ABSTRACT

This thesis presents a study on biochemical optimization and nutritional assessment of corn (*Zea mays* L. cv. Pioneer 31B40) silage for improved livestock feed. Initially, wheat silage was prepared using two sizes of corn (medium & small) and two specific inoculants (Lactic acid bacteria silage inoculant & Bon silage inoculant) aimed at improving fermentation quality and nutrient preservation. Periodic testing (10, 20, 30, 40 days) of silage samples tracked the fermentation process, enabling insights into quality changes over time. Analytical assessments such as High-Performance Liquid Chromatography (HPLC) and proximate analysis were conducted to quantify key nutrients, including sugars, starches, proteins, and fibers, providing a comprehensive nutritional profile. Results demonstrated that LAB inoculant-treated silage exhibited enhanced fermentation stability, resulting in higher nutrient retention compared to other samples. Results showed that silage sample S2 that was medium sized corn inoculated with Lactic acid bacteria inoculant had enhanced levels of digestible carbohydrates, protein and other nutrients, contributing to improved feed quality. Dry matter content of sample S2 was 78.01% and 56.01% after 40 days of fermentation at 70°C and 100°C. The moisture content of sample S2 was 10% on day 10 that further decreased to 6% on day 40. The pH of all the silage samples decreased but the highest decline was determined by sample S2 that was from 4.3 to 3.9 after 40 days of fermentation. During ensiling, lactic acid bacteria convert sugars in the plant material into organic acids (acetic acid, lactic acid and butyric acid), mainly lactic acid, which lowers the pH and stabilizes the silage. This microbial activity consumes water, leading to a gradual increase in dry matter content. The measured humidity of sample S2 was 67% after 40 days of fermentation. The highest protein content was obtained from the sample S2 that was 21.06%. The highest ash content was obtained from the sample S2 that was 9g/100g. Moreover, Neutral detergent fiber (NDF) (80g/100g) and Acid detergent fiber (ADF) (40g/100g) were also evaluated. Fermentation acid analysis was determined. The highest lactic acid content (76%) and acetic acid content (41%) was observed by sample S2 after 40 days of fermentation. The cellulose and hemicellulose content of sample S2 was 321g and 246g after 40 days of fermentation period. Aerobic stability test was conducted which showed that sample S2 exhibited the most pH drop, indicating a more effective fermentation process. These findings support optimized corn silage as a nutrient-dense, high-quality feed source that may enhance livestock growth and productivity in regions dependent on forage alternatives. Key words; corn, silage, LAB, HPLC