Influence of chestnut tannins on in vitro crude protein rumen degradability kinetics of red clover silage

Herremans S.[1], Decruyenaere V.[1], Beckers Y.[2], Froidmont E.[1]
[1]Walloon Agricultural Research Centre, Production and Sectors Department, Belgium
[2]University of Liège, Gembloux AgroBio-Tech, Precision Livestock and Nutrition, Belgium
Contact : s.herremans@cra.wallonie.be

Objective

To study the ability of additives to decrease in vitro crude protein degradability of silages with high protein content.

Methods

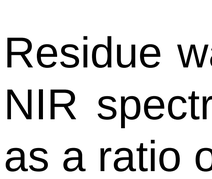
Red clover was ensiled :
- without additive (control),
- with Sil70 acid (TimacAgro)
- with chestnut tannin extract (40 g/kg DM).

An artificial rumen (Daisy I, Ankom, see picture) was run with dried silage samples for varying time steps.

Residue was weighted and analyzed for CP content by NIR spectroscopy. Relative loss results are expressed as a ratio of remaining quantity in the bag after t0.
Results were then processed through the equation of Orskov & McDonald (1979). A general linear model was used to compare relative losses and degradation rates.

Results

- Both additives reduced silage DM degradability from 0.5 to 72h of incubation compared to the control silage (-20% for acid and -25% for tannin after 72h; $P < 0,05$). Tannin was even more effective than acid for the first 12h ($P < 0,05$).
- CP degradation of the tannin silage was slower ($P < 0,05$ from 3 to 48h). Chestnut tannin reduce CP degradation rate ($P < 0,05$) contrary to Sil70 acid.
- Tannins were thus able to reduce both DM and CP degradability in the rumen from the beginning and until at least 48h.



What literature says

According to several authors, tannins form complexes with proteins making them less susceptible to lysis (Piluzza et al., 2014). This complex is thought to dissociate at low or high pH (Jones & Mangan, 1977), which can occur in the abomasum or in the duodenum and allow a higher digestion of proteins in the intestine.

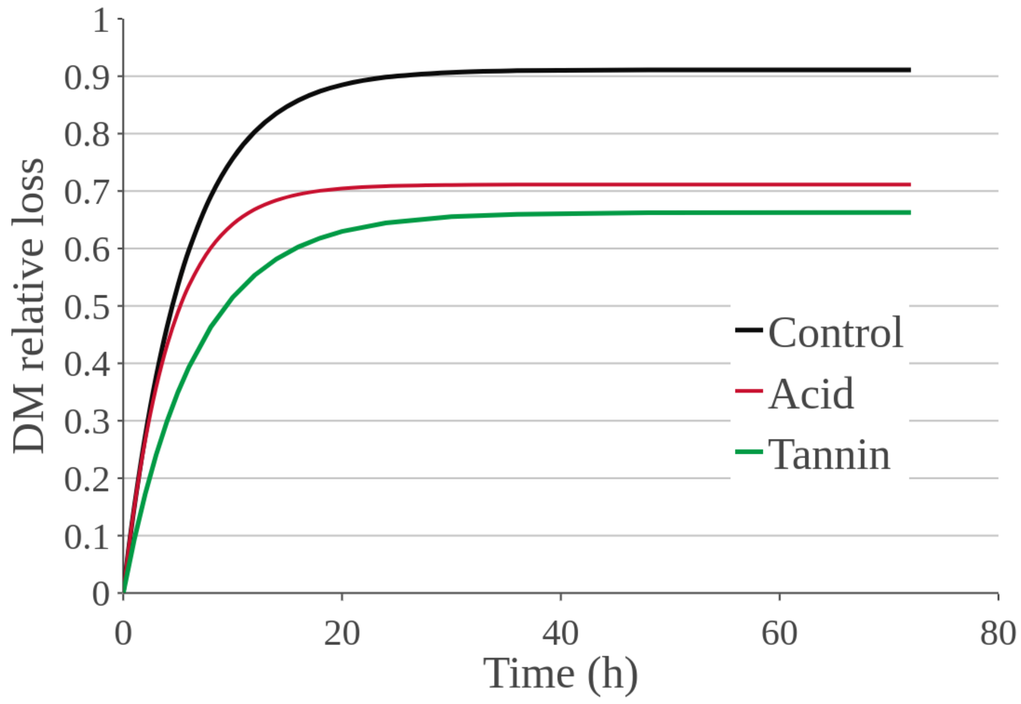


Figure 1 Dry matter relative loss from 0 to 72h

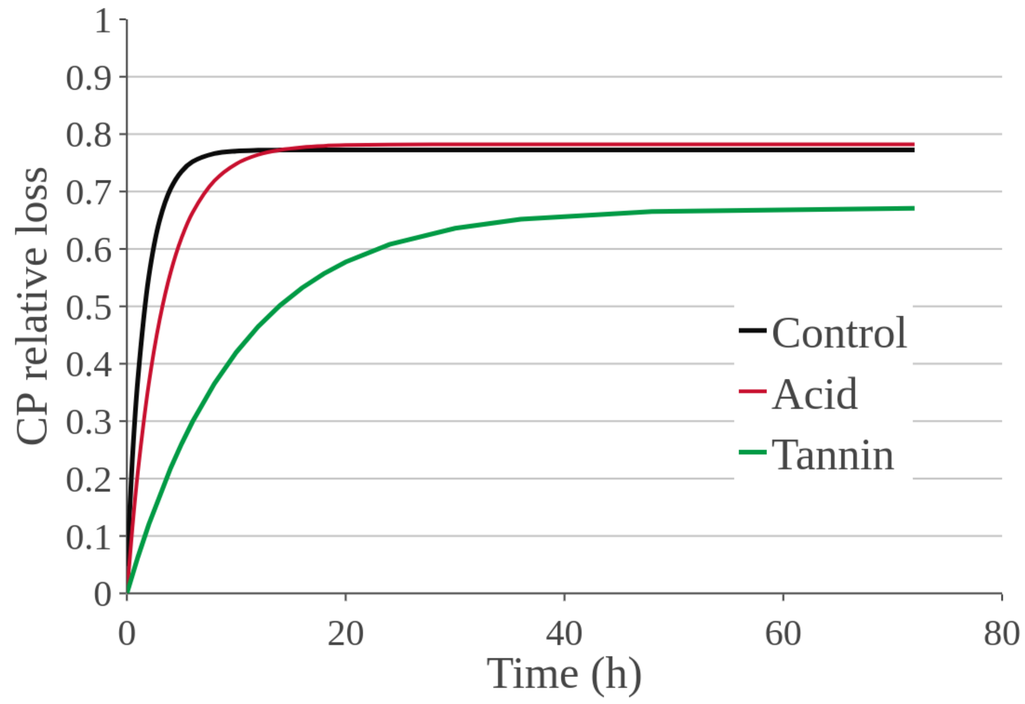


Figure 2 Crude protein relative loss from 0 to 72h

Conclusion

Our experiment showed the potential of chestnut tannins to decrease CP degradation in the rumen probably because tannin-protein complexes protected these molecules from lysis. By allowing more proteins to reach the intestine, chestnut tannins could improve feed nitrogen use efficiency in ruminants.

References

Jones, W.T., Mangan, J.L., 1977. Journal of The Science of Food and Agriculture, 28, 126–136.
Piluzza, G., Sulas, L., Bullitta, S., 2014. Grass and Forage Science, 69, 32–48.
Orskov, E., McDonald, I., 1979. Journal of Agricultural Science, 92 (2), 499-503.

Wallonie recherche CRA-W
Walloon Agricultural Research Centre
To address today's questions and to prepare tomorrow's challenges
www.cra.wallonie.be