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Feeding Rabbits in Traditional System With Improved Forage Legumes in South-Kivu. D. R. Congo

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Abstract

To investigate for an efficient feeding of rabbits in the traditional system essentially with some improved high yield forage legumes. Two animal nutrition trials were conducted from September 2011 to February 2012 in Mugwahi farm in Nyangezi, South-Kivu, D. R. Congo. Five female rabbits replicated three times were fed essentially in traditional system with supplements of improved forage legumes; first with *Leucaena diversifolia* from the selection of CIAT in Colombia and second with *Desmodium intortum*. Five others as local controls were fed only on local forages.

The palatability evaluation showed that *Calliandra calothyrsus* was most appreciated by rabbits; *Desmodium intortum* and *Leucaena diversifolia* had a moderate palatability. The weight gain showed that rabbits which received a supplement of *Leucaena diversifolia* grew better than those fed on local forages.

In term of palatability, the various forages supplied to female rabbits only *C. calothyrsus* performed significantly with a high RIP during the first trial and the improved forages *D. intortum* and *L. diversifolia* had a moderate one during the second trial. Regarding the weight gain of rabbits, the introduced forages; *L. diversifolia* performed better than the local ones. The cropping of improved legumes constitutes an alternative to avoid long walks to collect fodder which is scarce in villages. These good forages on farm could remain available even in the dry season. Studies to determine the constraints of adoption of forage crops by the farmers will improve forage production.

Keywords: Forage legumes, Rabbits, Palatibility, Weight gain

1. Introduction

Farming in the South-Kivu Province of the Democratic Republic of Congo is characterized by an extensive animal-agriculture system (Maass, 2012). The demographic inflation and the subsequent pressure on natural resources shall boost a change of agricultural practices and livestock husbandry while shifting toward semi-intensification or intensified systems (Katunga, 2004). Forage crops to feed rabbits are scarcely applied in the region (Maass, 2012), though they could help breeders to turn toward more appropriate practices, responding to conditions of land scarcity with shortages of pastures within a context of increasing food demand and protein malnutrition. Human food is generally expensive and cannot allow farmers to secure profits when it is used as livestock feed. This paper aims at investigating for an efficient feeding of rabbits in the traditional system essentially with some improved high yield forage legumes with high nutritional values from the selection of the CIAT in Colombia (CIAT, 2008).

2. Materials and Methods

2.1 Location and Characteristics of the Study Site

All of the animal nutrition trials were conducted at Mugwahi farm in Nyangezi, about 30 km South of Bukavu (Latitude 2.88°S, Longitude 27.03°E), the elevation is of ca. 1580 m asl. The soil is acidic with pH 3.9.

2.2 Origin of Animals and Animal Husbandry

A total of 30 females rabbits, six months old were received from Sisters' Monastery of Murhesa during the trial with *Desmodium intortum* and the same animals of nine months old during the trial with *Leucaena diversifolia*. They were local breeds mixed at low level with Californian and Flanders giant breeds. Five animals were kept in wooden boxes 1.2 m × 0.6 m × 0.6 m. Then five rabbits formed a group replicated three times.

2.3 Feeds and Nutritional Quality

Overall, two trials were conducted. First the supplement of *D. intortum* began on September, 27th 2011 and finished on December, 20th 2012 and the second one with *L. diversifolia* with the same animals in December, 28th 2012 to February, 20th 2012.

In the first trial, five female rabbits replicated three times were fed 75% on local grasses plus 25% supplement of *D. intortum* and five other female rabbits replicated three times received the local feed only. During the second trial with supplement feeding on *L. diversifolia,* fifteen female rabbits received 75% of local feeding plus 25% supplement of *L. diversifolia* and fifteen others on the local feed only. All rabbits were accustomed for two weeks in the first trial and one week in the second one before the feeding trials started. Animals were fed at 8:0 am and 16:0 pm. Water was unlimitedly supplied throughout the experiments. All animals were fed "*ad libitum"*. Foliages were harvested without any restriction of age and species following the farmer practices. Local feeds were collected from road, path sides and swamp and crop residues in the surroundings according to availability. Improved forage legumes were planted in a nearby field, harvested in the morning. All the forages were supplied to rabbits when slightly wilted. Nutritive values were mostly assessed by Near Infrared Reflectance Spectroscopy (NIRS) at ILRI-Ethiopia. Time of harvesting the forages was about two hours per meal per person and could require seven kilometers walk some days but

usually three kilometers. The samples for chemical analysis were all collected on young leaves after the trials.

2.4 Palatibility of Feeds and Development of Animal Weights

The various feed stuffs were identified and weighed on a hanging scale (KERN & Sohn GmbH) with 5 g minimum and 10 kg maximum in order to assess their availability. Thereafter, they were dispatched into similar portions and species to provide every one rabbit per cage with an equal amount of 600 g of feed from each component. This resulted in variable amounts as well as different compositions of individual feeds day by day (Table 2). Before every meal, feed remains were collected, identified and weighed and the quantity of feed species refusals noted. The feed availability and the composition of grasses were calculated at each meal during the two trials. The Relative Index of Palatability (RIP) formula was FeedXcons(%)=(FeedXoffered(g)-FeedXrefused(g))/(FeedToffered(g))-FeedTrefused(g))

FeedXoffered(%)=(FeedXToffered(g)) / (FeedToffered(g)).

RIP=(FeedXcons (%)) / (FeedXoffered (%)) where; low palatability (RIP≤ 0.8); moderated palatability (RIP =≤ 0.8-1.2) and highly palatability (RIP => 1.2).

To follow up the development of animal weights, every animal was weighed once a week only for the trial with *L. diversifolia* supplement with the same hanging scale.

2.5 Data Analysis

For data analysis, Anova, Tukey test and clusters were run on STATVIEW version 5.0, Past version 2.15, STATISTICA 6 and Genstat for Teaching sofwares.

3. Results

3.1 Nutritive Values of Foliages

The Table1 presents the chemical analysis of various foliages eaten by the rabbits.

The different foliages represented in Table 1 show good nutritive values. Crude proteins ranged from 15.3-28.7% which is very good. Values of ADF concentration for *Bidens pilosa, Brachiaria ruziziensis, Calliandra calothyrsus*, *Dichrocephala integrifolia, Erlangea sp., Ipomoea batatas, Trifolium baccarinii* were very good as well. The other forages have a very high ADF especially *Albizzia gummifera*.

Table 1. Chemical composition of the meal (%)

Forage species	DM*	OM	CP	NDF	ADF
Albizzia gummifera	26.5	95.8	28.7	74.9	54.1
Bidens pilosa	26.8	82.4	n.d*	48.2	26.0
Brachiaria ruziziensis	30.9	84.5	15.9	64.9	30.5
Calliandra calothyrsus	29.5	96.2	23.7	41.6	28.1
Conyza sumatrensis	28.2	83.6	n.d	45.0	49.2
Crassocephalum monteosum	24.4	85.2	n.d	46.2	49.3
Crassocephalum vitellinum	20.4	81.8	17.1	48.1	52.9
Desmodium intortum	23.4	92.4	22.2	64.1	47.3
Dichrocephala integrifolia	20.8	86.5	27.7	46.9	28.0
Digitaria vestita	29.5	88.8	n.d	78.4	46.2
Drimaria cordata	23.5	89.8	20.9	59.8	36.1
Erlangea sp.	30.1	84.9	n.d	51.0	27.4
Galinsoga parviflora	19.5	84.3	24.1	40.5	39.0
Ipomoea batatas	23.4	86.2	23.7	26.6	20.4
Leucaena diversifolia	32.1	94.9	24.7	36.2	26.6
Pennisetum purpureum	21.3	85.7	n.d	63.4	31.9
Trifolium baccarinii	20,3	54,4	16,3	26,4	17,4

DM; dry mater, OM; Organic mater, CP; Crude proteins, NDF; Neutral Detergent Fiber, ADF; Acid Detergent Fiber, n.d; not determined

3.2 Palatibility of Forages

Table 2 shows the Relative Index of Palatibility (RIP).

Table 2. RIP of forages eaten by rabbits (Means±Sd)

Forages	**Botanical family**	***D. intortum***	**n***	***L. diversifolia***	**n***
Albizzia gummifera	Leguminoseae	0.860±0.9d	6	n.a	n.a
Bidens pilosa	Asteracea	1.0403±1bc	120	0.9961±1ab	77
Brachiaria ruziziensis	Poaceae	0.8197±0.8de	30	n.a	n.a
Calliandra callothyrsus	Leguminoseae	1.3938±1.4a	8	n.a	n.a
Conyza sumatrensis	Asteracea	0.8245±0.8de	56	1.000±1ab	77
Crassocephalum monteosum	Asteracea	0.8844±09cd	9	n.a	n.d
Crassocephalum vitellinum	Asteracea	0.9293±0.9cd	86	0.9366±0.9b	82
Desmodium intortum	Leguminoseae	1.0260±1bc	72	n.a	n.a
Dichrocephala integrifolia	Asteracea	1.0018±1cd	68	1.0000±1ab	6
Digitaria vestita	Poaceae	0.6317±0.6e	6	0.8700±0.9bc	10
Drimaria cordata	Caryopyllariaceae	n.a**	n.a	0.8895±0.9bc	19
Erlangea sp	Asteracea	0.9492±1cd	12	0.7750±0.8c	12
Galinsoga parviflora	Asteracea	1.0170±1c	90	1.0895±1.1a	38
Ipomoea batatas	Convulvulaceae	1.0702±1.1bc	107	1.0876±1.1ab	89
Leucaena diversifolia	Leguminoseae	n.a	n.a	0.9167±0.9bc	48
Panicum repens	Poaceae	n.a	n.a	0.9167±0.9bc	6
Pennisetum purpureum	Poaceae	0.7987±0.8de	24	0.8500±0.9bc	6
Setaria barbata	Poaceae	1.1640±1.2b	5	n.a	n.a
Lsd($p<0.05$)	-	0.14395	-	0.09634	-

n*= number of samples; n.a**=data not available; Means with same letters within the same column do not differ significantly ($P>0.05$).

Tukey test grouping of RIP values shows five groups of means in the first trial and three in the second one. Only C. *calothyrsus* led to high palatability during the first trial; the trial with *L. diversifolia* supplement showed that the first group had only a moderate RIP. The frequencies of botanical families used in the trial of *D. intortum* suppplement were respectively 63.1% for Asteracea, and Convulvulacea 15.3%, Leguminosea 12.3% and Poacea 9.3%. The trial of *L. diversifolia* supplement mentionned Asteracea 62.2%, Convulvulacea 18.9%, Leguminosea 10.2%, Poacea 4.7% and Caryophyllacea 4%. The foliages botanical families have similar frequencies in the two trials even if in the second one there is one more family.

3.3 Weight Gain

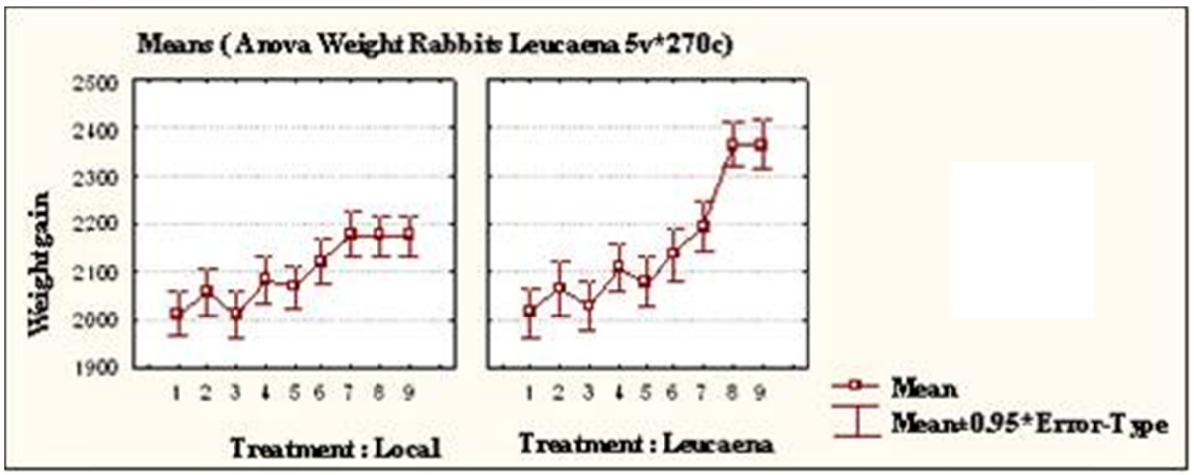

Figure 1. Weekly weight gain of rabbit fed with *L. diversifolia* supplement

The rabbits fed on the supplement of *L. diversifolia* showed a significant increase of live weight gain ($P<0.05$). Figure 3 shows that from the seventh week the weight of rabbits fed on the supplement of *Leucaena divesrifolia* increased significantly while the local control stagnated.

4. Discussion

4.1 Palatibility of Forages

During the two trials, only *C. calothyrsus* in the first trial led to a high RIP. Its low ADF concentration of 28.1% is an advantage because of its correlation with enzymatic digestibility (Heinritz et al., 2012) though its wide variation in condensed tannin concentrations (1.5-19.4%) has also been reported (Cook et al., 2005). As foliages were harvested following the local farm practices with no emphasis on age, the palatability can vary within the foliage species. The improved forages *D. intortum* and *L. diversifolia* were recorded with moderate palatability but *Desmodium intortum* had been very well accepted by cavies (Bindelle et al., 2007). Palatability can be influenced by dry mater and the level of antinutritional factors such as tannins and hence the preference by animals (Osunga et al., 2008) as well as crude fiber content, post-ingestive factors and sensorial perception, previous experience with the feed (Solà-Oriol et al., 2009) and digestibility (Bindelle et al., 2007). Farmers did not necessary insist on the quality of the forages harvested because it was very difficult to select only young forages in sufficient quantities and determined species for the rabbits in the village. They usually also go far around 3 kilometers to collect forages. Leaves green Taiwan of the sweet potato has 19.4% of Crude proteins and possess a similar nourishing value to the one of the alfalfa (Dominguez, 2012). Leaves of *I. batatas* offered here were crop residues.

4.2 Weight Gain

The rabbits fed on *L. diversifolia* showed significant increases of live weight.

gain. The curves of weight gain are not exponential especially in the supplement of *L. diversifolia*. We did not detect any symptom of intoxication during the trial with *Leucaena,* through many authors mentioned the mimosine toxin in this forage (Egli, 1988); (Kouonmenioc et al., 1991); (Heinritz et al., 2012). Otherwise (Scapinello et al., 2000) observed that *L. leucocephala* efficiently replaced alfalfa hay from 15% to 75% in diets for growing rabbits.

5. Conclusion

In term of palatability, the various forages supplied to female rabbits performed significantly less than C. *calothyrsus* with a high RIP in the first trial and the improved forages *D. intortum* and *L. diversifolia* had a moderate one during the second trial. Regarding the weight gain of rabbits, the supplement *L. diversifolia* performed better than the local ones. The cropping of improved legumes constitutes an alternative to avoid long walks to collect fodder which is scarce in villages. These good forages on farm could remain available even in the dry season. Studies to determine the constraints of adoption of forage crops by farmers will help to improve forage production near the households and boost rabbit production.

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