Jurnal Sain Peternakan Indonesia
Available at https://ejournal.unib.ac.id/jspi/index
DOI: https://doi.org/10.31186/jspi.id.20.4.240-246
P-ISSN 1978-3000
E-ISSN 2528-7109
Volume 20 Issue 4 October-December 2025

Effect of Dietary Vitamin C Supplementation on the Growth Performance of KUB Chicken

S. Multazam, R. Haryanti, A. Aini, and G. N. Islami*

Fakultas Ilmu Kesehatan, Sains dan Teknologi, Universitas Bima Internasional MFH, Indonesia
Corresponding Author: nabilla.islamiah04@gmail.com
Revised: 2025-12-22, Accepted: 2025-12-25, Publish: 2025-12-31

ABSTRACT

This study aims to determine the effect of vitamin C supplementation in rations on the performance of KUB chickens. The study was conducted from August 5 to October 10, 2025, in Pejanggik Village, Praya Tengah District, using a completely randomized design (CRD) with one direction, involving 100 DOC KUB chickens. The treatment consisted of four levels, namely P0 (control without vitamin C), P1, P2, and P3, each of which received additional vitamin C of 100, 200, and 300 mg/kg feed, with each treatment repeated 5 times and each replication containing five chickens. The data were analyzed using one-way analysis of variance (ANOVA) in SPSS version 26. The study showed that adding vitamin C to the feed had no significant effect on feed intake, body weight, or feed conversion efficiency.

Keywords: Body Weight, KUB Chicken, Performance, Vitamin C,

INTRODUCTION

Ayam Kampung Unggul Balitnak (KUB Chicken) is an innovation developed by the Ministry of Agriculture to increase the productivity of superior free-range chickens in Indonesia. In West Nusa Tenggara (NTB), KUB chickens are expected to be a strategic solution to meet the community's need for animal protein, while simultaneously driving economic growth through more modern and efficient chicken farming (BSIP, 2025). Free-range chickens exhibit high diversity in appearance and genetic traits, with a broad distribution across urban and rural areas. The potential of free-range chickens is promising, both economically and socially, because KUB chickens can meet the demand for highly nutritious food and support local and regional market absorption (Suryana, 2017). One type of chicken widely developed for meat production is the free-range chicken (BPTP, 2016).

Feed management encompasses selecting high-quality feed, scheduling feeding, and monitoring nutrient intake to support optimal growth in KUB chickens. This approach ensures production efficiency and reduces operational costs for farmers (Akhsan, 2024). Good feed management is a key factor in determining the success of Balitbangtan's (Indonesian Agency for Agricultural Research and Development) Superior Village Chicken (KUB) farming, as it includes selecting high-quality feed, scheduling timely feeding, and closely monitoring nutrient intake to support optimal growth from the DOC stage to harvest. This approach not only ensures overall production efficiency but also significantly reduces farmers' operational costs by minimizing feed waste, preventing health problems such as malnutrition and obesity, and improving feed conversion efficiency, thereby increasing body weight (BSIP, 2025).

Indonesia has a tropical climate with two seasons: rainy and dry. During the dry season, daytime temperatures can reach their highest levels as humidity decreases, resulting in drier air. These conditions are uncomfortable for chickens and can trigger heat stress. Chickens, as homeotherms, maintain a relatively constant body temperature; therefore, when ambient temperatures are high, their ability to dissipate heat is limited. Furthermore, chickens lack sweat glands and, thus, cannot dissipate heat through sweating. Therefore, body temperature regulation relies heavily on other mechanisms such as panting and peripheral blood flow regulation. Therefore, chickens should be maintained within a comfortable temperature range to minimize stress during environmental adaptation. Heat stress can reduce feed intake, cause weight loss, and, in laying hens, decrease egg production and quality.

KUB chicken is a local chicken breed developed by the Ministry of Agriculture's Agricultural Research and Development Center through six generations of native chicken selection, with an average annual egg production of approximately 180 eggs per chicken (Aditya, 2019). Native chickens are relatively resistant to heat stress and highly adaptable, as they can adjust to diverse environments (Mubarak et al., 2018). Therefore, this study aims to determine whether

KUB chickens, provided with supplemental feed, can withstand the hot environmental conditions typical of tropical areas in an open-cage system.

MATERIALS AND METHODS

Location and Time of Research

This research was conducted in Pejanggik Village, Praya Tengah District, Central Lombok Regency, West Nusa Tenggara Province, from August 5 to October 10, 2025.

Research Materials

The research materials used in the study are as follows: (1) DOC (Day Old Chick) KUB 100 (unsex) aged 5 days. (2) Rice husks as a base for the cage. (3) The feed used in this study is commercial feed produced by PT. Charoen Pokphand Indonesia and (4) The drugs and vitamins used are Rodalon, as an antiseptic drug that functions to sterilize the cage. The vitamins used are Vita Stress, administered from arrival until harvest. As for vitamin C IPI 50 mg was added to the treatment applied during the study. One tablet contains 50 mg of vitamin C. ND IB vaccine at 7 days old, Gumboro A at 15 days old, ND La Sota at 25 days old, Gumboro B at 30 days old.

The equipment used in the research is as follows: (1) 20 3 kg capacity feeders, (2) 20 1 liter capacity drinking water containers, (3) 20 lamps for lighting, (4) sprayer, (5) thermohygrometer, (6) 10 kg capacity scales, (7) mortar for grinding vitamin C, (8) bucket for mixing feed, (9) plastic for storing feed, (10) camera, (11) stationery and (12) The cages used are 20 cages made of bamboo measuring 1 x 0.50 x 0.50 m. The distance between the surface of the cage and the ground is 0.50 m.

Research methods

The feed ingredients used consist of commercial feed and vitamin C. The vitamin C is first finely ground with a mortar and pestle, then mixed into the feed in a bucket or container until evenly distributed. This mixing process aims to produce a homogeneous feed mixture ensuring that each portion of the feed contains the same proportion of vitamin C before being fed to livestock. Mixing is conducted to prepare the chickens' feed requirements for one week; therefore, the mixing process is carried out once per week. This arrangement is intended to maintain the feed's freshness and prevent spoilage during storage.

Research Design

The study employed a completely randomized design (CRD) with a one-way layout, involving 100 5-day-old chicks. All chicks were assigned to four treatments, with five replications per treatment, for a total of five chicks per replication. The four treatments were distinguished based on the amount of vitamin C supplemented in the livestock ration. The treatments in this study were: (1) P0 = without vitamin C supplementation in the feed, (2) P1 = added vitamin C of 100 mg/kg commercial feed, (3) P2 = added vitamin C of 200 mg/kg commercial feed, and (4) P3 = added vitamin C of 300 mg/kg commercial feed.

Observed Variables

The variables observed in this study were: {Feed consumption was calculated by subtracting the amount of feed given from the remaining feed in each replication, so that feed consumption during the study could be known (Trisiswi and Supartini, 2015). The formula for feed consumption is the amount of feed given (g) minus the remaining feed (g)}. (2) Body weight gain (Body weight gain was calculated by subtracting the body weight of one week from the previous week). (3) Environmental temperature (Environmental temperature can be measured using a thermohygrometer placed indoors) and (4) Feed conversion {Feed conversion was obtained by dividing the amount of feed consumption by the increase in body weight over the same time and units (Rasyaf, 2003)}.

$$\text{Feed Conversion} = \frac{Feed\ Consumption\ (g)}{\text{Weight Gain (g)}}$$

Data analysis

Data from all parameters were analyzed using one-way analysis of variance (ANOVA) in SPSS version 26 to evaluate the effect of vitamin C supplementation in the ration on the performance of KUB chickens. If the ANOVA results showed a significant difference among treatments, a further test was conducted using Duncan's Multiple Range Test (DMRT) at the 5% significance level to determine the specific mean differences among treatments.

RESULTS AND DISCUSSION

Cage Temperature and Humidity

High environmental temperatures can reduce the capacity of the chicken's antioxidant defense system by reducing feed consumption,

ultimately contributing to weight loss (Zain et al., 2023). Warm-blooded livestock maintain their survival by maintaining a relatively constant body temperature and do not directly respond to changes in the surrounding air temperature (Astuti et al., 2019). In other words, in both cold and hot environmental conditions, body temperature tends to be stable. Data on the temperature distribution in the cage during the study are presented in Table 1.

Table 1. Temperature in the cage during the study

07.00 WITA	°C value	12.00 WITA	°C value
Lowest temperature	24.8	Lowest temperature	29.6
Highest temperature	28.3	Highest temperature	33.5
Mode	26.5	Mode	32.4
Median	26.5	Median	32.1
Average/Mean	26.5	Average/Mean	31.9

Based on the temperature data from the cage, the lowest temperature occurs in the morning (24.8 °C) and at noon (29.6 °C), whereas the highest temperature in the morning reaches 28.3 °C and at noon 33.5 °C. This pattern indicates that the research location is in a humid environment. In the morning, the temperature of the cage is still within the comfortable temperature range for poultry, which is around 18–28°C (Damerow, 2015), while during the day the temperature of the cage reaches around 32.4°C which is slightly above that range but can still be classified as a comfort zone, seen from the continued increase in feed consumption so that the chickens appear to be still able to tolerate the temperature.

Chickens' body temperature tends to be higher during the day and lower at night. When it's bright, chickens are typically more active, increasing their body heat production. However, when the lights are off or dusk approaches, they rest more, allowing their body temperature to drop and heat to be released into the environment more quickly (Saleh and Erwan, 2016).

The study found that adding vitamin C to the KUB chicken ration did not affect feed intake. This indicates that the low recorded feed consumption was primarily due to uniform maintenance treatments across all groups, with the only difference being the vitamin C level provided. If referring to the standard feed consumption requirements for KUB chickens as reported by Harianto et al. (2021) of approximately 258.125 grams/head/week, while the average consumption ranges from 199-213 grams/head/week, then the feed consumption level can be categorized as below the recommended standard. The performance data for broiler chickens following the addition of vitamin C to the feed are presented in Table 2.

The addition of vitamin C has been proven to help reduce stress levels and organ damage in livestock. Physiologically, chickens can synthesize vitamin C under normal temperature conditions; however, when they experience stress, the demand for vitamin C increases, necessitating additional supplementation via feed and drinking water (Widiandini et al., 2022).

Table 2. KUB Chicken Performance Data Due to the Addition of Vitamin C in Feed

Treatment	P0	P1	P2	P3	P Value
Feed Consumption (grams/head/week)	203±4.73	215±13.56	201±12.48	204±7.55	0.320
Body Weight (grams/head/week)	355±35.87	364±33.31	372±30.29	351±34.04	0.230
Body Weight Gain (grams/head/week)	97±8.81	105±7.83	99±6.86	96±9.36	0.340
Feed Conversion	2.13±0.28	2.08±0.23	1.99±0.19	2.11±0.23	0.308

Description: Not significantly different (P>0.05),
P0 = without vitamin C supplementation in feed
P1 = added vitamin C at 100 mg/kg commercial feed
P2 = added vitamin C at 200 mg/kg commercial feed
P3 = added vitamin C at 300 mg/kg commercial feed.

There are four main production performance parameters: feed consumption, body weight, body weight gain, and feed conversion, each expressed in grams per head per week for growth variables and as a ratio for feed conversion. Feed consumption (grams/head/week) denotes the amount of feed consumed by chickens in one week, whereas body weight (grams/head/week) indicates the accumulated body weight at the end of the observation week. The data in Table 3 show that feed consumption during the study at the location ranged from 203-215 grams/head/week, which is below the standard feed consumption requirement for KUB chickens, according to Harianto et al. (2021), of approximately 258.125 grams/head/week. This pattern also indicates that feed consumptionis related to environmental temperature during rearing, as one of the critical factors influencing feed intake in chickens. Relatively high environmental temperatures suppress feed intake, preventing chickens from reaching optimal final weight (Salam, 2013). In addition to temperature, several other factors that influence poultry feed consumption include livestock health status, individual characteristics, production level, housing system and conditions, availability of drinking water, feed palatability, energy content of rations, gender, and growth phase (Suprijatna, 2005).

Vitamin C supplementation in rations is a nutritional strategy that can mitigate the effects of heat stress on poultry (Tamzil, 2014). The addition of vitamin C as a feed supplement to rations is intended to maintain optimal production performance under stressful environmental conditions (Hidayatik et al., 2021). Broiler and laying hens are among the poultry groups that are highly sensitive to heat stress, increasing their risk of reduced productivity if not adequately managed (Tamzil et al., 2022). Average feed consumption in aquaculture is typically expressed as the amount of feed per bird per day and is strongly influenced by age, body weight, and feed quality. The average weekly feed consumption of KUB chickens is presented in Figure 1.

Vitamin C supplementation in chicken rations had no significant effect (P>0.05) on feed consumption in KUB chickens across all treatments. This finding aligns with Kusnadi's (2006) report that vitamin C supplementation at various levels (0, 250, 500, and 750 ppm) did not consistently impact feed consumption and live weight gain under comfortable temperature conditions. Therefore, the results of this study confirm that the addition of vitamin C to rations does not significantly impact feed consumption.

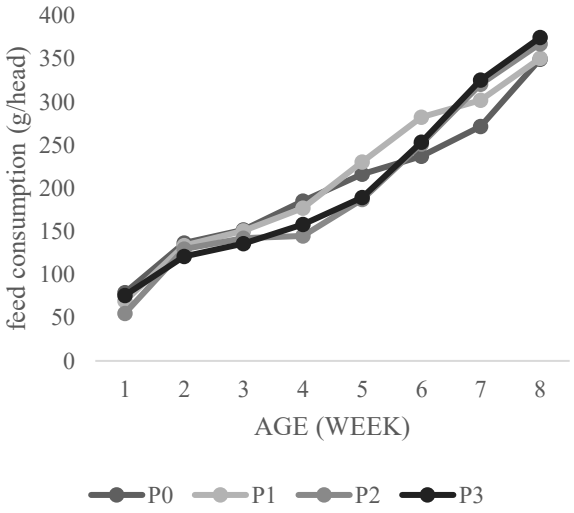

Figure 1. Feed consumption (g/head) from 1 to 8 weeks of age.

Weight Gain

The addition of vitamin C to the KUB chicken ration did not have a significant effect (P>0.05). This indicates that vitamin C supplementation did not significantly affect the increase in body weight gain in KUB chickens. The average body weight gain during the study ranged from 91–103 grams/head/week, consistent with the findings of Agisni (2022) for the same type of chicken, which reported an average of 91.99–101.84 grams/head/week. To determine the body weight gain of KUB chickens, see Figure 2.

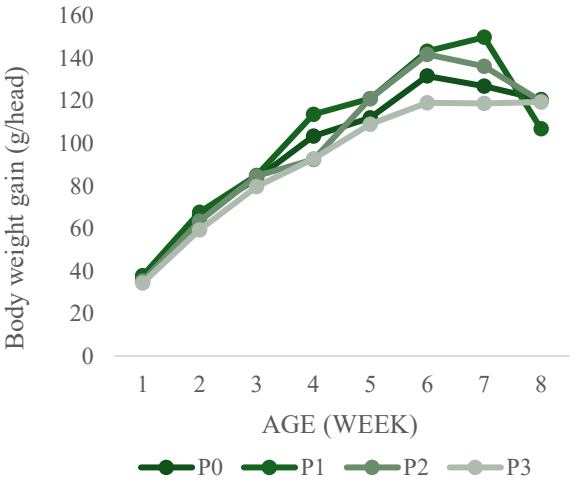

Figure 2. Body weight gain (g/head) from 1 to 8 weeks of age.

Based on statistical analysis, the addition of vitamin C did not significantly affect weight gain in KUB chickens (P > 0.05). The decrease in weight gain in the 8th week, as seen in Figure 2, is thought to be related to feed digestibility; low digestibility limits nutrient absorption, thus inhibiting growth. Vitamin C plays an important role in maintaining chicken health and immune function, but it is not the primary energy source for supporting tissue growth and development (Hussain et al., 2022). Average weekly body weights are shown in Figure 3.

Body Weight

Body weight data in Table 2 and Figure 3 show that the addition of vitamin C to the KUB chicken ration did not have a significant effect (P>0.05) on body weight. This indicates that vitamin C supplementation did not significantly affect the growth of KUB chickens. During 8 weeks of rearing, body weight ranged from 766.5 to 860 grams per head, which is slightly below the standard range for 8-week-old harvest weights of 0.8–1.0 kg per head (Kaleka, 2015). The body weight gain of KUB chickens is presented in Figure 3.

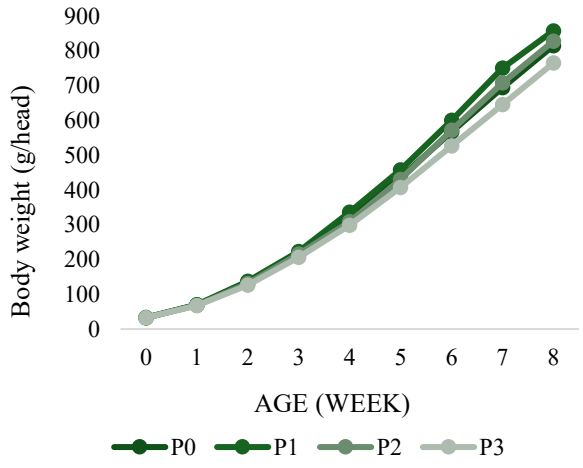

Figure 3. Body weight (g/head) from 1 to 8 weeks of age

Statistical tests showed that vitamin C supplementation did not significantly affect body weight in KUB chickens (P>0.05). Meeting nutritional needs across all treatments is considered the primary factor contributing to weight gain. Based on the graph in Figure 3, the highest body weight (g/chicken/week) was found in treatment P1 at 869 g, while the lowest body weight was recorded in treatment P3 at 766.5 g.

Feed Conversion

The addition of vitamin C to the KUB chicken ration had no significant effect (P>0.05). This indicates that feed consumption and body weight gain were similar across treatments, resulting in no significant differences in feed conversion efficiency. This finding aligns with Anggitasari et al. (2016) report, which states that feed conversion efficiency does not differ significantly when feed intake and body weight gain are comparable across treatments. Figure 4 shows the feed conversion figures for KUB chickens.

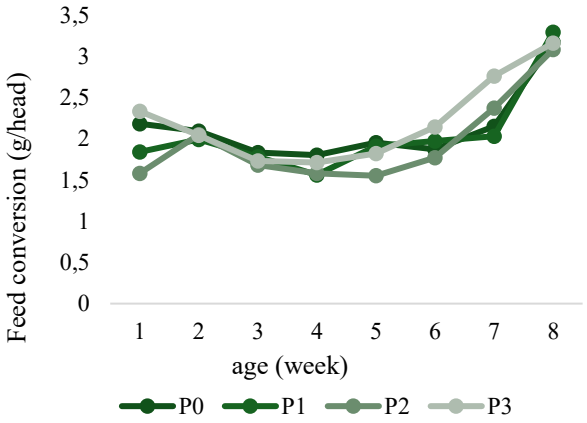

Figure 4. Feed conversion from 1 to 8 weeks of age.

The average feed conversion value in this study was 2.13 for the P0 (control) treatment, 2.08 for P1, 1.99 for P2, and 2.11 for P3. According to Yuwanta (2004), lower feed conversion efficiency indicates greater feed utilization efficiency, as it reflects the proportion of feed converted into body weight. Consistent with this, Ufie et al. (2024) reported that a low feed conversion value indicates greater efficiency in converting feed into meat; thus, in this study, the P2 treatment, with a conversion value of 1.99, can be considered to have the best feed utilization efficiency compared with other treatments.

CONCLUSION

The results showed that adding vitamin C as an anti-stress agent to commercial rations at 100-300 mg/kg did not affect the performance of KUB chickens raised in open-system cages. To more accurately evaluate the role of vitamin C as an anti-stress factor, vitamin C supplementation should be administered to chickens experiencing heat stress.

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