Effect of dietary acidifier on intestinal pH of New Zealand White rabbit

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Abstract. The microflora condition in the small intestine of weaning rabbits hasn't developed yet. The use of acidifiers in rabbit feed aims to suppress harmful microorganisms and digestive disorders, especially in weaning rabbits. This research used different levels of acidifier as feed additives for weaning rabbits given on pellet feed. The acidifier addition level was control (T_0), 0.1% (T_1), 0.2% (T_2) and 0.3% (T_3). The parameter measured was the pH of the different parts of the small intestine. The research used 64 weaning rabbits (35 days old) which were kept for 6 weeks. Parameter measured was the pH of the parts of the small intestine consisting of the duodenum, jejunum and ileum. This research used a randomized group design with 4 treatments and 8 replications. The results showed that the addition of acidifiers had no significant difference effect ($P>0.05$) on pH of the duodenum and ileum, but there was a trend to decrease pH in all parts of intestine. While, the effect of acidifiers showed significant differences ($P<0.05$) on pH of jejunum. The conclusion is that the use of acidifier with a level of 0.3% gives the best effect to decrease of intestine pH of New Zealand White Rabbits.
Keywords: acidifier, pH, small intestine, rabbit

1 Introduction

Rabbit farming in Indonesia shows constant development after the Covid 19 case. Rabbits farming are able to survive because these livestock use source feedstuff from local resources. The carrying capacity of feed sources in Indonesia is an advantage in managing livestock businesses. It's just that the obstacles experienced by breeders are digestive problems that often occur on farms. This condition often even proceeds to cases of death, especially in small rabbits. This problem of digestive disease in young rabbits is caused by many factors, one of which is from feed.

Feed is the main source of nutrition for livestock. Providing feed that suitable with their nutritional. High quality of feed will make livestock develop properly. The problem is that rabbits usually lack fiber intake in their feed, so this is the most common cause of gastrointestinal disorders in rabbits. The condition of the digestive ecosystem is mainly related to the immune regulatory system. Microbial control is carried out to improve digestive efficiency and health. This microbial regulation of the digestive tract can overcome digestive problems in weaning rabbits [1].

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The condition of microorganisms in the digestive tract has different resistance to intestinal pH, this can be the cause of digestive disorders. [1] The digestive ecosystem is involved in several major physiological functions and particularly in digestive and immune system regulation. Therefore, microbiota control can be done to improve digestive efficiency and digestive health in animal husbandry. [2] Intestinal connection with components of this microflora from birth. But it is still limited in how it affects normal development and physiology

Rabbits generally have a small intestine pH value ranging from 6.4-7.4 [3]. At this pH, the condition of the microflora in the intestines of weaning rabbits that are not yet stable can easily cause diarrhea and death in young rabbits. The high pH of the rabbit intestine results in not being able to stabilize the bacteria that enter the digestion, so this is a problem for breeders. Farmers will overcome this problem by giving antibiotics, but since antibiotic was restricted or prohibited, farmers experience problems. Therefore, it is necessary to find a solution with the use of other feed additives in the form of organic acids or acidifiers. The addition of organic acids to the diet of rabbits is also important because weaned rabbits do not have enough capacity to acidify their stomach content [4].

Antimicrobial feed additives used worldwide in animal husbandry to improve the economy and ecology of animal production. It can be increasing growth rates, reducing feed expenditure and reducing the risk of disease [5].

This research to determine the effect of the use of acidifiers in feed on the intestine pH of New Zealand White rabbits. The expectation use of acidifiers can reduce the pH value in the digestive system. pH on intestine reach acidic conditions so that it can control and increase the number of nonpathogenic microbes (BAL) in the digestive system.

2 Materials and Methods

The research material used 64 New *Zealand* White rabbits. The rabbits uses weaning rabbit with an age of 1 month. The in vivo experiments was carried out for 6 weeks. The feed ingredients used are corn, rapeseed meal, soybean meal, pollard, grass, coconut meal, corn gluten feed, mineral mix and molasses. The feed ingredients are formulated and processed into one to become pellet-shaped basal feed. The treatment feed used basal feed added with Pros G. Brand of acidifier containing formic acid (350 gm), lactic acid (58 gm), propionic acid (78 gm), citric acid (99.50 gm) and silocon dioxide (18.50 gm).

The research method used field experiments, namely *in vivo tests on* New Zealand White rabbits. The experimental design used was a randomized design complete with 4 treatments and 8 replication. The treatments tested are as follows:

T0 = basal diet
T1 = basal diet + 0,1 % *acidifier* (PROS Acid G)
T2 = basal diet + 0,2 % *acidifier* (PROS Acid G)
T3 = basal diet + 0,3 % *acidifier* (PROS Acid G)

The variable observed in this research was the pH of the parts of the small intestine consisting of the duodenum, jejunum and ileum. pH measurement is done by removing digesta from the small intestine and placed in a tray or container, then digesta is measured using a pH meter [6]. The data obtained during the study were then analyzed using ANOVA (*Analysis of variance) fingerprints*, if there is a real or very real difference in influence between treatments, it will be continued with the Duncan Multiple Distance Test.

Table 1. Feed Ingredient and Nutrition Content

Feed Ingredient	%
Corn	18
Rice bran	15
Pollard	24
Copra meal	3
Spybean meal	12
Rapeseed meal	7
Corn Gluten Feed	7.8
corn pericarp	5
Brachiaria Decumbens	6
Molases	2
premix	0.2
Total	100
Nutrition Content	
Crude Protein (%)	19.05
Crude Fiber (%)	16.85
Crude Fat (%)	2,73
NDF (%)	58,18
ADF (%)	31,40
Selulose (%)	16,90

3 Results and Discussion

The results on the effect of adding *acidifiers* in pellet feed on the pH of the small intestine of *New Zealand White rabbits* are presented in table 2. The statistical analysis showed that the addition *of acidifiers* to the feed did not have a different effect (P>0.05) on the pH value of the duodenum. The highest duodenum pH value is shown by T_1 (6.77±0.30) while the lowest duodenal pH value is shown by T_3 (6.64 ±0.19). In Figure 1 can be seen that the duodenum pH trend increases at T_1, then at T_2 and T_3 decreases along with the increase in the level of acidifier.

Table 2. Average pH value of parts of the small intestine

Variables	Treatments			
	T0	T1	T2	T3
pH Duodenum	6.73±0.28	6.77±0.30	6.71±0.37	6.64±0.19
pH Jejunum*	7.02 ± 0.29^{ab}	6.76 ± 0.19^{a}	7.11 ± 0.46^{b}	6.91 ± 0.43^{ab}
pH Ileum	7.41±0.37	7.37±0.33	7.36±0.30	7.23±0.44

Information: T0 = without acidifier, T1 = addition of 0.1% acidifier; T2=addition of 0.2% acidifier, T3=addition of 0.3% acidifier; * $^{a–b}$ means within the same row without the same superscripts are significantly different ($p < 0.05$)

The effect of the treatment showed a significanty different (P<0.05) in the pH of the jejenum. The highest pH value of the jejunum was shown by the T_2 (7.11±0.46); where the To, T_2 and T_3 treatments show not different from the same notation. In figure 1 can be seen

that the trend of jejenum pH decreases, but at T_2 it increases. And at T_3 was decreases again. The lowest jejunum pH was shown by T_1 (6.76±0.19).

The addition of acidifier on feed did not difference effect between treatments (P>0.05) in the ileum. The highest ileal pH value was shown by T_0 (7.41±0.37) while the lowest ileal pH value was shown T_3 (7.23±0.44). In figure 1, it can be seen that the pH trend of the ileum decreases along with the increase level of acidifier.

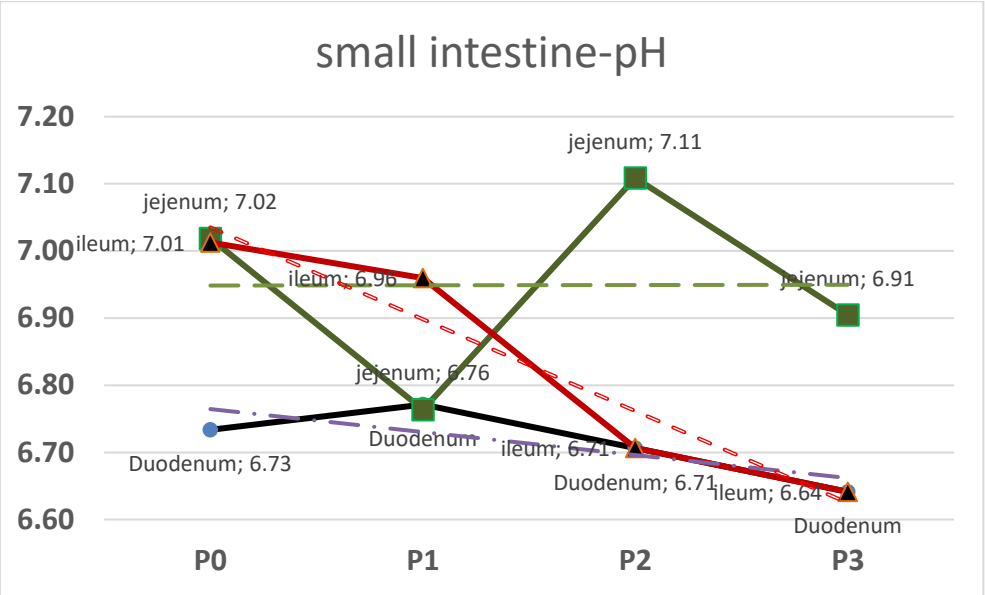

Fig. 1. Trends in the pH of the duodenum, jejenum and ileum in each treatment

Treatment level 0.3% acidifier (T_3) to pellet feed gave the best results in lowering the pH value of the small intestine of New Zealand White rabbits. The pH value of the duodenum at T_3 was 6.64±0.19, jejunum pH 6.91±0.43 and ileal pH 7.23±0.44. The pH value obtained can still be good and normal condition. [3] The pH of the small intestine in guinea pigs and rabbits is in the range of pH values around 6.4-7.4. [7] Further added that explain detail in rabbits, the pH value of the diduodenum was between 6.0-6.6 and the jejunum pH value was 6.6-7.0 and around the distal ileum value was 7.4. The use of *acidifier* as much as 0.3% in pellet feed was still safe and tolerable, because the final pH obtained does not drop dramatically and exceeds the normal limit of rabbit intestinal pH in general. In addition acidifier, pH conditions that are not too acidic will prevent *acidosis* in livestock.

Overall result from treatment of adding acidifier in rabbit feed can be seen in Table 2. The addition of acidifiers to pellet feed results in a decrease in pH in each treatment, this happens because acidifiers act as organic acids that have a role to acidify the digestive tract, especially in small intestine. According to [8] a decrease pH in the digestive tract due to acidifier administration occurs when acid breaks down in the digestive tract and liberates hydrogen ions (H +) ; then more hydrogen ions (H +) are released by the acidifier from organic acids, the pH in the digestive tract was getting more acidic. The acidic atmosphere in the digestive system provides several advantages, including suppressing the development of pathogenic bacteria that inhibit the digestive process and increasing the amount of BAL in the intestine so that indirectly the use of acidifiers will maintain microbial balance and even increase microbes in the digestive system. The good condition on digestive system will

facilitate absorbing nutrients. The intestine will be optimal in digestion of feed and it will be more healthful .

4 Conclusion

The conclusion of this research was the adding of *acidifier* with level 0.3% in feed can have the best effect on reducing intestinal pH of New *Zealand White Rabbit*.

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