Chicken Weight Analysis

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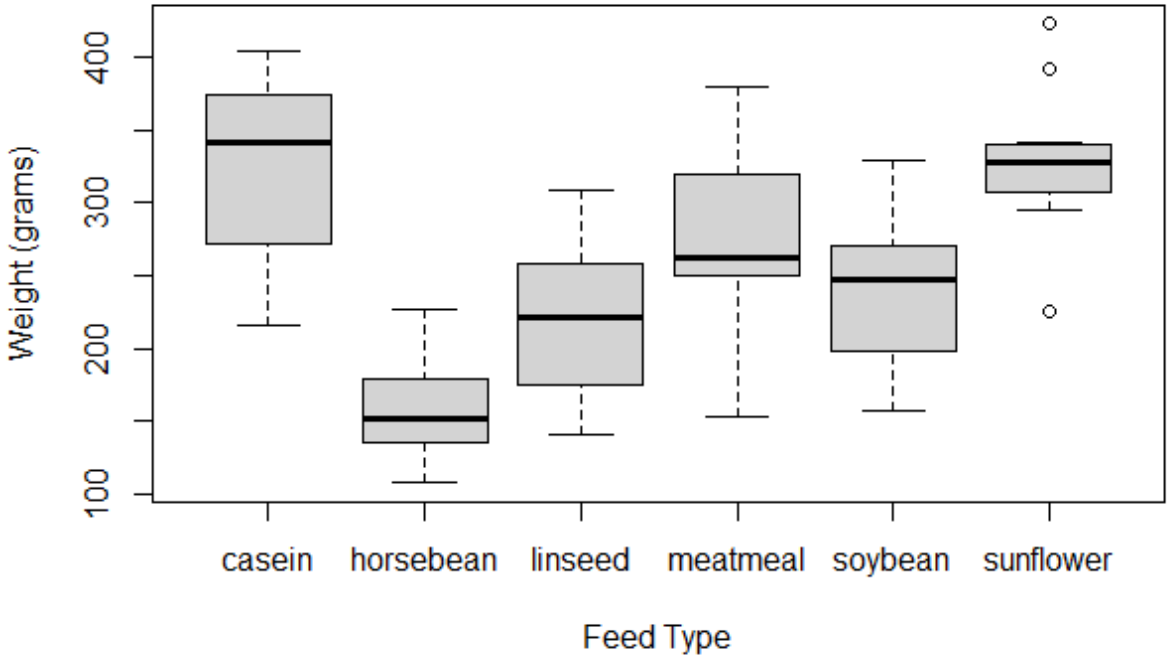
1. Introduction:

The data used in this project was collected to determine the effectiveness of multiple feed supplements on the growth rate of chickens. The purpose of this analysis is to conclude if the average weight is significantly impacted by various feed types. Newly hatched chicks were randomly put into six groups, and each group was given a different feed supplement. Their weights, in grams, after six weeks are given along with the feed types.

Question: Does the average chicken weight differ based on feed type?

The box plot below displays some variability with very few outliers. I will run more analysis to gain more insight on the data.



2. Methods: ANOVA & Pairwise T-test (Multiple Comμparisons)

An ANOVA test is used to determine if the average weight of chickens are significantly different from one another based on feed type. A pairwise t-test is used to calculate pairwise comparisons between feed types; a Bonferroni correction is used to reduce the chance of a type 1 error. To run an ANOVA, the following assumptions have to be met:

- **Normality of population distribution**
- **Homogeneity of variance**
- **Independent observations**

Given that these assumptions have been met:

- Null hypothesis H_0 **:** The average chicken weight is the same for all six feed types
  - H_0 : $\mu_{horsebean} = \mu_{linseed} = \mu_{soybean} = \mu_{sunflower} = \mu_{meatmeal} = \mu_{casein}$
- Alternative Hypothesis: At least one feed type significantly differs in weight than the others
  - H_a **:** At least one μ is not equal to the others

3. Results: ANOVA table

Response variable:	Df	Sum sq.	Mean sq.	F-value	p-value
feed	5	231129	46226	15.37	5.94e-10 ($p<0.05$)
Residuals	65	195556	3009		

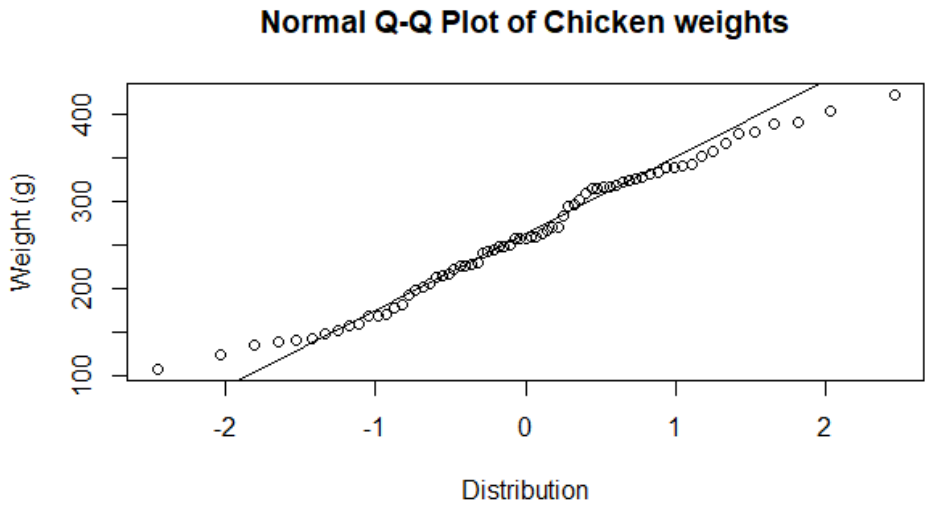
Conclusion: I have rejected the null hypothesis H_0 that the average chicken weight is the same for all six feed types, in favor of the H_a. There is strong evidence that at least one of the feed type average weights is different from the others.

With evidence that at least one of the averages differs, a paired t-test was used to determine which feed type(s) showed a statistical difference. I have concluded that 5 of the pairs showed a statistical difference amongst their weights.

- linseed vs. casein
- meatmeal vs. horsebean
- soybean vs. casein
- soybean vs. horsebean
- soybean vs. sunflower

4. Assumptions:

- Normality and Homogeneity of Variance - The QQ plot below shows the distribution is relatively normal and that there are not any large outliers that have a huge impact.
    - To confirm Homogeneity of Variances, a Levene Test was used.



Levene's Test for Homogeneity of Variance (center = mean)

Response:	Df	F-value	p-value
Group	5	0.9873	0.4324
	65		

- Independent observations - It is assumed that the samples were taken independently of each other so this assumption has been met.

5. Conclusion:

The analysis concluded that the chickens' average weight after 6 weeks is significantly impacted by feed type. I reject the null hypothesis given that: $F(5,65) = 15.37$, $p < 0.05$. Using a paired-test for multiple comparisons showed that there are significant differences in the average weight of 5 feed type pairs.

Limitations: Although a conclusion was reached, there are potential limitations to this analysis. The goal of this analysis was to determine if the average chicken weight differed based on feed type. In order to better understand the relationship between weight and feed type, it may be valuable to collect data on the growth rate of chickens. By comparing the initial weight to the weight after six weeks, there is a possibility that we may be able to better understand the relationship between chicken weight and feed type.