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Morphometry and Organ Indices of Broilers After Supplementation of *Sargassum glaucescens* (J. Agardh, 1848) Ethanolic Extract

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Abstract
Broiler chickens are a primary protein source due to their rapid growth, which is strongly influenced by the nutrients in the feed. *Sargassum glaucescens*, a marine macroalgae rich in bioactive compounds, shows potential as a feed additive. This study aims to evaluate the effect of *Sargassum glaucescens* ethanolic extract (SGE) on broiler morphometry and organ indices. A total of 300 individual day-old broiler chicks of the *Cobb 500* strain were divided into 4 treatments based on a completely randomized design, each treatment with 5 replicates consisting of 15 chickens. The treatment of SGE was given with variations of K (0% SGE/Basal Feed (BF), P1 (0.5% SGE/kg BF), P2 (1% SGE/kg BF), and P3 (2% SGE/kg BF). Parameters observed were body morphometry (beak, neck, head, back, wings, and thigh length, chest circumference, body height, and organ indices (liver, gizzard, spleen, bursa of Fabricius, intestine, and intestinal length). The results showed that SGE significantly improved morphometry and organ indices of broilers as the concentration increased. This is due to the role of flavonoids and phenolic content in increasing cell proliferation. This study concluded that the administration of SGE up to 2% was able to improve morphometry and organ indices of broilers.

Keywords: Bioactive compound; Feed additive; Macroalgae; Morphometry; Poultry

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INTRODUCTION

Broiler meat is one of the main protein sources because they can be produced in only 5-7 weeks due to the fast growth rate (Astungkarawati *et al*., 2014; Aprianto *et al*., 2023). A major factor that determines the growth, tissue repair, and metabolic function of broilers is nutrition. The quality of protein in broiler meat is strongly influenced by nutrition, feed formulation, and digestive system efficiency. Adequate and balanced nutrition not only improves daily body weight gain but also promotes the growth of body morphometry such as body length and chest circumference, and organ indices (the relative weights of digestive and vital organs). This growth will later serve as important indicators of physiological status and overall productivity in broilers (Kuietche *et al*., 2014). An enhanced digestive system is a major variable in promoting better growth and development of chickens (Koli *et al*., 2019). Hence, improving feed quality is important to support broiler growth and productivity. (Sinurat *et al*., 2000; Listyasari *et al*., 2022).

The *Cobb 500* strain broilers have many advantages resulting from many years of genetic selection, such as good weight gain, more resistance to the coop temperature and rearing density, and good feed conversion (Deminicis *et al*., 2021). Feeding the broilers with high-nutrition feed can significantly affect the quality and body composition of broilers, thus maximizing the beneficial traits obtained from genetic selection (Mir *et al*., 2017). The feed additive substances have been widely applied in addition to providing a meal with a balanced nutritional content to optimize animal performance.

Feed additives from natural ingredients are the latest strategy used by the farmer to increase broiler productivity. Feed additives can increase broiler growth rates, maintain health, and improve production efficiency (Kurniawan *et al*., 2021). Natural feed additives for broilers can be in the form of probiotics, organic acids, prebiotics, and phytogenic compounds (Alhotan, 2021). These ingredients can improve the health and physiological aspects of the gastrointestinal tract, nutrient absorption, and the immune system of broiler chickens (Agboola *et al*., 2015; Alagawany *et al*., 2020).

As an archipelago country, Indonesia has a vast saltwater area with high biodiversity. This potential, one of which is macroalgae, can be found along the coastline of Indonesia, and it can be utilized to enhance the provision of animal feed. Several marine macroalgae of Indonesia that have been utilized as broiler feed are *Caetomorpha linum* (Saragih *et al*., 2024) and *Sargassum crassifolium* (Mahata *et al*., 2023). *Sargassum* sp. is a macroalgae species that has the potential to be applied as a feed supplement in broiler feed (Yegdaneh *et al*., 2020). Macroalgae of this genus have high nutritional value and are generally safe to use as food ingredients for humans and animals (Kulshreshtha *et al*., 2020). These macroalgae are rich in essential nutrients, such as proteins, carbohydrates, vitamins, crude fibers, lipid, and minerals. Additionally, *Sargassum* sp. also contains compounds that can stimulate the immune system and improve broiler appetite, thus the energy obtained from feed can be maximized for growth (Al-Khalaifah *et al*., 2022; Chavan *et al*., 2022).

Many species of *Sargassum* have been explored as an alternative feed ingredient in the poultry industry. Research done by Mahata *et al*. (2023) proved that the provision of up to 18% *Sargassum crassifolium* in broiler rations was safe without reducing broiler growth performance. Research of Abed El-Fatah *et al.* (2023) showed that using 0.5% *Sargassum muticum* powder in feed was able to increase the quality of broiler's weight gain and carcass yield. These two studies demonstrate that *Sargassum* has a promising potential as a natural feed additive in improving poultry performance.

One of the species from the *Sargassum* genus that has the potential to be used in broiler feed formulations but has not been properly explored for its benefits is *Sargassum glaucescens* (J. Agardh, 1848). *Sargassum glaucescens* grows in large amounts on Porok Beach, Gunung Kidul, Yogyakarta, and is expected to provide positive benefits on broiler productivity, like other *Sargassum* species. Therefore, this study aimed to evaluate the effect of *Sargassum glaucescens* supplementation on morphometry and organ indices of broilers.

MATERIALS AND METHODS

This research was an experimental study conducted from July 2024 to February 2025. The research design used a completely randomized design consisted of 4 treatment groups: Control (K) only given basal feed (BF), Treatment 1 (P1) given 0.5% ethanolic extract of Sargassum glaucescens (SGE)/kg BF, Treatment 2 (P2) given 1% SGE/kg BF, and Treatment 3 (P3) given 2% SGE/kg BF. The concentration is determined based on the reference from Prihambodo *et al*. (2021), which states that the range of flavonoid concentrations in broiler feed is 0-60,000 mg/kg basal feed. Each treatment group was made into 5 replicates, each containing 15 male and female Day-Old Chick (DOC) broilers of the *Cobb 500* strain with an average weight of ±48 grams. Thus, the total of DOC was 300 individuals with a 50:50 male-to-female ratio.

Sargassum glaucescens (J. Agardh, 1848) was collected from Porok Beach, Gunung Kidul, Yogyakarta. Ethanolic extract of *Sargassum glaucescens* was prepared by maceration. The macroalgae were dried for 4 days and ground with a blender. Macroalgae powder was extracted using 96% ethanol in a ratio of 1:2. The mixture was stirred occasionally for 24 hours and then filtered. Maceration was repeated 3 times. The filter results were collected and thickened using a rotary evaporator at 40°C.

Acclimation, rearing, and feeding were conducted at Sawitsari Research Station, Faculty of Biology, Universitas Gadjah Mada. Broilers were acclimated and kept in an 82.5 x 59 x 45.5 cm^3 (150 liters) pen equipped with 2 lamps to maintain the temperature in the range of 30-32°C (Popescu *et al.*, 2018). Broilers were acclimated from posthatch up to 3 days of age. Basal feed as much as 10 grams and drinking water were given in the morning and evening from 2 days of age. Treatment feed was given from 4 to 14 days of age. The feed used in this study was basal feed from PT Sari Rosa Asih, which was added with SGE at 4 different concentrations according to the treatment group. The amount of basal feed given refers to Syahridah (2023). The extract was first dissolved in warm water before being mixed into the basal feed using a mixer. Feed and drinking water were given ad libitum at 7:00 am and 4:00 pm.

A total of 3 broilers from each treatment replicate were randomly selected for body morphometry measurements. Body weight measurements were taken at posthatch, 4, 9, 12, and 14 days of age. Morphometric measurements include several parameters and the measurement method is as follows: Beak length (cm) was measured start at the base of the maxilla to the tip of the maxilla, head length (cm) was measured from the base of the upper part of the beak to the back of the head, neck length (cm) was measured from the first cervical vertebrae to the last cervical vertebrae, body length (cm) was measured from the base of the neck to the pubic bone at the back of the body, chest circumference (cm) was measured by wrapping a measuring tape around the scapula, wing length (cm) was measured from the base of the wing to the tip of the metacarpus bone and the tip of the longest finger bone on the wing, thigh length (cm) was obtained by measureing the femur starting from the distal end that articulates with the tibia, fibula, and patella. Body height (cm) was obtained by measuring from the highest point of the head when the chicken is in a standing position to the bottom of the foot (Permadi *et al*., 2020; Putri *et al*., 2020; Pratiwi *et al*., 2023).

A total of 1 broiler from each replication of treatment was randomly selected to be euthanized at 15 days of age, so the total number of broilers euthanized was 20. Before being euthanized, broilers were fasted for 12 hours (Ginting *et al*., 2023). Body weight was weighed before euthanasia (Poberezhets *et al*., 2021). Euthanasia was performed by cutting the throat at the neck, just behind and below the ear, using one quick and precise slice (Villar, 2021). The ventral part is opened using scissors and scalpels. The liver, gizzard, spleen, bursa of Fabricius, and intestine were separated from the abdominal cavity. Each organ was washed with 0.9% NaCl and then weighed. Intestinal length was measured using a measuring tape.

Organ indices were calculated with the formula that is referred to Albab *et al*. (2022) below:

$$\text{Relative organ indices (\%)} = 100\text{x } \left(\frac{fresh\ organ\ weight\ (g)}{(live\ body\ weight\ (g)}\right)$$

Data were statistically analyzed using the One-Way ANOVA test and followed by Duncan's test on SPSS 26.0 software at a significance level of P≤0.05.

RESULTS

Based on the conducted research, it can be observed that the growth profile of posthatch broilers up to age 4 days in all groups is not significant (P≥0.05). This is because at post-hatch age up to 4 days, broiler DOC's have not been fed the treatment diet. After the treatment feeding period, specifically at the age of 4 to 14 days, it was observed that the body growth profile of broilers given SGE increased significantly compared to the control group, with the best growth found in the P3 group (2% SGE) (Table 1).

The results of organ indices measurements in Table 2 showed that SGE in broiler feed significantly increased the weight index of liver, spleen, bursa of Fabricius, intestine, and intestinal length, especially in P3, compared to the control group. The gizzard index appeared larger in the group fed SGE as the concentration of the extract increased, but there was no significant difference between treatments.

Table 1. Body growth profile of 14-day-old Broilers After Supplementation of *Sargassum glaucescens* ethanolic extract.

Day	Parameter (cm)	Treatment (Mean±SD)				P-value
		K	P1	P2	P3	
Post-hatch	Beak length	1.746 ± 0.039^{ns}	1.794 ± 0.025^{ns}	1.76 ± 0.030^{ns}	1.754 ± 0.039^{ns}	0.163
	Head length	2.446 ± 0.112^{ns}	2.408 ± 0.223^{ns}	2.600 ± 0.116^{ns}	2.464 ± 0.161^{ns}	0.285
	Neck length	2.894 ± 0.087^{ns}	2.906 ± 0.033^{ns}	2.908 ± 0.043^{ns}	2.914 ± 0.067^{ns}	0.962
	Body length	7.034 ± 0.079^{ns}	7,034 ± 0.096^{ns}	7.100 ± 0.066^{ns}	7.118 ± 0.197^{ns}	0.589
	Body height	11.308 ± 0.487^{ns}	11.64 ± 0.497^{ns}	11.408 ± 0.599^{ns}	11.232 ± 0.205^{ns}	0.560
	Chest circumference	9.044 ± 0.138^{ns}	9.386 ± 0.637^{ns}	9.306 ± 0.298^{ns}	9.535 ± 0.184^{ns}	0.242
	Thigh length	5.036 ± 0.159^{ns}	5.252 ± 0.275^{ns}	5.052 ± 0.112^{ns}	4.920 ± 0.122^{ns}	0.064
	Wing length	4.784 ± 0.087^{ns}	4.814 ± 0.206^{ns}	4.808 ± 0.113^{ns}	4.828 ± 0.102^{ns}	0.963
4	Beak length	2.046 ± 0.022^{ns}	2.082 ± 0.016^{ns}	2.000 ± 0.083^{ns}	1.990 ± 0.045^{ns}	0.033
	Head length	2.672 ± 0.094^{ns}	2.660 ± 0.100^{ns}	2.660 ± 0.074^{ns}	2.686 ± 0.089^{ns}	0.962
	Neck length	3.086 ± 0.136^{ns}	3.104 ± 0.039^{ns}	3.026 ± 0.124^{ns}	3.160 ± 0.201^{ns}	0.510
	Body length	7.174 ± 0.076^{ns}	7.274 ± 0.193^{ns}	7.306 ± 0.055^{ns}	7.288 ± 0.117^{ns}	0.353
	Body height	12.594 ± 0.585^{ns}	12.840 ± 0.457^{ns}	13.234 ± 0.117^{ns}	13.092 ± 0.256^{ns}	0.094
	Chest circumference	10.100 ± 0.458^{ns}	9.782 ± 0.159^{ns}	10.032 ± 0.154^{ns}	9.994 ± 0.131^{ns}	0.289
	Thigh length	6.204 ± 0.109^{ns}	6.018 ± 0.153^{ns}	6.080 ± 0.240^{ns}	6.300 ± 0.070^{ns}	0.148
	Wing length	5.828 ± 0.161^{ns}	5.748 ± 0.220^{ns}	5.504 ± 0.395^{ns}	5.508 ± 0.336^{ns}	0.227
9	Beak length	2.098 ± 0.046^{a}	2.180 ± 0.037^{b}	2.200 ± 0.021^{b}	2.246 ± 0.022^{c}	0.000

Day	Parameter (cm)	Treatment (Mean±SD)				P-value
		K	P1	P2	P3	
	Head length	2.992 ± 0.043^{a}	3.026 ± 0.029^{a}	3.040 ± 0.062^{a}	3.106 ± 0.025^{a}	0.004
	Neck length	5.252 ± 0.169^{a}	5.338 ± 0.101^{a}	5.414 ± 0.120^{a}	5.948 ± 0.317^{b}	0.000
	Body length	8.928 ± 0.371^{a}	9.168 ± 0.064^{a}	9.454 ± 0.100^{b}	9.552 ± 0.045^{b}	0.000
	Body height	17.482 ± 0.447^{a}	18.348 ± 0.209^{b}	18.460 ± 0.373^{b}	18.646 ± 0.286^{b}	0.000
	Chest circumference	15.426 ± 0.328^{a}	15.714 ± 0.080^{b}	16.238 ± 0.230^{c}	17.010 ± 0.132^{d}	0.000
	Thigh length	7.498 ± 0.177^{a}	7.674 ± 0.179^{a}	8.060 ± 0.077^{b}	8.196 ± 0.281^{b}	0.000
	Wing length	8.446 ± 0.090^{a}	8.738 ± 0.128^{b}	9.160 ± 0.130^{c}	9.206 ± 0.064^{c}	0.000
12	Beak length	2.328 ± 0.054^{a}	2.354 ± 0.039^{ab}	2.406 ± 0.051^{b}	2.538 ± 0.037^{c}	0.000
	Head length	3.090 ± 0.045^{a}	3.100 ± 0.021^{a}	3.112 ± 0.016^{a}	3.186 ± 0.038^{b}	0.001
	Neck length	5.786 ± 0.184^{a}	6.066 ± 0.115^{b}	6.354 ± 0.051^{c}	6.458 ± 0.080^{c}	0.000
	Body length	11.124 ± 0.438^{a}	11.218 ± 0.101^{ab}	11.486 ± 0.054^{bc}	11.586 ± 0.104^{c}	0.019
	Body height	18.926 ± 0.791^{a}	19.709 ± 0.616^{b}	20.680 ± 0.533^{c}	20.952 ± 0.229^{c}	0.000
	Chest circumference	19.386 ± 0.130^{a}	20.620 ± 0.244^{b}	21.134 ± 0.262^{c}	21.300 ± 0.132^{c}	0.000
	Thigh length	8.486 ± 0.109^{a}	8.842 ± 0.167^{b}	9.046 ± 0.196^{bc}	9.214 ± 0.120^{c}	0.000
	Wing length	10.194 ± 0.100^{a}	10.360 ± 0.059^{b}	10.460 ± 0.059^{b}	10.860 ± 0.104^{c}	0.000
14	Beak length	2.892 ± 0.043^{a}	2.986 ± 0.043^{b}	3.038 ± 0.037^{c}	3.200 ± 0.021^{d}	0.000
	Head length	3.154 ± 0.055^{a}	3.184 ± 0.064^{a}	3.218 ± 0.052^{a}	3.422 ± 0.103^{b}	0.000
	Neck length	6.132 ± 0.084^{a}	6.382 ± 0.052^{b}	6.620 ± 0.188^{c}	7.018 ± 0.225^{d}	0.000
	Body length	12.078 ± 0.093^{a}	12.160 ± 0.030^{ab}	12.340 ± 0.062^{b}	12.812 ± 0.350^{c}	0.000
	Body height	20.366 ± 0.380^{a}	21.160 ± 0.557^{b}	22.332 ± 0.540^{c}	22.954 ± 0.514^{c}	0.000
	Chest circumference	20.246 ± 0.580^{a}	20.726 ± 0.392^{a}	22.222 ± 0.480^{b}	25.208 ± 0.483^{c}	0.000
	Thigh length	8.966 ± 0.474^{a}	9.146 ± 0.161^{a}	9.828 ± 0.440^{b}	10.726 ± 0.223^{c}	0.000
	Wing length	10.542 ± 0.243^{a}	10.866 ± 0.372^{a}	11.000 ± 0.312^{a}	12.172 ± 0.372^{b}	0.000

Note: K: Control group, Basal Feed (BF) without *Sargassum glaucescens* ethanolic extract (SGE); P1: 0.5% SGE/kg BF; P2: 1% SGE/kg BF; P3: 2% SGE/kg BF. $^{a-d:}$ different superscript shows significant differences (P≤0.05), ns: not significant.

Table 2. Organ Indices of 14-Day-Old Broilers After Supplementation of *Sargassum glaucescens* Ethanol Extract.

Parameter	Treatment (Mean±SD)				P-value
	K	P1	P2	P3	
Gizzard index (g/g)	5.464 ± 0.120^{ns}	5.481 ± 0.247^{ns}	5.492 ± 0.109^{ns}	5.545 ± 0.063^{ns}	0.848
Liver index (g/g)	2.694 ± 0.065^{a}	2.826 ± 0.161^{ab}	2.950 ± 0.070^{b}	2.965 ± 0.203^{b}	0.023
Spleen index (g/g)	0.089 ± 0.005^{a}	0.092 ± 0.003^{ab}	0.099 ± 0.003^{b}	0.110 ± 0.009^{c}	0.000
Bursa of Fabricius index (g/g)	0.221 ± 0.009^{a}	0.247 ± 0.011^{b}	0.276 ± 0.031^{c}	0.310 ± 0.018^{d}	0.000
Intestine index (g/g)	6.382 ± 0.334^{a}	7.044 ± 0.324^{b}	7.065 ± 0.345^{b}	7.562 ± 0.398^{c}	0.001
Intestine length (cm)	93.9 ± 0.840^{a}	101.8 ± 0.582^{b}	110.9 ± 0.303^{c}	127.6 ± 0.488^{d}	0.000

Note: K: Control group, Basal Feed (BF) without *Sargassum glaucescens* ethanolic extract (SGE); P1: 0.5% SGE/kg BF; P2: 1% SGE/kg BF; P3: 2% SGE/kg BF. $^{a-d:}$ different superscript shows significant differences (P≤0.05), ns: not significant.

DISCUSSION

The life phase of broiler is divided into 3 phases based on the growth phase, namely the pre-starter period (1-7 days), the starter period (8-28 days), and the finisher phase (29 days-harvest) (Ananda *et al.*, 2022). The early posthatch period in the pre-starter phase is an important period for broiler survival. Broiler chicks must be able to adapt from using nutrients in the yolk to an exogenous diet to meet their needs (Ravindran and Abdollahi, 2021). Broilers were given a small amount of basal feed during the acclimation period from 2 to 3 days of age to allow adaptation to occur before being given basal feed supplemented with SGE. Broilers will have a high daily relative growth rate during the early phase of their life. The nutrients provided in the feed and feed additives during this phase will determine the growth, maturation, and reproduction of the chickens. Therefore, a 2-week study period is relevant to be able to evaluate the effect of supplementing SGE in feed on broiler morphometry and organ indices.

Body size (morphometry) can be used to predict chicken carcass composition. Although the morphometry of broiler strains is the result of genetic selection, broiler body growth will still be influenced by external factors such as rearing environment and nutrition. Morphometric measurements and organ indices were used in this study as parameters to determine the effect of SGE supplementation on broiler growth. In their first two week of life, broilers will undergo substantial cell multiplication known as hyperplasia (Fatmaningsih *et al*., 2016). The morphometry of broilers fed with SGE was shown to increased significantly from the age of 9 to 14 days of age compared to the control group. This indicates that SGE feed is capable in optimizing cell multiplication and enlargement in broilers. The improvement of the morphometric variables can be used as a foundation for predicting production potential (Ashifudin *et al*., 2017). The significant increase in broiler morphometric growth is thought to be closely related to the flavonoid and phenolic content of *Sargassum glaucescens*, which can enhance intestinal calcium absorption (Wang *et al*., 2022). Additionally, it is presumed that there is an interaction between these components and transcription factors of the myogenesis process, such as PGC-1α, Nrf1, and TFAM, as well as other myogenic regulators. These growth factors will subsequently work together to stimulate soft tissues and bone growth (Setiawan *et al*., 2018).

The study spotted that the index of intestinal weight as well as intestinal length is increased after given SGE feed. Growth in this early phase is very important because it is accompanied by increased secretion of digestive enzymes, increased intestinal surface area for nutrient absorption, as well as improved nutrient transport systems and enhanced immune systems (Ravindran and Abdollahi, 2021). In this study, it was found that the administration of SGE significantly increased liver weight. This increase in liver weight was similar to that obtained in Tumabcao and Garcia (2024), who used dried *Sargassum* sp. in feed at 40%. Based on a summary of Zaefarian *et al.* (2019), the relative weight of the liver will increase until day 14 post-hatching, but will decrease thereafter. This is because hepatocyte cells will undergo hyperplasia and hypertrophy in the early phase of life, which is influenced by the type of feed given. However, the relative weight index of the liver will decrease so that there is no excessive accumulation of fat in its tissues. An increase in gizzard weight was observed in this study, although not significant. Alshamy *et al*. (2018) stated that large gizzard size tends to increase the degree of food processing and availability of nutrients for intestinal absorption. The results of this study are in accordance with the research of Kumar (2018), who stated that the supplementation of *Sargassum* powder in broiler feed can increase the relative weight of broiler's organs, such as the gizzard, liver, and intestines.

In broilers, the Bursa Fabricius is the primary lymphoid organ; meanwhile, the secondary lymphoid organs are the spleen (Arfanda *et al*., 2019; Fransiska *et al*., 2020). When gut activity and health improve, it may have a good impact on lymphoid organs. According to (Huang *et al*., 2016; Rohollahzadeh *et al*., 2018)T and B lymphocytes production will increase as a result of the good quality of the gut. This is reflected by the high organ's relative weight. The group fed with SGE had significantly greater index of the spleen and Bursa of Fabricius, as seen from the size of greater intestinal length and weight compared to the control group. According to Chavan *et al*. (2022), broiler feed which was added with 0,13% *Sargassum wigetti* macroalgae, led to a significant rise in spleen weight, whereas the bursa weight did not differ significantly from that of the control group.

There are up to 200 types of bioactive compounds contained within *Sargassum* macroalgae, those are including protein, vitamins, dietary fiber, carotenoids, minerals, and secondary metabolites such as flavonoids, terpenoids, polyphenols, fucoidans, sterols, and glucolipids. This has made it suitable as a good natural feed additive (Liu *et al*., 2012; Yegdaneh *et al*., 2020). Animal feed enriched with this macroalgae can increase the palatability, digestibility, and intestinal absorption of feed, resulting in better growth performance than those fed with only basal feed (Alloui *et al*., 2012; Kumar, 2018). It is suspected that the mechanism of action of *Sargassum* involves its flavonoids and polyphenols content. These compounds are known for their role as antioxidants mediated by various underlying mechanisms, including reduction or binding of reactive oxygen species (ROS), chelation of metal ions, and inhibition of enzymes involved in oxidative stress (Cheynier, 2012; Lindawati and Ma'ruf, 2020). These compounds are also capable of reducing the level of malonaldehyde formed from the oxidation of unsaturated fatty acids (Ri *et al*., 2017). High oxidative stress may result in reduced livestock performance, such as low body weight and meat quality. However, the effectiveness and mechanism of action of these compounds may vary depending on their structure, concentration, and pharmacokinetics (Valenzuela-Grijalva *et al*., 2017). Therefore, further research is required to study the types of flavonoids and phenols contained in *Sargassum glaucescens*.

CONCLUSION

It can be concluded that the supplementation of up to 2% concentration SGE in broiler feed showed the most optimal results, characterized by a significant increase in morphometry such as beak, neck, head, back, wings, thigh length, chest circumference, and body height. Organ indices such as the relative weight of liver, gizzard, spleen, bursa, intestine, and intestinal length increased along with the increase of SGE concentration in feed. These findings presumed that the bioactive compounds in *Sargassum glaucescens* ethanolic extract play a role in supporting the growth and development of broiler vital organs in the early life phase. Thus, it has the potential to be applied in the broiler production industry to improve the growth and physiological health of broiler chickens.

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CONFLICT OF INTEREST

All authors acknowledge and agree to the writing of this manuscript and declare that there are no conflicts to declare.

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