Seasonal Variation and Protein Precipitation Capacities of Tannins in *Salix alexsensis* in Browsed and Unbrowsed Populations

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Introduction

One known function of tannins in biological systems is to bind proteins, making them unpalatable for herbivores. Moose in particular might consume so much tannin rich forage that they excrete more protein than they eat. My goal was to characterize protein precipitation capacity of a choice moose forage, Feltleaf Willow (*Salix alexensis)* to determine total digestible protein in forage along the Tanana river in Fairbanks, Alaska and see if plants that were browsed showed higher tannin levels and thus lower usable protein. Seasonal Variation was also measured to gain insight into winter nutrition.

Photo 1 -*Alces alces* enjoying a tannin-laden snack

Materials and Methods

Leaves were collected from browse along the Tanana river from inside and out of moose-proof enclosures. The samples were freeze dried then ground with a 40 mesh Wiley Mill. Extractions were done with cold methanol (Martin and Martin 1982.) Samples were centrifuged and 35µl of the supernatant was pipetted into microplates and combined with 140µl of 5mg/ml BSA standard and centrifuged again. 5µl of this supernatant was put in a microplate well and 250µl of Bio-Rad Bradford quick assay reagent was added and the absorbance at 590nm was read and turned into concentration by a standards curve of BSA.

Net Protein was obtained by elemental analysis to find %N and multiplying by 6.25.

Digestible protein was obtained using the equation of Robbins et al. (1987)

Equation 1: Z = –3.87 + 0.9283X – 11.82Y

Where X is crude protein (%DM) and Y is PPC(µg/µl) and Z is Digestible Protein (%DM).

Results

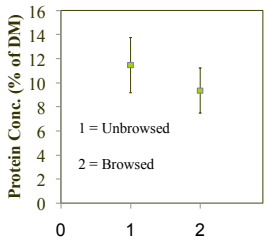

Fig. 1 – Average of concentration of protein (% DM) found in the dry mass of unbrowsed and browsed leaves. Mean ± S.E., n=3 for unbrowsed, 5 for browsed

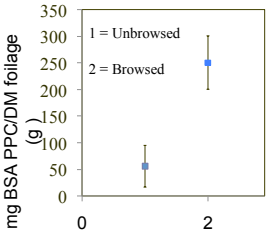

Fig. 2 – Protein precipitation of BSA (mg) per gram of dry forage for the enclosed and unenclosed treatments. Mean ± S.E., n=3 for unbrowsed, 5 for browsed.

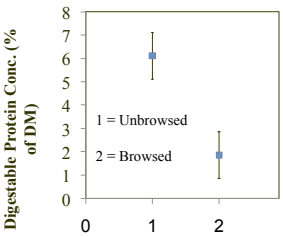

Fig. 3 – Average digestible protein concentration (% DM). Mean ± S.E., n=3 for unbrowsed, 5 for browsed

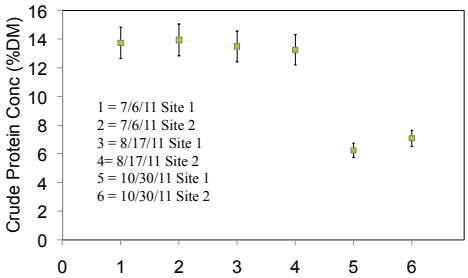

Fig. 4 – Average Crude protein concentration (% DM) in seasonal forages (leaves for summer forage represented by 1-4 and stems in winter forage represented by 5 and 6) from each of two sites. Mean ± S.E., n=3

Results Continued

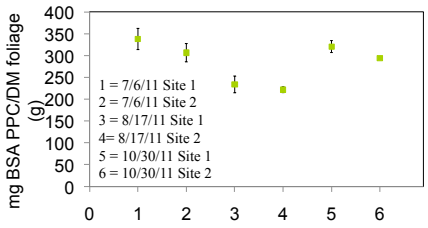

Fig. 5 – Protein precipitation capacity of forages (leaves for summer forage represented by 1-4 and stems in winter forage represented by 5 and 6) by date and site. Mean ± S.E., n=3

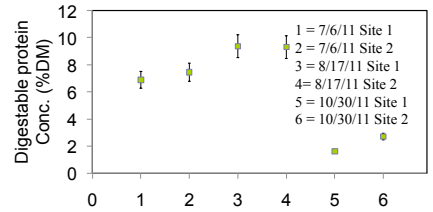

Fig 6 – Digestable protein concentration (% DM) of forages (leaves for summer forage represented by 1-4 and stems in winter forage represented by 5 and 6) by date and site. Mean ± S.E., n=3

Discussion

The data indicates that there is a difference in protein precipitation capacity of tannins, but not in nutrition (Fig 2,3) between browsed an unbrowsed samples, suggesting plants may respond to browsing. During the summer, tannins increase with time, but winter forage is similar to early summer. Usable protein remains constant over summer but decreases in winter, indicating that moose must alter behavior to account for lower nutrition in winter, as well as experience physiological changes to accommodate a 50% lower protein intake.

Acknowledgements

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