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The Effect of Addition of Shallot (*Allium ascalonicum* L.) Peel Flour as a Feed Additive on Antibacterial Activity and Characteristics of Small Intestine of Broiler

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Abstract. *Feed is the most important factor in broiler farming to achieve optimal productivity, because feed costs reach 60-70% of the total production costs, therefore the quantity and quality of feed need to be considered. Efforts that can be made to increase feed efficiency and reduce production costs in broiler farming businesses are by adding feed additives. This study aims to evaluate the effect of adding shallot peel flour as a feed additive on antibacterial activity and characteristics of broiler intestines. The method used in this study is a laboratory analysis method and a field experimental method designed using a Completely Randomized Design (CRD) with 6 treatments and 5 replications. The results showed that the treatment of adding red shallot peel flour as a feed additive gave a very significant difference (P <0.01) on the pH, viscosity, length of villi and surface area of the villi of the small intestine of broiler, but gave no significant difference (P>0.05) on the number of villi and depth of the crypts of the small intestine of broiler. The conclusion of this study is that the addition of red shallot peel flour with a level of 1% as an additive in feed gives the best results in improving the characteristics of the small intestine of broiler.*

Keywords: *Broiler, Feed additives, Intestinal characteristics, Shallot peel*

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INTRODUCTION

Broiler is a type of superior breed that is crossed from chicken nations that has high productivity in producing meat. Fast broiler productivity must be supported by good feed in terms of quality and quantity. Feed is the most important factor in broiler farming to achieve optimal productivity, therefore the quantity and quality of feed need to be considered, because feed costs reach 60-70% of the total production cost (Astuti et al., 2015). Efforts that can be made to improve feed efficiency and reduce production costs in broiler farming businesses is to add feed additives to feed.

Feed additive is an ingredient that does not include food substances that are added to feed in small amounts and aims to spur growth and increase feed efficiency in broilers (Nuningtyas, 2014). Antibiotics are one of the feed additives that are widely used by farmers to support the productivity of their livestock. However, the continuous administration of antibiotics in feed can cause negative effects such as providing resistance to microorganisms and can cause residues in the carcass so that it is dangerous to consume because it can provide antibiotic resistance properties to consumers (Anggitasari et al., 2016). Phytobiotics are a type of feed additive that can be used as an alternative to antibiotics.

Phytobiotics are a type of feed additive that is widely developed and used. Phytobiotics are herbal products derived from plants that have antibacterial properties so that they can improve the quality of the digestive tract (pH and microflora balance), feed conversion, improve the digestibility of feed nutrients and improve performance so that they can be used as feed additives (Ramiah et al., 2014). Giving phytobiotics to poultry can increase feed efficiency, productivity, can function as antimicrobials and improve intestinal histomorphology so that it can increase the immunity of poultry (Rohma et al., 2019).

One of the herbal plants that can be used as phytobiotics is shallot (*Allium Ascalonicum* L). Shallot have phytochemical content such as flavonoids, fructans, organosulfur, and saponins which play an important role as antioxidants and antibacterials so that they are beneficial for health (Saputra et al., 2016). Not only the tubers, but shallot peel which are considered waste and not used by the community also have useful phytochemical content. Kumar et al (2022) stated that the phytochemical content in shallot peel is higher than the tubers. The phytochemical content contained in shallot

includes alkaloids, flavonoids, terpenoids, saponins, polyphenols and quercetin which have antibacterial activity (Octaviani et al., 2019). Thus, this study was conducted to analyze the antibacterial properties and its implementation on the intestinal characteristics of broilers.

LITERATURE REVIEW

Feed is the most important factor in broiler farming to achieve optimal productivity, therefore the quantity and quality of feed need to be considered, because feed costs reach 60-70% of the total production costs (Astuti et al., 2015). Feed costs reach 60-70% of the total production costs, so efforts to reduce feed costs are very important in order to increase farmer income (Herlina et al., 2015). Efforts that can be made to increase feed efficiency and reduce production costs in broiler farming businesses are by adding feed additives to the feed.

Feed additives are materials that are not included in food substances that are added to feed (rations) in small amounts and aim to stimulate growth and increase feed efficiency in broiler chickens (Nuningtyas, 2014). Phytobiotics are one type of feed additive that can be used as an alternative to antibiotics. Phytobiotics are herbal products derived from plants that have antibacterial properties so that they can improve the quality of the digestive tract (pH balance and microflora), feed conversion, increase digestibility of feed nutrients and improve performance so that they can be used as feed additives (Ramiah et al., 2014). One of the herbal plants that can be used as phytobiotics is shallot (*Allium Ascalonicum* L.).

Shallot contain phytochemicals such as flavonoids, fructans, organosulfur, and saponins which play an important role as antioxidants and antibacterials so that they are beneficial for health (Saputra et al., 2016). Kumar., et al. (2022) stated that the phytochemical content in shallot peel is higher than in the bulb. Based on the results of phytochemical tests conducted by Prabowo and Noer (2020) on red shallot peel extract, it showed that red shallot peel contains flavonoids, saponins, tannins, alkaloids, and phenols. According to Utami (2022) in his research, the total flavonoid content in red onion skin is 108.21 mg/g.

Flavonoids work as antibacterials can be divided into three mechanisms, namely inhibiting nucleic acid synthesis, inhibiting cell membrane function, and inhibiting energy metabolism (Hendra et al., 2011). Flavonoids that have antibacterial properties make

them potentially able to improve health and improve the quality of digestive organ characteristics, as well as support nutrient absorption and broiler productivity. Yatalaththov., et al (2021) stated that flavonoid compounds can improve the characteristics of the small intestine, thereby affecting the rate of nutrient absorption.

RESEARCH METHODS

The method used in this study is a laboratory analysis method using a descriptive and field experimental method designed using a Complete Random Design (CRD) with 6 treatments and 5 replicates. The material used in this study was shallot peel and 360 Day Old Chick (DOC) broiler chicken strain New Lohman MB202 P. The observed variable was the ability of onion peel flour against Lactic Acid Bacteria (LAB), Escherichia coli, and Salmonella sp. As well as the characteristics of the small intestine which include hydrogen potential (pH), viscosity, number of villi, vili length, vili surface area, and the crypt depth of the broiler small intestine.

Procedures

1. Bacterial Inhibition Test

Bacterial inhibition test using the Kirby Bauer disc method based on Magvirah (2019).

- Made a culture of lactic acid bacteria in MRS-A media, Escherichia coli bacteria and Salmonella sp. on Mac Conkey Agar media for 24 hours.
- Bacterial suspension is made by homogenizing 1 ml of aquades with each of the bacteria that has been cultured.
- Prepared NA media in a petri dish and incubated for 24 hours.
- Inoculated bacteria by spread plate using L glass.
- Closed petri dish to prevent contamination.
- Soaked disc paper in each sample for 20 minutes.
- Wait for the disc paper to dry.
- Disc paper is placed with a small amount of gentle pressing in each treatment on the NA media that has been added bacteria aseptically.
- Incubated media in an incubator for 24 hours at 37°C.
- Measured the diameter of the barrier zone using a caliper with an accuracy of 0.02 mm.

2. Feed Mixing Treatment

Mixing of treatment feed is carried out by mixing basalt feed and shallot peel flour and then stirring until smooth. Mixing shallot peel flour in basal feed is carried out according to the percentage of application that has been determined in each treatment as follows:

P0 (+) : Basal feed without antibiotics

P0 (-) : Basal feed + antibiotics (zinc bacitracin) 0,1%

P1 : Basal feed + 0,25% shallot peel flour

P2 : Basal feed + 0,50% shallot peel flour

P3 : Basal feed + 0,75% shallot peel flour

P4 : Basal feed + 1% shallot peel flour

3. Data Analysis

The data obtained is presented with the Ms. Excel program, which then the data will be processed by analysis of variance (ANOVA) from the Complete Random Design (RAL) with 6 treatments and 5 replicates. If there are results that have a real effect ($p < 0.05$) or very real ($p < 0.01$), then a follow-up test is carried out with the Duncan's Multiple Distance Test (Steel and Torrie, 1995).

RESULTS AND DISCUSSION

1. Shallot Peel Flour Bacterial Inhibition Test (*Allium ascalonicum* L.)

Data from the results of the research on the inhibition of shallot peel flour (*Allium ascalonicum* L.) against lactic acid bacteria (LAB), *Escherichia coli* and *Salmonella* sp. can be seen in Table 1.

Table 1. Bacterial resistance of shallot peel flour

Sample Type	Jamming Zone Diameter (mm)		
	LAB	*Escherichia coli*	*Salmonella* sp.
Shallot Peel Flour	0,79	1,80	1,99

Source: Results of Analysis of the Indonesian Healthy Animal Laboratory, Malang (2025).

The data from the research results in Table 1. suggests that shallot peel flour can inhibit the growth of lactic acid bacteria, *Escherichia coli* and *Salmonella* sp. This is because shallot peel contains phytochemicals that are able to work as an antibacterial. Based on the results of phytochemical tests conducted by Prabowo and Noer (2020), it is stated that the phytochemical content contained in onion peel extracts are flavonoids, saponins, tannins, alkaloids, and phenols. The diameter of the inhibition zone produced

by onion peel flour against the growth of lactic acid bacteria, *Escherichia coli* and *Salmonella* sp. They are 0.79 mm, 1.80 mm and 1.99 mm, respectively. The inhibition ability is relatively weak because it has an inhibition zone diameter of ≤5 mm.

Lactic acid bacteria are a type of non-pathogenic bacteria that are beneficial to poultry health, so the smaller the inhibition zone produced, the better the feed additive. This is in accordance with Nurcahyo et al (2017) who stated that lactic acid bacteria can inhibit the growth of pathogenic bacteria, spur immune response, compete with toxins produced by bacteria to attach to receptors contained in the epithelium of the small intestine and alter metabolism by increasing the activity of digestive enzymes, fermenting glucose into lactic acid, safe for consumption, improving digestibility and absorption.

The weak inhibition of onion peel flour against *Escherichia coli* and *Salmonella* sp. Because the antibacterial compounds contained in the skin of shallots are not able to penetrate the cell walls of *Escherichia coli* and *Salmonella* sp. so that its growth is difficult to inhibit. Gram-negative bacteria *Escherichia coli* has a complex and triangular cell wall structure with an outer layer in the form of lipoproteins, a middle layer in the form of lipopolysaccharides and an inner layer in the form of peptidoglycan which makes gram-negative bacteria more difficult to penetrate by antibacterial compounds (Hamidah et al., 2019). Rahmah (2021) stated that *Salmonella* sp. It has a cell wall that is not easily denatured by the active substance. This is strengthened by the Lingga et al (2015) which state that the cell wall structure of gram-positive bacteria is simpler compared to gram-negative bacteria.

2. Effect of the Addition of Shallot Peel as a Feed Additive on the Characteristics of the Small Intestine of Broilers

Observations of the characteristics of the small intestine include pH, viscosity, number of villi, length of villi, surface area of villi and crypt depth are performed on the small intestine of the ileum. Data from the results of the study related to the effect of the addition of shallot peel flour (*Allium ascalonicum* L.) as a feed additive on the characteristics of the small intestine of broilers can be seen in Tables 2 and 3.

Table 2. Effect of the addition of shallot peel flour on the pH and viscosity of the small intestine of broiler

Treatment	Observation Variables	
	pH**	Viskositas (mPa.s)**
P0(+)	7,72±0,20^{d}	26±9^{a}
P0(-)	7,31±0,30^{cd}	27±16,68^{a}
P1	6,97±0,46^{bc}	51,2±4,49^{ab}
P2	6,42±0,38^{ab}	34,8±2,16^{ab}
P3	6,12±0,25^{a}	40,6±20,95^{ab}
P4	6,13±0,22^{a}	57,4±19,26^{b}

Source: Results of Analysis of the Indonesian Healthy Animal Laboratory, Malang (2025).
Note: The superskip letters (a-d) in the column show a very noticeable influence (P<0.01).

Data from statistical analysis related to the addition of shallot peel flour as a feed additive to the pH of the small intestine of the ileum gave a very noticeable difference in influence (P<0.01). Based on the data, the results of the study showed that broilers fed treated had a lower pH value when compared to broilers fed control. This is because shallot peel contain antibacterial compounds that can inhibit the growth of pathogenic bacteria which increases the population of lactic acid bacteria. Yuanita et al (2019) stated that the high population of lactic acid bacteria causes an increase in the production of organic acids which makes the pH of the small intestine low. This statement is supported by Rahmawati et al (2014) who stated that decreased pH conditions make the condition of the small intestine more acidic, acidic condition of the small intestine can reduce the development of pathogenic bacteria such as Escherichia coli and Salmonella sp. So that it can improve the condition of the digestive tract and the absorption of nutrients in the small intestine to be better.

The results of statistical analysis showed that the addition of shallot peel flour as a feed additive had a very real effect (P<0.01) on the viscosity of broiler. This is influenced by the level of application of shallot peel flour so that there is an effect on the viscosity of the broiler. This is in accordance with the results of research conducted by Maharani (2024) which states that the administration of shallot peel flour as a feed additive provides a very noticeable difference in the viscosity of the small intestine of broilers. Natsir et al (2016) stated that the increased viscosity of the contents of the small intestine can have a negative effect, namely reducing digestive efficiency because the diffusion rate of endogenous enzymes to react with substrates and nutrients becomes slow and can be absorbed in villi in the wall of the small intestine. Meanwhile, the decrease in intestinal viscosity has a positive effect on digestion, namely it can increase enzymatic digestive

activity to react with the substrate, thus allowing an increase in the rate of diffusion of feed substances and absorption in the villi ileum (Emma et al., 2013).

Table 3. Effect of the addition of shallot peel flour on the histomorphology of the small intestine of broiler

Treatment	Observation Variables			
	Number of Vili (*transversal cut*)	Vili Length (μm)**	Villi Surface Area (μm²)**	Depth of Crypt (μm)
P0(+)	6,12±1,96	546,59±80,37^{ab}	634,60±87,81^{a}	158,42±28,86
P0(-)	5,72±1,38	552,07±60,41^{ab}	650,03±81,55^{a}	137,82±25,97
P1	6,12±1,22	512,10±87,38^{ab}	605,25±81,95^{a}	179,60±37,21
P2	5,24±1,13	499,36±43,64^{a}	599,74±36,76^{a}	180,11±25,13
P3	4,88±0,52	455,74±73,13^{a}	583,83±51,94^{a}	193,03±32,86
P4	4,6±0,66	633,63±44,17^{b}	786,99±38,11^{b}	217,15±74,84

Source: Results of Analysis of the Indonesian Healthy Animal Laboratory, Malang (2025)
Note: The superskip letters (a-d) in the column show a very noticeable influence (P<0.01)

The results of statistical analysis showed that the treatment of adding shallot peel flour as a feed additive gave a very significant difference (P<0.01) on the length of the villi and the surface area of the villi of the small intestine of broiler, but gave an insignificant difference (P>0.05) on the number of villi and the depth of the crypts of the small intestine of broiler chickens. Although the treatment of adding shallot peel flour as does not have a noticeable difference, descriptively the P1 treatment with the addition of shallot peel flour gives higher results when compared to other treatments. These results are in accordance with previous research that has been conducted by Mozin et al (2015) which stated that the use of flour extract and shallot peel juice containing flavonoids in feed was not able to affect the number of intestinal villi of broilers.

The treatment of adding shallot peel flour produces a very noticeable difference in the length and area of the surface of the small intestine villi of broilers because the shallot peel contains phytochemical compounds that can act as antibacterial which can reduce the population of pathogenic bacteria in the intestine, so that the length and width of the villi increase. A decrease in pathogenic bacterial colonies greatly affects the length of small intestinal villi, whereas conversely, an increase in pathogenic bacterial colonies can inhibit the growth of small intestinal vili length (Jamilah et al., 2014). Dwijayanti et al (2022) stated that the longer and wider the villi, the wider the surface of the vili in the intestine, this is related to improving digestive function and nutrient transport systems throughout the body. The condition of long villi in the small intestine has a positive effect on broiler health and productivity. The length of the villi is proportional to the absorption

of nutrients, increased production, improved health, the effectiveness of enzyme work, and the smooth transport of nutrients in the digestive tract (Awad et al., 2011).

Although the study showed that the treatment did not have a significant difference in the effect on the crypt, descriptively feed with the addition of shallot peel flour provided a higher value of cryptic depth when compared to the control treatment. This is because treatment with the addition of shallot peel flour is able to balance the microflora of the small intestine by reducing the population of pathogenic bacteria and increasing non-pathogenic bacteria. Wresdiati et al (2013) stated that good non-pathogenic bacterial conditions can increase the thickness of the intestinal mucosa, and have an impact on increasing the depth of crypts and villi length. The deeper size of the crypt can increase the ability to digest and absorb nutrients in the intestines, thus affecting the growth of livestock (Kusuma et al., 2020).

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that the addition of shallot peel flour as a feed additive at a level of 1% provides the best results in improving the characteristics of the small intestine of broilers with the highest values of villi, villi surface area and crypt depth and is able to produce low pH values.

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