

Unsaturated Fatty Acid Content of Milk from PE Goat Fed with Palm Oil Sludge Meal and Tea Waste Combination

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Abstract This experiment was conducted to study the effect of Palm Oil Sludge Meal (POSM) and Tea waste (TW) combinations (25%) in the ration (78% TDN; 23% CP) containing field grass (30%) and tempe waste (45%) on PE goat nutrient intakes, milk production, composition and unsaturated FA concentrations. Treatments were combination ratio between POSM and TW i.e: R0 = POSM 25% + TW 0% (1 : 0); R1 = POSM 16.67% + TW 8.33% (1 : 0.5); R2 = POSM 14.28% + TW 10.72% (1 : 0.75), and R3 = POSM 12.25% + TW 12.25% (1:1). Results showed that the treatments did not affect feed and nutrient intakes, and milk composition (dry matter, density, fat and solid non fat); however, the treatment effect on unsaturated FA concentrations was significant ($P < 0.05$). R1 produced milk with the highest concentrations of oleic (37.73%) and linoleic (7.53%) acids, while R3 yielded the highest concentration of linolenic acid (2.79%). As conclusion, feeding PE goat with 16.67% POSM and 8.33% TW (R1) produced the best combination in increasing milk unsaturated FAs concentration.

Keywords Goat milk, Palm oil sludge, Tea waste, Unsaturated fatty acid

1. Introduction

Unsaturated fatty acids (FAs) in goat milk are good bioactive components for supporting human health through its therapeutic effects as anti-atherosclerosis and anti-hypercholesterolemia. Feeding does with feed riching in unsaturated FA can increase unsaturated FA concentrations in milk [1]; the potential feed is palm oil sludge meal (POSM), byproducts of palm oil production; POSM is rich in crude protein (CP 13.30%), ether extract (EE 29.76%) and unsaturated FA content (oleat 39.10%, and linoleat 8.18%) [2, 3]. POSM unsaturated FAs need to be protected from hydrogenation by rumen microbes into saturated FAs [1, 4] that can be done by using tannin; 4 % tea waste tannin extract (TW) can protect POSM [3]. Tannin is a polyphenolic compound in TW (6.3% concentration) [5] and capable of bonding protein preventing enzyme digestion in the animal gastrointestinal tract [6]. TW, byproduct from tea drink industry, also has potential as feed source (17.3% CP; 34.7% nitrogen free extract, NFE contents) [7]. To protect unsaturated FAs, it is more practical and applicable to combine POSM with TW in a ration. Therefore, this experiment was conducted to study the effect of POSM and TW combination on PE goat milk production, composition and unsaturated FA concentrations.

2. Materials and Methods

Twelve does of PE goat (2nd lactation) were used. Preliminary period was 14 days followed with collecting data period. Rations (78% TDN; 23% CP) were field grass (30%) given separately, tempe waste (45%) and the remaining 25% was a combination of POSM (PT Kertajaya, Malingping, Banten) and TW (PT Coca-cola Amatil, Bekasi); the last feeds were mixed before given. Combination ratio between POSM and TW : R0 = POSM 25% + TW 0% (1 : 0); R1 =

POSM 16.67% + TW 8.33% (1: 0.5); R2 = POSM 14.28% + TW 10.72% (1 : 0.75), and R3 = POSM 12.25% + TW 12.25% (1:1). Does received 3 times a day feeds, 4% body weight (BW) basis, [8]; and *ad libitum* drinking water. Does were milked twice a day (07.00 and 15.00), milk samples were from morning milking. Randomised block design (4 treatments and 3 blocks; groups of does on BW basis; A = 35 - 37 kg; B = 37 - 39 kg; C = 39 - 41 kg), analysis of variance and Tukey test was applied [9, 10].

3. Results and Discussion

Treatments affected nutrient composition. Increases in TW level increased DM (27.54-4.53%), crude fibre (CF; 13.13-20.36%) and tannin contents (0.00-0.77%), but reduced ash (7.15-.03%), EE (1.60-0.74%) and NFE (55.23-47.16%) contents; no effects on CP (21.75-25.72%) and TDN contents (77.12-79.04%). POSM and TW combinations did not affect fresh, DM and TDN intakes, and feed intake percentage on BW basis (Table 1). Treatments affected ash, EE, CP and CF intakes ($P < 0.01$). Treatment effects were not significant on milk production and composition, and milk density (Table 1), but influenced unsaturated FA concentrations; the highest oleic and linoleic acid concentrations were obtained at 8.33% TW level (R1); TW level at 12.25% (R3) produced the highest linolenic acid concentration.

Table 1. Fresh, dry matter and nutrient intakes

Variables	R0	R1	R2	R3
Intakes	(g/head/day)			
Fresh	4545.21 ± 307.77	4630.71 ± 243.93	4510.24 ± 243.93	4584.52 ± 253.63
Dry matter	1939.70 ± 131.50	1963.64 ± 103.38	1908.96 ± 103.26	1927.98 ± 106.67
% BW	5.17 ± 0.02	5.16 ± 0.01	5.16 ± 0.02	5.15 ± 0.06
Ash	138.69 ± 9.40 ^A	105.84 ± 5.57 ^C	117.59 ± 6.36 ^B	96.98 ± 5.37 ^D
CP	443.89 ± 30.09 ^C	427.10 ± 22.48 ^B	490.92 ± 26.55 ^A	438.60 ± 24.27 ^{BC}
Ether extract	30.99 ± 2.10 ^A	29.00 ± 1.53 ^B	23.07 ± 1.25 ^C	14.36 ± 0.79 ^D
Crude fibre	254.78 ± 17.27 ^D	355.79 ± 18.73 ^C	377.04 ± 20.39 ^B	392.59 ± 21.72 ^A
TDN	1521.53 ± 103.15	1540.30 ± 81.09	1497.41 ± 81.00	1512.33 ± 83.67
Milk production (mL/head/day)	1295.46 ± 121.95	1362.50 ± 229.47	1434.24 ± 196.86	1433.58 ± 171.38
Milk composition:				
Density (g/cm ³)	1.030 ± 0.004	1.028 ± 0.004	1.030 ± 0.001	1.029 ± 0.002
Dry matter (%)	18.111 ± 3.658	18.719 ± 0.798	18.022 ± 0.502	18.033 ± 3.372
Fat (%)	7.733 ± 2.389	8.527 ± 1.070	7.730 ± 0.360	7.870 ± 2.794
Solid non fat (%)	10.223 ± 1.528	10.383 ± 0.853	10.129 ± 0.453	10.172 ± 0.639
Protein (%)	5.363 ± 0.713	5.297 ± 0.454	5.277 ± 0.108	5.200 ± 0.327
Lactosa (%)	3.390 ± 0.378	3.227 ± 0.473	3.313 ± 0.060	3.233 ± 0.188
Unsaturated fatty acid concentration (%)				
Oleat (C18:1)	21.14 ± 0.60 ^B	34.73 ± 2.66 ^A	16.00 ± 4.02 ^B	19.29 ± 4.54 ^B
Linoleat (C18:2)	4.94 ± 1.77 ^{ab}	7.53 ± 1.56 ^a	4.59 ± 0.98 ^{ab}	2.64 ± 1.44 ^b
Linolenat (C18:3)	1.31 ± 0.42 ^B	0.81 ± 0.14 ^B	0.66 ± 0.24 ^B	2.79 ± 0.80 ^A

Abbreviations for treatments please refer to Materials and Methods. Data with different capital letter in the same row are highly significantly different ($P < 0.01$). Data with small letter in the same row are significantly different ($P < 0.05$).

4. Conclusion

Feeding PE does with 16.67% POSM and 8.33% TW (R1) produced the best combination in increasing milk unsaturated FAs concentration.

5. References

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