

12/12/96

DP Barcode : D230408
PC Code No : 593
EEB Out : DEC 17 1996

To: Linda Propst
Product Manager 73
Special Review and Reregistration Division (7508W)

From: Daniel D. Rieder, Acting Chief
Ecological Effects Branch/EFED (7507C)

Attached, please find the EEB review of...

Reg./File # : 0081
Chemical Name : Metalaxyl
Type Product : herbicide
Product Name :
Company Name :
Purpose : Review information to upgrade avian repro studies.

Action Code: 606
Reviewer: Brian Montague

Date Due: 1/2/97

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1 (A)			72-2 (A)			72-7 (A)		
71-1 (B)			72-2 (B)			72-7 (B)		
71-2 (A)			72-3 (A)			122-1 (A)		
71-2 (B)			72-3 (B)			122-1 (B)		
71-3			72-3 (C)			122-2		
71-4 (A)			72-3 (D)			123-1 (A)		
71-4 (B)			72-3 (E)			123-1 (B)		
71-5 (A)			72-3 (F)			123-2		
71-5 (B)			72-4 (A)			124-1		
72-1 (A)			72-4 (B)			124-2		
72-1 (B)			72-5			141-1		
72-1 (C)			72-6			141-2		
72-1 (D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed)
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 12 1996

Memorandum

Subject: Review of Supplemental Data for Avian Reproduction Studies with Metalaxyl D 23 0408

From: Norm Cook, Acting Chief *Norm Cook*
Ecological Effects Branch *12/12/96*
Environmental Fate and Effects Division(7507C)

To: Linda Propst, Product Manager 73
Special Review and Reregistration Division(7508W)

The Ecological Effects Branch has reviewed addition information provided by Ciba Geigy Corporation and it's contract laboratory, Wildlife International regarding bobwhite and mallard avian reproduction studies MRID 43624601 and 43624602. These studies were actually conducted 16 years ago but only recently submitted to the Agency. As a result the procedures used in the studies do not adhere to presently accepted methodology for such studies. They were considered to have provided some information of use in the hazard assessment process, and in general the studies were considered to have been conducted according to GLP of that time.

In reviewing the summaries of the laboratory raw data provided by the registrant(actual raw data not provided) and also the letter from Joann Beavers of Wildlife International the reviewer was able to answer some of the questions posed in the initial review. Ciba Geigy searched it's records regarding the lot number for this particular batch of metalaxyl. They stated that the same batch was used for a fish early life stage test(MRID 244183) and that the purity of this batch was 90.1 % active ingredient. Though this is a rather circuitous route for this information, the reviewer was able to confirm that this was the purity of the batch used in the fish study. Therefore, we will assume this to be the purity of the material used by Wildlife International. No laboratory analysis of the feed was apparently conducted for these studies.

In reviewing the performance of the controls in the bobwhite quail study it was discerned that the birds were below the levels normally expected. Hatch success was only 62% based on hatch to reported live embryos. Of the total 814 eggs laid by control birds only 286 chicks lived to the 14 day posthatch period, with 100 of 386 hatchlings apparently succumbing during this 14 day period. The Branch also ran additional statistics on the numbers of eggs cracked in each pen to the numbers laid and found that there was a statistically significant difference between controls



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and all three of the test concentration groups for this parameter. This would indicate that a true NOEL has not been established for this parameter and that the lowest dose tested may still be above the LOEL for egg shell cracking. Eggshell thickness was lower in all treatment groups when compared to controls, however the Branch could not statistically verify a significant difference in eggshell thickness. Sampling sizes were small for this parameter (only 5 eggshell measurements per week). The shorter egg laying period used in this bobwhite study was noted in the first review (8 weeks vs. 10 weeks). Review of the weekly data, however indicates that all test groups had probably peaked by week 18 and were consistently lower for the following week for all test groups.

The data summaries for the mallard study also allowed the Agency to further analyze the parameters on a week by week basis. Again control level reproductive performance appeared to be lower than test groups in some parameters such as total eggs laid. This led to lower egg set and viable egg numbers for controls. There was a significant effect to eggshell integrity with higher numbers of eggs cracked in 300 and 900 ppm test concentrations. Eggshell thinning was apparent at 900 ppm. Numbers of chicks hatched showed downward trends in the 300 and 900 ppm test levels when compared to egg laid, eggs set, and live embryos for the controls. Of the 666 eggs laid by control birds only 379 hatched (56.9%). Only 182 of the control hatchlings survived 14 days posthatch (27% of eggs laid). Individual weights of adults and hatchlings could not be compared as only adult pen weights were measured by the laboratory for this study. Unlike newer studies egg weights were provided, but not hatchling or 14 day survivor weights.

Though the Agency still considers the information provided to be useful data, the submission of new studies following presently accepted guideline and providing endpoints currently examined by the Agency is still required to fulfill avian reproduction guidelines for metalaxyl. The data provided by the registrant will however be appended to the existing study reviews. Unfortunately, the studies remain supplemental data. Further inquiries regarding this review may be directed to Brian Montague at 305-6438 or Les Touart at 305-6134.

s = 19.463

Note: df used for table values are approximate when v > 20.

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	12	76.900	95.100	89.317
2	100 ppm	12	80.000	92.100	85.400
3	300 ppm	12	68.200	94.200	84.892
4	900 ppm	12	78.100	93.600	87.475

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Control	34.485	5.872	1.695
2	100 ppm	15.542	3.942	1.138
3	300 ppm	57.083	7.555	2.181
4	900 ppm	26.840	5.181	1.496

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	148.651	49.550	1.480
Within (Error)	44	1473.448	33.487	
Total	47	1622.099		

Critical F value = 2.84 (0.05,3,40)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	89.317	89.317		
2	100 ppm	85.400	85.400	1.658	
3	300 ppm	84.892	84.892	1.873	
4	900 ppm	87.475	87.475	0.780	

Dunnnett table value = 2.13 (1 Tailed Value, P=0.05, df=40,3)

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	12			
2	100 ppm	12	5.032	5.6	3.917
3	300 ppm	12	5.032	5.6	4.425
4	900 ppm	12	5.032	5.6	1.842

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Control	12	89.317	89.317	89.317
2	100 ppm	12	85.400	85.400	85.922
3	300 ppm	12	84.892	84.892	85.922
4	900 ppm	12	87.475	87.475	85.922

Metalaxyl Bobwhite % Eggs Set to Eggs Laid
 File: Met%SET.BWQ Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Control	89.317				
100 ppm	85.922	1.437		1.68	k= 1, v=44

4

300 ppm 85.922 1.437 1.76 k= 2, v=44
 900 ppm 85.922 1.437 1.79 k= 3, v=44

s = 5.787

Note: df used for table values are approximate when v > 20.

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	12	5.000	14.000	11.083
2	100 ppm	12	7.000	15.000	11.667
3	300 ppm	12	7.000	17.000	11.417
4	900 ppm	12	7.000	14.000	10.917

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Control	10.811	3.288	0.949
2	100 ppm	6.788	2.605	0.752
3	300 ppm	6.992	2.644	0.763
4	900 ppm	5.356	2.314	0.668

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	4.063	1.354	0.181
Within (Error)	44	329.417	7.487	
Total	47	333.479		

Critical F value = 2.84 (0.05,3,40)

Since F < Critical F FAIL TO REJECT Ho: All groups equal

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	11.083	11.083		
2	100 ppm	11.667	11.667	-0.522	
3	300 ppm	11.417	11.417	-0.298	
4	900 ppm	10.917	10.917	0.149	

Dunnnett table value = 2.13 (1 Tailed Value, P=0.05, df=40,3)

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho: Control < Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	12			
2	100 ppm	12	2.379	21.5	-0.583
3	300 ppm	12	2.379	21.5	-0.333
4	900 ppm	12	2.379	21.5	0.167

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Control	12	11.083	11.083	11.389
2	100 ppm	12	11.667	11.667	11.389
3	300 ppm	12	11.417	11.417	11.389
4	900 ppm	12	10.917	10.917	10.917

Metalaxyl Eggs Set Week 19 Bobwhite
 File: Metlxegg.w19 Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Control	11.389				
100 ppm	11.389	0.274		1.68	k= 1, v=44
300 ppm	11.389	0.274		1.76	k= 2, v=44
900 ppm	10.917	0.149		1.79	k= 3, v=44

~~Property~~ Mallard Study Data

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Controls	5	41.200	72.000	55.520
2	100 ppm	5	42.600	69.000	58.400
3	300 ppm	5	34.900	57.300	47.250
4	900 ppm	5	16.700	60.800	42.970

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Controls	164.317	12.819	5.733
2	100 ppm	109.305	10.455	4.676
3	300 ppm	95.400	9.767	4.368
4	900 ppm	266.129	16.313	7.296

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	768.645	256.215	1.614
Within (Error)	16	2540.606	158.788	
Total	19	3309.250		

Critical F value = 3.24 (0.05,3,16)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Controls	55.520	55.520		
2	100 ppm	58.400	58.400	-0.361	
3	300 ppm	47.250	47.250	1.038	
4	900 ppm	42.970	42.970	1.575	

Dunnnett table value = 2.23 (1 Tailed Value, P=0.05, df=16,3)

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Controls	5			
2	100 ppm	5	17.772	32.0	-2.880
3	300 ppm	5	17.772	32.0	8.270
4	900 ppm	5	17.772	32.0	12.550

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Controls	5	55.520	55.520	56.960
2	100 ppm	5	58.400	58.400	56.960
3	300 ppm	5	47.250	47.250	47.250
4	900 ppm	5	42.970	42.970	42.970

Metalaxyl Mallard Hatch Success to Eggs Laid
 File: metaELd.hch Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Controls	56.960				
100 ppm	56.960	0.181		1.75	k= 1, v=16

300 ppm	47.250	1.038	1.83	k= 2, v=16
900 ppm	42.970	1.575	1.86	k= 3, v=16

s = 12.601

Note: df used for table values are approximate when v > 20.

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Controls	5	922.000	1186.000	1059.800
2	100 ppm	5	921.000	1037.000	966.000
3	300 ppm	5	918.000	1034.000	1004.800
4	900 ppm	5	871.000	1011.000	972.000

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Controls	13384.700	115.692	51.739
2	100 ppm	2064.000	45.431	20.317
3	300 ppm	2401.700	49.007	21.917
4	900 ppm	3263.000	57.123	25.546

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	27686.950	9228.983	1.748
Within (Error)	16	84453.600	5278.350	
Total	19	112140.550		

Critical F value = 3.24 (0.05,3,16)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Controls	1059.800	1059.800		
2	100 ppm	966.000	966.000	2.041	
3	300 ppm	1004.800	1004.800	1.197	
4	900 ppm	972.000	972.000	1.911	

Dunnnett table value = 2.23 (1 Tailed Value, P=0.05, df=16,3)

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Controls	5			
2	100 ppm	5	102.467	9.7	93.800
3	300 ppm	5	102.467	9.7	55.000
4	900 ppm	5	102.467	9.7	87.800

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Controls	5	1059.800	1059.800	1059.800
2	100 ppm	5	966.000	966.000	985.400
3	300 ppm	5	1004.800	1004.800	985.400
4	900 ppm	5	972.000	972.000	972.000

Metalaxyl Mallard 19 Week Total Feed Consumption
 File: metafeed.tot Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Controls	1059.800				
100 ppm	985.400	1.619		1.75	k= 1, v=16
300 ppm	985.400	1.619		1.83	k= 2, v=16
900 ppm	972.000	1.911	*	1.86	k= 3, v=16

s = 72.652
 Note: df used for table values are approximate when v > 20.

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	33.500	37.000	34.700
2	100 ppm	5	34.500	37.500	35.600
3	300 ppm	5	26.000	37.000	33.100
4	900 ppm	4	26.000	28.500	27.625

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Control	2.075	1.440	0.644
2	100 ppm	1.800	1.342	0.600
3	300 ppm	17.425	4.174	1.867
4	900 ppm	1.229	1.109	0.554

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	163.849	54.616	9.216
Within (Error)	15	88.887	5.926	
Total	18	252.737		

Critical F value = 3.29 (0.05,3,15)
 Since F > Critical F REJECT Ho:All groups equal

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 DUNNETTS TEST

***** WARNING *****
 This data set has unequal replicates. The Bonferroni T-test should be used instead of the Dunnett's test.

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	34.700	34.700		
2	100 ppm	35.600	35.600	-0.585	
3	300 ppm	33.100	33.100	1.039	
4	900 ppm	27.625	27.625	4.333	*

Dunnett table value = 2.24 (1 Tailed Value, P=0.05, df=15,3)

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHawt.mal Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	100 ppm	5	3.449	9.9	-0.900
3	300 ppm	5	3.449	9.9	1.600
4	900 ppm	4	3.658	10.5	7.075

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHaWt.mal Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	163.849	54.616	9.216
Within (Error)	15	88.887	5.926	
Total	18	252.737		

Critical F value = 3.29 (0.05,3,15)
 Since F > Critical F REJECT Ho:All groups equal

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHaWt.mal Transform: NO TRANSFORM
 BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	34.700	34.700		
2	100 ppm	35.600	35.600	-0.585	
3	300 ppm	33.100	33.100	1.039	
4	900 ppm	27.625	27.625	4.333 *	

Bonferroni T table value = 2.34 (1 Tailed Value, P=0.05, df=15,3)

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHaWt.mal Transform: NO TRANSFORM
 BONFERRONI T-TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	100 ppm	5	3.607	10.4	-0.900
3	300 ppm	5	3.607	10.4	1.600
4	900 ppm	4	3.826	11.0	7.075

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHaWt.mal Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Control	5	34.700	34.700	35.150
2	100 ppm	5	35.600	35.600	35.150
3	300 ppm	5	33.100	33.100	33.100
4	900 ppm	4	27.625	27.625	27.625

Metalaxyl Hatchling Weight Terminal-Means Mallard
 File: MetaHaWt.mal Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Control	35.150				
100 ppm	35.150	0.292		1.75	k= 1, v=15
300 ppm	33.100	1.039		1.84	k= 2, v=15
900 ppm	27.625	4.333	*	1.87	k= 3, v=15

s = 2.434
 Note: df used for table values are approximate when v > 20.

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Controls	5	2.000	12.000	5.400
2	100 ppm	5	1.000	6.000	3.600
3	300 ppm	5	3.000	14.000	7.800
4	900 ppm	5	6.000	21.000	9.400

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Controls	14.800	3.847	1.720
2	100 ppm	6.300	2.510	1.122
3	300 ppm	15.700	3.962	1.772
4	900 ppm	42.800	6.542	2.926

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	98.550	32.850	1.651
Within (Error)	16	318.400	19.900	
Total	19	416.950		

Critical F value = 3.24 (0.05,3,16)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Controls	5.400	5.400		
2	100 ppm	3.600	3.600	0.638	
3	300 ppm	7.800	7.800	-0.851	
4	900 ppm	9.400	9.400	-1.418	

Dunnett table value = 2.23 (1 Tailed Value, P=0.05, df=16,3)

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Controls	5			
2	100 ppm	5	6.292	116.5	1.800
3	300 ppm	5	6.292	116.5	-2.400
4	900 ppm	5	6.292	116.5	-4.000

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Controls	5	5.400	5.400	4.500
2	100 ppm	5	3.600	3.600	4.500
3	300 ppm	5	7.800	7.800	7.800
4	900 ppm	5	9.400	9.400	9.400

Metalaxyl Mallard Eggs Cracked-8 Week Totals
 File: metaeggs.crk Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Controls	4.500				
100 ppm	4.500	0.319		1.75	k= 1, v=16
300 ppm	7.800	0.851		1.83	k= 2, v=16
900 ppm	9.400	1.418		1.86	k= 3, v=16

s = 4.461

Note: df used for table values are approximate when v > 20.

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Controls	8	32.000	69.000	47.375
2	100 ppm	8	31.000	78.000	59.125
3	300 ppm	8	38.000	68.000	47.750
4	900 ppm	8	7.000	69.000	39.875

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Controls	205.982	14.352	5.074
2	100 ppm	360.696	18.992	6.715
3	300 ppm	106.786	10.334	3.654
4	900 ppm	398.411	19.960	7.057

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	1512.844	504.281	1.882
Within (Error)	28	7503.125	267.969	
Total	31	9015.969		

Critical F value = 2.95 (0.05,3,28)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Controls	47.375	47.375		
2	100 ppm	59.125	59.125	-1.436	
3	300 ppm	47.750	47.750	-0.046	
4	900 ppm	39.875	39.875	0.916	

Dunnnett table value = 2.17 (1 Tailed Value, P=0.05, df=24,3)

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Controls	8			
2	100 ppm	8	17.761	37.5	-11.750
3	300 ppm	8	17.761	37.5	-0.375
4	900 ppm	8	17.761	37.5	7.500

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Controls	8	47.375	47.375	53.250
2	100 ppm	8	59.125	59.125	53.250
3	300 ppm	8	47.750	47.750	47.750
4	900 ppm	8	39.875	39.875	39.875

Metalaxyl Mallard Total Hatchlings By Week
 File: metatot.hch Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Controls	53.250				
100 ppm	53.250	0.718		1.70	k= 1, v=28
300 ppm	47.750	0.046		1.78	k= 2, v=28
900 ppm	39.875	0.916		1.81	k= 3, v=28

s = 16.370
 Note: df used for table values are approximate when v > 20.

Propargite Bobwhite Quail Data

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Controls	12	0.000	11.000	3.083
2	100 ppm	12	0.000	8.000	3.500
3	300 ppm	12	0.000	8.000	3.083
4	900 ppm	12	0.000	9.000	3.583

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Controls	10.083	3.175	0.917
2	100 ppm	7.545	2.747	0.793
3	300 ppm	7.174	2.678	0.773
4	900 ppm	7.902	2.811	0.811

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	2.563	0.854	0.104
Within (Error)	44	359.750	8.176	
Total	47	362.313		

Critical F value = 2.84 (0.05,3,40)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Controls	3.083	3.083		
2	100 ppm	3.500	3.500	-0.357	
3	300 ppm	3.083	3.083	0.000	
4	900 ppm	3.583	3.583	-0.428	

Dunnnett table value = 2.13 (1 Tailed Value, P=0.05, df=40,3)

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Controls	12			
2	100 ppm	12	2.486	80.6	-0.417
3	300 ppm	12	2.486	80.6	0.000
4	900 ppm	12	2.486	80.6	-0.500

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Controls	12	3.083	3.083	3.083
2	100 ppm	12	3.500	3.500	3.292
3	300 ppm	12	3.083	3.083	3.292
4	900 ppm	12	3.583	3.583	3.583

Metalaxyl Bobwhite Eggs Laid Week 12
 File: Metlxegg.w12 Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Controls	3.083				

100 ppm	3.292	0.178	1.68	k= 1, v=44
300 ppm	3.292	0.178	1.76	k= 2, v=44
900 ppm	3.583	0.428	1.79	k= 3, v=44

s = 2.859

Note: df used for table values are approximate when v > 20.

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	12	0.207	0.234	0.220
2	100 ppm	12	0.195	0.227	0.212
3	300 ppm	12	0.203	0.230	0.218
4	900 ppm	12	0.192	0.234	0.215

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM
1	Control	0.000	0.009	0.003
2	100 ppm	0.000	0.012	0.003
3	300 ppm	0.000	0.009	0.003
4	900 ppm	0.000	0.012	0.004

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	0.0004	0.0001	1.000
Within (Error)	44	0.0051	0.0001	
Total	47	0.0055		

Critical F value = 2.84 (0.05,3,40)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	0.220	0.220		
2	100 ppm	0.212	0.212	1.939	
3	300 ppm	0.218	0.218	0.408	
4	900 ppm	0.215	0.215	1.082	

Dunnett table value = 2.13 (1 Tailed Value, P=0.05, df=40,3)

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	12			
2	100 ppm	12	0.009	4.0	0.008
3	300 ppm	12	0.009	4.0	0.002
4	900 ppm	12	0.009	4.0	0.004

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Control	12	0.220	0.220	0.220
2	100 ppm	12	0.212	0.212	0.215
3	300 ppm	12	0.218	0.218	0.215
4	900 ppm	12	0.215	0.215	0.215

Metalaxyl Bobwhite Mean Eggshell thickness
 File: meteggsh.bwq Transform: NO TRANSFORM
 WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Control	0.220				
100 ppm	0.215	1.043		1.68	k= 1, v=44