Influence of dietary corn silage level on young Brown cattle performance

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Abstract

The experiment used 30 Brown steers assigned to three groups of ten animals each, with an initial average weight of 314 kg (C), 313 kg (E1) and 305 kg (E2). Group C had unrestricted access to the silage and compound feed throughout the experimental period (82 days), group E1 had unrestricted access to the corn silage, but received limited amounts of compound feed; group E2 had unrestricted access to the corn silage, but limited access to the compound feed during the first stage (41 days) and unrestricted access during the second stage (also 41 days). The important variation of the amount of corn silage in the diets required different structures of the compound feeds, in order to obtain isoenergetic and isoproteic diets. The total feed intake during the first stage of the experiment was (kg DM/animal/day): 6.76 in C, 6.86 in E1 and 6.69 in E2. During the second stage of the experiment the relevant values were 7.84 in C, 7.85 in E1 and 7.70 in E2. The average weight gain (g/animal/day) during the first stage were 1268 in C, 1122 in E1 and 1146 in E2, while during the second stage the respective values were 1342 in C, 1244 in E1 and 1366 in E2. Throuhgout the whole experimental period, no significant differences (p=0.24) were recorded, thought, between the three groups.

Keywords: *cattle, feeding, silage, performance, concentrate*

Introduction

The free administration of silage to ruminants generally lowers animal performance which means that the animal's genetic potential is not fully used.

Feeding large amounts of silage to ruminants is, however, economical (Nicolae *et al.*, 1997), since the cost of metabolisable energy from silages is half the energy from compound feeds.

To facilitate the choice of silage administration we must quantify their effect of animal performance, thus to find a balance between the economic and animal performance (Steen, 1995; Paterson *et al.*, 1995).

If compound feeds are given in limited amounts, than animal performance will depend on the characteristics of the silage. If the

silage is poor feed intake will not be at the level expected for that particular category (Dulphy and van Os, 1996), the ruminal synthesis will not lead to a normal microbial synthesis, the amounts of energy, amino acids and other nutrients absorbed through the gut wall can not sustain high productions.

If concentrates are give at discretion, ingestion is forced meaning that the animal will eat high amounts of concentrates at the expense of silage, but the overall dry matter intake will be high, towards the high limit for that particular category of animals (Dulphy, 1978). According to the ratio between the intake of compound feeds and of bulk feeds (silage) the result may by favorable or not (Fox *et al.*, 1991).

For an average supply of concentrates the ruminal microbial population has favorable conditions of development supplying additional amounts of IDPM and energy because they have a good substrate (energy, protein and vitamins, minerals) easier degradable, proper for starting ruminal fermentation which degrade progressively the cell walls resulting assimilation energy and access to cell content (Geay *et al.*, 1991).

For a higher concentrate supply, the fast degradation of concentrate feeds may lead to dysfunctional rumen activity (such as ketosis).

Material and methods

The experiment used Brown fattening steers with 300 kg average initial weight, for 82 days divided in two similar periods.

To determine the productive effect and the efficiency of silage feeding, the following situations were taken into consideration for the three groups:

- free administration of silage and compound feed (CF), group C
- freed administration of silage and restricted supply of compound feed, group E1
- alternate free and limited administration of compound feeds and full time free administration of silage, group E2

The major variation of corn silage level required the formulation of specific compound feeds (Table 1).

Table 1 *Compound feed formulation (%)*

	CF administered free	CF administered limited
Wheat	32.9	35.5
Barley	42.8	26.4
Sunflower meal	19.3	33.1
Dialcium phosphate	1.0	1.0
Feed grade limestone	2.0	2.0
Salt	1.0	1.0

Vitamin-mineral premix	1.0	1.0

The parameters assessed were as follows:
- feed intake, determined daily
- body weight, determined at three stages

The differences between groups were calculated with a monofactorial experimental design (ANOVA) preceded by Grubbs test to screen for gross errors (Sandu, 1997).

Results and discussion

Nutritive value of dietary ingredients

The energy and protein value of the dietary ingredients (corn silage and the two types of compound feeds) calculated as recommended by Burlacu 1991, 1996, is shown in Table 2.

The compound feed given free had a higher energy value and less protein value than the compound feed given restrictedly due to their different structure in order to provide overall similar amounts of nutrients.

Feed intake

Table 3 shows the feed intake of the 3 groups during the two periods expressed "as such" and in kg dry matter per day. Table 4 shows the ratio between the intake of silage and compound feed.

During the first period with CF restriction for groups E1 and E2, the highest silage intake (full time free administration) was observed in these groups: 4.64 kg DM/day for E1 and 4.47 kg DM/day for E2, compared to 3.05 kg DM./day for C.

Table 2 *Energy and protein value of the dietary ingredients (by kg DM)*

	meat FU	IDPB (g)	IDPE (g)
Corn silage	0.93	50	68
CF free	1.18	110	104
CF limited	1.12	135	112

During the second stage, while CF was still restricted for group E1 it had the highest intake of corn silage, 5.40 kg DM/day followed by group C with 3.76 kg DM/day and E2 with 3.44 kg DM/day (E2 and C received both feeds free).

The overall total intake (silage and CF) was similar in the 3 groups: 7.29 kg DM/day in group C, 7.35 kg DM/day in group E1 and 7.19 kg DM/day in group E2.

The proportion of constituents was, however, different. The ratio corn silage/CF was 47/53, 68/32 and 55/45 for the three groups respectively.

Table 3 *Feed intake (kg/day)*

	Corn silage		CF free		CF limited	
	Gross	DM	Gross	DM	Gross	DM
Group C						
1st period	8.72	3.05	4.22	3.71	-	-
2nd period	10.74	3.76	4.64	4.08	-	-
Group E1						
1st period	13.25	4.64	-	-	2.52	2.22
2nd period	15.44	5.40	-	-	2.78	4.45
Group E2						
1st period	12.79	4.47	-	-	2.52	2.22
2nd period	9.82	3.44	4.84	4.26	-	-

Table 4 *Ratio between corn silage/compound feed (% of DM)*

	C		E1		E2	
	1st period	2nd period	1st period	2nd period	1st period	2nd period
Ratio	45/55	48/52	67/33	68/32	67/33	44/56

Weight gain

Table 5 shows animal weight gain.

During the first part of the experiment the restriction of CF intake, despite the higher silage intake (free) yielded lower weight gains in all experimental groups, 1122 g/day in group E1 (88% of C) and 1146 g/day in group E2 (90% of C).

During the second part, continuing CF restriction confirmed the previous low gains, 1244 g/day in group E1, but the free administration of CF increased the gain, 1366 g/day higher than C which received free CF throughout the experiment.

Overall, C had the highest weight gain, 1305 g/day followed by E2 with 1256 g/day (96% of C) and by E1 with 1183 g/day (90% of C and 94% of E2).

The differences between the three groups are, however, low under the given experimental conditions. This is shown better in Table 6 which gives the values of P calculated with ANOVA, between the weight gains of the three groups throughout the experimental period.

Table 5 *Body weight and average weight gain*

	C	E1	E2
Initial weight (g)	314	313	305
Intermediary weight (g)	366	359	352
Final weight (g)	421	410	408

Gain 1st period (g/day)	1268	1122	1146
Gain 2nd period (g/day)	1341	1244	1366
Overall gain (g/day)	1305	1183	1256

Table 6 *Values of P and significance of weight gain difference*

	C	E1	E2
C	-	0.006**	0.176*
E1	0.006	-	0.110*
E2	0.176	0.110	-

* significant difference for $p<0.05$ and not significant for $p<0.5$
** significant difference for $p<0.001$ and not significant for $p<0.05$

Efficiency of diet utilization

Table 7 shows the efficiency of diet utilization (meat FU/kg gain) and protein (IDPN/kg gain) throughout the experiment.

The lowest amount of energy for one kg of gain was in group E2 with 5.89 mFU followed by C with 5.95 mFU and E1 with 6.15 mFU. The lowest amount of protein for 1 kg gain was in group C with 459 g IDPN followed by E2 with 472 g and E1 with 478 g IDPN.

This is one criterion to assess diet efficiency but a better one should be the cost of one kg of gain. Unfortunately there is no correlation between the real cost of 1 kg silage and 1 kg CF. According to the particular cost at a given moment the breeder may calculate the economic efficiency and decide for one of the three solutions presented by this paper.

Table 7 *Overall efficiency of diet utilization*

	C	E1	E2
mFU/kg gain	5.95	6.15	5.89
g IDPN/kg gain	459	478	472

Conclusions

Throughout the experiment all three groups had similar feed intakes (silage+CF), about 7.25 kg DM/day, with different proportions, however, of the two ingredients.

The overall average gain was 1305 g/day in group C, 1183 g/day in group E1 and 1256 g/day in group E2, with nonsignificant differences for $P<0.5$ between C and E2 and for $P<0.05$ between C and E1.

According to the momentary cost the breeder may select one of the three solutions proposed by this paper.

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