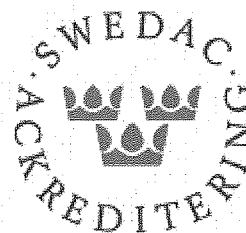


**TEST REPORT issued by an Accredited Testing Laboratory**



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EN ISO/IEC 17025

**Report nr. 2011-113/84: Determination of the protective effectiveness of the product HAresil against wood destroying basidiomycetes. Determination of the toxic values (European standard EN 113:2004)**

This report is issued by the Department of Forest Products, Division of Wood Science at the Swedish University of Agricultural Science, Uppsala, Sweden. The Wood Protection Laboratory at the Department is accredited according to ISO 17025.

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Prof. Nasko Terziev

22 December 2011, Uppsala

Name and address of the supplier	Nocturne AB, Trossvägen 5, 181 66 Lidingö, Sweden
Contact person	Robert Feledy
Name and type of the tested product	HAresil
Names and concentrations of the active ingredients (data of the producer)	SiO <sub>2</sub> 18-23% w/w Li <sub>2</sub> O 0.6-0.9% w/w K <sub>2</sub> O 4.5-9% w/w Na <sub>2</sub> O 0.1-1% w/w

Date of the products	6 February 2011	
Solvent or diluents used	Water	
Wood species	Scots pine ( <i>Pinus sylvestris</i> L.) sapwood	
Average density	512 kg/m <sup>3</sup>	
Species of fungi used	<i>Postia placenta</i> FPRL 280 <i>Coniophora puteana</i> BAM Ebw. 15 <i>Trametes versicolor</i> CTB 863A	
Concentrations of the product tested	61.0 – 30.5 – 15.25 – 7.62 – 3.81%	
Target retentions	366 – 183 – 91.5 – 45.75 – 22.88 kg/m <sup>3</sup>	
Actual retentions	See Tables 3, 4 and 5	
Duration of conditioning after impregnation	14 days	
Ageing tests carried out	According to EN 84:1997	
Method of sterilisation used	Gamma irradiation	
Date of exposure to fungi	5 April 2011	
Date of assessment	26 July 2011	
Uncorrected mass loss	See Tables 3, 4 and 5	
Correction values	See Table 2	
Corrected mass loss	See Tables 3, 4 and 5	
Mean mass loss of virulence specimens	<i>Postia placenta</i> FPRL 280	<b>25.5 %</b>
	<i>Coniophora puteana</i> BAM Ebw. 15	<b>32.5 %</b>
	<i>Trametes versicolor</i> CTB 863A	<b>17.4 %</b>
Toxic values	See Table 1	

#### Principle of the test

Series of test specimens of susceptible wood species, e.g. Scots pine sapwood are impregnated with solution in which the concentration of the tested preservative are ranged in a given progression. The test specimens are dried after impregnation and exposed to ageing procedure followed by exposure of the test specimens to attack by basidiomycetes in pure cultures to determine the toxic values of the tested product. A

test to be valid requires each untreated control specimen to have a mass loss of at least the minimum required by the standard to validate the associated treated specimen unless the treated specimen has a mass loss of at least 3% (m/m). A minimum of three valid treated test specimens per treated solution concentration for each fungus is required.

### Interpretation

The interpretation and practical conclusions that can be drawn from this report demand a specialised knowledge of wood preservation and, for this reason, the test report cannot of itself constitute an approval certificate.

### Results

The volume of each test specimen was taken as 18.75 cm<sup>3</sup>. All groups of specimens for calculating correction values and mass losses of treated samples contained 5 samples; all groups of virulence specimens contained 6 samples.

A summary of the formulation's effectiveness is shown in Table 1. Comprehensive data on product mass loss and moisture content after exposure to the test fungi are presented in Tables 3, 4 and 5.

In the test with the fungus *Postia placenta* (Table 3), all of the untreated control specimens had mass loss larger than the minimum required by the standard, i.e. 20%, thus validating all the treated test specimens. Two of the treated specimens had moisture content higher than the maximum permitted by the standard, i.e. 80%, and mass loss less than 3%. The specimens were rejected as invalid. This has not affected the determination of the formulation's effectiveness.

In the test with the fungus *Coniophora puteana* (Table 4), all of the untreated control specimens had mass loss higher than the minimum required by the standard, i.e. 20%, thus validating all the treated test specimens. Four of the treated specimens had moisture content higher than the maximum permitted by the standard, i.e. 80%, and mass loss less than 3%. These specimens were rejected as invalid. This has not affected the determination of the formulation's effectiveness.

In the test with the fungus *Trametes versicolor* (Table 5), all of the untreated control specimens had mass loss higher than the minimum required by the standard, i.e. 15%, thus validating all the treated test specimens. Two of the treated specimens had moisture content higher than the maximum permitted by the standard, i.e. 80%, and mass loss less than 3%. These specimens were rejected as invalid. This has not affected the determination of the formulation's effectiveness.

When testing *Postia placenta* (Table 1 and 3) on Scots pine sapwood specimens, a retention of 176.4 kg/m<sup>3</sup> provided protection according to the requirement of the standard EN 113 after leaching according to the standard EN 84, thus showing toxic values of 98.2 – 176.4 kg/m<sup>3</sup> achieved by impregnation of 30.5% treating solution concentration. The average mass loss of highest failing concentration was 16.9%.

When testing *Coniophora puteana* (Table 1 and 4) on Scots pine sapwood specimens, a retention of 179.2 kg/m<sup>3</sup> provided protection according to the requirement of the standard EN 113 after leaching according to the standard EN 84,

thus showing toxic values of 98.2 – 179.2 kg/m<sup>3</sup> achieved by impregnation of 30.5% treating solution concentration. The average mass loss of highest failing concentration was 18.2%.

When testing *Trametes versicolor* (Table 1 and 5) on Scots pine sapwood specimens, a retention of 98.2 kg/m<sup>3</sup> provided protection according to the requirement of the standard EN 113 after leaching according to the standard EN 84, thus showing toxic values of 44.9 – 98.2 kg/m<sup>3</sup> achieved by impregnation of 15.25% treating solution concentration. The average mass loss of highest failing concentration was 2.4%.

### Summary

The effectiveness of HAresil against selected test fungi is presented in Table 1.

**Table 1. Effectiveness of HAresil leached according to EN 84; Scots pine sapwood**

<i>Test fungus</i>	<i>Toxic values</i>		<i>Average mass loss of highest failing concentration, %</i>
	<i>Treating solution concentration, % (m/m)</i>	<i>Preservative retention, kg/m<sup>3</sup></i>	
<i>Postia placenta</i> FPRL 280	15.25 – 30.5	98.2 – 176.4	16.9
<i>Coniophora puteana</i> BAM Ebw. 15	15.25 – 30.5	98.2 – 179.2	18.2
<i>Trametes versicolor</i> CTB 863A	7.62 – 15.25	44.9 – 98.2	2.4

Table 2. Calculation of correction values C for HAresil – Scots pine sapwood

<i>Treating solution concentration, % (m/m)</i>	<i>Uptake of solution, g</i>	<i>Preservative retention, kg/m<sup>3</sup></i>	<i>Mass loss, %</i>	<i>Correction value C, %</i>
0	13,86	0	1,1	
0	14,35	0	1	
0	14,32	0	1,3	<b>1,0</b>
0	14,24	0	1,1	
0	14,60	0	0,7	
<b>mean</b>	<b>14,3</b>	<b>0</b>	<b>1,0</b>	
61.0	12,09	393,3	-9,3	
61.0	12,09	393,3	-9,8	
61.0	12,85	418,1	-9,7	<b>-9,4</b>
61.0	12,34	401,5	-8,4	
61.0	12,40	403,4	-9,6	
<b>mean</b>	<b>12,4</b>	<b>401,9</b>	<b>-9,4</b>	
30,5	10,86	176,7	-4,4	
30,5	11,69	190,2	-4,0	
30,5	10,58	172,1	-3,8	<b>-3,7</b>
30,5	11,57	188,2	-3,5	
30,5	10,64	173,1	-2,9	
<b>mean</b>	<b>11,1</b>	<b>180,0</b>	<b>-3,7</b>	
15,25	12,26	99,7	-1,6	
15,25	12,27	99,8	-1,3	
15,25	12,42	101,0	-1,7	<b>-1,5</b>
15,25	12,44	101,2	-1,6	
15,25	12,62	102,6	-1,8	
<b>mean</b>	<b>12,4</b>	<b>100,9</b>	<b>-1,5</b>	
7,62	10,87	44,2	-0,4	
7,62	11,15	45,3	-0,7	
7,62	11,45	46,5	-0,5	<b>-0,4</b>
7,62	11,23	45,6	-0,4	
7,62	11,08	45,0	-0,2	
<b>mean</b>	<b>11,2</b>	<b>45,3</b>	<b>-0,4</b>	
3,81	9,41	19,1	0,0	
3,81	9,74	19,8	-0,1	
3,81	9,85	20,0	0,3	<b>0,2</b>
3,81	10,12	20,6	0,3	
3,81	10,51	21,4	0,2	
<b>mean</b>	<b>9,9</b>	<b>20,2</b>	<b>0,2</b>	

**Table 3. Summary of results *Postia placenta* FPRL 280; HAresil leached according to EN 84; Scots pine sapwood**

Treating solution concentration, % (m/m)	Uptake of solution, g	Preservative retention, kg/m <sup>3</sup>	Uncorrected mass loss, %	Correction value (see Table 2), %	Corrected mass loss, %	Moisture content treated specimens, %	Mass loss control specimens, %	Moisture content control specimens, %
0	14,8	0	30,1	1,0	29,1			70,1
0	13,6	0	26,1	1,0	25,1			70,0
0	13,7	0	27,2	1,0	26,2			57,7
0	13,9	0	25,0	1,0	24,0			57,1
0	14,3	0	24,5	1,0	23,5			65,1
0	13,7	0	26,1	1,0	25,1			67,5
<b>mean</b>	<b>14,0</b>	<b>0</b>	<b>26,5</b>		<b>25,5</b>			
61,0	12,31	400,5	-12,5	-9,4	-3,1	73,7	46,6	53,5
61,0	11,98	389,7	-11,2	-9,4	-1,8	80,0	41,1	60,3
61,0	11,82	384,5	-12,5	-9,4	-3,1	77,3	41,7	58,5
61,0	12,11	394,0	-12,0	-9,4	-2,6*	82,2	42,3	56,9
61,0	11,71	381,0	-12,4	-9,4	-3,0	91,6	46,2	62,0
<b>mean</b>	<b>12,0</b>	<b>389,9</b>	<b>-12,1</b>		<b>-2,7</b>		<b>43,5</b>	
30,5	11,27	183,3	-4,4	-3,7	-0,7	57,3	56,4	49,9
30,5	9,99	162,5	-4,7	-3,7	-1,0	51,1	57,1	52,3
30,5	11,41	185,6	-4,7	-3,7	-1,0	58,4	51,1	48,7
30,5	10,70	174,1	-4,6	-3,7	-0,9	55,4	57,3	51,9
30,5	10,84	176,3	-4,7	-3,7	-1,0	66,9	58,7	51,4
<b>mean</b>	<b>10,8</b>	<b>176,4</b>	<b>-4,6</b>		<b>-0,9</b>		<b>56,1</b>	
15,25	12,72	103,5	15,3	-1,5	16,8	55,1	38,5	77,0
15,25	11,48	93,4	19,0	-1,5	20,5	51,4	45,2	68,5
15,25	12,21	99,3	11,4	-1,5	12,9	56,0	44,3	71,4
15,25	11,94	97,1	15,4	-1,5	16,9	52,2	43,6	72,7
15,25	12,00	97,6	15,9	-1,5	17,4	57,8	37,5	83,3
<b>mean</b>	<b>12,1</b>	<b>98,2</b>	<b>15,4</b>		<b>16,9</b>		<b>41,8</b>	
7,62	10,97	44,6	19,7	-0,4	20,1	57,7	31,4	67,9
7,62	10,68	43,4	17,8	-0,4	18,2	47,9	39,7	58,7
7,62	11,08	45,0	17,9	-0,4	18,3	68,2	32,4	66,6
7,62	11,54	46,9	22,9	-0,4	23,3	52,8	42,0	64,6
7,62	10,89	44,3	24,8	-0,4	25,2	51,1	35,7	62,0
<b>mean</b>	<b>11,0</b>	<b>44,8</b>	<b>20,6</b>		<b>21,0</b>		<b>36,2</b>	
3,81	9,48	19,3	22,1	0,2	21,9	66,9	32,4	64,1
3,81	8,42	17,1	22,7	0,2	22,5	58,6	29,6	64,9
3,81	10,19	20,7	22,9	0,2	22,7	73,3	29,9	62,0
3,81	9,53	19,4	17,2	0,2	17,0	60,0	34,9	70,4
3,81	9,41	19,1	19,6	0,2	19,4	62,1	34,3	64,9
<b>mean</b>	<b>9,4</b>	<b>19,1</b>	<b>20,9</b>		<b>20,7</b>		<b>32,2</b>	

\* Rejected replicates due to high moisture content and mass loss being less than 3% are marked with red colour. The mean value does not consider the rejected replicate.

**Table 4. Summary of results *Coniophora puteana* BAM Ebw. 15; HAresil leached according to EN 84; Scots pine sapwood**

Treating solution concentration, % (m/m)	Uptake of solution, g	Preservative retention, kg/m <sup>3</sup>	Uncorrected mass loss, %	Correction value (see Table 2), %	Corrected mass loss, %	Moisture content treated specimens, %	Mass loss control specimens, %	Moisture content control specimens, %
0	14,7	0	25,2	1,0	24,2			67,45
0	13,4	0	35,5	1,0	34,5			65,17
0	14,7	0	31,0	1,0	30,0			72,19
0	14,3	0	40,5	1,0	39,5			64,56
0	14,4	0	28,4	1,0	27,4			72,12
0	13,2	0	40,1	1,0	39,1			70,36
<b>mean</b>	<b>14,1</b>	<b>0</b>	<b>33,5</b>		<b>32,5</b>			
61,0	11,82	384,5	-9,4	-9,4	0,0*	93,1	38,6	69,0
61,0	12,35	401,8	-9,5	-9,4	-0,1	78,9	45,8	79,7
61,0	12,37	402,4	-8,9	-9,4	0,5	63,8	31,0	49,5
61,0	12,13	394,6	-8,4	-9,4	1,0	73,0	42,4	61,0
61,0	11,93	388,1	-8,7	-9,4	0,7	71,6	39,6	60,4
<b>mean</b>	<b>12,1</b>	<b>394,3</b>	<b>-9,0</b>		<b>0,7</b>		<b>39,5</b>	
30,5	9,99	162,5	-4,9	-3,7	-1,2	127,7	44,9	74,9
30,5	11,70	190,3	-3,5	-3,7	0,2	74,8	46,2	58,5
30,5	11,21	182,3	-6,2	-3,7	-2,5	73,9	37,1	63,2
30,5	10,94	178,0	-5,5	-3,7	-1,8	74,2	37,4	61,8
30,5	11,25	183,0	-4,3	-3,7	-0,6	69,2	30,5	61,3
<b>mean</b>	<b>11,0</b>	<b>179,2</b>	<b>-4,9</b>		<b>-1,2</b>		<b>39,2</b>	
15,25	12,05	98,0	4,7	-1,5	6,2	82,3	34,8	53,3
15,25	12,12	98,6	-3,0	-1,5	-1,5	131,2	43,7	62,2
15,25	11,98	97,4	36,9	-1,5	38,4	60,9	23,7	53,6
15,25	12,31	100,1	20,2	-1,5	21,7	47,4	20,5	48,4
15,25	11,92	96,9	5,2	-1,5	6,7	70,4	36,6	54,1
<b>mean</b>	<b>12,1</b>	<b>98,2</b>	<b>16,7</b>		<b>18,2</b>		<b>31,8</b>	
7,62	10,58	43,0	19,9	-0,4	20,3	50,8	35,0	56,4
7,62	10,49	42,6	13,8	-0,4	14,2	53,9	36,9	64,7
7,62	10,77	43,8	1,3	-0,4	1,7	81,0	41,6	61,8
7,62	11,01	44,7	29,7	-0,4	30,1	60,0	31,4	62,8
7,62	11,35	46,1	29,8	-0,4	30,2	67,1	34,1	60,2
<b>mean</b>	<b>10,8</b>	<b>44,1</b>	<b>18,9</b>		<b>23,7</b>		<b>35,8</b>	
3,81	11,05	22,5	12,8	0,2	12,6	45,4	21,4	48,4
3,81	10,45	21,2	31,8	0,2	31,6	61,2	30,1	58,5
3,81	9,47	19,2	23,0	0,2	22,8	50,1	30,5	57,3
3,81	9,13	18,6	31,8	0,2	31,6	62,8	34,1	63,6
3,81	9,92	20,2	7,8	0,2	7,6	57,9	36,0	59,0
<b>mean</b>	<b>10,0</b>	<b>20,3</b>	<b>21,4</b>		<b>21,2</b>		<b>30,4</b>	

\* Rejected replicates due to high moisture content and mass loss being less than 3% are marked with red colour. The mean values do not consider the rejected replicates.

**Table 5. Summary of results *Trametes versicolor* CTB 863A; HAresil leached according to EN 84; Scots pine sapwood**

Treating solution concentration, % (m/m)	Uptake of solution, g	Preservative retention, kg/m <sup>3</sup>	Uncorrected mass loss, %	Correction value (see Table 2), %	Corrected mass loss, %	Moisture content treated specimens, %	Mass loss control specimens, %	Moisture content control specimens, %
0	13,9	0	18,3	1,0	17,3			67,45
0	13,4	0	18,9	1,0	17,9			65,17
0	14,4	0	17,0	1,0	16,0			72,19
0	14,5	0	19,4	1,0	18,4			64,56
0	14,6	0	17,8	1,0	16,8			72,12
0	13,3	0	19,1	1,0	18,1			70,36
<b>mean</b>	<b>14,0</b>	<b>0</b>	<b>18,4</b>		<b>17,4</b>			
61,0	12,54	408,0	-8,7	-9,4	0,7	71,7	15,7	42,4
61,0	12,07	392,7	-8,2	-9,4	1,2	66,6	16,2	56,9
61,0	11,94	388,4	-9,1	-9,4	0,3*	85,2	17,7	57,9
61,0	11,81	384,2	-8,8	-9,4	0,6	87,3	16,1	47,3
61,0	11,82	384,5	-8,7	-9,4	0,7	77,5	16,2	57,1
<b>mean</b>	<b>12,0</b>	<b>391,6</b>	<b>-8,7</b>		<b>0,9</b>		<b>16,4</b>	
30,5	11,21	182,3	-3,9	-3,7	-0,2	72,0	17,1	73,2
30,5	11,02	179,3	-3,3	-3,7	0,4	57,7	16,1	41,2
30,5	11,21	182,3	-3,1	-3,7	0,6	48,2	19,1	62,8
30,5	11,24	182,8	-3,3	-3,7	0,4	60,7	16,1	65,8
30,5	10,21	166,1	-2,9	-3,7	0,8	49,8	17,7	63,4
<b>mean</b>	<b>11,0</b>	<b>178,6</b>	<b>-3,3</b>		<b>0,4</b>		<b>17,5</b>	
15,25	11,95	97,2	-1,5	-1,5	0,0	37,4	17,1	59,2
15,25	12,17	99,0	-0,5	-1,5	1,0	38,8	17,8	69,0
15,25	12,14	98,7	-1,2	-1,5	0,3	34,4	22,7	74,6
15,25	12,58	102,3	-1,0	-1,5	0,5	44,6	17,4	64,9
15,25	11,55	93,9	-0,7	-1,5	0,8	35,6	16,6	66,4
<b>mean</b>	<b>12,1</b>	<b>98,2</b>	<b>-1,0</b>		<b>0,5</b>		<b>18,3</b>	
7,62	10,92	44,4	1,6	-0,4	2,0	40,5	15,2	62,6
7,62	11,18	45,4	0,5	-0,4	0,9	36,2	16,2	57,7
7,62	10,96	44,5	0,5	-0,4	0,9	33,7	15,0	56,5
7,62	11,27	45,8	2,9	-0,4	3,3	35,5	19,0	64,0
7,62	10,92	44,4	4,6	-0,4	5,0	39,3	16,0	55,6
<b>mean</b>	<b>11,1</b>	<b>44,9</b>	<b>2,0</b>		<b>2,4</b>		<b>16,3</b>	
3,81	9,83	20,0	9,5	0,2	9,3	43,5	17,8	58,3
3,81	9,58	19,5	6,5	0,2	6,3	40,4	15,9	52,8
3,81	9,85	20,0	6,8	0,2	6,6	37,6	16,6	50,6
3,81	9,80	19,9	1,3	0,2	1,1	32,2	17,3	57,5
3,81	9,75	19,8	3,3	0,2	3,1	39,2	17,3	58,5
<b>mean</b>	<b>9,8</b>	<b>19,8</b>	<b>5,5</b>		<b>5,3</b>		<b>17,0</b>	

\* Rejected replicates due to high moisture content and mass loss being less than 3% are marked with red colour. The mean value does not consider the rejected replicates.