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Optimising Ensilability of Sorghum-Soybean Mixture Using Epiphytic Lactic Acid Bacteria Inocula

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Abstract

Lactic acid fermentation is a desirable trait for silage making. However, legumes own a high buffer capacity, which might lead to pitfalls when ensiling. In contrast, graminaceous forages may favour ensilability. The objective was to investigate the optimal sorghum/soybean proportion to optimise acidification. Secondly, we assessed epiphytic lactic acid bacteria (LAB) of sorghum (*Sorghum bicolor* L. var. H70) and soybean (*Glycine max* var. Panorama 29) to facilitate lactic acid fermentation in a rapid *in-vitro* test (Rostock Fermentation Test-RFT). Forage was harvested at pre-flowering stage in December 2013 at CIAT Palmira, Colombia. LAB from sorghum and soybean were cultivated on Rogosa agar for 5 days at 35 °C and a single LAB from each material were isolated. Inoculates were evaluated for their acidification ability: LAB-epiphytic S738 (from sorghum), LAB-epiphytic S739 (from soybean), LAB from CIAT bacteria collection (S66.7), commercial silage inoculant (SilAll4 × 4TM-Brazil) and a control. Sorghum and soybean and their combination (100/0, 33/67, 67/33, 0/100) were also tested for ensilability. 50 g of minced forage were introduced into an autoclaved 200 ml water in triplicate. The treatments were incubated at 37°C to determine the pH at 0 (before inoculation), 20, 28, 44 and 48 hours. We used a completely randomised design with factorial arrangement, where the first factor was the inclusion level of sorghum in the mixture and the second factor was the inoculant used. $Y_{ij} = \mu + S_i + I_j + S_i I_j + e_{ij}$; where Y is the target variable, μ is the overall mean, S = proportion of sorghum in the silage (100/0, 33/67, 67/33, 0/100), I = inoculant (S738, S739, S66.7 and control), j and e = random experimental error. At higher amounts of sorghum in the mixture, the pH registered lower averages. e.g. at 20h sorghum/soybean (100/0) the pH was 3.8, followed by 4.4 and 5.4 for sorghum/soybean mixture (63/37 and 37/63, respectively). The worst pH value (6.1) was for soybean alone (0/100). S738 (4.85) and S66.7 (4.86) showed the best acidifying potential at 20 hours ($p = 0.0196$), whereas control had the worst pH value (5.05). Larger inclusion of sorghum assured better lactic acid fermentation. Epiphytic lactic acid bacteria are a feasible option to be used as inoculants to promote lactic acid fermentation.

Keywords: Epiphytic lactic acid bacteria, rostock fermentation test, tropical forage