THE ABC'S OF FORAGE ANALYSIS: WHAT ARE NSC AND NFC?

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Often times, you'll see the carbohydrate terms nonstructural carbohydrates (**NSC**) and nonfibrous carbohydrates (**NFC**) listed on your forage report, or they may be used as parameters for comparing forage seed varieties. Both NSC and NFC measure carbohydrates that are not 'structural', in other words, carbohydrates other than cellulose and hemicellulose (constituents of the plant cell wall). There are key differences between NFC and NSC, and depending on your lab of choice, there might also be differences in how NSC and NFC are determined. For this reason, you should direct procedure related questions to the lab you are working with, and use caution when comparing results from different labs.

Nonstructural carbohydrates (NSC)
- Sugars, starches, and organic acids.
- *Measured in the lab.*

Nonfibrous carbohydrates (NFC)
- Sugars, starches, organic acids, *and pectin.*
- *Not measured, but calculated by difference.*

The primary compounds making up the NSC fraction of plants are sugars, starches, and organic acids. Typically, NSC is measured by an enzymatic method. In contrast, NFC is not determined chemically, rather it is a calculated value based on other determined values of the forage. Basically, NFC is determined by difference, where: NFC = 100 – (%Neutral Detergent Fiber + %Crude Protein + %Fat + % Ash). Similar to NSC, the NFC will contain sugars, starches, and organic acids, but NFC also contains pectin. Pectin is a carbohydrate that is part of the plant cell wall. This is an important difference and one reason why the % NFC and % NSC on your forage lab analysis report will typically not be same.

Using the example report, NFC is calculated as: 100 - (41.69* + 7.7 + 3.01 + 6.46) = 41.14
* NDF must be first corrected for bound protein: NDF (42.80) – NDF Protein (1.11) = 41.69*

In the example corn silage report, the NFC is 41.14% while the NSC is 34.56%. The corn silage also contains 33.86% starch (DM basis) and the starch makes up 82.30% of the NFC (not shown). Most plants have some amount of pectin in their cell walls, and some feedstuffs including citrus pulp and beet pulp are high in pectin. In the rumen, pectin is highly digestible just like sugars, starches, and organic acids. Because the constituents in both NSC and NFC are highly digestible, estimates of NSC and NFC provide information on the energy content of the forage.

Chemistry Analysis Results	
Dry Matter	35.9
Moisture	64.1
Proteins	% DM
Crude Protein	7.7
NDF Protein (NDICP)	1.11
Fiber	% DM
ADF	29.19
NDF	42.80
Carbohydrates	% DM
Starch	33.86
Crude Fat	3.01
Energy and Index Calculations	% DM
TDN	68.02
NFC	41.14
NSC	34.56
Minerals	% DM
Ash	6.46

Other articles in the "ABC's of Forage Analysis" series:

The ABC's of Forage Analysis:
http://cestanislaus.ucanr.edu/newsletters/Dairy_Newsletter45011.pdf

The ABC's of Forage Analysis: Fiber & Digestibility:
http://cestanislaus.ucanr.edu/newsletters/Dairy_Newsletter46368.pdf