

การใช้ประโยชน์กระถินหมักต่อการเจริญเติบโตและการเปรียบเทียบทางเศรษฐกิจในแกะพันธุ์ซานต้า อินเนส

Utilization of *Leucaena leucocephala* silage on growth and economic comparison in Santa Ines sheep

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บทคัดย่อ: การทดลองนี้ประเมินการใช้กระถินหมักเป็นแหล่งอาหารหลักต่อการเจริญเติบโตของแกะพันธุ์ซานต้า อินเนส ในการทดลองครั้งนี้ใช้แกะพันธุ์ซานต้า อินเนสเพศผู้ อายุ 6 เดือน ที่มีน้ำหนักตัวระหว่าง 16-29 กก. จำนวน 6 ตัว สัตว์ทดลองแบ่งออกเป็นสองกลุ่มและสุ่มให้ได้รับอาหารทดลองตามแผนการทดลองแบบ t-test โดยอาหารทดลองประกอบด้วย 1) กระถินหมัก (T1) และ 2) อาหารที่เอมอาร์หมัก (T2) สัตว์ทดลองได้รับอาหารตามทรีตเมนต์วันละ 2 ครั้ง คือเวลา 08.00 และ 16.00 น. เป็นเวลา 50 วัน ทำการบันทึกปริมาณการกินได้ น้ำหนักตัวและความคุ้มค่าทางเศรษฐกิจ จากผลการทดลองพบว่า การกินได้และค่าเฉลี่ยการเจริญเติบโตต่อวันของแกะที่ได้รับอาหารทั้งสองทรีตเมนต์ที่ไม่มีความแตกต่างกันทางสถิติ ค่าอัตราการแลกเนื้อ (FCR) ของแกะที่ได้รับอาหาร T2 (6.97) และ T1 (7.03) มีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ($P < 0.05$) ต้นทุนค่าอาหารของแกะที่ได้รับอาหารสูตร T1 และ T2 มีค่าเท่ากับ 43.79 และ 63.84 บาทต่อตัว ตามลำดับ การเปรียบเทียบความคุ้มค่าทางเศรษฐกิจของแกะที่ได้รับอาหาร T1 และ T2 มีค่าเท่ากับ 315.57 และ 286.46 บาทต่อตัว ตามลำดับ จากผลการทดลองในครั้งนี้สามารถที่จะแนะนำได้ว่ากระถินหมักมีศักยภาพสามารถใช้เพื่อการผลิตแกะในแง่ของประสิทธิภาพของสัตว์และประสิทธิผลด้านต้นทุนการผลิต

คำสำคัญ: กระถินหมัก, แกะพันธุ์ซานต้า อินเนส, น้ำหนักเฉลี่ยต่อวัน

ABSTRACT: This experiment evaluate the use of *Leucaena leucocephala* as the sole fermented feed on growth of Santa Ines sheep. Six, 6 months old, males, Santa Ines sheep with body weight ranged from 16-29 kg, were used in the experiment. The animals were divided into two groups and were randomly assigned to receive dietary treatments according to a t-test design. Dietary treatments were 1) *L. leucocephala* silage and 2) fermented TMR. The animals were fed twice daily at 8.00 and 16.00 h for 50 days. Feed intake, body weight and economic values were recorded. The results found that the feed intake and ADG of sheep fed T1 and T2 were not significantly different. The FCR of sheep fed T2 (6.97) and T1 (7.03) significantly differ ($P < 0.05$). Feed cost of T1 and T2 were 43.79 and 63.84 B/h, respectively. Economic return of sheep fed T1 and T2 were 315.57 and 286.46 B/h, respectively. Based on the present result, it can be suggested that *L. leucocephala* silage has promising potential for sheep production in term of animal performance and cost effectiveness.

Keywords: *Leucaena leucocephala* silage, Santa Ines sheep, average daily weight gain

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Introduction

Santa Ines is an economic meat sheep, introduced from Brazil origin. Many advantages attributed of this breed, i.e, disease tolerate, well adapted to local climatic environment, high productivity, consume various forages and easily for marketing, has been getting more attention from the Thai farmer in expanding its production. DLD (2017) has reported a number of farmer and sheep, raised in Thailand were 5,387 farmers and 53,228 heads. The highest amount of sheep is in the 9th livestock region in southern Thailand, accounted for 20,865 heads (39.20%) and 4,407 farmers (81.81%), respectively.

Leucaena leucocephala (*L. leucocephala*) is the most widely used tree forage as protein for ruminants (Shelton and Bewbaker, 1994) and has been reported to be the highest producer of forage protein among the tropical legumes (Brewbaker and Hutton, 1979). The crude protein content obtained from leave and stem mixture of *L. leucocephala* ranged between 17.9-22.1% (Harun, et al., 2017; Khamseekhiew et al., 2018a). Khamseekhiew et al., (2018b) also stated that the anti-nutritional factors of dried *L. leucocephala* such as total phenolics, total tannins, and condensed tannins were 22.3, 15.2 and 12.2 %, respectively.

Cherdthong et al., (2015) reported feeding *L. leucocephala* silage had significantly higher in the body weight gain of Thai cattle than that of Napier grass silage. Suemae et al. (2017) demonstrated that native and Anglo-nubian cross-bred goats received sole *L. leucocephala* had higher average

daily weight gained (66.67 g/head/day) as compare with animal fed *Brachiaria humidicola*. This experiment was also extended eventually result on economic revenue of up to 431.84 Baht/head when fed *L. leucocephala* alone. However, the use of *L. leucocephala* as the silage on growth in Santa Ines sheep haven't yet evaluated in the southern condition. The objective of this experiment was therefore to determine the use of *L. leucocephala* silage as the sole diet compared with the TMR on growth and economic return in sheep.

Materials and methods

Feed preparation

The naturally grown *L. leucocephala* was harvested from the adjacent areas nearby the Prince of Sonkla University, Surat Thani campus by cutting the youngest shoot parts of about 60 cm from the tip. After chopped to a small size of 3.0-5.0 cm by chopping machine, the chopped leucaena were divided into two proportions; one was for silage preparation and the other was used as partial ingredient for TMR preparation. Leucaena silage (T1) was prepared by adding the mixture of 95 kg fresh chopped leucaena and the dissolved 2 kg of molasses with 6 L. of tape water. The mixture was kept in 120 L. plastic container for 21 days prior using in the experiment. Feed materials including leucaena forage, molasses, Napier grass, soy bean meal, cassava hay, palm kernel cake, and other ingredients as used for the preparation of total mixed ration and its cost is presented in Table 1.

Table 1. Preparation of total mixed ration of treatment 2 (T₂) as DM basis and its cost.

Ingredient	Amount (kg)	Price per kg (Baht)
Napier grasse	35.7	1.5
Cassava chip	6.0	4.0
Leucaena forage	6.0	3.0
Soybean meal	28.1	20.0
Palm kernel cake	18.3	6.5
Molasses**	5.0	2.5
Salt	0.1	15.0
Urea	0.4	20.0
Total	100.0	6.58

** Molasses were the mixture of 1 kg of molasses and 3 liters of water

Animals

Six male Santa Ines sheep, with average body weight (BW) of 23.4±6.7 kg, 6 to 7 months old were used in t-test design. Animal was caged individual at space of 1.0x1.5x1.2 m. Each goat was dewormed using ivermectin and vaccination prior the start of experiment. Dietary treatment consisted of leucaena silage (T1) and fermented total mixed ration (T2). Treatment feeds were kept in 120 L. plastic container. Dietary treatment were fed to sheep twice daily at 08.00 and 16.00 h, respectively as well as the mineral block and clean drinking water were available throughout the experiment.

Data collection and analysis

The experiment was lasted for 50 days consists of adaptation and experimental periods. Adaptation period was carried out between days 1 to 14, to allowed animal adapted to the feed. Each animal body weight was recorded prior the start of experiment and TMR was offered ad libitum. Experimental period was conducted between days 15–50. Daily BW of sheep were recorded at week 1 to 5. Feed offered and refusal in each animal were measured during

this 5 weeks period to analysis of feed intake, FCR and economics comparison. SPSS 16.0 were used as for data analysis.

Results and discussion

Voluntary feed intake

Feed intake of sheep received dietary T1 (642.1) and T2 (624.8 g) were not significantly different. Generally, the differences of feed intake in small ruminant can be attributed by environment, feed texture, animal house condition, animal management and health. In addition, Saithanoo et al. (2001) mentioned that roughage consumption of goats was affected by many factors including fiber level in particular cell wall and the level of CP in the diet. Furthermore, feed in take in goats were positively correlated with roughage quality (Hussain et al., 1996; Domingue et al., 1991 and Goetsh et al., 2011). To the present study, since feed were formulated in the similar CP content in both dietary treatments, this could be explained the above feed intake of sheep received the two treatments were not differed.

Table 2 Voluntary feed intake of sheep received (T_1) and (T_2) over a 35 day period.

Week	Feed intake (g/head/day)		<i>p</i> -value
	Leucaena silage (T_1)	Fermented TMR (T_2)	
1	539.04	532.37	0.12
2	595.23	575.23	0.09
3	642.67	626.18	0.22
4	695.23	671.42	0.36
5	738.23	719.04	0.08
Mean	642.08	624.84	0.16

SEM= standard error of mean

Body weight change of sheep

The mean BW change of sheep throughout the tested period were 4.33 and 3.66 kg, respectively for T_1 and T_2 (Figure 1). This BW change was similar to the report of Wattanachan and Ngampongsai (2012) who found that

goats fed TMR for 90 days gaining weight between 3.71 to 4.80 kg. Suemae et al. (2017) reported that the BW gain of native and Anglo-nubian crossbred goats fed solely leucaena silage and 50% mixed leucaena silage for 90 days was 6 kg/head.

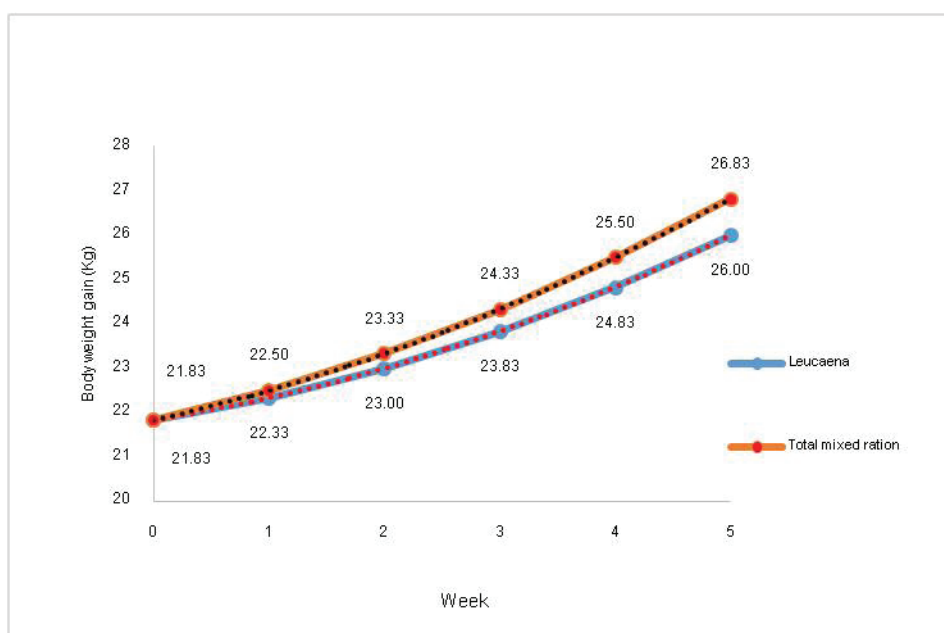
**Figure 1** Body weight gain of sheep received T_1 and T_2 over a 35 day period.

Table 3 Average daily gain (ADG) of sheep received T₁ and T₂ over a 35 days period.

Week	Average daily gain (g/head/day)		SEM	P-value
	Leucaena silage (T ₁)	Fermented TMR (T ₂)		
1	95.88±28.53	89.35±20.15	9.137	0.762
2	95.28±25.86	88.33± 20.23	8.622	0.733
3	87.15±23.58	85.85±20.60	8.090	0.946
4	88.68±23.02	91.06±19.88	7.873	0.899
5	89.51±21.49	93.29±20.02	7.632	0.834
Mean	91.30±24.49	89.57±20.17	8.204	0.930

SEM= standard error of mean

Feed conversion ratio

The FCR of sheep fed two dietary treatments is presented in Table 4. FCR of sheep fed TMR (6.97) was significantly lower than that of leucaena silage (7.03). This result is in agreement with Wattanachan and Ngampongsai (2012) who reported that FCR of goats

fed TMR containing high level of OPF ranged between 8.02 to 11.31. Inthirak et al. (2011) observed that FCR of native goats, 1 to 2 years old, was 10.38 when fed TMR containing 10%CP. In our study, the FCR of sheep was lower than that of goats may due to the difference in feed and animal species.

Table 4 Feed conversion ratio (FCR) of sheep received T₁ and T₂ over a 35 days period.

Week	Feed conversion ratio : FCR		SEM	P-value
	Leucaena silage (T ₁)	Fermented TMR (T ₂)		
1	5.62±0.11 ^a	5.95±0.00 ^b	0.079	0.009
2	6.24±0.00 ^a	6.51±0.00 ^b	0.060	0.000
3	7.36±0.00 ^a	7.29±0.00 ^b	0.017	0.000
4	7.83±0.00 ^a	7.37±0.01 ^b	0.101	0.000
5	8.24±0.00 ^a	6.97±0.00 ^b	0.122	0.000
Mean	7.03±0.03 ^a	6.97±0.00 ^b	0.016	0.035

SEM= standard error of mean

^{a,b} Means within the same row with different superscripts differ ($P<0.05$).**Economic return**

Table 5 shows the production cost and economic comparison of sheep fed two dietary treatments throughout the period of 35 days. Production cost of 1 kg weight gain of sheep received leucaena silage (T₁) and fermented TMR (T₂) were 43.8 and 63.8 Baht/head.

The consequence cost of sheep production for T₁ and T₂ during 35 days were 276.4 and 160.2 Baht/head.

Based on the present study, it can be implied that the use of natural forage as TMR in ruminants able to minimize the cost of production, resulted in the higher farm profit. This scenario is similar to Suemae et al. (2017) who reported that production cost of 1 kg weight gain of goat received 100% leucaena silage was 111.2 Baht. Goats fed solely leucaena silage lasted for 90 days had benefit return for 431.8 Baht/head. Wattanachan and Ngampongsai (2012) also reported

Table 5 Production cost and economic comparison of sheep fed two dietary treatments throughout 35 days.

Economic value	Dietary treatment	
	Leucaena silage (T ₁)	Fermented TMR (T ₂)
Feed price (Baht/kg)	6.23	9.16
Feed conversion ratio (FCR)	7.30	6.97
Cost of feed to gain 1 kg BW (Baht/head)	43.79	63.84
Body weight gain over a 35 days (kg)	3.66	4.33
Total cost of feed over a 35 days (Baht/head)	160.23	276.44
Price of sheep (Baht/kg)	130	130
Profit from sale of sheep (Baht/head)	475.80	562.90
Profit (Baht/head)	315.57	286.46
Difference (Baht/head)	29.11	

the economic return from goats was 501.1 Baht/head during 84 days of fattening when replacement of concentrate with TMR containing high oil palm frond ration.

Conclusion

No differences were observed for voluntary feed intake and ADG among the two sheep groups. However, FCR and economic return were significantly different. Cost of production of 1 kg weight gain of sheep was lower in T1 (43.8) than in T2 (63.8 Baht/head). Base on the present study, it can be concluded that leucaena silage is the potential feed for improvement the ADG and economic return of Santa Ines sheep as compared with fermented TMR containing more proportion of concentrate.

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