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# THE EFFECTS OF USING THREE KINDS OF FEEDING METHODS ON CHICKS' GROWTH

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**Abstract.** *In this study, we attempted to determine if there are any significant differences between three different methods used in feeding the chicks on the growth of chicks. Also, this experiment determines the best method that used for increasing the weight of chicks. The study findings showed that the existence of a high percentage of nutrition's found in the imported plants feeding method was the best for improving growth in chicks.*

**Keywords.** *Complete Randomized Design; Chick's Feeding; Poultry Production.*

## 1. Introduction

Poultry are all birds elected and tamed by humans in order to make economical benefits from them. Chicken raising and production differs from both developed and developing countries. In the developing countries, chicken production reaches 94% of all kinds of birds produced in these countries, while we find in the developing countries that the percentage of chicken production compared to total birds' production reaches 92.5%.
The 20th century has seen great developments in raising and producing meat chickens. The production of chicks has increased significantly in the 1950s. At that period, chicken meat was 10% of the total meat production on the world market, but this number reached 20% in the mid 1980s.

According to the statistics published in 1998, North America ranked first in chicken's production, then Asia, Europe, Africa, respectively. The USA is the largest producer in chickens and China comes in the second place. Egypt is the largest Arab country in producing chickens. (Miglid.M.2008)

## 2. Chicken's basic physiology

### *2.1 Growth physiology*

In the general term, growth means the increase in body mass. The importance of this study emerges from the fact that growth is strongly related to with chicken's meat production, since meat harvest is determined by the amount of growth taking place within the body. Therefore, studies and researches related to meat production focus on growth and factors determining it.
Growth takes place in tow major stages:
A- In the fetus stage.
B- Growth taking place after hatching.
Growth lasts until the mass reaches size mature body, which ranges in chickens from 24-28 weeks. The chicks used in the study were Hubber, which is one of the best breeds used for obtaining meat from chickens. Chicks' weights ranged from 50 grams to 55 grams. (Miglid.M.2008)
Three different methods were used in nutrition:
1-method A.: It contained a high percentage of nutritions found in domestic plants such as (corn, barley, wheat), In moreover nutrition’s elements found in animals (leather, meat, and animal wastes), and few of industrial nutrients elements such as vitamins, carbohydrates, protins and antibioties which used as anti – diseases.
2-method B: It contained a high percentage of nutritions found in imported plants such as (corn, barley, wheat), In moreover nutrition’s elements found in animals (leather, meat, and animal wastes), and few of industrial nutrients elements such as vitamins, carbohydrates, protins and antibioties which used as anti – diseases.
3-method C: It contained a equal percentage of nutritions found in domestic plants such as (corn, barley, wheat), In moreover nutrition’s elements found in animals (leather, meat, and animal wastes), and few of industrial nutrients elements such as vitamins, carbohydrates, protins and antibioties which used as anti – diseases.

### *2.2 Growth stages in chickens*

There are two stages in chickens growth
I- Fetus growth, which begins from fertilization and ends with the hatching of the egg.( 21 days in chickens).
II- After hatching period lasting for 60 days and is divided into the following periods:

A- 1 to 10 days. In this stage the chick depends in feeding on the yellow part of the egg. Growth in this stage is slow.

B- 11 to 30 days. In this period, heat production in the body increases and feathers grow fast. In this period, glands develop fast. This period is characterized by significant grow in all body parts.

C- 31 to 60 days. In this period, growth continues in high rates. Feathers growth completes and thermometer system in the body also completes. (Miglid.M.2008)

 

## *2.3 Growth measures*

Increases in growth are expressed using the following means:
I- Absolute growth rate, which is the increase rates during a fixed time period.
II- Relative growth rate, which is the relative absolute increase in weight during a given time period.
Generally speaking, chickens are the fastest growing animals in farm. Chicks increase their weight 60 times during the first two months. (Miglid.M.2008)

## 3. Study Objectives

- Increasing chicks weights to the optimal levels.
- Using the best feeding method in the farm.
- Identifying an easy applicable, profitable way to perform the project.
- Obtaining maximum profits taking into consideration the following factors:
    - Total cost.
    - Time.
- Obtaining the best weight for the chick in a short time and least cost.
- Obtaining a healthy chick with suitable weight and able to resist most of known diseases.

## 4. Literature review:

The majority of studies conducted in this field focused on improving food and medications given to chickens to maintain their safety and get the maximum profits. John H.Skilling, Boca Raton. The effect of using different feeding methods on the growth of chicks has not yet been addressed. Our experiment suggested on using the Complete randomized design (CRD) (Douglas ,1998).. This design has too many uses in our life and there are a lot of studies done on CRD (Douglas ,1998). However this is the first time of studying raising poultry by CRD.
This project discusses several additional topics concerning single-factor experiments and the analysis of variance. These include methods for choosing an appropriate sample size for comparing treatment means, using the analysis of variance to detect dispersion effect. (Douglas ,1998).

## *4.1 Choice of sample size*

In any experimental design problem a critical discussion is the choice of sample size – that is; determining the number of replicates to run. Generally, if the experimenter is interested in detecting small effects then more replicates are required. In this section. We discuss several approaches to determining sample size. Although out discussion focuses on a single-factor design, most of the methods can be used in more complex experimental situations. (Douglas ,1998)

Because of high cost ,winter season and limited time of the experiment so the study sample consisted of 15 chicks divided evenly into three groups (5 chicks for each group), but the way of choosing chicks randomly was:
Only one hatchery have in the farm with 160 eggs (because in winter use only one hatchery) The sample was selected using systematic random sampling, with cycle length equal to 11, i.e., the 11th coming from the breeder.
Data were collected from three different farmes located in the north area of Jordan

**Table 1: Descriptive for data**

| Farm | Location | Sample size |
|---|---|---|
| Alayob farmer | Almsara | 5 |
| Alkteeb farmer | Almzarea'a | 5 |
| Sahel horan farmer | Altorra | 5 |


**Figure 1: Jordan map**

## *4.2 DISCOVERING DISPERSION EFFECTS*

We are focused on using the analysis of variance and related method to determine which factor levels result in differences among treatment or factor level means. It is customary to refer to these effects as location effects. In some problems. How ever, we are interested in discovering whether the different factor levels affect variability; that is. We are interested in discovering potential dispersion effects. This will occur whenever the standard deviation. Variance or some other measure of variability is used as a response variable.(Douglas ,1998)

# 5. Methodologies

## *5.1 Study sample*

The study sample consisted of 15 chicks divided evenly into three groups, each compromising of 5 chicks. The sample was selected using systematic random sampling, with cycle length equal to 11, i.e., the 11th coming from the breeder.

## *5.2 Feeding methods*

The researcher used three different feeding methods
1- First method (group A).
2-Second method (group B).
3- Third method (group C).

## *5.3 Procedure*

The chicks were divided into the three feeding methods using random drawing, where the chicks were given numbers from 1 to 15. feeding methods were coded weights of chicks were recorded twice, one as soon we select the chicks, i.e., before conducting the study, and the second record after six days. The three groups received three different feeding methods as following:
- Group 1 takes feeding type A.
- Group 2 takes feeding type B
- Group 3 takes feeding type C

So, CRD design was used in the study. After six days, weights were taken another time to determine the differences between pre-weights and post-weights. The difference in weights were recorded and tabulated

## *5.4 Experimental components:*

1-Factores : we have one factor which is methods of food.
2-Response : The weight of chicks.
3-Treatment : Represent three level of food (A, B, C).
4-Treatment structure : Ordinal.
5-Experimental unit: In our data it is the same of sampling unite which is chicks.
6-Replication: Five replications for each treatment.
We assume the selection of small chicken and apply all three kind of food in random. where the chicks given numbers from 1 to 15 and the feeding method coded as A,B and C then we select number of chicks with letter from method of feeding and repeat this step until getting five chicks for each group.

 

```
wieght
     ‚
115 ˆ                                A
     ‚
110 ˆ
     ‚
105 ˆ
     ‚
100 ˆ
     ‚
 95 ˆ
     ‚                               A
 90 ˆ
     ‚A                              A                              A
 85 ˆ
     ‚
 80 ˆ                                B
     ‚
 75 ˆ
     ‚A
 70 ˆ                                                               A
     ‚
 65 ˆA                                                              A
     ‚
 60 ˆA
     ‚
 55 ˆ
     ‚
 50 ˆ                                                               A
     ‚
 45 ˆ                                                               A
     ‚
 40 ˆ
     ‚
 35 ˆ
     ‚
 30 ˆ
     ‚
 25 ˆA
     ‚
     Šˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒƒˆƒ
      A                              B                              C

                                    food
```

**Figure 2: Plot of data**

Figure (1) represents the plot of data. Kind of food A and C have almost same effect on chick's weight, but the variability between observations in B has smallest, and we show the highest variability between observations in A.
The maximum weight for chicks which equal 116 occurs at food B, The minimum weight for chicks which equal 25 occurs at method A.

## 8. The model for CRD:

The research model can be written as:

$$y_{ij} = \mu + \tau_i + \epsilon_{ij} \qquad i=1, 2, 3. \quad j=1, 2, 3, 4, 5.$$

Where,

- $y_{ij}$ :-The j-th observation (weight) taken under the food level i,
  i=1, 2, 3, 4. & j=1, 2, 3, 4, 5

- $\mu$:-Over all means.

- $\tau_i$ :- The effect of 3-rd treatment (A, B, C).
- $\in_{ij}$ :-The random error.

The model assumed that:

$$\sum_{i=1}^{a} \tau_i = 0$$

Before testing the hypothesis we must checking the assumption to see if using this model is suitable or not.

# 9. Statistical analyses

## Descriptive statistics for data

**Table 2: Descriptive statistics for data**

| Level of food | N | ------------wieght----------- Mean | Std Dev |
|---|---|---|---|
| 1 | 5 | 62.2000000 | 23.3388089 |
| 2 | 5 | 91.2000000 | 15.0233152 |
| 3 | 5 | 63.6000000 | 17.0967833 |

We can show the means and standard deviation for levels of food(TRT), each level of food have five observations, the mean for method A equal 62.2 with standard deviation equal 23.3 (have largest variation), for B equal 91.2 with standard deviation equal 15.02(have smallest variation) and for C equal 63.6 with standard deviation equal 17.1.

## *9.1 CRD assumptions are:*

1-Normality assumption.
2-Constant variance.
3-Independent assumption.
(We will assume that independent assumption is satisfied).
Also, we will chick if there are any Outlieries in our data.

### 9.1.1 Normality assumption:

We used p-p plot to test the normality:

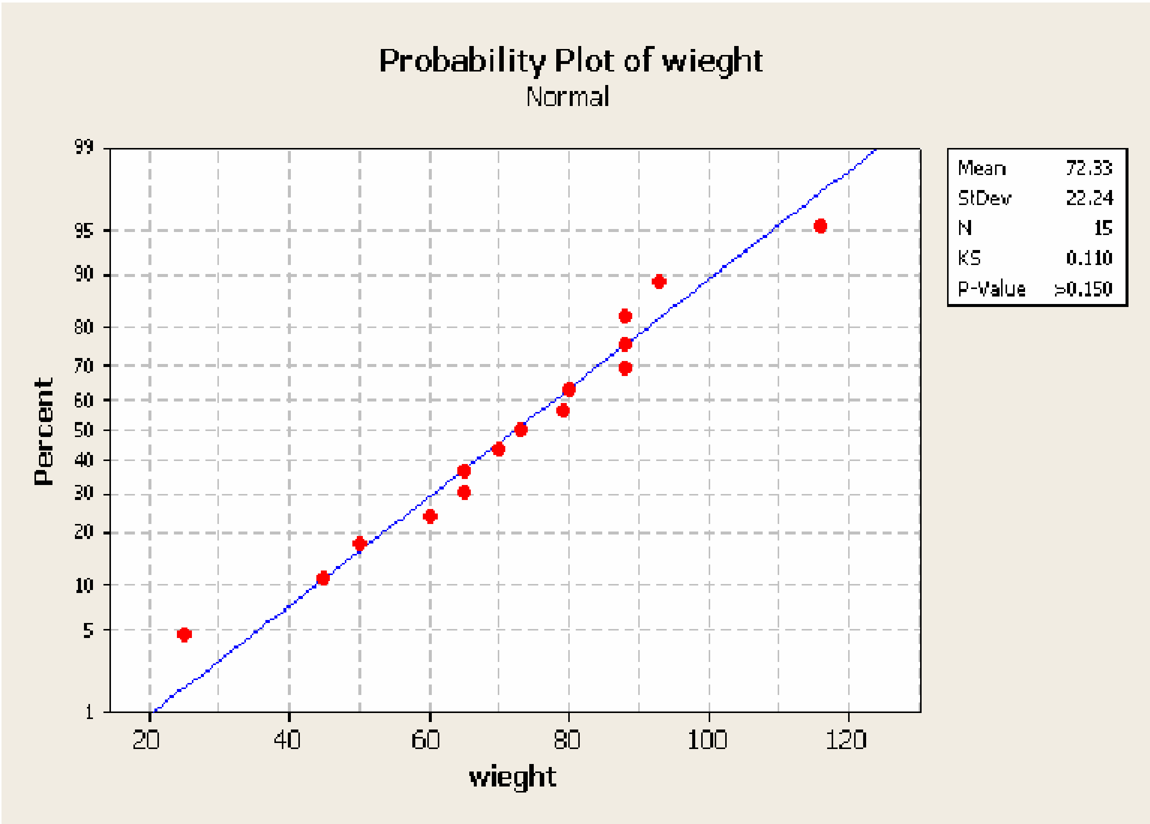


**Figure 3: The normal probability plot of the residuals.**

We show from the normal probability plot of the residuals that there is no severe indication of non normality.
The point come close to forming a straight line, that indicate the residuals are approximately have normal distribution.
There is no matter for any kind of transformation for data.

### 9.1.2 Constant variance:

(1) If there are statistically significant differences between the variances among the three level of food (A, B, and C).
The null hypothesis for the test is that all population variance
(Food) are the same.
The alternative hypothesis is that one or more population variance differ from the others
$H_o : \sigma^2{}_A = \sigma^2{}_B = \sigma^2{}_C$
VS
$H_1$: At least two variances differ from the others.

**Table 3: The Bartlett's Test**

| | |
|---|---|
| **Response** | **weight.** |
| **Factors** | **food.** |
| **ConfLvl** | **90.0000.** |
| **Bartlett's Test (normal distribution)** | |
| **Test Statistic: 0.766.** | |
| **P-Value** | **: 0.682.** |

 

Table (2) represent the output for testing the equal variances using Bartlett's test, The p-value of food (treatment) equal 0.682, assuming we choose $\alpha$ -level of 0.1, since p-value of food equal 0.682 is larger than $\alpha$ -level (0.1) we conclude that there are no significant difference among the variance for each levels of foods (A, B, C), that means the common variances is satisfied.

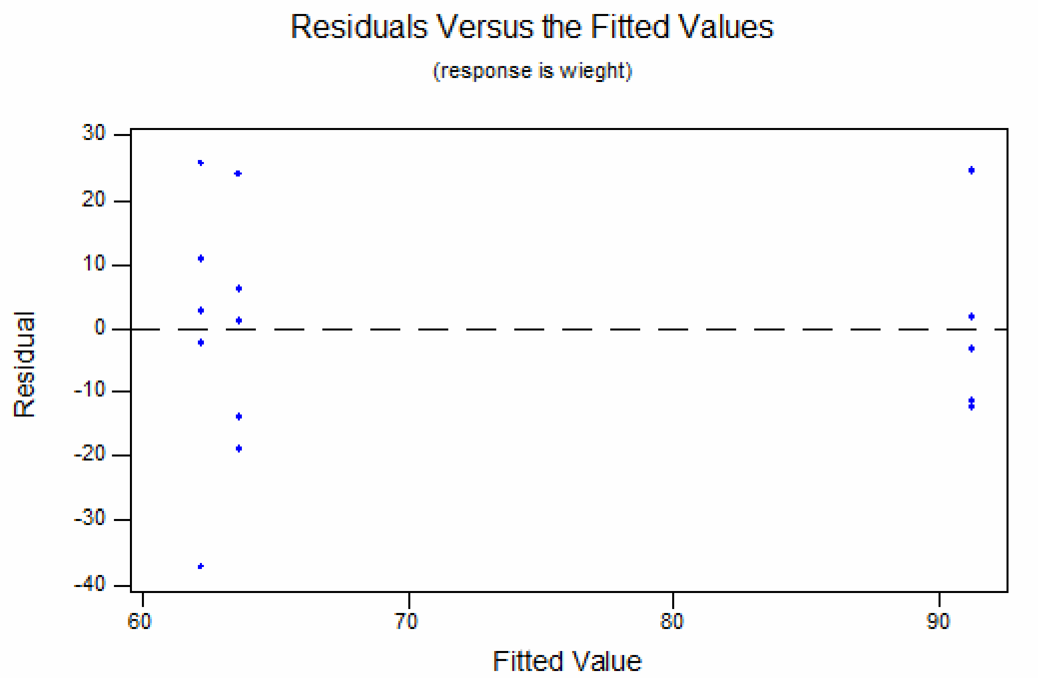

**Figure 4: The plot of the residuals versus fitted value.**

We show from the plot of the residuals versus fitted value that is scattered randomly and there is no specific trend so, we have constant variance, which means we have not any problem with our observation, there is no matter for any kind of transformation for data.

**Outliers**

For checking if we have outlier between the observation or not:

If $|d_{ij}|$ greater than or equal 4 ➔ then $y_{ij}$ is outlier

(Outlier is the value that is unusually large or small).

Where,

$|d_{ij}| = |e_{ij} / \sqrt{MSE}|$ (table (2)).

$d_{ij}$ called standardized residual.

i=1, 2, 3. j=1, 2, 3, 4, 5.

**Table 4: The standardized residual**

| A | B | C |
|---|---|---|
| 0.57447 | 0.59574 | 0.72340 |
| 1.37234 | 0.17021 | 0.98936 |
| 0.11702 | 1.31915 | 0.07447 |
| 1.97872 | 0.09574 | 0.34043 |
| 0.14894 | 0.64894 | 1.29787 |

From table (3) we note that all standardized residual are less than 4 which mean there is no outlier in the data. The four assumptions are valid so using this model for this data is suitable.

## *9.2 Study hypothesis :*

(1) If there are statistically significant differences among the three level of food (A, B, and C).
The null hypothesis for the test is that all population means
(Food) are the same.
The alternative hypothesis is that one or more population means differ from the others
$H_0$ : $\mu_A = \mu_B = \mu_C$
VS
$H_1$ : At least two means differ from the others.

**TABLE (5): ANOVA TABLE**

Dependent Variable: wieght

| Source | DF | Sum of Squares | Mean Square | F Value | Pr> F |
|---|---|---|---|---|---|
| Model | 2 | 2674.5333 | 1337.2667 | 3.78 | .0532 |
| Error | 12 | 4250.8000 | 354.2333 | | |
| Corrected Total | 14 | 6925.3333 | | | |

Figure (4) represent the ANOVA table, The p-value of food (treatment) equal 0.0532, assuming we choose $\alpha$ -level of 0.1, since p-value of food (0.0532) less than $\alpha$ -level (0.1) we conclude that there are significant difference among the levels of foods (A, B, C), that means the foods does affect the growth of chicks, other word there is difference between three kind of food and the affect from food on weight of chicks not same in three kind of food.

 

## *9.3 Pair wise comparison*

We have to making pair wise comparison among treatment means, because the result of analysis is there are significant differences among the levels of food (A, B and C).

**TABLE (6): pair wise comparison among treatment means.**

| i/j | A | B | C |
|---|---|---|---|
| A | | 0.0314 | 0.9083 |
| B | 0.0314 | | 0.0389 |
| C | 0.9083 | 0.0389 | |

From table (5) we conclude there are significant differences among the levels of food (A&B, and B&C), that means the food affect the chicks growth. Also, there are not significant differences among the levels of methods (A&C), which means the food does not affect the chick's growth.
dima al-rousan. 2008. Personal Communications.

## 10. Conclusions

We conclude that the different level of methods (A, B, C) does affect the chicks growth, Also Based on the study results, there are significant differences at ($\alpha$ =0.1) between the three feeding methods. The study results showed that B feeding method was the best method for improving growth in chicks.

## Acknowledgement
To our dear Dr. Amjad AL-Nasser who dedicated his precious time to keep us on the right track while conducting our research.
To the other doctor who was the guide and mentor of our work, Dr. Mohammad Baker.

# APPENDEX I

**THE DATA**

| | chicks 1 | chicks 2 | chicks 3 | chicks 4 | chicks 5 |
|---|---|---|---|---|---|
| food A | 73 | 88 | 60 | 25 | 65 |
| food B | 80 | 88 | 116 | 93 | 79 |
| food C | 50 | 45 | 65 | 70 | 88 |

# APPENDEX II

## Abbreviations:

1- $\bar{y}_{i.}$ :- is the mean of the i-th treatment (food A,B,C so, i=3).

2- $\bar{y}_{..}$ :- is the mean of the total observation.

3-N = $\sum_{i=1}^{3} n_i$ ,(N=15).

4-Error sum of square (SSE): A measure of the amount of variability within the individual samples, associated of N-a ➔a=3 & N= $\sum_{i=1}^{3} n_i$ .

Where, a = # of treatment (a=3)

5-Treatment sum of square (SSTRT): A measure of how different is the sample means are from one another associated of (a-1=2).

6-Total sum of square (SST): The fundamental identity in single factor ANOVA (SST=SSE+SSTRT).

7-Mean square: a sum of square divided by it is d.f .

8-For single factor ANOVA:

MSTRT=SSTRT/2 and MSE=SSE/12.

9-We have one values for F :

F1=MSTRT/MSE

=the test statistics for testing the null hypothesis for the test is that all population means are the same.The alternative hypothesis is that one or more population means differ from the others, When the null hypothesis is true, F has an F distribution with numerator (a-1=2)d.f and denominator of(N-a=12)d.f.

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