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Original Article

Meniran (*Phyllanthus niruri* Linn) Extract Potential on Texel Sheep Feed Consumption, Body Weight Gain and Feed Conversion

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ABSTRACT

Meniran contains phytochemical compounds that are efficacious for productivity. This research was conducted to determine the effectiveness of meniran extract on feed consumption, body weight gain and feed conversion ratio of Texel sheep. This research was conducted using Completely Randomized Design by divided 20 Texel sheeps into 4 treatments, each treatment consisted of 5 repetitions. The treatment groups consisted of : P0 (sheeps were given CMC-Na 0.5% solution), P1 (given meniran extracts at 5% concentration), P2 (given meniran extracts at 10% concentration) and P3 (given meniran extracts at 20% concentration). administration of treatment between groups using a syringe (20 ml) amount of 1ml/kgBB per oral. Data in the form of feed consumption, body weight gain and feed conversion ratio were then analyzed using ANOVA and continued with Duncan's test. The best result on body weight gain and feed conversion ratio by P1. This research show that meniran extracts had no effect on feed consumption but can increase body weight gain at 5% concentrations and decrease feed conversion ratio at 5% concentrations.

Keywords: Broiler, Buriti oil, Digestibility, Heat stress, Inorganic matter, Organic matter

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Introduction

Sheep farming is a business that has good development potential in tropical countries like Indonesia. The high economic value of sheep is mainly obtained from their meat, apart from that, sheep in Indonesia are one of the genetic resources as producers of milk, skin and fur (Udo and Budisatria, 2011). Total consumption of lamb from all provinces in Indonesia from 2019 to 2021 reached 140,575.27 tons (Central Bureau of Statistics, 2022). One effort that can be carried out in sheep farming considering the high consumption of sheep meat is fattening (Udo and Budisatria, 2011).

A suitable sheep fattening business in tropical climates such as Indonesia is to use Texel sheep. Texel sheep can be used for fattening because their immune system is suitable for tropical climates, they are prolific, have a free breeding season, and are easy to adapt (McManus *et al.*, 2020). Good immune system in Texel sheep can be influenced by several factors, one of which is providing good feed in the form of quality forage so that it affects the productivity and immunity of the sheep. Texel sheep can be used for fattening because their immune system is suitable for tropical

climates, they are prolific, have a free breeding season, and are easy to adapt (McManus *et al.*, 2020). Good immune system in Texel sheep can be influenced by several factors, one of which is providing good feed in the form of quality forage so that it affects the productivity and immunity of the sheep. one of which is providing good feed in the form of quality forage so that it affects the productivity and immunity of the sheep. Optimal body endurance and maximum fattening in Texel sheep do not only rely on forage alone but also require feed additives that can increase livestock productivity. One feed additive that can be used is herbal plant extracts (Diaz-Medina *et al.*, 2021).

Sheep productivity can be optimized by using herbal plants mixed into the sheep's feed or drink as a feed additive. Currently, herbal feed additives are not only used to increase the productivity and quality of sheep meat, but also as a safe alternative without causing dangerous residual effects. Herbal plants can benefit livestock because they have an effect on increasing appetite and nutrient digestibility (Redoy *et al.*, 2020). Phytochemical compounds contained in herbal plants function to support productivity and can maintain livestock health (Piao *et al.*, 2023).

Flavonoids and saponins are a class of phytochemical compounds found in meniran (*Phyllanthus niruri* Linn). The flavonoids in meniran act as immunomodulators. Flavonoids work by restoring and repairing a compromised immune system and suppressing excessive function, so that the body's immune system is maintained (Sabdoningrum *et al.*, 2020). The immunomodulatory properties of meniran work by stimulating the body's immune system to become immune to disease (Jantan *et al.*, 2019). Good body immunity as a result of increased immune cell performance also has an effect on increasing appetite, increasing productivity and protecting livestock from stress and disease (Niu *et al.*, 2022).

An important component to see the performance of Texel sheep is through optimal growth. Saponins in meniran can accelerate growth and increase feed efficiency, thereby influencing body weight gain (Hidanah *et al.*, 2022). The quantity and quality of feed given to sheep is a factor in increasing the body weight of sheep. Saponin works by increasing the diameter of the villi and the permeability of the intestinal cell walls, thereby affecting the absorption of nutrients from feed (Chaudhary *et al.*, 2018).

Increasing the unit body weight of sheep can be done by paying attention to feed conversion (Lourencon *et al.*, 2023). Determination of feed conversion in sheep can be seen through a comparison between the total amount of feed consumed by livestock and the products produced by livestock, namely in the form of increase in body weight (Li *et al.*, 2024). Factors that influence feed conversion are the amount of feed consumed by livestock, animal body weight, livestock activity and environmental temperature. The higher the quality of feed consumed by livestock, the greater the effect on increasing livestock body weight so that the use of feed is more efficient (Dobes *et al.*, 2021). According to Cannas *et al.* (2019), the smaller the feed conversion value, the more efficient the use of feed, so that it can be used as an effort to increase the body weight of sheep.

Therefore, based on the statement above, research was conducted regarding the potential effectiveness of meniran (*Phyllanthus niruri* Linn) extract on feed consumption, body weight gain, and feed conversion of Texel sheep.

Materials and methods

Research design

This research was carried out from October to December 2023. The preparation of meniran (*Phyllanthus niruri* Linn) extract was carried out at the Pharmacology Laboratory, Basic Veterinary Medicine Division, Faculty of Veterinary Medicine, Airlangga University, Surabaya. Treatment of Texel sheep to see feed consumption, body weight gain and feed conversion was at Panji Farm, Jalan Siwalanpanji no. 38 Buduran District, Sidoarjo Regency.

This research used 9 month old male Texel sheep with an initial body weight of 15-18 kg as experimental animals. The minimum number of sheep samples used for this research was 5 sheep in each treatment. This research used 4 experimental treatments, so the total number of sheep used during the research was 20 sheep.

Feeding

Feeding is done 1 time with concentrate and 3 times with forage in 1 day. The concentrate is given in the morning with a concentrate composition for 20 sheep, namely 7 kg of corn tump, 3 kg of concentrate, 3 kg of tofu dregs and 500 gr of premix

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so that 1 sheep is given around 450 gr of concentrate from 2% of its body weight. Providing forage for 20 sheep with Pakchong grass as much as 20 kg each giving so that the total given 3 times a day is 60 kg. Give 2.5 kg of forage to 1 sheep from 10% of its body weight. The concentrate is given in the morning at 7 o'clock, while the forage is given 3 times, precisely at 11 am, 3 pm and 7 pm.

Preparation of Meniran extract (*Phyllanthus niruri* Linn)

Simplicia meniran is macerated using 96% ethanol then soaked for 3 x 24 hours and stirred twice a day. The mixture is then filtered using flannel cloth to obtain the filtrate. The filtrate resulting from maceration was evaporated using a rotary evaporator at a temperature of 50°C. The extract obtained was diluted to 5%, 10%, and 20% with CMC-Na 0.5% (0.5 gr of CMC-Na in 100 ml of hot distilled water) (Sabdoningrum *et al.*, 2021). A 5% concentration is made from 5 grams of meniran extract diluted with CMC-Na 0.5%, a 10% concentration of 10 grams of meniran extract diluted with CMC-Na 0.5%, and a 20% concentration of 20 grams of meniran extract diluted with CMC- Na 0.5% (Hidanah *et al.*, 2022). Meniran extract (*Phyllanthus niruri* Linn) for each treatment: 5%, 10%, and 20%, was given orally with a 20 ml syringe.

Treatment of Meniran extract (*Phyllanthus niruri* Linn) on Texel sheep

Feed and cage adaptation was carried out for 2 weeks. Meniran (*Phyllanthus niruri* Linn) extract is given after administering the concentrate. The control group sheep were not given meniran (*Phyllanthus niruri* Linn) extract but rather a placebo in the form of 0.5% CMC-Na, while meniran (*Phyllanthus niruri* Linn) extract was given to the treatment group. The treatment group was given meniran (*Phyllanthus niruri* Linn) extract orally at concentrations of 5%, 10%, and 20%. The treatment was given orally as much as 1 ml of meniran extract (*Phyllanthus niruri* Linn): 1 kg of sheep's body weight. The treatment given to the sheep group was as follows:

P0: The group of sheep that were not given meniran (*Phyllanthus niruri* Linn) extract but were given CMC-Na 0.5% orally at 1 ml of CMC-Na/kgBB sheep.

P1: A group of sheep were given meniran extract (*Phyllanthus niruri* Linn) at a concentration of 5% orally at 1 ml/kgBW of sheep.

P2: A group of sheep were given meniran extract (*Phyllanthus niruri* Linn) at a concentration of 10% orally at 1 ml/kgBW of sheep.

P3: A group of sheep were given meniran (*Phyllanthus niruri* Linn) extract at a concentration of 20% orally at 1 ml/kgBW of sheep.

Calculation of feed consumption

Feed consumption can be calculated by subtracting the amount of feed given from the remaining feed (Karangiya *et al.*, 2016). Data on feed consumption during treatment was carried out by adding up feed consumption from the start of treatment to the end of treatment. The formula for calculating feed consumption is: Feed consumption (kg) = Amount of feed given (kg) – Amount of remaining feed (kg)

Increase in body weight

Data on body weight gain during treatment was obtained from the body weight of the sheep at the end of the treatment minus the initial weight before treatment (Mayulu and Suhardi, 2016).

Feed conversion

Feed Conversion Ratio (FCR) is the ratio between feed consumption and body weight gain (Jannah *et al.*, 2022). Feed conversion calculations are carried out after data on feed consumption and body weight gain are obtained. The formula for calculating feed conversion is: FCR = Feed consumption (kg) / weight gain (kg)

Data analysis

The research data were arranged in tables presented in the form of averages and standard deviations using the IBM SPSS Statistics version 25 computer program. Analysis of this research data used ANOVA (Analysis of Variance). Then proceed with the Duncan test to determine whether there are real differences between treatment groups.

Result

Feed consumption

The results of calculating feed consumption for Texel sheep treated with meniran extract (*Phyllanthus niruri* Linn) showed that the results between treatments were not significantly different (P>0.05). The average and standard deviation of Texel sheep feed consumption given meniran extract (*Phyllanthus niruri* Linn) is shown in table 1 and figure 1.

Table 1. Average and standard deviation of feed consumption (kg/head) of Texel sheep during treatment

Treatment	Feed consumption ± Standard deviation
P0	$41.00^{a} \pm 2.19$
P1	$41.36^{a} \pm 2.95$
P2	$42.16^{a} \pm 2.51$
P3	$41.58^{a} \pm 2.51$

Note: Different superscripts in the same column indicate significant differences (p<0.05).

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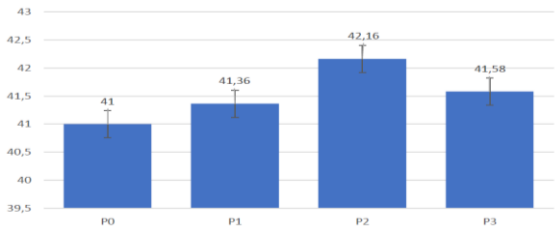

Figure 1. Bar histogram of average feed consumption of Texel sheep during treatment

Increase in body weight

The results of calculating body weight gain for Texel sheep given meniran (*Phyllanthus niruri* Linn) extract showed that P0 was significantly different from P1 and P2 (P<0.05) but not significantly different from P3 (P>0.05). P1 is significantly different from P0 (P<0.05) but not significantly different from P2 and P3 (P>0.05). P2 is significantly different from P0 and P3 (P<0.05) but not significantly different from P1 (P>0.05). P3 is not significantly different from P0 and P1 (P>0.05) but is significantly different from P2 (P<0.05). The average and standard deviation of body weight gain for Texel sheep given meniran extract (*Phyllanthus niruri* Linn) is shown in table 2 and figure 2.

Table 2. Average and standard deviation of body weight gain (kg/head) of Texel sheep during treatment

Treatment	Increase in body weight ± Standard deviation
P0	$7.00^{a} \pm 0.87$
P1	$8.16^{bc} \pm 0.72$
P2	$8.62^{c} \pm 0.47$
P3	$7.68^{ab} \pm 0.49$

Note: Different superscripts in the same column indicate significant differences (p<0.05)

Feed conversion

The results of calculating feed conversion for Texel sheep given meniran (*Phyllanthus niruri* Linn) extract showed that P0 was not significantly different from P3 (P>0.05), but was significantly different from P1 and P2 (P<0.05). P1 and P2 are not significantly different from P3 (P>0.05), but are significantly different from P0 (P<0.05). P3 is not significantly different from P0, P1, and P2 (P>0.05). The average and standard deviation of feed conversion for Texel sheep given meniran (*Phyllanthus niruri* Linn) extract are shown in table 3 and figure 3.

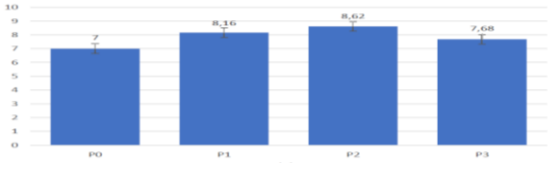

Figure 2. Bar histogram of average final body weight of Texel sheep during treatment

Table 3. Average and standard deviation of Texel sheep feed conversion during treatment

Treatment	Feed conversion ± Standard deviation
P0	$5.95^{b} \pm 0.98$
P1	$5.08^{a} \pm 0.32$
P2	$4.89^{a} \pm 0.30$
P3	$5.41^{ab} \pm 0.23$

Note: Different superscripts in the same column indicate significant differences (p<0.05)

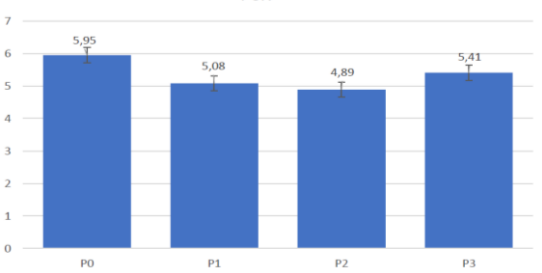

Figure 3. Bar histogram of average feed conversion of Texel sheep during treatment

Discussion

Feed consumption

The research results based on table 1 show that the total feed consumption of Texel sheep during the study for P0 was 41 kg, 41.36 kg for P1, 42.1 kg for P2 and 41.58 for P3. According to Nuraini *et al.* (2020) feed consumption can be determined by reducing the amount of feed given with the remaining feed. The results of statistical tests using ANOVA followed by the Duncan test showed results that were not significantly different between all treatments (P>0.05).

Table 1 shows that the results of administering meniran (*Phyllanthus niruri* Linn) extract were not significantly different between treatments. A concentration of 10% produces the highest feed consumption, followed by concentrations of 20% and 5%. The meniran (*Phyllanthus niruri* Linn) extract given during treatment had a fine concentration because it was in liquid form and increased appetite due to palatability, thereby increasing Texel sheep feed consumption.

This is related to the opinion of Irwansyah and Junaedi (2019), that high and low feed consumption values in livestock are influenced by palatability. Animal feed with sufficient protein content and a fine structure can increase the value of feed consumption. Appetite is influenced by good body immunity. The immunomodulatory activity of meniran can stimulate immune cells to maintain better body resistance (Aldi *et al.*, 2014). Meniran herb contains flavonoids which play an immunomodulatory role (Sabdoningrum *et al.*, 2020). The immunomodulatory process in the body works by increasing the proliferation of immune cells. Oral administration of meniran extract to experimental

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animals affects the increase in activity of B lymphocyte and T lymphocyte proliferation (Hidanah *et al.*, 2018).

Increase in body weight

The research results based on table 2 showed that the average increase in body weight of Texel sheep after treatment for P0 was 7 kg, 8.16 kg for P1, 8.62 kg for P2 and 7.68 kg for P3. Body weight gain can be calculated by the difference between the final body weight after treatment minus the initial body weight before treatment (Gler *et al.*, 2013). The results of statistical tests using ANOVA then followed by the Duncan test showed significant differences ($p<0.05$).

Table 2 shows the results of giving meniran (*Phyllanthus niruri* Linn) extract at concentrations of 5%, 10%, and 20% which can increase body weight gain compared to the control group that was not given treatment. The highest body weight was in group P2 with meniran extract (*Phyllanthus niruri* Linn) at a concentration of 10%. The results of the study showed that feed consumption rates and body weight increased equally in the group treated with meniran (*Phyllanthus niruri* Linn) extract. The increase in body weight also goes hand in hand with an increase in feed consumption because there is an increase in the rate of fiber digestion and the rate of microbes in the rumen (Ungerfeld *et al.*, 2018).

Meniran (*Phyllanthus niruri* Linn) is a herbal plant that contains phytochemical and nutritious compounds such as saponins and flavonoids. Saponins are able to enlarge the diameter of the villi and increase the permeability of intestinal cell walls, thereby increasing the absorption of feed nutrients and at low levels can increase the transport of nutrients between cells (Chaudhary *et al.*, 2018). Optimal and efficient digestibility influences nutrient absorption in the metabolic process, the better the digestibility of feed, the greater the influence on feed consumption, which is also followed by an increase in body weight (Ravindran *et al.*, 2021). The feed conversion value and body weight gain in this study had the same results at a concentration of 5%. According to Camacho-Pérez *et al.* (2022), the smaller the conversion value, the greater the body weight of the sheep.

Feed conversion

The research results based on table 3 showed that the average feed conversion for Texel sheep during treatment P0 was 5.95, 5.08 for P1, 4.89 for P2 and 5.41 for P3. Feed conversion can be obtained by dividing feed consumption data by body weight gain, meaning that to get 1 kg of livestock weight, it can be seen from the amount of feed consumed by the livestock (Mottet *et al.*, 2017). The feed conversion value was calculated using ANOVA then followed by the Duncan test, showing that the results were not significantly different between treatments ($P>0.05$).

Table 3 shows the results of giving meniran (*Phyllanthus niruri* Linn) extract with concentrations of 5%, 10% and 20% which had lower feed conversion values compared to the control group which was not treated. The best and lowest feed conversion values were obtained by the group given meniran (*Phyllanthus niruri* Linn) extract with a concentration of 10%. The results of the feed conversion value in this study showed an average of 4.89 – 5.95. According to Davison *et al.* (2023) the value of good feed conversion in sheep starts from numbers 4 – 7. Factors that influence feed conversion include the animal's body condition, digestibility, the surrounding environment and the quality of the feed provided (Alemneh and Getabalew, 2019). Apart from these factors, the phytochemical content in meniran also influences animal feed conversion.

The flavonoid compounds in meniran are believed to be able to stimulate increased performance of immune cells to create better body resistance (Panche *et al.*, 2016). The saponin content in menirann functions to increase digestibility because it works by widening the pathway for nutrient absorption through the intestinal villi (Chaudhary *et al.*, 2018). Optimal digestibility is when the metabolic process is able to absorb nutrients well so that the feed provided is more efficient. The more efficient the feed given to livestock, the lower the feed conversion value will be (Patience *et al.*, 2015). The low conversion values obtained by groups P1, P2, and P3 in this study indicate efficient use of feed in all treatment groups. According to Fry *et al.* (2018), the smaller the feed conversion value, the more efficient the use of feed will be.

Conclusion

The administration of meniran (*Phyllanthus niruri* Linn) extract increased the body weight gain of Texel sheep and reduced the feed conversion value of Texel sheep. Apart from that, giving meniran extract had no effect on increasing Texel sheep feed consumption

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