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Comparison of crude protein intestinal digestibility by mobile bag and in vitro methods

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Statement of the Problem: Nutritive value of crude protein in feeds for ruminants is characterized by rate and extent of degradation in the rumen and intestinal digestibility in rumen undegradable proteins (RUP). It is inevitable to obtain exact and correct RDP (rumen degradable proteins) and RUP values and values of ideal RUP digestibility to characterize crude protein in feeds. The intestinal digestibility of rumen undegraded protein is one important parameter in the updated protein evaluation systems for ruminant production. There exist a number of methods to assess intestinal digestibility; they have strong and weak points; e.g., the in vivo method, the mobile bags method, which is widespread and the in vitro method using commercial enzymes.

Objective: The objective of the study was to compare intestinal digestibility of rumen undegraded crude protein by mobile bag and in vitro methods. Extracted meals, cereals, legumes, byproducts from bio-ethanol production-DDGS, maize and lucerne silages were used for this purpose.

Methodology & Theoretical Orientation: Degradability of crude protein of feeds and degradation characteristics were determined by *in sacco* method on three dry cows with permanent rumen and duodenal cannulas. The undegraded feed residues after 16 hours incubation in the rumen were used to determine intestinal digestibility by the mobile bag method on the same animals. Bags with undegraded feed residues were incubated in pepsin (700 U/g)/0.1 M HCl solution 60 min at 39 °C before an insertion into the duodenum. For in vitro determination was used a two-stage incubation in the apparatus Daisy II. In the first stage the original bags (F57, f. ANKOM Technology) with homogenized undegraded feed residues (0.5 g in four repetitions) were incubated for 1 hour at 39 °C in 0.1 M HCl (pH 1.9) with 1 g pepsin/l, after rinsing in distilled water, in the second stage, followed 24 hours incubation in 0.5 M phosphate buffer (pH 7.75) containing pancreatin 3 g/l and thymol 0.05 g/l.

Findings: When comparing mobile bag with *in vitro* data were observed significant correlations (Pearson) with differences among the feeds groups. For legumes ($r=0.917$), cereals ($r=0.845$) and for maize silages ($r=0.954$). The coefficient of correlation for the group of DDGS feeds and for extracted meals was $r=0.739$ and $r=0.702$, respectively. For lucerne silages was the correlation weaker $r=0.548$. The correlation across all tested feeds was $r=0.803$. Between mobile bag and in vitro ileal digestibility is the linear relation: $y=0.853x+1.359$ ($R^2=0.7398$).

Conclusion & Significance: The mobile bag method (MBM) is used to determine the intestinal CP digestibility (DSI) for more than two decades. Due to its labor cost and dependency on cannulated animals, it is necessary to look for alternative *in vitro* method. We can conclude that the *in vitro* enzymatic method provides DSI values that are in good agreement with the values obtained by the mobile bag method. High correlation coefficient ($R^2=0.739$) in linear regression between the two methods suggests that this method may be effectively used for estimation of intestinal digestibility of undegradable crude protein in the rumen in ruminants.

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Biography

Maria Polacikova is a Researcher with 25 years' experience with the analysis of feed and biological materials. She studies the use of genetically modified feeds in animal nutrition and their effect on quality of animal products. Since last 8 years she is the leading Analyst of feed in the Chemical Laboratory, Research Institute for Animal Production Nitra, National Agricultural and Food Centre. As a Specialist, on utilization of nutrients rumen degradability, intestinal digestibility by in vivo, in sacco and in vitro methods, she participated in several research projects of the Ministry of Agriculture and Slovak Research and Development Agency, and also projects within bilateral foreign cooperation.

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