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Effect of Different Poultry Diets on Growth Performance of Poultry Chicks: A Case Study from a Poultry Farm

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Abstract

Poultry farming plays an important role in supplying meat and eggs, which are significant sources of protein for human consumption. The growth and development of poultry chicks largely depend on the nutritional quality and composition of the feed provided during their early stages of life. The present study aims to examine the effect of different poultry diets on the growth performance of poultry chicks through a case study conducted at a poultry farm. A total of 60 eggs were selected from a population of 800 eggs belonging to four poultry species Pure Breed, Hybrid Chicken, Bantam Chicken, and Broiler using a stratified random sampling technique with equal representation of 15 eggs from each species. After hatching, the chicks were divided into groups and provided with four different types of diets for a period of 24 days. The diets consisted of combinations of proteins, vitamins, carbohydrates, minerals, and fatty acids. The growth of the chicks was monitored by recording their weight and height regularly. Additional factors such as gender and the future purpose of the chick (egg-laying or meat production) were also considered in the analysis. Descriptive statistical methods and comparative analysis were used to study the relationship between diet composition and growth performance. The results indicate that diet composition has a noticeable influence on the growth of poultry chicks, and diets containing higher protein and balanced nutrients contribute to improved growth performance. The findings of this study provide useful insights for poultry farmers regarding effective feed management practices for better poultry productivity.

Keywords: Poultry diet, Chick growth, Poultry nutrition, stratified sampling, Growth performance

1. Introduction

Poultry farming is an important agricultural activity that contributes significantly to the production of meat and eggs, which are major sources of protein for human consumption. The growth and productivity of poultry chicks depend on several factors such as species, environmental conditions, management practices, and particularly the type of diet provided during their early developmental stages. Proper nutrition plays a crucial role in achieving optimal growth in poultry birds.

In commercial poultry farming, farm owners often raise chicks for a specific period in order to meet the requirements of particular customers or markets. In many cases, customers expect the chicks to reach certain growth standards, such as a specified body weight or height, within a given time frame. However, the growth of some poultry species may not always reach the desired level within the available time due to differences in nutritional requirements and biological characteristics. As a result, poultry farm owners may experiment with different types of diets in order to improve the growth performance of chicks. These diets are sometimes selected arbitrarily without a clear understanding of their impact on different poultry species.

Several companies provide various types of poultry feeds, each claiming that their feed is effective in improving the growth and health of poultry chicks. However, identifying the most suitable diet that consistently promotes healthy growth across different species remains a challenge for poultry farmers. Therefore, it is necessary to scientifically evaluate the effect of different poultry diets on the growth performance of chicks.

The present study aims to assist a poultry farm owner in identifying the most effective diet for promoting the growth of poultry chicks using statistical techniques. In addition to analyzing the effect of different diets, the study also examines whether factors such as species and gender influence the growth patterns of chicks. By understanding how these factors interact with diet, poultry farmers can make more informed decisions regarding feed management.

This analysis will help the poultry farm owner manage the farm more efficiently by selecting the most appropriate diet that promotes healthy growth while minimizing unnecessary expenditure on ineffective feed types. Furthermore, the findings of this study may contribute to improving productivity and profitability in poultry farming by ensuring that chicks achieve the desired growth standards within the specified time period.

2. Objectives of the Study

The present study aims to analyze the impact of different poultry diets on the growth performance of poultry chicks using statistical techniques. The specific objectives of the study are as follows:

1. To examine whether different types of poultry diets result in similar or different growth patterns in terms of weight and height of chicks.
2. To determine whether chicks of different age groups require different types of diets for optimal growth.
3. To analyze the effect of diet and gender on the growth of chicks, particularly with respect to their height and weight.
4. To investigate whether the impact of diet varies across different poultry species with respect to their weight gain.
5. To identify the type of diet that contributes most effectively to the healthy growth of poultry chicks.
6. To provide recommendations that may help poultry farm owners reduce feeding costs and improve overall farm profitability.

3. Materials and Methods

3.1 Study Design

The present study was conducted as a case study to examine the effect of different poultry diets on the growth performance of poultry chicks. The experimental design was simple and systematic. Initially, a total population of 800 eggs belonging to four different poultry species was considered. Each species consisted of 200 eggs, forming four homogeneous groups based on species type.

To ensure equal representation from each species, stratified random sampling was used. From the total population, 60 eggs were randomly selected, with 15 eggs from each species. The four poultry species considered in this study were Pure Breed (PB), Hybrid Chicken (HC), Bantam Chicken (BC), and Broiler (BR).

After the eggs were hatched successfully, the chicks were distributed into four experimental groups, each group receiving a different type of diet. The allocation ensured that each group contained chicks from all four species so that the effect of diet across species could be properly evaluated.

3.2 Diet Types

Four different diet compositions were used in the experiment. Each diet contained different combinations of essential nutrients required for chick growth. The diet types used in the study are presented in Table 1.

Table 1: Types of Diets Used in the Experiment

Diet Code	Diet Composition
Diet 1	Proteins + Vitamins
Diet 2	Proteins + Carbohydrates
Diet 3	Vitamins + Minerals + Proteins
Diet 4	Fatty Acids + Minerals + Carbohydrates

Each experimental group of chicks was assigned one of the above diet types, and the same diet was provided continuously throughout the experimental period.

3.3 Poultry Species

The experiment included four different poultry species. These species and their corresponding codes are shown in Table 2.

Table 2: Types of Poultry Species

Species	Code
Pure Breed	PB
Hybrid Chicken	HC
Bantam Chicken	BC
Broiler	BR

3.4 Experimental Procedure

After hatching, the chicks were carefully placed into four experimental groups (Group I, Group II, Group III, and Group IV). Each group contained chicks from all four species, ensuring a balanced representation. Each group was assigned a specific diet type, and the feeding experiment was conducted for 24 consecutive days.

During the experimental period, the growth performance of the chicks was monitored daily. The following measurements were recorded:

- Body weight of chicks
- Height of chicks

In addition to these measurements, other relevant factors were also considered, including:

- Gender of the chick
- Future purpose of the chick (egg-laying or meat production)

These variables were included in the study to examine whether they influenced the growth response to different diets.

4. Results

This section presents the results obtained from the statistical analysis of the data collected during the experimental study. The primary objective of the analysis was to examine the effect of different poultry diets on the growth performance of poultry chicks belonging to four different species, namely Bantam Chicken (BC), Broiler (BR), Hybrid Chicken (HC), and Pure Breed (PB). Growth performance was evaluated using two important indicators: average body weight and average height of the chicks.

Table 3: Summary according to Species

	Species	**BC**		**BR**		**HC**		**PB**	
Measurement	**Day**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**
Weight	Day 1	0.0450	0.0011	0.0452	0.0013	0.0429	0.0013	0.0461	0.0015
	Day 24	0.9781	0.0236	0.9857	0.0236	0.9864	0.0290	0.9932	0.0309
	Increase (Day 24 − Day 1)	0.9331	0.0238	0.9405	0.0241	0.9435	0.0295	0.9472	0.0314
Height	Day 1	2.0490	0.1040	2.0860	0.1020	2.1215	0.0903	2.2017	0.0774
	Day 24	6.6780	0.1630	6.8750	0.1910	6.7310	0.1840	6.9680	0.1740
	Increase (Day 24 − Day 1)	4.6290	0.1360	4.7880	0.1490	4.6090	0.1610	4.7660	0.1650

Table 3 shows the summary of weight and height growth of chicks according to species. The initial weight and height at Day 1 are quite similar across all species, indicating comparable starting conditions. By Day 24, all species show substantial increases in both weight and height. Among them, PB species

shows the highest weight at Day 24 and the greatest weight increase, while BR species records the highest increase in height. However, the differences among species are relatively small, suggesting that growth patterns are similar across the four species during the study period

Table 4: Summary according to purpose of Chick produced

	Purpose of Chick produced	**Egg Laying**		**Food**	
Measurement	**Day**	**Mean**	**SE**	**Mean**	**SE**
Weight	Day 1	0.0449	0.0010	0.0447	0.0008
	Day 24	0.9930	0.0213	0.9796	0.0163
	Increase (Day 24 − Day 1)	0.9481	0.0217	0.9349	0.0165
Height	Day 1	2.0909	0.0735	2.1257	0.0622
	Day 24	6.8380	0.1430	6.7790	0.1120
	Increase (Day 24 − Day 1)	4.7470	0.1260	4.6537	0.0905

Table 4 summarizes the growth of chicks according to the purpose of production (egg laying and food production). The initial weight and height at Day 1 are very similar for both groups, indicating comparable starting conditions. By Day 24, chicks produced for egg laying show slightly higher mean weight and greater weight increase compared to those produced for food. Similarly, the increase in height is also slightly higher in egg-laying chicks. However, the differences between the two groups are relatively small, suggesting that the purpose of production does not lead to major differences in growth during the study period.

Table 5: Summary according to diet provided to Chicks

Measurement	**Day**	**Diet 1**		**Diet 2**		**Diet 3**		**Diet 4**	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Weight	Day 1	0.0452	0.0011	0.0449	0.0012	0.0422	0.0013	0.0466	0.0014
	Day 24	0.9638	0.0054	0.9994	0.0088	1.1198	0.0065	0.8676	0.0035
	Increase (Day 24 − Day 1)	0.9186	0.0050	0.9545	0.0088	1.0776	0.0061	0.8211	0.0036
Height	Day 1	2.3000	0.0971	1.8062	0.0591	2.2323	0.0689	2.1043	0.0907
	Day 24	6.8020	0.1350	6.7631	0.0974	7.5754	0.0757	6.1300	0.1040
	Increase (Day 24 − Day 1)	4.5023	0.0605	4.9569	0.0642	5.3431	0.0678	4.0257	0.0384

Table 5 presents the growth performance of chicks under different diet types. The initial weight and height at Day 1 are similar across all diet groups, indicating comparable starting conditions. By Day 24,

chicks fed with Diet 3 show the highest mean weight and the greatest increase in weight, followed by Diet 2 and Diet 1, while Diet 4 shows the lowest weight growth. A similar pattern observed for height, where Diet 3 results in the highest height at Day 24 and the largest height increase. These results suggest that Diet 3 is the most effective diet for promoting both weight and height growth of poultry chicks during the study period.

To examine the influence of different factors on the growth of poultry chicks, a one-way analysis of variance (ANOVA) was performed. The analysis was conducted separately for two growth indicators: body weight and height of chicks. Measurements were considered at Day 1, Day 24, and the increase in growth (Day 24 – Day 1). The factors included in the analysis were diet type, species, gender, and purpose of production (egg laying or food production). The significance of each factor was evaluated using the corresponding p-values obtained from the analysis and is given in below Table.

Table 6: P-values of ANOVA tests to check significance of
Different factors on growth of chicks

	Day	Diet	Species	Gender	Purpose of production
Weight	Day1	.104	0.382	0.675	0.897
	Day24	<.001	0.983	0.510	0.613
	Diff (Day24 – Day1)	<.001	0.985	0.503	0.623
Height	Day1	<.001	0.716	0.321	0.718
	Day24	<.001	0.651	0.219	0.725
	Diff (Day24 – Day1)	<.001	0.778	0.414	0.540

The results of the one-way analysis indicate that diet has a significant effect on the growth of poultry chicks, particularly for weight and height measured on Day 24 and for the increase in growth (Day 24 – Day 1), as the p-values are less than 0.001. However, the effect of diet on the initial weight at Day 1 is not significant ($p = 0.104$), indicating that the chicks had similar starting weights before the feeding experiment. On the other hand, the factors species, gender, and purpose of production show p-values greater than 0.05 for both weight and height measurements, suggesting that these factors do not have a statistically significant effect on the growth of chicks during the study period. Overall, the results suggest that diet composition is the main factor influencing the growth performance of poultry chicks in the experiment. The below figure illustrates the mean increase in weight and Height of poultry chicks in 24 days under different diet types with standard error bars.

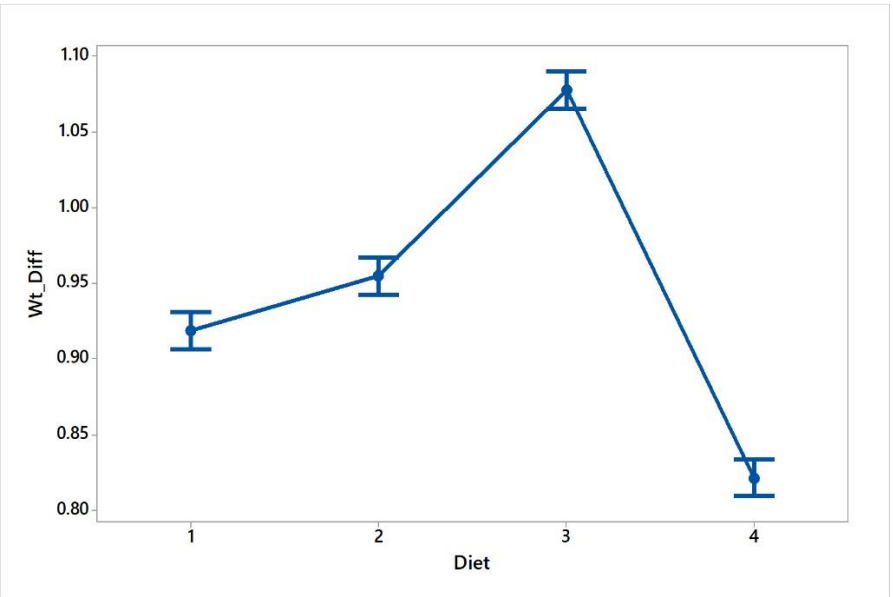

Figure 1: Interval Plot for Increase in Weight under different diet types

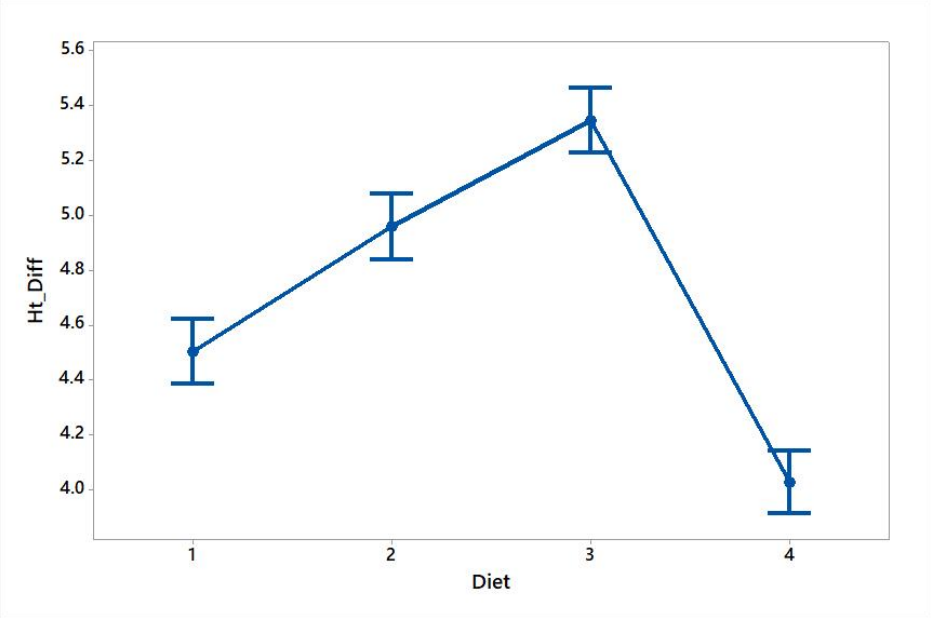

Figure 2: Interval Plot for Increase in height under different diet types

From figures it is observed that Diet 3 shows the highest mean weight gain, indicating that chicks fed with this diet experienced the greatest growth during the study period. Diet 2 shows the second highest weight increase, followed by Diet 1, which demonstrates moderate growth. In contrast, Diet 4 shows the lowest weight gain among all diets. The error bars indicate relatively small variability within each diet group, suggesting that the weight gain pattern is consistent across the samples. Overall, the graph highlights that Diet 3 is the most effective diet for promoting weight growth in poultry chicks during the experimental period.

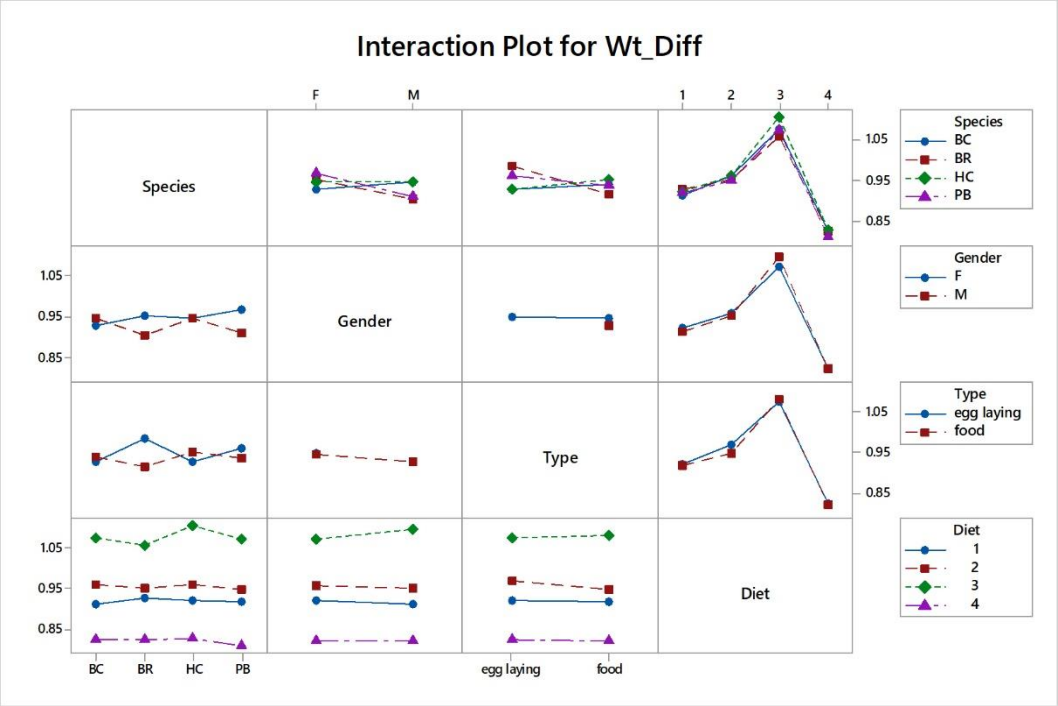

Figure 3: Interaction plot to assess impact of different factors on chick weight growth

Figure 3: Interaction plot to assess impact of different factors on chick weight growth

Figure 3 and Figure 4 show the interaction plots illustrating how species, gender, purpose of production, and diet affect the increase in weight and height of chicks over 24 days. The lines for species, gender, and production purpose are mostly parallel, indicating that these factors do not strongly interact with each other in influencing chick growth. This suggests that the growth patterns remain generally similar across different species, between males and females, and between chicks produced for egg laying or food.

However, a clear difference is observed with respect to diet type. In both figures, Diet 3 consistently shows the highest increase in both weight and height, indicating that this diet supports better growth of chicks. Diet 1 and Diet 2 show moderate growth, while Diet 4 consistently records the lowest increase in both weight and height. These results suggest that diet composition plays the most important role in determining the growth performance of chicks, whereas the effects of species, gender, and production purpose are relatively small during the study period.

5. Conclusion

This study examined the growth performance of poultry chicks under different diet compositions by analyzing changes in body weight and height from Day 1 to Day 24. The results indicate that diet composition plays a significant role in influencing the growth of chicks, while factors such as species, gender, and purpose of production do not show a statistically significant effect during the study period. Among the diets tested, Diet 3 (Vitamins + Minerals + Proteins) demonstrated the highest increase in both weight and height, indicating that this nutrient combination provides better support for chick growth. In contrast, Diet 4 (Fatty Acids + Minerals + Carbohydrates) showed the lowest growth performance, suggesting that this composition may be less effective for promoting rapid growth in chicks.

Overall, the findings highlight the importance of balanced and nutrient-rich diets in poultry farming to enhance growth performance. The superior performance of Diet 3, which contains proteins along with essential vitamins and minerals, suggests that such combinations are beneficial for optimal development. These results may help poultry farmers and researchers better understand the role of nutrition in chick development and guide future studies aimed at improving feed formulations for enhanced poultry productivity.

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