

**Enhanced Efficacy from the  
Combination of  
Copper(II) and Cu-8:  
Laboratory and Field Studies**

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# CCA WOOD PRESERVATIVE

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- ★ **Economical, effective, water-borne and forgiving.**
- ★ **However, concerns over arsenic exposure and ultimate disposal.**
- ★ **Thus, need to develop alternative wood preservatives, especially for residential market.**

# SYNERGISM STUDY

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- Screened about 70 biocide combinations.
- Agar plate test, 2 brown-rot and 2 white-rot fungi.
- 3 parts of a low-cost biocide (DDAC, Cu(II), borate, etc.) and 1 part of second biocide.

# Among about 70 mixtures examined, tested Cu(II) plus Cu-8

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- Among highest synergism seen.
- A bit surprised.
- Re-tested with agar plate using 2 brown-rot, 1 white-rot, and 1 soft-rot fungi.

# Agar plate IC<sub>50</sub>, ppm, 5 replicates per concentration-fungus.

	<b>Cu(II)</b>	<b>Cu-8</b>	<b>Cu:Cu-8 3:1</b>	<b>Cu:Cu-8 1:1</b>	<b>Cu:Cu-8 6:1</b>
<i>P. placenta</i>	>>100	6	3[SF=?]	3	2
<i>G. trabeum</i>	62	3	3[SF=3.5]	3	4
<i>T. versicolor</i>	137	2	2[SF=3.8]	2	2
<i>C. globosum</i>	34	4	3[SF=5.9]	4	5

# Agar-block decay test using *P. placenta*, SYP sapwood, 8 weeks incubation, 5 replicates.

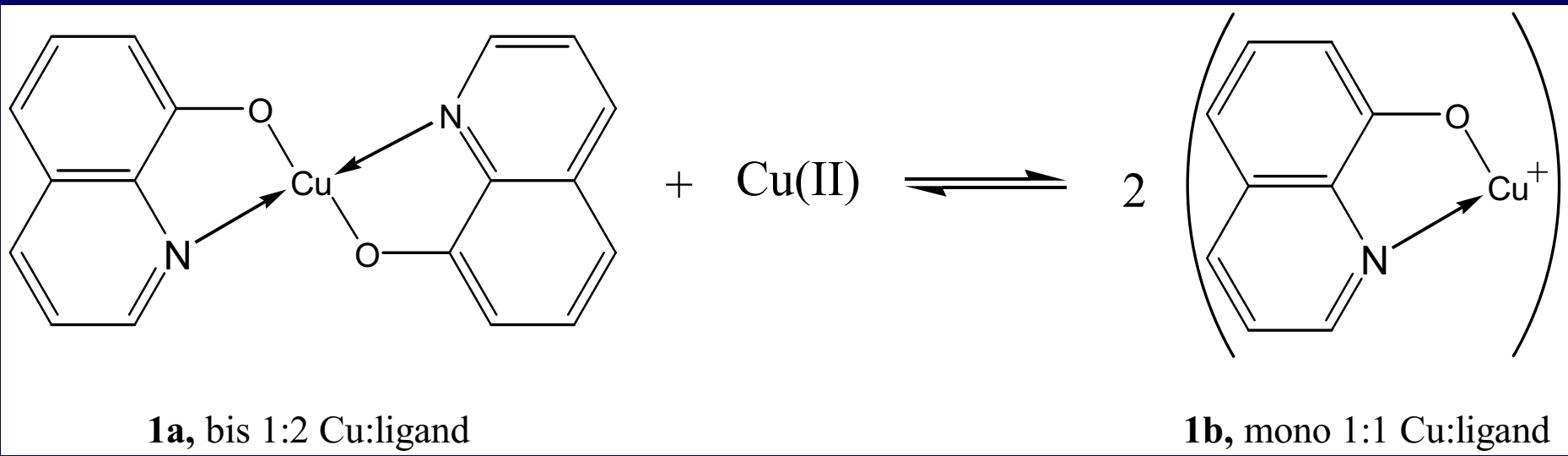
Treatment	Average Ret. (pcf)	Avg. Wt. Loss (%)
ACC	<b>0.024</b>	<b>42.6</b>
ACC	<b>0.047</b>	<b>50.0</b>
ACC	<b>0.119</b>	<b>26.1</b>
ACC	<b>0.200</b>	<b>52.9</b>
Cu-8	<b>0.005</b>	<b>48.9</b>
Cu-8	<b>0.013</b>	<b>47.0</b>
Cu-8	<b>0.015</b>	<b>35.5</b>
Cu-8	<b>0.040</b>	<b>9.8</b>
ACC:Cu-8	<b>0.024:0.006</b>	<b>27.9</b>
ACC:Cu-8	<b>0.048:0.008</b>	<b>9.6</b>
ACC:Cu-8	<b>0.050:0.006</b>	<b>4.5</b>
ACC:Cu-8	<b>0.100:0.024</b>	<b>10.5</b>
Untreated Controls	--	<b>53.7</b>

# Ground-Exposure Field Stakes

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- SYP sapwood
- Cu(II) -- ammonical copper carbonate, retention as CuO, water-borne, air-dried.
- Cu-8, Nytek 10, mineral spirits, air-dried.
- 10 stakes per treatment-site.
- Dorman Lake and Saucier plots.

Treatment	3-year Average Rating, 10 stakes			
	Dorman Lake		Saucier	
	Decay	Termite	Decay	Termite
ACC, 1.0%	<b>6.7</b>	<b>8.7</b>	<b>8.0</b>	<b>8.0</b>
Cu-8, 0.30%	<b>6.9</b>	<b>7.1</b>	<b>7.0</b>	<b>6.7</b>
Cu-8, 0.69%	<b>9.9</b>	<b>9.5</b>	<b>9.6</b>	<b>9.8</b>
ACC:Cu-8, 0.25:0.08%	<b>8.0</b>	<b>8.7</b>	<b>9.4</b>	<b>9.9</b>
ACC:Cu-8, 0.50:0.17%	<b>9.9</b>	<b>9.8</b>	<b>10.0</b>	<b>10.0</b>
ACC:Cu-8, 0.75:0.25%	<b>9.9</b>	<b>9.9</b>	<b>10.0</b>	<b>10.0</b>
ACC:Cu-8, 0.75:0.13%	<b>9.5</b>	<b>10.0</b>	<b>10.0</b>	<b>10.0</b>
ACC:Cu-8, 0.75:0.08%	<b>9.0</b>	<b>9.7</b>	<b>10.0</b>	<b>10.0</b>



Bis (**1a**) and mono (**1b**) complexes of Cu(II) and 8-Hydroxyquinoline

# CONCLUSIONS

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- **Mixture of (bis) Cu-8 plus Cu(II) highly “synergistic”.**
- **Combination may shift equilibrium to (mono) Cu-8 form.**
- **Mono form reported more toxic (Cochrane, 1958)**
- **Mono form may be easier to formulate than (bis) Cu-8.**