

APPLICATION OF A COMPLETELY RANDOMIZED DESIGN TO DETERMINE THE BEST TREATMENT IN CHICKEN PRODUCTION IN 2022

Aguilar Reyes Johanna^{1*}, Sani Wilson², Chariguamán Nancy¹,
Coello-Cabezas Julio³, Mejía Nora⁴, Ormaza Rosa¹, Santiana
Cristian¹, Puente R. Mariana Isabel⁵, Londo Yanchambay Fabián¹

¹Escuela Superior Politécnica de Chimborazo (ESPOCH), Facultad de
Ciencias, Riobamba, Chimborazo 060106, Ecuador

²Investigador independiente, Riobamba, Chimborazo, 060105, Ecuador

³Escuela Superior Politécnica de Chimborazo (ESPOCH) – Sede Orellana,
Francisco de Orellana, Orellana 220150, Ecuador.

⁴Grupo de Investigación y Desarrollo en Agroindustria (IDEA), Escuela
Superior Politécnica de Chimborazo (ESPOCH), Riobamba, Chimborazo
060106, Ecuador

⁵Universidad Nacional de Chimborazo, Facultad de Ciencias Políticas y
Administrativas.

Corresponding E-mail: johannae.aguilar@epoch.edu.ec

Abstract

The objective of the study was to identify the most effective treatment in the rearing, fattening, and benefit/cost of CHICKENS, resulting in a delicate but statistically reliable task, since the use of techniques coupled with the various required responses covers the expectations in people —readers or entrepreneurs who want to get involved in the poultry sector. The methodology indicates a quantitative investigation, with an application purpose and an explanatory level of depth, developed in an experimental field, the DCA technique is excluded for the manipulation of the weight variable that considers the collected data, which produced four groups of twenty chickens each. one, applying 4 different treatments that use the balanced ones: NUTRIL, ALCÓN, WAYNE, and PROAVES respectively. The type of inference is inductive during the longitudinal temporal period, the population is constituted by the broiler chickens of the BROILER breed, and the eighty samples of them with similar characteristics. As an instrument, the manual recording of the weights was used, and R-Studio analysis.

After compliance with the assumptions of normality, homogeneity of variance, and independence, the application of the

experimental technique was carried out, and after confirming the existing difference between the means of the treatments, it was sought to define them by applying a comparison between the pairs of treatment given Tukey's method. Then, with a graph of means, it was concluded that the balanced "PROAVES" showed better results in standing and peeled weight; similarly for higher benefit/cost. Therefore, it is advisable to use last this in case there are economic purposes involved, and if it is desirable to obtain a higher weight in chickens.

1. Introduction

The present investigation collects information from an experimental design based on the breeding and care of Broiler chickens, accompanied by a statistical analysis that measures the effectiveness of four treatments to determine the best of them. For its application, eighty chickens of the breed are considered and divided into four groups of twenty each, randomly selected.

The treatments are based on the consumption of balanced feed sectioned by the nutritional information based on the percentages of humidity, protein, fat, fiber, ash, calcium, phosphorus, etc., as well as the number of survivors, vaccination of the specimens, and benefit-cost obtained after its application; all these are essential in measuring the final weight of chickens. It is worth mentioning that vaccination is given at eight, fifteen, and twenty-one days after starting the process. The statistical development in this experiment fits directly with a Completely Randomized Design (DCA), complemented by various techniques that involve a detailed statistical analysis in the delivery of results and future decision-making.

Chicken meat being one of the most consumed foods worldwide, appears as a business opportunity for several entrepreneurs who are familiar with the subject. However, there are several individuals who choose to enter the business without prior knowledge or experience, which generates great waste of time and money. To avoid this, necessary information and solid, accurate, and reliable answers are required.

The time it takes to fully develop a broiler chicken should be considered, since, based on this, a total of eight weeks is set for the consignment of the final information. In addition, the care provided based on the four treatments is specified as the research work progresses. For this reason, reporting the consumption of balanced feed, vaccines, and other materials is essential for the sum of economic amounts to knowing the investment made.

Knowing the treatment that gives better performance in the production of broiler chicken meat is a desire of several entrepreneurs. Its great demand reflects high-profit rates, which is why national and world industries offer its consumption in various presentations, considering it attractive to people who want to taste it daily. The increase in several of these companies helps us to corroborate the potential of the market. In this way, several of the interested parties seek to enter this world, some betting all their trust on empirical knowledge, and others leaning towards the scientific and precision path, so as not to generate losses and rather take advantage of the studies carried out for their benefit. In addition. The scientific advances dedicated to the continuous improvement of these specimens are successful since they show great effectiveness in time and reaching the ideal weight; Knowing this, the experiment is proposed to find out if the weight of the chickens differs based on the treatments used.

2. Methodology

2.1 Type of investigation.

The quantitative research method, since the variables under study are statistical variables, according to the objective applied, since the research focuses on a problem in the field of poultry farming, according to the level of depth in the object of explanatory study, because we worked on the analysis of the data collected, according to the manipulation of experimental variables, since the information came from a primary source, according to the type of inductive inference, since we sought to know the best treatment that influenced the development of broilers, according to the longitudinal period of time, since the complete process of the experiment was followed (Hernández Sampieri, et al., 2014) (Patten & Newhart, 2018).

2.2 Experimental research design

A quantitative research method was used since the variables under study are statistically mutable and dependent on the manipulation of variables and experimental design (Berger, et al., 2018).

2.3 Data collection technique

Data collection was carried out through a weekly record that began with the reception of the chickens in the first week and ended in the eighth. This gives the importance of observing the changes that arose as time progressed, and therefore the growth of the chickens. On the other hand, with good data collection, it was possible to respond to the problem posed, and meet all the objectives of the study. For the collection of these data in the experimental design, a prudential time was required to directly visualize the object under study. In principle, a manual record was used, using a notebook in which all the information

related to the weights was recorded and later Excel to digitize the information.

2.4 Statistical model

The experimental design will be based on a DCA

$$Y_{ij} = \mu + r_i + e_{ij} \quad (1)$$

Where:

μ = overall mean

r_i = treatment effect

e_{ij} = measurement error Y_{ij}

3. Results

3.1 Descriptive analysis

Table 1: Descriptive measurements of BROILER chickens

DESCRIPTIVES	NUTRIL			ALCÓN			WAYNE			PROAVES		
	LIVE	PEELED	SALE PRICE	LIVE	PEELED	SALE PRICE	LIVE	PEELED	SALE PRICE	LIVE	PEELED	SALE PRICE
Mean	7,40	5,92	7,40	8,17	6,54	8,17	7,48	5,98	7,48	8,33	6,66	8,33
Typical error	0,25	0,20	0,25	0,15	0,12	0,15	0,16	0,13	0,16	0,20	0,16	0,20
Median	7,22	5,77	7,22	8,11	6,49	8,11	7,42	5,94	7,42	8,76	7,01	8,76
Mode	6,80	5,44	6,80	8,71	6,97	8,71	7,95	6,36	7,95	8,90	7,12	8,90
Standard deviation	1,10	0,88	1,10	0,67	0,54	0,67	0,74	0,59	0,74	0,91	0,73	0,91
Sample variance	1,21	0,77	1,21	0,45	0,29	0,45	0,54	0,35	0,54	0,83	0,53	0,83
Kurtosis	-0,17	-0,17	-0,17	-1,42	-1,43	-1,42	-1,26	-1,27	-1,26	-0,06	-0,06	-0,06
Asymmetry coefficient	0,06	0,06	0,06	0,09	0,09	0,09	-0,18	-0,18	-0,18	-0,99	-0,99	-0,99
Range	4,23	3,38	4,23	2,00	1,60	2,00	2,25	1,80	2,25	3,03	2,42	3,03
Minimum	5,11	4,09	5,11	7,23	5,78	7,23	6,19	4,95	6,19	6,40	5,12	6,40
Maximum	9,34	7,47	9,34	9,23	7,38	9,23	8,44	6,75	8,44	9,43	7,54	9,43
Addition	147,99	118,38	147,99	163,48	130,75	163,48	149,61	119,66	149,61	166,58	133,25	166,58
Account	20	20	20	20	20	20	20	20	20	20	20	20

Figure 1: Boxplot diagram weights and price of chickens

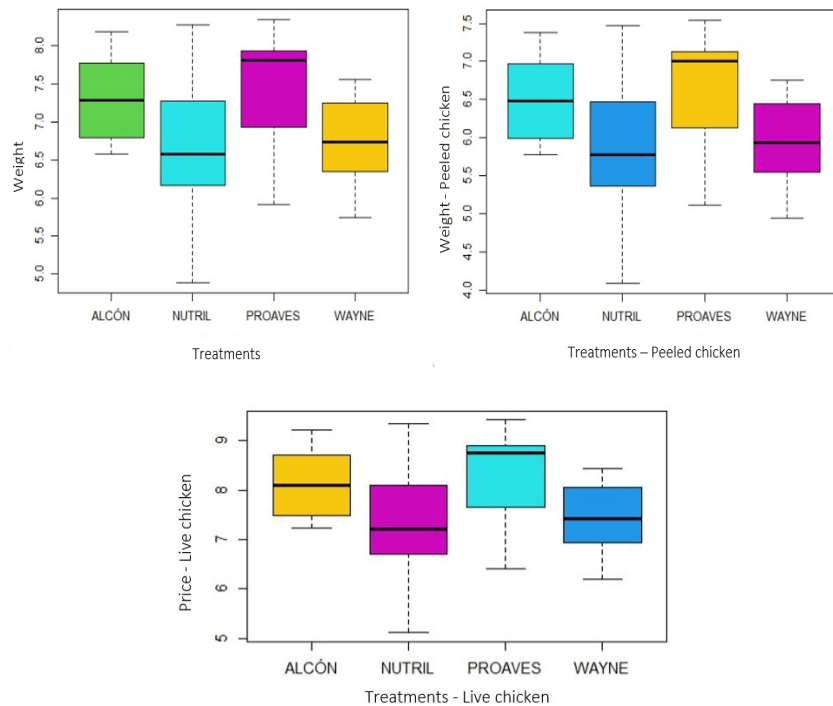
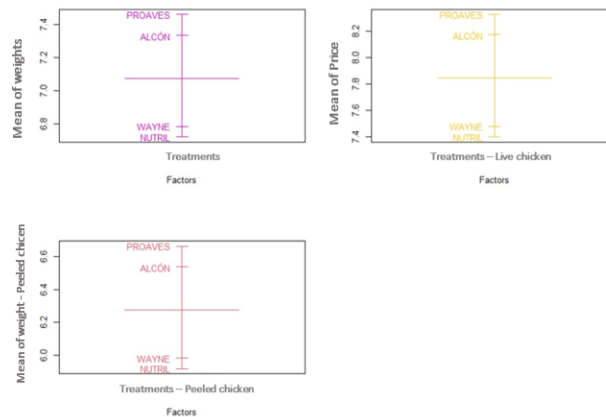


Figure 2: Graph of means with respect to the treatments



On the data collected in week 8, a descriptive analysis was carried out, from which for the 4 treatments: NUTRIL, ALCÓN, WAYNE, and PROAVES, there seems to be a certain difference on average, with 8.33 the highest value presented, and 7, 40 the minor, generating slight speculations about the possible best treatment.

It is also observed that the standard deviation shown by the NUTRIL treatment is the largest of all, giving us to understand that its dispersion is greater than the others, thus, in the variance, similar results will be

obtained since this represents the variability of the dispersion given in the treatments with respect to the mean, the highest being that of treatment A.

The kurtosis shows negative values, so in the four treatments, we would speak of a platykurtic distribution, that is, the data present a flattened shape compared to normal behavior, and therefore it has a small concentration of data in the mean. Regarding the asymmetry, in both the WYNE and PROAVES treatments a negative value is presented; therefore, their data have a negative asymmetry and are skewed to the right, not the case for the NUTRIL and ALCÓN treatments that have an asymmetry positive indicating that the data is concentrated in the left part of the distribution presenting a bias to the left.

The minimum values presented in the weights of the chickens indicate that the NUTRIL treatment presents the lowest of all, and in its maximum values the PROAVES treatment, is the highest of all the weights; the latter also features the largest sum of all weights.

3.2 Verification of Assumptions

The verification of assumptions appears as a fundamental act prior to the analysis; With this, it was possible to give greater validity to the study, and three assumptions were considered, which was developed as the work progressed. It is relevant to mention that, for the graphic analysis, the residuals were used, and given the existence of several methods for the verification of the assumptions, those that fit with the characteristics of the data were considered. The verification of the assumptions analytically was much more reliable than doing it graphically. This entailed planting hypotheses that with statistical tests could be verified and verify compliance with the assumptions.

Figure 3: Chart of mean weights on live chickens

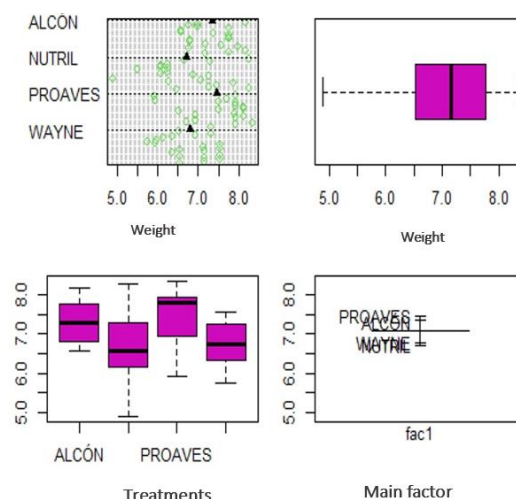


Figure 4: Chart of weights on live chickens

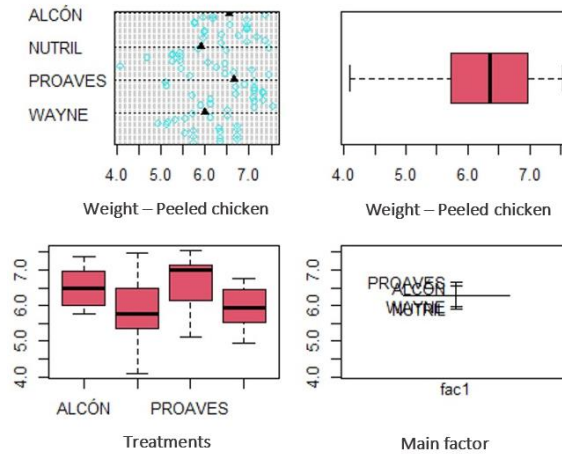
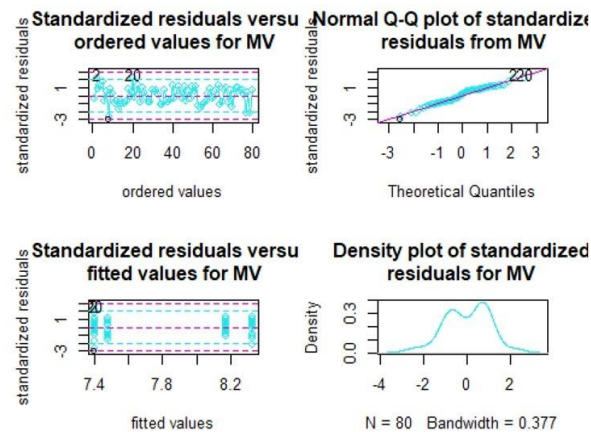


Figure 5: Sale prices of chickens



3.3 Hypothesis Statement

Experiment setup:

Visualize the effect of the balanced on the means of the weights of the broiler chickens.

Factor: Balanced Type

Levels: A (Nutril), B (Alcón), C (Wayne) and D (Proaves)

Response variable: Weight of the chickens measured based on the application of the balanced.

Repetitions: 20

3.4 Hypothesis approach:

$H_0: \mu_{\text{Nutril}} = \mu_{\text{Alcón}} = \mu_{\text{Nutrilwayne}} = \mu_{\text{Proaves}}$

$H_1: \mu_i \neq \mu_j$, for any $i \neq j$

The $F(\text{calculated})$ turned out to be greater than the $F(\alpha)$ statistic, therefore, the null hypothesis was rejected, and it was verified that the means of the treatments are different; In the same way, a p value = 0.0011 was obtained, which indicates that the treatments: Nutril, Wayne, Alcón and Proaves differ significantly.

3.5 Residue analysis:

Figure 6: Analysis of Residues weights of live chickens

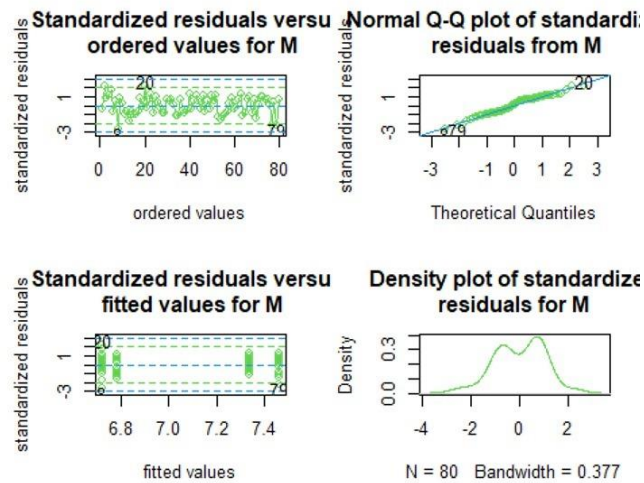
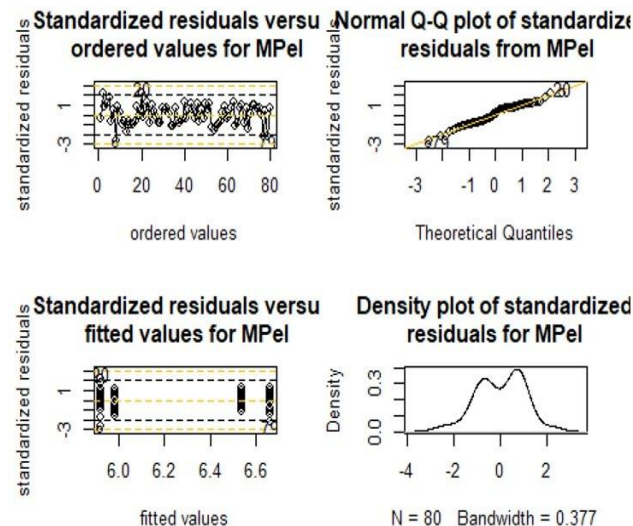
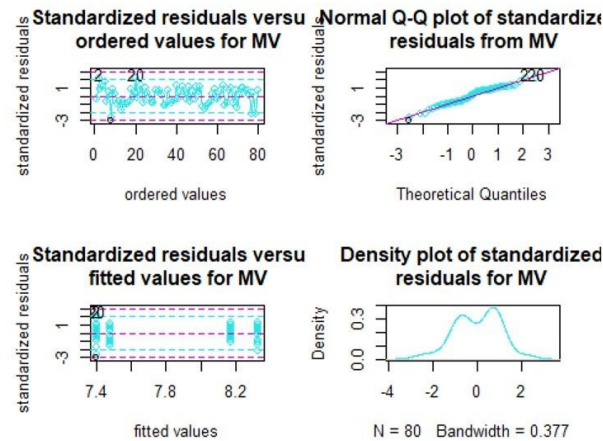


Figure 7: Analysis of residues of peeled chicken weights



What we can observe is that the pairs of means between: Wayne-Nutril; Alcon-Wayne; Since Proaves-Alcón's interval contains zero, it means that these pairs of means do not present significant differences respectively for the weights of skinned chickens.

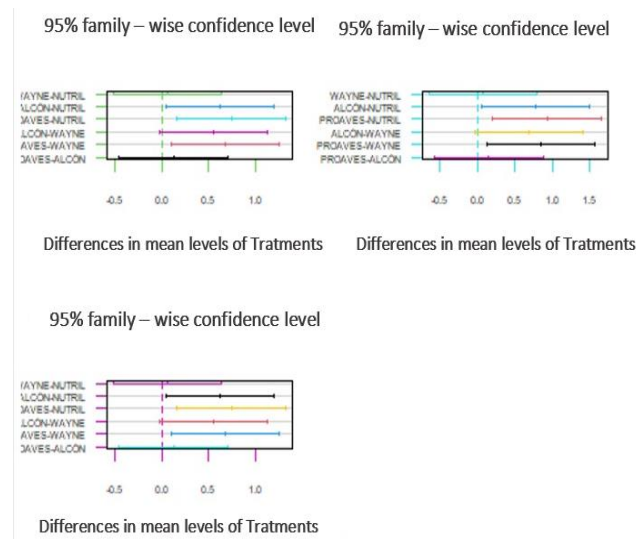
Figure 8 Analysis of waste sale price



3.6 Tukey's test:

Knowing that the null hypothesis was rejected, we proceeded to compare pairs of means according to the Tukey method.

Figure 9: Pairwise comparisons of mean Tukey



What we can observe is the pairs of means between Wayne-Nutril; Alcon-Wayne; Since Proaves-Alcón's interval contains zero, it means that these pairs of means do not present significant differences respectively for the variable weights per foot.

It can be observed that the pairs of means between Wayne-Nutril; Alcon-Wayne; Since Proaves-Alcón's interval contains zero, means that these pairs of means do not present significant differences respectively in the sale price of chickens.

5. Conclusions

After the analysis carried out; a great influence was evidenced by the treatments in the weights acquired, investments made, profits obtained and the causes that accompany it. Thus, both the treatment using the PROAVES feed and the treatment using the ALCÓN feed turned out to be the best.

Based on the descriptive statistical analysis, it was possible to determine that the treatment with the best performance in weight corresponds to the one that uses the balanced PROAVES, reaching 8.33; followed by ALCÓN with 8.17; WAYNE with 7.48 and NUTRIL with 7.40 pounds average respectively. In all four cases we speak of a platykurtic distribution due to the small concentration of data in the mean and therefore the existence of positive and negative asymmetries that generates biases in the right or left part of the distribution. With the help of statistical tests for the assumptions of normality, homogeneity and independence, compliance with these could be verified.

A completely randomized Design (DCA) was established since it was desired to study the influence of four treatments on the weights of the chickens and to compare the existence or not of differences between their means. When the latter was confirmed, a Tukey test was applied, finding minimal significant differences between the pairs of means: ALCÓN-NUTRIL; PROAVES – NUTRIL; PROAVES-WAYNE stops the live weights of the chickens in the same way for the peeled weights and sale price of the chickens.

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