

Figure 7a-Number of Females by Group;

The SAS System

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable FEMALES Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
1=Control	6	67.50	57.0	10.583005	11.250000
2=CNP	6	53.50	57.0	10.583005	8.916667
3=AgCNP	6	50.00	57.0	10.583005	8.333333

Average scores were used for ties.

Kruskal-Wallis Test

Chi-Square DF Pr > ChiSq

1.0208 2 0.6002

GROUP=1=Control

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	5.0000000	13.0000000	9.6666667	10.0000000	2.6583203	1.0852547	6.8769306	12.4564027

GROUP=2=CNP

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	5.0000000	13.0000000	8.5000000	8.0000000	2.8106939	1.1474610	5.5503577	11.4496423

GROUP=3=AgCNP

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	1.0000000	13.0000000	7.5000000	8.0000000	4.8062459	1.9621417	2.4561542	12.5438458

Figure 7a-Egg weight by Group;

The SAS System

The NPAR1WAY Procedure

Wilcoxon Scores (Rank Sums) for Variable EGGS Classified by Variable GROUP

GROUP	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
1=Control	6	52.50	57.0	10.643971	8.750
2=CNP	6	76.50	57.0	10.643971	12.750
3=AgCNP	6	42.00	57.0	10.643971	7.000

Average scores were used for ties.

Kruskal-Wallis Test

Chi-Square DF Pr > ChiSq

3.6807 2 0.1588

GROUP=1=Control

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	0	4.2000000	1.4166667	0.8500000	1.6690317	0.6813793	-0.3348746	3.1682080

GROUP=2=CNP

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	1.6000000	2.6000000	1.9666667	1.9500000	0.3502380	0.1429841	1.5991144	2.3342189

GROUP=3=AgCNP

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	0	2.1000000	0.8666667	0.6500000	0.7916228	0.3231787	0.0359095	1.6974239

Figure 7b-Number of Females by Group;

Used the normality test for small samples based on calculating the z-score from Skewness as described in: 2012_Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. All sample means failed to reject the null hypothesis that the data come from a normal distribution. Thus, we used ANOVA to evaluate mean differences.

The GLM Procedure

Dependent Variable: FEMALES

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	380.9789683	126.9929894	39.46	<.0001
Error	31	99.7638889	3.2181900		
Corrected Total	34	480.7428571			

The SAS System

The MEANS Procedure
GROUP=1=Control_with

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	5.0000000	11.0000000	8.8888889	10.0000000	1.9002924	0.6334308	7.4281949	10.3495829

GROUP=2=Control_without

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	7.0000000	13.0000000	10.3333333	10.0000000	1.8708287	0.6236096	8.8952871	11.7713796

GROUP=3=CNP

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	9.0000000	13.0000000	10.3333333	10.0000000	1.4142136	0.4714045	9.2462726	11.4203941

GROUP=4=AgCNP

Analysis Variable : FEMALES

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
8	0	6.0000000	2.1250000	2.0000000	1.9594095	0.6927559	0.4868926	3.7631074

The GLM Procedure
Least Squares Means
Adjustment for Multiple Comparisons: Tukey-Kramer

GROUP	FEMALES LSMEAN	LSMEAN Number
1=Control_with	8.8888889	1
2=Control_without	10.3333333	2
3=CNP	10.3333333	3
4=AgCNP	2.1250000	4

Least Squares Means for effect **GROUP**

Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: **FEMALES**

i/j	1	2	3	4
1		0.3368	0.3368	<.0001
2	0.3368		1.0000	<.0001
3	0.3368	1.0000		<.0001
4	<.0001	<.0001	<.0001	

GROUP	FEMALES LSMEAN	95% Confidence Limits	
1=Control_with	8.888889	7.669306	10.108471
2=Control_without	10.333333	9.113751	11.552916
3=CNP	10.333333	9.113751	11.552916
4=AgCNP	2.125000	0.831437	3.418563

Figure 7b-Egg weight by Group;

AgCNP rejected the normality assumption by the skewness test described above. Thus, we used Kruskal-Wallis which established that at least one median is different.

The NPAR1WAY Procedure

Analysis of Variance for Variable EGGS Classified by Variable GROUP

GROUP	N	Mean
1=Control_with	9	2.711111
2=Control_without	9	2.866667
3=CNP	9	1.133333
4=AgCNP	6	0.633333

Kruskal-Wallis Test

Chi-Square	DF	Pr > ChiSq
11.5990	3	0.0089

GROUP=1=Control_with

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	0	5.4000000	2.7111111	2.6000000	2.2430138	0.7476713	0.9869780	4.4352442

GROUP=2=Control_without

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	1.1000000	4.3000000	2.8666667	3.0000000	1.0185774	0.3395258	2.0837187	3.6496146

GROUP=3=CNP

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
9	0.2000000	1.8000000	1.1333333	1.4000000	0.5809475	0.1936492	0.6867776	1.5798891

GROUP=4=AgCNP

Analysis Variable : EGGS

N	Minimum	Maximum	Mean	Median	Std Dev	Std Error	Lower 95% CL for Mean	Upper 95% CL for Mean
6	0	2.8000000	0.6333333	0.2500000	1.0782702	0.4402020	-0.4982419	1.7649085

Group sample sizes not equal, or some ranks tied. Performed Dunn's test, alpha=0.05

Comparison group = GROUP_NEW

Compare	Diff	SE	q	q(0.05)	Conclude
2 vs 4	15.78	5.09	3.1	2.638	Reject
2 vs 3	10.06	4.55	2.21	2.638	Do not reject
2 vs 1	Do not reject (within non-sig. comparison)				
1 vs 4	12.11	5.09	2.38	2.638	Do not reject
1 vs 3	Do not reject (within non-sig. comparison)				
3 vs 4	Do not reject (within non-sig. comparison)				

Note: "Do not reject (within non-sig. comparison)" indicates that any comparison within the range of a non-significant comparison must also be non-significant.

Reference: Biostatistical Analysis, 4th Edition, J. Zar, 2010.

