

Optimization of protein feeding in organic milk production – economy and environment

Projektansvarig: Pekka Huhtanen, Institutionen för norrländsk jordbruksvetenskap (NJV), SLU.

1. Changes in research plan

Our department got funding from SLF (Stiftelsen Lantbruksforskning, SLF project “Högre utnyttjande av protein i mjölkproduktionen för bättre miljö and mer pengar till mjölkföretagaren”). As these two projects – one in organic farming and the other in traditional farming – are both related to optimization of protein feeding of lactating dairy cows, we asked both from SLU EkoForsk and SLF to make some changes to the original research plan to improve the synergy between the projects. Both funding bodies accepted our proposals for the changes. Instead of three feeding trials in original SLU EkoForsk proposal we will conduct two feeding studies and use saved resources to development an in vitro technique for determination diet / feed protein value. In SLF study one study plan was changed to evaluate the effects and interactions of the level protein supplementation and grass vs. grass red-clover silages. The protein supplement used in this study will be processed following the rules of organic production (no hexane extraction).

Combining the projects allowed us to hire a PhD student. The student (Helena Gidlund) started at our department at the beginning of this year.

2. Model development for in vitro studies

A mechanistic dynamic model was developed to understand the kinetics of protein degradation and substrate fermentation in the automated in vitro system gas production system. The gas production model is based on first-order digestion kinetics and rumen fermentation stoichiometry. Protein degradation to ammonia N is assumed to be a first-order process. Microbial protein synthesis is driven by microbial pool size and ATP production from the fermentation. The developed model is a useful tool in developing the hypothesis of protein digestion kinetics, designing the studies and optimization of the sampling procedures.

3. Data-analysis of protein response

A data-analysis from published data was conducted to evaluate protein effects on milk production, feed intake and digestibility. The studies were conducted in conventional production systems, but it can not be expected protein effects are markedly different in conventional and organic production systems. Feeding the cows without supplementary protein decreased milk yield by about 10% compared with practical levels of protein feeding. However, because the high prices of organic protein the value of production losses may not be much greater than the savings in feed costs. The results will be used to formulate the diets for the production trials. A presentation will be given in the Grovfoderkonferens in Umeå.

4. Research plan for 2012

The changes in the study plan and hiring the PhD student caused some delay in starting the project, but conducting two instead of three feeding experiments allows catching the time table as the in vitro studies can run in parallel with feeding experiments. In 2012 we will start developments of the in vitro method and continue working with the model developed earlier. In the next autumn we start the feeding experiment investigating the effects of four levels of cold-pressed cake in concentrate in cows fed either primary or regrowth silages that are different in the proportion of red clover.

Sammanfattning

Verksamheten under det första året inleddes med att vi reviderade försöksplanen. Tack vare gynnsam beviljning av finansiering från annan finansiär (SLF) inom proteinområdet kunde vi i samråd med SLU EkoForsk ersätta ett av de planerade produktionsförsöken med en in vitro studie och därmed friställa medel att anställa en doktorand (Helena Gidlund) som skall arbeta med båda projekten, som underlag för hennes avhandling. Förutom revisionen av projektet har vi genomfört två forskningsuppgifter. Ett, framtagning av en dynamisk modell för att utvärdera protein nedbrytning in vitro och två, en dataanalys av publicerade data för att studera responsen av ökad protein utfodring för mjölkproduktionen. Resultaten av dataanalysen presenteras vid Grovfoderkonferensen in Umeå Feb, 2012. Det kommande året 2012 planerar vi att utveckla in vitro metoden för protein värdering vidare och även att genomföra det första produktionsprojektet med fokus på proteinutfodring i ekologisk mjölkproduktion och olika nivåer av rödklöver i grovfodret.