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Growth Performance Of F3 Hybrid Local Chickens Fed With Fermented Feed Containing Probiotics And Digestive Enzymes

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ABSTRACT

This study aims to evaluate the effectiveness of using fermented feed containing local probiotics and digestive enzymes on the growth of hybrid local chickens during the grower phase, which has been carried out at the Livestock Field Laboratory (LLP) of the Department of Animal Husbandry, Syiah Kuala University, Teuku Umar University Livestock Physiology and Reproduction Laboratory, and Plant Disease Laboratory, Faculty of Agriculture, Syiah Kuala University, Banda Aceh. The research material consisted of 150 Day Old Chicken (DOC) F3 hybrid local chickens derived from ALPU KUB cross, which were grouped by sex and given four different treatments, namely: (P0) 100% commercial feed, (P1) 100% fermented feed of local probiotics and digestive enzymes, (P2) a mixture of 50% fermented local probiotics and digestive enzymes with 50% commercial feed, and (P3) a mixture of 30% fermented local probiotics and digestive enzymes with 70% commercial feed. The results showed that fermented feed had a significant effect ($P < 0.05$) on the weight gain of chickens from 5 to 20 weeks of age, both males and females, with an increase in feed conversion and efficiency, while 100% fermentation caused a decrease in feed consumption, conversion, and efficiency which had an impact on the growth of hybrid local chickens during the grower phase. In the future, this research is expected to serve as a foundation for developing more efficient and sustainable fermented feed technology, while also enhancing the productivity of local hybrid chickens.

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1. Introduction [Heading of Section]

Fermented diet is an alternative technology used to improve feed quality, followed by high protein retention, which will have an impact on chicken performance (Yaman et al., 2012). The advantages of fermented diet include improving diet quality, increasing digestibility, extending diet shelf life, and providing positive effects on chicken growth, productivity, diet efficiency, and health (Buckle et al., 2013). One type of Indonesian local chicken that is already popular is the superior local

broiler chicken (ALPU), which can be harvested at 6 weeks of age and has a growth rate that exceeds that of native chickens. It has the ability to adapt to local feed and has economic value as a promising broiler chicken (Yaman et al., 2010). Additionally, there is also a local layer chicken, namely the Research and Development Agency (KUB) native chicken, which has high and consistent egg-laying characteristics. KUB chickens have an egg production of 160–180 eggs/year, a hen-day egg production of 50%, a peak hen-day egg production of 65–70%, and an age of first egg-laying of around 20–22 weeks. Business opportunities for KUB chickens remain wide open, through the utilisation of meat and eggs, which can be pursued through the development of KUB chickens (Prawiranegara et al., 2018).

In the use of locally sourced fermented diet, probiotics and enzymes are used as diet additives to improve diet digestibility, thereby increasing efficiency and optimising the productivity of superior local chickens (Astuti et al., 2015). Probiotics containing non-pathogenic microbes can have positive effects on health and physiology, including hypocholesterolemia, which lowers cholesterol levels in livestock blood plasma (Azizah et al., 2020). Probiotics contain beneficial bacteria that are introduced into the digestive system to dominate disease-causing (pathogenic) bacteria. Probiotics work by suppressing microbial populations through competition by producing antimicrobial compounds or through nutrient competition, altering microbial metabolism by increasing or decreasing enzyme activity, and stimulating immunity through increased antibody levels or the activity of large cells.

MATERIALS AND METHODS

This research was conducted over a period of six months, from January to June 2025. Chicken maintenance and feeding activities were carried out at the Field Laboratory of Animal Husbandry (LLP), Faculty of Agriculture, Syiah Kuala University.

MATERIAL

The main subject of this study was local hybrid chickens that were fed fermented diet based on local probiotics and exogenous digestive enzymes. The probiotics used were derived from local microbial isolates such as *Lactobacillus salivarius* and *Clostridium butyricum*, which have been shown to improve growth performance, production performance and gut health (Lv et al., 2021; Xiang et al., 2019). The digestive enzymes used include phytase and xylanase, which function to improve nutrient digestibility and feed utilisation efficiency (Kayan et al., 2025).

The treatments diet was formulated using fermented local feed ingredients, combined with probiotic and digestive enzymes, and designed to meet the nutritional requirements of local hybrid chickens. Details of the diet ingredients, formulation, and nutritional composition are presented in Table 1:

Table 1. Research ration feed formulation

No	Material	Percentage (%)
1	Rice bran	14
2	Soybean meal (SBM)	12
3	Corn	51
4	Meat meal	6
5	Poultry mineral mix	1
6	Sago flour	2
7	Shrimp head meal	6
8	Leucaena leaf meal	6
9	Enzim zymax	1.2
10	L- lysine	3
11	Probiotic	0.05
12	DL-Methionine	0.45
Total		100

Table 2. Feed Formulation and Nutritional Value

No	Material	Treatment			
		P1	P2	P3	P4
1	RK (%)	0	50	30	-
2	Paferproen (%)	0	100	50	70
	Number (%)	100	100	100	-
3	Nutritional Value				
a.	Protein (%)	18	20	19	-
b.	EM (kkal)	2700	3321	3312	-
c.	Crude fibre (%)	7	5.75	3.87	4.51
d.	Coarse fat (%)	7	6.28	6.29	6.00
	Total	100			

Description: RK 324-1: Diet from PT. Charoen Phophand, Paferproen: Local diet, The source of analysis: Industrial Services and Standardisation Agency, Banda Aceh, 2024.

RESEARCH METHODOLOGY

This study began with the preparation of the tools and materials needed for all stages of the activity. Organic feed materials were collected as the basic components of chicken feed, then mixed and fermented anaerobically for 21 days. A total of 120 F3 hybrid local chickens (ALH) were used as experimental animals, all of which were and female and male. The chickens were placed in prepared cages and treated for 150 days. The study used a completely randomised design (CRD) with four treatments and five replicates. Feed was provided three times a day, at 07:00, 14:00, and 18:00 WIB. Drinking water was provided ad libitum. The feed treatment consisted of a combination of locally sourced probiotic-based fermented feed and exogenous digestive enzymes, which were administered according to the following formulation levels:

P0: Administration 100% commercial diet,

P1: Administration 100% local probiotic fermented diet and digestive enzymes,

P2: Administration 50% local probiotic fermentation and digestive enzymes with the 50% commercial and

P3: Administration 30% local probiotic fermentation and digestive enzymes with added 70% commercial diet.

OBSERVED PARAMETERS

Physical quality parameters : Growth rate, feed consumption, and FCR (Feed Conversion Ratio).

RESULTS AND DISCUSSION

The results showed that feeding fermented diet with local probiotics and digestive enzymes (P1) resulted in the highest weight gain in female chickens (809.91 ± 118.82 g) compared to other treatments. This indicates that pure fermented feed has a positive effect on the growth of female chickens during the grower phase. In male chickens, treatment P1 also showed the highest body weight (732.75 ± 26.24 g) compared to other treatments, although the difference was not very significant compared to P3 (724.60 ± 20.44 g). Meanwhile, treatment P2 (a mixture of 50% fermented feed and 50% commercial diet) showed the lowest body weight in male chickens (716.28 ± 19.78 g), indicating that this mixture proportion was less than optimal in supporting male chicken growth. Overall, the average weight gain of female chickens was higher than that of male chickens, with an average value of 744.88 g compared to 723.21 g for male chickens (table 3).

This indicates that female chickens are more responsive to fermented feed than male chickens.

This responsiveness can be attributed to physiological differences between the two sexes, whereby female chickens tend to have a more efficient metabolism in utilising nutrients, especially in conditions of fermented diet rich in probiotics and digestive enzymes. A study by Naeem and Bourassa (2025). shows that probiotics in poultry diet can improve gut microbiota balance, which contributes to improved digestibility and feed efficiency.

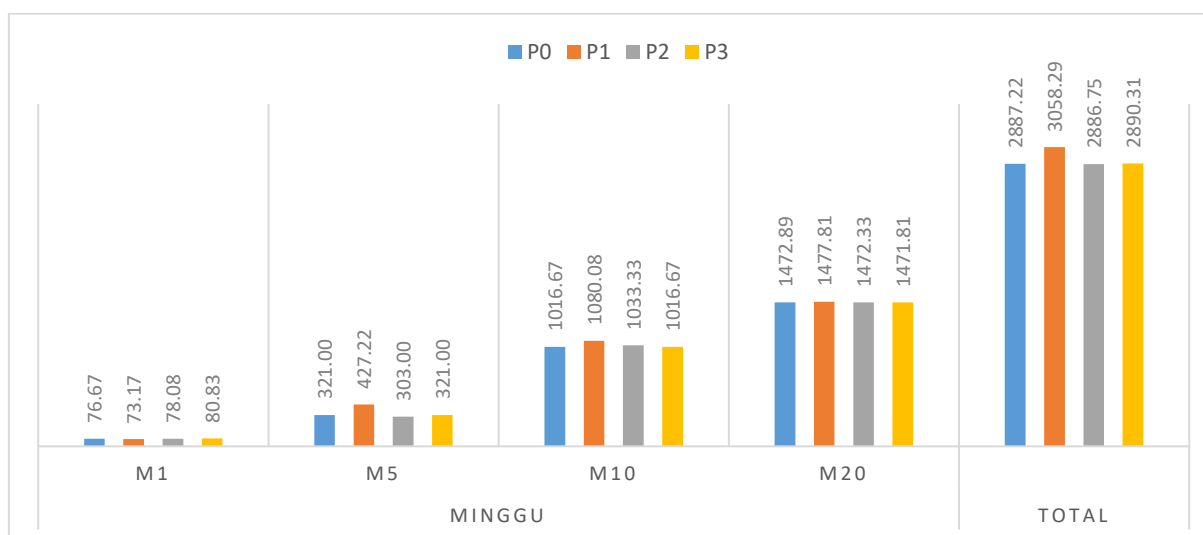
Table 3. Weight Gain of Local Hybrid Chickens

sex	Variabke Diet				Total	average
	P0	P1	P2	P3		
Male	719,22±27,4 ^s	732,75±26,24 ^b	716,28±19,78 ^h	724,60±20,44 ^c	2892,84	723,21
Female	723,76±34,4 ^c	809,91±118,82 ^a	724,35±31,77 ^d	721,48±32,77 ^f	2979,50	744,88
Total	1442,98	1542,66	1440,63	1446,08	5872,34	
average	721,49	771,33	720,31	723,04		734,04

Description: a, b superscripts indicate significant differences (P<0.05).

In terms of total weight gain, treatment P1 produced the highest total weight (1542.66g) compared to the other treatments, while P2 had the lowest total weight (1440.63g). The overall average of all treatments showed that fermented diet had a positive effect on the growth of local hybrid chickens, with an average weight gain of 734.04 g. This indicates that pure fermented diet has a positive effect on chicken growth, particularly in improving diet efficiency and nutrient absorption. According to research by Tridayana et al. (2022), fermented diet containing probiotics and digestive enzymes can significantly increase poultry weight, as probiotics help improve the balance of gut microbiota and digestive enzymes contribute to more optimal nutrient breakdown.

These results indicate that the use of fermented diet with local probiotics and digestive enzymes can improve the growth of local hybrid chickens, especially in female chickens. However, the formulation of fermented diet and commercial diet mixtures needs to be optimised to provide better results in male chickens.



Picture 1. Graph of Average Weight Gain of Local Hybrid Chickens over 20 Weeks

Based on the average weight gain graph (Figure 1), the results showed that during the 20 weeks of maintenance, medium-type local F3 hybrid chickens given treatment P1 (100% fermented diet with local probiotics and digestive enzymes) experienced better weight gain compared to other treatments. This fermented diet serves as an effective alternative in increasing chicken growth each week, because

the fermentation process increases the nutrient content in the diet, thereby meeting the nutritional needs of the livestock. This opinion is in line with the research by Anwar et al. (2020) which states that one of the main factors affecting weight gain is diet consumption. Additionally, Noferdiman et al. (2020). Also emphasised that, in general, weight gain in poultry is greatly influenced by the amount of diet consumed and the nutritional content of the diet. Thus, the use of fermented diet rich in probiotics and digestive enzymes can be an effective strategy in increasing the productivity of local hybrid chickens.

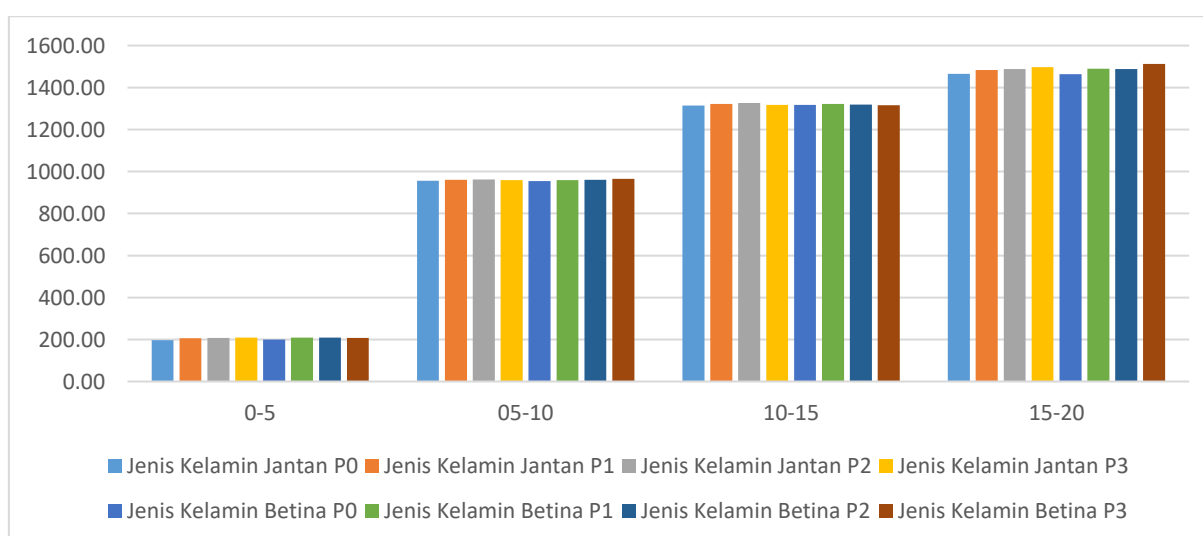
DIET CONSUMPTION

. The results showed that diet consumption of local F1 hybrid chickens increased with age, both in males and females. In general, diet consumption peaked between weeks 15 and 20, indicating that the nutritional requirements of chickens increase with their growth and development (Table 4).

Table 2. Average Feed Consumption of Local Hybrid F1 Chickens over 20 Weeks

Week	Sex							
	Male				Female			
	P0	P1	P2	P3	P0	P1	P2	P3
0-5	197.17	206.23	208.30	208.43	200.60	208.41	209.41	208.10
05-10	955.56	960.70	962.83	959.56	954.90	959.87	960.88	965.82
10-15	1314.27	1322.43	1325.85	1318.08	1317.77	1322.04	1318.35	1315.11
15-20	1465.97	1483.28	1488.05	1496.55	1463.03	1488.89	1488.31	1513.16
Total	3932.96	3972.63	3985.03	3982.61	3936.30	3979.20	3976.96	4002.19
Average	983.24	993.16	996.26	995.65	984.07	994.80	994.24	1000.55

The results of the analysis of variance showed that feeding fermented diet using proteolytic bacteria did not significantly affect diet consumption ($P>0.05$). The highest average diet intake was obtained from female P3 with 1000.55 (g/e), followed by male P2 with 996.26 (g/e), then male P3 with 995.65 (g/e), female P1 with 994.80 (g/e), P2 females 994.24 (g/e), P1 males 993.16 (g/e), P0 females 984.07 (g/e), and the lowest was P0 males with 983.24 (g/e).



Picture 2. Average Feed Consumption Chart for Local Hybrid Chickens over 20 Weeks

Female chickens had a higher average feed intake than male chickens, with an average of 1000.55 g compared to 995.65 g for males. This indicates that female chickens have greater energy requirements, especially in the final growth phase. According to research by Hascik et al. (2010), poultry diet consumption is influenced by physiological factors, including metabolism and energy requirements for growth. Higher diet consumption in the fermentation treatment indicates that fermentation improves digestibility and diet efficiency. However, the increase in feed consumption needs to be analysed further to ensure that the increase in consumption is in line with increased growth and diet efficiency. Overall, the results of this study indicate that fermented diet with local probiotics and digestive enzymes can increase diet intake in local F1 hybrid chickens, especially in female chickens. The optimal feed formulation needs to be further developed to ensure a balance between diet intake and growth efficiency.

Figure 2 shows the feed consumption pattern of local hybrid chickens during a 20-week period, comparing various treatments of fermented diet and commercial feed. In general, the graph shows an upward trend in diet consumption as the chickens age, both in males and females. This is consistent with previous studies stating that the nutritional requirements of poultry increase with their growth and development. High feed consumption does not necessarily indicate that the chickens being raised have good productivity and diet efficiency. Chickens with good productivity are characterised by optimal diet consumption and high weight gain.

FEED EFFICIENCY AND OPTIMAL FORMULATION

Table 1 shows that treatment P2 (a mixture of 50% fermented diet and 50% commercial diet) had the lowest total body weight (1440.63g) not much different from treatment P3 (a mixture of 30% local probiotic fermented diet and digestive enzymes with 70% commercial diet) with a total body weight of 1446.08 g. This indicates that this mixture proportion is insufficient in meeting nutritional requirements and is suboptimal in supporting the growth of local hybrid chickens. A study by Ibrahim and Usman (2019) reported that mixing 30% fermented material with conventional diet did not show a significant effect on diet efficiency. Ramdani et al. (2018) also stated that if the ration is deficient in protein or essential amino acids, it will cause a decrease in production and the chickens will lose weight.

FEED EFFICIENCY (FE) BERDASARKAN FEED CONVERSION RATIO (FCR)

Diet efficiency is calculated by comparing the increase in body weight with the amount of diet consumed. If the energy content in the ration is high, diet consumption will decrease, whereas if the energy content is low, diet consumption will increase to meet energy requirements, thereby affecting feed efficiency. Fitriani and Sami (2019) stated that feed efficiency is important for measuring the ability of livestock to utilise diet. Feed conversion ratio (FCR) is a benchmark for determining diet efficiency in chicken farming. A high feed conversion ratio indicates poor diet efficiency.

Table 3 presents the average FCR values for local hybrid chickens. The lowest value was obtained by treatment P1 with an average of 1.83, indicating that for every 1 kg of meat produced by local hybrid chickens, 1.83 kg of diet is required. The highest average FCR values were obtained by treatment P2 (2.04), P3 (1.97), and P1 (1.96), with an overall average of 1.95.

Table 5. Comparison of FCR Values for Local Hybrid Chickens Aged 0-20 Weeks.

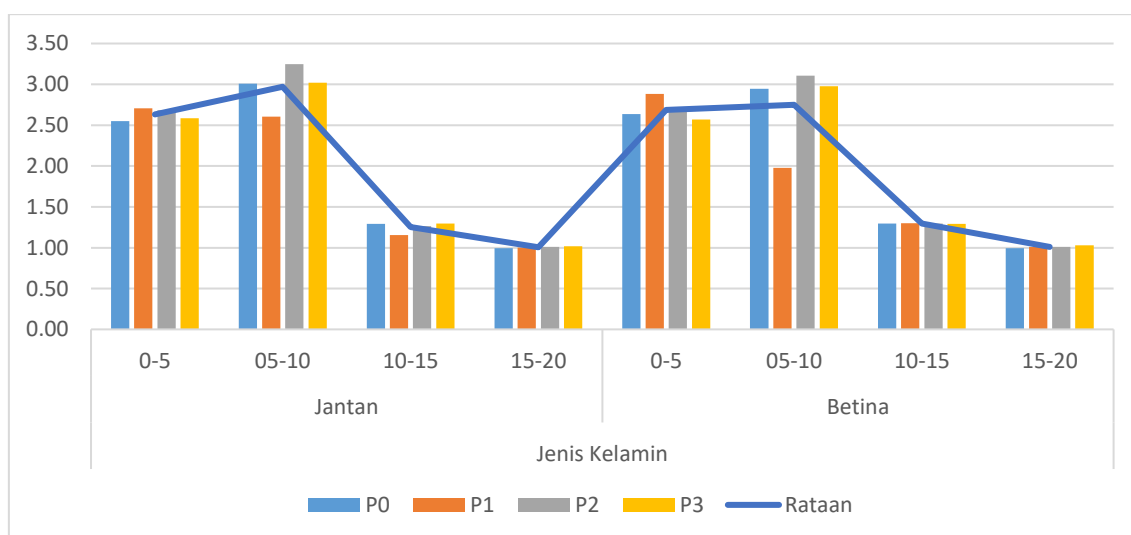
Treatment	Sex / Week								Rataan
	Male				Female				
	0-5	05-10	10-15	15-20	0-5	05-10	10-15	15-20	
P0	2,55	3,01	1,29	0,99	2,64	2,94	1,30	0,99	1,96
P1	2,71	2,61	1,16	1,00	2,88	1,98	1,30	1,01	1,83
P2	2,68	3,25	1,26	1,01	2,67	3,10	1,30	1,01	2,04

P3	2,58	3,02	1,30	1,02	2,57	2,98	1,29	1,03	1,97
Rataan	2,63	2,97	1,25	1,01	2,69	2,75	1,30	1,01	1,95

The results of this study are excellent when compared to the study reported by Purnamasari et al. (2024) on feed conversion in super native chickens, with an average FCR value of 2.68.

Graph 4 shows a visualisation of the comparison of FCR values that affect feed efficiency. Table 3 and Graph 4 compare feed consumption with weight gain over a certain period of time. The lower the FCR value, the less feed is needed to increase the weight of the chickens, according to Fauzi et al. (2023). The average FCR value in this study was 1.95, meaning that every 1.95 kg of feed consumed resulted in 1 kg of body weight gain in local hybrid chickens.

The data in the table and graph show differences in feed conversion rates. These differences in feed conversion can be influenced by various factors, one of which is differences in feed management and the temperature of the livestock rearing environment, resulting in varying feed conversion rates. Fatmaningsih et al. (2016) added that factors affecting feed conversion include genetics, feed quality, temperature, and raw materials that support nutrition in feed. This is reinforced by Rusli et al. (2019), who state that there are factors that can influence feed digestibility or ration consumption, including the age of native chickens, daily activities, environmental temperature, and ration quality and quantity.



Picture 4. Comparison Chart of Average FE and FCR Values for Local Hybrid Chickens

CONCLUSION

The use of fermented feed containing local probiotics and digestive enzymes has a positive impact on the growth of local hybrid chickens during the grower phase. Chickens fed 100% fermented feed (P1) experienced the highest weight gain, especially in female chickens, indicating that gender affects the response to fermented feed. Additionally, feed intake increased with age, with the highest intake occurring between weeks 15 and 20. Treatment P3 (30% fermented feed + 70% commercial feed) showed the highest feed intake in female chickens, indicating that the combination of fermented and commercial feed still had a positive effect on feed intake. Fermented feed also showed good effectiveness, as evidenced by the low FCR values obtained from the comparison between treatments. Overall, fermented feed improves feed efficiency and digestibility; however, the optimal formulation between fermented feed and commercial feed still needs to be further developed to ensure a balance between feed consumption and growth efficiency. Thus, this study provides a basis for the development

of more efficient and sustainable fermented feed technology, which has the potential to increase the productivity of local hybrid chickens as an economical alternative for farmers..

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