BYPASS PROTEINS IN METHANE MANAGEMENT: A PROMISING APPROACH

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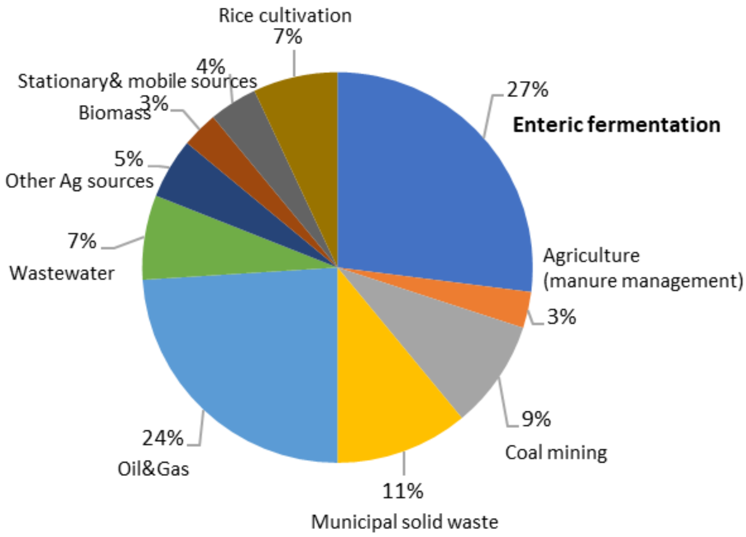
Introduction: Anthropogenic methane emissions, estimated at 9,390 million metric tons of CO_2 equivalent by 2020, represent a significant environmental challenge (EPA, 2020). Among the various sources contributing to these emissions, enteric fermentation, accounting for 27%, stands out as a major contributor (Fig. 1, Global Methane Initiative).

Fig.1. Estimated global anthropogenic methane emissions by source, 2020.



This process, inherent to the digestive systems of animals like cattle, sheep, and buffalo, generates methane—a potent greenhouse gas with a global warming potential approximately 30 times greater than carbon dioxide. Reducing methane emissions is imperative for mitigating climate change and its associated impacts on energy, health, and overall performance.

Properly balanced inclusion of bypass proteins in the diet of dairy cows can facilitate enhanced nutrient digestion, reduction of excessive rumen fermentation, and minimized gas production, including methane. By optimizing protein utilization and thereby mitigating enteric fermentation, a significant decrease in methane emissions associated with dairy cow digestion can be achieved. This carries substantial environmental benefits, given methane's status as a potent greenhouse gas contributing to climate change.

Through strategic dietary interventions focused on bypass proteins, the dairy industry has the potential to make meaningful contributions to methane mitigation efforts while improving overall environmental sustainability.

Trial design: A comprehensive trial was conducted by research center in Spain, comprising 250 Holstein cows distributed across four groups fed with different bypass protein types as substitutes for soybean meal: soybean meal (SBM), SoyPass (protected soy seed cake), RaPass (protected rapeseed cake), and SoyPreme (protected soy seeds). Over a 42-day period, key parameters including milk yield, fatty acid profile, digestibility, and methane emissions were meticulously monitored.

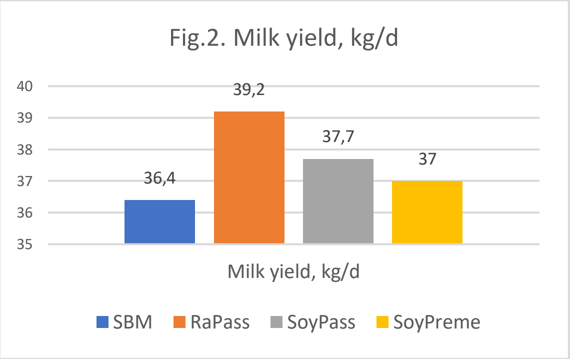
Results:

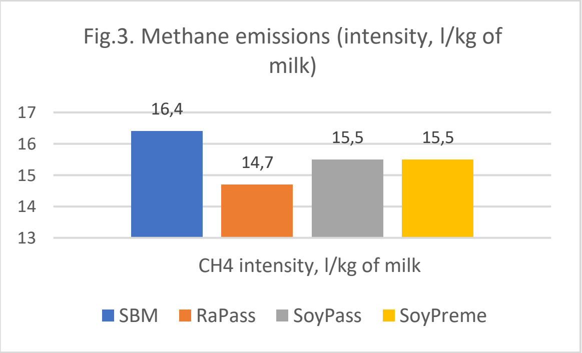
Milk Yield Improvement: RaPass supplementation resulted in the highest milk yield improvement, with significant increases observed compared to soybean meal. Specifically, RaPass led to a remarkable increase of 2.8 kg of milk per day per cow, surpassing the gains achieved with SoyPass (0.9 kg) and SoyPreme (0.6 kg). Thus substitution of 1 kg of SBM with 1 kg of RaPass led to additional 2,8 kg of milk per cow (Fig.2).

Healthier Milk Fatty Acid Profile: Bypass proteins positively influenced the fatty acid profile of milk, promoting the production of beneficial polyunsaturated fatty acids. Significant increases in polyunsaturated fatty acids (PUFAs) were observed: RaPass (28%), SoyPass (11%) and SoyPreme (45%).

Highly Digestible Raw Material: RaPass demonstrated high digestibility compared to SBM and contributing to reduced methane emissions. Notably, the total digestibility of crude protein (CP) for RaPass reached 96% of that of soybean meal, indicating its efficacy as a highly digestible protein source.

Methane Reduction: RaPass supplementation led to a substantial reduction in methane emissions, contributing to environmental sustainability. Methane intensity, measured in liters per kilogram of milk, decreased by 10.4% with RaPass, compared to reductions of 5.5% observed with both SoyPass and SoyPreme (Fig.3).





In this trial, a substantial reduction in methane (CH4) intensity was achieved. The theoretical calculation indicates that 1 ton of RaPass substituting Soybean meal could potentially generate a reduction of 629 kilograms of equivalent CO2 under the specific trial conditions. Applying the same calculation to SoyPass yields a reduction of 476 kilograms of methane per ton of SoyPass fed to dairy cows.

Discussion: The findings underscore the efficacy of bypass proteins, particularly RaPass, in simultaneously enhancing dairy production efficiency and mitigating methane emissions. Improved nutrient digestion, a healthier milk fatty acid profile, and reduced methane emissions associated with RaPass supplementation highlight its potential as a sustainable dietary alternative for dairy cows. It is derived from local harvests, thereby exhibiting an improved carbon footprint compared to soybean meal.

Conclusion: Dietary strategies utilizing bypass proteins offer promising avenues for addressing methane emissions in dairy farming while enhancing productivity. The significant improvements in milk yield, fatty acid profile, digestibility, and methane reduction underscore the importance of incorporating bypass proteins into dairy cow diets for sustainable agricultural practices.

RaRass, a sustainable protein source derived from rapeseed, offers significant advantages over soybean meal (SBM) in terms of carbon footprint and protein optimization. Utilizing Rapass in animal feed not only provides a high-quality protein comparable to SBM but also results in a lower environmental impact. Rapeseed is cultivated locally and typically requires fewer resources and results in lower greenhouse gas emissions compared to soybeans, which are often associated with deforestation and extensive land use. By integrating RaPass into feed formulations, producers can achieve efficient protein optimization while simultaneously reducing their carbon footprint, contributing to more sustainable livestock production practices.

References:

1. EPA (2020). Climate Change - Methane Emissions. Retrieved from https://www.epa.gov/climatechange

2. Global Methane Initiative. Retrieved from https://www.globalmethane.org/