Cell Wall Characteristics Related to Alfalfa Digestibility

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Fiber digestibility of alfalfa for animal nutrition is a complex system encompassing animal, plant, and microbe biological traits. We investigated the relationship between alfalfa cell wall components and *in vitro* neutral detergent fiber digestibility (IVNDFD) speed (16-hr) and potential (96-hr) by cattle ruminant microbes. A composite alfalfa (*Medicago sativa* L.) population from seven commercial cultivars underwent two cycles of bidirectional selection for plants with low or high stem 16-h IVNDFD and low or high stem 96-h IVNDFD. The resulting selected populations were then evaluated by near inferred spectrometry for structural cell wall components. Hemi-cellulose components, xylose, and mannose were found to have a greater negative correlation (-0.81 and -0.88, respectively) on the speed of digestion (16-h IVNDFD) than lignin (-0.70). Whereas, for the overall potential of stem digestibility, lignin had the greatest negative correlation (-0.89). Lignin and 96-h IVNDFD had the strongest broad sense heritability across the populations (0.74 and 0.70, respectively). Xylose was observed to have a moderate broad sense heritability (0.58). Pectin components correlated positively with speed of digestion (0.41) but had limited correlation on the overall digestibility potential. As IVNDFD increased with each breeding cycle, it remained stable across environments as did concentrations of total cell wall components, lignin, hemi-cellulose, and pectin. However, the cellulose concentrations were not stable across environments. Cell wall components such as xylose (hemi-cellulose) and pectin could be used as selection traits for increasing IVNDFD by conventional breeding and these components be a way to link *in vitro* digestibility to plant genes for genomic selection.