

## The GLIMMIX Procedure

Model Information	
Data Set	WORK.DBH
Response Variable	DBH
Response Distribution	Gaussian
Link Function	Identity
Variance Function	Default
Variance Matrix Blocked By	GLB
Estimation Technique	Restricted Maximum Likelihood
Degrees of Freedom Method	Kenward-Roger
Fixed Effects SE Adjustment	Kenward-Roger

Class Level Information		
Class	Levels	Values
Year	5	Fifth Fourth Seventh Sixth Third
Location	2	Hill Farm LA Tech
Block	4	1 2 3 4
Family	6	AGH2 AGH25 AGHS1 AGHS2 AGHS3 AGHS4
GLB	48	AGH25_Hill Farm_1 AGH25_Hill Farm_2 AGH25_Hill Farm_3 AGH25_Hill Farm_4 AGH25_LA Tech_1 AGH25_LA Tech_2 AGH25_LA Tech_3 AGH25_LA Tech_4 AGH2_Hill Farm_1 AGH2_Hill Farm_2 AGH2_Hill Farm_3 AGH2_Hill Farm_4 AGH2_LA Tech_1 AGH2_LA Tech_2 AGH2_LA Tech_3 AGH2_LA Tech_4 AGHS1_Hill Farm_1 AGHS1_Hill Farm_2 AGHS1_Hill Farm_3 AGHS1_Hill Farm_4 AGHS1_LA Tech_1 AGHS1_LA Tech_2 AGHS1_LA Tech_3 AGHS1_LA Tech_4 AGHS2_Hill Farm_1 AGHS2_Hill Farm_2 AGHS2_Hill Farm_3 AGHS2_Hill Farm_4 AGHS2_LA Tech_1 AGHS2_LA Tech_2 AGHS2_LA Tech_3 AGHS2_LA Tech_4 AGHS3_Hill Farm_1 AGHS3_Hill Farm_2 AGHS3_Hill Farm_3 AGHS3_Hill Farm_4 AGHS3_LA Tech_1 AGHS3_LA Tech_2 AGHS3_LA Tech_3 AGHS3_LA Tech_4 AGHS4_Hill Farm_1 AGHS4_Hill Farm_2 AGHS4_Hill Farm_3 AGHS4_Hill Farm_4 AGHS4_LA Tech_1 AGHS4_LA Tech_2 AGHS4_LA Tech_3 AGHS4_LA Tech_4

Number of Observations Read	240
Number of Observations Used	240

Dimensions	
G-side Cov. Parameters	2
R-side Cov. Parameters	1
Columns in X	126
Columns in Z per Subject	1
Subjects (Blocks in V)	48
Max Obs per Subject	5

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Optimization Information	
Optimization Technique	Dual Quasi-Newton
Parameters in Optimization	2
Lower Boundaries	2
Upper Boundaries	1
Fixed Effects	Profiled
Residual Variance	Profiled
Starting From	Data

Iteration History					
Iteration	Restarts	Evaluations	Objective Function	Change	Max Gradient
0	0	4	337.79560627	.	5.28E-13

Convergence criterion (ABSGCONV=0.00001) satisfied.

Fit Statistics	
-2 Res Log Likelihood	337.80
AIC (smaller is better)	343.80
AICC (smaller is better)	343.93
BIC (smaller is better)	349.41
CAIC (smaller is better)	352.41
HQIC (smaller is better)	345.92
Generalized Chi-Square	27.50
Gener. Chi-Square / DF	0.15

Covariance Parameter Estimates			
Cov Parm	Subject	Estimate	Standard Error
Variance	GLB	0.2675	0.07035
AR(1)	GLB	0	.
Residual		0.1528	0.01800

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Type III Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Year	4	144	4058.38	<.0001
Location	1	36	90.58	<.0001
Year*Location	4	144	19.76	<.0001
Family	5	36	18.48	<.0001
Year*Family	20	144	4.79	<.0001
Location*Family	5	36	0.13	0.9849
Year*Location*Family	20	144	0.77	0.7482

F Test for Year*Location Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Fifth	1	68.68	112.48	<.0001

Simple Differences of Year*Location Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Location	_Location	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Fifth	Hill Farm	LA Tech	-1.9848	0.1871	68.68	-10.61	<.0001	<.0001

Tukey Grouping for Year*Location Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Location	Estimate	
Year Fifth	LA Tech	9.1051	A
Year Fifth			
Year Fifth	Hill Farm	7.1203	B

F Test for Year*Location Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Fourth	1	68.68	84.50	<.0001

Simple Differences of Year*Location Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Location	_Location	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Fourth	Hill Farm	LA Tech	-1.7203	0.1871	68.68	-9.19	<.0001	<.0001

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Tukey Grouping for Year*Location Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Location	Estimate	
Year Fourth	LA Tech	6.3744	A
Year Fourth			
Year Fourth	Hill Farm	4.6541	B

F Test for Year*Location Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Seventh	1	68.68	80.17	<.0001

Simple Differences of Year*Location Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Location	_Location	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Seventh	Hill Farm	LA Tech	-1.6756	0.1871	68.68	-8.95	<.0001	<.0001

Tukey Grouping for Year*Location Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Location	Estimate	
Year Seventh	LA Tech	12.2550	A
Year Seventh			
Year Seventh	Hill Farm	10.5794	B

F Test for Year*Location Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Sixth	1	68.68	59.98	<.0001

Simple Differences of Year*Location Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Location	_Location	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Sixth	Hill Farm	LA Tech	-1.4494	0.1871	68.68	-7.74	<.0001	<.0001

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Tukey Grouping for Year*Location Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Location	Estimate	
Year Sixth	LA Tech	11.0402	A
Year Sixth			
Year Sixth	Hill Farm	9.5908	B

F Test for Year*Location Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Third	1	68.68	12.82	0.0006

Simple Differences of Year*Location Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Location	_Location	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Third	Hill Farm	LA Tech	-0.6700	0.1871	68.68	-3.58	0.0006	0.0005

Tukey Grouping for Year*Location Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Location	Estimate	
Year Third	LA Tech	2.9246	A
Year Third			
Year Third	Hill Farm	2.2546	B

F Test for Year*Family Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Fifth	5	68.68	14.17	<.0001

Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Fifth	AGH2	AGH25	-0.4203	0.3241	68.68	-1.30	0.1991	0.7865
Year Fifth	AGH2	AGHS1	-0.9569	0.3241	68.68	-2.95	0.0043	0.0420
Year Fifth	AGH2	AGHS2	-1.1507	0.3241	68.68	-3.55	0.0007	0.0068
Year Fifth	AGH2	AGHS3	-1.2211	0.3241	68.68	-3.77	0.0003	0.0032
Year Fifth	AGH2	AGHS4	-2.5250	0.3241	68.68	-7.79	<.0001	<.0001

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Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Fifth	AGH25	AGHS1	-0.5366	0.3241	68.68	-1.66	0.1024	0.5634
Year Fifth	AGH25	AGHS2	-0.7304	0.3241	68.68	-2.25	0.0274	0.2204
Year Fifth	AGH25	AGHS3	-0.8007	0.3241	68.68	-2.47	0.0160	0.1400
Year Fifth	AGH25	AGHS4	-2.1047	0.3241	68.68	-6.49	<.0001	<.0001
Year Fifth	AGHS1	AGHS2	-0.1938	0.3241	68.68	-0.60	0.5519	0.9910
Year Fifth	AGHS1	AGHS3	-0.2641	0.3241	68.68	-0.81	0.4179	0.9644
Year Fifth	AGHS1	AGHS4	-1.5681	0.3241	68.68	-4.84	<.0001	<.0001
Year Fifth	AGHS2	AGHS3	-0.07037	0.3241	68.68	-0.22	0.8288	0.9999
Year Fifth	AGHS2	AGHS4	-1.3743	0.3241	68.68	-4.24	<.0001	0.0006
Year Fifth	AGHS3	AGHS4	-1.3040	0.3241	68.68	-4.02	0.0001	0.0013

Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)				
LS-means with the same letter are not significantly different.				
Slice	Family	Estimate		
Year Fifth	AGHS4	9.5920		A
Year Fifth				
Year Fifth	AGHS3	8.2881		B
Year Fifth				B
Year Fifth	AGHS2	8.2177		B
Year Fifth				B
Year Fifth	AGHS1	8.0239		B
Year Fifth				B
Year Fifth	AGH25	7.4873	C	B
Year Fifth			C	
Year Fifth	AGH2	7.0670	C	

F Test for Year*Family Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Fourth	5	68.68	16.51	<.0001

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Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Fourth	AGH2	AGH25	-0.3639	0.3241	68.68	-1.12	0.2654	0.8712
Year Fourth	AGH2	AGHS1	-1.6194	0.3241	68.68	-5.00	<.0001	<.0001
Year Fourth	AGH2	AGHS2	-1.6211	0.3241	68.68	-5.00	<.0001	<.0001
Year Fourth	AGH2	AGHS3	-1.1847	0.3241	68.68	-3.65	0.0005	0.0048
Year Fourth	AGH2	AGHS4	-2.5590	0.3241	68.68	-7.89	<.0001	<.0001
Year Fourth	AGH25	AGHS1	-1.2555	0.3241	68.68	-3.87	0.0002	0.0022
Year Fourth	AGH25	AGHS2	-1.2572	0.3241	68.68	-3.88	0.0002	0.0022
Year Fourth	AGH25	AGHS3	-0.8208	0.3241	68.68	-2.53	0.0136	0.1217
Year Fourth	AGH25	AGHS4	-2.1950	0.3241	68.68	-6.77	<.0001	<.0001
Year Fourth	AGHS1	AGHS2	-0.00171	0.3241	68.68	-0.01	0.9958	1.0000
Year Fourth	AGHS1	AGHS3	0.4347	0.3241	68.68	1.34	0.1843	0.7617
Year Fourth	AGHS1	AGHS4	-0.9396	0.3241	68.68	-2.90	0.0050	0.0487
Year Fourth	AGHS2	AGHS3	0.4364	0.3241	68.68	1.35	0.1826	0.7586
Year Fourth	AGHS2	AGHS4	-0.9379	0.3241	68.68	-2.89	0.0051	0.0493
Year Fourth	AGHS3	AGHS4	-1.3742	0.3241	68.68	-4.24	<.0001	0.0006

Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)				
LS-means with the same letter are not significantly different.				
Slice	Family	Estimate		
Year Fourth	AGHS4	6.8485		A
Year Fourth				
Year Fourth	AGHS2	5.9107		B
Year Fourth				B
Year Fourth	AGHS1	5.9090		B
Year Fourth				B
Year Fourth	AGHS3	5.4743	C	B
Year Fourth			C	
Year Fourth	AGH25	4.6535	C	D
Year Fourth				D
Year Fourth	AGH2	4.2896		D

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F Test for Year*Family Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Seventh	5	68.68	13.26	<.0001

Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Seventh	AGH2	AGH25	-0.02369	0.3241	68.68	-0.07	0.9420	1.0000
Year Seventh	AGH2	AGHS1	-0.4087	0.3241	68.68	-1.26	0.2116	0.8056
Year Seventh	AGH2	AGHS2	-0.7000	0.3241	68.68	-2.16	0.0343	0.2634
Year Seventh	AGH2	AGHS3	-0.5881	0.3241	68.68	-1.81	0.0740	0.4599
Year Seventh	AGH2	AGHS4	-2.2643	0.3241	68.68	-6.99	<.0001	<.0001
Year Seventh	AGH25	AGHS1	-0.3850	0.3241	68.68	-1.19	0.2390	0.8420
Year Seventh	AGH25	AGHS2	-0.6763	0.3241	68.68	-2.09	0.0407	0.3003
Year Seventh	AGH25	AGHS3	-0.5644	0.3241	68.68	-1.74	0.0861	0.5070
Year Seventh	AGH25	AGHS4	-2.2406	0.3241	68.68	-6.91	<.0001	<.0001
Year Seventh	AGHS1	AGHS2	-0.2912	0.3241	68.68	-0.90	0.3721	0.9463
Year Seventh	AGHS1	AGHS3	-0.1794	0.3241	68.68	-0.55	0.5818	0.9937
Year Seventh	AGHS1	AGHS4	-1.8555	0.3241	68.68	-5.72	<.0001	<.0001
Year Seventh	AGHS2	AGHS3	0.1119	0.3241	68.68	0.35	0.7310	0.9993
Year Seventh	AGHS2	AGHS4	-1.5643	0.3241	68.68	-4.83	<.0001	<.0001
Year Seventh	AGHS3	AGHS4	-1.6762	0.3241	68.68	-5.17	<.0001	<.0001

Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Family	Estimate	
Year Seventh	AGHS4	13.0174	A
Year Seventh			
Year Seventh	AGHS2	11.4531	B
Year Seventh			B
Year Seventh	AGHS3	11.3412	B
Year Seventh			B
Year Seventh	AGHS1	11.1618	B
Year Seventh			B
Year Seventh	AGH25	10.7768	B



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Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Slice	Family	Estimate	
Year Seventh			B
Year Seventh	AGH2	10.7531	B

F Test for Year*Family Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Sixth	5	68.68	16.04	<.0001

Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Sixth	AGH2	AGH25	-0.2837	0.3241	68.68	-0.88	0.3845	0.9519
Year Sixth	AGH2	AGHS1	-0.9029	0.3241	68.68	-2.79	0.0069	0.0656
Year Sixth	AGH2	AGHS2	-0.9487	0.3241	68.68	-2.93	0.0046	0.0451
Year Sixth	AGH2	AGHS3	-1.3610	0.3241	68.68	-4.20	<.0001	0.0007
Year Sixth	AGH2	AGHS4	-2.5997	0.3241	68.68	-8.02	<.0001	<.0001
Year Sixth	AGH25	AGHS1	-0.6192	0.3241	68.68	-1.91	0.0603	0.4002
Year Sixth	AGH25	AGHS2	-0.6650	0.3241	68.68	-2.05	0.0440	0.3187
Year Sixth	AGH25	AGHS3	-1.0774	0.3241	68.68	-3.32	0.0014	0.0141
Year Sixth	AGH25	AGHS4	-2.3160	0.3241	68.68	-7.15	<.0001	<.0001
Year Sixth	AGHS1	AGHS2	-0.04586	0.3241	68.68	-0.14	0.8879	1.0000
Year Sixth	AGHS1	AGHS3	-0.4582	0.3241	68.68	-1.41	0.1620	0.7188
Year Sixth	AGHS1	AGHS4	-1.6969	0.3241	68.68	-5.23	<.0001	<.0001
Year Sixth	AGHS2	AGHS3	-0.4123	0.3241	68.68	-1.27	0.2077	0.7998
Year Sixth	AGHS2	AGHS4	-1.6510	0.3241	68.68	-5.09	<.0001	<.0001
Year Sixth	AGHS3	AGHS4	-1.2387	0.3241	68.68	-3.82	0.0003	0.0027

Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)					
LS-means with the same letter are not significantly different.					
Slice	Family	Estimate			
Year Sixth	AGHS4	11.8992		A	
Year Sixth					
Year Sixth	AGHS3	10.6605		B	
Year Sixth				B	

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Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)					
LS-means with the same letter are not significantly different.					
Slice	Family	Estimate			
Year Sixth	AGHS2	10.2482	C	B	
Year Sixth			C	B	
Year Sixth	AGHS1	10.2023	C	B	D
Year Sixth			C		D
Year Sixth	AGH25	9.5831	C		D
Year Sixth					D
Year Sixth	AGH2	9.2995			D

F Test for Year*Family Least Squares Means Slice				
Slice	Num DF	Den DF	F Value	Pr > F
Year Third	5	68.68	12.50	<.0001

Simple Differences of Year*Family Least Squares Means Adjustment for Multiple Comparisons: Tukey								
Slice	Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
Year Third	AGH2	AGH25	-0.09482	0.3241	68.68	-0.29	0.7708	0.9997
Year Third	AGH2	AGHS1	-1.5896	0.3241	68.68	-4.90	<.0001	<.0001
Year Third	AGH2	AGHS2	-1.6557	0.3241	68.68	-5.11	<.0001	<.0001
Year Third	AGH2	AGHS3	-0.6881	0.3241	68.68	-2.12	0.0374	0.2815
Year Third	AGH2	AGHS4	-1.7722	0.3241	68.68	-5.47	<.0001	<.0001
Year Third	AGH25	AGHS1	-1.4948	0.3241	68.68	-4.61	<.0001	0.0001
Year Third	AGH25	AGHS2	-1.5609	0.3241	68.68	-4.82	<.0001	<.0001
Year Third	AGH25	AGHS3	-0.5933	0.3241	68.68	-1.83	0.0715	0.4497
Year Third	AGH25	AGHS4	-1.6774	0.3241	68.68	-5.17	<.0001	<.0001
Year Third	AGHS1	AGHS2	-0.06610	0.3241	68.68	-0.20	0.8390	1.0000
Year Third	AGHS1	AGHS3	0.9015	0.3241	68.68	2.78	0.0070	0.0663
Year Third	AGHS1	AGHS4	-0.1826	0.3241	68.68	-0.56	0.5751	0.9932
Year Third	AGHS2	AGHS3	0.9676	0.3241	68.68	2.99	0.0039	0.0384
Year Third	AGHS2	AGHS4	-0.1165	0.3241	68.68	-0.36	0.7204	0.9992
Year Third	AGHS3	AGHS4	-1.0841	0.3241	68.68	-3.34	0.0013	0.0132

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Tukey Grouping for Year*Family Least Squares Means Slice (Alpha=0.05)				
LS-means with the same letter are not significantly different.				
Slice	Family	Estimate		
Year Third	AGHS4	3.3951		A
Year Third				A
Year Third	AGHS2	3.2786		A
Year Third				A
Year Third	AGHS1	3.2125	B	A
Year Third			B	
Year Third	AGHS3	2.3110	B	C
Year Third				C
Year Third	AGH25	1.7177		C
Year Third				C
Year Third	AGH2	1.6229		C

Family Least Squares Means					
Family	Estimate	Standard Error	DF	t Value	Pr >  t
AGH2	6.6064	0.1930	36	34.23	<.0001
AGH25	6.8437	0.1930	36	35.45	<.0001
AGHS1	7.7019	0.1930	36	39.90	<.0001
AGHS2	7.8216	0.1930	36	40.52	<.0001
AGHS3	7.6150	0.1930	36	39.45	<.0001
AGHS4	8.9504	0.1930	36	46.37	<.0001

Differences of Family Least Squares Means Adjustment for Multiple Comparisons: Tukey							
Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
AGH2	AGH25	-0.2373	0.2730	36	-0.87	0.3905	0.9514
AGH2	AGHS1	-1.0955	0.2730	36	-4.01	0.0003	0.0037
AGH2	AGHS2	-1.2152	0.2730	36	-4.45	<.0001	0.0010
AGH2	AGHS3	-1.0086	0.2730	36	-3.69	0.0007	0.0088
AGH2	AGHS4	-2.3440	0.2730	36	-8.59	<.0001	<.0001
AGH25	AGHS1	-0.8582	0.2730	36	-3.14	0.0033	0.0362
AGH25	AGHS2	-0.9780	0.2730	36	-3.58	0.0010	0.0118
AGH25	AGHS3	-0.7713	0.2730	36	-2.83	0.0077	0.0760
AGH25	AGHS4	-2.1067	0.2730	36	-7.72	<.0001	<.0001
AGHS1	AGHS2	-0.1197	0.2730	36	-0.44	0.6635	0.9978

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Differences of Family Least Squares Means Adjustment for Multiple Comparisons: Tukey							
Family	_Family	Estimate	Standard Error	DF	t Value	Pr >  t	Adj P
AGHS1	AGHS3	0.08690	0.2730	36	0.32	0.7521	0.9995
AGHS1	AGHS4	-1.2485	0.2730	36	-4.57	<.0001	0.0007
AGHS2	AGHS3	0.2066	0.2730	36	0.76	0.4540	0.9729
AGHS2	AGHS4	-1.1288	0.2730	36	-4.14	0.0002	0.0026
AGHS3	AGHS4	-1.3354	0.2730	36	-4.89	<.0001	0.0003

Tukey Grouping for Family Least Squares Means (Alpha=0.05)			
LS-means with the same letter are not significantly different.			
Family	Estimate		
AGHS4	8.9504		A
AGHS2	7.8216		B
			B
AGHS1	7.7019		B
			B
AGHS3	7.6150	C	B
		C	
AGH25	6.8437	C	D
			D
AGH2	6.6064		D