JWPR
Journal of World's Poultry Research
2026, Scienceline Publication
J. World Poult. Res. 16(3): 358-369, 2026
Review Paper
DOI: https://dx.doi.org/10.36380/jwpr.2026.33
PII: S2322455X2600033-16
ISSN: 2322-455X
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The Role of Dietary Fibre in Modulating Gastrointestinal Development, Nutrient Utilization, and Growth Performance in Broiler Chickens: A Review

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Received: June 17, 2026, Revised: July 21, 2026, Accepted: August 22, 2026, Published: September 30, 2026

ABSTRACT

Dietary fibre, known as a diluent in poultry feed, has recently attracted considerable interest owing to its potential functional benefits beyond energy provision. The present study aimed to obtain findings related to the effects of different sources of dietary fibre on gastrointestinal tract (GIT) development, nutrient utilization, gut microbiota, and growth performance in broiler chickens. Dietary fibre is a major constituent of plant feed resources. Traditionally, dietary fibre was regarded as an antinutritional factor. The consideration of dietary fibre as an antinutritional factor was due to its negative effects on nutrient utilization, as it impairs feed intake and digestibility in broiler chickens. However, recent studies have indicated that the inclusion of dietary fibre at 2 to 3% in the diet of broiler chickens served multiple functions. Dietary fibre induces GIT development, gizzard activity and functionality, and digestive physiology. Fibre enhances enzyme secretion, digestion, fermentation, and absorption of nutrients. Dietary fibre keeps homeostasis through balancing the host and gut microbiota, increasing the composition and population of commensal bacteria, and reducing the pH of the GIT. The low pH creates an unfavorable environment for pathogenic bacterial proliferation. Thus, fibre helps maintain immunity, which further enhances the production performance in broiler chickens. In Ethiopia, where financial constraints and limited infrastructure hindered access to conventional feed ingredients, studies have primarily focused on replacing costly concentrates with more accessible and affordable alternatives, including dietary fibre sources. The present study revealed that including dietary fibre in the diet of broiler chickens resulted in different responses, with 2-3% inclusion generally beneficial, while exceeding 30 g/kg may decrease broiler chickens' growth performance; therefore, determining precise levels of dietary fibre inclusion is essential.

Keywords: Broiler chicken, Fibre, Gastrointestinal tract, Growth performance

INTRODUCTION

The global demand for meat consumption was anticipated to increase by approximately 60 to 70 percent by the year 2050, driven by population growth and economic development (Sumbule et al., 2021). The production of broiler chickens plays a pivotal role in ensuring a rapid and sustainable supply to satisfy the growing demand. According to Oke et al. (2024), broiler chicken production has been increasing worldwide due to population growth, industrialization and urbanization, intensive production systems, and increased use of improved breeds. However, inadequate availability coupled with poor-quality feed resources are major constraints of the poultry sector, especially in developing countries including Ethiopia (Abera et al., 2024).

Nutrition is the backbone of profitable broiler chicken production. On average, feed accounts for the largest portion of total production costs. Specifically, in modern broiler chicken production, feed is the primary expense, making up approximately 70% of the overall production costs (Sugiharto, 2019). Consequently, several studies have been conducted to investigate the productive performance of broiler chickens using potential alternative feed resources (Sittiya et al., 2020; Tejeda and Kim, 2020;

Zhang et al., 2023). Recently, alternative feed ingredients that enhance the production performance of broiler chickens have been of great concern for scientific communities (El-Deek et al., 2020; Grigore et al., 2025). The need for alternative feed ingredients has led to the use of dietary fibre as a strategy to decrease the cost of feeds (Amerah et al., 2009; Yadav and Jha, 2021). Fibre naturally exists in plant-based feed resources and is a vital constituent in poultry diets (Jha et al., 2019). Dietary fibre refers to a group of heterogeneous compounds that includes oligosaccharides, non-starch polysaccharides, pectin, waxes, and lignin (McDonald et al., 2008). Dietary fibre is highly resistant to enzymatic hydrolysis by alimentary enzymes (Jha and Mishra, 2021). However, an optimal level of dietary fibre is important in poultry nutrition, as it supports improved productive performance (Esmail, 2012; Barszcz et al., 2024).

Previous findings indicated that dietary fibre had adverse effects on feed intake and nutrient digestibility (Jha et al., 2019), while its impact on growth performance was not notable (Sittiya et al., 2020). A recent study demonstrated that dietary fibre at 3% inclusion improved growth performance and digestive physiology in broiler chickens (Rasool et al., 2023). Furthermore, soluble dietary fibre (SDF) is generally recognized to diminish nutrient utilization primarily due to its viscous nature, which decreases the passage rate (Mateos et al., 2012). On the contrary, insoluble dietary fibre increases nutrient utilization by improving gastrointestinal development and enzyme secretion (Donadelli et al., 2019). Additionally, particle size plays a significant role in the use of dietary fibre in broiler nutrition. For instance, large particle size (coarse particles) of dietary fibre increases broiler chicken performance, while fine particle fibres negatively affect growth performance (Xu et al., 2017; Donadelli et al., 2019). Consequently, it has been recommended that a feed particle size of at least 1 mm should be used to enhance gizzard development (Svihus, 2011).

The incorporation of dietary fibre at a level of 2% lignocellulose within the grower and finisher diets for broiler chickens yielded beneficial effects on their performance (Kheravii et al., 2017). Accordingly, Abdollahi et al. (2019) demonstrated that the dietary inclusion of insoluble fibre products such as 10 g/kg lignocellulose improved digestive function and boosted growth performance in broiler chickens. It has been observed that insoluble fibre, made up of 15% coarse hulls with equal parts of oats and barley hulls, promotes the development of the gastrointestinal tract (GIT; Sacranie et al., 2012), improves nutrient digestibility (Jiménez-Moreno et al., 2013a), and enhances utilization (Donadelli et al., 2019). Nowadays, the inclusion of fibre in broiler chicken diets is more advanced and has been given more attention by animal nutritionists (Bedford et al., 2024). As a result, there are many studies related to the use of fibre in poultry nutrition worldwide (Adibmoradi et al., 2016; Tejeda and Kim, 2021; Nguyen et al., 2022). However, the use of dietary fibre in broiler chicken nutrition, with special reference to the digestive system, nutrient utilization, and performance, has not been extensively reviewed. Therefore, the present study aimed to review the current findings on the role of dietary fibre in broiler chicken nutrition in relation to GIT development, nutrient utilization, gut microbiota, and growth performance.

SEARCH CRITERIA

This study used a conventional literature review methodology. The keywords used to find relevant information on the role of dietary fibre in modulating the GIT, nutrient utilization, and performance were poultry, chicken, broiler, fibre, dietary fibre, dietary fibre sources, dietary fibre level, fibre feeding, dietary fibre-based feeding, fibre and GIT, fibre and growth performance, and fibre and microbiota. The data were retrieved using the Web of Science (WoS), Scopus, and Google Scholar databases. Research articles sourced from reputable scholarly journals, encompassing both reviews and original research papers, were prioritized during the selection process. Additionally, the reference lists of most articles related to the current review were thoroughly examined to identify further pertinent findings. After collecting all the necessary information, the study selected relevant articles or research papers published from 2003 onward from different databases for the current review. Although the total number of articles downloaded from the different searching databases at the beginning was 217, the total number of articles used to write the present study was 83. Old publications, duplicate publications, those published in non-reputable journals, and articles that did not directly relate to the aim of the current study were excluded.

DIETARY FIBRE AND GASTROINTESTINAL TRACT DEVELOPMENT

The avian stomach contains two different compartments, which include the proventriculus and the ventriculus (Hyder et al., 2023). The physiology of the gut, particularly the proventriculus and ventriculus, has been comprehensively discussed (Svihus, 2014). The

proventriculus secretes hydrochloric acid and digestive enzymes such as pepsin, which are added to the feed (Scanes and Pierzchala-Koziec, 2014). However, since the proventriculus has a very limited capacity and the feed is retained there for a short period, most of the hydrolysis of feed materials takes place in the gizzard (Svihus, 2011).

The gizzard controls many physiological functions of the GIT and plays a key role in mechanical breakdown and enzymatic digestion of ingesta (Scanes and Pierzchala-Koziec, 2014). Gizzard development and functionality are positively affected by dietary fibre inclusion (Mousavi et al., 2024). The inclusion of dietary crude fibre from 7 to 9% enhances GIT development and growth performance in broiler chickens aged between 22 and 42 days (Zhang et al., 2023). The benefits of including moderate levels of fibre (2-3%) are more significant when incorporated into low fibre diets (Mateos et al., 2012). Nevertheless, the effect of fibre on GIT development is highly determined by different interacting factors such as fibre sources used, particle size of the fibre, and amount of fibre (Mateos et al., 2012; Jiménez-Moreno et al., 2013b). According to Jiménez-Moreno et al. (2013a), fibre enhances GIT development, but higher fibre levels might negatively affect intestinal mucosal structure in young broiler chickens, since their requirement ranges from 82 to 101 g/kg diet.

Dietary changes have significant effects on GIT development, particularly the gizzard of broiler chickens (Celi et al., 2017). Therefore, the size of the gizzard rapidly enlarges due to the inclusion of structural components such as dietary fibre in the diet of broiler chickens (Jiménez-Moreno et al., 2013b; Kheravii et al., 2017). Shang et al. (2020) reported that wheat bran inclusion at 30 g/kg in the diet of broiler chickens did not affect the relative weight of the proventriculus and small intestine, and the relative length of the small intestine, but resulted in a higher (12.7 g/kg of body weight [BW]) relative weight of the gizzard. In contrast, Jiménez-Moreno et al. (2011) indicated that the inclusion of 20 and 50 g/kg of pea hulls in the diet of broiler chickens improved the relative weight of the GIT. In addition, supplementation of soybean hull at 4% had more remarkable effects on the gizzard (29 g) and small intestine sections, including the jejunum (29 g), duodenum (12 g), and ileum (28 g; Tejeda and Kim, 2020). Sittiya et al. (2020) observed that supplementing broiler chickens' diet with 5% soybean hulls increased the relative length of the small intestine sections, including the duodenum (1.42), the jejunum (3.72), and the ileum (3.9 cm). Furthermore, the data regarding the impact of different sources of fibre inclusion on GIT development in broiler chickens are briefly summarized in Table 1.

Table 1. Effects of different dietary fibre sources on gastrointestinal tract development in broiler chickens

Strain	Organ	Treatment							Duration	Reference
		Oat hulls (g)			Sugar beet pulp (g)					
Broiler chickens		Control	25	50	75	25	50	75	18 days	
	Liver (g/kg BW)	27.7	27	27.1	26.8	27.8	27	28.9	(p = 0.97)	Jiménez-Moreno et al. (2013b)
	Pancreas (g/kg BW)	3.35	3.13	3.02	3.47	3.28	3.61	3.8	(p = 0.04)	
Broiler chickens		Oat hull (%)								
		0	2	4	6	8	P-value			
	Gizzard plus proventriculus (LW%)	1.64	1.40	1.76	1.32	1.82	0.20		35 days	Mossami and Kalmendal (2011)
	Duodenum (LW%)	0.90	0.92	0.82	0.92	0.94	0.46			
	Jejunum (LW%)	1.82	2.00	1.64	2.02	2.26	0.04			
	Ileum (LW%)	1.16	1.64	1.14	1.54	1.70	0.004			
	GIT (LW%)	7.32	8.16	7.34	8.58	9.04	0.06			
		Control	BMD	3% OH	FCOH		P-value			
Broiler chickens	Gizzard (g/kg BW)	19.6	19.9	20.0	24.6		< 0.0001		36 days	Adewole et al. (2020)
		Control	SRH	IRH			P-value			
		Weight of empty digestive organs (% of BW, without digesta)								
	Gizzard	2.16	2.41	1.86			0.07		21 days	Hartini et al. (2018)
	Small intestine	3.26	3.49	2.80			0.12			
	Ceca	0.35	0.33	0.19			0.001			

Bacitracin, methylene disalicylate, BW: Body weight, 3% OH: Fine oat hulls incorporated in the diet at 3%, FCOH: Free choice oat hulls, SRH: Soluble rice hull, IRH: Insoluble rice hull, LW%: Percent of live weight, GIT: Gastrointestinal tract

DIETARY FIBRE AND GUT FLORA PROFILE

The gut of the broiler chicken comprises different structures, including the crop, proventriculus, gizzard, small intestine, and large intestine, with a dense and diverse microbial community (Yeoman et al., 2012). The gut, extending from the crop to the colon, serves as the site of microbial activity (Pan and Yu, 2013). Microbes are densely populated in the large intestine, particularly in the caecum and colon, at about 10^{11} to 10^{12} colony-forming units/g of luminal content (Wuraola, 2024). The gut microbiome contains large, diverse microbial communities crucial for chicken growth and health (Wei et al., 2013). The diverse microbial communities inhabiting the GIT include bacteria, methanogenic archaea, fungi, and viruses (Yeoman et al., 2012). Among these microbial communities, bacteria have the largest population and diversity (Shang et al., 2018). Paiva and McElroy (2014) noted that antibiotics were used in broiler chickens' diets to maintain GIT health and thus help optimize growth performance. However, repetitive use of antibiotics resulted in their prohibition within the European Union and other countries (Casewell et al., 2003; Cardinal et al., 2019). The complete prohibition of antibiotics increased the risk of bacterial diseases and may have limited the growth performance of broiler chickens (Attia et al., 2025). Therefore, potential alternative feed resources to replace antibiotic growth promoters have been investigated (Gadde et al., 2017). Thus, dietary fibers with prebiotic functions have garnered significant attention due to their specific influences on the composition and activity of gut microbiota (Qiu et al., 2022).

Furthermore, the positive and symbiotic interaction between the GIT and the gut microbiota plays an essential role in nutrient absorption, immune development, and disease resistance (Pan and Yu, 2013). Hence, the disturbance of gut flora may adversely affect growth and health performance in broiler chickens (Kohl, 2012). The interrelationship between GIT and nutrition is indicated in Figure 1. Several factors such as the environment, feed, and the microbiota within the gut affect the overall performance and health of the GIT in broiler chickens (Shang et al., 2018). Among these factors, feed is the major constraint that directly influences the nature of the microbiota in the host, and its effect is extremely significant (Yadav and Jha, 2019). Feed plays a principal role in determining the composition and density of the intestinal microflora in broiler chickens post-hatching (Shang et al., 2018; Yadav and Jha, 2019). According to Fathima et al. (2022), the bacterial population in the GIT was affected by diet changes. Changes in the bacterial population are attributed to specific bacterial species having specific substrate preferences (Haberecht et al., 2020).

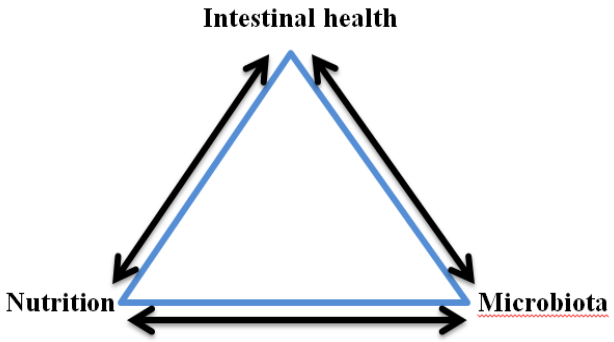

Figure 1. Relationship between intestinal health, nutrition, and microbiota in poultry

Dietary fibre plays a vital role in modulating the microbial population in the GIT (Qiu et al., 2022). Thus, the use of fibre sources such as wheat bran in broiler chicken nutrition is essential to help control the gut microbiome (Vermeulen et al., 2018). Wheat bran, a major end product of flour milling industries, provides fibre for poultry (Bach et al., 2026). Fibre particularly serves as a source of energy for microbes in the GIT via fermentation (Zhang et al., 2023). Dietary fibre may decrease gastrointestinal pH by improving fermentation in the foregut and secretion of HCl in the proventriculus (González-Alvarado et al., 2008). The reduction in GIT pH makes it unfavorable to pathogenic bacteria and enhances the proliferation of beneficial bacteria (Svihus, 2011; Yadav et al., 2016). Bogusławska et al. (2015) reported that dietary lignocellulose supplementation at 0.5% in broiler chickens' diet increased *Lactobacillus* spp. count in the ileum and *Bifidobacterium* spp. count in the ileum and caeca, while decreasing the ileal and caecal *Escherichia coli* and *Clostridium* spp. Additionally, Kheravii et al. (2017) indicated that lignocellulose supplementation at 2% decreased caecal *Clostridium* spp. counts, implying its potential to control *Clostridium* spp. in the GIT. Controlling Clostridium species in the GIT suggested that feeds rich in specific types of dietary fibre, such as structural components, could help reduce some disease risks (Guo et al., 2020). Studies on dietary fibre and its effects on gut flora in broiler chickens are summarized in Table 2.

Table 2. Responses of gut microbiota to different sources of dietary fibre in broiler chickens

Strain	Duration (days)	Fibre source	Level (%)	*Lactobacillus* spp. (log_{10} CFU/g)		*Bifidobacterium* spp. (log_{10} CFU/g)		*Escherichia coli* (log_{10} CFU/g)		Reference
Broiler chicken	42	Inulin		**Ileum**	**Caecum**	**Ileum**	**Caecum**	**Ileum**	**Caecum**	Nabizadeh (2012)
			0	7.29	8.18	6.22	7.91	7.06	8.76	
			0.5	7.42	8.48	7.01	8.30	6.64	7.54	
			1	7.54	8.83	6.77	8.74	6.18	6.29	
			SEM	0.071	0.224	0.200	0.100	0.245	0.071	

				Lactobacillus spp. (log_{10} CFU/g)	*Lactobacillus* spp. (log_{10} CFU/g)	*Clostridium perfringens* (log_{10} CFU/g)	*Enterobacteriaceae* (log_{10} CFU/g)		
				Crop	**Caecum**	**Caecum**	**Caecum**		
Broiler chicken	36	Oat hull and sugar beet pulp	1.6% CF	7.9	9.8	5.9	8.4		Jiménez-Moreno et al. (2011)
			5% OH	7.1	8.6	1.2	5.9		
			5% SBP	8.4	10.0	6.2	8.4		
			P-value	$p < 0.01$	$p = 0.08$	$p < 0.05$	$p < 0.01$		

				Helicobacter pullorum (%)	*Megamonas hypermegale* (%)	*Campylobacter jejuni* (%)	*Escherichia coli* (%)	*Firmicutes* (%)	*Bacteroidetes* (%)	
				Caecum	**Caecum**	**Caecum**	**Caecum**	**Caecum**	**Caecum**	
Broiler chicken	21	DDGS and WB*	Low fibre**	5.3	2.3	0.05	1.9	36.2	41.2	Walugembe et al. (2015)
			High fibre***	12.2	12.7	0.7	12.4	54.8	26.4	

CF: Crude fibre, DDGS: Dried distillers' grain with soluble, OH: Oat hull, SBP: Sugar beet pulp, SEM: Standard error of mean, WB: Wheat bran. *Both lower and higher fibre diet were based on corn-soy bean meal, but the higher fibre diet had the addition of 60.0 g/kg of DDGS and 60.0 g/kg of wheat bran, **Lower fibre diet: Based on corn-soy bean meal with no wheat bran and DDGS, ***High fibre diet: Formulated based on corn-soy bean meal-DDGS-wheat bran with the addition of 80.0 g/kg of DDGS and 80.0 g/kg of wheat bran

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DIETARY FIBRE AND NUTRIENT UTILIZATION

Dietary crude fibre inclusion at 7 to 9% in the broiler chickens' diet improved their growth performance (Zhang et al., 2023). Under practical feeding conditions, supplementation of dietary fibre sources such as wood shavings at 6% in the diet of broiler chickens enhanced gizzard function (Shirzadegan and Taheri, 2017). Moderate inclusion of insoluble fibers (2 to 3%) in the diet of broiler chickens enhanced gizzard development, which resulted in increased nutrient digestibility and utilization and improved growth performance (Xu et al., 2017; Kheravii et al., 2018; Donadelli et al., 2019). Jiménez-Moreno et al. (2013a) observed that the addition of 2.5% dietary fibre improved the feed conversion ratio of broiler chickens aged between 1 and 18 days. However, according to Walugembe et al. (2015), supplementation with a higher dietary source (60 g/kg dried distillers' grain with solubles and 80 g/kg wheat bran) was reported to affect nutrient metabolism in broiler chickens. In addition, Walugembi et al. (2015) reported that the growth performance of broiler chickens was not affected when supplemented with 60 to 120 g/kg dried distillers' grain with solubles in the diet. Furthermore, supplementing broiler chickens' diet with 30 g/kg wheat bran improved digestibility of dry matter (0.73 versus 0.75), organic matter (0.77 versus 0.79), gross energy (0.76 versus 0.78), and crude protein (0.63 versus 0.67) compared to the control (Shang et al., 2020). It has been indicated that supplementation of dietary fibre improved GIT immunity, physiology, and digestion of nutrients in broiler chickens raised under a concentrate feeding system (González-Alvarado et al., 2008). Gut health can occur due to enhanced proventriculus and gizzard activity and longer retention time in the upper part of the GIT (Svihus, 2011). Gizzard activity enhances fermentation in the crop (Classen et al., 2016) and decreases gut pH (Naderinejad et al., 2016), and improves secretion and functionality of digestive enzymes, such as increased pepsin activity (Svihus, 2011; Husvéth et al., 2015). Moreover, the high gizzard activity provides sufficient time for HCl secretion (Mateos et al., 2012; Qaisrani et al., 2015). However, previous studies indicated that the amount, particle size, and sources of dietary fibre were among the key factors affecting nutrient utilization (Xu et al., 2017; Vermeulen et al., 2018). For instance, nutrient utilization was higher in broiler chickens fed coarse fibre particles compared to those fed fine fibre particles (Donadelli et al., 2019). Figure 2 illustrates the mechanisms through which coarse dietary fibre influences nutrient utilization.

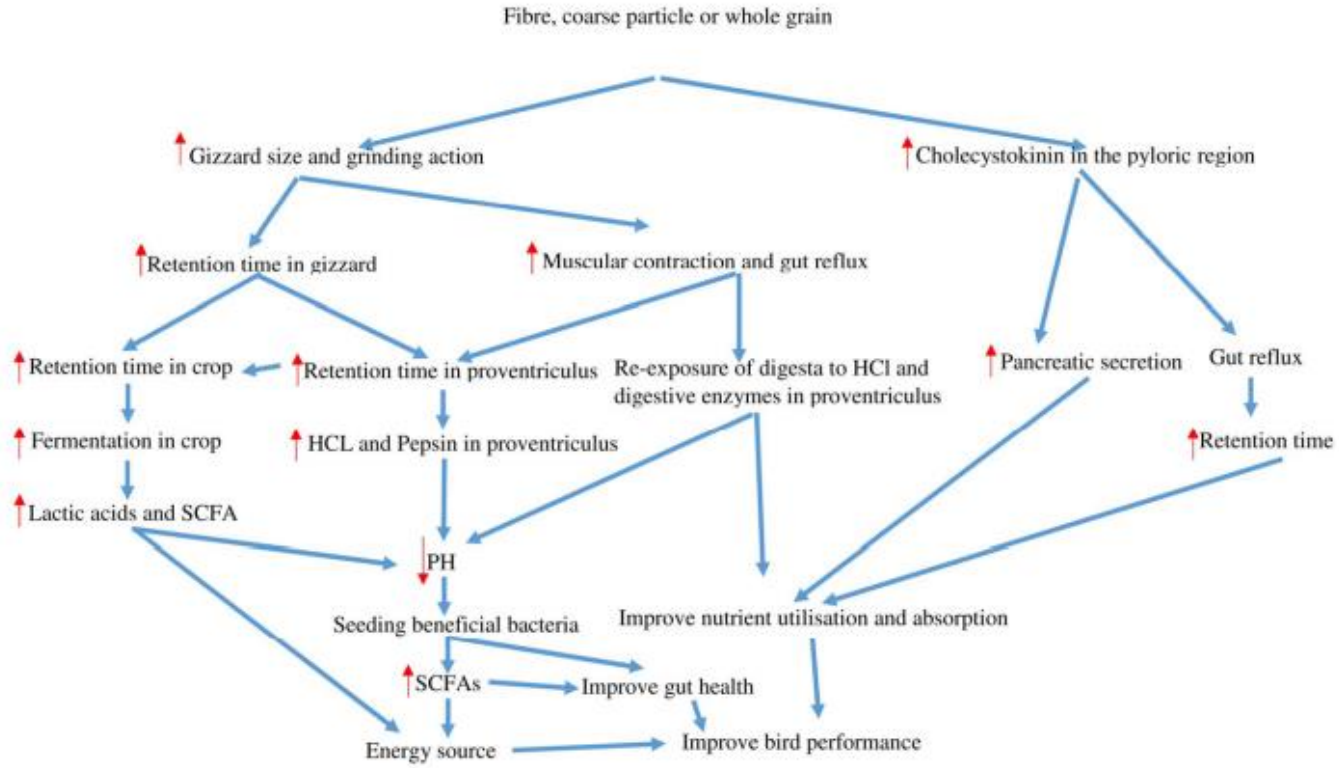

Figure 2. Mechanisms of dietary fibre to improve digestibility, growth performance, and gut health in poultry. Source: Kheravii et al. (2018)

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DIETARY FIBRE AND GROWTH PERFORMANCE

Several studies have been conducted regarding the impact of fibre on growth performance in broiler chickens (Walugembe et al., 2015; Donadelli et al., 2019; Sittiya et al., 2020). Nursiam et al. (2021) demonstrated that the inclusion of 1% commercial fibre source improved GIT development and productive performance in broiler chickens. In addition, Mateos et al. (2012) reported that adding oat hulls at 2-3% to the broiler chickens' diet enhanced growth performance. According to Ginindza et al. (2022), the supplementation of 6.4% crude fibre increased feed intake and growth performance in broiler chickens. The challenge of proposing an exact fibre level arises from different interacting factors, such as age and species, fibre sources used, management, and prevailing environmental conditions (Mateos et al., 2012).

Furthermore, Adibmoradi et al. (2016) indicated that inclusion of dietary hull at 0.75 to 1.5% in the broiler chickens' diet resulted in improved growth performance. Kheravii et al. (2017) found that sugarcane bagasse supplementation at an inclusion level of 2% improved body weight gain in broiler chickens aged 0 to 24 and 0 to 35 days. González-Alvarado et al. (2010) indicated that adding oat hulls in the diet of broiler chickens aged between 1 to 42 days improved their growth performance. Conversely, adding 1 or 2% lignocellulose fibre had minimal impact on the growth performance of broiler chickens from 0 to 24 days and 0 to 35 days (Kheravii et al., 2017). Similarly, supplementation of sunflower hulls at a 3% inclusion level had no impact on the growth performance of broiler chickens (Kimiaeitalab et al., 2017).

Furthermore, Aziz-Aliabadi et al. (2021) observed that broiler chickens exhibited optimal performance when fed diets devoid of fibre and fat at 7 days of age. However, the lowest feed conversion ratio was recorded at 14 days with a diet comprising 0.98% sugar beet pulp and 1.0% soybean oil. Dos Santos et al. (2019) reported decreased body weight gain at 2.5% soybean hull inclusion in the diet of broiler chickens aged between 1 and 21 days. However, Adewole et al. (2020) found no significant effect on growth performance and carcass yield when oat hulls were supplemented at 3% in the diet of broiler chickens. According to García et al. (2019), 3% oat hull supplementation in broiler chickens' diet did not have any effect on their growth performance.

Although fibre has been reported to have a positive impact on poultry at modest levels (2-3%), inclusion of fibre in the diet at 30 g/kg could have a negative influence on growth performance (Sadeghi et al., 2015). The impact of dietary fibre supplementation depends on its inclusion level. Higher fiber content might negatively affect growth, while lower levels may not provide significant benefits (Kheravii et al., 2018). For instance, Jiménez-Moreno et al. (2011) revealed that the addition of dietary pea hulls at a level of 5% enhanced growth by 15% and feed conversion ratio by 3% in broiler chickens aged between 1 and 18 days.

However, increasing levels of dietary pea hulls to 7.5% affected growth performance. Another study conducted by Jiménez-Moreno et al. (2013a) indicated that increasing the sugar beet pulp from 25 to 75 g/kg of diet decreased the growth performance of broiler chickens aged between 1 and 6 days. Walugembe et al. (2014) observed that higher dietary fibre (60 g/kg of both dried distillers' grains with solubles and wheat bran reduced the average daily gain of broiler chickens by 11.2 g per head. Furthermore, the effect of different sources of dietary fibre on the growth performance of broiler chickens is summarized in Table 3.

CONCLUSION

The inclusion of dietary fibre in broiler chickens' diet plays an important role in enhancing growth performance, GIT development, nutrient utilization, and gut microbiota balance. The effects of dietary fibre on growth performance, GIT development, and nutrient utilization in broiler chickens depend on many factors, including age and species of the broiler chickens, fibre sources used in the diet, particle size, management, and prevailing environmental conditions. Including 2 to 3% dietary fibre in broiler chicken diets enhanced production performance, while excessive inclusion (exceeding 30 g/kg) might decrease overall performance, and lower inclusion might not exert any significant effect. It is recommended to identify different dietary fibre sources and determine their precise levels in broiler chicken nutrition. Furthermore, reviewing the effects of dietary fibre in relation to the histology of broiler chickens is essential.

Table 3. Effects of different sources of dietary fibre on the growth performance in broiler chickens

Strain	Duration (days)	Fibre source	Level (treatment)	ADG (g/head)	FI (g/day)	FCR	Reference
Broiler chicken	1-56	Maize and barley	100% maize	38.81	-	2.67	Ali et al. (2020)
			66.6% maize and 33.3% barley	37.89	-	2.72	
			33.3% maize and 66.6% barley	35.88	-	2.84	
			100% barley	31.18		3.14	
				BWG (g/day)	FI (g/day)	FCR	
Broiler chicken	1-42	No supplemental fibre	No	52.4	93.1	1.77	Saadatmand et al. (2019)
		Sugar beet pulp	30 g/kg SBP	49.3	86.8	1.76	
		Rice hull	30 g/kg RH	49.1	85.6	1.72	
				DWG (g/day)	DFI (g/day)	-	
Broiler chicken	1-42	Sugar beet pulp	No	59.2	112.1	-	Sadeghi et al. (2015)
		Rice hull	30 g/kg SBP	56.1	115.4	-	
		Equal combination of SBP/RH	30 g/kg RH	58.3	114.5	-	
			30 g/kg SBP/RH	58.9	112.0	-	
				BWG (g/bird/day)	DFI (g/h/d)	FCR	
Broiler chicken	11-42	Barley and rice hulls	No	72.23	126.53	1.75	Adibmoradi et al. (2016)
			LBH (0.75% barley hull)	74.59	128.52	1.72	
			HBH (1.5%barley hull)	75.48	127.25	1.68	
			LRH (0.75% rice hull)	74.05	131.74	1.79	
			HRH (1.5% rice hull)	76.69	131.69	1.71	

ADG: Average daily gain, BWG: Body weight gain, DFI: Daily feed intake, DWG: daily weight gain, FCR: Feed conversion ratio, FI: Feed intake, HBH: The diets contained high level of barley hulls (1.5%), HRH: The diet contained high level of rice hulls (1.5%), LBH: The diets contained low level of barley hulls (0.75%), LRH: The diet contained low level of rice hulls (0.75%), RH: Rice hull, g/h/d: Gram/head/day, SBP: Sugar beet pulp, -: Not reported

DECLARATIONS

Acknowledgments

The author expressed gratitude to Debark University, Debark, Ethiopia, for providing adequate time and facilities, including internet access, to facilitate the preparation of the present study.

Authors' contributions

Muluye Fekade was responsible for conceptualization, data collection, writing the initial manuscript draft, reviewing the draft, and submitting the manuscript for publication. The author has read and approved the final edition of the manuscript before publication in the present journal.

Availability of data and materials

All information related to the present study is available upon reasonable request from the author.

Competing interests

The author declares no competing interests related to the present study.

Ethical considerations

The author confirmed that this study has not been submitted for publication elsewhere. Furthermore, no AI tools were employed in the preparation and writing the draft and revisions of the manuscript. The author is solely responsible for the accuracy, originality, and integrity of the final content prior to submission, throughout the revision process, and at the point of final publication.

Funding

No funding was allocated for the present study.

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