Investigations on protein requirements of fattening bulls of the German Holstein breed

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Introduction

The objective of this study was to re-examine the recommendations of protein supply for fattening bulls, published by the German Society of Nutrition Physiology (GfE, 1995). The protein requirement is known to be closely linked to the N-requirement of the microbes in the rumen, substantially depending on the supply with metabolisable energy (ME). The N-requirement of the microbes is widely accepted to be appr. 1.62 g N/MJ ME.

Materials und Methods

The diets fed to the bulls were designed to meet the energy requirement according to the German recommendations (GfE 1995) for high body weight gain.

Design of the experiment

Animals:	62 bulls „German Holstein breed“
Fattening period:	194 kg – 550 kg live weight (LW) (duration of the experiment: 13 months)
Housing:	non isolated stable boxes (7 resp. 8 animals per box) slatted floor
Roughage:	maize silage fed ad libitum
Concentrates:	restricted feeding, rising from 2.1 to 3.2 kg/d according to live weight
Water:	free access
Data registration:	individually feed and water intake through a computerized feeding system
Analyses:	concentrate and silage samples were taken once or twice a week for dry matter and crude nutrient analysis
Statistics:	SAS-software package, NLIN procedure, broken-line-model

The concentrates fed to the bulls consist of wheat, sugar beet pulp, mineral premix and soybean oil. Furthermore soybean meal or peas were given as additional protein source. The protein feedstuffs were allotted to the various groups in different amounts, so that the protein supply met the GfE-recommendations (groups S I and P) or they were undersupplied (group S II) or oversupplied (group S III).

Results and Discussion

The mean intake of maize silage and concentrate, of crude protein (XP, g/d), ME (MJ/d) and the ratio g XP/MJ ME are summarized in Table 1.

Table 1: Average daily intake of maize silage (MS), concentrate (CC), soybean meal (SBM) and peas (P), crude protein (CP) and metabolisable energy (ME)

Group (n)	Phase	MS	SBM/P	CC	Total	XP	ME	XP/ME
	kg	kg DM/d				g/d	MJ/d	g/MJ
S I (15)	200 – 550	5.44	0.71	2.58	8.01	937	89.7	10.5
S II (16)	200 – 550	5.26	0.36	2.52	7.78	790	87.0	9.1
S III (16)	200 – 550	5.40	1.07	2.53	7.93	1068	88.9	12.0
P (15)	200 – 550	5.73	1.80	2.50	8.23	902	92.0	9.8

As the intake of utilisable crude protein (uCP) is known as limiting in the live weight range between 200 and 300 kg, the intakes in this phase were checked to be 896 g (group S I), 853 g (group S II), 943 g (group S III) or 891 g (group P), which indicates that the supply exceeded in all groups the GfE-recommendation of 779 g/d.

The results of growth and slaughter performance are given in Table 2.

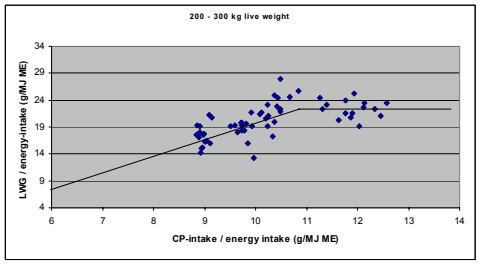
Table 2: Results of growth and slaughter performance

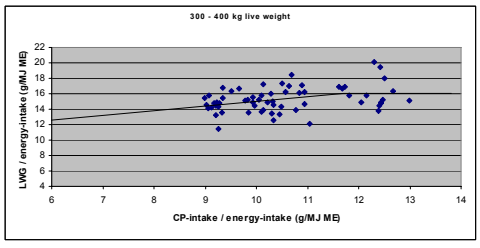
	Group			
	S I	S II	S III	P
Live weight gain (g/d)	1297[a]	1192[b]	1362[a]	1269[a]
Live weight before slaughter (kg)	545	542	544	543
Killing out percentage	54	54	54	54
Cavity fat (kg)	35[a]	30[b]	34[a]	35[a]

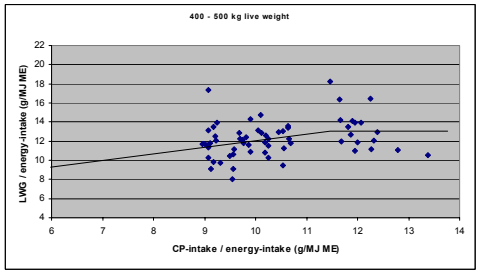
a > b ($p < 0.05$)

Average live weight gain (LWG) was registered on a high level for all groups. The data on slaughter performance do not show meaningful differences between groups, except of those for cavity fat, which was found to be lower in group S II.

In Figure 1 live weight gain is plotted against XP-intake. To eliminate the effect of ME-intake on live weight gain, CP and live weight gain were related to ME- intake.







Applying the broken line model for data analysis the following CP-requirements were estimated for the 100 kg phases:

200-300 kg LW	10.7 g CP/MJ ME
300-400 kg LW	11.7 g CP/MJ ME
400-500 kg LW	11.5 g CP/MJ ME

Conclusions

Comparing these results with the recommendations of the GfE, shows for 200-300 kg LW an underestimation of 1.8 g CP, for 300-400 kg LW conformity and for 400-500 kg an overestimation of 0.7 g CP.