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The effect of industrial processing and abomasal methionine infusion on utilisation of faba bean protein in dairy cows

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Faba bean (FB, *Vicia faba*) is an ancient grain legume, the utilization of which is hampered by higher protein rumen degradability and lower Met content relative to soybean or rapeseed meals (RSM). We hypothesized that industrial processing of FB and supplemental Met improves milk production to a comparable level with RSM.

Five rumen-fistulated multiparous Finnish Ayrshire cows averaging 74 d in milk were allocated to experimental diets according to a 5x5 Latin square with 21-d periods. Treatments consisted of total mixed rations (TMR) containing isonitrogenously milled or processed FB with or without abomasal Met infusion (15 g/d) or RSM as a positive control. Industrial processing of FB comprised dehulling, flaking and heat treatment. Concentrates (400 g/kg TMR dry matter (DM), crude protein (CP) 189-196 g/kg concentrate DM) contained also barley, oats and molassed sugar-beet pulp. Forage was grass silage (11.2 MJ ME/kg DM, 146 g CP/kg DM). Data were analysed by ANOVA.

Processing of FB substantially decreased the N solubility in borate-phosphate buffer (672 vs. 233 g soluble N/kg N) without an increase in acid detergent insoluble N (< 92 g ADIN/kg N). Commercial RSM contained high amounts of ADIN (297 g/kg N). The DM intake was on average 1.5 kg higher on FB diets relative to RSM ($P<0.05$), but this had no effect on milk yield. Milk production level of this physiological study averaged 27.7 kg/d. Processing of FB tended to increase milk yield by 1.4 kg/d ($P=0.07$), but abomasal Met infusion on FB diets had no effect. Milk content of lactose, fat, protein and urea were unaffected by treatment except for higher milk protein content on FB diets relative to RSM ($P<0.05$). Protein source had no major effect on rumen fermentation pattern. Rumen fluid ammonia-N concentration averaged 7.69 mmol/L and processing of FB tended to decrease it ($P=0.09$). Replacing RSM by FB had no effect on arterial essential amino acids, but processing of FB increased or tended to increase arterial Arg, Leu and Val ($P\leq0.10$). Furthermore, abomasal infusion of Met increased arterial Met (19.7 vs. 26.7 µmol/L, $P<0.01$).

Interestingly, replacing RSM with FB resulted in similar milk yield. Processing of FB decreased N solubility and improved milk yield, whereas Met supplementation of FB diets was ineffective. Further milk production trials are needed.