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“Development on the margin”

## Precipitation Ability of different Tannin Extracts for BSA at Variable pH Values *in vitro*

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### Abstract

Tannins are known to form complexes with proteins at rumen pH conditions. These complexes are not available for rumen microbes, but may dissociate in the abomasum due to the low pH. The objective of this study was to determine the ability of quebracho (*Schinopsis lorentzii*), mimosa (*Acacia mearnsii*), tara (*Caesalpinia spinosa*) and gambier (*Uncaria gambir*) extracts to precipitate bovine serum albumin (BSA) *in vitro* at six pH values between 7 and 2.

Increasing amounts of each extract (up to 10 mg extract) were added to sodium-acetate-buffer with 1.5mg BSA ml<sup>-1</sup>. Precipitated protein was measured by the Bradford colour reagent method. For each combination of extract type and pH value data were fitted to a log-logistic equation:  $f(x) = 0 + d/1 + \exp(b(\log(x) - \log(e)))$ . Parameter  $d$  equals the maximum precipitation (plateau), and  $e$  equals the amount of extract when 50% of  $d$  was reached (ED50).

Results show large differences in the BSA amount precipitated among the different extracts and in combination with pH values. Tara showed questionable plateau values, higher than the amount of BSA in solution, which may be related to interactions with the colour reagent.

Mimosa precipitated all BSA, independent of pH value. Mimosa achieved higher plateaus than quebracho ( $p < 0.001$ ), except for pH 7. Tara plateaus were comparable to mimosa, except for pH 3 and 6. Gambier often did not achieve plateaus for the amount of extract weighed. Comparing different pH values within extract, quebracho plateaus increased up to pH 4 ( $p < 0.0001$ ). Increase of mimosa plateaus was only significant between the lowest and the highest pH values. Increasing pH value did not influence plateaus for tara and gambier ( $p > 0.05$ ). Less quebracho was necessary to reach ED50 than tara at pH 6 and 7, or gambier at pH 3 and 5, or mimosa at pH 3. However, more quebracho was necessary than mimosa at pH 6 and 7 ( $p < 0.01$ ).

In conclusion, stepwise pH change from 7 to 2 hardly influenced the precipitation ability of mimosa, tara and gambier, while quebracho precipitation ability declined with decreasing pH. The results suggest that tannin-protein complexes with quebracho may dissociate in the abomasum, whereas mimosa, tara and gambier may not.

**Keywords:** *Acacia mearnsii*, *Caesalpinia spinosa*, gambier, mimosa, pH, protein precipitation, quebracho, *Schinopsis lorentzii*, tara, *Uncaria gambir*

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