

PERFORMANCE OF GROWING RABBITS FED ON DIETS CONTAINING HIGH MOISTURE SORGHUM SILAGE GRAIN WITH LOW OR HIGH TANNIN CONTENTS

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ABSTRACT

The performance of growing rabbits fed on isoenergetic diets containing high moisture sorghum silage grain with low or high tannin levels was evaluated. Treatments consisted of diets containing increasing levels of high moisture sorghum silage grain with low or high tannin contents (0, 33, 66 and 100%) as a replacement to corn. Eighty-four New Zealand White rabbits (42 males and 42 females), 35 days old, were allotted in a completely randomized design, with 7 treatments and 12 replications each. There was no effect ($p>0.05$) on performance, carcass per kilogram and live weigh gain of growing rabbits. High moisture sorghum silage grain, with low or high tannin contents, may totally replace corn in diets of growing rabbits.

Key words: sorghum, tannin, growth.

INTRODUCTION

High moisture silage grain, chiefly corn, is an alternative for grain production in farms, generally in pig feeds. In contrast to dry corn, there are many advantages (no taxes on product, no financial losses in transport, freight and moisture discounts, lesser storage costs, anticipation in harvest period and lesser losses from damage by insects and rodents) in this modality.

SCAPINELLO *et al.* (2001) concluded that high moisture silage grain is suitable in replacing dry corn in diets with growing rabbits.

On the other hand, sorghum grains may also be an alternative silage modality in animal feed to replace corn. Among other cereals sorghum (*Sorghum bicolor* L. Moench) is fifth in world area cultivation (MAGALHÃES *et al.*, 2000).

Although sorghum and corn have equivalent minerals and vitamins, the former lacks ethereal extract, is poor in coloring compounds and, according to its variety, may contain high tannin levels.

Tannins are polyphenolic compounds found in the pericarp of sorghum grains, which provide them with an astringent taste. This is why they are resistant to bird attacks, rotteness-causing fungi in the grains prior to harvest and insect resistant. Tannin causes complexation with proteins, affects digestibility, modifies tastiness (MAGALHÃES *et al.*, 2000) and reduces metabolic energy rate (ROSTAGNO, 1986). The association of tannin with protein and the stability of the complex may be due to the formation of hydrogen bridges and hydrophobic interactions among the molecules. Proteins differ widely with regard to their affinity by tannins.

Researches (ALVARENGA, 1979; ROSTAGNO, 1986) have shown that tannins in some sorghum varieties may damage the performance of monogastrics. However, sorghum's high moisture anaerobic incubation has reduced chemically detectable tannin (TEETER *et al.*, 1986) and improved animal performance (MITARU *et al.*, 1984).

Since sorghum production has significantly increased in Brazil and since there is a dearth in literature on the subject in Brazil, a better focusing in research on performance of rabbits fed on silage grain is more than justified.

The aim of our research is to evaluate the use of high moisture sorghum silage grain, containing either low or high tannin rates, as a substitute for dry corn in diets for growing rabbits.

MATERIAL AND METHODS

Experiment was carried out at the Rabbit Breeding sector of the Iguatemi Experimental Farm of the State University of Maringá.

Eighty-four, 42 males and 42 females, white New Zealand rabbits, 35-75 days old, were distributed in a totally randomized design, with 7 treatments and 12 replications. The animals were housed, individually, in galvanized wire cages placed in a stone shed. Mean temperature during the period of the experiment reached 20.3°C, with a maximum at 30°C and a minimum at 9°C.

Treatments consisted of one control feed (Table 1) with dry corn, and six feeds in which dry corn was replaced by moisture sorghum silage grain (MSSG), according to energy values, with low (65,89% dry matter) or high tannin (68,76% dry matter) contents at 33, 66 and 100% rates. Values of digestible energy of high moisture sorghum silage grain, with previously determined low and high tannin contents, were respectively 4285 and 4116 kcal/kg of dry matter.

Diets, containing the same amount of energy, calcium, phosphorus and amino acids for methionine+cystine and lysine, were given *ad libitum* in pellets to the rabbits.

Table 1: Chemical and percentage composition of diets (% as fed basis)

Ingredients	Replacement Levels (%)						
	Control diet	Low tannin sorghum silage			High tannin sorghum silage		
		33	66	100	33	66	100
Corn	25.00	16.67	8.33	-	16.67	8.33	-
Low tannin sorghum silage	-	7.86	15.72	23.58	-	-	-
High tannin sorghum silage	-	-	-	-	8.12	16.24	24.37
Soybean meal	10.40	10.40	10.40	10.40	10.40	10.40	10.40
Wheat meal	20.00	20.63	21.29	21.92	20.31	20.59	20.85
Alfalfa hay	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Cynodon hay	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Common salt	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Limestone	0.54	0.53	0.52	0.51	0.54	0.54	0.54
Dicalcium phosphate	0.45	0.46	0.46	0.47	0.45	0.45	0.45
Vit. + min. supplement	0.50	0.50	0.50	0.50	0.50	0.50	0.50
L-Lis-HCL	0.09	0.09	0.08	0.08	0.09	0.09	0.09
DL-Methionine	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Vegetable oil	2.40	2.24	2.08	1.92	2.30	2.24	2.18
Antioxidant	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	100	100	100	100	100	100	100
<u>Calculated composition¹</u>							
Dry matter, %	88.2	88.2	88.2	88.2	88.2	88.0	88.0
Crude protein, %	16.3	16.4	16.5	16.6	16.2	16.2	16.2
DE kcal/kg	2550	2550	2550	2550	2550	2550	2550
Crude fiber, %	13.3	13.3	13.4	13.5	13.4	13.5	13.5
Calcium, %	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Phosphorus, %	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Met + Cis, %	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Lysine, %	0.8	0.8	0.8	0.8	0.8	0.8	0.8

1 - Based on the values of chemical composition of raw materials of rations (ROSTAGNO *et al.*, 2000)

At 75 days old all rabbits, without fasting, were killed, and hot carcass, without head and viscera, were weighted.

Aerobic stability of silages was evaluated by reading of temperature at opening of silos and then at 1, 2, 3, 6, 7, 8, 9 and 10 hours. Room temperature was simultaneously read too.

Variance analyses were also taken for all treatments and degrees for corn substitution levels by those of sorghum with high or low tannin rates were represented by polynomials. The level 0% (control diet) was compared against each other levels of inclusion, by Dunnett's Test ($P < 0.05$). The means of control diet, means of low tannin

sorghum silage and means of high tannin sorghum silage were compared by Tukey Test ($P < 0.05$). The data were, previously, corrected for sex and initial weight.

RESULTS AND DISCUSSION

There was no difference ($P > 0.05$) in variance analysis among treatments for performance and carcass. Total substitution of corn by moisture sorghum silage grain with low or high tannin contents is thus possible (Table 2).

In their work on rabbits fed on moisture sorghum silage grain, SCAPINELLO *et al.* (2001) also concluded that total replacement of dry corn in diets was feasible. In the case of nursery pigs, Oliveira (2002) stated that the total substitution of dry corn by moisture corn silage grain was possible.

With the exception of control, regression analysis showed a linear decrease in weight gain ($P < 0.05$) and worse linearity in food conversion ($P < 0.05$) in proportion to the rate corn is replaced by moisture sorghum silage grain with low tannin contents. Since sorghum silage with low tannin contents showed higher aerobic activity during the first hours of silo opening, than silage high tannin. This may have partially damaged silage quality and performance decrease.

Table 2 . Average initial weight (IW), daily average weight gain (DAWG), daily average feed intake (DAFI), feed:gain ratio (F:G), carcass weight (CW), carcass yield (CY) of growing rabbits (35- 75 days old) fed on rations with increasing levels of high moisture sorghum grain silage with high and low tannin contents

Variables	Replacement levels (%)										
	Low tannin sorghum silage					High tannin sorghum silage					
	0	33	66	100	Mean	33	66	100	Mean	SE ¹	CV ²
IW (g)	849	871	845	846	854	845	843	837	842	8.74	9.08
DAWG g) ³	40.34	43.59	41.53	40.68	41.93	41.61	41.58	41.64	41.61	0.91	7.55
DAFI (g)	118.5	127.1	128.9	125.6	127.2	127.1	127.4	128.5	127.6	2.91	7.90
F:G ⁴	2.95	2.91	3.10	3.10	3.04	3.05	3.07	3.10	3.07	0.05	5.53
CW (g)	1177	1210	1190	1182	1194	1213	1194	1202	1203	21.90	6.32
CY(%)	49.36	48.74	49.05	49.40	49.06	49.94	49.20	49.48	49.53	0.39	2.74

1 – Standard error; 2 – Coefficient of variation; 3 – Linear effect ($p < 0.05$) for low tannin sorghum silage ($Y = 44.64 - 0.0433 x$); 4 – Linear effect ($p < 0.05$) for low tannin sorghum silage ($Y = 2.87 + 0.0027 x$)

No difference ($p > 0.05$) was found in performance and carcass traits in the case of sorghum with high tannin rates when corn was gradually replaced by silage.

TEETER *et al.* (1986) reported that detoxification of sorghum grains with high tannin rates improved growth rate and feeding efficiency of pigs. Such improvement failed in low tannin sorghum grains by an identical process.

When good nutrition rate, similar behavior of animals in performance, carcass characteristics per kg live weight in growing rabbits are taken into consideration, it may be concluded that corn may be totally replaced by moisture sorghum silage grain with low or high tannin rates.

CONCLUSIONS

It may be concluded that, within the limits of the above experiment, moisture sorghum silage grain, with either low or high tannin contents, may totally replace corn in growing rabbit diets without any damage to performance.

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