PERFORMANCE OF GROWING RABBITS FED *LABLAB PURPUREUS* FORAGE WITH MOLASSES MINI-BLOCKS AND RESTRICTED COMMERCIAL PELLETS

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ABSTRACT

This study aimed to evaluate the forage legume, *Lablab purpureus,* with or without molasses mini-blocks (MMB) as an energy supplement in Altex, New Zealand White, and crossbred rabbits (n=78) from 13 litters (initial age 49 to 55 d, mean body weight 1,088 g) during a 42-d feeding experiment. Rabbits fed commercial pellets *ad libitum* served as the positive control diet, while rabbits fed 24-h sun-dried lablab leaves *ad libitum* with MMB (without commercial pellets), served as the negative control diet. Diets also included lablab fed *ad libitum* with restricted amount of pellets (25, 50 or 75%) with or without MMB for a total of eight diets. Each diet had three pen replicates, except for positive and negative control groups which had four pen replications. All pens contained three rabbits. Commercial pellets had higher DM, NDF, ADF, and ADL (93.7, 39.5, 18.2, and 6.2%) compared to lablab forage (59.2, 29.8, 18.0, and 4.8%) and MMB (90.9, 20.5, 7.7, and 4.0%). Lablab had higher CP and EE than commercial pellets or MMB (16.7 vs. 16.1 and 8.8%; 4.9 vs. 4.0 and 3.5%). Final weights and daily gains were lowest for negative controls (1643 vs. 2336 to 2539 g and 11.2 vs. 25.2 to 27.5 g/d; $P<0.05$), but not significantly different among the 7 others diets. Total DM intake was different ($P<0.05$) for all diets, except for positive controls and the 25% pellets without MMB group. Lablab forage intake was similar ($P>0.05$) between pens receiving 50 or 75% pellets (77 to 80 g DM/d), whereas pens receiving 25% pellets consumed more forage (91 d DM/d) without influence of the presence of MMB. The highest forage intake was observed for the negative controls (101 g DM/d). DM intake of MMB was lowest ($P<0.05$) for the 75% pellets diet (19 g DM/d), all other means were higher but statistically similar (24, 22 and 25 g DM/d for 50, 25 or 0% pellets). Feed conversion ratio was poorest for negative controls (14.6), whereas the 50 and 75% pellets without MMB diets were intermediate and similar (7.1 and 7.7 respectively), and all 5 remaining diets had the better mean conversion rates (4.7 to 6.5, the lowest value for the positive control). Final weights closely paralleled results for live pre-slaughter and hot carcass weights. Negative controls clearly had the poorer mean dressing percentage (62.3%; $P<0.05$). Abdominal fat percentage was the lowest for negative controls ($P<0.05$) compared to positive controls and 25% pellets with or without MMB and 50% pellets with MMB diets. In conclusion, poor performances were observed for rabbits fed only lablab with MMB. There were no benefits of feeding MMB with lablab forage. In lesser developed countries, the limit feeding (25%) of a concentrate supplement of similar nutritive value (but ideally using local feedstuffs from on-farm forage plots) to commercial pellets may produce more acceptable results.

Key words: Rabbits, Forages, Growth and carcass traits, Energy supplements, Tropical agriculture.

INTRODUCTION

Rabbits can subsist on high roughage, low grain diets, which is of great importance to production in lesser-developed countries. Murphy *et al.* (1999) reported *Lablab purpureus* as a valuable legume that can be used in tropical farming systems. *Lablab purpureus* is an important warm season annual forage legume in Australia, Brazil, and other tropical countries (Skerman *et al*., 1988). The plant is relatively heat and drought tolerant (Fribourg *et al.*, 1984), but is sensitive to low temperatures (Gonzalez,

1987).
Molasses is used to prepare multi-nutrient blocks to provide a source of energy (Preston, 1995). Multi-nutrient blocks can be fed to rabbits during all phases of production (Dinh Van Binh *et al.,* 1991). Supplementation of alfalfa-based diets with molasses blocks resulted in satisfactory growth performances without feed waste (Amici and Finzi, 1995). In Mauritius, age to market weight was reduced when multi-nutrient blocks were used to supplement commercial pelleted diets (Ramchurn and Raggoo, 2000).

Our objective was to evaluate lablab forage with molasses mini-blocks (MMB) as a potentially local and inexpensive diet for rabbits that could be beneficial to small-scale, limited-resource farmers.

MATERIALS AND METHODS

Study Site, Animals, Housing, and Diets

The experiment was conducted at Texas A&M University–Kingsville from 2 July to 13 August, 2007. The study area (27˚ 36' N, 97˚ 57' W) is considered semi-arid and subtropical. Altex (n=10) and New Zealand White (n=12) animals were produced from the TAMUK rabbit research facility, and crossbreds (n=56) were obtained from two local sources. There were a total of 78 animals (range for age was 49 to 55 d and average body weight [BW] was 1,088 g) from 13 litters (litters size range was 4 to 8 kits). Rabbits were housed in commercial pens (76.2 x 76.2 x 45.0 cm) fitted with automatic water valves.

Rabbits were randomly assigned to pens containing three rabbits with the limit of two rabbits of the same breed-type and barring littermates. Two control diets: positive (*ad libitum* commercial pellets) and negative (*ad libitum* lablab forage with MMB), and diets with restricted 25, 50 or 75% pellets with *ad libitum* lablab with or without MMB were involved. Rabbits were subjected to a 7-d adaptation period to diets prior to the 42-d experiment followed by data collection. There were three pen replicates per diet, except for positive and negative controls which had four pen replicates to enhance experimental precision.

A commercially pelleted diet (Nutrena Rabbit Pellets, Cargill-Nutrena Feeds Division, Minneapolis, MN) was used. Restricted pellet feeding (25, 50, and 75%) was determined based on calculated average feed intake per pen of rabbits fed pellets *ad libitum* (positive controls) on the previous day. Lablab plants at the rapid growth stage were harvested daily from plots at Texas A&M University-Kingsville and sun-dried for 24 h. Leaves were separated and fed *ad libitum* to rabbits using commercial forage feeders. MMB were prepared using molasses (50.1%), alfalfa hay (17.2%), crimped oats (24.7%), and cement (8.0%) according to methods outlined by Finzi and Amici (1996). Briefly, a Thomas-Wiley mill was used to grind alfalfa hay cubes and crimped oats to 1 mm diameter. Molasses was poured into a plastic container with wetted cement followed by ground alfalfa and ground crimped oats. A 1 kg mix was transferred into a 1 L beaker and placed in a drying oven at 54^{o}C for 3 d. MMB were offered *ad libitum* and placed on pen floors. Trace-mineralized salt blocks were provided to all experimental rabbits (excluding positive controls). Samples of pellets, lablab leaves, and MMB were collected and analyzed by Proximate Analysis (AOAC, 1990) for DM, CP, ADF, NDF, ADL, EE, and ash.

Traits Measured

Daily intake and refuse weights of pellets, lablab, and MMB were recorded daily and summed weekly per pen on a dry matter basis. Individual body weights were recorded weekly. Gross feed conversion ratio in pens was calculated for the 6-wk experimental period. All crossbred rabbits (n=56) were euthanized by sudden cervical dislocation for assess carcass trait appraisal that included: pre-harvest body and hot carcass weights and dressing and pelvic fat percentages. Hot carcass weight included esophagus, head, heart, kidneys, liver, lungs, trachea, and thymus (Blasco and Ouhayoun, 1993).

Statistical Analysis

Data were subjected to ANOVA using Mixed Model and General Linear Model procedures (SAS, 2003). Individual growth and carcass traits were analyzed according to fixed diet, random pen nested within diet, fixed breed-location, diet x breed-location interaction, and random error (assumed to be NID; 0, σ^2_{ϵ}). Pen trait data were analyzed according to only fixed diet and random error sources. Least-squares means were all tested for significance at the P<0.05 probability level.

RESULTS AND DISCUSSION

Nutrient Composition of Experimental Diets

The chemical composition of commercial pellets, MMB, and lablab forage is provided in Table 1. Because of added cement, the ash content of MMB was higher than lablab and pellets (19.6 vs. 9.2 and 8.5%). Our results are in agreement with previous data published by Ruiz-Feria and Lukefahr (1998), Linga *et al*. (2003) or Omole *et al*. (2007).

Table 1: Chemical composition of diet ingredients (% dry matter)

	Pellets	MMB	Dried Lablab forage
Dry matter	93.7	90.9	59.2
Crude protein	16.1	8.8	16.7
NDF	39.5	20.5	29.8
ADF	18.2	7.7	18.0
ADL	6.2	4.0	4.8
Ether Extract	4.0	3.5	4.9
Ash	8.5	19.6	9.2

Individual and Pen Trait Performances

Least-squares diet means (SE) for growth, feed utilization, and carcass traits are shown in Table 2. For final weights and daily gains, only means of negative controls differed (P<0.05). In the first week of the experiment (after the adaptation period), negative controls may have foundered on MMB (50% diarrhea cases with one death), possibly due to an insufficient supply of lablab forage, resulting in dramatic weight losses. Ruiz-Feria and Lukefahr (1998) reported that rabbits fed commercial pellets had heavier BW by 159 g and more rapid average daily gain by 3.8 g/d than rabbits on 50:50% and 75:25% restricted pellet:lablab diets, respectively. Linga *et al*. (2003) reported that pellet-fed rabbits had heavier BW by 580 g and more rapid daily gain by 15.6 g/d than rabbits fed fresh or dried lablab forage with either sugar cane or MMB. In Vietnam, Le Thu Ha *et al*. (1996) observed more rapid gains by 30% when rabbits were fed mulberry and *Trichanthera gigantean* leaves with MMB compared to a diet of grasses with concentrates.

For pen traits, least-squares means for total DM intake was different (P<0.05) for all diets, except for positive controls and the 25% pellets without MMB group which were similar (Table 2). There is a tendency that pens receiving MMB at the same level of pellets restriction had numerically higher total DM intake. Obviously, pens receiving from 0 to 100% pellets had a consistently higher DM intake of pellets with little apparent influence of the absence or presence of MMB. Lablab forage intake least-squares means were similar (P>0.05) between pens receiving 50 or 75% pellets, whereas pens receiving 25% pellets consumed more forage, but less by approx. 10 g than that of negative controls. DM intake of MMB was lowest (P<0.05) for the 75% pellets diet, all other means were higher but similar. Feed conversion ratio was poorest for negative controls (due in part to the very poor gain performance), whereas the 50 and 75% pellets without MMB diets were intermediate and similar, and all remaining diets had the better mean conversion rates. Ruiz-Feria and Lukefahr (1998) and Linga *et al*. (2003) reported similar results for positive controls with lower mean values for total DM feed intake and feed conversion ratio.

Table 2: Generalized least-squares means for growth, feed utilization, and carcass traits (units in g)

Forage	No	Dried Lablab leaves *ad libitum*							SE	P-value
Pellets	*ad lib.*	75%		50%		25%		0%		
Blocks (MMB)	No	No	MMB	No	MMB	No	MMB	MMB		
Initial weight	1119	1127	1155	1077	1080	1026	1131	1117	*35*	0.2492
Final weight	2487b	2539b	2456b	2398b	2365b	2337b	2484b	1643a	*83*	<0.0001
Daily gain	26.6b	27.5b	26.1b	26.5b	25.2b	25.5b	27.2b	11.2a	*1.3*	<0.0001
Total DM intake	116.9a	161.6d	179.3e	136.5c	157.2d	119.5a	141.4c	126.3b	*4.3*	<0.0001
Pellets DM intake per fryer	116.9d	82.9c	83.0c	56.4b	56.6b	28.7a	28.7a	0	0.81	<0.0001
Forage DM intake	-	78.7a	77.6a	80.1a	77.1a	90.8b	90.9b	101.1c	4.0	0.0024
MMB DM intake	-	-	18.7a	-	23.5b	-	21.8b	25.2b	1.4	0.0497
Feed conversion ratio	4.7a	6.5a	7.7b	5.8a	7.1b	5.0a	5.5a	14.6c	1.1	<0.0001
Slaughter weight (SW)	2238c	2305c	2140bc	2133bc	2057bc	1979b	2259c	1443a	111	<0.0001
Carcass weight	1551c	1572c	1472bc	1475bc	1455bc	1358b	1546c	898a	72	<0.0001
Dressing %	70.0bc	68.9bc	69.4b	69.8b	71.4c	69.2b	68.6b	62.3a	1.3	<0.0001
Emptied digestive tract, % SW	13.1a	14.6b	15.4b	16.3b	15.0b	19.0c	15.5b	24.9d	0.80	<0.0001
Abdominal fat, % SW	1.48b	1.15ab	1.03ab	1.09ab	1.49b	1.41b	1.41b	0.89a	0.18	0.0380

a,b,c,d,e Least-squares means in rows with different letters are different at P<0.05

Carcass trait analyses revealed that diet means for final weights closely paralleled results for live pre-slaughter and hot carcass weights (Table 2). In regards to dressing percentage, negative controls clearly had the poorer mean value (62.3%; P<0.05), whereas the best carcass yields (71.4%) were from fryers on the 50% pellets with MMB diet. This result to some extent follows the pattern for emptied digestive tract weights in which positive controls had the smallest mean while negative controls had the largest mean (all other diets being intermediate and similar (P>0.05), except for the higher mean value of 19.0% for the 25% pellets without MMB diet). Lastly, abdominal fat percentage (an indicator of physiological maturity) was lowest for negative controls (P<0.05) compared to positive controls and 25% pellets with or without MMB and 50% pellets with MMB diets.

CONCLUSIONS

Poor performances were observed for rabbits fed only lablab with MMB, perhaps a reflection of the early enteric disease episode. Hence, the study should be repeated. Also, there were no benefits of feeding MMB with lablab forage. In lesser developed countries, the limited feeding (25%) of a concentrate supplement of similar nutritive value, but ideally using local feedstuffs from on-farm forage plots, to our commercial pellets may yield more acceptable results.

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