# Locally produced protein feeds for dairy bull calves

**Introduction** Some cases have shown that feeds grown on the own farm contributes less to environmental problems than far-distant grown feeds. Soya bean meal is widely used in the world as a protein feed of good nutritional quality but the ethics around the cultivation of the beans are often questioned. Calves need high concentrations of protein with high protein quality in their feed for proper growth. The purpose of this study was to compare dry matter intake (DMI), live weight gain (LWG), feed efficiency (FE), rumen function and profitability in calves fed protein feeds produced in Sweden vs. soya bean meal.

**Materials and Methods** The experiment was carried out at Götala Beef and Sheep Research Station, Swedish University of Agricultural Sciences (SLU), Skara. Dairy bull calves (84 Swedish Red and Swedish Holstein per year) were used in a completely randomized design. The protein feeds studied were rolled peas (PE) and rolled field beans (FB) in year 1, Swedish grown rolled soya beans (SSB) and dried distiller's grains with solubles (DDGS) in year 2, which were compared to imported soya bean meal (SBM) both years. The DMI, FE and faecal traits were recorded at a pen level (four pens, each with seven calves, per treatment) while LWG was recorded on the individual calves. The calves were weighed regularly and averaged 90 and 93 kg in live weight at the start of year 1 and 2, respectively, and ended at 245 and 271 kg. A total mixed ration consisting of a grass/clover silage (90/10), rolled barley and vitaminised minerals, together with either PE, FB, SSB, DDGS or SBM, was fed to the calves. Feed was offered *ad libitum* once a day. The diets were balanced to be isonitrogenic and isoenergetic. Diets were rebalanced four times according to changed nutrient requirements during growth. Cold-pressed rapeseed cake (322 g CP per kg DM) was included in the diet of calves given PE, FB, DDGS and SSB until the calves reached an average live weight of 175 kg. Nutrient composition in DM of the silage (154 g CP) and concentrates (PE 211, FB 281, DDGS 349, SSB 400, SBM 528 g CP, respectively) were analysed by conventional methods. All DDGS came from the same batch and contained 21% ADIN of total N. One fresh faecal sample was collected from each pen four times during each year. The faeces consistency was determined visually on a scale, DM and content of grains and long particles (> 10 mm) in the faecal matter were analysed. Analyses of DMI and FE were done with PROC GLM, SAS (ver. 9.1, 2003), whereas PROC MIXED, SAS, was used for analyses of faecal traits and LWG. The profitability was calculated as value of calf growth less cost of feeds consumed at 2010 price level in Southern Sweden. In sensitivity analyses different prices were used.

**Results** In year 1, no differences in daily DMI or LWG were found between calves with the different diets (Table 1). There was, however, a tendency for a higher intake of ME for the calves fed PE than for the other calves, but the FE did not differ between treatments. In year 2, feeding DDGS resulted in the highest LWG due to higher intakes of ME, CP and also to a strong tendency for higher DM intake than calves fed SBM, but FE was similar in all treatments (Table 1). The faecal traits differed little or not at all between the treatments except for the last sampling occasion in year 2 where a firmer consistency, a higher DM content and a higher number of grains were found in faeces from calves fed DDGS and SSB compared to calves fed SBM. Most profitable in the basic price situation was PE year 1 and DDGS year 2. However, relatively small increases in cost of PE production or decreases in SBM-price would make SBM most profitable year 1. DDGS was most profitable year 2 at any probable price situation.

Table 1. Average daily intake of dry matter (DM), neutral detergent fibre (NDF), metabolizable energy (ME) and crude protein (CP), average daily live weight gain (LWG) and feed efficiency (FE) of bull calves, means and standard error of the means (SEM)

| | Year 1 | | | | | Year 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | PE | FB | SBM1 | SEM | P [1] | DDGS | SSB | SBM2 | SEM | P [1] |
| Intake of DM (kg day-1) | 4.66 | 4.38 | 4.41 | 0.091 | NS | 4.81 | 4.50 | 4.45 | 0.098 | 0.058 |
| Intake of NDF (kg day$^{-1}$) | 1.65 | 1.62 | 1.64 | 0.033 | NS | 1.78$^{a}$ | 1.57$^{b}$ | 1.66$^{b}$ | 0.035 | ** |
| Intake of NDF (% of LW) | 1.00 | 1.05 | 1.01 | 0.022 | NS | 1.01$^{a}$ | 0.91$^{b}$ | 1.00$^{a}$ | 0.013 | *** |
| Intake of ME (MJ day$^{-1}$) | 57.1 | 53.2 | 53.3 | 1.11 | 0.054 | 60.9$^{a}$ | 57.7$^{ab}$ | 55.5$^{b}$ | 1.24 | * |
| Intake of CP (g day$^{-1}$) | 760 | 710 | 741 | 17.3 | NS | 811$^{a}$ | 750$^{b}$ | 725$^{b}$ | 16.8 | * |
| LWG (kg day$^{1}$) | 1.16 | 1.08 | 1.12 | 0.029 | NS | 1.34$^{a}$ | 1.25$^{b}$ | 1.21$^{b}$ | 0.027 | ** |
| FE (g gain MJ$^{-1}$ ME) | 20.1 | 20.2 | 21.0 | 0.27 | NS | 22.2 | 21.7 | 22.0 | 0.21 | NS |

Means with different superscripts (a, b) differ significantly ($P < 0.05$).

**Conclusion** Swedish grown protein feeds can replace imported SBM with maintained or, regarding DDGS, even improved performance in dairy calves. All diets resulted in good rumen function and diets with PE and DDGS resulted in the best profitability. The high ADIN concentration of DDGS should decrease the availability of important amino acids needed for optimizing LWGs of the calves fed the DDGS diet. However, this was apparently not the case in this study.

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