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CARIBBEAN FOOD CROPS SOCIETY

44

**Forty Fourth
Annual Meeting 2008**

Miami, Florida, USA

**Vol. XLIV – Number 2 Continued
Poster Session Abstracts
With Some Posters Expanded as Full Papers**

MEETING HOST:



Poster #38

Lamb's Voluntary Intake and Digestibility of Forage Soybean 'Hinson Long-Juvenile' (*Glycine max*) and Lablab 'Rongai' [*Lablab purpureus* (L.) Sweet]

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ABSTRACT.

In Puerto Rico, tropical grasses do not adequately meet the nutritional requirements of dairy cows. For this reason, imports alfalfa hay and costly concentrate based diets are used in the dairy industry. It has been widely documented that legumes are generally higher in nutritive value than grasses, but information on forage intake and nutritive value of the annual legumes forage soybean Hinson Long-Juvenile (HLJ) (*Glycine max*) and lablab cv. Rongai [*Lablab purpureus* (L.) Sweet] is limited. The research objective was to compare daily intake, and dry matter, crude protein (CP), and neutral detergent fiber (NDF) digestibility of 'HLJ' and 'Rongai' hay when fed to mature lambs. The experiment was conducted at the University of Puerto Rico, Finca Alzamora using rams (28.4±4 kg BW) in a completely randomized design with three replicates. Rams were housed in individual cages and fed treatment diets for a 7d adaptation period and 5d of data collection. Higher voluntary feed intake ($P<0.05$) was observed by rams fed 'HLJ' than Rongai (0.944 vs. 0.852 kg/d). Crude protein and NDF concentration were 15.7 and 15.5% and 42.8, and 41.7% for HLJ and Rongai, respectively. CP and NDF digestibility of HLJ and Rongai did not differ ($P>0.05$). But DM Digestibility (56.2 vs. 49.6%) was higher ($P<0.05$) in HLJ than Rongai. Both HLJ and Rongai exhibit potential for use in hay conservation systems to improve the feeding value of diet basal on grass hay and minimize concentrate use in dairy cows.

KEYWORDS: Voluntary intake, forage soybean, lablab

RESUMEN.

En Puerto Rico, las gramíneas tropicales no cumplen adecuadamente los requerimientos nutricionales de las vacas lecheras. Por consiguiente, se utilizan heno de alfalfa y dietas basadas en alimentos concentrados de altos costos en la industria lechera. Se ha documentado extensamente que las leguminosas generalmente tienen mayor valor nutritivo que las gramíneas, pero información en el consumo y valor nutritivo forrajero de las leguminosas anuales soya forrajera Hinson Long-Juvenile (HLJ) (*Glycine max*) y Lablab cv. Rongai [*Lablab purpureus* (L.) Sweet] es limitada. El objetivo de esta investigación fue comparar el consume diario de materia seca, proteína bruta (CP), y fibra detergente neutro (NDF) y digestibilidad de heno de HLJ y Rongai en la alimentación de ovinos adultos. El experimento fue conducido en la Universidad de Puerto Rico, Finca Alzamora utilizando ovejos (28.4±4 kg peso vivo) en cajas individuales y alimentados por un periodo de 7 días de adaptación y 5 de recolección de

datos. Se observó mayor consumo voluntario ($P<0.05$) por los ovejos alimentados por HLJ en comparación con Rongai (0.944 vs. 0.852 kg/d), no se encontró diferencia significativa ($P>0.05$) en el contenido de proteína bruta y de FDN, los cuales se obtuvieron 15.7%, 15.5% y 42.8, 41.7 para HLJ y Rongai respectivamente. Aunque la digestibilidad (56.2 vs. 49.6%) fue mayor ($P<0.05$) en HLJ en comparación con Rongai. Ambas leguminosas forrajeras HLJ y Rongai presentan gran potencial en sistemas de conservación utilizando henos para mejorar el valor alimenticio de dietas básicas de gramíneas y reducir la utilización de concentrados en las industrias lecheras.

PALABRAS CLAVES: Consumo voluntario, soya forrajera, lablab

INTRODUCTION

Forage intake, especially the fibrous part, is vitally important in ruminant feeding. Ruminants require a high level of quality fiber in their diets for good rumen function, feed efficiency and production (milk, meat, hair). In Puerto Rico, native or naturalized grasses do not meet the nutritional requirements of high producing ruminants. For this reason, alfalfa hay and concentrate based diets are used in the dairy industry.

Tropical forage legumes represent an alternative to increase animal performance in the tropics (Skerman et al., 1992) and are an option to minimize the use of concentrates and alfalfa in milk production systems in Puerto Rico. The addition of legumes in tropical pastures can improve CP concentration, rate of passage and feed intake (Kretschmer and Pitman, 2001).

Forage soybean (*Glycine max*) and Lablab (*Lablab purpureus*) are legumes with potential for use in dairy production systems in Puerto Rico. Soybean has been considered one of the best annual proteinaceous seed and hay producing plant (Sheaffer et al., 2001). It provides high protein and energy feed supplement that complements ruminant nutritional requirements (Rotz et al., 2001). Lablab can be grazed or used for hay or silage; its foliage has high protein and digestibility (Murphy et al., 1999) and lablab is among the most palatable legume for livestock (Valenzuela et al., 2002).

In Puerto Rico, information on forage intake and nutritive value of the annual legumes forage soybean Hinson Long-Juvenile ('HLJ') (*Glycine max*) and lablab cv. Rongai [*Lablab purpureus* (L.) Sweet] are limited. Research objectives were to compare daily intake, and dry matter, crude protein (CP), and neutral detergent fiber (NDF) digestibility of HLJ and Rongai hay when fed to mature lambs.

MATERIAL AND METHODS

The experiment was conducted at the University of Puerto Rico, Finca Alzamora using rams (28.4±4 kg BW) in a completely randomized design with three replicates. Rams were housed in individual cages and feed treatment diets for a 7d adaptation period and 5d of data collection. Treatments used were Soybean cv. Hinson Long-Juvenile (HLJ) and Rongai sun cured hay (66-d re-growth) at 4% of body weight and fed *ad libitum*. Hay offered, rejected and digestibility [(intake-feces/intake) *100] were determined. At the end of the period rams were weighed and representative samples were taken of feed offered, rejected and feces for crude protein and NDF determination.

Chemical analyses were conducted at the Animal Nutrition Laboratory of the University of Puerto Rico, Mayagüez. Crude protein was determined by micro-Kjeldhal

method using a nitrogen analyzer *Kjeltec system 1002* ($CP = N \times 6.25$). Neutral detergent fiber (NDF) was determined with the Fiber Analyzer Ankom 200, following the methodology of Van Soest et al. (1991) ($CC = 100 - NDF$). Data were analyzed according to a completely randomized design with a SAS program (2006) with $\alpha = .05$.

RESULTS AND DISCUSSION

There was treatment difference ($P < 0.05$). Higher voluntary feed intake ($P < 0.05$) was observed by rams fed HLJ than Rongai (0.944 vs. 0.852 kg/d). Higher intake (100 g) of HLJ hay (80% of forage on offer consumed) can be attributed to a higher leaf:stem ratio as compared to Rongai (75% of forage on offer consumed). Crude protein and NDF concentration were 15.7 and 15.5% and 42.8, and 41.7% for 'HLJ' and Rongai, respectively. Both CP and NDF digestibility of HLJ and Rongai did not differ ($P > 0.05$), but DM digestibility (56.2 vs. 49.6%) was higher ($P < 0.05$) in HLJ than Rongai (Table 1 and Figure 1).

Voluntary intake is the most important factor in production systems and is associated with quality and palatability. In this study we observed that both hays were readily consumed. Valenzuela and Smith (2002) described lablab as highly palatable with 55% digestibility and similar to the digestibility of Rongai observed in this study. Dry matter digestibility of HLJ was in the range reported previously (56.2%).

Crude protein (>15%) and NDF (42%) values for both HLJ and Rongai reflect a high quality forage. Tobias and Villalobos (2004) reported that soybean harvested at R6 stage (full seed 90-d) had 20% CP and 42% of NDF. It is well documented that season of the year has an effect in plant development and disposition of nutrient content. Many studies also found an increase in the fiber fraction of the plant with its maturity (Murphy and Colucci, 1999). Additional studies should assess date of maturity of both HLJ and Rongai.

CONCLUSIONS

Both HLJ and Rongai exhibited high voluntary intake, as well as excellent CP and NDF supporting their potential for use in hay conservation systems to improve the feeding value of grass hay based diets and minimize concentrate use in dairy cows in Puerto Rico. Lambs fed with HLJ showed more voluntary intake and higher digestibility in comparison with Rongai hay. It was observed that leaves were preferred by lambs rather than stem fractions. Other nutritional and non-nutritional factors have to be considered to determine which one of these legume hays have better forage quality.

ACKNOWLEDGMENTS

Research was financially supported by the TSTAR grant "Improving the productivity of warm season legumes"

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Table 1. Voluntary daily intake and digestibility of forage soybean Hinson long-juvenile and lablab cv. Rongai hay.

| Treatments | Voluntary Intake (Kg) | Intake of total offered (%) | Digestibility (%) |
|---------------|-----------------------|-----------------------------|-------------------|
| Soybean (HLJ) | 0.94a | 80.05a | 56.22a |
| Rongai | 0.85b | 75.01b | 49.59b |

Values followed by the same letter are not significantly different.

Figure 1. Crude Protein and NDF concentration of forage soybean Hinson long-juvenile (HLJ) and Lablab cv. Rongai hay

