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Effects of different energy and protein levels on growth performance and nutrients apparent digestibility in lambs of Yanshan cashmere goat

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1. Introduction

Yanshan cashmere goat is a local breed of China. It is famous in its high cashmere yeild and good cashmere quality in China.

The purpose of this experiment is to study the effects of different energy and protein levels of diets on growth performance and nutrients apparent digestibility in rams of Yanshan cashmere goat.



2. Material and Methods

Ninety 4-month-old weaned rams of Yanshan cashmere goat (15 kg) were randomly divided into 9 groups (10 lambs per group) with 9 different totally mixed rations.

The metabolic energy(ME) were formulated at 9.5, 10.5 and 11.5 MJ/kg•DM.

Digestible crude protein(DCP) were 8.5%, 9.5% and 10.5%, respectively.

The experimental period was 60-days.

The growth performance and nutrients apparent digestibility were measured.

Table 1 Composition and nutrient levels of experimental diets

Items	GroupI	GroupII	GroupIII	GroupIV	GroupV	GroupVI	Group VII	Group VIII	GroupIX
Ingredients									
Corn straw	35.0	35.0	35.0	23.0	23.0	23.0	10.0	10.0	10.0
peanut vine	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Alfalfa hay	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Corn	27.0	24.0	21.0	45.0	44.9	41.9	64.0	61.5	59.0
Soybean meal	6.0	9.0	12.0	5.5	16.1	19.0	5.0	8.0	11.0
Wheat bran	13.0	13.0	13.0	7.5	7.5	7.5	1.5	1.0	0.5
CaHPO ₄	0.2	0.2	0.2	0.2	0.2	0.2	0.7	0.7	0.7
Premix ^a	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NaCl	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Total	100	100	100	100	100	100	100	100	100
Nutrient levels									
ME / (MJ/kg)	9.58	9.57	9.56	10.53	10.52	10.51	11.49	11.50	11.50
DCP/%	8.50	9.53	10.55	8.52	9.54	10.56	8.50	9.49	10.48
NDF/%	38.45	38.75	38.78	33.05	32.24	31.34	22.27	21.50	21.31
ADF/%	20.09	20.90	21.60	17.94	17.55	17.04	11.69	11.91	11.78
Ca/g	6.12	6.20	6.30	5.71	5.80	5.88	6.26	6.34	6.42
P/g									

Nine diets with different energy and protein levels in this experiment

3. Results

3.1 Effects of different energy and protein levels on growth performance

Table 2 Effects of different energy and protein nutrition levels on growth performance of Yanshan cashmere goats

Items	Initial weight(kg)	Final weight(kg)	ADG(g)	DMI(kg/d)	F/G	
GroupI	16.46±1.45	23.24±2.46	113.00±31.40 ^{ab}	0.81±0.10 ^a	7.66±1.94 ^a	
GroupII	16.74±1.81	24.98±3.21	120.62±33.92 ^{ab}	0.82±0.12 ^a	7.25±1.72 ^{ab}	
GroupIII	16.77±2.26	23.79±2.82	117.04±26.51 ^{ab}	0.81±0.08 ^a	7.19±1.55 ^{ac}	
GroupIV	16.25±1.48	23.18±1.71	115.50±19.50 ^{ab}	0.71±0.08 ^b	6.35±1.35 ^{ad}	
Groups	GroupV	15.09±1.29	22.64±3.35	125.83±45.20 ^{ab}	0.69±0.07 ^{bc}	6.04±1.82 ^{bcd}
	GroupVI	16.22±2.89	24.09±3.58	131.11±29.27^a	0.72±0.09 ^b	5.76±1.43 ^{bcd}
	GroupVII	16.66±1.58	21.93±1.71	99.58±15.08 ^b	0.61±0.08 ^d	6.22±1.00 ^{ad}
	GroupVIII	16.13±2.46	23.04±3.41	115.24±35.03 ^{ab}	0.62±0.08 ^d	5.89±2.12 ^{bcd}
	GroupIX	15.67±1.89	23.32±2.72	139.44±30.56^a	0.67±0.08 ^c	5.01±1.09 ^d

Note: Values with no letter or the same letter superscripts means no significant difference ($P>0.05$), while with different small letter superscripts means significant difference ($P<0.05$) in the same column.

3.2 Effects of energy and protein levels on energy digestion

Table 3 Effects of energy and protein levels on energy digestion of Yanshan cashmere goats

Items	General energy intake (MJ/d)	Fecal energy (MJ/d)	Urinal energy (MJ/d)	Digestible energy (MJ/d)	General energy digestibility (%)	
Group I	17.88±1.67	6.34±1.20ab	0.55±0.02ab	11.55±1.46	64.56±5.89d	
Group II	17.12±2.28	6.45±0.75a	0.72±0.16a	10.67±1.65	62.20±2.14d	
Group III	16.99±0.96	5.96±1.37abc	0.57±0.17ab	11.03±1.26	64.99±7.45d	
Group IV	16.20±1.48	5.07±0.53bc	0.44±0.06b	11.13±1.00	68.74±1.12c	
Groups	Group V	16.86±0.77	5.19±0.73abc	0.46±0.10b	11.67±0.74	69.25±3.76c
	Group VI	16.33±2.95	4.76±0.92cd	0.44±0.04b	11.57±2.44	70.65±4.45c
	Group VII	15.45±1.08	3.66±0.29de	0.40±0.12b	11.79±1.19	76.20±2.74a
	Group VIII	15.15±0.50	3.44±0.56e	0.43±0.19b	11.71±0.71	77.28±3.77a
	Group IX	15.52±1.60	3.18±0.34e	0.39±0.15b	12.35±1.56	79.40±2.47a

No difference of energy digestion in the same energy level; The energy digestion increased with higher energy in different energy levels .

Table 4 Effects of energy and protein levels on nitrogen metabolism of Yanshan cashmere goats

Items		Nitrogen intake (g/d)	Fecal nitrogen (g/d)	Urinal nitrogen (g/d)	Nitrogen digestibility (%)
Groups	Group I	21.88±2.04abc	8.43±1.44a	6.53±1.93ab	61.23±7.63c
	Group II	22.72±3.03ab	7.90±1.19ab	7.10±0.87ab	65.26±2.00bc
	Group III	24.54±1.38a	7.99±0.92ab	8.52±0.89a	67.51±2.42abc
	Group IV	19.01±1.74cd	6.66±0.66bcd	6.05±2.57b	64.99±0.95bc
	Group V	21.76±1.00abc	7.43±0.95ab	6.17±2.02ab	65.84±4.45bc
	Group VI	22.78±4.12ab	6.96±1.26abc	6.86±0.59ab	69.31±3.79ab
	Group VII	17.43±1.22d	5.61±0.51cd	5.19±1.13b	67.64±4.27abc
	Group VIII	18.40±0.61cd	5.36±0.92d	5.92±0.87b	70.88±4.86ab
	Group IX	19.99±2.06bcd	5.12±0.89d	6.06±1.02b	74.29±4.48a

The nitrogen digestion increased with higher protein in the same energy level;
The nitrogen digestion increased with higher energy in different energy levels.

Table 5 Effects of different energy and protein levels on nutrients in Yanshan cashmere goats

Items	Dry matter (%)	Organic matter(%)	NDF(%)	ADF(%)	Crude fat(%)	
Group I	65.20±5.90de	67.36±5.32de	42.00±0.51	36.00±11.95	72.65±7.35	
Group II	62.85±2.06e	64.89±2.11e	37.62±4.46	33.61±4.45	74.01±5.11	
Group III	65.26±7.36de	67.65±6.94de	41.48±12.06	39.68±13.12	68.33±9.43	
Group IV	70.23±1.46cd	71.96±1.11cd	42.50±3.38	38.25±3.21	74.40±4.53	
Groups	Group V	70.32±3.68cd	72.54±3.39cd	42.09±6.20	38.59±7.93	74.23±4.95
	Group VI	71.94±4.14bc	73.85±4.04bc	44.83±8.46	41.38±8.11	77.53±7.06
	Group VII	77.59±2.56ab	79.16±2.42ab	39.47±6.66	33.37±6.50	76.73±2.43
	Group VIII	78.73±3.23a	80.27±3.09a	40.19±9.78	35.50±12.29	78.34±7.30
	Group IX	80.29±2.27a	81.85±2.36a	47.20±6.02	44.53±5.34	79.18±2.29

The digestion of DM, OM, NDF, ADF and CF increased with higher energy and protein level

4. Conclusion

4.1 the suitable energy and protein level of diet for Yanshan cashmere goats from 15-25kg : ME at 10MJ/kg; DCP at 9.5%

4.2 The level of energy and protein of diet for Yanshan cashmere goats influenced the digestion of nutrients

Thanks for your attention!