration is controlled first of all by the development of tyloses in the vessels. If the quantitative proportion of tyloses to the vessel lumen might be given, it would be possible to estimate the degree of liquid penetrability of wood to a certain extent. Such a quantitative estimation, however, was found to be difficult beyond the authors expectation.

During the above trial for the quantitative estimation, some morphological observations of tyloses were carried on, and the results obtained will be reported in this paper. And further, it is generally known that tyloses are usually formed in a process of heartwood formation (Chattaway, 1949; Trendelenburg, 1955; Dadswell and Hillis, 1962), accordingly the observations were carried out in connection with heartwood formation.

Materials and Methods

The following six species of hardwoods, of which the development of tyloses seems to be comparatively conspicuous, were chosen as the materials.

Onigurumi: Japanese walnut (Juglans sieboldiana Maxim.), domestic.

Houai-to-oku: white oak (Quercus alba Linn.), from North America.

Shirakashi: oak sp. (Quercus myrsinaefolia Bl.), domestic.


Niseakashia: black locust (Robinia pseudoacacia Linn.), domestic.

Akarawan: red lauan (Shorea negrosensis Foxw.), from South-east Asia.

A. Light Microscopic Observation

For this observation the wood blocks were softened in autoclave (120°C, 3kg/cm², 60-90 min.), and were sectioned by a Jung-type sliding microtome with attention to avoid removal or breakdown of tyloses. According to a trial in advance, sections adequate to the purpose were 15-25μ thick and 5×10 mm in size. They were made into temporary preparations mounted with glycerine jelly.

For histochemical observation, the following colour reactions and stainings (Table) were applied, and for the observation of physical properties of tylosis wall the polar-
izing microscope was used.

Table Tests for color reactions and stainings

<table>
<thead>
<tr>
<th></th>
<th>Reagent for colour reaction</th>
<th>Dyestuff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose</td>
<td>Iodine-potassium iodide solution</td>
<td>Methylene blue</td>
</tr>
<tr>
<td></td>
<td>Zinc chloride-iodine solution</td>
<td>Safranin</td>
</tr>
<tr>
<td>Lignin</td>
<td>Phloroglucinol hydrochloric acid</td>
<td></td>
</tr>
<tr>
<td>Pectic substance</td>
<td></td>
<td>Ruthenium red</td>
</tr>
<tr>
<td>Cork</td>
<td></td>
<td>Sudan IV</td>
</tr>
<tr>
<td>Lipid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Electron Microscopic Observation

For this observation, heartwoods of white oak, chestnut and black locust were mainly used, and the replica method (filmy replica mould; acetylcellulose method) was applied to their longitudinal surfaces (radial or tangential). As the specimens for electron microscope, a part of replica films moulded by the surface of vessels full of tyloses was put on a sheetmesh (Fig.). The electron microscope used was type JEM-T6S (60KV).

Observation Results and Discussion

A. Shape of Tyloses

SHIRAKASHI (oak sp.)

In SHIRAKASHI, tylosis formation increases gradually from sapwood to heartwood and every successive stages of tylosis development are well observed. Initial bud tyloses (Photo 1) can be seen in earlywood vessels of the sapwood. Subsequent stages of the development of tyloses are illustrated in Photo 2. It is shown in Photos 1 and 2 and more obviously in Photo 3 that every tylosis arises from only a ray parenchyma cell adjacent to a vessel, where no thickening of the vessel wall exists.

This partial lack of thickening of the vessel wall is characteristic of Shirakashi which is the only species among the materials in the present investigation.

HOWAITO-OKU (white oak)
In white oak numerous tyloses occur even in sapwood, and bud tylosis shows nearly a globular form (Photo 4). In most cases, tyloses in sapwood arranging in a longitudinal row (Photo 5) block the lumen of vessel so closely that each tylosis appears to be likely a vessel segment.

**Niseakashia (black locust)**

In black locust the plentiful development of tyloses is observed in its final stage (Photo 6). Abundant tyloses block the lumen of vessel so closely that every
tylosis shows nearly similar polyhedral form in three dimensional sections. Besides, such an appearance of tylosis is generally observed both in sapwood and heartwood, and initial bud tyloses are hardly found in the present investigation, therefore, it is supposed that they will nearly all be in the cambial zone.

B. Structure of Tylosis Walls

Photo 7 shows a tylosis in the sapwood of white oak. In its surface the fibrillar orientation can be seen but is not always well-regulated. Since the transverse sections of tylosis walls appear usually bright, showing the double refraction between crossed nicols under the polarizing microscope (Photo 8), microfibrils in tylosis wall orient parallel to the wall surface and are interwoven over the surface.

In Photos 9 and 4 many minute spots like pits are found in the surfaces of tylosis wall of white oak. Similar spots are also found in black locust (Photo 10) but it is not distinctive from these micrographs whether such a spot is a true pit or a mere indenture of the wall.

In microchemical observation of color reactions on the tylosis walls of white oak,
the presence of cellulose in them can be confirmed by the positive reaction with iodine-potassium iodide or zinc chloride-iodine solution. On the other hand the lignification of them is also recognized by the scarlet colour reaction with phloroglucinol-hydrochloric acid or by the staining with safranin or methylen blue. Besides, from the staining with ruthenium red and sudan IV, the presence of pectic substance, lipid, or suberisation is found although not so evident as the colour reactions on cellulose or lignin.

Electron microscopic observations of the tylosis walls are not yet sufficient. Among a few instances, Photo 11 shows a structure found in a replica of tylosis wall surface of white oak heartwood. Many wrinkles and small prominences on the wall surface are considered to be resulted by the encrustation of lignin. Photo 12 shows the structure found in a replica on the tylosis wall surface of heartwood in Japanese chestnut, and double kinds, small and large ones, of prominent warts are remarkable.

**Conclusion**

1. In black locust and white oak, tyloses are abundantly present throughout their
sapwood, up to the outer most rings of it, and heartwood. These two species are the
2. Tyloses in Shirakashi (oak sp.) show quite various shapes and every success­
3. In tylosis formation in Shirakashi, it is remarkable that its tyloses arise from
4. Tyloses arising from longitudinal wood parenchyma cells are found only in
5. Tylosis walls in white oak show the secondary thickening and the lignification
to a certain extent. Besides, the structure of fibrillar orientation is observed in the
6. On the surfaces of tylosis walls in Japanese chestnut, there are double kinds,

摘 要

木材の発達の著しい内外面広葉樹材6種についてその形態を光学顕微鏡的に観察し,
さらにチローズ膜の表面構造を電子顕微鏡的に観察して, チローズの形成発達の推定に資し,
あわせて顕微化学的, 偏光顕微鏡的観察を行なってチローズ膜の性質を知る一助とした。その
結果を要約すれば,

1. ニセアカシアとホウイトオークはともに辺材最外縁にすでにチローズが見られ, 辺・
心材を通じて密に存在し, チローズ発達の最も著しい樹種である。
2. シラカシのチローズは不規則な形を示し, その発達段階が明らかに観察される。
3. 同じくシラカシのチローズ形成上注目すべきは, それが由来する放射柔組織が道管と
隣接している部分に道管の肥厚が見られないことである。
4. この観察の範囲で木部柔細胞に由来するチローズを認めたのはニセアカシアのみであ
った。
5. ホウイトオークのチローズ膜は2次の肥厚を示し, かなり木化しているのみならず,
フィブリルの配向が見られる。
6. クリのチローズ膜の表面には矢小2種のいぼが重複的に存在し, 非常に特徴的であ
る。

Literature Cited

2) DADSWELL, H. E. and HILLIS, W. E., "Wood Extractives and their Significance to the Pulp