

## Effect of fermented *Indigofera sp.* and turmeric flour on the digestive visceral organs of native chickens

### *Pengaruh penambahan Indigofera sp. fermentasi dan tepung kunyit terhadap organ visceral pencernaan ayam kampung*

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#### ABSTRACT

This study aims to evaluate the effect of providing fermented *Indigofera sp.* leaf flour and turmeric flour on the visceral organs of the digestive tract in native chickens as Kampung Unggul Balitbangtan (KUB). The method employed was a completely randomized design (CRD) with four treatments (T0, T1, T2, and T3) and seven replicates; each unit consisted of one chicken with the following treatment doses, combination between commercial diet, fermented *Indigofera sp.* leaf flour, and turmeric flour. The measured variables included the weight of digestive organs and the percentage of the length of small intestine segments. Results indicated that administration fermented *Indigofera sp.* leaf flour and turmeric flour had a significant effect ( $P < 0.05$ ) on the weight of digestive organs and the length of the ileum in KUB chickens, but did not significantly affect ( $P > 0.05$ ) the length of the duodenum and jejunum. The conclusion is that offering fermented *Indigofera sp.* and turmeric flour at a level of 10% in the diet can improve the efficiency of the KUB chickens digestive system, characterized by a decrease in digestive organ weight.

#### ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh pemberian tepung daun *Indigofera sp.* fermentasi dan tepung kunyit terhadap visceral organ saluran pencernaan ayam kampung (Kampung Unggul Balitbangtan/KUB). Penelitian ini menggunakan Rancangan Acak Lengkap (RAL) dengan 4 perlakuan dan 7 ulangan, masing-masing unit terdiri atas 1 ekor ayam dengan dosis perlakuannya meliputi variasi antara ransum komersial, tepung daun *Indigofera sp.* terfermentasi, tepung kunyit. Variabel yang diamati meliputi bobot organ dalam pencernaan dan persentase panjang segmen usus halus. Hasil penelitian menunjukkan bahwa pemberian tepung daun *Indigofera sp.* fermentasi dan tepung kunyit memiliki efek nyata ( $P < 0,05$ ) pada berat organ pencernaan dan panjang ileum ayam KUB, tetapi tidak memberikan pengaruh yang nyata ( $P > 0,05$ ) pada panjang duodenum dan panjang jejunum. Kesimpulan dari penelitian ini adalah pemberian fermentasi *Indigofera sp.* dan tepung kunyit pada level 10% dalam pakan dapat meningkatkan efisiensi sistem pencernaan ayam KUB, yang ditandai dengan penurunan berat organ pencernaan.

**Kata kunci:**

SAyam Kampung Unggul  
Balitbangtan (KUB)  
Tepung daun *Indigofera sp.*  
Tepung kunyit  
Saluran Pencernaan



## INTRODUCTION

The development of the native chicken business is certainly inseparable from feed, as one of the main supports in the production process. According to Risyahadi et al. (2022) stated that in terms of nutrition, feed is one of the most important elements in supporting basic life needs, growth, production, reproduction, and livestock health. Good feed will enable poultry to engage in normal physical activity. Feeding within normal limits helps maintain the balance of body tissues and produces energy so that it can function in the metabolic process.

The use of local functional feed materials is an important strategy in increasing the efficiency of poultry production without relying on synthetic additives. One of the potential local feed ingredients is *Indigofera sp.* leaves, which have a high protein content (24,17%) and low crude fiber content (17.83%) (Sirait et al., 2012). Research results Daud et al. (2020) have shown that administering *Indigofera sp.* at a concentration up to 15% does not reduce the performance of superior local chickens and can even improve feed efficiency and economic performance. On the other hand, turmeric (*Curcuma longa*) as a phyto-genic additive containing curcumin compounds has been proven to increase the activity of intestinal digestive enzymes, which can improve nutrient absorption and utilization Aderemi et al. (2023) which has a positive effect on the Kampung Unggul Balitbangtan (KUB) chicken by improving nutrient absorption and utilization, as well as enhancing the digestive health of chickens.

The high protein content in *Indigofera sp.* will help supply the protein needs of poultry. However, *Indigofera sp.* also has limitations in terms of nutrient content, such as high crude fiber content. To reduce the content of crude fiber and increase the nutritional content of feed ingredients, fermentation processing can be carried out (Daud et al., 2020). Fermentation is a process of converting organic substrates through enzymes that utilize microorganisms to break down feed ingredients that are difficult to digest, thereby improving nutritional quality, growth, and increasing the digestibility of crude fiber, protein, and other nutrients (Amanah et al., 2023). As an enzyme producer, the fermentation

process is required to break down crude fiber and increase protein content (Daud et al., 2020).

The addition of fermented *Indigofera sp.* leaf flour and turmeric flour in feed can improve the work of the digestive tract, because the bioactive substances in fermented *Indigofera sp.* leaf flour and turmeric flour provide a combination of ingredients that complement each other and provide improvement to the digestive tract organs of KUB chickens. However, until now, there is still a lack of studies related to the combination of the use of fermented *Indigofera sp.* leaf flour and turmeric flour on the condition of the digestive organs in KUB chicken. Thus, this study was conducted with the hope that the combination of fermented *Indigofera sp.* leaf flour and turmeric flour can improve the visceral condition of the digestive organs of KUB chickens. This study aims to determine the effect of the administration of *Indigofera sp.* leaf flour and turmeric flour on the visceral organs of the digestive tract of native chickens as KUB.

## MATERIALS AND METHODS

### Material

This research was carried out at the Gowa Experimental Garden of the South Sulawesi Agricultural Technology Assessment Center (BPTP South Sulawesi), Pa'bentengan Village, Bajeng District, Gowa Regency, South Sulawesi Province. The materials used in this study were blenders, buckets, lamp fittings, gasoline, litter cages that have partitions measuring 80x50x60 cm, 15 watt lamps, 1 liter drinking place, 3 kg feed holders, digital scales, machetes, saw pliers, ties rope and water, Day old chick (DOC) native chicken as Kampung Unggul Balitbangtan (KUB), EM4, molasses, commercial rations, *Indigofera sp.* leaf flour, ferment and yellow turmeric flour.

### Method

This study used 28 DOC chickens from Kampung Unggul Balitbangtan (KUB) (Unsexung). Maintenance was carried out using a cage with a litter base divided into 28 plots, randomly arranged based on a Completely randomized design (CRD) with four treatments and seven replications, each replication or experimental unit contained 1 chicken per plot.

**Research Design**

This study used a Completely randomized design (CRD) consisting of four treatments and seven replicates for each one chicken. KUB chickens in this study were given a feed treatment produced by the Gowa Agricultural Assessment and Technology Center (BPTP) with the addition of fermented *Indigofera sp* leaf flour and turmeric flour in the feed. The dosage of treatment was as follows:

- T0 = Control (100% commercial diet without treatment)
- T1= 95% commercial diet+5% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour
- T2= 90% commercial diet+ 10% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour
- T3= 85% commercial diet+ 15% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour

In the maintenance phase, DOC was kept for 8 weeks in a brooding cage and given commercial feed and ad libitum water. After 8 weeks of age, 28 KUB chickens were placed in an experimental unit cage with a cage area of 80 cm x 50 cm x 60 cm, each plot containing one KUB chicken. In this phase, treatment rations were given starting from the age of 8 weeks. Treatment feed was given twice a day, namely every morning at 07.00 WITA and afternoon at 15.00 WITA, for drinking water was provided ad libitum, and this was done until the KUB chickens were 12 weeks old. In this grower phase, weight was measured on the first day, then the next weighing was done once a week.

***Indigofera sp.* Fermentation**

The leaves of *Indigofera sp.* were taken directly from the tree. The manufacture of

*Indigofera sp.* leaf flour was by separating the leaves and stems, then wilting the leaves to obtain 10 kg of dry *Indigofera sp.* leaves. After that, 100 ml of EM-4 and 200 g of molasses were added as fermentation ingredients. The fermentation process was carried out for 14 days using a vacuum device. After fermentation, the leaves of *Indigofera sp.* were dried in an oven at 150°C for 24 hours. After drying, the leaves of *Indigofera sp.* were made into flour using a blender and then sifted to get a fine flour. After the *Indigofera sp.* leaf flour has finished and was ready to be given to the flour was wrapped separately for each treatment according to the required dosage.

**Research Variables**

The variables measured in this study were the weight of the digestive organs, including the crop, ventriculus, small intestine segment (duodenum, jejunum, ileum), cecum, and percentage length of the small intestinal segment (duodenum, jejunum, ileum). The weight and length of the small intestine (cm) were observed after the small intestine was cleaned, and each part of the small intestine was then separated into its segments, including the duodenum, jejunum, and ileum. The duodenum is a part of the small intestine that is shaped like a U., jejunum is the middle part of the small intestine that starts from the end of the duodenum to the Meckel's diverticulum, and the ileum starts from the boundary Meckel's diverticulum until the beginning of the branching of the secum (Incharoen et al., 2016). Weighing is carried out after the digests part is removed.

The weight of the organs of the digestive tract and the length of the segments of the small intestine are determined by the formula Satimah et al. (2019);

Table 1. Nutritional standards for Kampung Unggul Balitbangtan (KUB) chicken feed

Phase	Protein	Metabolic energy	Calcium	Phosphor	Amino acid lysine	Amino acid methionine
	(%)	(kcal/kg)	(%)	(%)	(%)	(%)
Starter (0-3 week)	20.0	3,000	0.9	0.6	1.1	0.45
Grower (4-12 week)	17.5	2,800	0.9	0.5	0.9	0.40
Layer (>12 week)	16.5	2,800	3.2	0.5	0.9	0.40

Source: Sitindaon et al. (2020)

$$\text{Percentage weight of digestive organs} = \frac{\text{weight of digestive organs (g)}}{\text{live weight (g)}} \times 100\%$$

$$\text{Percentage of length of small intestine segment} = \frac{\text{length of small intestine segment (cm)}}{\text{live weight (g)}} \times 100\%$$

### Data Analysis

The data was analyzed in a variety of ways in accordance with the Completely randomized design (CRD) with four treatments and seven replications. If it shows a real difference, it is followed by the smallest real difference test (BNT) test using the SPSS program 26.

## RESULTS AND DISCUSSION

Data from the results of visceral research on the digestive tract organs of chickens in Kampung Unggul Balitbangtan (KUB) in the grower phase, given leaf flour of *Indigofera sp.* fermentation and turmeric flour can be seen in Table 2.

### Weight of the Digestive Organs

*Indigofera sp.* fermentation and turmeric flour showed a significant influence ( $P < 0.05$ ) on the weight of the digestive tract organs of KUB chickens in the grower phase.

### Crop

The results of the variance analysis in Table 2 showing that the administration of fermented *Indigofera sp.* leaf flour and turmeric flour has a significant effect ( $P < 0.05$ ) on the crop weight of KUB chicken. The crop weight of

KUB chicken obtained in this study ranged from 4.45-6.85%. The average value showed normal results, not below the standard as shown by the results of Pujiawati et al. (2021) research, namely by providing high crude fiber feed on the characteristics of the digestive tract of crossed native chickens is 2.69-5.63%.

Data in Table 2 showing crop weight in T0 treatment (6.85%) to T3 treatment (5,31%). Decrease the loss of crop weight due to the additional feed given, namely *Indigofera sp.* leaf flour. Fermentation has a low crude fiber content due to the fermentation process that lowers the crude fiber content of the leaves *Indigofera sp.* and also bioactive substances in the form of curcumin contained in turmeric flour which can speed up the digestive process, according to Daud et al. (2020) statement in the fermentation process, enzymes are needed to break down crude fibers and increase protein levels, added by (Liwe et al., 2014). Fermentation causes nutrients in the form of proteins, carbohydrates and fats to be broken down into smaller fractions to facilitate the process of digestion and absorption of nutrients. A smooth and optimal digestion process could cause the crop of KUB chickens (T3) to work lighter, which will affect the crop size to become smaller.

### Ventriculus

Based on Table 2 the administration of fermented *Indigofera sp.* leaf flour and turmeric flour has a real effect ( $P < 0.05$ ) on the ventriculus weight of KUB chickens. The average percentage of chicken ventriculus of KUB chickens in the T0 control treatment (16.71%) while the average

Table 2. Weight of digestive organs of KUB chicken feed *Indigofera sp.* leaf flour fermentation and turmeric flour

Parameters	Treatment				P. Value
	T0	T1	T2	T3	
Crop (%)	6.85±0.89 <sup>a</sup>	4.55±0.38 <sup>a</sup>	4.45±0.68 <sup>a</sup>	5.31±1.07 <sup>b</sup>	0.001
Ventriculus (%)	16.71±0.75 <sup>a</sup>	15.41±1.03 <sup>b</sup>	10.34±0.60 <sup>c</sup>	12.01±2.54 <sup>c</sup>	0.001
Duodenum (%)	7.57±0.78 <sup>a</sup>	4.84±0.63 <sup>b</sup>	6.22±0.79 <sup>b</sup>	6.14±1.45 <sup>c</sup>	0.001
Jejunum (%)	11.71±0.75 <sup>a</sup>	6.74±0.83 <sup>a</sup>	6.42±1.45 <sup>b</sup>	8.11±1.39 <sup>c</sup>	0.001
Ileum (%)	6.42±1.27 <sup>a</sup>	3.97±0.83 <sup>a</sup>	4.80±0.53 <sup>a</sup>	4.45±0.68 <sup>b</sup>	0.001
Caecum (%)	7.00±0.57 <sup>a</sup>	3.74±0.36 <sup>ab</sup>	3.54±0.45 <sup>b</sup>	4.67±1.63 <sup>c</sup>	0.001

Note: <sup>abc</sup>Different superscripts on the same row and column indicate a significant effect ( $P < 0.05$ ).

T0 = Control (100% commercial diet without treatment), T1 = 95% commercial diet+5% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour, T2 = 90% commercial diet+ 10% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour, T3 = 85% commercial diet+ 15% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour.

percentage of ventriculus in the T1 treatment (15.41%), T2 treatment (10.34%), and T3 treatment (12.01%) was lower than the control treatment (T0).

This shows that *Indigofera sp.* leaf flour fermentation and turmeric flour can reduce the workload of ventriculus in digesting feed due to the improvement in nutritional quality from the fermentation of *Indigofera sp.* leaf flour and increased feed digestibility, this is in agreement with Fitria et al. (2023) fermentation is feed processing using microorganisms which will later produce enzymes to break down crude fiber and increase carbohydrate content, protein and fat into smaller fractions so that it facilitates the digestion process and absorption of nutrients and reduces antinutrients, in line with statements by Djunaidi et al. (2021; Lopes et al., 2022) fermented *Indigofera sp.* leaf flour can increase the availability of nutrients and reduce antinutrients compounds so that digestion becomes more efficient.

In addition, the active compound in the form of curcumin is present Turmeric flour is anti-inflammatory and antimicrobial which helps to reduce chronic risks caused by antinutrients substances so that the work of the ventriculus becomes lighter, from the results of research by Lahay et al. (2021) with the administration of a combination of fermented *Indigofera sp.* leaf flour and turmeric flour causing efficiency and weight loss of the digestive organs, namely the ventriculus. Also added is a statement from the results of the research of (Azis et al., 2019). The administration of fermented *Indigofera sp.* leaf flour and turmeric flour shows that the combination can inhibit the growth of pathogenic microbes and support the health of the digestive tract.

The average weight of the ventricles of KUB chickens obtained in this study ranged from 10.34-16.71%, in contrast to the results of the research obtained by Pujiawati et al. (2021) the average weight value of crossed native chicken ventriculus was 21.85-33.85% and also in the ventriculus in ducks which was 28.4-32.2%. Rizkika et al. (2022), the height and weight of the ventriculus depend on the feed given and the composition of the feed must be adjusted to the needs of the livestock. Ananda et al. (2022) stated that the nutritional value of the feed must

be adjusted to the needs of poultry, so that the working function of the ventriculus is not too heavy in digesting nutrients, one of which is coarse fiber, the nutrients in feed have a function in changing the size of the ventriculus which can indirectly be affects ventricular activity.

### Weight of Small Intestine Segment

The segments of the small intestine consist of the duodenum, jejunum, and ileum. In the small intestine, chemical digestion occurs through enzymes produced by the pancreas. Based on the results of statistical analysis, it is shown that giving *Indigofera sp.* fermentation and turmeric flour has a pronounced effect ( $P < 0.05$ ) on the weight of the duodenum, jejunum, and ileum. This indicates that the provision of additional feed in the form of leaf flour *Indigofera sp.* fermentation, and turmeric flour gives a positive response to each treatment. Leaf flour administration treatment *Indigofera sp.* fermentation and turmeric flour in rations against duodenum weight, jejunum, and ileum had a low average duodenal weight, jejunum, and ileum compared to controls.

The decline is due to leaf starch *Indigofera sp.*, which has previously been fermented so that the crude fiber content decreases, then the administration of turmeric flour, which contains bioactive substances in the form of curcumin, which plays a role in improving the digestive process. The role of active compounds such as curcumin and the results of anti-nutrient degradation from fermentation can reduce inflammation and metabolic activity of intestinal tissues, thereby reducing organ weight. This decrease can be interpreted as efficiency in the absorption of nutrients, so that hypertrophy does not occur due to excessive workload. A combination of curcumin from turmeric and a decrease in anti-nutrient substances through *Indigofera sp.* leaf fermentation plays a major role in suppressing inflammation and increasing absorption efficiency (Suprpto et al., 2020).

The active compounds of curcumin found in turmeric can stimulate the digestive process by affecting the secretion of pancreatic enzymes (Jubair et al., 2021). He et al. (2024) added that curcuminoids can affect the activity of the lipase enzyme in the pancreas, which is important for fat metabolism so that it can

improve the digestive process, increase the digestibility of feed, and accelerate the time of digestive transit so that the digestive process is fast and optimal. Nevia et al. (2025) as well as flour *Indigofera sp.* fermented plays a role in improving the morphology of the small intestine in this case expanding the absorption surface and facilitating the absorption of nutrients, then lowering anti-nutrient compounds, increasing nutrient availability, improving the integrity of the intestinal mucosa so that the segments of the small intestine do not work extra to digest and absorb nutrients.

The average percentage of duodenum, jejunum, and ileum weight from each treatment in this study at duodenum weight ranged from 4.84-7.57%, jejunum weight ranged from 8.11-11.71%, and ileum weight ranged from 3.97-6.42%. The average value of the study's results showed normal results. Research results from Pujiawati et al. (2021) showed that the average weight value of the duodenum, jejunum, and ileum of crossed native chickens, namely the 7.54-9.57%, jejunum 8.99-17.79%, and ileum 8.28-15.38%.

### Caecum

Based on the results of statistical analysis, it shows that by giving leaf flour of *Indigofera sp.* fermentation and turmeric flour showed a pronounced effect ( $P < 0.05$ ) on the weight of the caecum. The average percentage of caecum weight in the control treatment (T0) was 7.00% (Table 2), and the average percentage of caecum weight in each treatment was T1 (3.74%), T2 (3.54%), and T3 (4.67%), lower than the control treatment (T0).

Combination of supplementary feeding in the form of leaf meal *Indigofera sp.* fermentation and turmeric flour may reduce the amount of undigested substrate and improve the efficiency of digestion and absorption of nutrients in the digestive tract so that the rest of the feed that enters the caecum becomes less and easier to digest, in addition to the decrease in caecum weight due to the antibacterial activity of turmeric and leaves *Indigofera sp.* that have been fermented that inhibits the growth of pathogenic bacteria present in the caecum (Azis et al., 2019). In this case fermentation of leaf flour *Indigofera sp.* lowers anti-nutrient compounds

and increases the availability of nutrients, so that more nutrients are absorbed in the small intestine segments (duodenum, jejunum, and ileum) and the residue that enters the caecum is reduced, with less crude fiber residue and nutrients entering the caecum, the microbial activity in the caecum is lighter in digesting the rest of the feed, then the role of turmeric flour is very helpful because of the presence of bio-active compounds that support the repair of the digestive tract and help the process digestion, to accelerate the breakdown and absorption of nutrients before entering the caecum, therefore there is a decrease in the weight of the caecum (Lahay et al., 2021).

The average percentage of caecum weight ranges from 3.54-7.00%. The average value of the results of this study is not the same as the results of Pujiawati et al. (2021) research; the average value of the caecum weight of crossed native chickens, which is 5.3%-7.76%, shows normal results and is not below standard.

### Length of Small Intestine Segment

Data from the results of visceral research on the digestive tract organs of KUB chickens in the grower phase fed *Indigofera sp.* The fermentation and flour of turmeric to the length of the segments of the small intestine (duodenum, jejunum, and ileum) are seen in Table 3.

Results of Fingerprint analysis in Table 3 showing that the administration of *Indigofera sp.* fermentation and turmeric flour had no noticeable effect ( $P > 0.05$ ) on duodenum and jejunum. However, it exerts a noticeable influence ( $P < 0.05$ ) on ileum length. As seen in Table 3, the length of the duodenum and jejunum treated with fermented *Indigofera sp.* flour and turmeric flour in each treatment had a higher average value compared to the control treatment.

Supplemental feeding in the form of fermented *Indigofera sp.* leaf flour and turmeric flour did not result in a decrease in the work of the duodenum and jejunum, which shows that the duodenum and jejunum continue to work normally. In accordance with the opinion of Sari et al. (2025) and Purwanti et al. (2020) duodenum and jejunum are the main segments in the digestion and absorption of nutrients. Although the feed given is in the form of *Indigofera sp.* fermentation leaf flour and

Table 3. Average length of small intestine segments of KUB chickens fed *Indigofera sp.* fermentation and turmeric flour in rations

Parameters	Treatment				P. Value
	T0	T1	T2	T3	
Duodenum	22.85±5.49	26.28±2.92	24.28±2.56	22.71±3.67	0.238
Jejunum	39.42±5.62	44.28±5.85	45.00±5.97	42.00±6.35	0.314
Ileum	25.42±3.82 <sup>a</sup>	22.57±2.63 <sup>ab</sup>	22.28±4.30 <sup>ab</sup>	20.00±2.16 <sup>b</sup>	0.046

Note: <sup>ab</sup>Different superscripts in the same row and column indicate a significant effect (P<0.05).

T0 = Control (100% commercial diet without treatment), T1 = 95% commercial diet+5% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour, T2 = 90% commercial diet+ 10% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour, T3 = 85% commercial diet+ 15% fermented *Indigofera sp.* leaf flour + 0.3% turmeric flour.

turmeric flour, the digestion and absorption process still occurs in the duodenum and jejunum, so that the workload of the duodenum and jejunum continues to work normally. The addition of turmeric flour to the ration causes changes in the length of the duodenum and the length of the jejunum caused by the curcumin contained in turmeric flour which functions in improving the working function of the digestive organs and increasing the development of intestinal villi so that it can optimize the absorption process of nutrients (Purwanti et al., 2020).

The addition of turmeric in the feed causes the work of the digestive organs to increase. The curcuminoids from turmeric extract are mostly in the form of curcumin, which is used as an antioxidant; besides that, curcumin also functions as an appetite enhancer. Administration of fermented *Indigofera sp.* leaf flour and turmeric flour did not show a significant effect on the length of the jejunum and duodenum. It is suspected that the coarse fiber in *Indigofera zolingeriana* can still be tolerated by the intestine in the process of protein absorption (Purwanti et al., 2020).

The ileum has a function for the absorption of water and minerals. In this study, the administration of fermented *Indigofera sp.* leaf flour and turmeric flour had a significant effect (P<0.05) on the length of the ileum. This shows that the addition of fermented *Indigofera sp.* leaf flour and turmeric flour influences each other so that the ileum is not too hard. Fermentation of *Indigofera sp.* leaves has been shown to reduce crude fiber content and increase the availability

and digestibility of macro-nutrients such as protein and energy. Meanwhile, the bio-active compound curcumin contained in turmeric acts as a natural phytobiotic that stimulates bile secretion and the activity of digestive enzymes, including protease, amylase, and lipase. This mechanism contributes to increased efficiency of the digestive process and nutrient absorption in poultry, which in turn can improve the physiological function of the digestive tract and optimize feed utilization (Azis et al., 2019; Purwanti et al., 2020; Fitria et al., 2023).

The average length of the ileum has decreased, as seen in Table 3 in T0 treatment (25.42%), there was a decrease in each treatment: T1 (22.57%), T2 (22.28%), and T3 (20.00%). Fermented *Indigofera sp.* leaf flour changes the nutrient content, namely by increasing the protein content and decreasing the crude fiber content so that feed is easier to digest. Fitria et al. (2023) the fermentation process utilizes nutrients contained in the substrate to increase enzyme activity that converts the nutrient content of crude fiber into simpler components, the lower the crude fiber value, the higher the digestibility of feed ingredients, so that the feed given can be absorbed properly. Then, curcumin, which is anti-inflammatory and improves micro-flora that increases absorption efficiency in the small intestine, so the combination can improve digestive efficiency, so that the ileum does not extend its surface for nutrient absorption, which causes the length of the ileum to decrease.

The average percentage of the small intestine segment length in each treatment in

this study included duodenum length ranging from 22.71-26.28%, jejunum length ranging from 39.42-45.00% and ileum length ranging from 20.00-22.57%, the average value indicates conditions that are still within the normal range and was not below standard. The results of this study are consistent with the results of Pujiawati et al. (2021) which showed that the relative length of the small intestine of crossbred native chickens ranged from 26.00-31.83% for duodenum, 40.00-61.00% for jejunum and 52.00-68.00% for the ileum.

### CONCLUSION

Fermented *Indigofera sp.* leaf flour and turmeric flour in feed can be given at a level of 10%, because it can increase the efficiency of the digestive system of KUB native chicken is characterized by a decrease in the weight of digestive organs, because additional feed ingredients in the form of *Indigofera sp.* leaf flour and turmeric flour strengthen in supporting the digestive efficiency of poultry through improved digestion and reduction of organ workload.

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