

Nutrients intake and ruminal parameters of heifer fed with corn silages inoculated

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Introduction Corn silage has high concentration of nutrients, which crucially affects its stability after opening the silos under the action of undesirable microorganisms. In this context, the use of microbial inoculants has been proposed in order to increase the aerobic stability of these silages (Kung Jr. et al., 2003). The bacterium most used in this process is *Lactobacillus buchneri*, because it is responsible for increasing acetic fermentation, which has an antifungal effect. However, for increased production of lactic acid has been proposed inoculation with *L. plantarum*, as this BAL is efficient in this process and still has less loss of carbon from CO₂ (McDonald et al., 1991). However, few studies have been conducted with heterofermentative inoculants and their associations in corn silages in Brazil (Zopollatto et al., 2009), as well as their effects on ruminal parameters in cattle. Therefore, the aim of this research was to investigate the effect of bacterial inoculants on the intake and ruminal parameters of cattle fed with inoculated corn silages.

Materials and Methods The corn whole plant was harvested between 30 and 35 % of DM. The treatments evaluated were animals fed with silages: control (silage untreated); LB (corn silage inoculated with 1x10⁵ cfu/g forage of *Lactobacillus buchneri* NCIMB 40788); LBLP (corn silage inoculated with 1x10⁵ cfu/g forage of *L. buchneri* NCIMB 40788 and 1x10⁵ cfu/g forage of *L. plantarum* MA18/5U). Three silos of surface with 10 tons of forage in each were made. After 165 days of fermentation the silos were opened. To evaluate the nutrients intake, three crossbred heifers (average weight of 368 kg) were used. The heifers were cannulated in the rumen. The animals remained in adaptation during 14 days and 3 days to collection of data for 3 periods. The heifers were fed once a day (7:00h) *ad libitum*. The intake was calculated daily. The diet was composed for 80% of corn silage and 20% of concentrates (8% of soybean meal, 87% of corn, 2% of urea and 3% of mineral salt). To determine the apparent digestibility it was carried partial collection of faeces during 3 days in the schedule 8:00; 12:00 and 16:00h, respectively. The total production of faeces was estimated by the internal indicator ADFi (acid detergent fiber indigestible) according to Casali (2006) incubated *in situ* during 264 hours. The ruminal fluid was collected before (time 0) and 3, 6, 9 and 12 hours on the last day of sampling each period. The design used was latin square 3 x 3, with 3 treatments, 3 animals and 3 periods repeated once a time. Data were submitted to analysis of variance comparing the treatment by the test t to 5% significance level.

Results and Discussion The dry matter and nutrients intake were not affected by use of inoculants (P>0.05) (Table 1). According to Kung Jr. et al. (2003) the organic acids produced in inoculated silages arising of fermentation of soluble sugars could decrease the intake, however, this it not observed in this work. The acetic and butyric ruminal concentration were affected significantly by inoculation with BAL obligate and facultative heterofermentative (P<0.05) as well the total concentration of VFA (Table 2). However, the acetate: propionate ratio, pH values and concentration of N-NH³ were not affected (P>0.05). The BAL obligate heterofermentative ferment hexoses to lactic acid, carbon dioxide and ethanol (or acetic acid in the presence of an alternative electron acceptor), and pentoses are converted to lactic and acetic acid (Holzer et al., 2003). Therefore, the ruminal concentration of acetate was higher when the animals were fed corn silages inoculated with *L. buchneri*. To same treatment, there was higher concentration of

butyric acid ruminal. Due to higher concentration of ruminal acetic and butyric acid to animals fed corn silage inoculated with *L. buchneri*, the concentration total volatile fatty acids was higher. The ruminal pH value to heifers fed with silage control was higher than that fed silage inoculated with LPLB. The animals fed with corn silage treated with LP presented intermediate value.

Conclusions The inoculation of *L. buchneri* associate or not to *L. plantarum* in corn silage did not affect the nutrients intake. The ruminal concentration of acetic and butyric acids were affected by inoculation of corn silage with *L. buchneri*.

References

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Table 1. Nutrients intake of crossbred heifers (kg/day) fed with corn silage inoculated and concentrate.

Itens	Control	LB	LBLP	VC (%)
DMI	7.06	7.14	6.67	7.19
OMI	6.81	6.83	6.38	7.08
CPI	0.74	0.79	0.71	8.53
TCI	5.95	5.9	5.55	7.14
NFCI	2.73	2.72	2.5	7.48
EEI	0.22	0.23	0.22	3.89
NDFI	2.92	2.9	2.77	10.73
ADFI	1.5	1.37	1.4	20.5
TDNI	4.35	4.44	4.1	7.29

*Treatments: Control = silage untreated; LB = inoculated silage with *Lactobacillus buchneri*; LBLP = inoculated silage with *Lactobacillus buchneri* + *Lactobacillus plantarum*.

Table 2. Ruminal parameters of cattle fed with corn silage inoculated and concentrate.

Itens	Control	LB	LBLP	VC (%)
Acetic acid (mMol/mL)	55.75 ^c	63.12 ^a	59.12 ^b	2.50
Propionic acid (mMol/mL)	11.14 ^a	12.88 ^a	13.59 ^a	14.76
Butyric acid (mMol/mL)	4.09 ^b	4.61 ^a	4.15 ^b	5.82
AA:PA	5.07 ^a	5.16 ^a	4.56 ^a	12.03
Total VFA (mMol/mL)	70.18 ^c	80.80 ^a	77.57 ^b	2.95
pH	6.14 ^a	6.09 ^{ab}	6.03 ^b	0.86
N-NH ₃ (mg/dL)	10.23 ^a	10.50 ^a	9.60 ^a	8.48

*Treatments: Control = silage untreated; LB = inoculated silage with *Lactobacillus buchneri*; LBLP = inoculated silage with *Lactobacillus buchneri* + *Lactobacillus plantarum*.