Research Article

Effect of Sex and Feeding Frequency on Growth Performance, Carcass Quality and Newcastle Disease Antibody Titers of Vietnamese Ac Chickens

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Abstract | This study aimed to evaluate the effects of feeding frequency and sex on growth performance, carcass characteristics, and Newcastle disease antibody titers in Ac chickens. The experiment was a 2x3 factorial design with three feeding frequencies (2, 3 and 4 times/day) and sex (male, female). The birds were fed *ad libitum* and had free access to water. The results showed that feeding frequency and gender had a significant effect on growth rate and feed efficiency ($p<0.05$). Chickens fed 4 times/day had the highest body weight at 8 weeks of age (483.02 g), while the 2 times/day group had the lowest (418.52 g). The average daily weight gain (ADG) increased with feeding frequency, while feed consumption and feed conversion ratio (FCR) decreased significantly ($p<0.01$). Male chickens had higher body weight (BW) and ADG than female chickens ($p<0.001$). Carcass showed that increasing the feeding frequency increased the carcass, breast and thigh meat weight ($p<0.01$). Gender affected the weight and thigh meat ratio, with males being higher than females. Regarding meat quality, the water loss rate of breast and thigh meat did not differ between treatments ($p>0.05$). The Newcastle disease (ND) antibody titers of chickens was stable between treatments ($p>0.05$). There was no significant interaction between feeding frequency and gender for most of the parameters. It can be concluded that when feeding frequency was increased to 4 times daily, the growth rate, feed efficiency and meat yield of Ac chickens improved, especially in males.

Keywords | Feeding frequency, Growth performance, Sex, Ac chicken

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INTRODUCTION

In Vietnam, poultry is a key player in the agricultural structure, providing significant protein-rich food for consumers (Khoa *et al.*, 2019). Due to consumers' preference for natural flavors and high nutritional value, the market for high-quality poultry meat products, specifically native breeds of chicken, has increased in recent years (Linh *et al.*, 2022a). Among these, the Ac chicken is a precious breed of chicken, with outstanding characteristics of black skin, meat and bones that are used widely in nutritious dishes and traditional medicine. However, Ac chicken grows at a slower rate than commercial chicken breeds (Linh *et al.*, 2022b), thus increasing productivity and feed efficiency must be an important goal to improve livestock efficiency.

Nutrition-related feed frequency (FF) is one of the most important nutritional management factors for growth efficiency, energy metabolism and meat quality of poultry. *Ad libitum* feeding could cause feed intakes that exceed the requirements for maintaining and producing a bird and also excess accumulation of body fat, which may disturb

the quality of meat (Butzen *et al*., 2013; Liu *et al*., 2020). Feeding at the correct frequency improves stabilizing of the blood glucose and amino acid levels, facilitates the optimization of the protein synthesis and as food can be supplied in the form of numerous small meals, can help the poultry digest and absorb the nutrients better, and it is better for the development of the gizzards and breast muscles, as well as having a positive influence on the meat yield and the value of carcass parts (Payne *et al*., 2019; Wang *et al*., 2024). The increase in feedings per day may improve feed intake and lead to weight gain and a reduction in feed conversion ratio in broilers. This mechanism is associated with an increase in digestive enzyme activities and the improvement of gizzard structure, leading to better crushing effects and nutrient efficiency (Huang *et al*., 2022; Payne *et al*., 2019). Furthermore, feeding several small meals also reduces physiological stress and restricts competition during feeding which ultimately stabilizes the endocrine system and improves immune function (van Emous *et al*., 2024). In addition, studies conducted reported that reasonable feeding frequency can increase the mass of lymphoid organs such as the thymus, bursa of Fabricius, and spleen, promoting the natural immune response of chickens (Payne *et al*., 2019; Wang *et al*., 2024). However, excessive feeding rate can decrease growth, lead to stress, and influence the final meat quality. From a recent study, Wang *et al*. (2024) found that the daily feeding frequency, which greatly controls the rate of nutrient digestion and absorption, significantly influences the weight gain rates of chickens as well as the way energy is distributed and energy reserves accumulated in the body. In addition, the experiment with 7-day-old Ross chickens also proved that in a different way (Aziz and Masoud, 2021) dividing the same feeding ration into several small meals (2-3 meals/day) increased body weight, raised the ADG, and cut feed intake when compared with feeding once a day. A similar study by van Emous *et al*. (2024) on laying hens demonstrated that variations in feeding frequency and feeding methods influence bird behavior and productive performance, indirectly affecting weight gain and flock uniformity.

Feeding frequency has been studied across various industrial chicken breeds; however, the effects of feeding frequency on the Ac breed have not been investigated. Ac chickens have slow growth rates, eat small amounts of feed and are sensitive to rearing procedures so that they respond differently to new feeding regimes. Figuring out how often to feed each chicken will not only improve their growth potential, feed efficiency, and meat quality, but also raise the Newcastle disease antibody titers impact of the native breed.

MATERIALS AND METHODS

Location and experimental period

The experiment was conducted at the Animal Husbandry Experimental Farm- Tra Vinh University, Tra Vinh Province, Vietnam (coordinates 9°55'05.8" N, 106°21'00.3" E) from May to August 2025. The entire research process on livestock was carried out in accordance with the regulations of the Science and Training Council of Tra Vinh University (No: 142/2024/HD.HDKH&DT-DHTV).

Experimental design and housing management

The study was conducted on 1- to 8-week-old Ac chickens to evaluate the effects of feeding frequency and sex on growth performance and carcass traits and immune response. The experiment was arranged in a 2 × 3 factorial design, including: Factor A (sex): 2 levels - male and female birds, factor B (feeding frequency): 3 levels - 2 times/day, 3 times/day, and 4 times/day. Each treatment was repeated 3 times with 8 birds per replicate and kept in pen. A total of 144 Ac chickens were randomly selected and evenly distributed by sex into experimental cages. The composition of ingredients was analyzed before going to experiment (Table 1).

Table 1: Chemical composition of feed ingredients.

Ingredients	DM	OM	CP	EE	NFE	CF	Ca	P	ME (Kcal)
Broken rice	86.2	99.7	7.98	0.91	90.7	0.10	0.020	0.100	3,488
Corn	87.2	98.4	7.15	1.8	88.2	1.24	0.004	0.140	3,699
Soybean	87.2	94.2	45.5	1.73	43.3	3.7	0.250	0.640	2,661
Rice bran	88.7	92.6	13.2	8.25	63.6	7.60	0.030	2.030	2,608
Fish meal	91.6	85.8	50	10	25.4	0.40	3.300	2.430	3,223
DCP	100	14.8	-	-	-	-	22.0	17.00	-
Stone meal	100	-	-	-	-	-	37.9	0.01	-
Methionine	99.3	-	-	-	-	-	-	-	-
Lysin	97.4	-	-	-	-	-	-	-	-
Mineral premix	100	-	-	-	-	-	-	-	-

DM: Dry Matter, OM: Organic Matter, CP: Crude Protein, EE: Ether Extract (Crude Fat), CF: Crude Fiber, Ca: Calcium, P: Phosphorus, ME: Metabolizable Energy (kcal/kg DM).

Chickens were kept on an indoor, naturally cool rice husk-lined floor with an automatic drinking water system to provide feed according to regulations (Table 2) and drinking water from every cage (*ad libitum*). The cages were cleaned and disinfected weekly and 12 hours of light were given each day. The temperature of the cage was set at temperatures between 29–32°C and average humidity around 60% on average daily. Chickens were monitored daily for health, behavior and feed intake. There were no deaths during the experiment. The experiment was conducted to observe the efficacy of Newcastle disease vaccine, but other types of vaccines were given simultaneously to maintain stable rearing conditions and biosecurity, the control condition between treatments. For this purpose, Newcastle disease vaccine was given twice in chickens with a baseline age of three days and 14 days. The chickens were also vaccinated for Fowl pox and Gumboro on day 7 and highly pathogenic avian influenza on day 14.

Table 2: Feed formulation and nutrient composition of Ac chickens.

Ingredients (g/100g)	Growth stages	
	1 - 4 weeks of age	5 - 8 weeks of age
Corn	24.0	30.2
Broken rice	13.0	12.5
Rice bran	29.0	28.3
Soybean	22.8	18.0
Fish meal	8.00	7.60
Dicalcium phosphate	0.30	0.30
Limestone powder	2.00	2.20
Lysine	0.20	0.20
Methionine	0.10	0.10
Mineral–vitamin premix	0.30	0.30
Salt	0.30	0.30
Total	100	100
Chemical composition		
DM (%)	88.0	88.0
OM (%)	91.7	91.7
CP (%)	21.0	19.0
Ca (%)	1.28	1.26
P (%)	0.80	0.76
ME (Kcal)	2,957	3,015

DM: Dry Matter, OM: Organic Matter, CP: Crude Protein, EE: Ether Extract, CF: Crude Fiber, Ca: Calcium, P: Phosphorus, ME: Metabolizable Energy (kcal/kg DM).

All chickens were fed the same balanced basic diet according to the nutritional standards of NRC (1994) ensuring adequate metabolizable energy (ME), protein, minerals and vitamins according to each stage of development. The diet formula is presented in Table 1. The amount of feed provided each day was calculated based on the average feed intake of chickens according to age, adjusted to increase gradually according to weekly body weight. Feeding frequency was as follows: 2 times/day: morning (07:00) and afternoon (16:00). 3 times/day: morning (07:00), noon (12:00) and afternoon (16:00). 4 times/day: early morning (06:00), mid-morning (09:00), afternoon (13:00) and late afternoon (17:00).

Growth performance

Chickens were weighed immediately after hatching (1 day old) to determine their initial weight. Throughout the experiment, body weight (BW) was measured weekly using an electronic scale with an accuracy of 0.01 g to monitor the growth rate of each treatment. Average daily gain (ADG) was calculated based on the difference in average weight between two consecutive weighings divided by the number of days in the period. Feed intake (FI) was determined by subtracting the total feed provided from the daily feed waste, then dividing by the total number of chickens in each cage. Feed intake was measured daily, starting from the first week until the end of the eighth week. Feed efficiency was assessed by the feed conversion ratio (FCR), which was calculated as the total feed consumed divided by the total body weight gain during the same period. FI, ADG and FCR data were aggregated by pen as the experimental unit to compare differences between treatments in feeding frequency and sex.

Carcass traits

The chickens were fasted for 6 hours, at 8 weeks of age, live weight of 18 chickens was randomly selected from the treatments for slaughtering (one bird for each replicate). The parameters selected were carcass weight, breast meat, thigh meat, digestive organs (liver, heart, gizzard). Furthermore, the immune organs including thymus, spleen and bursa of Fabricius were separated and weighed. The parameters included carcass weight, breast meat and thigh meat weight, mass of organs such as liver, gizzard and immune organs including spleen, thymus, bursa of Fabricius. All samples were measured using a digital balance with a 0.01 g accuracy for precision in weighing. After slaughter, breast and thigh meat samples were cut from each treatment to get cooking loss rates. Each sample was weighed before cooking and was recorded to record the mass up until then, and it was boiled in boiling water for 5 minutes. The meat was then reweighed after being cooked, and the loss was measured as the weight before and after cooking and the loss was made as the percentage loss of water during processing.

Newcastle disease (ND) antibody titers

One chicken was randomly sampled for serum analysis in

each treatment. Blood sampling was performed twice in the experiment: Blood samples were taken from the wing vein of chickens at 14 and 28 days of age using a 23G needle and a 5 mL syringe, each sample was determined separately for the treatment. Blood samples were refrigerated at 2–8 °C and immediately transported to the laboratory for analysis. Indices such as Hemoglobin (HI) were determined in accordance with TCVN 8400-4:2010. The data were used to evaluate the immune response status of the chickens according to each feeding frequency.

Data analysis

The data obtained were original data, preliminarily processed using Microsoft Excel 365 software. Statistical analysis was performed using the two-way ANOVA method to evaluate the effects of gender (A), feeding frequency (B) and interaction effects (A × B). Mean comparisons were performed using the Tukey test at significance levels $p < 0.05$.

RESULTS

The effect of sex and feeding frequency on growth performance of the chickens

The results (Table 3) showed that feeding frequency and gender both significantly affected the growth performance of Ac chickens. Chickens fed 4 times/day had significantly higher body weight and average daily gain (ADG) than those fed 2 or 3 times ($p < 0.05$). At 8 weeks of age, the 4-time feeding group reached 483 g, higher than the 2-time feeding group. Regarding gender, male chickens always had higher weight and ADG than female chickens at all stages ($p < 0.01$). In contrast, feed intake (FI) was not significantly affected in the period of 1–4 weeks ($p > 0.05$) but tended to decrease with increasing feeding frequency in the later stages. In particular, feed conversion ratio (FCR) was significantly improved with increasing feeding frequency ($p < 0.01$), the 4-time feeding group achieved the lowest FCR, demonstrating better feed efficiency. There was no significant interaction between feeding frequency and gender ($p > 0.05$). In general, increasing feeding frequency helped improve productivity and feed efficiency of Ac chickens, especially at the age of 5-8 weeks, while maintaining a stable physiological state and optimizing the growth process.

Carcass characteristics

The results (Table 4) showed that feeding frequency and gender significantly affected the slaughter parameters of Ac chickens. Chickens fed 4 times/day had significantly higher live weight, carcass, breast meat and thigh meat than those fed 2 or 3 times ($p < 0.05$), while the carcass weight and meat percentage were not significantly different. Male chickens had higher weight and meat percentage than female chickens ($p < 0.01$), reflecting superior growth rate and muscle accumulation. The parameters of liver, gizzard, thymus, bursa of Fabricius, spleen (Table 5) and intestinal length were not different ($p > 0.05$), indicating that increased feeding frequency did not affect the structure of digestive and immune organs, but contributed to improving meat yield and metabolic efficiency in Ac chickens.

Table 3: Effects of sex and feeding frequency on growth performance of Ac chickens.

Variable	FF			Sex		SEM/P		
	2 times	3 times	4 times	Male	Female	FF	Sex	FF*Sex
Body weight, g/bird								
1 day	20.47	20.34	19.70	20.20	20.14	0.565/0.599	0.461/0.934	0.800/0.873
4 weeks of age	174.9^{b}	181^{ab}	192.3^{a}	192.6^{a}	172.9^{b}	3.677/0.01	3.002/0.01	5.201/0.485
8 weeks of age	418.5^{b}	459.5^{a}	483^{a}	501.2^{a}	406.2^{b}	8.972/0.01	7.326/0.01	12.69/0.939
Daily weight gain, g/bird/day								
1-4-week-old	5.510^{a}	5.730^{ab}	6.130^{a}	6.150^{a}	5.450^{b}	0.12/0.01	0.120/0.01	0.178/0.443
5-8-week-old	8.690^{b}	9.940^{a}	10.38^{a}	11.02^{a}	8.330^{b}	0.299/0.05	0.244/0.01	0.424/0.818
1-8-week-old	7.100^{b}	7.840^{a}	8.270^{a}	8.580^{a}	6.890^{b}	0.157/0.01	0.128/0.01	0.227/0.926
Feed intake, g/bird/day								
1-4-week-old	13.36	14.13	13.45	13.65	13.65	0.381/0.328	0.311/0.989	0.538/0.622
5-8-week-old	33.08^{a}	30.81^{ab}	29.55^{b}	33.11^{a}	29.18^{b}	0.923/0.05	0.754/0.003	1.306/0.218
1-8-week-old	23.22^{a}	22.47^{ab}	21.50^{b}	23.38^{a}	21.42^{b}	0.426/0.01	0.348/0.002	0.603/0.318
Feed conversion ratio								
1-4	2.420^{a}	2.470^{a}	2.190^{b}	2.220^{b}	2.500^{a}	0.05/0.01	0.042/0.01	0.074/0.893
5-8	3.870^{a}	3.130^{b}	2.880^{b}	3.040^{b}	3.540^{a}	0.131/0.01	0.107/0.01	0.185/0.984
1-8	3.290^{a}	2.880^{b}	2.620^{b}	2.744^{b}	3.120^{a}	0.07/0.01	0.063/0.01	0.110/0.916

Means with different superscript letters in a row differ significantly ($p < 0.05$).

Table 4: The effect of sex and feeding frequency on carcass characteristics.

Variable	FF			Sex		SEM/P		
	2 times	3 times	4 times	Male	Female	FF	Sex	FF*Sex
Live weight, g	424.5[b]	442[ab]	454[a]	483.8[a]	396.5[b]	6.651/0.02	5.430/0.01	9.406/0.444
Carcass weight, g	271.4[b]	292.3[a]	300.2[a]	314.1[a]	261.8[b]	5.207/0.06	4.251/0.01	7.364/0.334
Carcass percentage	63.21	65.78	66.70	64.47	65.99	1.219/0.155	0.995/0.302	1.725/0.984
Breast weight, g	42.75[b]	47.41[a]	50.00[a]	51.78[a]	41.66[b]	1.103/0.02	0.900/0.01	1.560/0.358
Breast percetange	15.79	16.23	16.62	16.50	15.93	0.550/0.581	0.449/0.388	0.778/0.677
Thigh weight, g	54.63[c]	59.50[b]	62.75[a]	67.83[a]	50.08[b]	0.632/0.01	0.516/0.01	0.894/0.113
Thigh percentage	20.05	20.26	20.85	21.61[a]	19.16[b]	0.551/0.854	0.450/0.02	0.779/0.948
Liver weight, g	12.16	12.126	11.83	12.61	11.50	0.577/0.896	0.471/0.121	0.816/0.447
Heart weight, g	2.710	2.450	2.500[a]	2.330[b]	2.770	0.133/0.355	0.108/0.014	0.188/.0151
Gizzard weight, g	18.18	19.08	18.25	19.11	17.90	1.028/0.792	0.839/0.328	1.454/0.983
Small intestine, cm	86.00	92.58	88.66	88.16	90.00	3.31/0.398	3.318/0.641	3.318/0.330
Large intestine, cm	26.76	30.41	28.54	2.700	2.700	1.152/0.123	0.940/0.723	1.152/0.247

Means with different superscript letters in a row differ significantly ($p < 0.05$).

Table 5: The effect of sex and feeding frequency on immune organ weights.

Organ	FF			Sex		SEM/P		
	2 times	3 times	4 times	Male	Female	FF	Sex	FF*Sex
Bursa of Fabricius, g	1.73	2.16	2.00	2.16	1.76	0.183/0.278	0.149/0.083	0.258/0.131
Spleen, g	0.10	0.12	0.10	0.11	0.10	0.009/0.202	0.007/0.679	0.012/0.029
Thymus, g	2.00	2.08	2.50	2.00	2.38	0.201/0.218	2.709/0.125	0.284/0.508

Table 6: The effect of sex and feeding frequency on cooking loss.

Meat type	FF			Sex		SEM/P		
	2 times	3 times	4 times	Male	Female	FF	Sex	FF*Sex
Breast, %	20.82	19.98	19.93	19.93	20.56	0.498/0.399	0.406/0.300	0.704/0.435
Thigh, %	30.38	30.07	29.47	29.86	30.09	0.462/0.392	0.377/0.670	0.654/0.651

Table 7: The effect of sex and feeding frequency on antibody titer.

Age (days)	FF			Sex		SEM/P		
	2 times	3 times	4 times	Male	Female	FF	Sex	FF*Sex
14	6.330	6.160	6.000	6.330	6.000	0.136/0.262	0.111/0.055	0.192/0.262
28	5.830	6.160	6.330	6.220	6.000	0.192/0.215	0.157/0.337	0.272/0.783

The results exhibited in Table 6 showed that feeding frequency and gender did not significantly affect the water loss rate of breast and thigh meat ($p > 0.05$). The mean water loss rate of breast meat ranged from 19.93–20.82%, and thigh meat from 29.47–30.38% among the treatments. It showed that changing the feeding frequency did not significantly change the water retention capacity of the meat, which meant that the quality of the meat after slaughter was maintained stably. Similarly, gender did not affect the water loss rate, demonstrating that the muscle structure and moisture retention capacity of the Ac chicken meat were similar between males and females.

Antibody titer in response to Newcastle disease vaccination

The results in the Table 7 show that feeding frequency and gender did not significantly affect the ND antibody titers at both 14 and 28 days of age ($p > 0.05$). HI values fluctuated stably in the range of 6.00–6.33, reflecting the normal and homogeneous blood physiology between the experimental groups. This demonstrates that changing the number of feeding times (2, 3, or 4 times/day) did not significantly affect the circulatory function and overall health of the Ac chickens during the early growth stage. In addition, no interaction was observed between feeding frequency and gender.

DISCUSSION

Feeding at a higher frequency contributes significantly to improved growth in chickens through physiological and behavioral mechanisms. When chickens are fed several

small meals a day, the source of nutrients such as glucose and amino acids is maintained stably, thereby continuously supporting the synthesis of muscle protein as the main organ of body mass accumulation in chickens. At the same time, high feeding frequency may also promote digestive enzyme activity and increase the development of gizzard structure, helping to grind food better, increase intestinal absorption area and improve digestive efficiency. Research by Aziz and Masoud (2021) on Ross broilers showed that feeding twice a day significantly increased weight gain and improved FCR compared to feeding once a day. In addition, Wang *et al.* (2024) reported that feeding frequency affects feeding behavior and feed intake, which in turn affects weight gain and carcass. In another study, van Emous *et al.* (2024) found that increasing feeding frequency in layer breeders not only improved feed intake but also reduced competition at the feeder as an indirect factor that improved growth. In this study, the live weight and carcass of chickens fed 4 times/day were superior to those of the 2 times/day group, consistent with this mechanism, or more specifically, feeding multiple small meals will provide even nutrition to stimulate muscle growth and increase weight gain and reduce FCR. Thus, the difference in growth between feeding frequency groups can be explained by maintaining a stable metabolic and absorption environment, together with reducing the time between meals, helping chickens use feed more efficiently and achieving higher body weight in the same rearing period.

The results of carcass characteristics indicated a significant influence of feeding frequency on the carcass, breast and thigh weights of the Ac chickens, although the carcass ratio was not altered. Chickens fed 4 times/day had higher carcass and breast and thigh muscle weights than those fed 2 or 3 times/day, and this finding suggested division of the ration would improve digestion efficiency and nutrient utilization. This observation was also in line with Wang *et al.* (2024), feeding at multiple times of the day contributes to balance in glucose and amino acid levels of circulation, allowing continual generation of muscle protein. When the body is adequately fed, muscle recruitment and carcass development will happen with greater efficiency for the good body condition of chickens and will increase the amount of meat produced due to increased mass. This effect also decreases metabolic stress, increases feed efficiency and helps to establish an optimal body physiological equilibrium during the growth phase. This point is in line with Aziz and Masoud (2021), it was observed that increasing feeding frequency enhanced the weight gain in Ross broilers and increased the meat yield, both of which depend on reducing the fasting period and maintaining a stable energy balance of the animal. This mechanism of action is better extended in the setting of more feedings to guarantee the plasma glucose and amino acid levels do not change, facilitating muscle protein synthesis and the increase in body mass (Yue *et al.*, 2024). This higher feed frequency also promotes the mechanical activity of the digestive enzymes, thus enhancing their ability to crush, absorb, and metabolize nutrients (Huang *et al.*, 2022). Moreover, having more than one feed per day decreases competitive behaviour and stress in the feeder, thus supporting feeding behaviour and physiological responses (van Emous *et al.*, 2024). The liver, heart, gizzard and immune organs (spleen, thymus, bursa of Fabricius) factors were not obviously influenced between treatments, which means that rising feeding frequency does not affect organ structure of the internal body of the chicken negatively, and the immune organs of the chicken body does not hurt. The observed absence of clear relationship between feeding frequency and the immune measures of Ac chickens may also be attributed to the physiological and immune control mechanisms in the chicken body. With diet continuing to provide enough energy, protein and micronutrients for the host to form, immune responses, including the mass of organs such as the thymus, spleen and bursa of Fabricius, are mostly developed by growth stage and genetics (Davoodi-Omam *et al.*, 2019; Farghly and Hassanien, 2012) and relatively insulated from changes in feeding regime. So, although both increasing or decreasing the rate of feeding will change the rate of nutrient absorption, this doesn't lead to any significant nutritional imbalance, so there is little difference in immunity. The chickens being experimental were also kept in the same kind of housing but were fully vaccinated and did not face environmental stress, hence this level of physiological stress was very benign and did not exert significant immune system changes. Several studies recently, Wang *et al.* (2024) and van Emous *et al.* (2024), also demonstrated that feeding frequency has a strong influence on energy metabolism and feeding behavior but not on immune function and hematological indices, which only respond significantly to exposure to nutritional or environmental stress. It can therefore also be concluded that in the context of balanced nutrition and good handling, the rate of the feeding is not strong enough to induce substantial changes in Ac chickens' immune system.

CONCLUSION

Feeding frequency has a clear effect on the growth and meat yield of Ac chickens. Chickens fed 4 times/day achieved better weight, weight gain and FCR, and had higher breast and thigh meat mass than the group fed less often. There was no difference in visceral organ weight and ND antibody titers, proving that increasing the number of feeding times did not have a negative impact on health. Thus, feeding 4 times/day is a suitable measure

to help improve the growth efficiency and meat yield of Ac chickens. The study also did not record an interaction between the factors of feeding frequency and gender.

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NOVELTY STATEMENT

The study was analyzed the effect of both feeding frequency and sex on performance of growth and immunity of native chickens in Vietnam. To our best knowledge, this paper was the first one, monitoring interaction of sex and feeding frequency in case of Ac chicken in Vietnam

AUTHOR'S CONTRIBUTION

NHQ: Write the original manuscript, conceptualization, and editing. NTL: writing review and editing. NTL: Supervision. All authors read and approved the final version of the manuscript.

Generative AI and AI-assisted technology statement

The study did not use any AI technology tools for any purpose.

Conflict of interest

The authors have declared no conflict of interest.

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