Data Evaluation Report on the Reproductive Effects of XDE-638 (Penoxsulam) on Avian Species *Anas platyrhynchos*

PMRA Submission Number EPA MRID Number 46276401

Data Requirement:

PMRA DATA CODE	
EPA DP Barcode	D288160
OECD Data Point	
EPA MRID	46276401
EPA Guideline	§71-4b

Test material: XDE-638 **Purity:** 97.7%
Common name: Penoxsulam
Chemical name: IUPAC: Not specified
CAS name: 2-(2,2-Difluoroethoxy)-N-(5,8-dimethoxy[1,2,4]triazolo[1,5-C]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide (pilot study, MRID 45831007)
CAS No.: Not specified
Synonyms: XR-638, X638177

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Date Evaluation Completed:

CITATION: Mach, J.J., and B.A. Medlicott. 2004 (Amended Final Report). XDE-638: Avian Reproduction Study with the Mallard (*Anas platyrhynchos*). Unpublished study performed by Genesis Laboratories, Inc., Wellington, CO. Laboratory Study No. 00013. Study sponsored by The Dow Chemical Company, Midland, MI for Dow AgroSciences LLC, Indianapolis, IN. Study initiated April 7, 2000 and completed July 30, 2002. Final amended report completed May 10, 2004.

EXECUTIVE SUMMARY:

The one-generation reproductive toxicity of XDE-638 (penoxsulam) to groups (16 pens/treatment level) of 1 male and 1 female of 16-week-old Mallard duck was assessed over approximately 20 weeks. XDE-638 was administered to the birds in the diet at nominal concentrations of 0 (solvent control), 250, 500, and 1000 ppm. Mean-measured concentrations were <70.7 (<LOQ, control), 231, 501, and 958 ppm a.i., respectively.

Adult male body weight gain was adversely affected at the highest treatment level; there were no other significant adverse effects on any adult parameter. In addition, no treatment-related effects were observed on egg production or quality, fertility, embryonic development, hatchability, or survival of hatchlings. No treatment-related effects on hatchling body weights were observed; however, 14-day-old body weights of ducklings were statistically-reduced compared to the control at all test levels. The mean body weights of the 14-day old ducklings were 240, 218, 211, and 215 g in the control, 250, 500, and 1000 ppm test groups, respectively. A hatchling brooder density test was provided as a supplement to this study (MRID 46276402) and it provided strong evidence that brooder density may have been the primary factor contributing to the survivor body weight reductions. As a result, the LOAEC for this study is defined by reductions in adult male body weight at the 958 ppm a.i. treatment level. The NOAEC was 501 ppm a.i.

This study is scientifically sound, fulfills guideline requirements for the reproductive toxicity of XDE-638 (penoxsulam) to Mallard duck (§71-4b), and is classified as CORE.

Results Synopsis

Test Organism Size/Age : 16-weeks old at test initiation (903-1422 g)

NOAEC: 501 ppm a.i.
LOAEC: 958 ppm a.i.
Endpoint(s) Affected: adult male body weight

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study protocol was based on procedures of the U.S. EPA Pesticide Assessment Guidelines, Series 71-4 (1988); U.S. EPA OPPTS Guideline No. 850.2300 (Public Draft, 1996); and OECD Guideline No. 206 (1984). Deviations from §71-4 are:

1. The maximum anticipated field residue was not specified.

2. The concentration of acetone used in preparation of the tests diets was not specified. Also, it was not specified if the acetone was allowed to completely evaporate off the treated feed prior to offering.

3. Extreme room temperature and humidity ranges were observed during housing of the Mallard: 11-41°C and 25-98%. EPA requires that the bird room is maintained at approximately 21°C and 55% relative humidity.

4. An extreme temperature range (11-23°C) was observed during egg storage. EPA requires that eggs are stored at approximately 16°C.

5. The hatching temperature range (81-100°F) was excessive, and below recommendations (approx. 102°F).

These deviations do not affect the scientific validity or acceptability of the study.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. This study was conducted in accordance with United States and OECD standards (p. 3).

A. MATERIALS:

1. Test Material XDE-638

Description: White powder

Lot No./Batch No.: B-765-44

Purity: 97.7%

Stability of Compound Under Test Conditions: Stability was assessed in treated feed prepared at 125 and 2000 ppm after 27 days of frozen storage, or after 7 or 14 days of ambient trough feeder storage. Recoveries were 85.4-99.5% of initial values after 7 or 14 days of ambient storage, and 105.7-111.1% of initial values after 27 days of frozen storage (pp. 39, 41, and 44 of Appendix B, MRID 45831007; Genesis Study No. 99051; refer to Reviewer's Comments section). Treated feed was prepared bi-weekly and stored at -17°C until needed.

Storage conditions of test chemical: Ambient

OECD requires water solubility, stability in water and light, pK_a, P_{ow}, and vapor pressure of the test compound. OECD requirements were not reported.

2. Test organism:

Table 1: Test organism.

Parameter	Details	Remarks / *Criteria*
Species (common and scientific names):	Mallard duck (*Anas platyrhynchos*)	
		EPA requires: a wild waterfowl species, preferably the mallard, Anas platyrhynchos, or an upland game species, preferably the northern bobwhite, Colinus virginianus.
Age at Study Initiation:	16 weeks	It was stated that birds were approaching their first breeding season.
		EPA requires: birds should be approaching their first breeding season.
Body Weight: (mean and range)	Overall range of 903-1422 g, with mean group ranges of 1104-1165 g (combined sexes).	Individual body weights were recorded at Weeks 0 (study initiation), 2, 4, 6, 8, and 20 (study termination; Appendix C2, pp. 83-86).
		EPA requires that body weights should be recorded at test initiation and at biweekly intervals up to week eight or up to the onset of egg laying and at termination.
Source:	Whistling Wings, Inc. Hanover, IL.	Birds were from the same hatch, and were phenotypically indistinguishable from wild birds.
		EPA requires that all birds should be from the same source.

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study - A 28-day range-finding study was conducted with 22-week-old Mallard duck (6 pairs/treatment level) and XDE-638 (purity 97.5%) at nominal concentrations of 0 (acetone control), 125, 250, 500, 1000, and 2000 ppm diet (MRID 45831007; Genesis Study No. 99051; refer to

Reviewer's Comments section). Reviewer-calculated mean-measured concentrations were 125, 254, 486, 898, and 1967 ppm a.i. (pp. 30 and 43 of Appendix B).

To assess homogeneity of XDE-638, samples from the top, middle, and bottom of treated feed prepared at 125 and 2000 ppm were collected; coefficients of variation were 3.4% for the 125 ppm level and 4.0% for the 2000 ppm level (p. 37 of Appendix B). Stability was assessed in treated feed prepared at 125 and 2000 ppm after 27 days of frozen storage, or after 7 or 14 days of ambient trough feeder storage. Recoveries were 85.4-99.5% of initial values after 7 or 14 days of ambient storage, and 105.7-111.1% of initial values after 27 days of frozen storage (pp. 39, 41, and 44 of Appendix B).

The birds were observed daily for mortality and clinical signs of toxicity. Body weights were determined at study initiation, and on Days 14 and 28. Feed consumption was measured weekly. Any birds found dead during the study were subject to gross pathological examination, and at study termination, three male and three females were arbitrarily selected from each test and control group for gross examination. During the study, the mean minimum and maximum temperature were 19 and 22°C, and the mean minimum and maximum relative humidity were 26 and 47% (Appendix A2, p. 24).

Body weight and feed consumption data were analyzed by a Chi-square test for normality and Bartlett's test for homogeneity of variance. Data were then compared to the solvent control group using one-way ANOVA and Dunnett's t-test.

No treatment-related mortality or clinical signs of toxicity were observed during the 28-day study (Table I, p. 16). One vehicle control male was found dead on Day 16. No treatment-related effects on body weight were observed (Table II, p. 17), and no treatment-related effects on food consumption were observed (Table III, p. 18). No treatment-related abnormalities were observed upon gross necropsy of 37 birds sacrificed at study termination (Table IV, p. 19). The NOAEC was 1967 ppm a.i.

b. Definitive Study

Table 2: Experimental Parameters.

Parameter	**Details**	**Remarks**
		Criteria
Acclimation period:	14 days	Mallard were fed a basal diet of Ranch-way 20% Lay Feed (Appendix D, p. 111), and provided public tap water from the Northern Colorado Water Association.
Conditions (same as test or not):	Same as test	
Feeding:	Water and feed were provided *ad libitum.*	
Health (any mortality observed):	All test birds were normal and active throughout the acclimation period. No disease or abnormalities were observed, and no medication was provided.	*EPA recommends a 2-3 week health observation period prior to selection of birds for treatment. Birds must be generally healthy without excess mortality. Feeding should be ad libitum, and sickness, injuries or mortality be noted.*
Test duration pre-laying exposure:	Approximately 10 weeks	Reduced reproduction was not observed by the study author, so a withdrawal period was not conducted.
egg-laying exposure:	Approximately 10 weeks	

Parameter	Details	Remarks *Criteria*
withdrawal period, if used:	No withdrawal period	*EPA requires* ***Pre-laying exposure duration*** *At least 10 weeks prior to the onset of egg-laying.* ***Exposure duration with egg-laying*** *At least 10 weeks.* ***Withdrawal period*** *If reduced reproduction is evident, a withdrawal period of up to 3 weeks should be added to the test phase.*
Pen (for parental and offspring) size:	Parents (one pair) were housed in 61- x 76- x 46-cm pens. Offspring (by set and group) were housed in 91- x 79- x 25-cm box-type battery brooders.	
construction materials:	Parental cages were constructed of galvanized steel. Hatchling cages were constructed of wood.	*Pens* *Adequate room and arranged to prevent cross contamination* *Materials* *Nontoxic material and nonbinding material, such as galvanized steel.*
number:	16 parental pens/treatment level	*Number* *At least 5 replicate pens are required for mallards housed in groups of 7. For other arrangements, at least 12 pens are required, but considerably more may be needed if birds are kept in pairs. Chicks are to be housed according to parental grouping.*
Number of birds per pen (male:female)	2 birds/pen (1 male:1 female)	*EPA requires one male and 1 female per pen. For quail, 1 male and 2 females is acceptable. For ducks, 2 males and 5 females is acceptable.*
Number of pens per group/treatment negative control: solvent control: treated:	N/A 16 pens 16 pens/treatment	*EPA requires at least 12 pens, but considerably more if birds are kept in pairs. At least 16 is*

Parameter	Details	Remarks
		Criteria
		strongly recommended.
Test concentrations (ppm diet) nominal: measured:	0, 250, 500, and 1000 ppm <70.7 (<LOQ, control), 231, 501, and 958 ppm a.i.	Mean-measured concentrations were determined from treated feed collected from Batches 1, 2, 3, 6, and 10 (Table 1, p. 28).
		EPA requires at least two concentrations other than the control are required; three or more are recommended.
Maximum labeled field residue anticipated and source of information:	Not specified	
		EPA requires that the highest test concentrations should show a significant effect or be at or above the actual or expected field residue level. The source [i.e., maximum label rate (in lb ai/A & ppm), label registration no., label date, and site should be cited]
Solvent/vehicle, if used type: amount:	Acetone Not specified	
		EPA requires corn oil or other appropriate vehicle not more than 2% of diet by weight
Was detailed description and nutrient analysis of the basal diet provided? (Yes/No)	Yes	Basal diets contained 20.0% protein, 2.0% fat, 10.5% fiber, and 3.0-3.5% calcium (Appendix D, p. 111). Offspring received Ranch-way Turkey and Game Bird Starter without the addition of test substance (Appendix D, p. 110).
		EPA requires a commercial breeder feed (or its equivalent) that is appropriate for the test species.
Preparation of test diet	The appropriate amount of test material was suspended in acetone, then combined with basal ration and mixed for 25 minutes (p. 16). To facilitate	Dietary concentrations were corrected for the purity of the test substance (p. 17). It was not specified if the

Parameter	**Details**	**Remarks**
		Criteria
	mixing, each test group was split into sub-batches and pooled together after the mix to form a single batch. Treated diets were prepared bi-weekly, and were stored at approximately -17°C until needed.	acetone was allowed to completely evaporate prior to offering.
		A premixed containing the test substance should be mechanically mixed with basal diet. If an evaporative vehicle is used, it must be completely evaporated prior to feeding.
Indicate whether stability and homogeneity of test material in diet determined (Yes/No)	Yes, in the pilot dietary study (MRID 45831007; Genesis Laboratory Study No. 99051; refer to Reviewer's Comments section).	
Were concentrations in diet verified by chemical analysis?	Yes	Samples were analyzed from feed collected from Batches 1, 2, 3, 6, and 10 (Table 1, p. 28).
Did chemical analysis confirm that diet was stable? and homogeneous?	Yes Yes	Stability was assessed in the pilot study in powdered diet prepared at 125 and 2000 ppm (MRID 45831007). Samples were stored for either 27 days under frozen conditions, or for 7 or 14 days under ambient trough feeder conditions. After 27 days of frozen storage, recoveries averaged 105.7-111.1% of initial concentrations, and after 7 or 14 days of ambient storage, recoveries averaged 85.4-99.5% of initial concentrations (pp. 39, 41, and 44 of Appendix B, MRID 45831007). Homogeneity was assessed by collecting samples from the top, middle, and bottom of treated feed prepared at 125 and 2000 ppm. Coefficients of variation were 3.4% for the 125 ppm level and 4.0% for the 2000 ppm level (p. 37 of Appendix B, MRID 45831007).
Feeding and husbandry	Feeding and husbandry	

Parameter	**Details**	**Remarks** ***Criteria***
	conditions appeared to be adequate, given guideline recommendations.	
Test conditions (pre-laying) temperature: relative humidity: photo-period:	 11-41°C 25-98% 7 hr light/day up through Week 8 and 17 hr light/day thereafter.	Light intensity averaged 11.3 foot-candles at bird level (p. 15). Temperature and humidity ranges were excessive (Appendix B2, p. 73). *EPA Requires* *Temperature:* *About 21 °C (70 °F)* *Relative humidity:* *About 55%* *Lighting* *First 8 weeks: 7 h per day.* *Thereafter: 16-17 h per day.* *At least 6 foot candles at bird level.*
Egg Collection and Incubation		
Egg collection and storage collection interval: storage temperature: storage humidity:	 Daily 11-23°C 41-88%	The temperature range was excessive (Appendix B3, p. 74). *EPA requires eggs to be collected daily; egg storage temperature approximately 16 °C (61 °F); humidity approximately 65%.*
Were eggs candled for cracks prior to setting for incubation?	Yes	 *EPA requires eggs to be candled on day 0*
Were eggs set weekly?	Yes	
Incubation conditions temperature: humidity:	 81-100°F <46-93%	Incubation and hatching occurred in the same incubator, in different compartments. Environmental conditions were the same for both phases (p. 18 and Appendix B4, p. 75). Appendix B4 erroneously reports that the temperature values provided are in °C.

Parameter	**Details**	**Remarks**
		Criteria
When candling was done for fertility?	Day 14 for fertility and Day 21 for viability.	
		EPA requires: *Quail: approx. day 11* *Ducks: approx. day 14*
When the eggs were transferred to the hatcher?	Day 24	
		EPA requires: *Bobwhite: day 21* *Mallard: day 23*
Hatching conditions temperature: humidity: photo-period:	 81-100°F <46-93% 16 hrs light/day (hatchlings)	Incubation and hatching occurred in the same incubator, in different compartments. Environmental conditions were the same for both phases (p. 18 and Appendix B4, p. 75). Appendix B4 erroneously reports that the temperature values provided are in °C. The hatching temperature range was excessive, and below recommendations.
		EPA requires: *temperature of 39 °C (102 °F)* *humidity of 70%*
Day the hatched eggs were removed and counted	Day 27 or 28	
		EPA requires Bobwhite: day 24 *Mallard: day 27*
Were egg shells washed and dried for at least 48 hrs before measuring?	Yes	
Egg shell thickness no. of eggs used: intervals: mode of measurement:	 All eggs laid on one day Every other week throughout the egg-laying period. Three points around the equatorial circumference were measured to the nearest 0.001 mm.	 *EPA requires newly hatched eggs be collected at least once every two weeks. Thickness of the shell plus membrane should be measured to the nearest 0.01 mm; 3 - 4 measurements per shell.*
Reference chemical, if used	None used	

2. Observations:

Table 3: Observations.

Parameter	**Details**	**Remarks/Criteria**
Parameters measured		
Parental: (mortality, body weight, mean feed consumption)	- mortality - signs of toxicity, injury, or illness - body weight - food consumption - necropsy	At test termination, at least half of the test animals were necropsied, which included specific examination of the GI tract, liver, kidneys, bile duct, heart, spleen, and reproductive organs.
Egg collection and subsequent development: (no. of eggs laid, no. of eggs cracked, shell thickness, no. of eggs set, no. of viable embryos, no. of live 3 week embryos, no. hatched, no. of 14-day survivors, average weight of 14-day-old survivors, mortality, gross pathology, others)	- eggs laid - eggs broken, cracked, small, and soft shelled, etc. - egg shell thickness - eggs set - viable embryos - live 3-week embryos - number of normal hatchlings - signs of toxicity and physical defects of hatchlings - number of 14-day-old survivors - 14-day-old survivor body weight	*EPA requires:* · *Eggs laid/pen* · *Eggs cracked/pen* · *Eggs set/pen* · *Viable embryos/pen* · *Live 3-week embryos/pen* · *Normal hatchlings/pen* · *14-day-old survivors/pen* · *14-day-old survivors/pen* · *Weights of 14-day-old survivors (mean per pen)* · *Egg shell thickness* · *Food consumption (mean per pen)* · *Initial and final body weight (mean per pen)*
Indicate if the test material was regurgitated	No indications of dietary regurgitation.	
Observation intervals (for various parameters)	Mortality and signs of toxicity were observed daily for adults and hatchlings. Parental body weights were recorded at Weeks 0, 2, 4, 6, 8 and 20 (test termination), and food consumption was determined weekly.	*Body weights and food consumption must be measured at least biweekly.*
Were raw data included?	Yes, sufficient.	

I. RESULTS AND DISCUSSION:

A. MORTALITY:

No treatment-related mortality was observed during the study (p. 22 and Table II, p. 29).

Table 4: Effect of XDE-638 on Mortality of *Anas Platyrhynchos.*

Treatment, ppm a.i. measured (and nominal) concentrations	Observation Period					
	Week 7		Week 14		Week 20	
	No. Dead		No. Dead		No. Dead	
	Male	Female	Male	Female	Male	Female
Control	0	0	0	0	0	0
231 (250)	0	0	0	0	0	0
501 (500)	0	0	0	0	0	0
958 (1000)	0	0	0	0	0	0

B. REPRODUCTIVE AND OTHER ENDPOINTS:

Abnormal Effects/Behavior: No overt signs of treatment-related toxicity were observed (p. 22 and Table II, p. 29). Incidental clinical observations normally associated with pen wear and/or interactions among pen mates were observed and included feather loss around the eyes, head, and/or neck; abrasions of the foot; foot injury; and pecking injury.

Food Consumption: No treatment-related effect on food consumption was observed (Table III, p. 30). Overall feed consumption averaged 123 g/bird/day for the control group, and 128, 126, and 126 g/bird/day for the 250, 500, and 1000 ppm test groups, respectively

Body Weight: No treatment-related effects on parental body weight or body weight changes were observed (p. 22 and Table IV, p. 31).

Necropsy: All necropsy findings were considered incidental to treatment (Table V, p. 32).

Reproductive Effects: No treatment-related effects were observed on egg production or quality, fertility, embryonic development, hatchability, or survival of hatchlings (Tables VII to XVI, pp. 34-43).

No notable abnormalities were observed in the hatchlings during the 14-day maintenance period (Table XVII, p. 44). No treatment-related effects on hatchling body weights were observed; however, 14-day-old body weights of hatchlings were statistically-reduced compared to the control at all test levels (Table XVIII, p. 45). The mean body weights of the 14-day old ducklings were 240, 218, 211, and 215 g in the control, 250, 500, and 1000 ppm test groups, respectively. The study authors reported that brooder density appeared to be a confounding factor in the body weight reductions.

Consequently, a supplemental hatchling brooder density test was performed and concurrently-submitted (MRID 46276402). The objective of the study was to determine the optimum density of Northern Bobwhite chicks and Mallard ducklings in commercially-available brooders during the 14-day hatchling phase without reducing

hatchling body weights or survivability. A detailed description of the methods and results of this supplemental study are provided in the Reviewer's Comments section. Overall, brooder density had a clear effect on the growth of ducklings, but no effect on the growth of quail (Tables IV and V, pp. 17-18, and Figures III and IV, pp. 23-24). Duckling body weights were greatly affected as the brooder density increased to 30 and 40 birds/brooder; 20 ducklings/brooder was the optimum density as identified by increased body weight gains. The optimum density of Bobwhite could range from 30 to 50 birds/brooder. No difference was observed in Mallard or Bobwhite mortality.

The study authors reported that since the brooder density (in the definitive study) was not maintained at a consistent density across treatment groups, an effect was seen that suggests that brooder density affected the results of the study, not the test substance (p.26). Actual brooder density data during the definitive study were not provided for review). The study authors further argued that if the test substance was causing an effect on the hatchlings, a significant difference would have appeared in other parameters; that no dose-response was observed in hatchling (Day 0) body weights.

Table 5: Reproductive and other parameters (nominal concentrations; study author-reported).

Parameter	Control	250 ppm	500 ppm	1000 ppm	NOAEC/ LOAEC
Eggs laid	594	673	649	685	1000 ppm >1000 ppm
Eggs laid/hen	37	42	41	43	1000 ppm >1000 ppm
Eggs cracked/eggs laid (%)	0	0	0	0	1000 ppm >1000 ppm
Shell thickness (mm ± SD)[1]	0.351	0.347	0.345	0.352	1000 ppm >1000 ppm
Eggs set	540	615	587	618	N/A
Viable embryos	433	580	556	539	N/A
Viable embryos/eggs set (%)	80.2	94.3	94.7	87.2	1000 ppm >1000 ppm
Live 3-week embryos	416	555	536	528	N/A
Live 3-week embryos/viable embryos (%)	96.1	95.7	96.4	98.0	1000 ppm >1000 ppm
No. of hatchlings	369	453	421	460	N/A
Hatchlings/viable embryos (%)	85.2	78.1	75.7	85.3	1000 ppm >1000 ppm
No. of normal hatchlings	369	453	421	458	N/A
No. of normal hatchlings/no. of hatchlings (%)	100	100	100	99.6	1000 ppm >1000 ppm
No. of normal 14-day old	364	445	414	445	N/A

Parameter	Control	250 ppm	500 ppm	1000 ppm	NOAEC/ LOAEC
survivors					
No. of normal 14-day old survivors/No. of normal hatchlings (%)	98.6	98.2	98.3	97.2	1000 ppm >1000 ppm
No. of total 14-day old survivors	364	445	414	447	N/A
No. of total 14-day old survivors/No. eggs laid (%)	61.3	66.1	63.8	65.3	1000 ppm >1000 ppm
Hatchling weight (g)	32	33	32	35	1000 ppm >1000 ppm
14-day old survivors weight (g)	240	218*	211*	215*	<250 ppm 250 ppm
Mean food consumption (g/bird/day)	123	128	126	126	1000 ppm >1000 ppm
Weight of adult males, g at start of treatment: at Week 8: at termination:	 1178 1188 1214	 1235 1232 1232	 1166 1193 1220	 1198 1210 1170	 1000 ppm >1000 ppm
Weight of adult females, g at start of treatment: at Week 8: at termination:	 1069 1056 1226	 1054 1052 1191	 1041 1007 1194	 1133 1119 1255	 1000 ppm >1000 ppm
Gross pathology (proportion of birds with pathological incidents)	No notable abnormalities observed.				

N/A = Not statistically-analyzed.
[1] Standard deviation not reported.
*Statistically-significant from the control group using ANOVA/Dunnett's t-test at the 0.05 level.

C. REPORTED STATISTICS:

The following variables were statistically analyzed: adult body weight, adult feed consumption, eggs laid, egg shell thickness, percentage of viable embryos of eggs set, percentage of live 21-day embryos of viable embryos, percentage of hatchlings of viable embryos, percentage of normal hatchlings of total number of hatchlings, percentage of 14-day old normal survivors of number of normal hatchlings, percentage of 14-day old survivors (total) of eggs laid, and 0- and 14-day hatchling body weight.

Data were assessed for normality using the Chi-square test and for homogeneity of variance using Bartlett's test. If the data set passed the tests for normality and homogeneity, an analysis of variance (ANOVA) was performed to determine statistically-significant differences between groups. If necessary, Dunnett's test (equal replicates)

or Bonferroni's test (not equal replicates) was then used to compare the treatment means with the control group mean. If the data set did not pass the tests for normality and homogeneity, they were transformed and re-analyzed. If an appropriate transformation did not succeed in normalizing the distribution, or if the variance was not homogeneous, the original untransformed data were analyzed by Kruskal-Wallis's non-parametric test (H-statistic). Dunn's multiple comparison procedure was used to compare each treatment group with the control. Proportional (percentage) data were routinely arc since transformed prior to analysis.

All variables were analyzed using TOXSTAT Version 3.4 (2003). Sample units were the individual pens within each experimental group, except adult body weights, where the sample unit was the individual bird. Nominal concentrations were used for all estimations.

D. VERIFICATION OF STATISTICAL RESULTS:

Statistical Method: Analysis was conducted using "chicks.sas" (Ver. 3; March 2002), a SAS program provided by EFED/OPP/USEPA. Data for all endpoints were examined graphically using box plots to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison test to detect LOAEC and NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric MannWhitney-U (with a Bonferroni adjustment) and Jonckheere's tests. Data for dead birds were excluded from the analyses. See Appendix I for output of reviewer's statistical verification and graphs for affected endpoints to support any reviewer-generated conclusions that may differ from those reported in the study. The mallard body weight means were analyzed from the hatchling brooder density study and it was verified that there were significant effects on body weight as a function of duckling density; these analyses were conducted using ANOVA followed by Tukey's multiple comparison test via TOXSTAT statistical software.

Table 6. Reproductive and other parameters (mean-measured concentrations; reviewer-reported).

Parameter	Control	231 ppm	501 ppm	958 ppm	NOAEC/ LOAEC
Eggs laid/pen	37.1	42.1	40.6	42.8	958 ppm/ >958 ppm
Eggs cracked/pen	0.0	0.0	0.0	0.0	958 ppm/ >958 ppm
Eggs not cracked/eggs laid (%)	100	100	100	100	958 ppm/ >958 ppm
Eggs set/pen	33.8	38.4	36.7	38.6	958 ppm/ >958 ppm
Shell thickness	0.35	0.35	0.35	0.35	958 ppm/ >958 ppm
Eggs set/eggs laid (%)	90.8	91.6	90.3	90.1	958 ppm/ >958 ppm
Viable embryo/pen	37.1	36.3	34.8	33.7	958 ppm/ >958 ppm

Parameter	Control	231 ppm	501 ppm	958 ppm	NOAEC/ LOAEC
Viable embryos/eggs set (%)	77.7	91.7	93.8	87.9	958 ppm/ >958 ppm
Live embryos/pen	26.0	34.7	33.5	33.0	958 ppm/ >958 ppm
Live embryo/viable embryo (%)	95.3	96.1	95.3	98.0	958 ppm/ >958 ppm
No. of hatchlings/pen	23.1	28.3	26.3	28.8	958 ppm/ >958 ppm
No. of hatchlings/eggs laid (%)	59.5	63.8	63.2	67.5	958 ppm/ >958 ppm
No. of hatchlings/eggs set (%)	65.9	69.9	69.9	74.8	958 ppm/ >958 ppm
No. of hatchlings/live embryos (%)	87.8	77.7	77.9	87.5	958 ppm/ >958 ppm
Hatchling survival/pen	22.8	27.8	25.9	27.8	958 ppm/ >958 ppm
Hatchling survival/eggs set (%)	63.6	68.4	68.8	72.3	958 ppm/ >958 ppm
Hatchling survival/no. of hatchlings (%)	97.5	97.6	97.8	96.7	958 ppm/ >958 ppm
Hatchling weight (g)	32.4	32.9	32.2	34.6	958 ppm/ >958 ppm
Survivor weight (g)	240.1	217.6	211.4	215.1	<231 ppm/ 231 ppm*
Mean food consumption (g/bird/day)	122.6	128.1	126.6	125.9	958 ppm/ >958 ppm
Male weight gain (g)	35.4	-2.8	53.7	-28.2	501 ppm/ 958 ppm
Female weight gain (g)	157.6	136.2	152.3	122.2	958 ppm/ >958 ppm

*The hatchling brooder density study showed that the significant effects shown at all levels for this parameter were likely caused by duckling density effects, not treatment.

E. STUDY DEFICIENCIES:

This study is considered scientifically valid, and the deficiencies listed were generally considered minor by the reviewer. Statistically-significant reductions in 14-day old chick body weights were observed (compared to the control) at all treatment levels (Table XVIII, p. 45). This was the only reproductive endpoint apparently affected. It was demonstrated in a supporting brooder density study (MRID 46276402; see Reviewer's Comments section for a complete synopsis) that duckling body weights were greatly affected as the brooder density increased to 30 and 40 birds/brooder, and the study authors maintain that overcrowding, and not the test substance, was the cause for the reductions in body weights (p. 26). This explanation appears to be reasonable, given the significant reductions in mallard body weight as a function of duckling density in the hatchling brooder study, as well as the lack of other signficant reproductive effects.

During the 20-week study, extreme ranges for both room temperature (11-41°C) and humidity (25-98%) were observed (Appendix B2, p. 73). The study authors reported that the 41°C record is most likely a transposition error as the minimum humidity reading was 25%, a value much lower than the surrounding days (recorded on 9/19/2000). The next highest recorded temperature was 32°C. Extreme ranges were also observed during incubation and hatching (which occurred in the same incubator in different compartments). Due to a lack of adverse effect on any parameter assessed (aside from the one in question above), these fluctuations did not appear to have any negative impact on the results of the study and are considered to be minor deviations.

F. REVIEWER'S COMMENTS:

Results of the reviewer's statistical analyses were similar to the study authors', with the exception of significant adverse effects detected by the reviewer's analysis on adult male body weight. As a result, the NOAEC and LOAEC for this study are based on this effect. The reviewer agrees with the study author that the statistically-significant reductions in 14-day old chick body weights (compared to the control) at all test levels was due to overcrowding in the brooders, and not a result of treatment with XDE-638. This explanation appears to be reasonable, given the significant reductions in mallard body weight as a function of duckling density in the hatchling brooder study, as well as the lack of other signficant reproductive effects.

A range-finding study was not reported in the current submission. However, in the previously-submitted avian reproduction study conducted with Mallard (MRID 45830101, Genesis Report No. 02014), a range-finding study was concurrently-submitted (MRID 45831007, Genesis Report No. 99051). The range-finding study also included verification of stability and homogeneity of XDE-638 in treated feed. Methods and results from the range-finding study were incorporated from the DER generated for MRID 45830101 into this document.

Data from a supplemental hatchling brooder density test was submitted [Mach, J.J. 2002. Northern Bobwhite (*Colinus virginianus*) and Mallard (*Anas platyrhynchos*) Hatchling Brooder Density Test. Unpublished study performed by Genesis Laboratories, Inc., Wellington, CO. Laboratory Study No. 01001. Study completed February 12, 2002. MRID 46276402]. The objective of the study was to determine the optimum density of Northern Bobwhite chicks and Mallard ducklings in commercially-available brooders during the 14-day hatchling phase without reducing hatchling body weights or survivability.

> Northern Bobwhite and Mallard eggs (from a reputable game bird farm) were incubated in the laboratory for 21 or 24 days, respectively, and hatched over a 42- or 24-hour period, respectively. Body weights were measured (minimum requirement of 7 g for Bobwhite and 30 g for Mallard), and the hatchlings were randomly placed into one of three brooders in a single battery according to a 3 by 3 Latin square design, generated by a computer program (RAN30). The density of the Bobwhite chicks in the three brooders was 30 (T1 group), 40 (T2 group), and 50 (T3 group). The density of the Mallard ducklings in the three brooders was 20 (T1 group), 30 (T2 group), and 40 (T3 group). Dead or removed birds were replaced, so the density was maintained). Body weights were again measured on Days 7 and 14. Brooder dimensions for the Bobwhites were 91 x 77 x 24 cm; the floor area per chick was 234 cm^2 for the 30-bird cage, 175 cm^2 for the 40-bird cage, and 140 cm^2 for the 50-bird cage (Table I, p. 14). Brooder dimensions for the

Mallards were 90 x 70 x 23 cm; the floor area per bird was 315 cm^2 for the 20-bird cage, 210 cm^2 for the 30-bird cage, and 158 cm^2 for the 40-bird cage. Mortality, moribundity, and signs of overcrowding were observed daily for 14 consecutive days. Body weight data were analyzed using a repeated-measures analysis of variance with the factors of brooder density and time (repeated over time) via SAS and Statistica software (p. 11). Initially, the initial body weights were used as a covariate, to determine if "low-weight" birds remained at a lower weight for the duration, and if "high-weight" birds maintained a weight level above the other birds.

During the study, the mean brooder temperatures were 37-39°C for the Bobwhite phase and 36-40°C for the Mallard phase. The birds were maintained on a 16-hour light/8-hour dark regimen, with an average light intensity of 13.3 foot-candles for the Bobwhite and 12.5 foot-candles for the Mallard. The hatchlings were fed Turkey and Game Bird Starter feed (Ranchway Feeds, Fort Collins, CO) and provided water as needed.

No density-effect on the mortality or replacement of chicks or ducklings was observed (Tables II and III, pp. 15-16). A total of ten Bobwhite were replaced during the study, with six dying during the test. Four died in the T3 group, and one died in each of the T1 and T2 groups. An additional ataxic bird was removed from the T3 group due to a deteriorating condition. On Day 7, one bird was added to each of the brooders in battery 3 because each treatment group was missing one bird. Other observations included ataxia and loss of righting reflex. A total of three Mallard were replaced during the study, with only one T2 group bird found dead. Dry down (T1), wet feathers on back (T2 and T3), and holding right eyelid closed (T2) were observed during the study and believed to be from the crowding and competition for water (p. 12).

A summary of mean body weights are provided in Tables IV and V, pp. 17-18. Overall brooder density had a clear effect on the growth of Mallard ducklings (Figure III, p. 23). A density effect on body weight was indicated by both the Density factor ($p=0.0014$) and the Density*Time interaction ($p=0.0001$) being significant (Table VI, p. 19). A similar effect was not observed in Bobwhite quail (Figure IV, p. 24), and neither the Density factor ($p=0.7538$) nor the interaction ($p=0.8758$) was significant. In Mallard, the brooder density 20 had significantly heavier body weights than either the brooder density 30 or 40, and the brooder density 30 had significantly heavier body weights than the brooder density 40 (Table VII, p. 20).

In conclusion, duckling body weights were greatly affected as the brooder density increased to 30 and 40 birds/brooder. In this test, 20 ducklings/brooder was the optimum density as identified by increased body weight gains. Based upon the similarity of Bobwhite body weight data, the optimum density could range from 30 to 50 birds/brooder. No difference was observed in Mallard or Bobwhite mortality.

G. CONCLUSIONS:

This study is scientifically sound, fulfills U.S. EPA guideline §71-4b, and is classified as CORE. A hatchling brooder density test was provided as a supplement to this study (MRID 46276402) and it provided strong evidence that brooder density may have been the primary factor contributing to the survivor body weight reductions. As a result, the LOAEC for this study is defined by reductions in adult male body weight at the 958 ppm a.i. treatment level. The NOAEC was 501 ppm a.i.

NOAEC: 501 ppm a.i.
LOAEC: 958 ppm a.i.
Endpoint(s) Affected: adult male body weight

III. REFERENCES:

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U.S. Environmental Protection Agency. 1988. Pesticide Assessment Guidelines, Subdivision E, Hazard Evaluation: Wildlife and Aquatic Organisms. Series 71-4: Avian Reproduction Test. pp. 48-57.

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Stromberg, J. 1975. A guide to better hatching. Stromberg Publishing Company. Pine River, Minnesota. 100 pp.

Mach, J.J. 2002. Northern bobwhite (*Colinus virginianus*) and mallard (*Anas platyrhynchos*) hatchling brooder density test. Genesis Laboratories Study ID 01001, Dow Chemical Company Report 010019. 46pp. This report has also been submitted for publication as Mortensen, S.R., J.J. Mach, J.L. Mattsson, L.G. McFadden. In press. Avian reproduction study: Effect of brooder density on body weight. Journal of Ecotoxicology and Chemistry.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Mallard repro, Penoxsulam, MRID 46276401

PRINTOUT OF RAW DATA

Obs	TRT	EL	EC	ENC_EL	ES	ES_EL	VE	VE_ES	LE	LE_VE	NH	NH_EL	NH_ES
1	Ctrl	35	0	100.00	31	88.57	30	96.77	30	100.00	27	77.14	87.10
2	Ctrl	24	0	100.00	23	95.83	20	86.96	19	95.00	17	70.83	73.91
3	Ctrl	27	0	100.00	24	88.89	23	95.83	22	95.65	19	70.37	79.17
4	Ctrl	44	0	100.00	38	86.36	37	97.37	34	91.89	27	61.36	71.05
5	Ctrl	25	0	100.00	23	92.00	21	91.30	21	100.00	19	76.00	82.61
6	Ctrl	55	0	100.00	49	89.09	6	12.24	5	83.33	4	7.27	8.16
7	Ctrl	52	0	100.00	50	96.15	49	98.00	49	100.00	48	92.31	96.00
8	Ctrl	45	0	100.00	41	91.11	1	2.44	1	100.00	1	2.22	2.44
9	Ctrl	43	0	100.00	41	95.35	40	97.56	40	100.00	32	74.42	78.05
10	Ctrl	5	0	100.00	4	80.00	4	100.00	4	100.00	4	80.00	100.00
11	Ctrl	28	0	100.00	24	85.71	19	79.17	15	78.95	8	28.57	33.33
12	Ctrl	55	0	100.00	47	85.45	47	100.00	43	91.49	42	76.36	89.36
13	Ctrl	67	0	100.00	62	92.54	56	90.32	55	98.21	52	77.61	83.87
14	Ctrl	42	0	100.00	39	92.86	37	94.87	37	100.00	35	83.33	89.74
15	Ctrl	46	0	100.00	43	93.48	43	100.00	41	95.35	34	73.91	79.07
16	Ctrl	1	0	100.00	1	100.00	0	0.00	0	.	0	0.00	0.00
17	Dose1	31	0	100.00	29	93.55	25	86.21	25	100.00	8	25.81	27.59
18	Dose1	59	0	100.00	53	89.83	53	100.00	52	98.11	39	66.10	73.58
19	Dose1	39	0	100.00	37	94.87	37	100.00	36	97.30	18	46.15	48.65
20	Dose1	16	0	100.00	15	93.75	5	33.33	5	100.00	2	12.50	13.33
21	Dose1	41	0	100.00	37	90.24	35	94.59	34	97.14	28	68.29	75.68
22	Dose1	42	0	100.00	38	90.48	38	100.00	37	97.37	36	85.71	94.74
23	Dose1	37	0	100.00	34	91.89	34	100.00	31	91.18	27	72.97	79.41
24	Dose1	47	0	100.00	42	89.36	37	88.10	32	86.49	27	57.45	64.29
25	Dose1	13	0	100.00	12	92.31	11	91.67	11	100.00	9	69.23	75.00
26	Dose1	61	0	100.00	56	91.80	55	98.21	55	100.00	53	86.89	94.64
27	Dose1	58	0	100.00	53	91.38	51	96.23	43	84.31	35	60.34	66.04
28	Dose1	68	0	100.00	63	92.65	58	92.06	58	100.00	53	77.94	84.13
29	Dose1	47	0	100.00	42	89.36	40	95.24	39	97.50	36	76.60	85.71
30	Dose1	39	0	100.00	36	92.31	36	100.00	35	97.22	35	89.74	97.22
31	Dose1	38	0	100.00	34	89.47	31	91.18	31	100.00	27	71.05	79.41
32	Dose1	37	0	100.00	34	91.89	34	100.00	31	91.18	20	54.05	58.82
33	Dose2	36	0	100.00	32	88.89	32	100.00	29	90.63	14	38.89	43.75
34	Dose2	40	0	100.00	37	92.50	32	86.49	32	100.00	28	70.00	75.68
35	Dose2	35	0	100.00	32	91.43	31	96.88	30	96.77	27	77.14	84.38
36	Dose2	43	0	100.00	38	88.37	38	100.00	38	100.00	24	55.81	63.16
37	Dose2	8	0	100.00	7	87.50	6	85.71	5	83.33	4	50.00	57.14
38	Dose2	62	0	100.00	53	85.48	52	98.11	50	96.15	39	62.90	73.58
39	Dose2	40	0	100.00	36	90.00	31	86.11	30	96.77	29	72.50	80.56
40	Dose2	29	0	100.00	27	93.10	23	85.19	20	86.96	7	24.14	25.93
41	Dose2	60	0	100.00	56	93.33	55	98.21	53	96.36	46	76.67	82.14
42	Dose2	57	0	100.00	52	91.23	46	88.46	45	97.83	37	64.91	71.15
43	Dose2	29	0	100.00	26	89.66	24	92.31	23	95.83	19	65.52	73.08
44	Dose2	53	0	100.00	48	90.57	45	93.75	45	100.00	35	66.04	72.92
45	Dose2	35	0	100.00	32	91.43	32	100.00	30	93.75	26	74.29	81.25
46	Dose2	51	0	100.00	46	90.20	46	100.00	46	100.00	31	60.78	67.39
47	Dose2	23	0	100.00	20	86.96	18	90.00	17	94.44	16	69.57	80.00
48	Dose2	48	0	100.00	45	93.75	45	100.00	43	95.56	39	81.25	86.67

49	Dose3	44	0	100.00	40	90.91	39	97.50	37	94.87	33	75.00	82.50
50	Dose3	38	0	100.00	33	86.84	31	93.94	31	100.00	22	57.89	66.67
51	Dose3	42	0	100.00	35	83.33	34	97.14	34	100.00	29	69.05	82.86
52	Dose3	38	0	100.00	35	92.11	35	100.00	34	97.14	33	86.84	94.29
53	Dose3	48	0	100.00	46	95.83	46	100.00	45	97.83	39	81.25	84.78
54	Dose3	36	0	100.00	34	94.44	34	100.00	33	97.06	24	66.67	70.59
55	Dose3	47	0	100.00	43	91.49	1	2.33	1	100.00	1	2.13	2.33
56	Dose3	43	0	100.00	38	88.37	36	94.74	35	97.22	35	81.40	92.11
57	Dose3	51	0	100.00	47	92.16	35	74.47	35	100.00	27	52.94	57.45
58	Dose3	46	0	100.00	42	91.30	41	97.62	40	97.56	35	76.09	83.33
59	Dose3	48	0	100.00	44	91.67	42	95.45	42	100.00	40	83.33	90.91
60	Dose3	39	0	100.00	35	89.74	35	100.00	35	100.00	33	84.62	94.29
61	Dose3	44	0	100.00	40	90.91	34	85.00	32	94.12	26	59.09	65.00
62	Dose3	39	0	100.00	35	89.74	32	91.43	32	100.00	28	71.79	80.00
63	Dose3	39	0	100.00	31	79.49	24	77.42	22	91.67	18	46.15	58.06
64	Dose3	43	0	100.00	40	93.02	40	100.00	40	100.00	37	86.05	92.50

Mallard repro,Penoxsulam, MRID 46276401

PRINTOUT OF RAW DATA (continued)

Obs	TRT	NH_LE	HS	HS_ES	HS_NH	THICK	HATWT	SURVWT	FOOD	WTGAINM	WTGAINF
1	Ctrl	90.00	27	87.10	100.00	0.35	34	257	110	-9	115
2	Ctrl	89.47	17	73.91	100.00	0.37	30	214	107	35	52
3	Ctrl	86.36	18	75.00	94.74	0.36	31	206	107	-23	93
4	Ctrl	79.41	27	71.05	100.00	0.37	29	238	116	-32	138
5	Ctrl	90.48	19	82.61	100.00	0.33	34	228	111	66	96
6	Ctrl	80.00	4	8.16	100.00	0.35	37	241	118	-143	221
7	Ctrl	97.96	48	96.00	100.00	0.35	37	282	130	152	239
8	Ctrl	100.00	1	2.44	100.00	0.36	32	189	123	-8	295
9	Ctrl	80.00	32	78.05	100.00	0.38	31	250	136	-84	-45
10	Ctrl	100.00	3	75.00	75.00	0.32	29	246	112	109	108
11	Ctrl	53.33	8	33.33	100.00	0.35	27	211	107	56	145
12	Ctrl	97.67	42	89.36	100.00	0.35	34	262	167	60	230
13	Ctrl	94.55	51	82.26	98.08	0.34	35	264	128	120	363
14	Ctrl	94.59	35	89.74	100.00	0.36	33	244	139	144	194
15	Ctrl	82.93	32	74.42	94.12	0.37	33	269	131	73	228
16	Ctrl	.	0	0.00	.	.	.	.	119	50	49
17	Dose1	32.00	7	24.14	87.50	0.36	33	177	115	0	217
18	Dose1	75.00	38	71.70	97.44	0.36	32	194	159	74	122
19	Dose1	50.00	18	48.65	100.00	0.39	35	229	136	-20	143
20	Dose1	40.00	2	13.33	100.00	0.34	37	272	116	-19	140
21	Dose1	82.35	28	75.68	100.00	0.35	33	247	121	83	-2
22	Dose1	97.30	36	94.74	100.00	0.34	35	223	138	-133	269
23	Dose1	87.10	27	79.41	100.00	0.33	30	203	145	73	99
24	Dose1	84.38	27	64.29	100.00	0.35	31	216	130	-28	25
25	Dose1	81.82	8	66.67	88.89	0.35	30	197	147	106	132
26	Dose1	96.36	51	91.07	96.23	0.33	31	207	123	-59	93
27	Dose1	81.40	34	64.15	97.14	0.35	35	216	137	-46	105
28	Dose1	91.38	53	84.13	100.00	0.36	36	221	120	-42	178
29	Dose1	92.31	35	83.33	97.22	0.35	32	249	105	-37	244
30	Dose1	100.00	34	94.44	97.14	0.33	33	217	128	-51	190
31	Dose1	87.10	27	79.41	100.00	0.34	33	202	114	21	115
32	Dose1	64.52	20	58.82	100.00	0.34	31	212	116	33	110
33	Dose2	48.28	14	43.75	100.00	0.37	35	205	119	75	328

34	Dose2	87.50	28	75.68	100.00	0.34	32	203	126	245	135
35	Dose2	90.00	27	84.38	100.00	0.37	34	264	104	44	101
36	Dose2	63.16	24	63.16	100.00	0.36	33	202	123	76	173
37	Dose2	80.00	4	57.14	100.00	.	31	171	151	51	255
38	Dose2	78.00	39	73.58	100.00	0.36	33	227	134	-2	195
39	Dose2	96.67	29	80.56	100.00	0.35	32	211	114	46	122
40	Dose2	35.00	6	22.22	85.71	0.35	32	214	124	139	195
41	Dose2	86.79	46	82.14	100.00	0.36	33	217	162	-11	111
42	Dose2	82.22	36	69.23	97.30	0.34	32	228	135	120	55
43	Dose2	82.61	18	69.23	94.74	0.35	31	203	153	21	94
44	Dose2	77.78	33	68.75	94.29	0.33	30	203	140	-26	186
45	Dose2	86.67	26	81.25	100.00	0.38	34	227	104	-55	80
46	Dose2	67.39	29	63.04	93.55	0.33	33	195	110	65	49
47	Dose2	94.12	16	80.00	100.00	0.35	31	217	101	1	174
48	Dose2	90.70	39	86.67	100.00	0.34	30	195	125	70	184
49	Dose3	89.19	32	80.00	96.97	0.34	33	206	191	-108	92
50	Dose3	70.97	22	66.67	100.00	0.34	29	196	112	-29	-44
51	Dose3	85.29	28	80.00	96.55	0.33	32	227	103	-87	155
52	Dose3	97.06	33	94.29	100.00	0.31	34	222	125	0	-62
53	Dose3	86.67	39	84.78	100.00	0.31	34	214	112	34	150
54	Dose3	72.73	22	64.71	91.67	0.38	32	195	125	6	196
55	Dose3	100.00	1	2.33	100.00	0.37	40	209	132	-2	2
56	Dose3	100.00	34	89.47	97.14	0.34	40	243	127	-107	218
57	Dose3	77.14	26	55.32	96.30	0.37	32	232	127	-124	130
58	Dose3	87.50	35	83.33	100.00	0.37	33	200	130	-115	164
59	Dose3	95.24	39	88.64	97.50	0.36	38	232	111	-156	141
60	Dose3	94.29	32	91.43	96.97	0.35	35	229	121	36	378
61	Dose3	81.25	26	65.00	100.00	0.39	37	226	131	121	137
62	Dose3	87.50	23	65.71	82.14	0.35	35	193	133	-29	120
63	Dose3	81.82	17	54.84	94.44	0.33	34	215	106	48	95
64	Dose3	92.50	36	90.00	97.30	0.34	36	203	128	60	83

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE EL (Eggs Laid)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.963	0.052	4.784	0.005	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	37.13	17.97	4.49	48.41	27.55, 46.70
Dose1	16	42.06	14.96	3.74	35.56	34.09, 50.03
Dose2	16	40.56	14.50	3.62	35.74	32.84, 48.29
Dose3	16	42.81	4.39	1.10	10.24	40.48, 45.15

Level	Median	Min	Max	%of Control(means)	%Reduction(means)

Ctrl	42.50	1.00	67.00	.	.
Dose1	40.00	13.00	68.00	113.30	-13.30
Dose2	40.00	8.00	62.00	109.26	-9.26
Dose3	43.00	36.00	51.00	115.32	-15.32

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests

Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	0.79	0.851

MannWhit(Bon) - testing each trt median signif. less than control

Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	42.50	.	.
Dose1	40.00	0.826	0.733
Dose2	40.00	0.981	0.640
Dose3	43.00	1.000	0.777

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE NEG_EC (Eggs Cracked)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
.	.	.	.	NO DATA FOR TEST

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	0.00	0.00	0.00	.	. , .
Dose1	16	0.00	0.00	0.00	.	. , .
Dose2	16	0.00	0.00	0.00	.	. , .
Dose3	16	0.00	0.00	0.00	.	. , .

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	0.00	0.00	0.00	.	.
Dose1	0.00	0.00	0.00	.	.
Dose2	0.00	0.00	0.00	.	.
Dose3	0.00	0.00	0.00	.	.

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE ENC_EL ((EL-EC)/EL (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
.	.	.	.	NO DATA FOR TEST

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	100.00	0.00	0.00	0.00	. , .
Dose1	16	100.00	0.00	0.00	0.00	. , .
Dose2	16	100.00	0.00	0.00	0.00	. , .
Dose3	16	100.00	0.00	0.00	0.00	. , .

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	100.00	100.00	100.00	.	.
Dose1	100.00	100.00	100.00	100.00	0.00
Dose2	100.00	100.00	100.00	100.00	0.00
Dose3	100.00	100.00	100.00	100.00	0.00

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE ES (Eggs Set)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.965	0.070	3.972	0.012	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	33.75	16.52	4.13	48.94	24.95, 42.55
Dose1	16	38.44	13.58	3.40	35.34	31.20, 45.68
Dose2	16	36.69	13.15	3.29	35.84	29.68, 43.69
Dose3	16	38.63	4.86	1.21	12.57	36.04, 41.21

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	38.50	1.00	62.00	.	.
Dose1	37.00	12.00	63.00	113.89	-13.89
Dose2	36.50	7.00	56.00	108.70	-8.70
Dose3	39.00	31.00	47.00	114.44	-14.44

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	0.59	0.899

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	38.50	.	.
Dose1	37.00	0.902	0.708
Dose2	36.50	0.981	0.601
Dose3	39.00	1.000	0.699

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE ES_EL (EggsSet/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.953	0.016	4.512	0.006	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	90.84	5.02	1.25	5.52	88.16, 93.51
Dose1	16	91.57	1.68	0.42	1.83	90.68, 92.47
Dose2	16	90.27	2.39	0.60	2.65	89.00, 91.55
Dose3	16	90.09	4.07	1.02	4.51	87.92, 92.25

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	91.56	80.00	100.00	.	.
Dose1	91.85	89.36	94.87	100.81	-0.81
Dose2	90.38	85.48	93.75	99.38	0.62
Dose3	91.11	79.49	95.83	99.17	0.83

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.88	0.598

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	91.56	.	.
Dose1	91.85	1.000	0.647
Dose2	90.38	0.941	0.213
Dose3	91.11	0.981	0.197

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE VE (Viable Embryo(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.963	0.050	3.193	0.030	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	27.06	18.07	4.52	66.78	17.43, 36.69
Dose1	16	36.25	14.42	3.61	39.79	28.56, 43.94
Dose2	16	34.75	13.15	3.29	37.84	27.74, 41.76
Dose3	16	33.69	10.08	2.52	29.94	28.31, 39.06

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	26.50	0.00	56.00	.	.
Dose1	36.50	5.00	58.00	133.95	-33.95
Dose2	32.00	6.00	55.00	128.41	-28.41
Dose3	35.00	1.00	46.00	124.48	-24.48

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.39	0.495

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	26.50	.	.
Dose1	36.50	1.000	0.910
Dose2	32.00	1.000	0.840
Dose3	35.00	1.000	0.766

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE VE_ES (ViableEmbryo/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.659	<.001	5.420	0.002	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	77.68	36.60	9.15	47.11	58.18, 97.18
Dose1	16	91.68	16.22	4.06	17.70	83.03, 100.00
Dose2	16	93.83	5.98	1.50	6.38	90.64, 97.01
Dose3	16	87.94	24.19	6.05	27.51	75.05, 100.00

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	95.35	0.00	100.00	.	.
Dose1	95.73	33.33	100.00	118.02	-18.02
Dose2	95.31	85.19	100.00	120.79	-20.79
Dose3	96.30	2.33	100.00	113.21	-13.21

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.27	0.736

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	95.35	.	.
Dose1	95.73	1.000	0.857
Dose2	95.31	0.680	0.755
Dose3	96.30	1.000	0.695

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE LE (Live Embryo(d21))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.971	0.131	3.277	0.027	USE NON-PARAMETRIC TESTS

****
BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	26.00	17.74	4.43	68.21	16.55, 35.45
Dose1	16	34.69	13.99	3.50	40.33	27.23, 42.14
Dose2	16	33.50	13.22	3.30	39.45	26.46, 40.54
Dose3	16	33.00	10.01	2.50	30.34	27.66, 38.34

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	26.00	0.00	55.00	.	.
Dose1	34.50	5.00	58.00	133.41	-33.41
Dose2	31.00	5.00	53.00	128.85	-28.85
Dose3	34.50	1.00	45.00	126.92	-26.92

****
NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.26	0.521

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	26.00	.	.
Dose1	34.50	1.000	0.903
Dose2	31.00	1.000	0.849
Dose3	34.50	1.000	0.845

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE LE_VE (LiveEmbryo/ViableEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.834	<.001	2.119	0.107	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	95.33	6.55	1.69	6.87	91.70, 98.95
Dose1	16	96.11	5.05	1.26	5.25	93.42, 98.80
Dose2	16	95.27	4.75	1.19	4.99	92.74, 97.81
Dose3	16	97.97	2.57	0.64	2.63	96.59, 99.34

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	98.21	78.95	100.00	.	.
Dose1	97.43	84.31	100.00	100.83	-0.83
Dose2	96.26	83.33	100.00	99.95	0.05
Dose3	98.91	91.67	100.00	102.77	-2.77

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.40	0.333

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	98.21	.	.
Dose1	97.43	1.000	0.484
Dose2	96.26	0.946	0.187
Dose3	98.91	1.000	0.716

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE NH (Number Hatched)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.976	0.235	2.384	0.078	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	23.06	16.80	4.20	72.84	14.11, 32.01
Dose1	16	28.31	14.60	3.65	51.58	20.53, 36.09
Dose2	16	26.31	11.89	2.97	45.18	19.98, 32.65
Dose3	16	28.75	9.65	2.41	33.57	23.61, 33.89

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	23.00	0.00	52.00	.	.
Dose1	27.50	2.00	53.00	122.76	-22.76
Dose2	27.50	4.00	46.00	114.09	-14.09
Dose3	31.00	1.00	40.00	124.66	-24.66

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	60	0.59	0.625

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	23.06	.	26.61	.	0.691	0.904	0.635	.	.
Dose1	28.31	0.973	26.61	0.848	.	0.975	1.000	.	.
Dose2	26.31	0.927	26.61	0.876	.	.	0.956	.	.
Dose3	28.75	0.979	26.61	0.890	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE NH_EL (NumberHatched/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.853	<.001	2.849	0.045	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	59.48	31.03	7.76	52.17	42.95, 76.02
Dose1	16	63.80	21.25	5.31	33.31	52.48, 75.13
Dose2	16	63.15	14.98	3.74	23.72	55.17, 71.13
Dose3	16	67.52	21.45	5.36	31.76	56.09, 78.95

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	74.17	0.00	92.31	.	.
Dose1	68.76	12.50	89.74	107.26	-7.26
Dose2	65.78	24.14	81.25	106.17	-6.17
Dose3	73.40	2.13	86.84	113.51	-13.51

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.83	0.608

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	74.17	.	.
Dose1	68.76	1.000	0.382
Dose2	65.78	0.475	0.184
Dose3	73.40	0.981	0.571

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE NH_ES (NumberHatched/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.845	<.001	2.979	0.038	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	65.87	34.25	8.56	51.99	47.62, 84.11
Dose1	16	69.89	23.51	5.88	33.64	57.36, 82.42
Dose2	16	69.92	16.09	4.02	23.01	61.35, 78.50
Dose3	16	74.85	23.05	5.76	30.79	62.57, 87.14

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	79.12	0.00	100.00	.	.
Dose1	75.34	13.33	97.22	106.11	-6.11
Dose2	73.33	25.93	86.67	106.16	-6.16
Dose3	82.68	2.33	94.29	113.64	-13.64

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.86	0.601

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	79.12	.	.
Dose1	75.34	1.000	0.411
Dose2	73.33	0.544	0.219
Dose3	82.68	1.000	0.620

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE NH_LE (NumberHatched/LiveEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.883	<.001	2.642	0.058	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	87.78	11.98	3.09	13.65	81.15, 94.42
Dose1	16	77.69	20.59	5.15	26.51	66.71, 88.66
Dose2	16	77.93	16.86	4.22	21.64	68.94, 86.91
Dose3	16	87.45	8.99	2.25	10.28	82.65, 92.24

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	90.00	53.33	100.00	.	.
Dose1	83.36	32.00	100.00	88.50	11.50
Dose2	82.42	35.00	96.67	88.77	11.23
Dose3	87.50	70.97	100.00	99.62	0.38

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	5.23	0.155

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	90.00	.	.
Dose1	83.36	0.274	0.083
Dose2	82.42	0.086	0.031
Dose3	87.50	0.978	0.345

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE HS (Hatching Survival(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.974	0.193	2.184	0.099	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	22.75	16.70	4.17	73.40	13.85, 31.65
Dose1	16	27.81	14.43	3.61	51.88	20.12, 35.50
Dose2	16	25.88	11.85	2.96	45.79	19.56, 32.19
Dose3	16	27.81	9.67	2.42	34.77	22.66, 32.96

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	23.00	0.00	51.00	.	.
Dose1	27.50	2.00	53.00	122.25	-22.25
Dose2	27.50	4.00	46.00	113.74	-13.74
Dose3	30.00	1.00	39.00	122.25	-22.25

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	60	0.51	0.679

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	22.75	.	26.06	.	0.711	0.912	0.711	.	.
Dose1	27.81	0.970	26.06	0.836	.	0.977	1.000	.	.
Dose2	25.88	0.923	26.06	0.865	.	.	0.977	.	.
Dose3	27.81	0.970	26.06	0.879	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE HS_ES (HatchingSurvival/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.847	<.001	2.536	0.065	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	63.65	32.84	8.21	51.60	46.15, 81.15
Dose1	16	68.37	23.34	5.84	34.14	55.93, 80.81
Dose2	16	68.80	16.79	4.20	24.40	59.85, 77.74
Dose3	16	72.28	22.80	5.70	31.54	60.13, 84.43

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	75.00	0.00	96.00	.	.
Dose1	73.69	13.33	94.74	107.42	-7.42
Dose2	71.41	22.22	86.67	108.09	-8.09
Dose3	80.00	2.33	94.29	113.56	-13.56

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.04	0.791

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	75.00	.	.
Dose1	73.69	1.000	0.515
Dose2	71.41	0.736	0.322
Dose3	80.00	1.000	0.643

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE HS_NH (HatchingSurvival/NumberHatched (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.644	<.001	0.296	0.828	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	97.46	6.52	1.68	6.69	93.85, 100.00
Dose1	16	97.60	3.93	0.98	4.03	95.50, 99.69
Dose2	16	97.85	3.99	1.00	4.08	95.72, 99.98
Dose3	16	96.69	4.54	1.14	4.70	94.27, 99.11

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	100.00	75.00	100.00	.	.
Dose1	100.00	87.50	100.00	100.14	-0.14
Dose2	100.00	85.71	100.00	100.40	-0.40
Dose3	97.22	82.14	100.00	99.20	0.80

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.37	0.338

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	100.00	.	.
Dose1	100.00	1.000	0.209
Dose2	100.00	1.000	0.382
Dose3	97.22	0.173	0.068

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE THICK (Eggshell thickness)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.986	0.715	1.889	0.142	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	0.35	0.02	0.00	4.71	0.34, 0.36
Dose1	16	0.35	0.01	0.00	4.15	0.34, 0.36
Dose2	15	0.35	0.01	0.00	3.83	0.34, 0.36
Dose3	16	0.35	0.02	0.01	6.41	0.34, 0.36

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	0.35	0.32	0.38	.	.
Dose1	0.35	0.33	0.39	98.24	1.76
Dose2	0.35	0.33	0.38	99.19	0.81
Dose3	0.34	0.31	0.39	98.08	1.92

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	58	0.53	0.663

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	0.35	.	0.35	.	0.741	0.968	0.686	.	.
Dose1	0.35	0.317	0.35	0.273	.	0.946	1.000	.	.
Dose2	0.35	0.558	0.35	0.296	.	.	0.918	.	.
Dose3	0.35	0.281	0.35	0.179	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE HATWT (Hatchling Weight)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.985	0.656	2.661	0.056	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	32.40	2.92	0.75	9.02	30.78, 34.02
Dose1	16	32.94	2.14	0.54	6.51	31.80, 34.08
Dose2	16	32.25	1.44	0.36	4.46	31.48, 33.02
Dose3	16	34.63	3.01	0.75	8.69	33.02, 36.23

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	33.00	27.00	37.00	.	.
Dose1	33.00	30.00	37.00	101.66	-1.66
Dose2	32.00	30.00	35.00	99.54	0.46
Dose3	34.00	29.00	40.00	106.87	-6.87

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	59	3.13	0.032

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	32.40	.	33.06	.	0.929	0.998	0.067	.	.
Dose1	32.94	0.912	33.06	0.850	.	0.858	0.221	.	.
Dose2	32.25	0.680	33.06	0.878	.	.	0.040	.	.
Dose3	34.63	1.000	33.06	0.892	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE SURVWT (Survivor Wt (d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.989	0.835	0.945	0.425	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	15	240.07	26.09	6.74	10.87	225.62, 254.51
Dose1	16	217.63	23.40	5.85	10.75	205.15, 230.10
Dose2	16	211.38	20.18	5.05	9.55	200.62, 222.13
Dose3	16	215.13	15.50	3.88	7.21	206.87, 223.38

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	244.00	189.00	282.00	.	.
Dose1	216.00	177.00	272.00	90.65	9.35
Dose2	208.00	171.00	264.00	88.05	11.95
Dose3	214.50	193.00	243.00	89.61	10.39

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	59	5.49	0.002

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	240.07	.	240.07	.	0.027	0.003	0.011	.	.
Dose1	217.63	0.007	217.63	0.003	.	0.845	0.988	.	.
Dose2	211.38	<.001	213.25	<.001	.	.	0.961	.	.
Dose3	215.13	0.003	213.25	<.001	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	**<lowest dose**	**Dose1**
Williams	<lowest dose	Dose1

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE FOOD (Food Consumption)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.917	<.001	0.219	0.883	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	122.56	15.89	3.97	12.97	114.09, 131.03
Dose1	16	128.13	14.56	3.64	11.36	120.37, 135.88
Dose2	16	126.56	18.33	4.58	14.49	116.79, 136.33
Dose3	16	125.88	19.88	4.97	15.80	115.28, 136.47

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	118.50	107.00	167.00	.	.
Dose1	125.50	105.00	159.00	104.54	-4.54
Dose2	124.50	101.00	162.00	103.26	-3.26
Dose3	126.00	103.00	191.00	102.70	-2.70

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.47	0.689

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	118.50	.	.
Dose1	125.50	1.000	0.893
Dose2	124.50	1.000	0.767
Dose3	126.00	1.000	0.627

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE WTGAINM (Male wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.994	0.985	0.519	0.671	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	35.38	81.42	20.36	230.17	-8.01, 78.76
Dose1	16	-2.81	63.72	15.93	-2265.50	-36.77, 31.14
Dose2	16	53.69	72.61	18.15	135.24	15.00, 92.38
Dose3	16	-28.25	79.82	19.96	-282.55	-70.78, 14.28

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	53.00	-143.00	152.00	.	.
Dose1	-19.50	-133.00	106.00	-7.95	107.95
Dose2	48.50	-55.00	245.00	151.77	-51.77
Dose3	-15.50	-156.00	121.00	-79.86	179.86

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	60	3.92	0.013

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	35.38	.	35.38	.	0.477	0.899	0.086	.	.
Dose1	-2.81	0.173	25.44	0.421	.	0.153	0.771	.	.
Dose2	53.69	0.929	25.44	0.449	.	.	0.015	.	.
Dose3	-28.25	0.025	-28.25	0.011	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	**Dose2**	**Dose3**
Williams	Dose2	Dose3

Mallard repro,Penoxsulam, MRID 46276401
ANALYSIS RESULTS FOR VARIABLE WTGAINF (Female wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.986	0.661	0.902	0.446	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.Interval
Ctrl	16	157.56	103.28	25.82	65.55	102.53, 212.60
Dose1	16	136.25	71.89	17.97	52.77	97.94, 174.56
Dose2	16	152.31	74.13	18.53	48.67	112.81, 191.81
Dose3	16	122.19	104.40	26.10	85.44	66.56, 177.82

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	141.50	-45.00	363.00	.	.
Dose1	127.00	-2.00	269.00	86.47	13.53
Dose2	154.00	49.00	328.00	96.67	3.33
Dose3	133.50	-62.00	378.00	77.55	22.45

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	60	0.51	0.675

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	157.56	.	157.56	.	0.907	0.998	0.682	.	.
Dose1	136.25	0.465	144.28	0.403	.	0.957	0.971	.	.
Dose2	152.31	0.687	144.28	0.430	.	.	0.778	.	.
Dose3	122.19	0.280	122.19	0.177	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Hatchling Brooder Density
mallard mean body weight
File: 6402w Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	2	6606.000	3303.000	92.607
Within (Error)	6	214.000	35.667	
Total	8	6820.000		

Critical F value = 5.14 (0.05,2,6)
Since F > Critical F REJECT Ho:All groups equal

mallard mean body weight
File: 6402w Transform: NO TRANSFORM

TUKEY method of multiple comparisons

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	0 0 0 3 2 1
3	40 ducks	173.000	173.000	\
2	30 ducks	200.000	200.000	* \
1	**20 ducks**	**239.000**	**239.000**	* * \

* = significant difference (p=0.05) . = no significant difference
Tukey value (3,6) = 4.34 s = 35.667

Box plots: