ADHESION AND RETENTION STUDY

The entire data set of results for adhesion and retention can be found in the Appendix B, Tables 31-55.

ADHESION

Overall Comparison of Formulations

Regression analysis of percentage adhesion was performed with the main effects and first order interactions. It was found that the main (highest deviance ratios) first order interaction was between species and surface (ie. adaxial and abaxial surface). Graphing the other first order interactions (results not shown here) indicated that these were not of great importance. Therefore a further model was run, involving all of the main effects, and the first order interaction, species by surface. The results are shown in Table 7. This analysis shows that droplet size and leaf surface (adaxial vs. abaxial) were the two most important factors involved in adhesion.

Table 7: Regression analysis of percentage droplet adhesion to the adaxial and abaxial leaf surfaces of sweetgum, red oak and red maple.
Accumulated analysis of deviance

Change	**d.f.**	**deviance**	**mean deviance**	**deviance ratio**
Formulation	10	38940.99	3894.1	146.69
Concentration	2	17603.77	8801.88	331.56
Leaf Surface	1	77884.33	77884.33	2933.83
Species	2	22471.6	11235.8	423.24
Drop Size	2	215420.52	107710.26	4057.34
Leaf Angle	2	13807.4	6903.7	260.06
Species*Surface	2	40979.37	20489.68	771.83
Residual	4928	130823.55	26.55	
Total	4949	557931.53	112.74	

% deviance explained = 76.6

Table 8 shows the standard errors and LSD comparisons obtained from this logistic regression model. The predictions are estimated mean proportions.

It can be seen from Table 8 that triclopyr TEA plus sequestrant plus n-octyl pyrrolidone plus Silwet 408 is the formulation which gives the highest overall adhesion. Triclopyr TEA plus sequestrant on its own gives the lowest adhesion, followed by Garlon 3A, then Garlon 4. All of the reformulated triclopyr amine formulations give significantly higher overall adhesion than the commercial Garlon 4 formulation.

Table 8 also shows that: adhesion increases with increasing product concentration; overall adhesion is greatest for sweetgum and red oak, followed by red maple; formulations adhere much more easily to the adaxial surfaces than to the abaxial surfaces of the leaves and adhesion decreases with increasing droplet size. Droplet size makes an enormous difference to adhesion. As the angle of incidence (slope) of the droplet increases, so adhesion decreases. The order of easiest leaf surface for a formulation to adhere to through to the least is: adaxial surface of red oak > adaxial surface of red maple > adaxial surface of sweetgum > abaxial surface of sweetgum > abaxial surface of red oak > abaxial surface of red maple. Although all are statistically different from each other, it is suggested that there would be no difference in practice among the adaxial surfaces.

Table 8: Standard errors and LSD comparisons for percentage droplet (650 , 1000 and 2000 μm) adhesion of 11 formulations by the adaxial and abaxial leaf surfaces of sweetgum, red oak and red maple (leaves mounted horizontally, at 22.5° and 45°) obtained from a logistic regression model.

Formulation	mean (%)	se	LSD
TTEA + n-octyl pyrrolidone + Silwet 408	84.2	.5	a
TTEA + alcohol ethoxylate + Silwet 408	80.4	.6	b
TTEA + alcohol ethoxylate + Silwet L-77	79.7	.6	bc
TTEA + alkylphenolic glycol ether + Silwet 408	79.5	.6	c
TTEA + Silwet 408	78.8	.6	c
TTEA + Silwet L-77	78.8	.6	c
TTEA + n-octyl pyrrolidone + Silwet L-77	76.9	.6	d
TTEA + alkylphenolic glycol ether + Silwet L-77	74.7	.6	e
Garlon 4	57.5	.6	f
Garlon 3A	45.2	.6	g
Triclopyr TEA + Seq. (TTEA)	36.0	.6	h

Table 8 continued

Concentration		mean	se	LSD
10%		83.6	.4	a
5%		70.4	.3	b
1%		59.7	.3	c
Species		mean	se	LSD
sweetgum		74.7	.3	a
red oak		72.2	.4	b
red maple		52.6	.3	c
Leaf Surface		mean	se	LSD
Adaxial		83.1	.2	a
Abaxial		51.5	.3	b
Droplet Size		mean	se	LSD
≈ 650 µm		88.1	.2	a
≈ 1000 µm		56.4	.3	b
≈ 2000 µm		17.6	.7	c
Leaf Angle		mean	se	LSD
horizontal		72.2	.3	a
22.5 °		68.3	.3	b
45 °		61.3	.3	c
Surface	Species	mean	se	LSD
Adaxial	red oak	85.9	.5	a
Adaxial	red maple	82.8	.5	b
Adaxial	sweetgum	81.2	.4	c
Abaxial	sweetgum	68.3	.5	d
Abaxial	red oak	58.6	.5	e
Abaxial	red maple	22.5	.4	f

Under the same subheading, means having the same letter in common are not significantly different.

Specific Adhesion Results

For ease of comparison of formulations a comprehensive presentation of the results of the interactions of formulations, droplet sizes and leaf surface *averaged for the three leaf angles*, on the adhesion of droplets, is given in Tables 9 - 15 for the three species. The results can be summarised as:

Adhesion

***Sweetgum*:** all formulations containing organosilicone surfactants gave 100% adhesion with 650 μm droplets; the stock triclopyr amine product and Garlon 3A adhered less and were more variable unless at 3.2% a.e. concentration, when they were all > 97% (Table 9). Adhesion tended to be less and much more variable for all stock triclopyr formulations with 1000 μm droplets (Table 10). Where there were differences in the formulations containing organosilicone surfactant, it was mainly between adaxial and abaxial surfaces (the abaxial adhesion was substantially less with all formulations), though the Silwet L-77 combinations tended to show lower adhesion at lower concentrations on the abaxial surface (Table 10). With 2000 μm droplets (Table 11) all formulations gave zero or negligible adhesion to the abaxial surface. Adhesion to the adaxial surface was low, if not 0%, with only 1.6% a.e. TTEA plus organosilicone giving 100% adhesion. The n-octyl pyrrolidone plus organosilicone solutions were not significantly different to the TTEA + organosilicone solutions.

***Red oak*:** adhesion of 650 μm droplets was > 93% for all formulations containing organosilicone surfactants (Table 12); the stock triclopyr solutions were lower (down to 63% for 0.32% a.e Garlon 3A on the abaxial surface). As droplet size increased to 1000 μm, abaxial adhesion was substantially lower for most formulations containing organosilicone surfactants, and with one exception (Garlon 4, 3.2% a.e.), at or close to zero for the stock triclopyr solutions (Table 13).

***Red maple*:** adhesion of 650 μm droplets was 100% for all adaxial surfaces with all formulations containing organosilicone surfactants, and equal to or > 86% with the stock triclopyr solutions (Table 14). Abaxial adhesion was very much lower for all solutions. The 1000 μm droplets gave > 80% adhesion on adaxial surfaces for all formulations containing organosilicone surfactants, but stock triclopyr solutions varied from 0% to 100 % (at the 3.2% a.e concentration) adhesion. Adhesion on abaxial surfaces did not exceed 12% for any of the formulations or stock solutions (Table 15).

Table 9: **Adhesion** of droplets (**~650 µm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **sweetgum.**

	Drop Size (µm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	650	100^{a}	100^{a}	100^{a}	100^{a}	100^{a}	100^{a}
Garlon 3A	650	81^{b}	34^{c}	100^{a}	100^{a}	100^{a}	100^{a}
Triclopyr TEA + Seq. (TTEA)	650	83^{b}	37^{b}	90^{b}	52^{b}	98^{b}	97^{b}
TTEA + n-octyl pyrrolidone + Silwet 408	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + n-octyl pyrrolidone + Silwet L-77	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + alcohol ethoxylate + Silwet 408	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + alcohol ethoxylate + Silwet L-77	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + alkylphenolic glycol ether + Silwet 408	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + alkylphenolic glycol ether + Silwet L-77	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + Silwet 408	650	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + Silwet L-77	650	100^{a}	100^{a}	100^{a}	100^{a}		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 10: **Adhesion** of droplets (**~1000 µm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **sweetgum.**

	Drop Size (µm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	1000	0^{b}	0^{e}	100^{a}	53^{b}	100^{a}	100^{a}
Garlon 3A	1000	0^{b}	0^{e}	7^{b}	0^{c}	100^{a}	14^{b}
Triclopyr TEA + Seq. (TTEA)	1000	0^{b}	0^{e}	4^{c}	0^{c}	13^{b}	5^{c}
TTEA + n-octyl pyrrolidone + Silwet 408	1000	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + n-octyl pyrrolidone + Silwet L-77	1000	100^{a}	26^{d}	100^{a}	100^{a}		
TTEA + alcohol ethoxylate + Silwet 408	1000	100^{a}	92^{b}	100^{a}	100^{a}		
TTEA + alcohol ethoxylate + Silwet L-77	1000	100^{a}	90^{b}	100^{a}	100^{a}		
TTEA + alkylphenolic glycol ether + Silwet 408	1000	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + alkylphenolic glycol ether + Silwet L-77	1000	100^{a}	26^{d}	100^{a}	100^{a}		
TTEA + Silwet 408	1000	100^{a}	100^{a}	100^{a}	100^{a}		
TTEA + Silwet L-77	1000	100^{a}	69^{c}	100^{a}	65^{b}		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 11: **Adhesion** of droplets (**~2000 μm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **sweetgum.**

	Drop Size (μm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	2000	0^{c}	0^{a}	0^{c}	0^{a}	0^{b}	0^{a}
Garlon 3A	2000	0^{c}	0^{a}	11^{bc}	0^{a}	33^{a}	11^{a}
Triclopyr TEA + Seq. (TTEA)	2000	0^{c}	0^{a}	0^{c}	0^{a}	0^{b}	0^{a}
TTEA + n-octyl pyrrolidone + Silwet 408	2000	33^{ab}	0^{a}	77^{a}	0^{a}		
TTEA + n-octyl pyrrolidone + Silwet L-77	2000	11^{bc}	0^{a}	89^{a}	0^{a}		
TTEA + alcohol ethoxylate + Silwet 408	2000	11^{bc}	0^{a}	8^{c}	0^{a}		
TTEA + alcohol ethoxylate + Silwet L-77	2000	40^{ab}	0^{a}	19^{bc}	0^{a}		
TTEA + alkylphenolic glycol ether + Silwet 408	2000	3^{c}	0^{a}	19^{bc}	0^{a}		
TTEA + alkylphenolic glycol ether + Silwet L-77	2000	22^{abc}	0^{a}	33^{b}	0^{a}		
TTEA + Silwet 408	2000	44^{a}	0^{a}	100^{a}	0^{a}		
TTEA + Silwet L-77	2000	11^{bc}	0^{a}	100^{a}	0^{a}		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 12: **Adhesion** of droplets (**~650 μm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **red oak**.

	Drop Size (μm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	650	100[a]	89[d]	100[a]	89[c]	100[a]	100[a]
Garlon 3A	650	95[b]	63[e]	100[a]	100[a]	100[a]	100[a]
Triclopyr TEA + Seq. (TTEA)	650	93[b]	66[e]	100[a]	89[c]	100[a]	94[b]
TTEA + n-octyl pyrrolidone + Silwet 408	650	100[a]	100[a]	100[a]	100[a]		
TTEA + n-octyl pyrrolidone + Silwet L-77	650	100[a]	100[a]	100[a]	100[a]		
TTEA + alcohol ethoxylate + Silwet 408	650	100[a]	100[a]	100[a]	100[a]		
TTEA + alcohol ethoxylate + Silwet L-77	650	100[a]	100[a]	100[a]	100[a]		
TTEA + alkylphenolic glycol ether + Silwet 408	650	100[a]	97[b]	100[a]	100[a]		
TTEA + alkylphenolic glycol ether + Silwet L-77	650	100[a]	93[c]	100[a]	100[a]		
TTEA + Silwet 408	650	100[a]	100[a]	100[a]	100[a]		
TTEA + Silwet L-77	650	100[a]	93[c]	100[a]	95[b]		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 13: **Adhesion** of droplets (**~1000 μm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **red oak.**

	Drop Size (μm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	1000	0[c]	0[d]	100[a]	14[e]	100[a]	100[a]
Garlon 3A	1000	0[c]	0[d]	80[b]	0[f]	100[a]	2[b]
Triclopyr TEA + Seq. (TTEA)	1000	0[c]	0[d]	59[c]	0[f]	99[a]	0[b]
TTEA + n-octyl pyrrolidone + Silwet 408	1000	100[a]	59[a]	100[a]	100[a]		
TTEA + n-octyl pyrrolidone + Silwet L-77	1000	100[a]	15[c]	100[a]	32[d]		
TTEA + alcohol ethoxylate + Silwet 408	1000	100[a]	46[ab]	100[a]	100[a]		
TTEA + alcohol ethoxylate + Silwet L-77	1000	100[a]	40[b]	100[a]	43[cd]		
TTEA + alkylphenolic glycol ether + Silwet 408	1000	100[a]	53[ab]	100[a]	62[b]		
TTEA + alkylphenolic glycol ether + Silwet L-77	1000	100[a]	0[d]	100[a]	49[bc]		
TTEA + Silwet 408	1000	100[a]	24[c]	100[a]	50[bc]		
TTEA + Silwet L-77	1000	97[b]	55[ab]	100[a]	34[d]		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 14: **Adhesion** of droplets (**~650 μm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **red maple.**

	Drop Size (μm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	650	100[a]	23[e]	100[a]	15[e]	100[a]	73[a]
Garlon 3A	650	93[b]	11[f]	100[a]	42[d]	100[a]	67[b]
Triclopyr TEA + Seq. (TTEA)	650	91[c]	9[f]	86[b]	11[e]	100[a]	54[c]
TTEA + n-octyl pyrrolidone + Silwet 408	650	100[a]	52[a]	100[a]	75[a]		
TTEA + n-octyl pyrrolidone + Silwet L-77	650	100[a]	50[a]	100[a]	71[ab]		
TTEA + alcohol ethoxylate + Silwet 408	650	100[a]	33[c]	100[a]	67[bc]		
TTEA + alcohol ethoxylate + Silwet L-77	650	100[a]	55[a]	100[a]	67[bc]		
TTEA + alkylphenolic glycol ether + Silwet 408	650	100[a]	40[b]	100[a]	63[c]		
TTEA + alkylphenolic glycol ether + Silwet L-77	650	100[a]	24[de]	100[a]	62[c]		
TTEA + Silwet 408	650	100[a]	30[cd]	100[a]	36[d]		
TTEA + Silwet L-77	650	100[a]	30[cd]	100[a]	63[c]		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

Table 15: **Adhesion** of droplets (**~1000 μm**) of triclopyr product (at 0.32, 1.6 and 3.2 % a.e.) and alternative formulations onto abaxial and adaxial leaf surfaces of **red maple.**

	Drop Size (μm)	0.32 % a e		1.6 % a e		3.2 % a e	
		AD	AB	AD	AB	AD	AB
Garlon 4	1000	0^{c}	0^{a}	98^{ab}	0^{c}	100^{a}	1^{a}
Garlon 3A	1000	0^{c}	0^{a}	79^{c}	0^{c}	89^{b}	0^{b}
Triclopyr TEA + Seq. (TTEA)	1000	0^{c}	0^{a}	18^{d}	0^{c}	83^{b}	0^{b}
TTEA + n-octyl pyrrolidone + Silwet 408	1000	100^{a}	0^{a}	100^{a}	12^{a}		
TTEA + n-octyl pyrrolidone + Silwet L-77	1000	100^{a}	0^{a}	95^{b}	3^{b}		
TTEA + alcohol ethoxylate + Silwet 408	1000	100^{a}	0^{a}	100^{a}	2^{bc}		
TTEA + alcohol ethoxylate + Silwet L-77	1000	100^{a}	0^{a}	100^{a}	0^{c}		
TTEA + alkylphenolic glycol ether + Silwet 408	1000	100^{a}	0^{a}	96^{b}	2^{bc}		
TTEA + alkylphenolic glycol ether + Silwet L-77	1000	100^{a}	0^{a}	100^{a}	3^{b}		
TTEA + Silwet 408	1000	80^{b}	0^{a}	99^{ab}	0^{c}		
TTEA + Silwet L-77	1000	100^{a}	33^{b}	100^{a}	5^{b}		

Results are the mean of 3 leaf angles.
Within each concentration x leaf surface column, values followed by the same lowercase letter do not differ significantly (p=0.05).

MAIN EFFECTS

There were a number of characteristic behaviour effects that were common to all formulations and that have been largely described previously in the literature. These are: leaf angle, leaf surface (abaxial vs adaxial), droplet size, product concentration and leaf surface character.

It is well known that adhesion is greater on smoother surfaces (eg, adaxial vs. abaxial) (Hartley and Brunskill, 1958; Anderson *et al.*, 1987; De Ruiter *et al.*, 1990; Wirth *et al.*, 1991) and decreases with increasing droplet size (Hartley and Brunskill, 1958). A very good explanation for why adhesion decreases with increasing droplet size is given by Spillman (1984). Adhesion generally becomes more difficult with increasing leaf angle (less horizontal presentation) (Stevens *et al.*, 1993). These trends are evident in the data presented in Figure 15. A constant concentration of Garlon 4 applied as droplets of 676, 951 and 1930 μm showed that as the size increased, adhesion decreased to zero. The smallest droplets adhered totally to abaxial or adaxial surfaces at any leaf angle. Intermediate droplet size adhesion varied with the surface and leaf angle. With the 951 μm droplet applied to the abaxial surface, adhesion actually decreased with decreasing angle. More usually increasing the leaf angle leads to decreased adhesion. In this case the droplet appeared to smash on the horizontal surface, forming tiny satellite droplets around the main drop, which is counted as nil adhesion, whereas on increasing the leaf angle some of the energy seemed to be dissipated and this smashing of the drop did not occur.

The effect of increasing product concentration in relation to adhesion is illustrated in Figure 16. At the highest concentration, adhesion was 100%; as the concentration drops (i.e., as the concentration of product surfactants is decreased) so does adhesion. The effect is more pronounced with abaxial surfaces than with adaxial (i.e., rougher surfaces are more difficult for droplets to adhere to). The increase in product concentration leads to a decrease in dynamic surface tension, which has been shown (Stevens *et al.*, 1993; Anderson and Hall, 1989) to be a major factor involved in adhesion.

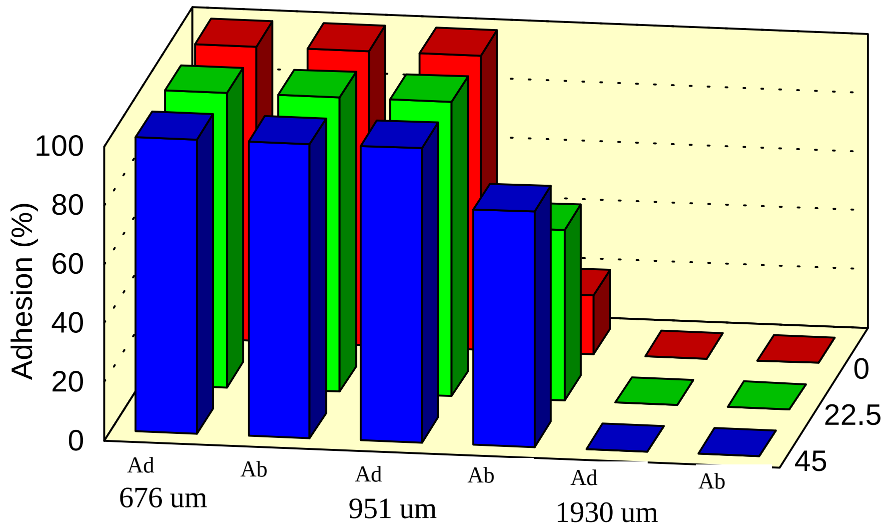

Figure 15: Comparison of the adhesion of Garlon 4 (3.59% product, 1.6% a.e.) droplets (676, 951 and 1930 µm vmd droplet size) onto sweetgum leaves at 0, 22.5 and 45 degree orientation from horizontal.

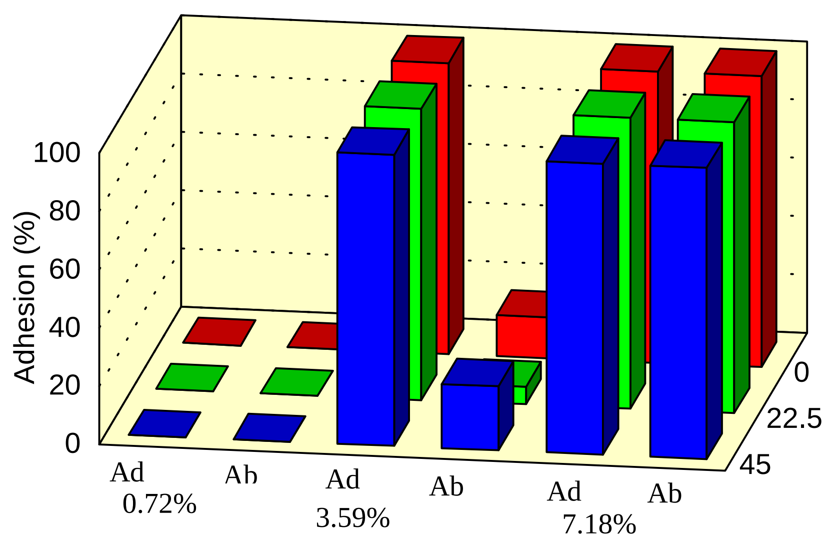

Figure 16: Comparison of the adhesion of Garlon 4 (at 0.72, 3.59, and 7.18% product) droplets (951 µm vmd droplet size) onto red oak leaves at 0, 22.5 and 45 degree orientation from the horizontal.

Formulation effects

The object of the present studies was to enhance the adhesion of the existing commercial formulation of triclopyr (as Garlon 3A). An illustration of the scope of the enhancement is given in Figure 17. It is clear that there was a substantial benefit in adding an organosilicone surfactant when the adhesion results are compared to either of the original formulations. Generally adhesion became more difficult with increasing leaf angle (less horizontal presentation). As leaf angle increased, so adhesion decreased with each formulation at 681 µm onto the abaxial surface of red maple leaves.

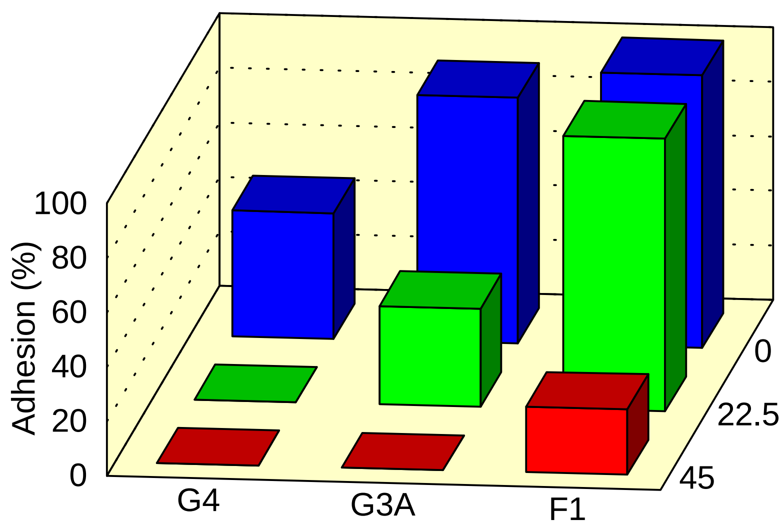

Figure 17: Comparison of the adhesion of Garlon 4 and Garlon 3A (at 1.6% a.e.) droplets (681 µm vmd droplet size) onto the abaxial surface of red maple leaves at 0, 22.5 and 45 degree orientation from horizontal. F1 series: triclopyr TEA + n-octyl pyrrolidone + Silwet 408.

RETENTION

The entire data set of results for adhesion and retention can be found in the Appendix B, Tables 31-55.

Overall Comparison of Formulations

Regression analysis of percentage retention was performed with the main effects and first order interactions (results not shown here). As with adhesion, a further model was run, involving all of the main effects, and the first order interaction, species by surface. The results are shown in Table 16. It can be seen that formulation is not significant. Leaf surface is the most significant effect.

Table 16: Regression analysis of percentage droplet retention to the adaxial and abaxial leaf surfaces of sweetgum, red oak and red maple.
Accumulated analysis of deviance

Change	d.f.	deviance	mean deviance	deviance ratio
Formulation	10	536.315	53.632	9.67
Concentration	2	1164.502	582.251	104.96
Surface	1	6993.374	6993.374	1260.71
Species	2	4971.186	2485.593	448.08
Drop Size	2	3699.645	1849.823	333.47
Angle	2	1693.851	846.926	152.68
Species*Surface	2	658.627	329.313	59.37
Residual	1028	5702.507	5.547	
Total	1049	25420.009	24.233	

% deviance explained = 77.6%

Table 17 shows the standard errors and LSD comparisons obtained from this logistic regression model. The predictions are estimated mean proportions.

It can be seen from Table 17 that formulation has no significant effect on retention. 100% retention was defined as a droplet which impacted and did not bounce further than a 1 cm radius. If the droplet were to impact the edge of the leaf, it may well bounce off.

Table 17 also shows that: concentration of product had no significant effect; retention by red maple was significantly lower than both sweetgum and red oak; retention to the adaxial surface was significantly higher than retention to the abaxial surface and droplet size was significant. As droplet size increased, retention decreased. Leaf angle had no significant effect on retention.The abaxial surface of red maple retains significantly less than all other leaf surfaces. There would be little difference in practice among the adaxial surfaces and the abaxial surface of sweetgum.

Table 17: Standard errors and LSD comparisons for percentage droplet (650 , 1000 and 2000 μm) retention of 11 formulations by the adaxial and abaxial leaf surfaces of sweetgum, red oak and red maple (leaves mounted horizontally, at 22.5° and 45°) obtained from a logistic regression model.

Formulation	mean	se	LSD
TTEA + n-octyl pyrrolidone + Silwet 408	92.8	2.5	a
TTEA + alcohol ethoxylate + Silwet 408	90.5	2.5	a
TTEA + n-octyl pyrrolidone + Silwet L-77	90.4	2.5	a
Garlon 4	90.2	2.5	a
Garlon 3A	90.1	2.5	a
TTEA + alcohol ethoxylate + Silwet L-77	90.1	2.5	a
TTEA + Silwet L-77	89.6	2.6	a
TTEA + alkylphenolic glycol ether + Silwet 408	89.1	2.6	a
TTEA + alkylphenolic glycol ether + Silwet L-77	88.7	2.7	a
TTEA	88.4	2.7	a
TTEA + Silwet 408	87.3	2.9	a

Table 17 continued

Concentration		mean	se	LSD
10%		92.9	2.6	a
5%		91.2	2.4	a
1%		87.4	2.8	a
Species		mean	se	LSD
sweetgum		98.7	.1	a
red oak		90.7	5	a
red maple		75.3	5	b
Leaf Surface		mean	se	LSD
Adaxial		96.2	5.0	a
Abaxial		83.3	.2	b
Droplet Size		mean	se	LSD
≈ 650 µm		96.9	.2	a
≈ 1000 µm		94.2	.2	b
≈ 2000 µm		54.8	17.8	c
Leaf Angle		mean	se	LSD
horizontal		92.1	2.5	a
22.5°		90.3	2.4	a
45°		86.81	2.9	a
Surface	Species	mean	se	LSD
Adaxial	sweetgum	99.6	.06	a
Adaxial	red oak	98.8	10.0	abc
Abaxial	sweetgum	97.8	.13	b
Adaxial	red maple	88.3	10.2	abc
Abaxial	red oak	82.5	.32	c
Abaxial	red maple	62.2	.67	d

Under the same subheading, means having the same letter in common are not significantly different.