

Title: *Ex Vivo* Ruminant Cellulosome For By-product Biomass Conversion

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Abstract

The valorization of lignocellulosic by-products from biofuel industries offers very wide perspectives in animal feedstuff and facilitates the integration and the application of the European directives (integration of biofuel in transport sector 2003/30/EC). This study was carried out to determine the effectiveness of supplementary fibrolytic ruminal enzymes on biofuel by-products for poultry diets. First, a model was developed to demonstrate the potential of ruminal cellulolytic enzymes *in vitro* on biofuel by-products (by poultry nutrition). Secondly, we developed their potentialities to provide an *ex vivo* system in order to produce ruminal cellulolytic enzymes to a large scale.

The complex microbiome inhabiting the rumen is a unique genetic resource for the conversion of plant cell wall biomass. This microbial ecosystem has developed an efficient strategy to degrade insoluble polysaccharides: the cellulosome (multienzyme complexe specialized in the adhesion and degradation of cellulose). Researches were focused especially onto rumen adherent bacteria (numerically predominant, represents 75% of the total microbial population and is responsible for 88 to 90% of ruminal endoglucanase). The measurement of the cellulolysis potential of ruminal fibrolytic enzymes *in vitro* requires the bacterial detachment of the fibers and the extraction of enzymes from the microorganism membrans. The bacterial detachment from ruminal fibers was studied commonly by differential centrifugation, by degradation of specific links and non-specific links and by conditions which stimulated absorption minima of bacterial adhesion. The model was defined by selected different treatments on the potential of the crude extract to hydrolyze commercial cellulosic substrates *in vitro*. The crude extract methodology was applicated on biofuel by-products in broiler intestinal conditions *in vitro* (30 to 50 mg per g of by-products).

Afterwards, an isolation technique was developed for ruminal cellulolytic bacteria cultivation. The strains were cultivated in a specific anaerobic medium which stimulates and induces the enzymatic production (10^6 cellulolytic ruminal bacteria /ml). An *ex vivo* system based on a continuous batch reactor was constructed in order to produce large scale of ruminal fibrolytic enzymes and to facilitate the control of all the fermentation parameters.

Biography

HISSETTE Mathias, male, bioengineer in chemistry, graduated from the Bioengineering Interfaculty School of the Université Libre de Bruxelles in 2006. He worked for the National Institute of Research in Montpellier, Mixed Unity of Research (France). Since 2008, he became Assistant Manager for the Direction Générale Opérationnelle Agriculture, Ressources naturelles et Environnement of the project, "Valorisation by poultry of structural carbohydrates from agro-industrial by-products : effects of ruminal fibrolytic enzymes", (Gembloux Agro-BioTech). Until 2010, he worked on potentialities of ruminal fibrolytic enzymes on biofuel by-products *in vitro* (Lignobiotech One Symposium, France). In recent year, he focused on the *ex vivo* production of fibrolytic ruminal enzymes (Green Chemical Symposium, Royal Chemical Society, Belgium).