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Abstract of Thesis/Dissertation

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Title : Investigating Enteric Methane Mitigation: Assessing the Impact of Various Materials on Ruminants' Fermentation, Intake, and Digestibility

Abstract

Ruminant farming, particularly with animals like cows, stands as a linchpin in regenerative agriculture, addressing global food security by providing 51% of livestock-derived protein. However, with the global population expected to reach 9.7 billion by 2050, the demand for meat and milk is surging, intensifying pressure on the livestock sector. Despite their crucial role, ruminants, through enteric fermentation, emit significant greenhouse gases (GHGs), presenting environmental sustainability challenges.

This intricate interplay demands a multifaceted approach to mitigate GHG emissions without compromising efficiency, profits, or animal welfare. Researchers globally are focusing on combating GHG emissions and optimizing production methods, with dietary intervention emerging as a significant avenue. Feed additives and by-products are promising for mitigating methane (CH_4) emissions during enteric fermentation.

Spent coffee waste (SCW), a by-product of coffee processing, has garnered attention as a potential alternative feed source for ruminants. The challenge lies in determining optimal dosages and understanding the effects on animal health and performance. Previous research highlights both advantages and disadvantages, emphasizing the importance of dosage effects concerning cost, availability, processing, and compatibility with other dietary components.

Researchers are also exploring anti-methanogenic materials, including organic acids lik

e fumarate and malate, which have shown methane-suppressing activity. Other organi c acids, like citrate and itaconate, common in the swine and poultry industries, may r egulate rumen microbiota and metabolic activity, influencing CH_4 production.

This growing interest in natural feed additives aims to enhance rumen fermentation eff iciency, reduce greenhouse gas emissions, and ensure the sustainability and ethical p ractices of livestock production. This integrated study comprises two parts. The first p art examines the use of by-products from human consumption as feed and feed addit ives for ruminants, considering both raw and ensiled forms under in vitro conditions. The latter part concentrates on in vivo conditions, exploring the application of novel C H_4 suppressors.

This comprehensive exploration seeks to balance the rising global demand for nutritio n while mitigating the environmental impacts of GHG emissions from ruminants. The i ndustry's challenge lies in transitioning toward more efficient production systems that f ulfill the nutritional needs of a growing global population while safeguarding the future of the planet.