UPDATE ON SAPSTAIN-CONTROL TRIALS AT OREGON STATE UNIVERSITY

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INTRODUCTION

This update describes performance of a 2nd group of sapstain-control products applied in "medium" and "strong" solutions as recommended by cooperating suppliers. Trials of "weak" solutions for cool-weather storage conditions are in progress. Three of the products are available to you, and you may be familiar with them. They are:

BUSAN 1009
QUINDEX N-10 GDP
NYTEK GD

Two others, used in Europe, are not yet available in the U.S. They are:

RODEWOD (Several variations tried)
MBT (Or Saptol-7)

Penta (PERMATOX 101) was included as a standard comparative treatment.

TEST METHODS

Stain-control products were tested both in the laboratory on small wood specimens, and also on studs which were stored close-piled under plastic sheeting outdoors. This paper describes the tests on studs.

The general requirements for test material were that it be of sound, green, sappy lumber, freshly-sawed, and free of visible fungal stain. Lumber from old logs which were stored for long periods was avoided.

Rough, green 2- by 4-inch studs were selected from bundles of freshly-sawn Douglas-fir and mixed hem-fir lumber. Selected Douglas-fir studs had sound, bright sapwood along the length of at least one face. Hem-fir lumber, not having descernible sapwood, was selected by using the presence of wane as an indicator of underlying sapwood. Supar pine was selected by cooperating mill personnel from freshly-sawn material.

Studs were dip-treated within 24 to 30 hours after being sawn, except pine which was collected from a more distant source. It was treated within 36 hours, including overnight wet storage, if necessary, under a water mist.

High-graded studs were distributed consecutively into six chemical treatment groups for dipping into solutions of sapstain-control products listed in Table 1. Studs were dipped indiviually to half-length for 15 seconds, drained briefly, and then stacked with their dipped ends together and best sapwood face for testing upturned. The undipped end of each stud served as its untreated control.

Six treatment groups of 15 studs each were assembled side by side to make up test bundles of 90 specimens. All specimens in a bundle were of the same wood, and the included treatments were all at either a medium or strong solution strength. The assembled bundle was tightly strapped, end-coated, and covered with black plastic sheeting to retard drying and to uniformly promote favorable conditions for staining throughout the bundle.

Wrapped bundles were stored outdoors on treated bunks at Corvallis, OR. They were roofed with flakeboard panels and shielded from solar heating of their south- and west-facing black plastic surfaces.

After two and six months, studs showing fungal stain or growth over 50% or more of their untreated face on the control end were rated for extent of fungal staining

and surface growth on the upturned face of the treated end. Studs that had dried out to 27% MC or less at 1/8" depth were not rated unless staining had already become well advanced.

RESULTS--DOUGLAS-FIR

Studs dipped during late April 1987 in medium-strength solutions were well protected for two months by all treatments (Table 2). Treatment with Permatox 101 provided excellent protection through six months if brown mold was disregarded; other treatments were considerably less successful. Light-colored and superficial growth of brown mold (Cephaloascus fragrans) is usually disregarded by lumber graders unless associated with a more serious defect such as decay.

Strong solutions applied in mid-May 1987 generally provided even better protection over a two-month period, although little improvement was possible in some cases. The increased dosages also reduced the occurrence of extensively stained studs having discoloration over 70% to 100% of the treated face area after six months of storage.

RESULTS--HEM-FIR

Sample sizes of the hem-fir treatments were limited because of slow and inadequate staining on the control end of some studs after two months of storage.

Most of the treatments with medium-strength solutions applied in early May '87 provided reasonably good, to good, protection during the first two months of storage, and the occurrence of extensively stained studs during that time was rare (Table 3). After six months of storage, there were few bright studs, except those treated with Permatox 101, and extensively stained studs were common among most of the other treatments.

Studs dipped in strong solutions during early June '87 were fully protected by MBT and 101 during the following two months of storage as air temperatures approached their annual peak in August. Most of the other treatments provided reasonably good protections, and few studs had stained extensively. After six months, only 101 still provided a high level of protection, and extensively stained studs were common among all other treatments.

RESULTS--SUGAR PINE

A lack of sapwood on some pieces reduced the number of studs suitable for these trials.

Studs dipped in medium-strength solutions during mid-May '87 were fully protected by MBT over the following two months of storage, but other treatments were less effective (Table 4). ROD 200+ was at least as good as 101, while the 1009 treatment was better. After six months, there were no bright studs in any of the treatments and extensively stained pieces were common.

Strong solutions of MBT, 101, and 1009 applied in mid-June '87 provided good to excellent protection during the following two months of storage as summer temperatures neared their August peak. Treatment with ROD 200+ yielded fewer bright studs, but there were no extensively stained pieces in any of those four treatments after the first two months of storage. After six months, there were few bright studs and extensive staining was common in all treatments except 101 and, to a lesser degree, ROD 200+.

CONCLUSIONS

These conclusions are based on storage conditions intended to stress the treatments and are therefore more severe than normally encountered in practice. Better product performance could be expected under more realistic field conditions.

Conclusions 2 and 3 support findings of our previous field trials.

1. During warming weather of spring and early summer when average monthly high temperatures rise about 65° F, medium-to-strong solutions of the products included in these trials should provide good to excellent protection of Douglas-fir for at least two months. Strong solutions of some products can provide virtually complete protections during that time. Some products also perform well on hem-fir and sugar pine, particularly so if strong solutions are used.

2. During prolonged storage (6 months), Permatox 101 generally provides the best protection of Douglas-fir and hem-fir, especially if brown mold is disregarded. None of the products performed well on similarly stored sugar pine.

3. Stain development tends to be slower and of lighter shade on hem-fir than on sapwood of Douglas-fir or sugar pine.

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Table 1. Products tested for sapstain control.

Product			Product Dilution		Concentration tested (% total a.i.)	
Name	Chemical	a.i.	Medium Sol.	Strong Sol.	Medium Sol.	Strong Sol.
		%				
Busan 1009	Methylene bis thiocyanate 2-(Thiocyanomethyl) thiobenzothiazole	10 10	1:100	1:50	0.21	0.42
Quindex N-1C	Copper-8-quinolinolate	10	1:60	1:50	(.031	.038)[a]
MBT (Saptol-7)	Methylene bis thiocyanate	10	1:16.7	1:12.5	0.58	0.75
Nytek GD + 4160 conditioner	Copper-8-quinolinolate 4160 (additive)[b]	10 0	1:60	1:40	(0.31	.046)[a]
Permatox 101	Sodium tetrachlorophenate Sodium pentachlorophenate Sodium metaborate anhydrous Phenylmercuric acetate	2.4 20.4 3.1 0.4	1:50	1:33.3	0.61	0.90
Rodewod 200EC + borax	Azaconazole Borax[b]	18.5 52.8	1:99	-----	1.65[c]	----
Rodewod 200EC +DF50	Azaconazole DF50[b]	18.5 50.0	-----	1:100	-----	0.30[d]
Rodewod 2280-40400	Azaconazole Dicecyl dimethyl ammonium chloride	4.3 43.0	-----	1:99	-----	0.44

[a] Percent copper metal
[b] Added to solution.
[c] Includes 1.46% a.i. of borax
[d] Used only on pine. Includes 0.10% a.i. of DF50.

Table 2. Percent of Douglas-fir studs that were bright or stained in sapwood after 2 and 6 months of outdoor storage at Corvallis. Values in parentheses disregard brown mold.

Treatment[1]	Dilution	No. of studs[2]	Months stored	Bright or slight stain	Stained Studs: 10-30% of face[3]	Stained Studs: 40-60% of face[3]	Stained Studs: 70-100% of face[3]
		(n)		- - - - - - -	Percent of (n)	- - - - - - -	
Douglas-fir dipped 4-28-87, medium strength solutions.							
ROD 200+	1: 99	15	2	93	7	0	0
1009	1:100	15	2	87	13	0	0
QU	1: 60	15	2	93	7	0	0
MBT	1: 16.7	15	2	93	7	0	0
NY+	1: 60	15	2	87	13	0	0
101	1: 50	15	2	73(100)	20(0)	7(0)	0
ROD 200+	do	14	6	21	7	7	64
1009	do	14	6	0	0	7	93
QU	do	14	6	0	7	14	79
MBT	do	14	6	29	14	7	50
NY+	do	13	6	0	15	0	85
101	do	11	6	18(91)	45(9)	18(0)	18(0)
Douglas-fir dipped 5-19-87, strong solutions.							
ROD 2280	1: 99	15	2	100	0	0	0
1009	1: 50	15	2	100	0	0	0
QU	1: 50	15	2	93	7	0	0
MBT	1: 12.5	15	2	100	0	0	0
NY+	1: 40	15	2	73	27	0	0
101	1: 33.3	15	2	100	0	0	0
ROD 2280	do	14	6	14	29	14	43
1009	do	14	6	7	7	36	50
QU	do	14	6	0	21	29	50
MBT	do	14	6	64	21	7	7
NY+	do	14	6	7	14	7	71
101	do	14	6	79(93)	14(7)	0	7(0)

[1] RODEWOD 200EC + borax, RODEWOD 2280-40400, BUSAN 1009, QUINDEX, SAPTOL-7 (MBT), NYTEK + 4160, PERMATOX 101.
[2] Includes studs having at least 50% stain of sapwood on control end.
[3] Percent of dipped sapwood face area only.

Table 3. Percent of hem-fir studs that were bright or stained after 2 and 6 months of outdoor storage at Corvallis. Values in parentheses disregard brown mold.

Treatment[1]	Dilution	No. of studs[2]	Months stored	Bright or slight stain	Stained Studs: 10-30% of face[3]	Stained Studs: 40-60% of face[3]	Stained Studs: 70-100% of face[3]
		(n)		- - - - - - - Percent of (n) - - - - - - -			
Hem-fir dipped 5-6-87, medium strength solutions.							
ROD 200+	1: 99	8	2	75	25	0	0
1009	1:100	14	2	57	29	7	7
QU	1: 60	10	2	50	50	0	0
MBT	1: 16.7	12	2	92	8	0	0
NY+	1: 60	8	2	88	0	12	0
101	1: 50	7	2	86(100)	14(0)	0	0
ROD 200+	do	13	6	15	23	31	31
1009	do	14	6	0	14	21	64
QU	do	13	6	0	31	31	38
MBT	do	14	6	0	14	0	86
NY+	do	14	6	7	50	29	14
101	do	14	6	64(100)	14(0)	7(0)	14(0)
Hem-fir dipped 6-4-87, strong solutions.							
ROD 2280	1: 99	7	2	71	14	0	14
1009	1: 50	12	2	75	17	8	0
QU	1: 50	12	2	42	42	0	17
MBT	1: 12.5	13	2	100	0	0	0
NY+	1: 40	12	2	75	25	0	0
101	1: 33.3	9	2	100	0	0	0
ROD 2280	do	15	6	7	27	27	40
1009	do	15	6	7	7	0	87
QU	do	15	6	0	0	20	80
MBT	do	15	6	7	20	13	60
NY+	do	15	6	13	27	27	33
101	do	14	6	93(100)	7(0)	0	0

[1] RODEWOD 200EC + borax, RODEWOD 2280-40400, BUSAN 1009, QUINDEX, SAPTOL-7 (MBT), NYTEK + 4160, PERMATOX 101.
[2] Includes studs having at least 50% stain of untreated face on control end.
[3] Percent of dipped face area.

Table 4. Percent of sugar pine studs that were bright or stained in sapwood after 2 and 6 months of outdoor storage at Corvallis. Values in brown mold parentheses disregard brown mold.

Treatment[1]	Dilution	No. of studs[2]	Months stored	Bright or slight stain	Stained Studs: 10-30% of face[3]	Stained Studs: 40-60% of face[3]	Stained Studs: 70-100% of face[3]
		(n)		- - - - - - - Percent of (n) - - - - - - -			
Sugar pine dipped 5-13-87, medium strength solutions.							
ROD 200+	1: 99	10	2	40	50	10	0
1009	1:100	8	2	62	25	0	12
QU	1: 60	9	2	0	33	11	55
MBT	1: 16.7	9	2	100	0	0	0
NY+	1: 60	10	2	0	10	20	70
101	1: 50	8	2	37	37	12	12
ROD 200+	do	13	6	0	8	8	85
1009	do	12	6	0	0	0	100
QU	do	12	6	0	0	0	100
MBT	do	12	6	0	17	42	42
NY+	do	14	6	0	0	0	100
101	do	13	6	0	0	23	77
Sugar pine dipped 6-11-87, strong solutions.							
ROD 200+DF	1:100	12	2	67	33	0	0
1009	1: 50	13	2	85	15	0	0
QU	1: 50	10	2	20	20	20	40
MBT	1: 12.5	12	2	92	8	0	0
NY+	1: 40	14	2	29	43	14	14
101	1: 33.3	13	2	92(100)	8(0)	0	0
ROD 200+DF	do	12	6	17	25	33	25
1009	do	13	6	0	15	23	61
QU	do	11	6	0	0	9	91
MBT	do	12	6	8	17	17	58
NY+	do	15	6	0	0	7	93
101	do	13	6	8(23)	77(69)	15(8)	0

[1] RODEWOD 200EC + borax, RODEWOD 200EC + DF 50, BUSAN 1009, QUINDEX, SAPTOL-7 (MBT), NYTEK + 4160, PERMATOX 101. RODEWOD 200EC + DF50EXP as strong solution on pine only.
[2] Includes studs having at least 50% stain of sapwood on control end. Studs having sapwood on dipped end only are also included.
[3] Percent of dipped sapwood face area only.