Non-structural carbohydrates and some attributes of nutritive value in alfalfa as influenced by genetic selection

Claessens[1], A., C. Chouinard-Michaud[1,2], R. Michaud[1], G. F. Tremblay[1], A. Bertrand[1], G. Bélanger[1], Y. Castonguay[1], R. Berthiaume[3], and G. Allard[2]
[1]Agriculture and Agri-Food Canada, Québec, QC, Canada, G1V 2J3; [2]Université Laval, FSAA, Pavillon Paul Comtois, Québec, QC, Canada, GIK 7P4; [3]Agriculture and Agri-Food Canada, Sherbrooke, QC, Canada, J1M 1Z3.

High non structural carbohydrate (**NSC**) concentration in forages improves ruminant N utilization and performance. Forage NSC concentration may be improved by genetic selection but the potential for improvement is not well known. We determined the effect on NSC concentration and other nutritive attributes of two field-grown alfalfa (*Medicago sativa* L.) populations divergently selected for NSC concentration obtained by intercrossing 10 genotypes selected for high **(NSC+)** or low **(NSC-)** NSC concentration from 500 AC Caribou genotypes. The two populations were established near Quebec City, Canada (46°48´N; 71°23´W) in 2006 and 2008, and harvested in AM (9h00) and PM (15h00) at early flowering once during the establishment year and three times during production years. A split plot design with eight replications was used with time of cutting as main plots and populations as subplots. Forage samples were evaluated for NSC (water soluble carbohydrates + starch), crude protein **(CP)**, acid detergent fibre **(ADF)**, neutral detergent fibre **(NDF)**, *in vitro* true digestibility **(IVTD)**, and *in vitro* NDF digestibility **(dNDF)** using near infrared reflectance spectroscopy. In the establishment years of 2006 and 2008, alfalfa NSC concentration respectively increased by 25 and 14% with the NSC+ as compared with the NSC- population, while it increased by 9, 8, and 9% in the production years of 2007, 2008, and 2009. This increase with the NSC+ population was mainly due to an increase in starch concentration. This genetic improvement of alfalfa NSC was achieved without affecting yield and other measured nutritive attributes. Alfalfa NSC concentration can be increased by genetic selection.