

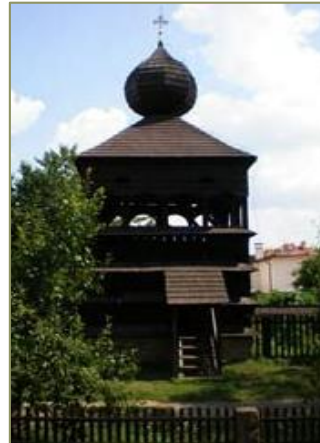
COLOUR CHANGES OF WOODEN SHINGLES TREATED WITH PINE TAR AFTER WEATHERING

Zuzana VIDHOLDOVÁ

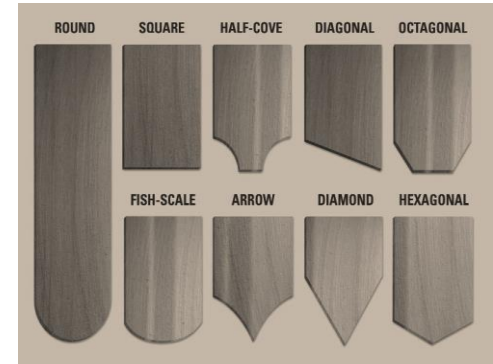
Wood shingles/shakes

- A CENTURIES OLD SOLUTION
- Traditionally used as a covering/roofing material
 - Natural material
 - Naturalistic appearance
 - Originality
 - Used for a centuries
- Suitable for restoring of historical buildings
- Esthetical aspect for modern buildings
 - Modern design
 - Interesting design
- Ecological aspect
 - Natural material
 - Without chemical treatment /in case durable species – larch, pine, cedar, .../

...the uses of wooden shingles in Slovakia in buildings/wooden constructions



Shakes or shingles?



Split shakes

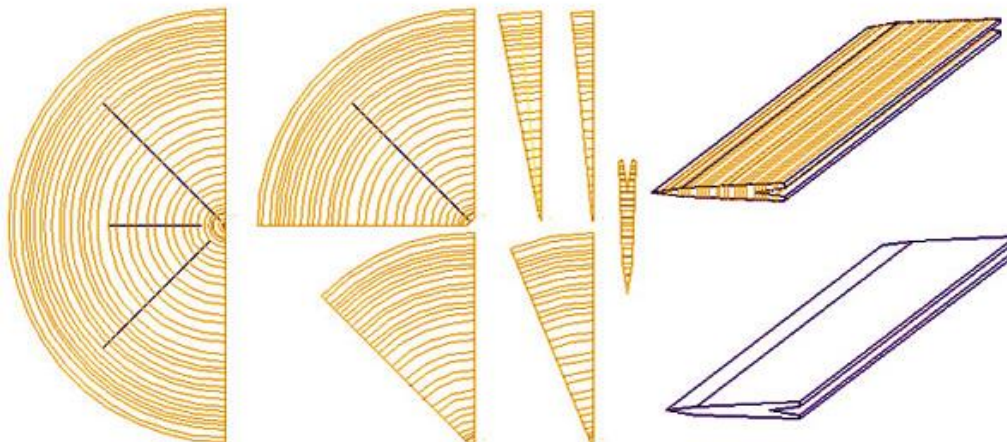
- can be
 - split
 - split and saw
 - simply sawn

Cut or saw shingles

- in all instances are sawn - depending on the chosen type and grade

Splited shakes – hand made

= are produced by hand using a sharp bladed steell knife and wooden hammer



Shingle damage



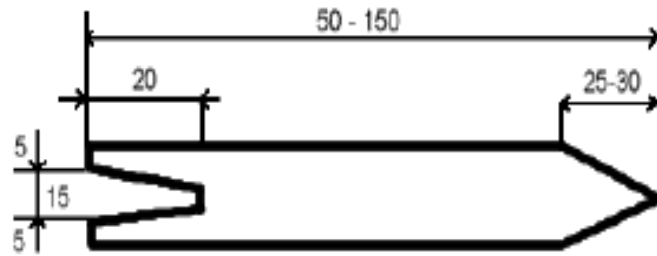
Lichen

Objective

- Weathering exposure is used to observe the photodegradation of different wooden shakes
 - Treated /Untreated
 - Different wood species



Material



LARCH
splited



PINE
thermally treated



SPRUCE
splited
cutted

Treatment

□ General

- **PINE TAR** from company Color spol. s r.o
- a dark colored,
- obtained as a by product through destructive distillation of pine wood in the manufacture of charcoal,
- Recommended amount – in first layer – 4-5 m²/l
– in second layer – 6-8 m²/l



□ Treatment of wooden shakes

- Pine tar was manually applied on wood by brush, in two layers with 24 hour drying time between it.

Weathering test

- Exterior exposure under 45° slope orientated to the South at Technical University in Zvolen
- Time: **1, 3, 6, 9 months** (from July to April)



Weathering progress evaluation

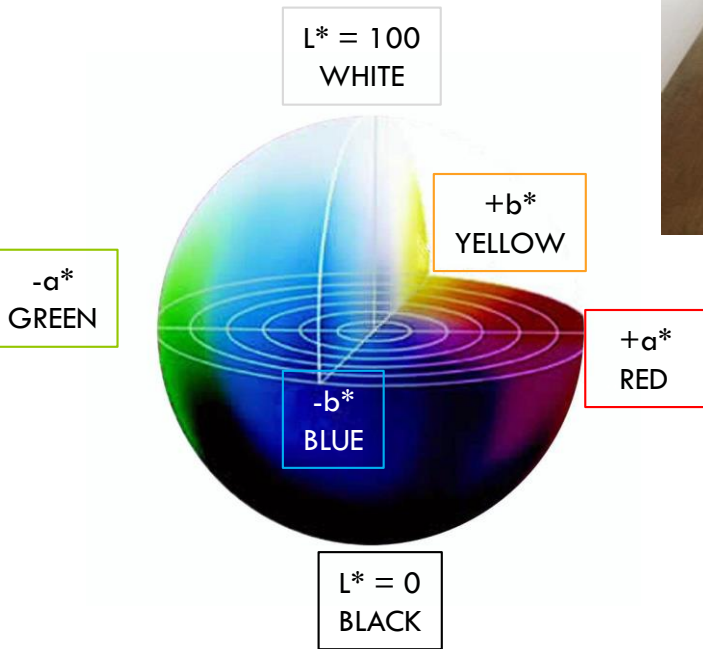
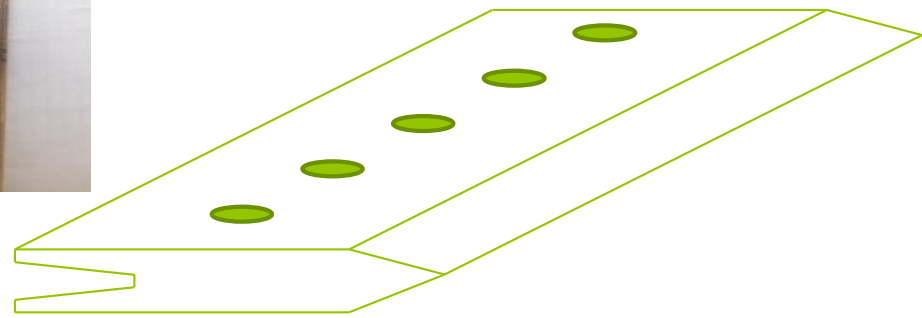
Undertaken tests:

- **Colour changes (CIE Lab)**
- Samples appearance and integrity (visual grading)
- Chemical changes in pine tar (GC-MS)
- Change in wood structure of weathered layer (SEM)

Colour changes (CIE Lab)



T: $20 \pm 1^\circ\text{C}$
RH: 60%



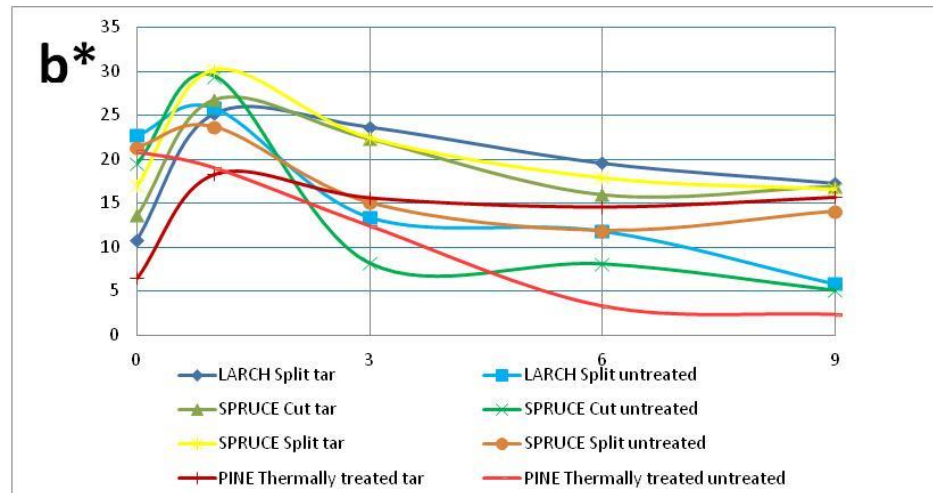
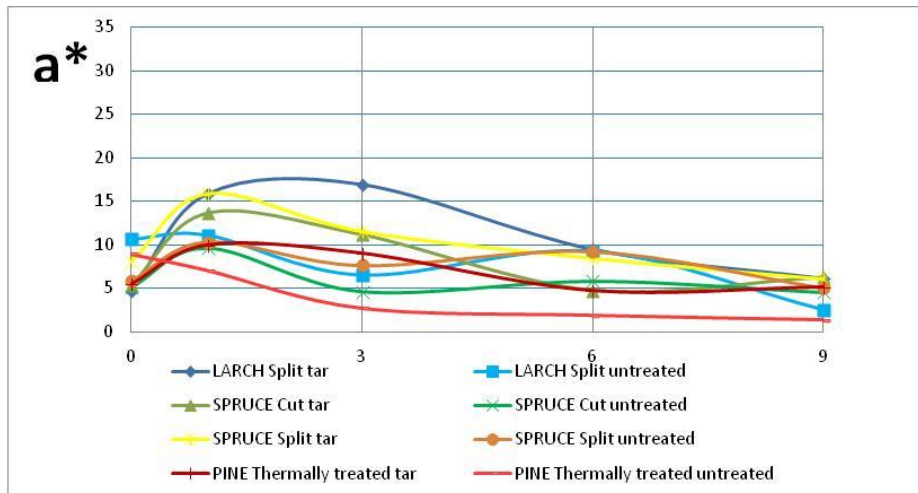
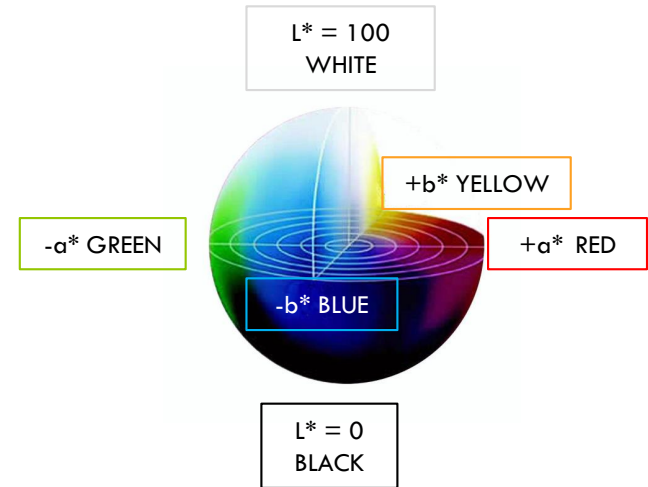
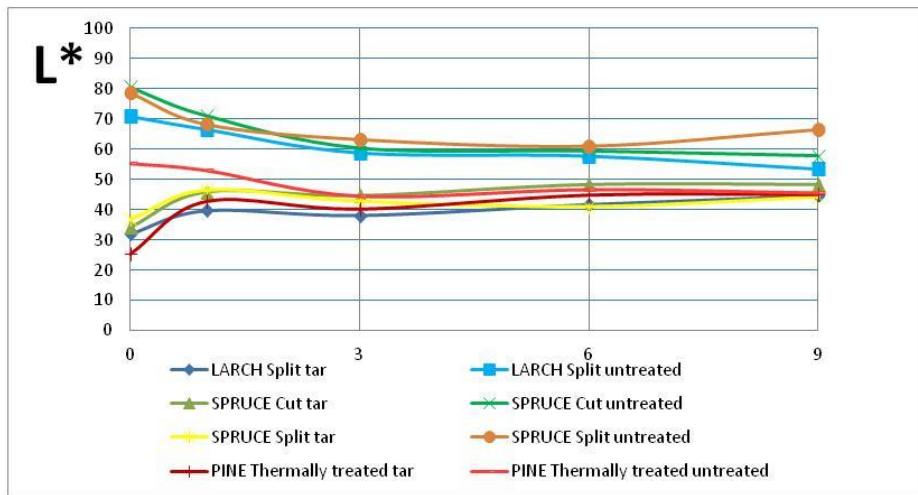
$$\Delta E^* = \sqrt{(\Delta a^*)^2 + (\Delta b^*)^2 + (\Delta L^*)^2}$$

$$\Delta a^* = a^*_{after} - a^*_{before}$$

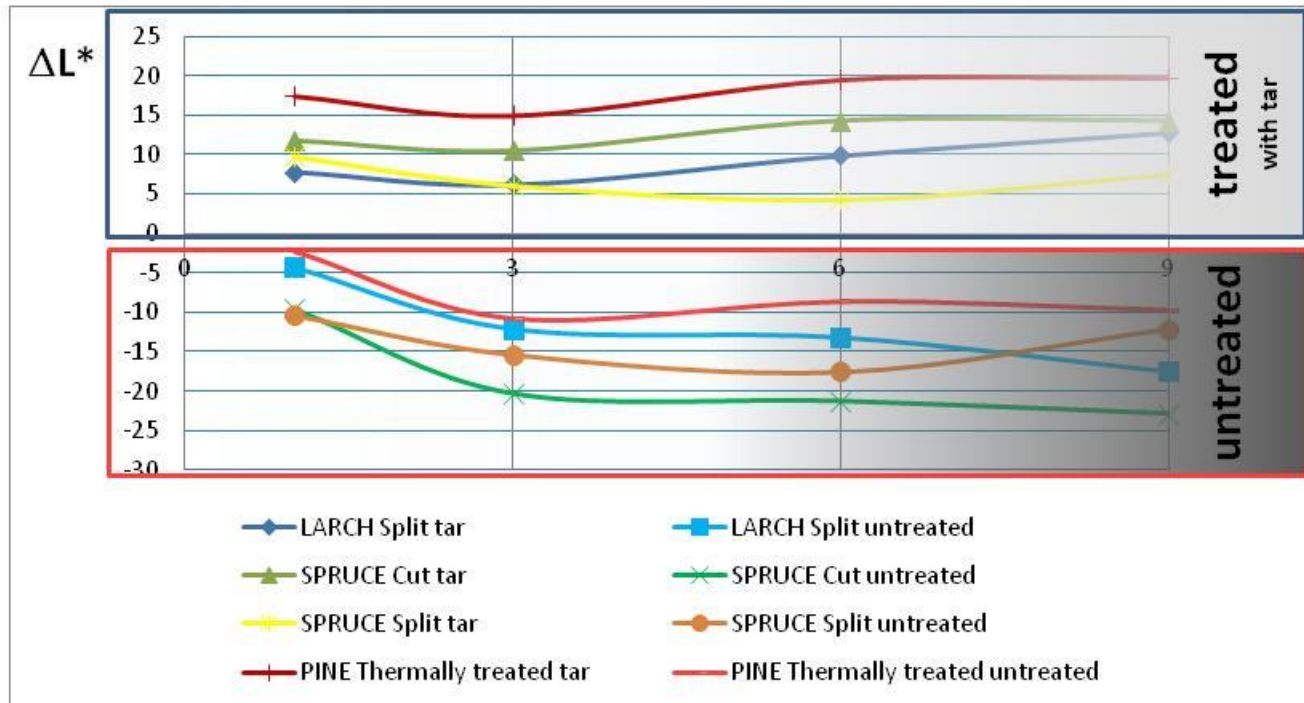
$$\Delta b^* = b^*_{after} - b^*_{before}$$

$$\Delta L^* = L^*_{after} - L^*_{before}$$

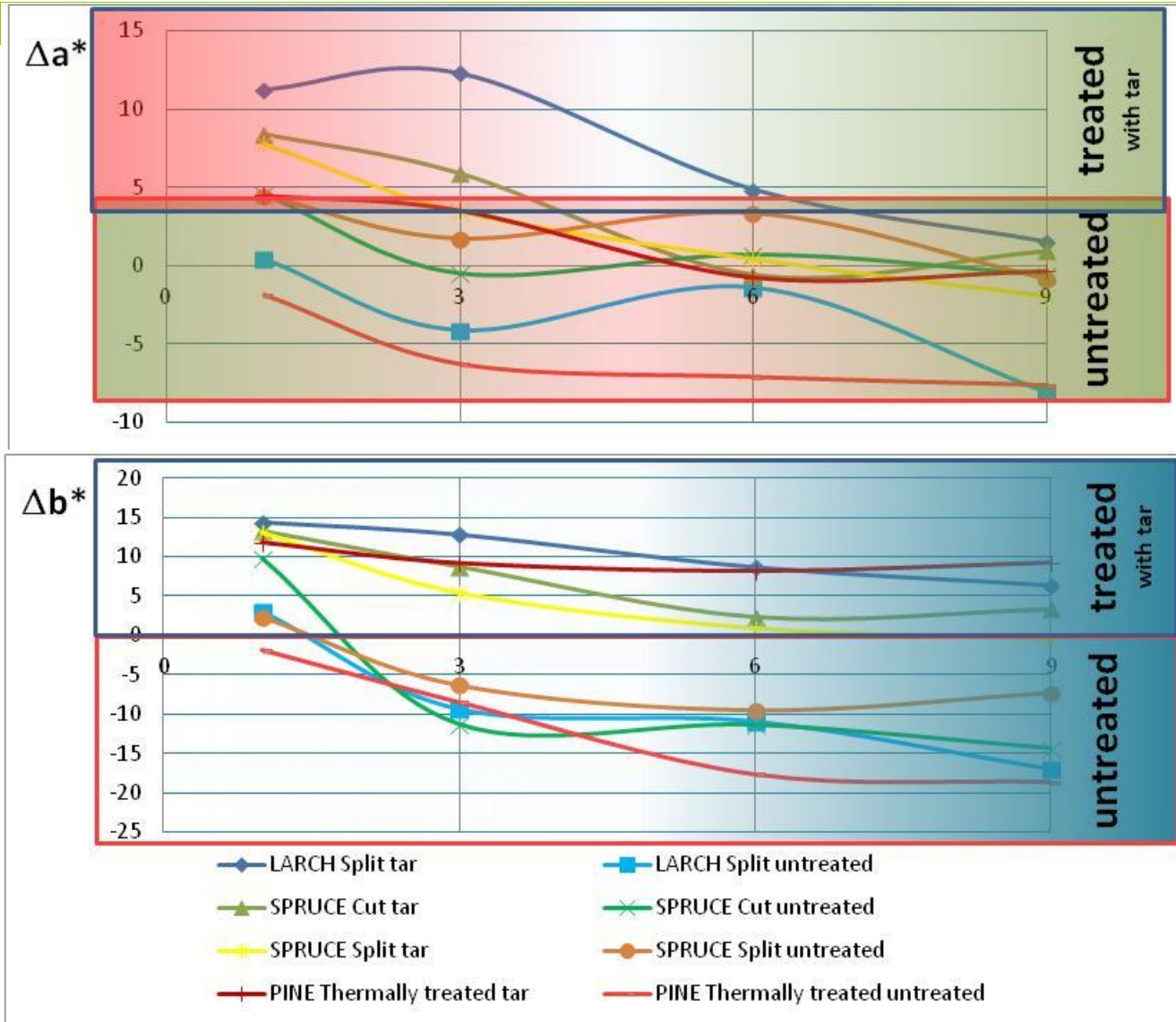
Colour parameters (CIE Lab)



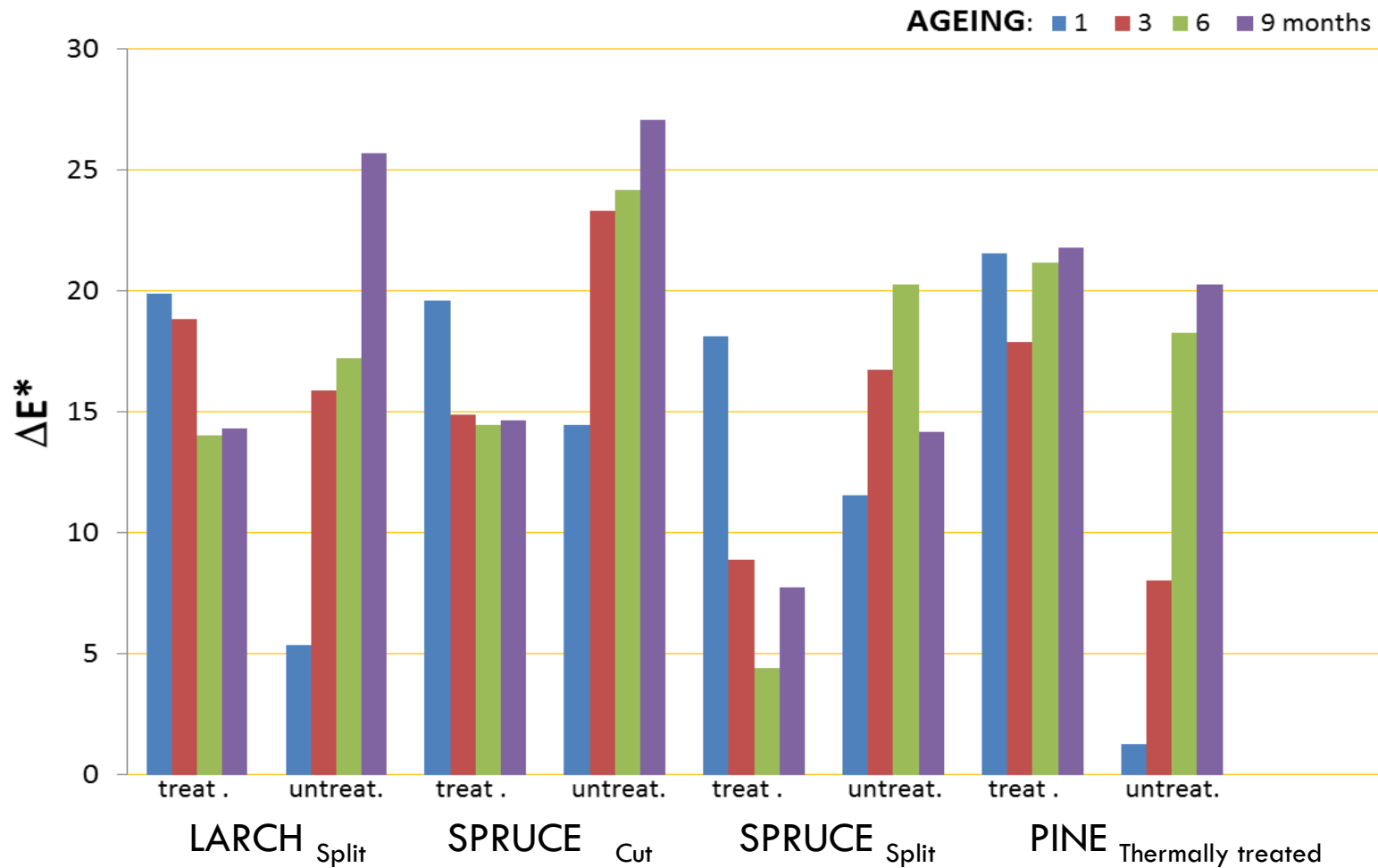
Variations ΔL^*



Variations Δa^* / Δb^*



Colour difference



Conclusions

- After nine months exposure untreated shakes show more discoloration than pine tar treated ones /excepting Pine thermally treated/
- Pine tar treated shakes were more lighter (+L*) while untreated ones were become darker (-L*)
- Both samples were become more blue
- with the prolonger time of exposure the colour change of untreated samples increase while treated one decrease
- After first summer month exposure pine tar treated shakes show more colour change like untreated ones (mainly due to changes in chemical composition)
- Spruce cut shakes show more discoloration than split ones.

Thank you for attentions....

Zuzana VIDHOLDOVÁ



Sofia, 28th February – 1st March 2017