Protection of Oak Roundwood in FSC Certified High Forests

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Methods of roundwood protection from ambrosia bark beetles through history

- **1900**: Traditional Methods
- **1930**: Chemical Methods
- **1970**: Biotechnical Methods
- **1990**: Biological Methods
- **2010**: Integrated Roundwood Protection
Forests and FSC certification

Ownership structure by share in growing stock

Growing stock by tree species

- **Pedunculate oak** 45.0 mil. m³ (14.9%)
- **Sessile oak** 28.7 mil. m³ (9.5%)
- **European beech** 113.2 mil. m³ (37.4%)
- **Narrow leaved ash** 11.8 mil. m³ (3.9%)
- **Hornbeam** 23.2 mil. m³ (7.7%)
- **Fir and spruce** 34.5 mil. m³ (11.4%)
- **Other species** 46.0 mil. m³ (15.2%)

Allowable cut

- **Pedunculate oak** 0.79 mil. m³ (13.6%)
- **Sessile oak** 0.52 mil. m³ (9.0%)
- **European beech** 2.16 mil. m³ (37.3%)
- **Narrow leaved ash** 0.27 mil. m³ (4.7%)
- **Hornbeam** 0.48 mil. m³ (8.3%)
- **Fir and spruce** 0.64 mil. m³ (11.1%)
- **Other species** 0.93 mil. m³ (16.1%)

FSC-GUI-30-001 Pesticide Policy - Guidance on Implementation:

FSC policy in relation to the use of pesticides in FSC-certified forests and plantations aims to minimize the negative environmental and social impacts of pesticide use whilst promoting economically viable management.

<table>
<thead>
<tr>
<th>Insect attack (pinholes)</th>
<th>Quality class A Quercus – A</th>
<th>Quality class B Quercus – B</th>
<th>Quality class C Quercus – C</th>
<th>Quality class D Quercus – D</th>
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<tbody>
<tr>
<td></td>
<td>not allowed</td>
<td>allowed in sapwood</td>
<td>allowed</td>
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Class A – first quality timber: generally corresponding to a butt log with clear timber or with only minor features which do not restrict use;

Class B – timber of average to first quality, with no specific requirements for clear wood;

Class C – timber of average to low quality, allowing all quality features which do not seriously reduce the natural features of wood.

Standard classification applies for the following species: Oaks (Quercus sessiliflora SALISB. or Quercus petraea LIEBL., Quercus robur L. or Quercus pedunculata EHRH.) and Beech (Fagus sylvatica L.).

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Pedunculate Oak (Quercus robur L.)

European Beech (Fagus sylvatica L.)

The purpose of this research was to explore the possibilities of targeted ethological manipulation of adult ambrosia beetles during their swarming flight in search for oak timber suitable for infestation.

Oak logs were used for evaluation of efficiency in each of the tested chemicals/trial designs.
Materials and methods

- In lowland even-aged oak stands methods of integrated oak roundwood protection were tested during period from 2003 to 2011.
- Use of pheromone baited intercept panel traps (an olfactory manipulation, trapping and monitoring of ambrosia beetle flight periods), repellents and net systems.
- Two field locations: 1) Jastrebarsko (most western part of oak distribution in Croatia and ecologically inferior to oak stands in the eastern part of country) and 2) Otok - eastern part of Croatia i.e. a good representatives of pedunculate oak stands.
Methods and results (1)

Year 2003:
- 6 panel traps with lineatin, 5 repetitions; α-pinene repelent;
- Jastrebarsko – 80 oak logs in control group and 85 in protected group;
- Otok – 61 logs in control group and 55 in protected group;

Otok site showed no difference between treated and control → α-pinene is INNEFFECTIVE!
Year 2009:
• Green Leaf Violatile (GLF) and Domowit-Typowit D® for trapping in panel traps ETOH;
• 12 traps with 5 repetitions; Tompin® repelent;
• 50 logs in both groups;
Methods and results (3)

Year 2010:
• 24 traps with 5 repetitions;
• Domowit-Typowit D® and ETOH in panel traps as attractive component;
• Hostowit® and Kombiwit® repelents;
• 50 logs in both groups;

Lack of protection because bark beetles generated aggregation pheromones!
Pheology was correlated with average weekly temperatures (if daily exceeds 9ºC *Typodendron* genus activates (Petercord 2006)).
Methods and results (5)

- Analysis of oak logs (12 m³) protected with Woodnet® system was done after 3 months of exposure.
- Detailed observation and debarking of oak timber showed only 24 pin holes overall.
- All observed pinholes were on places where bark was previously damaged.
- In six pinholes females of *Xyleborus monographus* were found. No other xylophagous insects or their remains were found on the Woodnet® system or near it.
- Only evidence of system toxicity were remains of beetles from genus *Geotrupes* near Woodnet® system.
Conclusions

• Panel traps were more attractive during early period of dispersion flight and sweeping forest for suitable hosts.

• Panel traps were more influenced with period of exposure than with attractive component used in experiments. Once aggregation process started in exposed oak logs pheromone baited traps lost its efficiency in protection of oak timber.

• Overall levels of protection with pheromone baited traps were insufficient in regard to strict FprEN 1316-1:2012:2012: E Hardwood round timber – Qualitative classification – Part 1: Oak and beech.

• Repellents used in experiments were inefficient although some species of ambrosia bark beetles are polyphagous (X. dispar, X. germanus).

• Protection of oak roundwood with Woodnet® system achieved excellent results, showed great modularity and usability in FSC certified forests.
Challenges and recommendations (1)

1. Integrated timber protection, will bring higher costs in the beginning (BASF Woodnet® price is 125 €/100 m² and previously used, but now banned, Deltacid in dose of 15 l/100 m² was 26 €).

2. Manipulation with covering/uncovering logs presents a challenge (especially in terms of poorly organized landings or for example elongated skidder roadside landings).

3. Developing method of targeted mechanical protection via the use of chemically treated polymer reusable net is FSC and WHO approved.
4. Woodnet systems should be used for the most valuable assortments which are on the landing site at the end of the harvesting season waiting for the bidding process.

5. Research was done on pedunculate oak timber and roundwood, but proposed integrated protection systems can be used on any roundwood because ambrosia bark beetles are polyphagous species that can successfully develop on broad specter of broadleaves and conifers alike.
Thank you for your attention!