

Total digestible nutrients of corn silage with different levels of enzymatic extract

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Introduction Fungi of the genus *Asperillus niger* are considered good producers of fibrolytic enzymes involved in the process of degradation of fiber, thus increasing the digestibility of food. Physiologically, there are a number of possible modes of action of exogenous enzymes and, as described, these effects can be as simple as the release of soluble carbohydrates or as complex as the removal of structural barriers ions. The effect depends on the type of food and type of enzyme used (Krueger & Adesogan, 2008). Another factor that should be studied is the level of enzyme to be applied. Some authors demonstrated that the addition of high levels of enzymes may be less effective than lower levels (Beauchemin et al., 2003). The optimal level of enzyme used depends on the diet, and high amounts reduce microbial attachment and limited digestion of food. The objective of this study was to evaluate the effect of adding the enzymatic extract of *Aspergillus niger* on the levels of total digestible nutrients (TDN) of corn silage.

Materials and methods The enzymatic extract of *Aspergillus niger* was obtained by submerged fermentation (FSbm) SR in a liquid medium containing 1% wheat bran as substrate. The vials were kept for 72 hours at 30°C under 100 rpm agitation. The xylanolytic and cellulolytic activities were assayed using 3',5'-dinitrosalicylic acid (DNS) (Miller, 1959), using 1% (v/w) birchwood xylan and CMcellulose as substrates, at 39°C, respectively. One unit (U) was defined as the amount of enzyme that releases 1 µmol of reducing sugar per min. The values of total digestible nutrients (TDN) were determined by the technique of gas production, according to the methodology described by Mauricio et al. (1999). The rumen fluid was taken from crossbred sheep Dorper x Santa Inês fitted with rumen cannula and maintained with diet based on corn silage. The enzyme doses were 0.0 (control), 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, and 4.0 mL, added at the time of incubation. We used the following equation: $EM \text{ (MJ / kg DM)} = 2.20 + (0.136 * \text{gas}_{24}) + (0.0057 * \text{CP}) + (0.00029 * \text{EE})$, where: EM is the metabolizable energy; gas₂₄ is the in vitro gas production in 24 hours, in mL / 0.2 g DM, and CP, mineral and EE are expressed in g / kg DM. Subsequently, the results were converted to TND, according to the equations proposed by NRC (2001). The experimental design was completely randomized design with nine treatments and four replications. Means were analyzed by regression test at 5% probability for the effect of time.

Results e discussion The enzymatic extract added to the silage at the time of incubation contained 25.78 U / mL xylanase and 1.54 U / mL cellulase at 39 ° C and pH 6.0. Table 1 shows the regression equations of TND on 24 and 48 hours of fermentation. The estimated curves for the same fermentation time, depending on the dose, are shown in Figure 1. There was a quadratic effect for the TDN 24 hours, and found the optimal dose of 3.8 mL. We observed a 6.1% increase in the TDN level when using the optimal dose (3.8 mL) compared with the control (0.0 mL). This increase in the TDN level is considered relevant since similar studies have shown a maximum increase of 4.0% (Queiroz et al., 2004). For the TDN in 48 hours fermentation it was observed linear effect, ie, an increase in the TDN level as the addition of enzyme extract. The use of

fibrolytic enzymes is an attractive way to improve energy utilization of tropical forages. Thus, more studies should be performed in order to reduce the variability of results and validate the effectiveness of the product.

Conclusion The addition of an enzymatic extract containing fibrolytic enzymes increased the total digestible nutrient content of corn silage.

References

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Table 1. Regression equations of TDN on 24 and 48 hours of fermentation.

TDN	Effect	R ²	F (Pr)	Optimal dose
24 hours	$TDN = 64.70 + 2.21Dose - 0.291(Dose)^2$	0.6761	6.26 (0.034)	3.80
48 hours	$TDN = 62.93 + 0.52 Dose$	0.4438	5.59 (0.051)	-

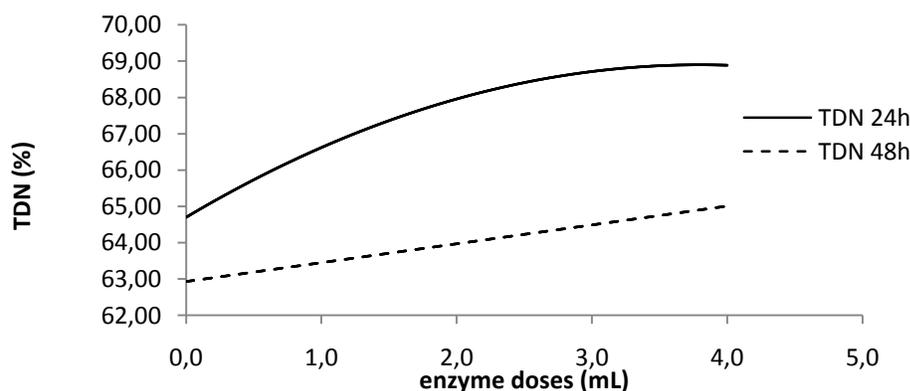


Figure 1. TDN estimated for 24 and 48 hours of fermentation depending on the doses of enzymatic extract used.