Formic Acid Treatments
2-3 January, 2007
Twenty Single Colonies, Duda Ranch, Rockledge, FL
Drone Brood in only four colonies.

90 ml 50% Formic Acid with 15 ml of Honey-B-Healthy®
Applied at circa 12:30, 2 Jan 07.

Hives Treated with 50% formic acid fumitagion.

	Mortality
FA1	100.00
FA2	
FA3	100.00
FA4	75.00
FA5	69.39
FA6	100.00
FA7	100.00
FA8	100.00
FA9	100.00
FA10	100.00
FA11	66.67
FA12	100.00
FA13	100.00
FA14	100.00
FA15	100.00
FA16	70.00
FA17	
FA18	100.00
FA19	100.00
FA20	95.65

Mean	93.15
Standard Error	2.84
Median	100.00
Mode	100.00
Standard Deviation	12.71
Variance	161.61
Kurtosis	0.35
Skewness	-1.49
Range	33.33
Minimum	66.67
Maximum	100.00
Sum	1676.71
Count	18.00
Confidence Level(0	5.87

No mites were found in hives FA2 and FA17. Thus, without data, they were left out of the calculations.

Controls

Formic Acid Treatments
Controls, Single colonies.
No Drone Brood.

90 ml Water with 15 ml of Honey-B-Healthy®
Applied to 10 Control Colonies at circa 3:30, 2 Jan 07.

Controls, 2-3 Jan 2007

			Column 1	
	Mortality			
C1	0.00		Mean	3.17
C2	6.67		*Standard Error*	*2.51*
C3	0.00		Median	0.00
C4	0.00		Mode	0.00
C5	0.00		Standard Deviation	7.95
C6	25.00		Variance	63.24
C7	0.00		Kurtosis	8.11
C8	0.00		Skewness	2.82
C9	0.00		Range	25.00
C10	0.00		Minimum	0.00
			Maximum	25.00
			Sum	31.67
			Count	10.00
			Confidence Level(0.	4.93

C6 had one dead mite out of four resulting in 25% mortality; removing this datum resulted in a more typical mean mortality of 0.74 %.

			Column 1	
	Mortality			
C1	0.00		Mean	0.74
C2	6.67		*Standard Error*	*0.70*
C3	0.00		Median	0.00
C4	0.00		Mode	0.00
C5	0.00		Standard Deviation	2.22
C6		(1dead/4)	Variance	4.94
C7	0.00		Kurtosis	9.00
C8	0.00		Skewness	3.00
C9	0.00		Range	6.67
C10	0.00		Minimum	0.00
			Maximum	6.67
			Sum	6.67
			Count	9.00
			Confidence Level(0.9	1.45

Mortality in control mites, all 30 colonies in all three treatments:

Numbers of live and dead mites in controls:				
	live	dead	Total Mites	%Mortality
Aug-06	592	5	597	0.84
Oct-06	401	11	412	2.67
Jan-07	66	2	68	2.94
	1059	18	1077	1.67
			overall mean	2.03

We can roughly subtract 2% from each treatment to allow for adjustment for control mortality, or we should apply a correction to our mortality data.

Summary of Mite Mortality in August 06, October 06, and January 07.

Formic Acid Treatments:				Numerical	Average
	live	dead	Total Mites	%Mortality	%Mortalit
Aug-06	26	468	494	94.74	92.59
Oct-06	67	810	877	92.36	93.48
Jan-07	27	180	207	86.96	93.15
	120	1458	1578	92.40	93.07
			overall mean	91.61	

Subtracting average control mortality of 2% results in a true mortality of 89.6% based on absolute numbers, and 91.07% based on the average of the mean mortalities of each treatment. The overall average control is 90.34%. Abbott's corrected mortality is 90.82%.

Abbott, W.S. 1925. A method for computing the effectiveness of an insecticide. J. Econ. Entomol. 18: 265-267. [next page]

Abbott's formula for corrected pesticide mortality.

$$\text{Corrected \%} = 100 * \left(1 - \frac{n \text{ in T after treatment}}{n \text{ in Co after treatment}}\right)$$

Were : n = Insect population , T = treated , Co = control

$$\text{Corrected \% Mortality} = \frac{(\%\text{ alive control} - \%\text{ alive treated}) \times 100\%}{(\%\text{ alive control})}$$

Corrected **((98% - 9)x100)/98**

90.82

Overall 50% FA mortality is 90.82% in capped brood cells (mostly drone).