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itials of the cambium. The first way has been shown to be too inefficient to have realized in real homoxylic woody plants, whereas non-storied fusiform initials must perfectly be fitted to make non-storied arrangement of the tracheids. Non-storied tracheid arrangement seems to be an evolutionary constraint which has prevented evolution from non-storied cambium to storied one in homoxylar woody plants.

References

Bailey I.W. 1923. The cambium and its derivative tissues. IV. The increase in girth of the cambium // Amer. J. Bot. V. 10. P. 499–509.

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DESICCATION-INDUCED DISPLACEMENTS OF THE TORI IN CONIFERS' WOODS (DECIPHERED PROTOCOLS)[3]

Tangentially sectioned spring woods of the latest growing rings were used in all experiments. The woods were sampled from the trunks of living trees in Moscow Region and immediately put into water to prevent them from desiccating. Wet wood samples were 30 μm thick sectioned tangentially with slide microtome. The sections were stained before being manipulated or thereafter. For pre-manipulation staining, the sections were processed either with the aqueous Chrysoidin or with aqueous Water Blue for 7 minutes, differentiated with ethyl alcohol and then 3 times watered. For post-manipulation staining, the sections were processed with ethyl-alcoholic Water Blue for 7 minutes. Two water drops per 100 ml solvent were added, because anhydrous alcoholic Water Blue did not stain tori. These different staining techniques did not influence results of the experiments.

Locations of the tori were detected with the light microscope under magnification 480×.

In every section, nearly all tori were originally flat, thin, unlignified and undisplaced, viz. nearly each torus was just in the middle of paired pits.

[3] Kedrov extensively investigated torus displacements in variously influenced conifers' woods for planned major article about torus functions in 1976–1981. The article was not prepared. Rather many protocols of experiments have remained, but only 7 ones are decipherable. They are presented here.

Experiment 1. Desiccation of woods of *Picea abies* (L.) Karst., *Larix sibirica* Ledeb. and *Pinus sylvestris* L.

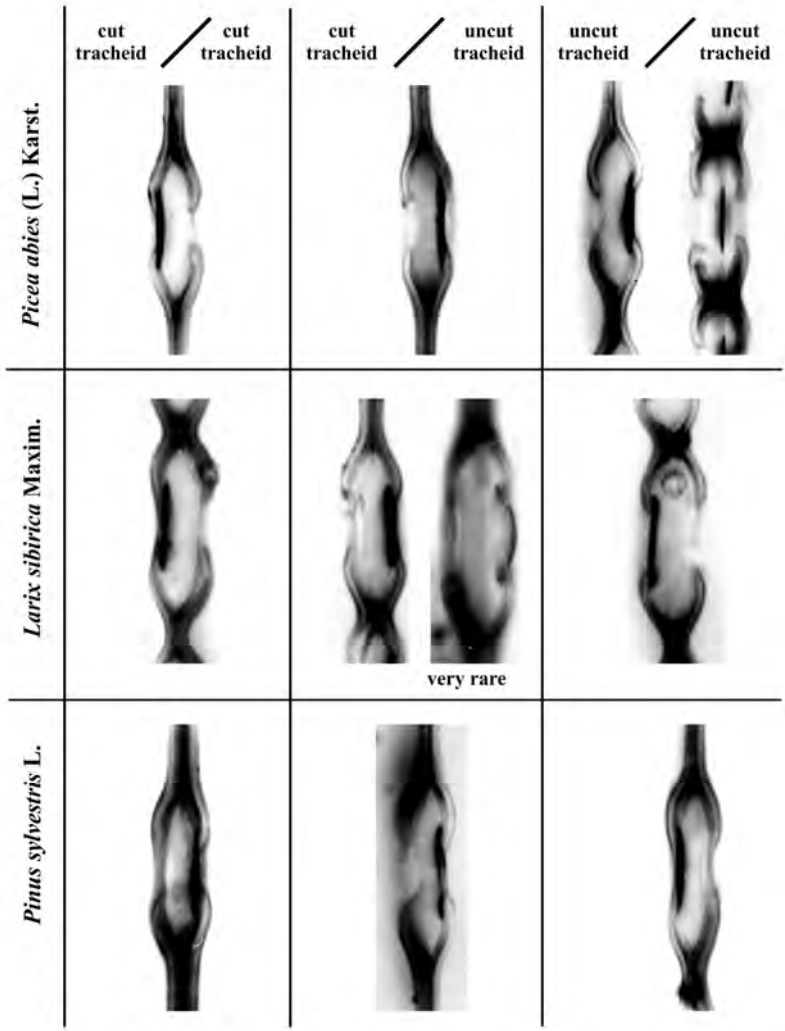

Fig. 1. **Torus displacements in desiccated woods:**
c.t – cut tracheid; *u.t* – uncut tracheid

The wood sections were mounted on slides and desiccated under room conditions for 1 to 16 hrs. The marginal tracheids of the sections had been cut by sampling woods, whereas those in the middle parts of sections remained intact. Accordingly, cut tracheid – to – cut tracheid tori,

cut tracheid – to – uncut tracheid tori and uncut tracheid – to – uncut tracheid tori were separately examined.

All cut tracheid – to – cut tracheid tori are flat and appressed to either orifice of the paired pits (Fig. 1, p. 31). Directions of the torus displacements are irregularly variable. So are the uncut tracheid – to – uncut tracheid tori, though few undisplaced ones have been revealed in *P. abies* wood as well (Fig. 1, p. 31). The cut tracheid – to – uncut tracheid tori are always appressed to the orifices of the pits of uncut tracheids. Such tori mostly remain flat, but a few ones have been discovered in *L. sibirica* that are slightly convex and protrude into the lumen of uncut tracheid (Fig. 1, p. 31).

Experiment 2. Desiccation of acetone-treated wood of *Pinus sylvestris* L.

Wet sections were mounted on slides. The water was replaced by the acetone. The sections thus processed were desiccated over 1 to 16 hrs under room conditions. All tori are flat and undisplaced.

Experiment 3. Desiccation of variously processed woods of *Picea abies* (L.) Karst.

Wet stained sections of the wood were mounted on slides. The control sections were dehydrated with ethyl alcohol for 3 minutes, put into xylol for 3 minutes and embedded in Canada Balm. The first-experiment version sections were desiccated for 4 minutes, processed with ethyl alcohol for 3 minutes, put into xylol for 3 minutes and embedded in Canada Balm. The second-experiment version sections were desiccated for 4 minutes, alcoholized for 3 minutes, rehydrated for 3 minutes, dehydrated with ethyl alcohol for 3 minutes, put into xylol for 3 minutes and embedded in Canada Balm. The third-experiment version sections were desiccated for 4 minutes, rehydrated for 3 minutes, alcoholized for 3 minutes, put into xylol for 3 minutes and embedded in Canada Balm.

The results are shown in the Table 1.

Table 1

Torus displacements in variously processed woods of *Picea abies*

Experiment version	Total torus number	Undisplaced tori		Displaced tori	
		Number	Per cent	Number	Per cent
Control	1462	1457	99.7	5	0.3
Version 1	1673	23	1.4	1650	98.6
Version 2	1573	1306	83	267	17
Version 3	1707	1533	89.7	176	10.3

Experiment 4. Desiccation of thermally treated wood of *Pinus sylvestris* L.

Control wood sections were mounted on slides, desiccated for 30 minutes, 1 hr, 2 hrs, 2 hrs 15 min., 2 hrs 15 min., 2 hrs 15 min., 2 hrs 15 min., respectively. These sections were thereafter rehydrated for 1 min., 1 min., 15 min., 1 hr, 2 hrs, 46 hrs, 120 hrs, respectively. The experimental wood sections were boiled in water for 30 min., mounted on slides and desiccated for 30 min., 1 hr, 2 hrs, 2 hrs 15 min., 2 hrs 15 min., 2 hrs 15 min., 2 hrs 15 min., respectively. The sections were then rehydrated for 1 min., 1 min., 15 min., 1 hr, 2 hrs, 46 hrs, 120 hrs, respectively.

All tori examined are displaced in control sections after 1 hr or longer desiccating, whereas many ones are undisplaced in experimental sections after the same desiccating period of time. The latter tori have evidently regained their middle positions in their paired pits.

Experiment 5. Long-term cooling of the wood of *Pinus sylvestris* L.

The control wood sections were mounted on slides, desiccated for 10 min. and rehydrated for 1 min. The experimental wood sections were kept in water medium in refrigerator under 0 – +5°C for 2 weeks, mounted on slides, desiccated for 10 min. and rehydrated for 1 min.

The control wood tori are mostly bent, but a few of them are flat. All the experimental wood tori are shriveled.

Experiment 6. Freezing of the wood of *Pinus sylvestris* L.

The wood sections were put into water medium, completely frozen, thawed and mounted on slides.

All tori are deformed. These are likely to result from ruptures of the pit membranes round the tori.

Experiment 7. Effects of wood desiccation longevity on the torus displacements in *Picea abies* (L.) Karst.

The wood sections were mounted on slides. The control ones were stained with aqueous Water Blue for 7 min. Vast majority of the tori are undisplaced (Table 2).

Experiment version 1. Some wood sections were desiccated for 2 min. and stained with alcoholic Water Blue for 7 min. Another ones were desiccated for 1 hr, 2 hrs, 3 hrs, 4 hrs, 5 hrs or 6 hrs, respectively, rehy-

drated for 3 min. and stained with aqueous Water Blue for 7 min. All tori in non-rehydrated sections were displaced (Table 2). The differently desiccated and rehydrated ones show various displaced tori – to – undisplaced tori proportions (Table 2). The longer is desiccation, the less reversible are torus displacements (Fig. 2, p. 35).

Table 2

Torus displacements in woods under variously long desiccations

Experiment version	Total number of the tori examined	Undisplaced tori		Displaced tori	
		Number	Per cent	Number	Per cent
Control	1183	1135	95.1	48	4.9
2-min. desiccation	924	0	0	924	100
1-hr desiccation, 3-min. rehydration	1050	906	86.3	144	13.7
2-hrs desiccation, 3-min. rehydration	991	685	69.1	306	30.9
3-hrs desiccation, 3-min. rehydration	1044	588	56.3	456	43.7
4-hrs desiccation, 3-min. rehydration	911	161	17.7	750	82.3
5-hrs desiccation, 3-min. rehydration	1201	132	10.9	1069	89.1
6-hrs desiccation, 3-min. rehydration	1038	19	1.8	1019	98.2

Experiment version 2. The wood sections were desiccated for 6 hrs and rehydrated for 10 min., 30 min., 1 hr, 2 hrs, 3 hrs, 5 hrs, 24 hrs, 48 hrs, 72 hrs, respectively. Only 1.8 % tori are undisplaced in 10-min. rehydrated wood sections, whereas very many tori are undisplaced in 30-min. rehydrated wood sections. The longer is rehydration, the more tori regain their middle positions in their paired pits.

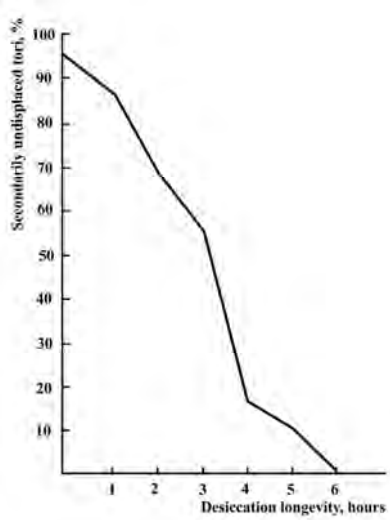

Fig. 2. **Torus re-displacements in variously desiccated and 10-min. rehydrated woods**

Experiment version 3. The wood sections were desiccated for 8 hrs 30 min. and then rehydrated for 30 min., 1 hr, 2 hrs, 3 hrs, 5 hrs, 24 hrs, 48 hrs and 72 hrs, respectively. A few undisplaced tori have only been revealed in 72-hrs rehydrated wood sections.

Experiment version 4. The wood sections were desiccated for 24 hrs and then rehydrated for 30 min., 1 hr, 2 hrs, 3 hrs, 5 hrs, 24 hrs, 48 hrs and 120 hrs, respectively. No one undisplaced torus has been revealed.

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FUNCTION OF THE TORUS IN CONIFERS' WOODS[4]

The conifer wood tori are usually considered to participate in regulation of the transpiratory water current through the wood and to prevent pit membrane from rupturing due to the hydrodynamic pressure in the wood. However, data have recently been obtained that the tori really prevent unsolved gas from penetrating bordered pits (Hart, Thomas, 1967). These data are only referred to sampled woods, though. Then, they need to be tested by experimenting on living trees.

[4] Interpolated author's abstract of the lecture given on December 12th 1973.