

Diurnal Variation Of Total Nonstructural Carbohydrates In Alfalfa

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Alfalfa (*Medicago sativa* L.) accumulates total nonstructural carbohydrates (TNC) during daylight because photosynthetic rate is greater than respiration rate. The TNC are composed of starch, fructans, sucrose, glucose, fructose and other mono- and disacharrides. Continued plant respiration during darkness depletes TNC. Our objectives were to determine diurnal variation of TNC concentrations and accumulation rates in alfalfa, and predict a time interval within which samples collected for animal evaluation can be compared effectively without confounding by the time-of-day effect.

Alfalfa (cv WL 322HQ) grown near Kimberly, Idaho (42°30' N, 114°8' W, elevation 1200 m) was sampled at 3-h intervals during the 24-h period prior to cutting. We composited 10 grab-samples per plot on a transect midway in a 4-ha field preceding first and fourth cuttings in 1997. The TNC concentrations were predicted by Near Infrared Reflectance Spectroscopy (NIRS) with calibration by an adaptation of wet chemistry (Smith 1969).

The TNC curves were roughly sinusoidal over a 24-h period (not shown), but linear between 0900 MDT (Fig. 1) and 1800 h. We conclude that TNC concentrations in alfalfa increase linearly during the day. Alfalfa forage samples for animal evaluation or TNC analyses should be taken within 1 h to control sample variation within 5%. Blocking can compensate for the diurnal variation in TNC concentration if sampling is completed within 1 h in each block. Alternatives would be to use time of day as a covariate or develop a regression equation to correct TNC for time of day under your environmental conditions.

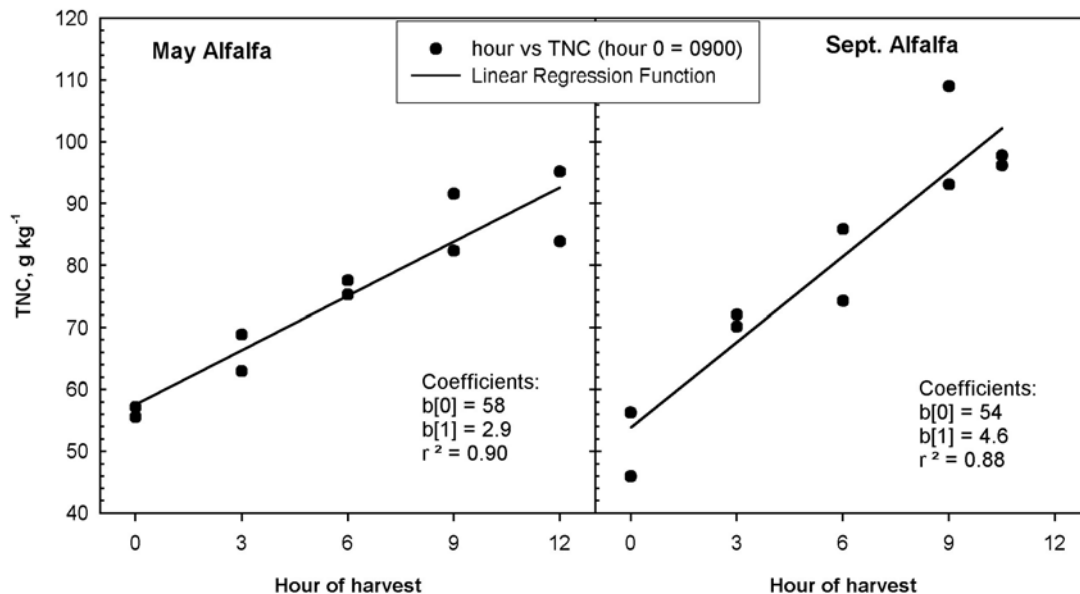


Figure 1. Diurnal TNC variation in alfalfa in May and September of 1997. TNC concentrations are linear between 0900 (harvest hour = 0) and 1800 MDT.