Consumption and Digestibility Value of Crude Fiber of Dairy Goat Feed with Supplementation Garlic Husk Flour and Organic Minerals (Cr, Se, and Zn-Lysinat)

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ABSTRACT
Supplementation of garlic husk flour and organic minerals (Cr, Se, and Zn-Lysinat) is an effort to manipulate the rumen microbial ecosystem to increase dairy goat feed's consumption and digestibility value of crude fiber. This research was designed to investigate the effect of supplementation of garlic husk flour and organic minerals in dairy goat feed on the consumption and digestibility of crude fiber. This research used 15 pregnant mothers of Jawarandu Goats on the 2nd lactation period with an average body weight of 37,70±5,38kg, which was fed with 70:30 dry matter of forage and concentrate. The method used was Completely Randomized Design (CRD) with three treatments and five replications. R0 was basal feed without supplementation (garlic husk flour and organic minerals), R1: R0 + 30ppm garlic husk flour, R2: R1 + 41,8ppm organic minerals (Cr, Se, and Zn-Lysinat). Data were analyzed using ANOVA, and the differences among the means were examined using the BNJ test. The results showed that supplementation of garlic husk flour and organic minerals (Cr, Se, and Zn-Lysinat) had a significant effect on the value of crude fiber consumption (2,140-3,490 grams/head) but did not affect the digestibility of crude fiber (86,32-91,30%). The highest consumption and digestibility values of crude fiber were produced by supplementation with 30 ppm of garlic husk flour, while the combination of supplementation of garlic husk flour with organic minerals decreased the consumption and digestibility value of crude fiber. In conclusion, supplementation of 30 ppm garlic husk flour and 41.8ppm organic minerals (Cr, Se, and Zn-Lysinat) has not increased consumption and digestibility crude fiber value of crude fiber value Jawarandu dairy goat.

Keywords: *Garlic husk flour, Jawarandu goat, organic mineral*

1. INTRODUCTION

Livestock businesses developing in Indonesia tend to be based on traditional agriculture and only rely on the provision of low-quality feed as the main feed. This affects the amount and composition of the resulting rumen fermentation products. Forage quality in tropical areas such as Indonesia tends to have high lignocellulose content and low nitrogen levels. This will affect the process of fermentative digestion in livestock, and the population of protozoa in the rumen ecosystem tends to be high. Manipulation of the rumen ecosystem is the right solution to increase rumen fermentation, decrease methane production, increase propionate and total volatile fatty acid, reduce feed protein degradation, reduce the proportion of acetate [1, 2, 3]. Protozoa will prey on fiber-degrading bacteria or cellulolytic bacteria, which will be harmful to the digestive process of livestock. Therefore, a number of studies have determined the effect of feeding ruminants with saponin rich plants such as *Enterelobium cyclocarum*, *Spinadus saponaria*, *Sapindus rarak*, *Sesbian sesban*, *Quillaja saponaria*, *Acacia auriculoformis* and *Yucca schidigera* [4]. [5] The authors suggested that adding the mixture (coconut oil: garlic powder at 8:4 and 0:16 mg) could improve rumen fluid fermentation in terms of VFA profile and reduce the protozoa population. Results have

shown that saponins have strong anti-protozoa activity and reduce the number of protozoa.

Garlic husk is one of the herbal plants as a feed additive that plays a role in reducing the number of protozoa (defaunation) and manipulating the rumen microbial ecosystem without leaving residue. Garlic husk is converted into flour which is smoother in texture and easily mixed in feed [6]. The use of feed additives such as antibiotics has proven to be a valuable tool to reduce energy and nitrogen losses in feed [7]. Garlic husk contains natural antimicrobial ingredients to inhibit the growth of gram-positive pathogenic bacteria, thereby increasing the absorption of nutrients and antioxidants. According to [8], the phytochemical analysis showed that the main compound of garlic is allicin (diallyl thiosulfate) which is a non-protein amino acid. Garlic husk contains bioactive compounds similar to garlic husk, such as allicin, allin, diallyl sulfide, and diallyl trisulfide have been reported modifying rumen fermentation parameters [9, 10]. Combining garlic husk powder with organic minerals is essential as dairy goat feed supplementation increases feed digestibility. The given chromium can affect the performance of rumen microbes so that metabolism will be directed to increase the supply of energy for production. Selenium in its physiological form in the form of glutathione (GSH-Px) plays a role in protecting cell and subcellular membranes from oxidative damage through the reduction of carcinogenic compounds into compounds that are safe for cells, including the secretory cells of the mammary glands that play a role in producing milk [11]. Zinc is an activator of several enzymes related to carbohydrate metabolism, degradation, and protein synthesis. The provision of zinc minerals can stimulate rumen microbial growth and improve livestock performance. Fiber consumption is the basis for the role of ruminants in optimizing dry matter (DM) consumption and stimulates the performance of rumen microbes in the rumen fermentation process. Ruminants require the consumption of fibrous feed to help the activity of rumen bacteria, especially dairy cattle in dire need of fibrous feed as precursors for the formation of lactose and milk fat increased digestibility of fiber in ruminants as a precursor for the formation of VFA, especially acetic acid. Acetic acid and propionic acid are the largest VFAs produced by rumen microbes, and acetic acid can be used directly by the mammary glands for milk fat synthesis. Propionic acid is used for glucose synthesis [12]. The addition of garlic husk on fattening lambs fed to total VFA and acetate was significantly higher than the control diet [13]. The concentration of propionate, butyrate, valerate, and the acetate to propionate ratio did not different between control and garlic husk on fattening lambs fed [13]. It is necessary to research the supplementation of garlic peel flour with organic minerals (Cr, Se, and Zn-Lysinat) in dairy goat feed to determine fiber consumption value and digestibility.

2. MATERIALS AND METHODS

The research was conducted using an in-vivo experimental method. This study used 15 pregnant mothers of Jawarandu goats, a second lactation period with a bodyweight of 37.70±5.38 kg, housed in metabolic cages measuring 2.25 m2 per head equipped with separate feed and drink containers. Goats were fed with a balance of dry matter (DM) forage and concentrate, namely 70%: 30%. The basal diet consisted of bran, cassava, pollard, coconut meal, salt, lime, and minerals with nutrients (CP 11.8%, CF 25.20%, and TDN 56.60%), garlic peel flour, organic minerals (Chromium, Selenium, and Zinc lysine). This study used a complete randomized design (CRD) with 3 (three) treatments which were repeated 5 (five) times. Research treatments were R0: basal feed without supplementation (CP 11.8%, CF 25.20%, and TDN 56.60%), R1: R0 + 30 ppm garlic peel flour, R2: R1 + 41.8 ppm organic minerals (Cr, Se, and Zn-Lysinat). Making garlic peel flour [14]. Manufacture of organic chromium and selenium minerals [15]. Feed consumption was obtained by weighing the feed and the rest of the feed in the morning and evening. The sample was analyzed CF [16] proximately then the results were used to calculate crude fiber consumption (CF) with the following formula:

$$\text{DM consumption (kg)} = (\text{Fresh feed (kg)x feed DM content (\%)}) - (\text{Fresh residue (kg)x residual DM content (kg)})$$

$$\text{CF consumption (kg)} = \text{DM consumption (kg) x CF content (\%)}$$

The fiber digestibility measurement phased used the total collection of feces for seven days [17].

$$\text{Digestibility of Crude Fiber (CF)} = \frac{\text{Crude fiber consumption (DM)} - \text{Crude fiber of feces (DM)}}{\text{Consumption of fiber crude (DM)}} \text{ x } 100\%$$

The nutrient composition of forage feed ingredients and concentrates given during the study is presented in Table 1, while the nutrient content of the feed used is shown in Table 2.

Data Analysis

The data obtained were analyzed using analysis of variance (ANOVA) if the results showed a significant difference followed by the BNJ test (Honest Significant Difference) [18].

Table 1. The composition of the research treatment feed

Control feed composition	R0	R1	R2
	..... %		
Forage *Pennisetum purpureum*	70.00	70.00	70.00
Concentrate	30.00	30.00	30.00
Bran	5.25	5.25	5.25
Onggok	3.00	3.00	3.00
Pollard	5.25	5.25	5.25
Coconut meal	15.90	15.90	15.90
Salt	0.15	0.15	0.15
Chalk	0.15	0.15	0.15
Mineral	0.30	0.30	0.30
Garlic husk powder (ppm/kg) DM	-	30.00	30.00
Cr organic (ppm)/kg DM	-	-	1.50
Se organic (ppm)/kg DM	-	-	0.30
Zn-Lysinat(ppm)/kg DM	-	-	40.00

Table 2. Nutrient content of a feed

Nutrient content	Type of feed given		Total Nutrient
	Pennisetum purpureum	Concentrate	
Crude Protein	4.98	6.82	11.80
Crude Fiber	20.10	5.10	25.20
Crude Fat	1.50	1.40	2.90
Ash	6.06	2.03	8.09
BETN	27.36	12.57	39.93
TDN	32.60	24.00	56.60

3. RESULTS AND DISCUSSION

The data obtained were analyzed using analysis of variance (ANOVA) if the results showed a significant difference followed by the BNJ test (Honest Significant Difference) [18].

4.1 Fiber Consumption

The analysis of variance showed that supplementation of garlic husk powder and organic minerals had a significant effect ($P<0.05$) on fiber consumption, as shown in Table 3. The results of further tests showed differences in the value of fiber consumption between treatments R1 and R2. While the R0 treatment was not significantly different from the R1 and R2 treatments.

Garlic husk powder supplementation can increase fiber consumption, and it is suspected that compounds from garlic husk powder can increase fibrinolytic microbial activity. However, the supplementation of garlic husk powder and organic minerals resulted in the same crude fiber consumption as the control diet. This condition occurs because (1) there is no synergism between garlic husk and organic minerals, (2) the status of mineral conditions in livestock (3) mineral utilization depends on the physiological condition of the livestock body.

The use of organic minerals has not been able to increase fiber consumption, and it is suspected that the adverse effects are caused by the combination of garlic husk with these organic minerals. [19] reported that some minerals can interact positively or negatively depending on other factors such as phytic acid and crude fiber, reducing mineral availability. It is suspected that

Table 3. Average consumption and digestibility of fiber in dairy goat feed supplemented with garlic husk powder and organic minerals

Parameter	R0	R1	R2
Fiber Consumption (kg/head)	2.7 ± 0.72^{ab}	3.49 ± 0.57^{a}	2.14 ± 0.24^{b}
Digestibility of crude fiber (%)	88.11 ± 3.66^{ns}	91.30 ± 3.21^{ns}	86.32± 1.42^{ns}

Information:
R0: Dairy goat control feed (PK 11.8%, SK 25.20% and TDN 56.60%); R1: R0 + 30 ppm Garlic husk powder (*Allium sativum*) R2 : R1 + 1.5 ppm Cr + 0.3 ppm Se + 40 ppm Zn Lysine. ns: non-significant (does not show a significant difference between treatments). Letter a, b: superscript different in the same line shows different results significant at 5% BNJ test (P<0.05).

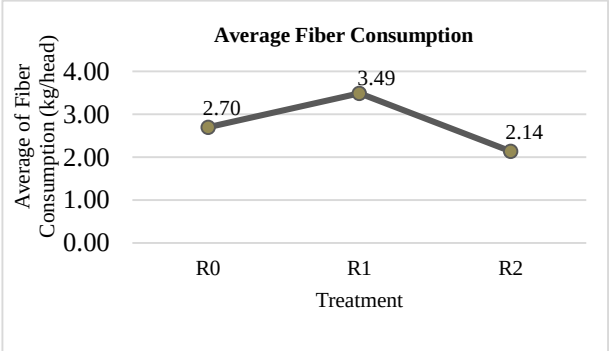

Figure 1. Average fiber consumption in dairy goat feed supplemented with garlic husk powder and organic mineral

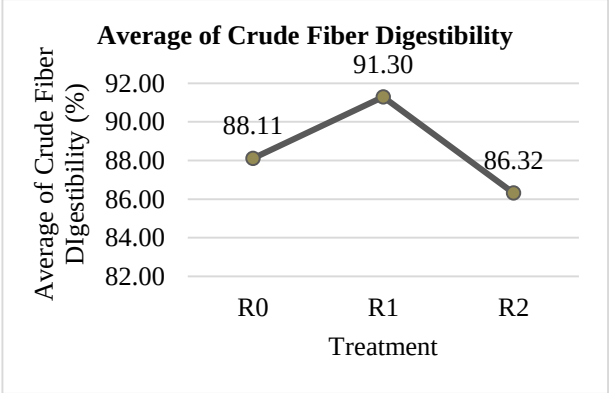

Figure 2. Average digestibility of crude fiber in dairy goat feed supplemented with garlic husk powder and organic mineral.

the activity of crude fiber-degrading bacteria has not worked optimally in digesting fibrous feeds with high lignin and cellulose content. This is because the content of allicin and other sulfide compounds contained in the essential oil of garlic peel has high antimicrobial power [20].

4.2 Digestibility of Crude Fiber

The analysis of variance showed that the supplementation of garlic husk powder and organic minerals had no significant effect (p>0.05) on the digestibility of crude fiber. This is because the nutrient content of feed ingredients between treatments is relatively the same. Supported by [21], there was no difference in nutrient digestibility (digestibility of dry matter, organic matter, and fiber) in the feed supplemented with garlic and essential berry oil with the control because there was no change in the nutrient composition of the feed given.

Supplementation of feed with garlic husk powder as much as 30 ppm increased the digestibility of crude fiber in dairy goats. The increase in nutrient digestibility is due to an increase in the population of cellulolytic bacteria such as *F. succinogenes*, *R. flavefaciens*, and *B. fibrisolvens*, which will further increase the utilization of feed fiber and provide more carbohydrates for microbes [22].

4. CONCLUSION

Supplementation of 30 ppm garlic husk powder and 41,8ppm organic minerals (Cr, Se, and Zn-Lysinat) has not been able to increase consumption and digestibility crude fiber value of Jawarandu dairy goat.

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