Analytical methods to formulate blend of rich-saponin plants for reducing ammonia emission in farms

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M. Le Bot, H. Jolivet, S. Suor-Cherer, M. Buffiere, A. BenarbiaNor-Feed
3 rue Amédéo Avogadro, 49070 Beaucouzé, France;
maxime.lebot@norfeed.net

EAAP
European Federation of Animal Science

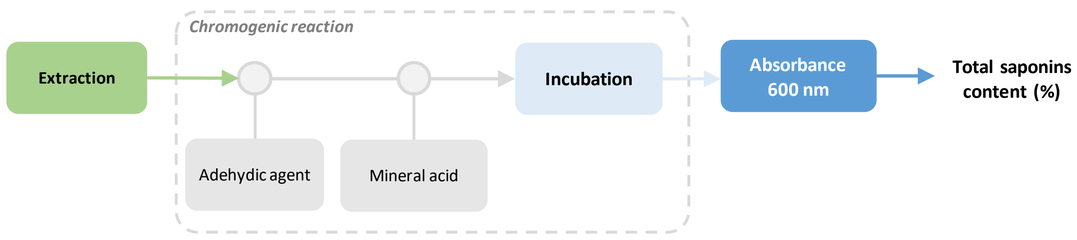
Introduction

The use of *Yucca schidigera* is a well-known solution to reduce ammonia emission in animal farms [1]. However, *Yucca schidigera* is harvested from the wild and its slow development makes it an endangered natural resource that tends to be an expensive solution [2]. Alternative solutions, economically and environmentally improved, appear to be necessary to reduce ammonia emission in farms. In this study, we formulated a commercial blend of saponin-rich plants consisting of four saponin plants (Norponin® Opti, Nor-Feed) by monitoring saponins properties using analytical methods. To evaluate the relationship between the analytical methods and the reduction of ammonia emission in farms, a trial on fattening pigs was performed.

Material and methods

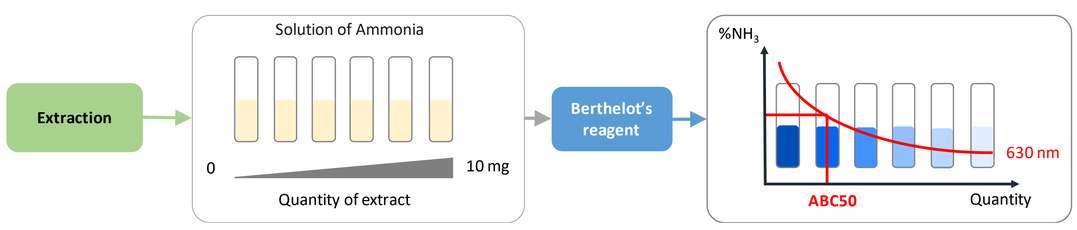
Analytical methods

Total saponin content



Total saponins content (%m/m) is determined with a colorimetric method patended under the registration number EP3742153A1 [3].

Ammonia Binding Capacity (ABC50)



ABC50 value allows to define the quantity (mg) of a product necessary to bind 50% of the free ammonia in solution. Lower is the value, better is the efficiency.

Trial

Breeding conditions

468 pigs (10 weeks old/30kg) were housed in 3 groups:
Control goup (CTL) → standard diet
Yucca Schidegera (YUCCA) → standard diet + 120 ppm of *Yucca Schidigera*
Blend of saponin-rich plants (OPTI) → standard diet + 120 ppm of OPTI

Duration of the experiment

The study was conducted over 7 weeks:
Week 0 → no supplementation
Weeks 1, 2, 3, 4 → with supplementation
Weeks 5, 6 → no supplementation

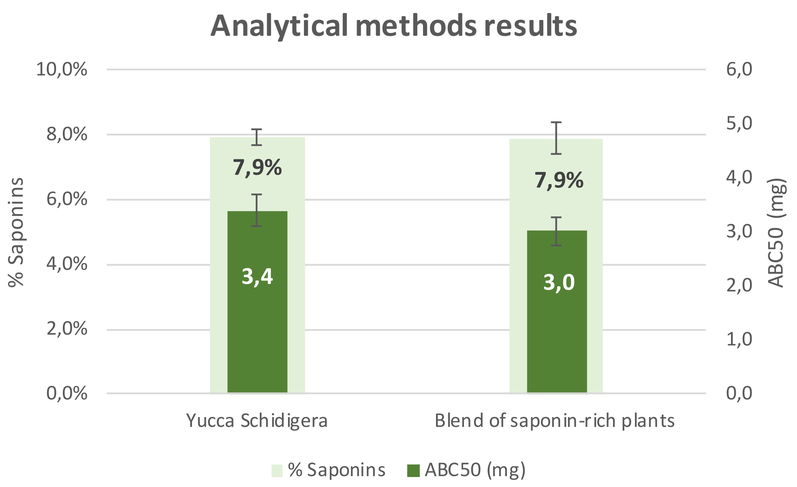
Diet

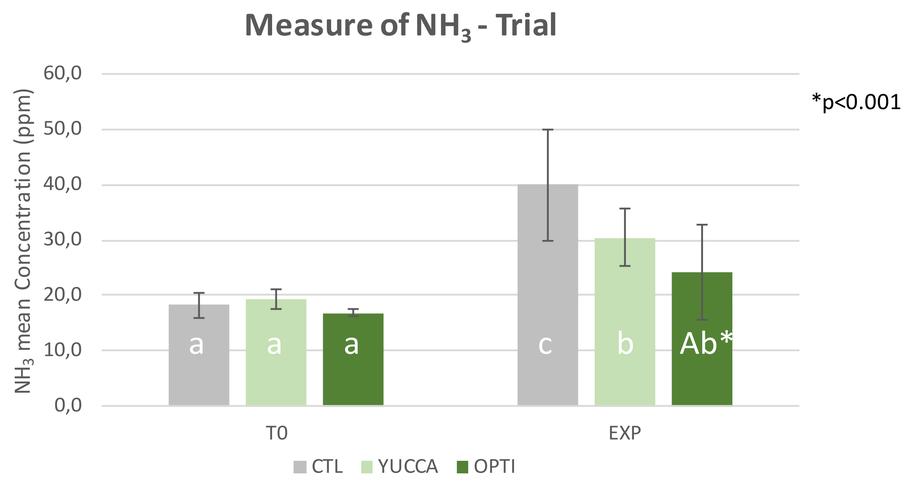
Pigs received 2.5 kg of complete feed daily. Distribution was done directly into the trough before the soup distribution, once a day, 6 days a week.

Ammonia measurement

Measurements were performed the first week before supplementation to monitor the initial basal level of atmospheric ammonia (T0) and during the 4 next weeks period with supplementation (EXP). Weekly ammonia- measurements were made at 30 cm above the walkways (2 measurements in 3 locations for each room per week) using Pro Gas Badge®.

Results





Yucca schidigera and blend of saponin-rich plants have the same percentage of saponins of 7.9% whereas ABC50 is better for Blend of saponin-rich plants (3.0 vs 3.4) indicating a better binding of ammonia in solution. For the trial results, Yucca group and OPTI group limit ammonia production along time by respectively -22% and -41% compared to the CTL group (P<0.01). Moreover, the OPTI group appears to be twice more efficient 41 vs 22% (P<0,0001) than the Yucca group.

Conclusion

The use of total saponin content and ABC50 method are interesting tools to estimate the potential efficiency of saponin plants for reducing ammonia emissions in farms. The commercial blend of saponin-rich plants shows better efficiency than *Yucca schidigera* whether it is with analytical methods or trial. This better efficiency could be explained by a higher structural diversity of saponins in the blend than *Yucca schidigera* permitting then to improve the capacity to bind ammonia. However, further studies are needed to confirm the observed efficacy and structural diversity of saponins.

References

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