Unclogging a Clog Mystery – Wood anatomy applied to Dutch Folklore

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Life of a wood anatomist never knows a dull moment. A few months ago I was approached by Pek van Andel, medical researcher at Groningen University, with a worldwide reputation for understanding the role of serendipity in science: the art of making unsought discoveries. He had heard a charming story how clog makers were able to recognise whether the iconic footwear in the Netherlands was made from willow (Salix) or poplar (Populus). The story came down via a restauration carpenter, Klaas-Jan Staal, whose cattle-farming granddad had heard it from a clog maker in the 1920s: applying spittle to one side of the heel of a clog, and blowing on the other side, would result in bubble formation when the wooden shoe was made of poplar, and have no effect at all when it was made of willow. Could I please explain the reasons why? Mindful of the notorious wood anatomical similarities between Salix and Populus (only differing in ray structure) and of the role of total vessel lengths in the permeability of wood for air and liquids, I could only think of differences in vessel lengths between these two genera, admittedly a somewhat counter-intuitive hypothesis because vessel length is usually correlated with vessel diameter (Zimmermann 1982) and the vessel diameter ranges in poplar and willow trees are very similar. Had clog makers unwittingly found an important but cryptic wood anatomical difference between poplar and willow?

Thankfully, Pek van Andel had also invited an opinion from Freark Dijk, an electron microscopist at Groningen University, and a devoted clog wearer in his spare time. Not troubled with a wood anatomical background, he simply diagnosed that willow had partition walls in its vessels as seen in low power SEM photographs (made by jetse Stokroos), and poplar had not. He also transformed the spittle test into an experimental set-up by attaching pieces of willow and poplar from the timber yard to a plastic tube and blowing air through it while under water: poplar appeared very permeable, willow impermeable. Automatically linking the term partition (“schot” in Dutch) to perforation plates (“doorboord tussenschot”), I begged to strongly disagree with

SEM picture of the thin-walled tyloses in Salix bakko Kimura (by courtesy of the Japanese Wood Database on the website of FFPRI, Tsukuba).
Freark’s interpretation. After all, both willow and poplar wood are full of simple perforation plates which can easily be mistaken for partitions by the non-initiated. Van Leeuwenhoek had even taken them for valves (analogous to those in blood vessels in mammals) in the 17th century. Careful light microscopic re-examination of the microscopic slides of Populus and Salix in the Leiden slide collection did not result in further progress. Only when I revisited the SEM pictures of Freark’s rather roughly cut end-surfaces did I see the light: many vessels of willow had smooth and thin-walled tyloses, clogging the vessels, and poplar had not. The tyloses did indeed look somewhat like partition walls in surface view, justifying Freark’s descriptive terminology. I should have known better before, because Grosser (1977) and Grosser & Teetz (1985) clearly documented that willow heartwood has abundant tyloses and that poplar usually lacks them.

This little anecdote illustrates how traditional clog makers have superior ways to identify similar looking timbers, and how amateurs can still outwit wood anatomists with simple observation, unbiased by academic jargon, clogging rather than illuminating the brain.

Incidentally, it would be worthwhile to study the incidence of tyloses in Salicaceae in greater detail, because in the few species of Populus and Salix represented in the Leiden collection slides, presence or absence of tyloses is not a constant feature within each of the genera.

References: