BANK BANDING WITH MORPHACTIN TO INHIBIT TREE GROWTH [1]

by H. Hield, R.M. Sachs and R.A. Backhaus

Abstract. A California supplemental registration now permits trunk bark banding with Maintain CF 125, a morphactin formulation, for tree growth inhibition. A band of equal width to the treated trunk or branch is sprayed or painted with a 1% concn of Maintain CF 125 in a specific oil carrier mixture. Pine sp. and *Acacia longifolia* are responsive to this level of treatment. Less responsive trees are being tested at a 2% concn, with increased band width, and with more frequent applications. *Calacedrus decurrens, Juglans hindsii, Platanus racemosa* and *Nerium oleander* have not responded to increased dosage.

Line clearance from tree growth is a major expenditure of utility companies. For a number of years it has been envisioned that a growth inhibitor treatment might reduce tree growth and offer a saving on pruning costs. This has in fact occurred. Foliar sprays with MH and Maintain CF 125 are applied to reduce growth of Platanus, Juglans, Ulmus and some other tree species in California (6). Limitations result from the number of species responsive to those chemicals and from restrictions on where sprays may be applied because of hazards from spray drift.

Chemical applications by injection and trunk bark banding have been investigated (1,2,5). Both permit a safer treatment because of the elimination of the drift factor. Bark banding applications are simple and rapid.

This report describes the recent supplementary California registration of Maintain CF 125 for bark banding to reduce tree growth. It also presents current information on responsive species and possible concn adaptation to increase the number of responsive species.

Supplemental registration. A 1% concn of Maintain CF 125 in either of 2 oil mixtures is allowed. The oil fraction may be either no. 2 diesel oil or transformer oil with a 7.5% emulsifier mixture. The specified emulsifier mixture (EM) is 9 parts Span 80 and 1 part Tween 80. The alternate carrier is 70% oil and 30% toluene.

Applications is by 3 gal sprayer or brush in a complete band equal in width to the trunk or branch diameter. Treatment is cautioned on small, diseased or stressed trees.

Pine trees at treatment should be dormant and not showing a candle growth stage. Treatment during rapid growth will result in distorted new shoot and leaf growth.

Deciduous trees are required to have 4 or 5 full sized leaves on the terminals before treatment. The development of an acceptable shade cover before treatment is desired since new growth is frequently distorted and subsequent leaf size reduced. Treatment should be before shoot elongation.

Label instructions on Maintain CF 125 container must be read with precautions and directions on each label followed.

Experimental testing

Chlorflurenol-methylester (Maintain CF 125) is the only chemical shown effective for bark banding. There have been over 5 years in which effective growth inhibition treatments have been applied on pine sp. (1,4). Examples from experiments have been selected to illustrate various responses (Table 1). Statistical significance was tested except for test 3, and values without ** and * are not significantly different from the control.

Test 3, a 1973 experiment with *Pinus radiata,* gives evidence of more than 7 months growth control from a 1 diam band with .63% CF 125 in spray oil and the Span-Tween emulsifier mixture. While generally effective the CF 125 separates in this mixture. For this reason the mixture must be prepared daily and requires frequent agitation. Otherwise a varying concn of CF 125 would be applied.

Carrier. Early in the bark banding research program (supported in part by the Electric Power

[1] Presented at the ISA Conference in Philadelphia, Pennsylvania in August 1977.

Research Institute) various carrier systems were tested for ability to hold CF 125 in mixture. It was determined that addition of 30% toluene or benzene to the oil carrier kept the CF 125 in solution. Growth inhibition was then tested with these carriers as well as with Mor Act, a proprietary wetting agent spray oil mixture, with EM-oil mixtures and with carrier mixtures without CF 125. Test 4 shows 30% toluene or benzene plus diesel was as effective as EM plus diesel carrier for giving CF 125 inhibition. Mor Act was a less effective carrier. The carrier mixture of EM or toluene with diesel, spray or transformer oil have not caused shoot growth reduction (Tests 1,4).

Growth reductions have occurred from the Maintain CF 125 in the EM plus oil carrier but there was also difficulty in keeping the CF 125 in a uniform mixture. With the 30% toluene (preferred to benzene) oil mixture there is 1 year of successful use and it is easier to manage.

Species. Variations in growth reduction from bark banding is correlated to responsiveness of that species to spray application. Acacia, as well as pine, shows long term inhibition from 1% concn and a 1 diam band (Tests 3, 5).

There are a number of species where growth reductions have not persisted, and increased concn, increased band width, as well as repeated applications are believed to be necessary to cause long-term growth reductions. Eucalyptus, elm and ash (Tests 1, 7, 8) are species where one or more of the above alterations of banding procedure have been necessary for prolonged inhibition.

Comparisons with increased amount of CF 125, by a higher conc or by a wider band, have not shown an advantage for either procedure (Test 7, 8). The 1% concn at a 2 or 4 diam band width has shown as great an inhibition as other combinations. A 1% CF 125 mixture is more stable than a 2% mixture. Also, the advantage of a standardized mixture (carrier and concn) would favor increasing band width rather than concn.

However, eucalyptus and ficus are 2 of several species where a 2% concn appears to be required. Eucalyptus results (Test 1) over several years have indicated that a 2% concn at a 2 or 4 diam band width with repeat application is necessary for long term growth stoppage.

Calocedrus decurrens, *Juglans hindsii*, *Platanus racemosa*, and *Nerium oleander* have not responded to the 1% concn, 1 diam band application.

Injury. Leaf curl occurs from CF 125 banding as it does from spray application. Small leaves (like pine) are less noticeably distorted than large leaves. Leaf drop sometimes occurs as the result of faster aging of older leaves. Slight canopy opening on elms has resulted from such leaf drop and the accompanying inhibition of new growth.

Bark is darkened as a result of oil application.

Figure 1. *Fraxinus uhdei.* Tree to right shows top growth reduction 71 days after a March 31 basal banding of 2 diam width with a 2% Maintain CF 125 concn. Tree to left not treated.

Table 1. Growth reduction responses of 7 tree species to trunk bark banding with chlorflurenol oil base solutions. Band width equal to trunk diameter except where specified application at twice (2x) of 4 times (4x) trunk diameter.

Test No.	Species	Maintain CF 125 concn. (%)	Carrier system	Days after treatment	Growth reduction (%)
1	*Eucalyptus globulus*	2.5	EM[1] + transformer oil	40	92.2**[2]
		2.5	EM + transformer oil	99	24.0
		2.5	EM + transformer oil	182	0.0
		2.5	30% benzene + 70% transformer oil	40	98.5**
		2.5	30% benzene + 70% transformer oil	99	53.2**
		2.5	30% benzene + 70% transformer oil	182	35.2*
			EM + transformer oil only	40	13.6
			EM + transformer oil only	99	0.0
			EM + transformer oil only	182	0.0
2	*Eucalyptus globulus*	1.0	30% toluene + 70% diesel normal bark	93	53.9
		1.0	30% toluene + 70% diesel normal bark	138	58.2
		1.0	30% toluene = 70% diesel bark injured	93	50.5
		1.0	30% toluene + 70% diesel bark injured	138	49.4
			bark injured only	93	14.1
			bark injured only	138	17.3
3	*Pinus radiata*	1.25	EM + spray oil	98	65.0NA
		1.25	EM + spray oil	182	82.2NA
		1.25	EM + spray oil	226	90.4NA
		.63	EM + spray oil	98	65.0NA
		.63	EM + spray oil	182	77.8NA
		.63	EM + spray oil	226	83.0NA
4	*Pinus radiata*	1.0%	30% toluene + 70% diesel	83	56.3**
		1.0%	EM in diesel	83	48.9**
		1.0%	30% benzene + 70% diesel	83	63.4**
		1.0%	MorAct[3]	83	33.3
			30% toluene + 70% diesel only	83	0.0
			EM in diesel only	83	9.4
			30% benzene + 70% diesel only	83	10.5
			EM in diesel only	83	5.5
5	*Acacia longifolia*	1.0	30% benzene + 70% diesel	199	50.2**
		1.0	Mor Act	199	50.3**
		0.25	30% benzene + 70% diesel	199	31.7
		0.25	Mor Act	199	0
			30% benzene + 70% diesel only	199	27.5
			Mor Act	199	0
6	*Ficus nitida*	1.0(2x)	30% toluene + 70% diesel on normal bark	45	39.7**
		1.0(2x)	30% toluene + 70% diesel on normal bark	131	37.3**
		1.0(2x)	30% toluene + 70% diesel over injured bark	45	53.5**
		1.0(2x)	30% toluene + 70% diesel over injured bark	131	38.6**
7	*Ulmus parvifolia*	1.0	40% toluene + 70% diesel	139	21.9
		1.0(2x)	30% toluene + 70% diesel	139	44.2
		1.0(4x)	30% toluene + 70% diesel	139	72.8**
		2.0	30% toluene + 70% diesel	139	13.2
		2.0(2x)	30% toluene + 70% diesel	139	75.0**
		2.0(4x)	30% toluene + 70% diesel	139	67.2**

8	*Fraxinus uhdei*	0.5(4x)	EM + diesel oil	44	63.4
		0.5(4x)	EM + diesel oil	114	28.2
		1.0(2x)	EM + diesel oil	44	74.6*
		1.0(2x)	EM + diesel oil	114	8.9
		1.0(4x)	EM + diesel oil	44	73.0*
		1.0(4x)	EM + diesel oil	114	34.0
		2.0(x)	EM + diesel oil	44	24.6
		2.0(x)	EM + diesel oil	114	54.8
		2.0(2x)	EM + diesel oil	44	72.2*
		2.0(2x)	EM + diesel oil	114	13.9
		2.0(4x)	EM + diesel oil	44	72.2*
		2.0(4x)	EM + diesel oil	114	60.1
9	*Nerium oleander*	2.0	EM + spray oil	80	8.3
		2.0(2x)	EM + spray oil	80	26.1
		2.0(4x)	EM + spray oil	80	14.8

1. EM = 7.5% of an emulsifier mixture of 9 parts Span 80 and 1 part Tween 80.
2. All data statistically analyzed except where marked with NA. Difference occurring at .01 and .05% probability levels from the control are shown by ** and * respectively
3. A proprietary product containing 17% atplus 300 in Sunco Superior Spray Oil No. 11.

Discoloration disappears more rapidly with warm temperatures and has not persisted longer than 3 months. Observation of 1974 tests by Davey Tree where bark bands started at ground level, leaving only 1 line of difference in bark color, led to the practice of banding from the soil line up.

Swelling of the banded zone has occurred on 4 year old *Pinus radiata* and *Fraxinus uhdei*. No evidence of increased epicormic sprouting or girdling has occurred.

An increased rate of bark aging frequently occurs on corky barked species 4 to 6 months after treatment. Bark changes without injury to the tree have occurred with treatments on juvenile and mature eucalyptus (more rapid aging), *Fraxinus uhdei* (uneven diameter growth and infrequent 2 cm surface splits), and *Ulmus parvifolia* (increased bark aging). This is supported by work of Doss et al. (1977) on Pinus radiata (3).

Some *Acacia longifolia* treated with CF 125 in 30% benzene in diesel oil were killed. Since death also occurred from the benzene-diesel carrier without CF 125, the benzene is suspect. Bark banding with Maintain CF 125 in other carriers has been repeated annually for 3 years. Foliar modifications were always outgrown and there was no bark response which damaged the tree.

Literature Cited

1. Alvarez, R.G. 1977. *Growth regulators.* J. Arbor. 3(5): 94-97.
2. Backhaus, R.A., R.M. Sachs and H.Z. Hield. 1976. *Tree growth inhibition by bark application of morphactins.* HortScience 11: 578-580.
3. Doss, R.P., P.M. Nueman, R.A. Backhaus, and R.M. Sachs. 1977. *Bark banding of Pinus radiata D. Don with morphactin (IT3456): Influence on trunk anatomy, assimilate transport and growth.* Physiol. Plant. 39: 280-284.
4. Harris, G.K., G.B. Garrette, and D.O. Anderson. 1971. *On turf, shrubs, vines and trees maintain success boosting growth retardants.* Weeds, Trees and Turf 10(3): 20-22, 24.
5. Himelick, E.B. 1972. *High pressure injection of chemicals into trees.* Arborist's News 37(9): 97-103.
6. Sachs, R.M., W.P. Hackett, R.G. Maire, T.M. Kretchum, and J. deBie. 1970. Chemical control of plant growth in landscapes. Calif. Agr. Exp. Stat. Bul. 844.

University of California
Dept. of Plant Sciences, Riverside and
Dept. of Environmental Horticulture, Davis