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Background and objective

One of the alternatives for reduction of methane (CH₄) production by ruminants that has drawn a considerable attention in recent years is the use of yeasts, as one type of direct fed microbes or probiotics. The objective of the present paper is to survey the influence of yeast (*Saccharomyces cerevisiae*) on CH₄ production as well as CH₄/DMI in dairy and beef cattle through meta-analytical methods.

Search strategy and selection criteria

An extensive, structured and systematic literature search was carried out using databases of ISI Web of Knowledge and Google Scholar. The publication period of studies was from January 1990 to December 2016. The keywords used for search of relevant studies included "(dairy cow OR beef) AND methane AND (yeast OR *Saccharomyces cerevisiae*)", collecting papers between 1990 and 2016. 1) Studies should include both a yeast-recipient (treated) group and a control unsupplemented group (no yeast administered); 2) Only studies with detailed in vivo measurement of CH₄ production were included; 3) The reviews (n = 10) as well as in vivo experiments on influence of yeast on production parameters and CH₄ production of other animals (sheep and goat; n = 15) and in vitro experiments (n = 14) were excluded from the database.

Data and analysis

Comprehensive Meta-Analysis Software (version 2.2) was used for the statistical analyses. The effect size for daily CH₄ production and CH₄/DMI for all included studies (dairy and beef cattle, dairy cattle, and beef cattle) was determined as standardized mean difference (SMD) at 95% level of confidence intervals. The SMD enable comparison of differences between groups regarding several variables and the model adopted in this meta-analysis was a random effects model. In order to test heterogeneity across studies, χ^2 (Q) test and I² statistic were used. Publication bias was examined through funnel plot and trim and fill method.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
7	Dairy and beef cattle	Yeast supplementation	No yeast supplementation	Metric: 1) Methane (CH ₄) production; 2) CH ₄ production/dry matter intake (DMI); Effect size: Standardized difference of the considered metrics between intervention and control	93.75

Results

- The effect of yeast addition on reduction of CH₄ production did not reach statistical significance when dairy and beef cattle were pooled (SMD = - 0.051; P = 0.792). The difference between yeast and control groups were not significant for dairy cows (SMD= - 0.083; P= 0.708) or for beef cattle (SMD= 0.057; P= 0.889) when analysed separated.
- The Q test and I²-statistic showed that there was no heterogeneity across studies on CH₄ production. The results of publication bias obtained through review of funnel plot and trim and fill method suggest that there is no publication bias in terms of CH₄ production by dairy and beef cattle.
- The results suggest that the effect of yeast on reduction of CH₄/DMI did not reach statistical significance when dairy and beef cattle data were pooled (SMD= - 0.087; P= 0.722), with only dairy cattle data (SMD = - 0.120; P = 0.732), or with only beef cattle data (SMD = 0.002; P = 0.996).
- No significant heterogeneity was found across studies on CH₄/DMI.
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

The results of three groups (all pooled, dairy and beef cattle, dairy cattle only, or beef cattle only) showed that supplementation of yeast does not significantly reduce CH₄ production or CH₄/DMI.