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Comparative Study of Performances of Broilers Under Purchased Feed Product and Homemade Feed Product

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Abstract: ***Broiler chickens are among the most widely farmed animals in the world, and this type of poultry plays a significant role in meeting the global demand for animal protein (The Human League (THL), 2023). Researchers developed homemade feed product consisting of mung bean, peanut, ginger, eggshell, and garlic, and compared its effectiveness on broiler performances with a commercially purchased feed, and was conducted over 45 days using a true experimental design to assess differences between the two feed types and their result on broilers' performances, including height, weight, feather condition, activity, and agility. Over the course of six weeks, the researchers produced six batches of homemade feed, and observed the broilers. The results indicated that while the broilers performed better on the commercial feed, the homemade feed was still effective, as it met the broilers' standard requirements for height, weight, feather condition, activity, and agility. Homemade feed was able to maintain its qualities for the entire 45-day observation period. In conclusion, the researchers recommend that future studies employ more advanced equipment, such as a high-powered blender, to improve the quality of homemade feed. Additionally, they suggest examining the effects of higher temperatures (above 35°C) on the feed ingredients to further enhance the product's performance.***

Keywords: Feed Product, Broilers' Performances, Feed Effectiveness, Feed Formulation.

I. INTRODUCTION

Broiler chickens are among the most widely farmed animals globally, primarily raised for meat production to meet the growing demand for animal protein. These birds are bred for rapid growth, reaching maturity in about seven weeks due to genetic selection. However, despite their rapid growth, broilers can sometimes die unexpectedly without showing any obvious signs of illness, a condition linked to metabolic diseases or poor nutrition, particularly high carbohydrate intake. Managing their nutrition and feed can help reduce these sudden deaths, with feed texture, density, and restriction methods being potential solutions.

The poultry industry has long faced the challenge of producing high-quality poultry while minimizing production costs. Broilers are typically fed pelleted diets, which offer benefits like reduced wastage and better taste appeal. However, some farmers opt for homemade feed products, which may be cheaper and allow greater control over ingredients, ensuring fresher, more natural diets for the birds. Homemade feed also avoids preservatives and additives commonly found in commercial feeds, potentially benefiting the birds' health while being cost-effective in the long term.

In the Philippines, broiler chicken farming is a significant part of the poultry industry, with Central Luzon leading the country in broiler chicken inventory. However, there is limited research comparing the effectiveness of homemade versus purchased feed products for broilers. While commercial feeds offer standardized nutrient qualities, they can sometimes be adulterated with substances like sawdust and sand. This study aims to compare the performance of broilers fed homemade and purchased feed, focusing on how different ingredients in homemade feed may affect broiler growth and overall health.

II. METHODOLOGY

This research will use experimental research within the quantitative research design branch. This approach involves collecting quantitative data and performing statistical analysis to achieve research objectives. Experimental design ensures precision and allows for drawing specific conclusions related to a hypothesis statement by conducting research in a controlled and objective

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manner. The main goal is to examine the dependent variable by the use of independent variable. True experimental design is a statistical method used to establish a cause-and-effect relationship between multiple factors (Bell, S., 2019). It is considered to be one of the most reliable type of research designs, offering compelling evidence to prove connections. Experimental research involves observing the outcomes of the study, such as risk factors and diagnostic test, without manipulating who is exposed to it. Researchers prefer to use true experimental research design as it is seen as the most precise form of experimental study. This is because true experiments rely on statistical analysis to either confirm or refuse a hypothesis. A real experiment is considered the best way to show cause and effect by testing independent variables.

According to Peter, B. and David, W. (2003), using research instruments emerges as the quintessential companion text to the researcher's toolkit. Jointly, these two volumes offer a stellar, hands-on introduction to the undertaking of a social research study, fully equipping scholars with the essential tools and methods necessary for systematic inquiry within the social sciences. In this research, there is one (1) methods for gathering data; the observational checklist.

An observational checklist is a structured list of items that is an observers' reference. It outlines specific aspects or behaviors to observe, which could be predetermined by the observer (British Council n.d). The checklist serves as a guide for systematic observation, ensuring that key areas of interest are covered during the observation process. By using an observational checklist, observers can maintain focus, consistency, and objectivity in their observations, facilitating accurate data collection and analysis.

III. RESULTS AND DISCUSSION

A. Comparative Study of Performances of Broilers Under Purchased Feed Product and Homemade Feed Product.

1) Observational checklist of significant differences between purchased feed product and homemade feed product to broilers in terms of height

This table shows the results that researchers used to determine the effectiveness of homemade feed product to HMFP broilers in terms of height. It shows that the researchers measured the height of two controlled groups each week to determine the effectiveness.

Table 1. Height of the broilers who eat purchased feed product:

STANDARD HEIGHT OF BROILERS IN CM: WEEK 1: 6.35-7.62cm WEEK 2: 10.16-12.7cm WEEK 3: 15.24-17.78 cm						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	Height	6.35-7.62cm	Height	10.16-12.7cm	Height	15.24-17.78cm
PFP 1	6.78cm	/	10.28cm	/	17.28cm	/
PFP 2	7cm	/	12cm	/	17.65cm	/
PFP 3	6cm	/	12cm	/	19cm	/
PFP 4	7.24cm	/	11.96cm	/	18.65cm	/
PFP 5	7cm	/	11cm	/	17cm	/

STANDARD HEIGHT OF BROILERS IN CM: WEEK 4: 20.32-22.86cm WEEK 5: 25.4-27.94cm WEEK 6: 30.48-35.56cm						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	Height	20.32-22.86cm	Height	25.4-27.94cm	Height	30.48-35.56cm
PFP 1	23.98cm	/	26.90cm	/	33cm	/
PFP 2	24.65cm	/	29.76cm	/	34.33cm	/
PFP 3	24cm	/	27cm	/	34.11	/
PFP 4	24.11cm	/	28.98cm	/	35cm	/
PFP 5	23.12cm	/	29.56cm	/	34cm	/

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Height of the broilers who eat homemade feed product:

STANDARD HEIGHT OF BROILERS IN CM: WEEK 1: 6.35-7.62cm WEEK 2: 10.16-12.7cm WEEK 3: 15.24-17.78 cm						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	Height	6.35-7.62cm	Height	10.16-12.7cm	Height	15.24-17.78cm
HMFP 1	6.53cm	/	10.25cm	/	15.98cm	/
HMFP 2	6.45cm	/	10.76cm	/	15.29cm	/
HMFP 3	7cm	/	11cm	/	15.28cm	/
HMFP 4	6.97cm	/	11.56cm	/	16.56cm	/
HMFP 5	7cm	/	11cm	/	16cm	/

STANDARD HEIGHT OF BROILERS IN CM: WEEK 4: 20.32-22.86cm WEEK 5: 25.4-27.94cm WEEK 6: 30.48-35.56cm						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	Height	20.32-22.86cm	Height	25.4-27.94cm	Height	30.48-35.56cm
HMFP 1	20.57cm	/	25.36cm	/	30.50cm	/
HMFP 2	20.40cm	/	25.4cm	/	30.48cm	/
HMFP 3	20.36cm	/	25.4cm	/	31.11cm	/
HMFP 4	21.93cm	/	26.78cm	/	32.92cm	/
HMFP 5	21.50cm	/	26.73cm	/	32.86cm	/

The broilers in the experiment showed steady height growth over 45 days, starting at 2.5 inches (6.35 cm) on Day 1 and reaching 13 to 14 inches (33.02 to 35.56 cm) by Day 45. Their height increased progressively each week, with notable milestones at Day 7 (3 inches), Day 14 (4-5 inches), Day 21 (6-7 inches), Day 28 (8-9 inches), Day 35 (10-11 inches), and Day 42 (12-13 inches). Factors influencing this growth included feed energy, particle size, form, environmental conditions, and genetics. These findings align with expected growth patterns for broilers under proper care and nutrition.

Table 2. Height of the broilers

OVERALL_HEIGHT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.900	1	7.900	24.566	.001
Within Groups	2.573	8	.322		
Total	10.473	9			

The one-way ANOVA test shows a significant difference in broiler height between purchased feed (PFP) and homemade feed (HMFP), with a p-value of 0.001, which is less than 0.05. This confirms significant height differences across the 6-week period. Broiler height growth is influenced by nutrients like protein, calcium, phosphorus, and vitamin D3, which are crucial for muscle and bone development. Deficiencies in these nutrients can hinder growth.

2) Observational checklist of significant differences between purchased feed product and homemade feed product to broilers in terms of weight

This table shows the results that researchers used to determine the effectiveness of homemade feed product to HMFP broilers in terms of weight. It shows that the researchers measured the weight of two controlled groups each week to determine the effectiveness.

Table 3. Weight of the broilers who eat purchased feed product:

STANDARD WEIGHT OF BROILERS IN KG: WEEK 1: 450-680g WEEK 2: 1.1-1.4kg WEEK 3: 1.6-1.8kg						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	Weight	0.40-0.68kg	Weight	1.1-1.4kg	Weight	1.6-1.8kg
PFP 1	0.6kg	/	1.4kg	/	1.7kg	/
PFP 2	0.56kg	/	1.3kg	/	1.7kg	/
PFP 3	0.50kg	/	1.2kg	/	1.6kg	/
PFP 4	0.48kg	/	1.2kg	/	1.6kg	/
PFP 5	0.50kg	/	1.3kg	/	1.7kg	/

STANDARD WEIGHT OF BROILERS IN KG: WEEK 4: 2.0-2.3kg WEEK 5: 2.5-2.7kg WEEK 6: 2.9-3.4kg						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	Weight	2.0-2.3kg	Weight	2.5-2.7kg	Weight	2.9-3.4kg
PFP 1	2.3kg	/	2.6kg	/	3.1kg	/
PFP 2	2.5kg	/	2.7kg	/	3.3kg	/
PFP 3	2.4kg	/	2.5kg	/	2.9kg	/
PFP 4	2.3kg	/	2.7kg	/	3.2kg	/
PFP 5	2.2kg	/	2.6kg	/	3.2kg	/

Weight of the broilers who eat homemade feed product

STANDARD WEIGHT OF BROILERS IN KG: WEEK 1: 450-680g WEEK 2: 1.1-1.4kg WEEK 3: 1.6-1.8kg						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	Weight	0.40-0.68kg	Weight	1.1-1.4kg	Weight	1.6-1.8kg
HMFP 1	0.6kg	/	1.3kg	/	1.8kg	/
HMFP 2	0.50kg	/	1.4kg	/	1.8kg	/
HMFP 3	0.60kg	/	1.1kg	/	1.6kg	/
HMFP 4	0.59kg	/	1.1kg	/	1.7kg	/
HMFP 5	0.48kg	/	1.2kg	/	1.6kg	/

STANDARD WEIGHT OF BROILERS IN KG: WEEK 4: 2.0-2.3kg WEEK 5: 2.5-2.7kg WEEK 6: 2.9-3.4kg						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	Weight	2.0-2.3kg	Weight	2.5-2.7kg	Weight	2.9-3.4kg
HMFP 1	2.1kg	/	2.5kg	/	2.9kg	/
HMFP 2	2.0kg	/	2.6kg	/	2.9kg	/
HMFP 3	2.1kg	/	2.5kg	/	3.2kg	/
HMFP 4	2.1kg	/	2.6kg	/	3.1kg	/
HMFP 5	2.2kg	/	2.6kg	/	3.3kg	/

This table represents the result that the researchers got during the experiment and observation in terms of Weight. PFP 1 to 5 broilers achieved the standard in week 1 to 6. While HMFP 1 to 5 broilers also match the standard of week 1 to 6. For each week, HMFP and PFP broilers showed improvements on their weights. PFP broilers dominated in weights, but HMFP broiler still manages to enter the standard weight or weight requirements of the broilers. According to USDA, (2020), broilers chickens exhibit impressive weight gain throughout their growth phase, experiencing substantial increases in size.

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Table 4. Weight of the broilers

OVERALL_WEIGHT

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.009	1	.009	4.690	.062
Within Groups	.015	8	.002		
Total	.024	9			

It shows no significant difference in broiler weight between purchased feed (PFP) and homemade feed (HMFP), with a p-value of 0.062, greater than 0.05. Broiler weight gain is influenced by protein, energy density, amino acids, vitamins, and minerals. Protein and key amino acids support muscle growth, while caloric density impacts growth rate. Vitamins A, D, E, and minerals like calcium and phosphorus help with weight gain. Feed form, such as pelleted diets, can also improve digestion and intake.

3) Observational checklist of significant differences between purchased feed product and homemade feed product to broilers in terms of feather

This table shows the results that researchers used to determine the effectiveness of homemade feed product to HMFP broilers in terms of feather. It shows that the researchers measured the feather of two controlled groups each week to determine the effectiveness.

Table 5. Feather of the broilers who eat purchased feed product:

STANDARD FEATHER'S MEASUREMENT OF BROILERS IN CM: WEEK 1: 1.27cm WEEK 2: 2.54-5.08cm WEEK 3: 5.08-7.62cm						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	EM	1.27cm	EM	2.54-5.08cm	EM	5.08-7.62cm
PFP 1	1.58cm	/	5cm	/	7cm	/
PFP 2	1.40cm	/	4.69cm	/	6.10cm	/
PFP 3	1.51cm	/	4.99cm	/	6.79cm	/
PFP 4	1.50cm	/	5cm	/	7.13cm	/
PFP 5	1.36cm	/	4.86cm	/	6.56cm	/

STANDARD FEATHER'S MEASUREMENT OF BROILERS IN CM: WEEK 4: 7.62-10.16cm WEEK 5: 10.16cm-12.7cm WEEK 6: 12.7-15.24						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	EM	7.62-10.16cm	EM	10.16cm-12.7cm	EM	12.7-15.24
PFP 1	10.10cm	/	11.97cm	/	14.92cm	/
PFP 2	8.94cm	/	10.73cm	/	13.59cm	/
PFP 3	9cm	/	10.90cm	/	13.90cm	/
PFP 4	10.15cm	/	12cm	/	15cm	/
PFP 5	8.90cm	/	10.70cm	/	14cm	/

Feather measurement for homemade feed product:

STANDARD FEATHER'S MEASUREMENT OF BROILERS IN CM: WEEK 1: 1.27cm WEEK 2: 2.54-5.08cm WEEK 3: 5.08-7.62cm						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	EM	1.27cm	EM	2.54-5.08cm	EM	5.08-7.62cm
HMFP 1	1.50cm	/	3.76cm	/	6cm	/
HMFP 2	1.49cm	/	4.58cm	/	5.89cm	/
HMFP 3	1.58cm	/	4cm	/	6cm	/
HMFP 4	1.50cm	/	4cm	/	6.10cm	/
HMFP 5	1.40cm	/	4.32cm	/	6.39cm	/

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STANDARD FEATHER'S MEASUREMENT OF BROILERS IN CM: WEEK 4: 7.62-10.16cm WEEK 5: 10.16cm-12.7cm WEEK 6: 12.7-15.24						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	EM	7.62-10.16cm	EM	10.16cm-12.7cm	EM	12.7-15.24
HMFP 1	8.50cm	/	10cm	/	12.76cm	/
HMFP 2	8cm	/	10cm	/	12.89cm	/
HMFP 3	7.99cm	/	10cm	/	12.89cm	/
HMFP 4	8.65cm	/	10.12cm	/	13.12cm	/
HMFP 5	8.79cm	/	10.27cm	/	13cm	/

While HMFP 1 to 5 broilers also match the standard of week 1 to 6. For each week, of HMFP and PFP broilers showed improvements on their feathers. PFP broilers has longer feathers, but HMFP broilers still manages to enter the standard length of feathers requirements of the broilers. According to Musa Sarica, (2021), broiler chickens exhibit impressive growth of feathers throughout their growth phase, leading to longer feathers.

Table 6. Feather of the broilers
OVERALL_FEATHERS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.697	1	1.697	18.801	.002
Within Groups	.722	8	.090		
Total	2.420	9			

This shows a significant difference in feather quality between broilers fed homemade feed and purchased feed, with an F-value of 18.801 and a p-value of 0.002, which is below the 0.05 significance level. The alternative hypothesis is accepted. Feather development is influenced by key nutrients like amino acids (methionine, cysteine), vitamins (biotin, folic acid), and trace minerals (zinc, copper, selenium). Deficiencies in these nutrients can lead to poor feather growth and damage. Nutritional adjustments, such as improving protein levels or adding bioavailable minerals, can enhance feather quality and reduce issues like feather breakage or poor regrowth.

4) *Observational checklist of significant differences between purchased feed product and homemade feed product to broilers in terms of agility.*

Table 7. Agility of the broilers who eat purchased feed product:

SPEED (s)						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	ES	8-10s	ES	8-10s	ES	6-8s
HMFP 1	10s	/	9s	/	8s	/
HMFP 2	9s	/	8.96s	/	8.56s	/
HMFP 3	9.90s	/	9s	/	8.50s	/
HMFP 4	10s	/	9s	/	8.90s	/
HMFP 5	9.50s	/	9.41s	/	8.10s	/

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SPEED (s)						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	ES	6-8s	ES	3-5s	ES	3.5-5s
HMFP 1	6.66s	/	5s	/	4.50s	/
HMFP 2	6.89s	/	5s	/	4.28s	/
HMFP 3	7.98s	/	4.98s	/	3.58s	/
HMFP 4	6s	/	5.12s	/	4s	/
HMFP 5	6s	/	5.32s	/	4s	/

Time speed of broilers who eat purchased feed product

SPEED (s)						
BROILERS	WEEK 1		WEEK 2		WEEK 3	
	ES	8-10s	ES	8-10s	ES	6-8s
PFP1	10s	/	9.56s	/	8.76s	/
PFP2	10.1s	/	9s	/	8.99s	/
PFP3	9.90s	/	9.75s	/	8.60s	/
PFP4	9.47s	/	9.12s	/	9s	
PFP5	10s	/	10s	/	9s	

SPEED (s)						
BROILERS	WEEK 4		WEEK 5		WEEK 6	
	ES	6-8s	ES	3-5s	ES	3.5-5s
PFP1	7s	/	7.13s		5.40s	/
PFP2	6s	/	7s		3.79s	/
PFP3	8.10s	/	7s		4.10s	/
PFP4	8s	/	7.12s		4s	/
PFP5	8s	/	7.24s		5.6s	/

The experiment tracked the agility of broilers over six weeks, focusing on their running speed in a 15-meter pathway. HMFP broilers consistently reached the standard speed (6-8 seconds) by week 6. PFP broilers reached the standard speed within 2 weeks, but PFP2 and PFP3 did not achieve the target time in week 3, though they improved by week 4. By week 5, none of the PFP broilers reached the standard speed (3-5 seconds), but they all met the standard again by week 6. The speed and agility of broilers are influenced by genetics, body composition, and health, with selective breeding prioritizing rapid growth and muscle development, particularly in the breast area. This emphasis on weight gain limits their running ability, as their heavier body mass places strain on their legs and joints, reducing mobility.

Table 8. Agility of the broilers

OVERALL_AGILITY

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.244	1	1.244	23.472	.001
Within Groups	.424	8	.053		
Total	1.668	9			

The one-way ANOVA test shows a significant difference in feather quality between broilers fed homemade feed (HMFP) and purchased feed (PFP), with a p-value of 0.001, which is below the 0.05 significance level. This indicates significant differences in feather measurement over 6 weeks, supporting the alternative hypothesis. Feather growth is influenced by adequate levels of protein, amino acids like methionine and cysteine, vitamins A, B, and E, and essential fatty acids like omega-3 and omega-6. These nutrients are vital for keratin synthesis, cell growth, and skin health, all of which affect feather quality and reduce issues like feather pecking.

IV. DISCUSSION

The experiment demonstrated that both HMFP and PFP broilers showed consistent and steady growth in height, weight, and feather development over the six-week monitoring period. PFP broilers generally outperformed HMFP broilers in terms of weight and feather length, reaching the required standards more quickly. Despite this, both feed types allowed the broilers to meet the expected growth milestones, confirming that with proper care, nutrition, and environmental conditions, broilers can develop successfully. The results align with established growth patterns, with factors like feed energy, particle size, and genetics contributing significantly to their development (Akinbobola, 2021).

For weight, both HMFP and PFP broilers showed improvement each week, with PFP broilers dominating in weight gain. HMFP broilers also met the standard weight requirements, though they did not surpass PFP broilers. This indicates that while both feed types supported healthy weight gain, PFP broilers were more efficient in achieving higher weights. Additionally, when it came to feather growth, PFP broilers consistently grew longer feathers compared to HMFP broilers, although the HMFP group still met the standard feather length requirements (Musa Sarica, 2021). This highlights that PFP broilers have a slight advantage in feather development, but HMFP broilers also maintained satisfactory growth in this area.

In terms of agility, HMFP broilers took longer to reach the standard running speed but consistently achieved it by week 6. PFP broilers, on the other hand, reached the standard speed within the first two weeks, although some PFP groups (PFP2 and PFP3) struggled in weeks 3 and 5 before improving by week 6. Despite their faster initial speed, PFP broilers' heavier body mass appeared to affect their mobility, making it harder for them to maintain their running ability over time. This suggests that the emphasis on rapid growth and muscle development, particularly in the breast area, may hinder their agility (Bessei, 2020; Wideman et al., 2023).

The results underscore the trade-off between rapid growth and mobility in broilers. Selective breeding for faster weight gain and muscle development can improve growth and feed efficiency but may negatively impact mobility and running ability. HMFP broilers, while slower to gain weight and grow feathers, showed better long-term consistency in terms of agility, maintaining the ability to meet the standard running speed. This indicates that while PFP broilers may excel in some areas of growth, HMFP broilers offer a more balanced performance across multiple factors (Bessei, 2020).

Ultimately, the experiment highlights the complexities of broiler farming, where factors such as feed, breeding practices, and environmental conditions all contribute to broiler performance. While PFP broilers show faster growth and better feather development, HMFP broilers offer improved agility and a more consistent overall performance. The findings suggest that farmers should consider both growth and mobility when selecting feed and breeding strategies for their broilers to ensure a balanced and healthy flock (Akinbobola, 2021; Bessei, 2020; Wideman et al., 2023).

V. CONCLUSION

The homemade feed product showed positive effects on the height, weight, feather development, activity, and agility of the broilers. This indicates that homemade feed can be effective in supporting the overall health and performance of broilers, offering a viable alternative to purchased feed under the right conditions.

There was a significant difference between homemade and purchased feed products in terms of broiler height, feather development, and agility. However, there was no significant difference in the weight of the broilers, suggesting that both feed types are equally effective in promoting weight gain but may differ in other performance areas, such as physical development and mobility.

Additionally, the researchers recommend that future studies assess the specific nutritional components of each ingredient in homemade feed to better understand their effectiveness for broilers. Economic analyses are also crucial to determine the cost-effectiveness of homemade feeds for smallholder farmers, taking into account their impact on feed conversion efficiency and overall productivity.

VI. LIMITATION

The focus of this study was to only compare the performances of broilers in each group under purchased feed product and homemade feed product in terms of height, weight, feather, activity, and agility. There were five broiler chickens in each of the two controlled groups, for a total of ten broilers. The researchers sought guidance from those who took care of the broilers to determine the best practices for their care; however, overall, the researchers were responsible for observing, analyzing, and interpreting the results. The independent variables were the purchased feed product and homemade feed product that the broilers consumed, while the dependent variable was the performance of the broilers, as their performances were influenced by the feeds offered to them.

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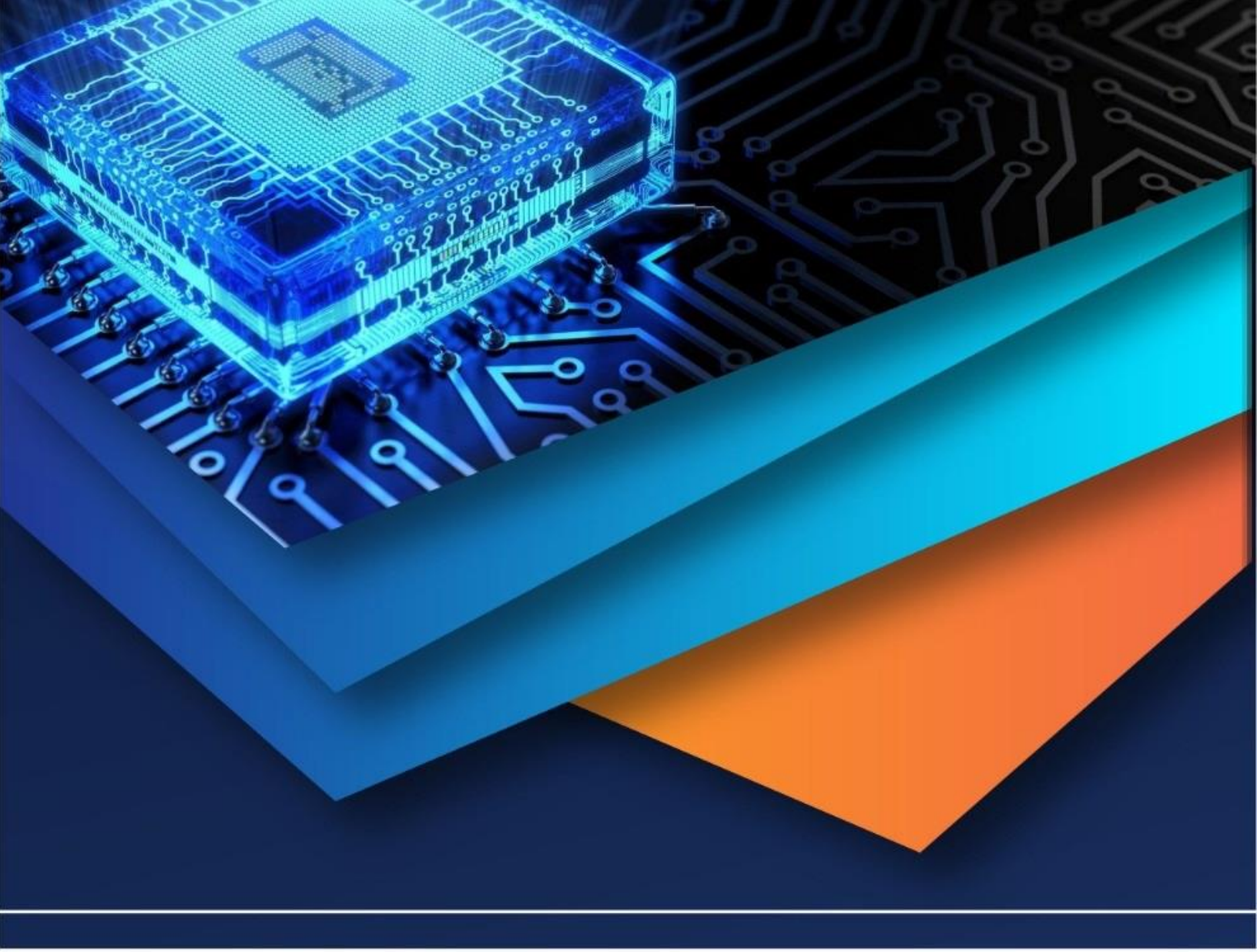
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