

Termite resistance of pure & mixed heartwood/sapwood Cypress plywoods

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The beginning of the story

- European Project PLYBIOTEST

QLK5-CT-2002-01270

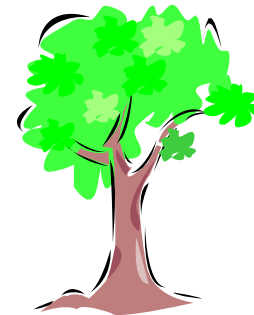
“Biological performance testing methodology to evaluate the durability of plywood as a quality indicator for exterior construction purposes”

- Influence of the top-veneer ?
- Top-veneer made of durable timber ?



The beginning of the story

- Farshid Faraji, Gonbad University, Iran
- Shortage of wood and wood products
- Plywood industry
- Large range of timbers available in the Caspian forest

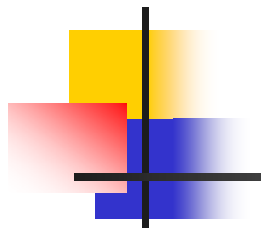








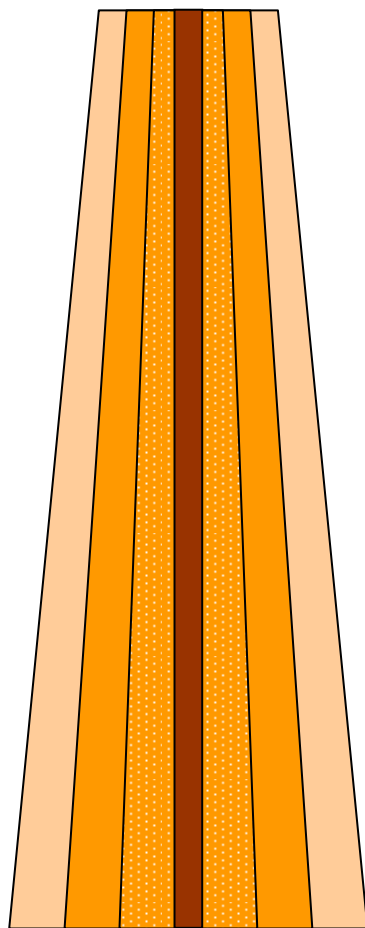
The scenario

- Cypress = *Cupressus sempervirens*
- Cypress heartwood = high durability
Presence of tropolones
- Plywood
Top veneers = Cypress heartwood
Other veneers = Cypress sapwood
- Different plywoods with different models of integration of the plies

2 Cypress trees
Avignon - South of France
45 years old



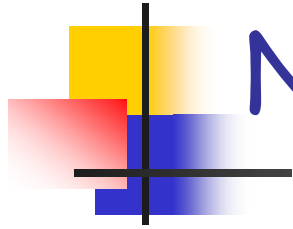
-  Sapwood
-  Outer heartwood
-  Inner heartwood
-  Core of peeling



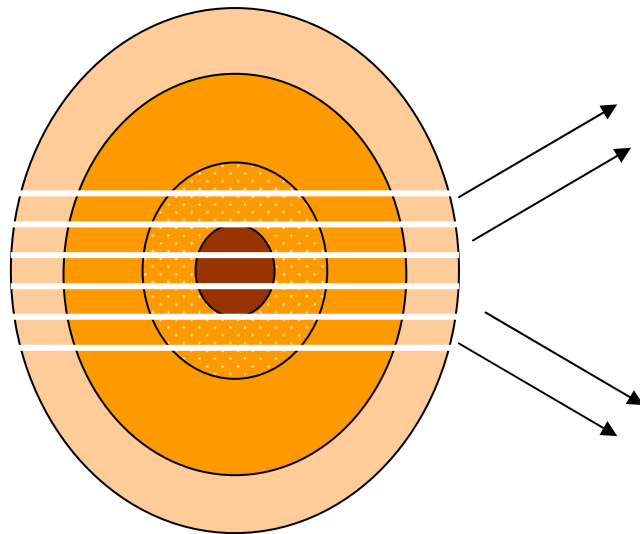
120 cm for peeling

150 cm for massive samples

120 cm for peeling { 13/10 mm plies
26/10 mm plies



Natural durability



boards for natural durability samples

central board for density and modulus of elasticity

boards for natural durability samples

Natural durability



- Evaluated according to the guidelines of EN 350-1 / EN 118 (6 samples)
visual quotation
- Guidelines of EN 117 (3 samples)
visual quotation + mass loss
- Use of other timbers :
Scotch pine sapwood, poplar, beech



Termites Reticulitermes santonensis



Natural durability

Visual quotation



Timber	Mass loss %	Standard deviation	Associated durability
Pine (sapwood)	6.98	1.05	Sensible
Beech	6.49	2.23	Sensible
Poplar	7.27	1.98	Sensible
Cypress (sapwood)	6.09	1.12	Sensible
Cypress (heartwood)	0.41	0.17	Durable
Cypress (sapwood)	-	-	Sensible
Cypress (heartwood)	-	-	Durable
Scotch Pine (sapwood)	-	-	Sensible

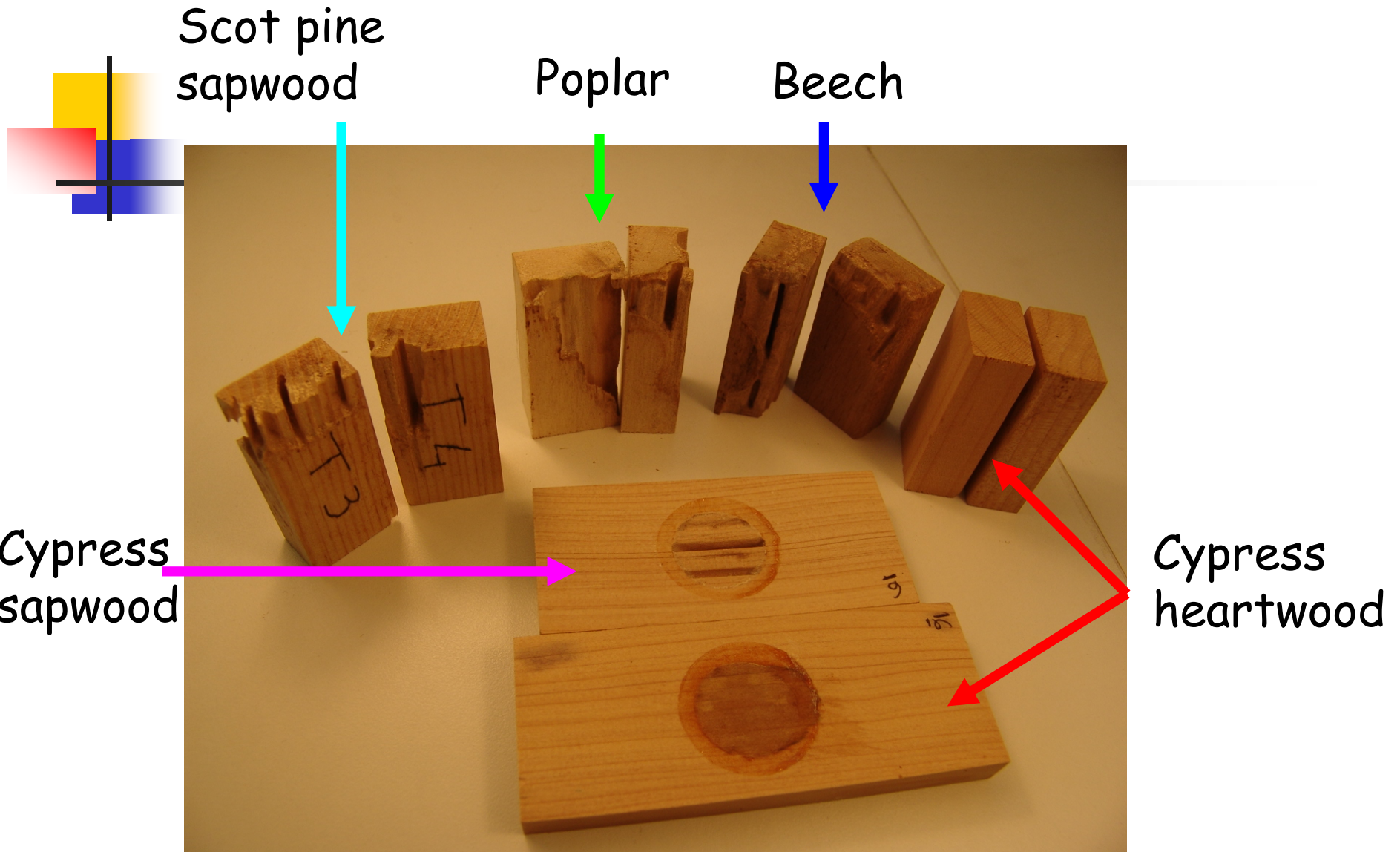
EN117



EN118

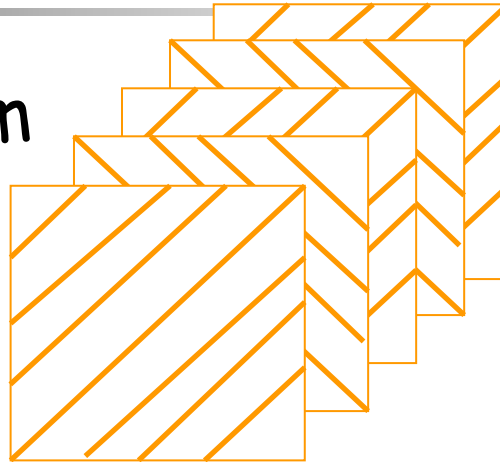


Mass loss = % of initial mass



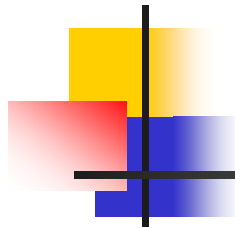
Plywoods

- 1.3mm or 2.6mm
- 5 or 9 plies

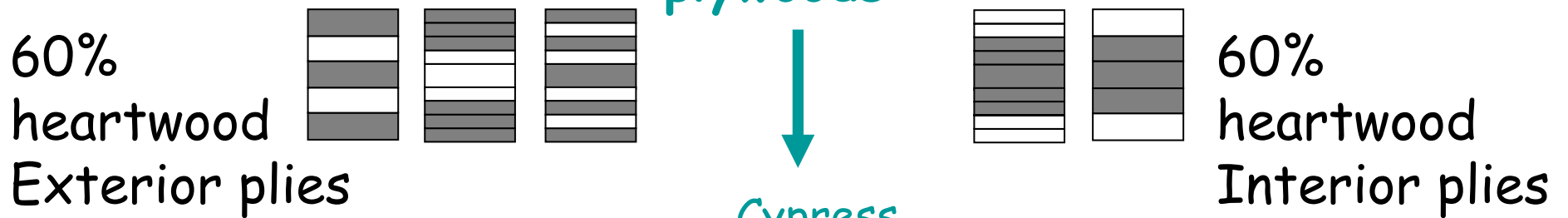


- 240 g/m² MUF glue, on the 2 sides of the inner plies
- Pressing 30°C, 2 hours
- Final thickness 13±0.5 mm

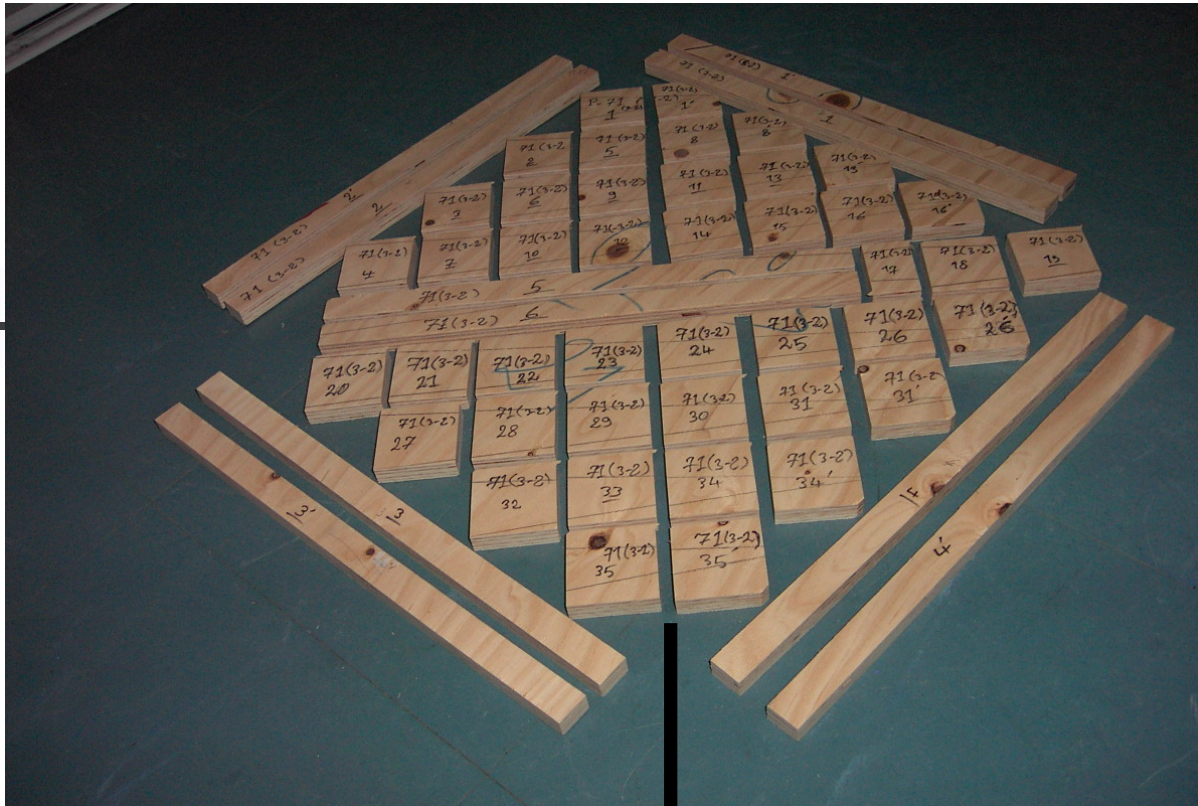
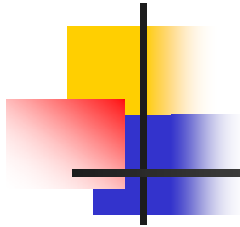
Plywood models



Cypress sapwood
Cypress heartwood
Poplar
Beech



Cypress
Sapwood/heartwood



3 months pre-conditioning
1 month conditioning
65% RH, 20°C



Sample dimensions
50 x 50 x thickness (mm)
EN 117
Visual quotation
Mass loss

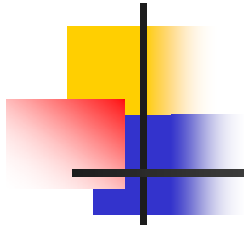
Plywoods durability

Pure panels

Visual quotation



Type of pure panel	Mass loss %	Standard deviation	Associated durability
Poplar 5 plies	8.53	0.35	Sensible
Poplar 9 plies	4.27	0.92	Sensible
Beech 5 plies	6.27	1.24	Sensible
Beech 9 plies	4.04	0.11	Sensible
Cypress-sapwood 5 plies	5.47	0.62	Sensible
Cypress-sapwood 9 plies	1.76	0.51	Sensible
Cypress-heartwood 5 plies	0.39	0.19	Durable
Cypress-heartwood 9 plies	0.34	0.08	Durable



5 plies - Sensible
Attack on any ply

No termite penetration
through the glue line



9 plies - Sensible
Attack preferentially
on top layers
+ in the thick core layer

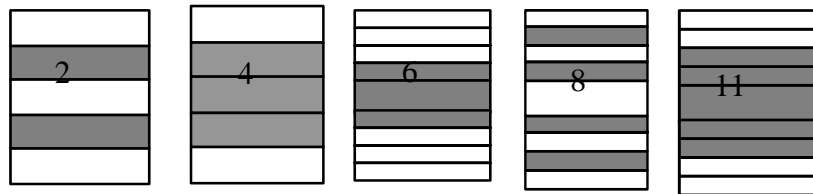
Plywoods durability

Mixed panels

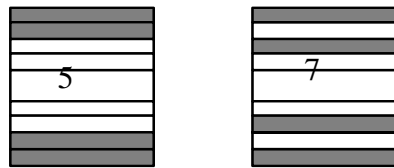
Type of panel	Mass loss %	Standard deviation	Associated durability
Mix 1	0.27	0.2	Durable
Mix 2	2.45	0.43	Sensible
Mix 3	0.21	0.17	Durable
Mix4	1.56	0.65	Sensible
Mix5	0.58	0.1	Moderately durable
Mix6	1.53	0.76	Sensible
Mix7	0.56	0.27	Moderately durable
Mix8	2.67	0.51	Sensible
Mix9	0.25	0.29	Durable
Mix10	0.32	0.27	Durable
Mix11	1.19	0.09	Sensible

Mixed panels

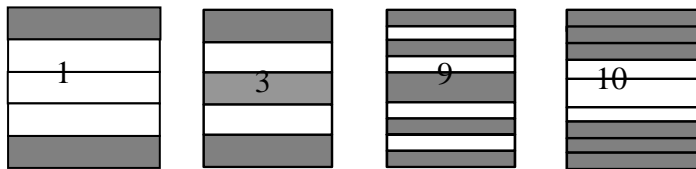
Cypress sapwood/heartwood



→ **Sensible**



→ **Moderately durable**



→ **Durable**

40%

60%

Cypress heartwood
Top veneers - Cypress heartwood



Conclusion

- Importance of the integration of the plies (durable/non durable, top veneer) to obtain plywood durable against termites
- A different use (better use ?) of biodiversity to obtain products with enhanced natural durability
- To think about :
 - Larger panels with edge seal ?
 - In « real » conditions (field tests) ?
 - For how long (tropolones from cypress are volatile) ?

Acknowledgement

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