Dose response effect of calcium peroxide-based dietary additive on performance and methane emissions of growing beef cattle

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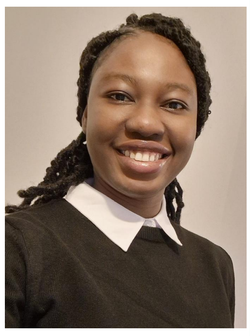

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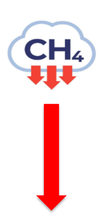
Introduction

Irish agriculture accounts for over 38% of national greenhouse gas emissions, with the greatest contribution from enteric fermentation in ruminant livestock. To meet the 2030 climate targets, there's an urgent need for practical, cost-effective feed interventions, especially for pasture-based systems predominant in Ireland. Calcium peroxide (CaO_2) has emerged as a promising methane (CH_4) mitigation additive for ruminant due to its capacity to slowly release oxygen in the rumen to suppress methane production. However, optimising its inclusion level is essential to achieve substantial methane emission reduction while maintaining animal production performance .

Calcium Peroxide Dietary Additive



Study Objective

The objective of the study is to evaluate the effect of calcium-peroxide (CaO_2) dietary additive at varying inclusion levels on:

- Animal production performance
- Methane emissions

Materials and Methods

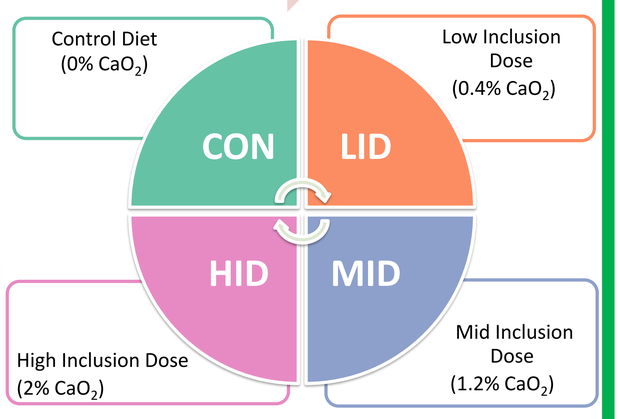
Animal Selection

Seventy-two spring-born Charolais cattle (36 steers and 36 heifers) with an average body weight of 450 kg and 15 months of age were randomly assigned to one of the four dietary inclusion levels of CaO_2, based on total dry matter intake (DMI).

Dietary Treatments

The dietary treatments include:

- Control diet (CON)
- Low inclusion dose (LID)
- Medium inclusion dose (MID)
- High inclusion dose (HID)



The dietary treatments were fed alongside a basal diet (grass silage) in a 60:40 forage:concentrate ratio.

Data Collection and Analysis

Animals received their respective treatments over 10 weeks, during the following data were collected:

Weekly DMI, growth, and emission data were analysed using REML in R, with treatment and weeks as fixed effects, block as a random effect, and animal as the experimental unit.

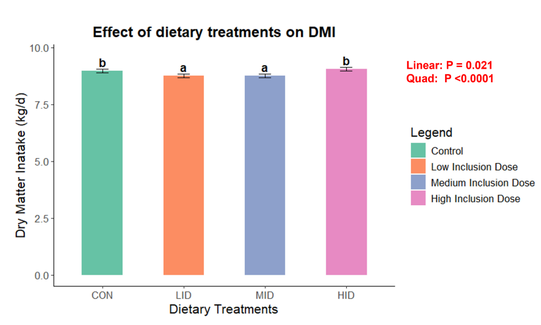
Conclusion

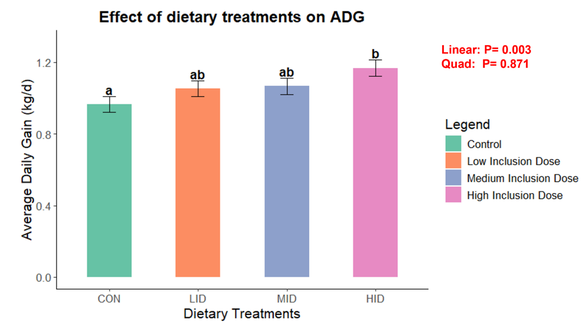
Supplementing a forage-based diet with 2.0% CaO_2 improved beef cattle's growth rate and feed efficiency while reducing methane emissions and intensity up to 10% and 19%, respectively. This strategy offers a practical solution for the livestock industry to enhance production efficiency and reduce methane emissions. However, there is a need for further research to evaluate the effect of the dietary additive throughout the life stages of beef cattle.

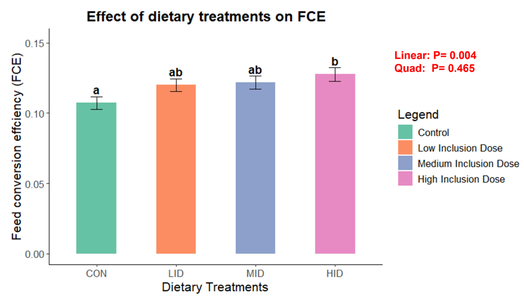
Results

Results on animal production performance

The DMI ranged from 8.76-9.1 kg/d across the treatment groups, with animals offered CON having 8.97 kg/d and HID having 9.1 kg/d ($P < 0.001$). A linear dose-response effect of CaO_2 was observed, with animals on the HID treatment having the highest ADG and FCE when compared to other treatment groups ($P < 0.001$).

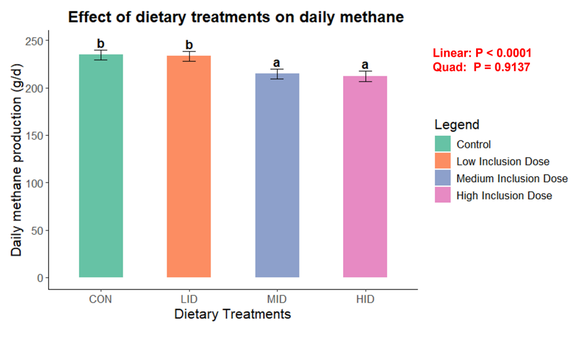


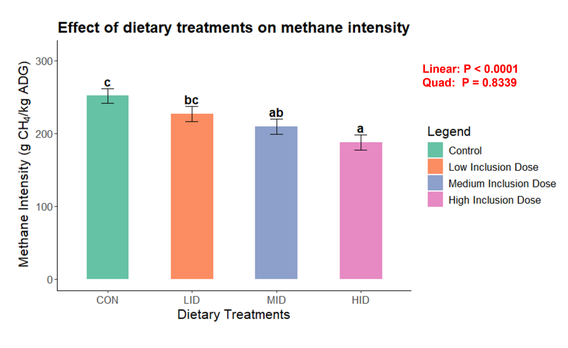


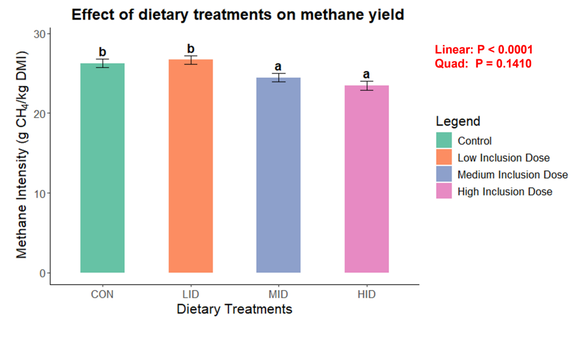


Results on methane emissions

CaO_2 reduced CH_4 emissions by 1-10% compared to CON and LID ($P < 0.001$). Animals offered HID had the lowest CH_4 intensity and yield among all dietary treatments ($P < 0.001$).







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