

# The Effect of Gembili Tuber on the Growth Performance of Quail

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## ABSTRACT

The aim of this study was to investigate the effect of gembili tuber on the growth performance of quail. The study was used 200 male quail of age 2 weeks. The completely randomized design was used in this study. The treatment of this study consists of T0: control (0% gembili tuber), T1: basal diet + 0,3% gembili tuber, T2: basal diet + 0,6% gembili tuber, T3: basal diet + 0,9% gembili tuber. The parameters of this study were feed intake, body weight gain and feed conversion ratio. The results showed that the administration of gembili tuber has significant effect ( $p < 0,05$ ) on the feed intake, body weight gain and feed conversion ratio of quail. The conclusion of the study was that administration of gembili tubers as a prebiotic increased the growth performance of quail.

**Keywords:** quail, performance, prebiotic

## INTRODUCTION

Quail was a type of poultry that was widely kept by the community because having fast growth. One of the efforts to support the growth of quails was used a prebiotic. Prebiotics are substrates that cannot be digested by the host digestive tract, but can be fermented by beneficial microflora in the digestive tract and play a role in increasing the growth and activity of beneficial bacteria. [1,2,3] There were various types of prebiotics, one of which was inulin. Inulin was a fructose unit connected by a  $\beta$  2-1 glycosidic bond with the terminal unit of glucose. [4,5] Several studies showed that

inulin has a good effect on the growth performance, carcass, intestinal morphology and stimulate the growth of *Lactobacillus* and *Bifidobacteria*. [4,6,7]

Gembili tubers was one of the local ingredients from Indonesia which has the potential to be a source of inulin. Setyaningrum et al. (2023) reported that gembili tuber contains of inulin 1.78%, sucrose 1.11%, raffinose 0.02% and mannose 0.01%. [8] The potential of inulin from gembili tubers as a prebiotic can be seen from its ability to support the growth of *Lactobacillus plantarum* and *Lactobacillus casei*. [9] So far, the use of gembili tuber was still widely used as a mixture in the manufacture of food ingredients. Meanwhile, the use of gembili tuber as a prebiotic of inulin in livestock was still rarely used. Existing information, the use of gembili tuber as a prebiotic was still used in broiler chickens and the results were able to support the growth of broiler chickens. [10] While the use of gembili tuber in quail has not been found, so it is necessary to use gembili tuber as a prebiotic in quail to support its growth. The aim of this study was to investigate the effect of gembili tuber on the growth performance of quail.

## MATERIALS & METHODS

A total of 200 male quails of aged 2 weeks, gembili tuber and basal diet consisting of corn, rice bran, soybean meal, fish meal, palm oil and premix were used in this study. The basal diet composition in this study

showed at Table 1. The treatment of this study consists of T0: control (0% gembili tuber), T1: basal diet + 0,3% gembili tuber, T2: basal diet + 0,6% gembili tuber, T3: basal diet + 0,9% gembili tuber. The parameters of this study were feed intake, body weight gain and feed conversion ratio.

Table 1 Basal diet

Ingredient	Composition (%)
Corn	49.50
Rice bran	7.00
Soy bean meal	31.50
Fish meal	10.00
Palm oil	1.00
Premix	1.00
<b>Total</b>	<b>100</b>
Content of nutrient	
Metabolizable Energy (kcal/kg)	2954.83
Crude protein (%)	22.26
Crude fiber (%)	4.03
Crude eter (%)	5.51
Calcium (%)	1.05
Phosphor (%)	0.58

The first step of this study was manufactured of gembili tuber flour. Nine months old of gembili tuber were peeled. Then washed, thinly sliced, dried in the sun and grinded to obtained of gembili tuber flour. The next steps of this study were treatment of gembili tuber on the quails. The 200 male quails of aged 2 weeks were divided randomly and placed into 20 experimental units, where each experimental unit contained of 10 quails.

The treatment of gembili tuber was carried out at the quail was 2-6 weeks old. The treatments of gembili tuber were given by the mixed with the basal diet. The quail during the study were given feed and drinking water adlibitum. Manual feeding and drinking were conducted in this study. The measurement of feed intake, body weight gain and feed conversion ratio based on Rehman et al. (2020).<sup>[11]</sup> Calculation of feed intake was done every day and accumulated for weekly. The measured of body weight was calculated weekly. Feed conversion ratio was calculated based on data of feed intake and body weight gain.

### STATISTICAL ANALYSIS

The completely randomized design was used in this study consist of 4 treatments with 5 replicates. The analysis of variance was used to analyzed of all data. Duncan's multiple range test was applied if there significant different among the treatments.

### RESULT

The research showed that the administration of gembili tuber was significantly ( $p < 0.05$ ) on the feed intake, body weight gain and feed conversion ratio of quail. The average of feed intake, body weight gain and feed conversion ratio were presented at Table 2.

Table 2 The Average of Quail Performance

Treatments	Parameters		
	Feed intake (g)	Body weight gain (g)	Feed conversion ratio
T0	408.00 <sup>a</sup>	82.70 <sup>b</sup>	4.94 <sup>a</sup>
T1	387.86 <sup>b</sup>	82.14 <sup>b</sup>	4.74 <sup>ab</sup>
T2	392.45 <sup>b</sup>	89.38 <sup>a</sup>	4.40 <sup>b</sup>
T3	399.29 <sup>ab</sup>	86.28 <sup>ab</sup>	4.63 <sup>ab</sup>

Means with different superscripts in the same column are significant different ( $p < 0.05$ )

### DISCUSSION

#### Feed Intake

The results showed that the administration of gembili tuber had significantly effect ( $p < 0.05$ ) on the feed intake of quail. Similar with Frobel et al. (2019) reported that the supplementation of prebiotic has an effect on the feed intake of broiler chickens.<sup>[12]</sup> However, different with Xia et al. (2019), supplementation of inulin did not affect on the feed intake of broiler.<sup>[13]</sup> Reda et al.

(2021) reported that supplementation of lycorice (*Glycyrrhiza glabra*) also gave the same results on the feed intake of quail.<sup>[14]</sup>

The supplementation of inulin increased the development of beneficial bacteria in the intestine and reduced the growth of pathogenic bacteria so that it can be improve the health.<sup>[4,15]</sup> Huang et al. (2015) reported that administration of inulin has a beneficial effect on improving the intestinal function of broiler chickens.<sup>[16]</sup> The

supplementation of inulin increased the concentration of lactic acid bacteria such as *Bifidobacteria* and reduce the number of pathogenic bacteria such as Enterobacteria, so resulting in better utilization of nutrients.<sup>[17,18,19]</sup>

### Body Weight gain

The results showed that the administration of gembili tuber had significantly different ( $p < 0.05$ ) on the body weight gain of quail. In line with Nabizadeh et al. (2012), supplementation of inulin increased the body weight gain of broiler chickens.<sup>[6]</sup> The same result was also reported by Wang et al. (2015), the supplementation of prebiotic at broiler increased the body weight.<sup>[20]</sup> However, in contrast with Huang et al. (2015) and Xia et al. (2019) reported that the supplementation of inulin had the same results on body weight gain of broiler.<sup>[13,16]</sup> Prebiotics were able to change the structure of the intestine so that there was increased the growth of beneficial bacteria, while the growth of pathogenic bacteria will be inhibited and this will have an impact on the growth.<sup>[20]</sup> Kozłowska et al. (2016) stated that inulin will increase the development of beneficial bacteria such as *Lactobacillus johnsonii* and *Bifidobacterium* in the intestine and reduce the growth of pathogenic bacteria.<sup>[4]</sup> Krismiyanto et al. (2014) reported that the decrease of number *Escherichia coli* bacteria in crossbred native chickens due to the treatment of inulin derived from dahlia tubers.<sup>[19]</sup> This condition will improve the microbial balance in the intestine and increased the efficiency of absorption of nutrients, especially protein so that this will affect the body weight gain. Alzueta et al. (2010) reported that administration of inulin increased the digestibility of protein in broiler chickens.<sup>[21]</sup>

### Feed Conversion Ratio

The research showed that the treatment of administration of gembili tuber was significantly ( $p < 0.05$ ) reduced the feed conversion ratio of quail. These results were

supported by data of feed intake and body weight gain also different significant. The results were in line with Zhao et al. (2016) reported that supplementation of lactose had a significant effect on the feed conversion ratio of broiler.<sup>[22]</sup> In contrast to the results of Xia et al. (2019) who reported that supplementation of inulin did not effect on the feed conversion ratio of broiler chicken.<sup>[13]</sup>

The supplementation of inulin stimulated the growth of *Lactobacillus* and *Bifidobacteria*.<sup>[5,15]</sup> The supplementation of inulin affected on performance, microflora, intestinal mucosal morphology and short chain fatty acids (SCFA).<sup>[6,7]</sup> SCFA will be used as an energy source for the host, besides that, increasing of SCFA contributed to lowering the pH in the intestine which can inhibit the growth of pathogenic bacteria and will also increase the feed efficiency.<sup>[23,24,25]</sup> The increased of intestinal health affected the absorption and utilization of more nutrients that lead to better of feed conversion ratio.<sup>[26]</sup>

### CONCLUSION

The conclusion of the study was that administration of gembili tubers as a prebiotic increased the growth performance of quail.

### Declaration by Authors

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**Conflict of Interest:** The authors declare no conflict of interest.

### REFERENCES

1. Chambers JR, Gong, J. The Intestinal Microbiota and Its Modulation for Salmonella Control in Chickens. Food Research International. 2011; 44: 3149–59.
2. Teng P Y, Kim WK. Review: roles of prebiotics in intestinal ecosystem of

- broilers. *Frontiers in Veterinary Science*. 2018; 5:245.
3. Dankowiakowska A, Bogucka J, Sobolewska A, Tavaniello S., Maiorano G, Bednarczyk M. Effects of in ovo injection of prebiotics and synbiotics on the productive performance and microstructural features of the superficial pectoral muscle in broiler chickens. *Poultry Science*. 2019; 98(10): 5157-5165.
  4. Kozłowska I, Marc-Pienkowska J, Bednarczyk M. Beneficial aspect of inulin supplementation as a fructooligosaccharide prebiotic in monogastric animal nutrition: a review. *Annals of Animal Science*. 2012; 16(2): 315 -331.
  5. Wu X Z, Wen ZG, Hua JL. Effects of dietary inclusion of *Lactobacillus* and inulin on growth performance, gut microbiota, nutrient utilization, and immune parameters in broilers. *Poultry science*. 2019; 98(10): 4656-4663.
  6. Nabizadeh A. The effect of inulin on broiler chicken intestinal microflora, gut morphology and performance. *Journal of Animal and Feed Science*. 2012; 21(4):725-734.
  7. Song J, Li Q, Li P, Liu R, Cui H, Zheng M, Everaert N, Zhao G, Wen J. The effects of inulin on the mucosal morphology and immune status of specific pathogen-free chickens. *Poultry science*. 2018; 97 (11): 3938-3946.
  8. Setyaningrum S, Siregar DJS, Pradana, TG. Combination of gembili tuber and *Lactobacillus plantarum* on the performance, carcass, hematological parameters, and gut microflora of broiler chickens. *Advances in Animal and Veterinary Sciences*. 2023; 11 (2): 203-210.
  9. Zubaidah E, Akhadiana W. Comparative study of inulin extracts from dahlia, yam, and gembili tubers as prebiotic. *Food and Nutrition Sciences*. 2013; 4: 8-12.
  10. Fajrih N, Khoirudin M, Fanani AF. Growth performance and health status of broiler that given tuber of gembili as inulin. *Jurnal Peternakan Indonesia (Indonesian Journal of Animal Science)*. 2020; 22(2): 141-149.
  11. Rehman A, Arif M, Sajjad N, Al-Ghadi MQ, Alagawany M, Abd El-Hack ME, Alhimaidi AR, Elnesr SS, Almutairi BO, Amran RA, Hussein EOS, Swelum AA. Dietary effect of probiotics and prebiotics on broiler performance, carcass, and immunity. *Poultry Science*. 2020; 99(12): 6946–6953.
  12. Froebel LK, Jalukar S, Lavergne TA, Lee JT, Duong T. Administration of dietary prebiotics improves growth performance and reduces pathogen colonization in broiler chickens. *Poultry science*. 2019; 98(12): 6668-6676.
  13. Xia Y, Kong J, Zhang G, Zhang X, Seviour R, Kong Y. 2019. Effects of dietary inulin supplementation on the composition and dynamics of cecal microbiota and growth-related parameters in broiler chickens. *Poultry Science*. 98 (12): 6942-6953.
  14. Reda FM, El-Saadony MT, El-Rayes TK., Farahat M., Attia, G., Alagawany, M. Dietary effect of licorice (*Glycyrrhiza glabra*) on quail performance, carcass, blood metabolites and intestinal microbiota. *Poultry Science*. 2021; 100(8): 101266.
  15. Yang J, Rose DJ. The impact of long-term dietary pattern of fecal donor on in vitro fecal fermentation properties of inulin. *Food and Function*. 2016; 7:1805–1813.
  16. Huang Q, Wei Y, Lv Y, Wang Y, Hu T. Effect of dietary inulin supplements on growth performance and intestinal immunological parameters of broiler chickens. *Livestock Science*. 2015; 180: 172–176.
  17. Lynch MB, Sweeney T, Callan JJ, Flynn B, O'Doherty JV. The effect of high and low dietary crude protein and inulin supplementation on nutrient digestibility, nitrogen excretion, intestinal microflora and manure ammonia emissions from finisher pigs. *Animal*. 2007; 1(8): 1112-1121.
  18. Toghyani M, Toghyani M, Tabeidian SA. Effect of probiotic and prebiotic as antibiotic growth promoter substitutions on productive and carcass traits of broiler chicks. In *International Conference on Food Engineering and Biotechnology*. 2011; 9: 82-86.
  19. Krismiyanoto L, Suthama N, Wahyuni HI. Feeding effect of inulin derived from *Dahlia variabilis* tuber on intestinal microbes in starter period of crossbred native chickens. *Journal of the Indonesian Tropical Animal Agriculture*. 2014; 39 (4):217–223
  20. Wang W, Yang H, Wang Z, Han J, Zhang D, Sun H, Zhang F. Effects of prebiotic supplementation on growth performance,

- slaughter performance, growth of internal organs and small intestine and serum biochemical parameters of broilers. *Journal of Applied Animal Research*. 2015; 43 (1): 33-38.
21. Alzueta C, Rodriguez ML, Ortiz LT, Rebolé A, Trevino J. Effects of inulin on growth performance, nutrient digestibility and metabolisable energy in broiler chickens. *British Poultry Science*. 2010; 51(3): 393-398.
  22. Zhao PY, Li HL, Mohammadi M, Kim IH. Effect of dietary lactulose supplementation on growth performance, nutrient digestibility, meat quality, relative organ weight, and excreta microflora in broilers. *Poultry Science*. 2016; 95(1): 84-89.
  23. Wong JM, De Souza R, Kendall CW, Emam A, Jenkins DJ. Colonic health: fermentation and short chain fatty acids. *Journal of Clinical Gastroenterology*. 2006; 40(3):235-243.
  24. Ribeiro T, Cardoso V, Ferreira LMA, Lordelo MMS, Coelho E, Moreira ASP, Domingues MRM, Coimbra MA, Bedford MR, Fontes CMGA. Xylo-oligosaccharides display a prebiotic activity when used to supplement wheat or corn-based diets for broilers. *Poultry Science*. 2018; 97(12): 4330-4341.
  25. Rinttila T, Apajalahti J. Intestinal microbiota and metabolites-implications for broiler chicken health and performance. *Journal of Applied Poultry Research*. 2013; 22(3), 647-658.
  26. Patel A, Sharma RK. Effect of feeding cow urine and Aloe vera on performance and carcass traits of broilers. *Journal of Animal Research*. 2013; 3(2):125-129.
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