

# EVALUATION OF *IN VITRO* GAS PRODUCTION METHOD AND ASSOCIATIVE EFFECTS OF RUMEN DIGESTION BETWEEN PASTURE AND SUPPLEMENTARY FEEDS

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**Objective:** Evaluation of feedstuffs is necessary for provision of a nutritionally balanced ration. A ration formulated for ruminants is often a mixture of individual feeds. The nutritive value of the feeds in mixtures are assumed to be additive. However, adding supplements particularly NFC to pasture based system can drastically change ruminal conditions and often has deleterious effects on forage digestion which is not additivity. This phenomenon is commonly referred to as associative effects. *In vitro* gas production (GP) method has been used as a measure appearance of fermentation products and can study kinetics of digestion by rumen microorganisms. Currently, to increase the energy intake of dairy cows in the pasture-based systems, supplements such as concentrate ingredients rich in starch or fiber and silages are included in the diet. However while associative effects are often discussed in ruminant nutrition, at least theoretically, they are seldom taken into account in feed formulation. The objectives of this experiment were to evaluate the usefulness of *in vitro* gas production method to identify associative effects on ruminal digestion between pasture and supplementary feeds.

**Materials and Methods:** Pasture was incubated with corn (C), barley (B), corn silage (CS) and grass silage (GS) at proportion of 0, 25, 50, 75, and 100% respectively in experiment 1. In experiment 2, pastures was incubated together with corn, barley, beet pulp (BP) and hay (H) at proportion of 75-25% and pasture + grain + fiber (three way mixtures) at proportion of 70-20-10%. In both experiments, rumen fluids were taken from ruminal fistulated cows fed pasture. Gas production was measured as described by Theodorou et al (1994). GP were monitored up to 96h and parameters were obtained by simple exponential equation. Organic matter (OM) effective degradability was obtained by France et al., (2000) model. The prediction was done for each observed value using the fitted parameters obtained from pure ingredients. Associative effects on parameters were tested by comparisons with the values predicted from those of single feeds assuming additive effects.

**Result: (Experiment 1)** Almost all feed mixtures had positive associative effects on lag time. Grain and CS supplementation showed positive associative effects on the potential GP, IVDMD and IVOMD. For rate of GP, negative associative effects were observed for corn and CS supplementation, whereas, such effects were not observed in barley supplementation. Associative effects were less stimulated by GS supplementation and in summer.

**(Experiment 2)** Both of all two-way and three-way mixtures had positive associative effects on lag time. For two-way mixture, corn supplementation showed positive effects on potential GP, IVDMD and IVOMD and negative effects on rate of GP. Such effects were not observed in other two-way supplements and on ED. Almost all three-way mixtures showed positive associative effects. Although the mixtures included corn tended to negative effects on rate of GP, the mixtures included BP tended to positive effects on digestibility. For ED, negative associative effects were found for P+C+H mixture, whereas, positive associative effects were found for P+B+BP mixture.

From both experiments, it is concluded that *in vitro* GP method is a useful tool for detecting associative effects of feed mixtures and associative effects on ruminal digestion were observed among pasture, starch and fiber source supplements. Associative effects were more pronounced on three-way combinations of feeds than two-way.