

Analysis of % Infected and % Severity in Berries, David Baird, VSN, 31 July 2023.

A design with 20 treatments and 5 replicates was analysed using a generalized linear model with a binomial distribution with a log link. The raw data for % berries infected and % severity of infection are shown in Figures 1 and 2. The treatment estimates with 83% confidence limits are shown in Figures 3 and 4. If two treatments confidence limits do not overlap, they are significantly different with 95% confidence. The results are also given in Tables 1 and 3.

The data was then analysed breaking the treatments down by base (HML32 = Protector 182 g/l and potassium bicarbonate, NSA (230 g/l) and NSA2%), additive (Nordox, Norshield, potum or sulphur) and rate (1 or 2) and the analysis of deviance tables are shown in Table 2 and 4. From these it can be seen that the type of base made no significance difference to either % berries infected and % severity of infection. Neither did the additives Nordox nor Norshield have any significant effects.

The rate of application and the Potum and Sulphur additives had highly significant effects. There were no interactions of any factor with rate. The additives Potum and Sulphur were only used together twice are so there two effects are highly confounded, but even so, there appears to a significance effect of adding both additives over either one applied on its own. A stepwise regression shown in Table 5 and 6 confirms this, resulting in a simple model of rate, Potum and Sulphur. These also indicate Potum has a stronger effect than Sulphur.

Conclusions

1. Potum has the strongest effect of any additive, followed by Sulphur.
2. Increasing the rate results in a significant reduction.
3. The type of base has no significant effect on the results.
4. Nordox and Norshield had no significant effects.

Some more tests of the combination of Potum and Sulphur would be wise, given that the combined effect was just tested on two treatments.

Table 1. Estimated % infected berries by treatment with 83% confidence limits and LSD 5% letters (means with a common letter are not significantly different).

Treatment	Estimate	Lower	Upper	LSD Letters
HML32+Potum+Nordox x1	23.9	15.9	33.4	fg
HML32+Potum+Nordox x2	5.7	2.1	11.7	abcd
HML32+Sulphur+HML Silco 250 x1	11.0	5.5	18.8	bcdef
HML32+Sulphur+HML Silco 250 x2	7.9	3.5	14.7	abcde
NSA+HML Silco 100+Norshield+Potum x1	9.4	4.2	17.1	abcdef
NSA+HML Silco 100+Norshield+Potum x2	3.6	0.9	8.9	abc
NSA+HML Silco 250+Norshield+Potum x1	18.4	11.5	26.9	def
NSA+HML Silco 250+Norshield+Potum x2	2.5	0.5	7.1	ab
NSA+HML Silco 250+Potum x1	20.4	13.0	29.6	ef
NSA+HML Silco 250+Potum x2	5.8	2.2	11.8	abcd
NSA+Potum+Norshield x1	13.7	7.8	21.5	cdef
NSA+Potum+Norshield x2	3.9	1.1	9.2	abc
NSA+Sulphur+HML Silco 250+Potum x1	3.0	0.6	8.4	abc
NSA+Sulphur+HML Silco 250+Potum x2	1.3	0.1	5.0	a
NSA+Sulphur+HML Silco 100 x1	39.9	29.7	50.7	g
NSA+Sulphur+HML Silco 100 x2	3.1	0.7	8.2	abc
NSA+Potum+Nordox x1	14.3	8.1	22.4	cdef
NSA+Potum+Nordox x2	6.1	2.4	12.1	abcd
NSA2%+Potum+Norshield x1	16.6	10.0	25.0	def
NSA2%+Potum+Norshield x2	1.7	0.2	5.8	ab
Untreated	100.0	99.0	100.0	h

Table 2. Accumulated analysis of deviance for % infected berries by soap, additive and rate.

Change	d.f.	deviance	mean deviance	deviance ratio	approx F pr.
+ Rep	4	33.221	8.305	1.68	0.161
+ Treated	1	1932.658	1932.658	391.68	<.001
+ Nordox	1	5.804	5.804	1.18	0.281
+ Norshield	1	6.514	6.514	1.32	0.254
+ Potum	1	27.311	27.311	5.53	0.021
+ Sulphur	1	44.148	44.148	8.95	0.004
+ Soap	2	3.043	1.521	0.31	0.735
+ Rate	1	220.117	220.117	44.61	<.001
+ Nordox.Rate	1	0.939	0.939	0.19	0.664
+ Norshield.Rate	1	0.426	0.426	0.09	0.770
+ Potum.Rate	1	1.162	1.162	0.24	0.629
+ Sulphur.Rate	1	0.628	0.628	0.13	0.722
+ Soap.Rate	2	9.564	4.782	0.97	0.383
Residual	91	449.022	4.934		
Total	109	2734.556	25.088		

Table 3. Estimated % severity of infection by treatment with 83% confidence limits and LSD 5% letters (means with a common letter are not significantly different).

Treatment	Estimate	Lower	Upper	LSD Letters
NSA+Sulphur+HML Silco 250+Potum x2	11.2	6.6	17.3	def
NSA2%+Potum+Norshield x2	2.5	0.7	6.2	abc
NSA+HML Silco 250+Norshield+Potum x2	5.4	2.3	10.3	abcdef
NSA+Sulphur+HML Silco 250+Potum x1	4.0	1.5	8.4	abcde
NSA+Sulphur+HML Silco 100 x2	6.2	2.7	11.6	abcdef
NSA+HML Silco 100+Norshield+Potum x2	2.5	0.6	6.2	abc
NSA+Potum+Norshield x2	14.5	9.3	20.9	f
HML32+Potum+Nordox x2	1.2	0.1	4.0	a
NSA+HML Silco 250+Potum x2	15.3	9.8	22.2	f
NSA+Potum+Nordox x2	4.0	1.5	8.2	abcde
HML32+Sulphur+HML Silco 250 x2	7.6	4.0	12.8	bcdef
NSA+HML Silco 100+Norshield+Potum x1	1.8	0.4	5.1	abc
HML32+Sulphur+HML Silco 250 x1	2.9	0.8	7.1	abcd
NSA+Potum+Norshield x1	1.0	0.1	3.7	a
NSA+Potum+Nordox x1	30.4	22.6	39.0	g
NSA2%+Potum+Norshield x1	1.6	0.3	4.9	ab
NSA+HML Silco 250+Norshield+Potum x1	9.1	5.0	14.8	cdef
NSA+HML Silco 250+Potum x1	2.2	0.6	5.6	abc
HML32+Potum+Nordox x1	12.5	7.7	18.8	ef
NSA+Sulphur+HML Silco 100 x1	1.3	0.2	4.2	ab
Untreated	90.7	86.9	93.7	h

Table 4. Accumulated analysis of deviance for % severity of infection by soap, additive and rate.

Change	d.f.	deviance	mean deviance	deviance ratio	approx F pr.
+ Rep	4	12.257	3.064	0.85	0.497
+ Treated	1	1732.565	1732.565	481.10	<.001
+ Nordox	1	0.397	0.397	0.11	0.741
+ Norshield	1	5.344	5.344	1.48	0.226
+ Potum	1	12.760	12.760	3.54	0.063
+ Sulphur	1	27.690	27.690	7.69	0.007
+ Soap	2	13.183	6.592	1.83	0.166
+ Rate	1	168.713	168.713	46.85	<.001
+ Nordox.Rate	1	0.261	0.261	0.07	0.788
+ Norshield.Rate	1	0.366	0.366	0.10	0.751
+ Potum.Rate	1	1.581	1.581	0.44	0.509
+ Sulphur.Rate	1	0.284	0.284	0.08	0.780
+ Soap.Rate	2	10.599	5.300	1.47	0.235
Residual	91	327.716	3.601		
Total	109	2313.716	21.227		

Table 5. Accumulated analysis of deviance and parameter estimates of significant terms selected by a stepwise regression for % infection of berries by soap, additive and rate.

Change	d.f.	deviance	mean deviance	deviance ratio	approx F pr.
+ Rep					
+ Treated	5	1965.879	393.176	82.61	<.001
+ Rate	1	217.825	217.825	45.77	<.001
+ Potum	1	24.231	24.231	5.09	0.026
+ Sulphur	1	45.938	45.938	9.65	0.002
Residual	101	480.683	4.759		
Total	109	2734.556	25.088		

Parameter	estimate	s.e.
Constant	10.6	11.5
Treated	-10.1	11.6
Rate=2	-1.587	0.260
Potum	-2.249	0.772
Sulphur	-1.787	0.752

Table 6. Accumulated analysis of deviance and parameter estimates of significant terms selected by a stepwise regression for % severity of infection by soap, additive and rate.

Change	d.f.	deviance	mean deviance	deviance ratio	approx F pr.
+ Rep					
+ Treated	5	1744.822	348.964	97.45	<.001
+ Rate	1	168.605	168.605	47.08	<.001
+ Potum	1	18.301	18.301	5.11	0.026
+ Sulphur	1	20.316	20.316	5.67	0.019
Residual	101	361.671	3.581		
Total	109	2313.716	21.227		

Parameter	estimate	s.e.
Constant	2.318	0.370
Treated	-2.655	0.781
Rate=2	-1.749	0.295
Potum	-1.842	0.706
Sulphur	-1.341	0.685

Figure 1. Boxplot % Infected berries.

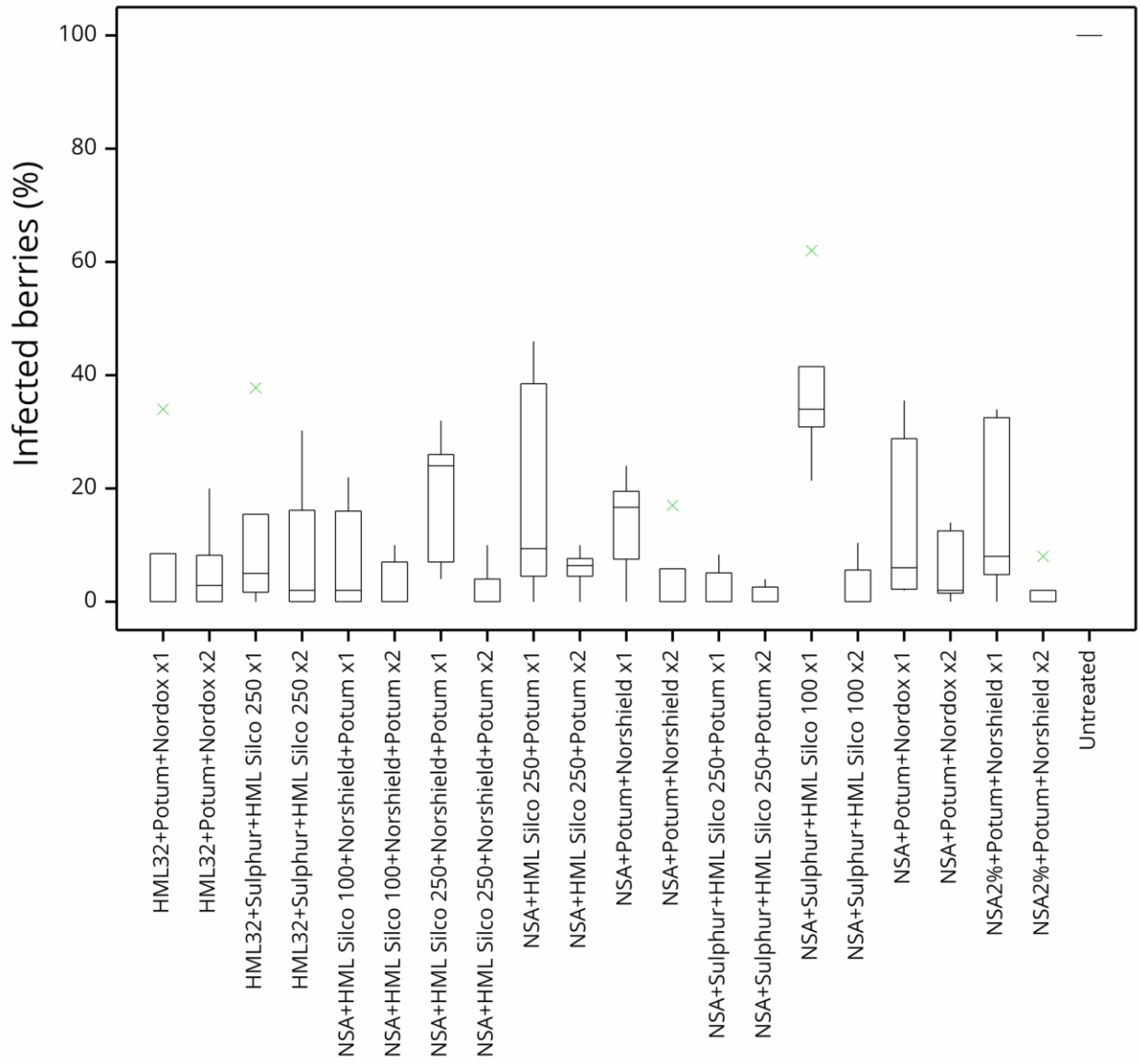


Figure 2. Boxplot % severity of infection.

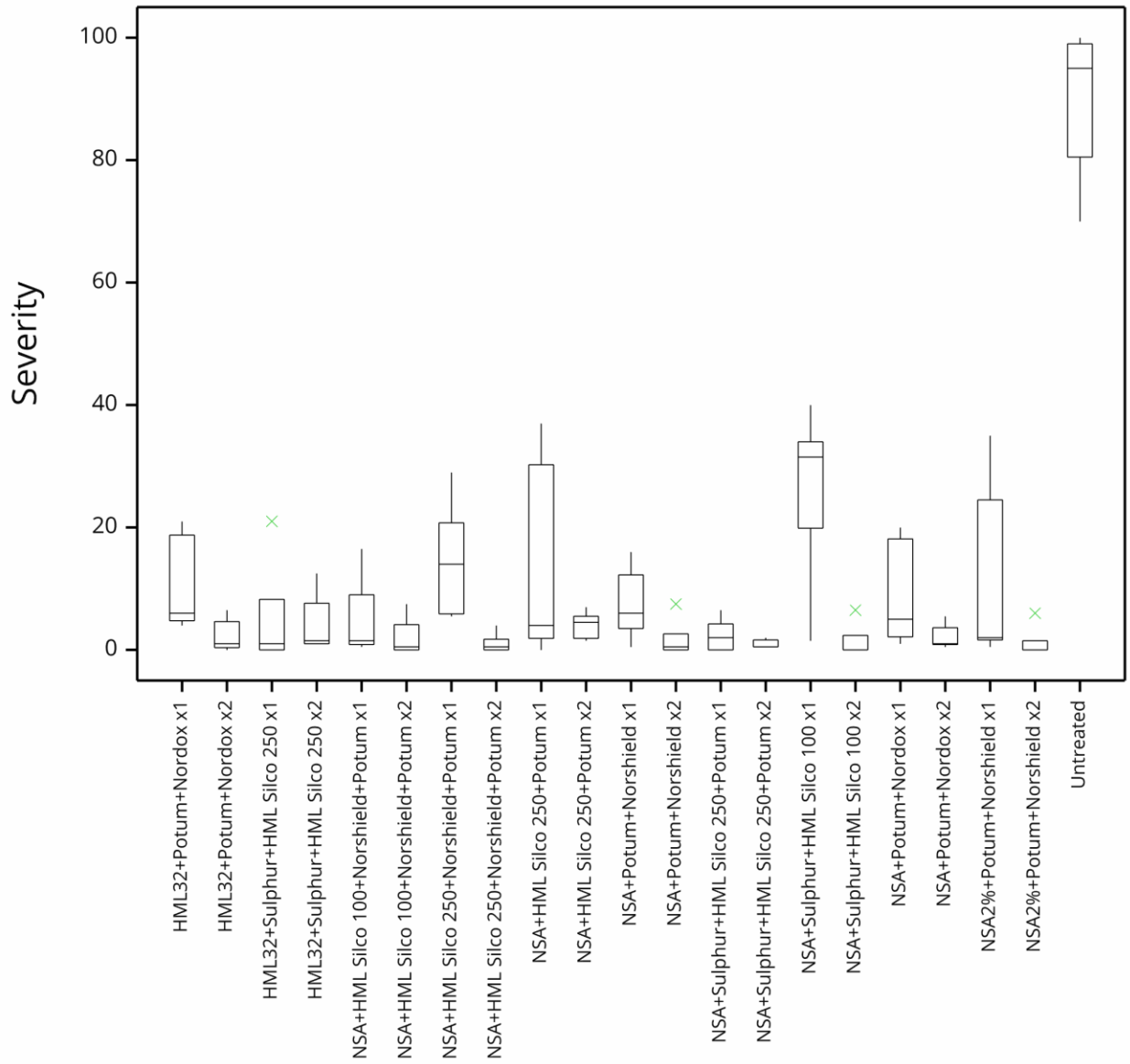


Figure 3. Estimated % infected berries by treatment (sorted in decreasing order) with 83% confidence limits.

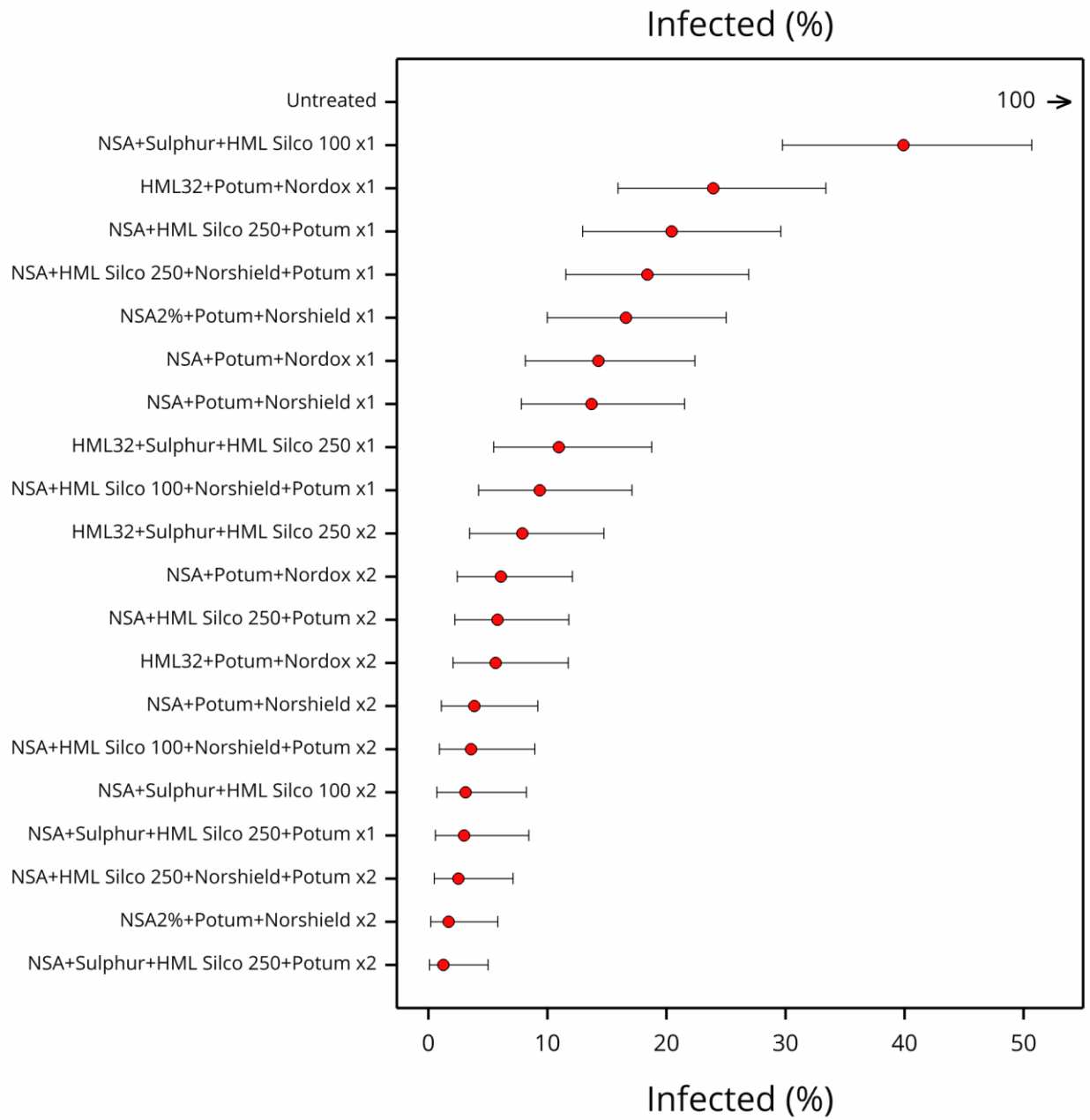


Figure 4. Estimated % severity of infection by treatment (sorted in decreasing order) with 83% confidence limits.

