

Organic acids production in pre-wilted Tifton 85 silages¹

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Introduction The ensiling process is the technique of converting soluble carbohydrates into lactic acid, causing decrease of pH silage mass to levels that inhibit the microbial activity, but retains its characteristics (Ferrari Junior et al., 2009). Tropical forages stand out for high production however, the excess moisture at the ensiling time increases the risk of undesirable fermentation. In order to reduce the moisture excess, the addition of citrus pulp is a viable alternative due its high capacity to retain moisture. In this context, microbial inoculants promote the digestion of structural and nonstructural carbohydrates as starch, yielding soluble sugars used as substrates for lactic fermentation. The aim of this study was to quantify organic acids in the pre-wilted Tifton 85 silage made with the addition of enzymatic bacterial inoculants and citrus pulp.

Materials and Methods This experiment was conducted at EMBRAPA – Gado de Leite, located in the city of Juiz de Fora, Minas Gerais state, Brazil (21°33'22"S 43°06'15"W). The treatments were: pre-wilted Tifton 85 silage with the addition of microbial inoculants; pre-wilted Tifton 85 silage with the addition of microbial inoculants and citrus pulp; pre-wilted Tifton 85 silage without microbial inoculants and with the addition of citrus pulp; pre-wilted Tifton 85 silage with no added microbial inoculants and with the addition of citrus pulp. The material was chopped and exposed to sunlight during 6 hours. The enzymatic bacterial inoculant containing *Streptococcus faecium*, *Lactobacillus plantarum*, *Lactobacillus salivarius*, cellulases and hemicellulases enzymes, was used following the manufacturer's recommendations. The citrus pulp was added at rate of 8 % fresh basis. The experimental silos were made in tubes of 10 cm diameter and 50 cm length, and stored for 60 days. The analysis of organic acids were made in a high-performance liquid chromatography (HPLC), a SHIMADZU, SPD-10A VP, coupled to an ultraviolet detector (UV), using 210 nm wavelength. The experimental design was a completely randomized in a factorial arrangement 2 (with or without microbial inoculant) x 2 (with or without citrus pulp), using 5 replications. The results were analyzed using the ANOVA procedure and means compared by the SNK test at 5% probability.

Results and discussion In pre-wilted Tifton 85 silages the use of citrus pulp reduced ($P < 0.05$) the levels of lactic acid, while the microbial inoculants increased it. Among evaluated silages, only silages without microbial inoculants and with citrus pulp had lower levels than those indicated by Catchpoole and Henzell (1971) ranging from 3 to 13 % of lactic acid. In pre-wilted Tifton 85 silage made with microbial inoculants, the addition of citrus pulp reduced ($P < 0.05$) the levels of acetic acid. However in silage made without citrus pulp and with the use of microbial inoculants acetic acid levels increased ($P < 0.05$). The addition of citrus pulp in silages without microbial inoculant reduced ($P < 0.05$) concentration of propionic acid. The use of microbial inoculants in silage without citrus pulp reduced ($P < 0.05$) the levels of propionic acid, however, silages made with citrus pulp and microbial inoculant increased the levels of propionic acid. The addition of citrus pulp had no effect ($P > 0.05$) on the concentration of butyric acid in pre-wilted Tifton 85 silage made with or without inoculant. The use of microbial inoculants in pre-wilted

Tifton 85 silage reduced ($P < 0.05$) levels of butyric acid in silages, but in all silages exceeded the levels indicated by Ferreira (2001), thus indicating the occurrence of undesirable fermentations.

Conclusions The addition of citrus pulp reduced the levels of lactic acid, while the use of microbial inoculant provided an increase in levels of lactic acid and reduced levels of butyric acid in pre-wilted Tifton 85 silages.

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References

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Table 1. Lactic, acetic, propionic and butyric acids content in pre-wilted Tifton 85 silages.

	Lactic Acid (% DM)			Acetic Acid (% DM)		
	Inoculant			Inoculant		
	Without	With	Mean	Without	With	Mean
Citrus pulp						
Without	4.24bA	5.88aA	5.06	0.84bA	1.70aA	1.27
With	1.46bB	3.76aB	2.61	1.10aA	0.79bB	0.95
Mean	2.85	4.82		0.97	1.25	
	Propionic Acid (% DM)			Butyric Acid (% DM)		
	Inoculant			Inoculant		
	Without	With	Mean	Without	With	Mean
Citrus pulp						
Without	0.27aA	0.21bA	0.24	3.88aA	2.28bA	3.08
With	0.09bB	0.17aA	0.13	3.16aA	2.51bA	2.83
Mean	0.18	0.19		3.52	2.39	

Means followed by the same letter, lowercase in line and uppercase in column, did not differ statistically $*(P > 0.05)$.