

POTENTIAL OF RUMINAL CELLULOSOME TO VALORISE BIOFUEL BY-PRODUCTS IN THE GASTRO-INTESTINAL TRACT OF POULTRY

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The valorisation of by-products from biofuel industry will promote the application of the 2010 (2003/30/EC) and 2020 European Directives, stipulating the inclusion of biofuels in transport sector. Addition of exogenous enzymes to valorize these by-products in monogastric animals opens very wide and interesting opportunities toward Sustainable Development. The approach pursued in this work is the utilization of fibrolytic rumen enzymes to valorize by-products in the digestive tract of the poultry.

The extraction protocol used to obtain a crude extract rich in fibrolytic rumen enzymes is mainly concerning bacteria associated to the solid content of the rumen (cellulosome) and contains two phases: (i) separation of the bacteria from the plant particles and (ii) extraction of the enzymes from the bacterial membrane. Various physico-chemical conditions were tested in order to extract the fibrolytic enzymes from the solid contents.

The activity of the primary extract was evaluated first with commercial cellulosic substrates (2 Units-15 Units/ml). This extract is also able to hydrolyse *in vitro* (intestinal conditions of broiler) by-products of the biofuel industry by producing quantities of sugars varying from 30 mg to 50 mg per g of by-products (grains of wheat, wheat bran and rapeseed expellers).

After demonstrating the potential of ruminal cellulosome *in vitro* on commercial cellulosic substrates and on biofuel by-products, a methodology to isolate and cultivate cellulolytic bacteria from rumen content (*Fibrobacter succinogenes*, *Ruminococcus albus* and *Fibrobacter flavefaciens*) has been developed. The selected cellulolytic microorganisms from rumen bacteria were cultivated on specific media inducing the production of fibrolytic enzymes. An *ex vivo* system based on a 10 liters continuous batch reactor was constructed in order to produce large scale up of ruminal fibrolytic enzymes and to facilitate the control of all the fermentation parameters.