Effect Of Nonstructural Carbohydrates on Ensiling Characteristics of Perennial Ryegrass

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Well-preserved grass silage is the result of the controlled fermentation of fresh grass; characterized by low pH, high lactic acid, and low ammonia (NH_3). Nonstructural carbohydrates (NSC) are the primary fermentation substrate. In temperate grasses, sugars (i.e. glucose, fructose, and sucrose), starch, and fructans are the primary NSC. Vacuum-sealed bags have been used effectively in silage research. Objectives of the study were to identify differences in fermentation characteristics between three high NSC and a control NSC grass ensiled via vacuum packing and sealing. Temperate, perennial ryegrasses, three with a relatively high NSC concentration (HNSC; AberAvon, AberDart, and Elgon) and one commonly grown in Oregon (CNSC; Linn) were selected. Fall 2002, one plot of each variety was planted at the Oregon State University dairy research facility in Corvallis, Oregon. July 2003, three replicates of each grass were ensiled at the a.m. and p.m. harvest. Prior to sealing, pre-ensiling samples were taken from each bag. To ensile, each bag was vacuum packed and sealed. Grasses were ensiled for 60 d. Data were analyzed with SAS. Fresh grass NSC was greater for HNSC versus CNSC grasses; magnitude greater for p.m. versus a.m. cutting. CNSC NSC was 15.7 and 16.7% for a.m. and p.m. cutting, respectively. HNSC NSC was 16.0 and 23.3% for a.m. and p.m. cutting, respectively. Vacuum packing and sealing efficiently ensiled direct-cut grass forages. Final pH was lower (4.12 vs. 4.25), lactic acid was higher (15.1 vs. 13.9%), and total acids was higher for HNSC grasses (17.8 vs. 16.4%). NH_3 did not differ between treatments. Final pH (4.15 vs. 4.22), lactic acid (13.9 vs. 15.1%), acetic acid (2.2 vs. 2.9%), total acids (16.1 vs. 18.0%), and NH_3 (1.5 vs. 2.3 crude protein equivalent %) were lower for p.m. versus a.m. cutting. Simple linear regressions did not establish consistently a strong relationship between NSC and selected fermentation parameters. Ensiling was most efficient for HNSC grass varieties harvested at the p.m. cutting.