N18.40 Effect of partial dehulling of barley on metabolizable energy determined in pigs.

U. Hennig*, S. Kuhla, W.B. Souffrant, A. Tuchscherer, and C.C. Metges
Research Institute for the Biology of Farm Animals, Dummerstorf, Germany

Introduction: Due to relatively high content of crude fiber (CF) in barley its energetic value is lower compared with that of wheat or corn. The energy digestibility of barley was negatively correlated to the CF content. In order to decrease the CF content in barley the husk (H) can be mechanically removed with unknown consequences for the energy value. **Objective** of the experiment was to investigate the effect of partial dehulling on metabolic energy (ME) of two barley varieties.

Materials and Methods: Five German Landrace barrows with 102 to 111 kg mean BW at the beginning and the end, respectively, were used to measure the effect of partial dehulling (-H) of two-row and six-row barley varieties (TRB-H and SRB-H vs. intact TRB and SRB) on ME from the experimentally derived levels of fecal digestible nutrients according to Hoffmann et al. (1993).
Diets were provided containing TRB + wheat gluten (WG), TRB-H + WG, SRB + WG, and SRB-H + WG (see **Table 1**). Pigs were supplied with diets according to a repeated group-period design at mean daily rates of 36 g DM × kg BW $^{-0.75}$. The contents of indigestible nutrients in WG, wheat straw, and boiled potato starch as further diet additives were determined in a preliminary experiment and were subtracted from the excreted nutrients of the barley assay diets.

Statistical evaluation of results was performed using a repeated measurement design and the procedure MIXED of SAS/STAT software, Version 8.2.

Table 1: Ingredient composition and analyzed nutrients of barley assay diets

Variety:	Two-row barley		Six-row barley	
Treatments:	TRB	TRB-H	SRB	SRB-H
Ingredient composition, g/kg diet DM:				
Barley	856	857	850	856
Wheat gluten	66	66	96	67
Steamed potato starch	-	-	14	-
Wheat straw	53	52	15	52
Mineral/vitamin premix [a]	25	25	25	25
Analyzed nutrient composition, g/kg diet DM:				
Crude protein [b]	194	198	206	189
Ether extract	25	27	27	25
Crude fiber	65	62	63	66
N-free extractives	693	693	682	699
Sugar	36	44	35	32
Starch	601	566	591	561
N-free residuals	121	145	119	172

[a] "Mineral feed for piglets No. 1152", Spezialfutter Neuruppin GmbH, Neuruppin, Germany
[b] Nitrogen × 6.25

Reference list:
1. Hoffmann, L., M. Beyer, and W. Jentsch. 1993. Arch. Anim. Nutr. 44:123-137.
2. Jung, H., G. Bolduan, B. Klenke, and R. Schneider. 1986. Die Wirkung geschälter Gerste in der Ration für Absetzferkel. Tierzucht 40 (2):81-82.

* E-mail: hennig@fbn-dummerstorf.de

Results: **Dehulling reduced CF only slightly** but increased N-free residuals (NfR) whereas CP remained nearly unchanged. **The levels of ADF and NDF were decreased in both TRB-H and SRB-H vs. intact varieties whereby in TRB-H this reduction was stronger.** In intact TRB compared to SRB the contents of CP and starch were numerically higher and the CF and NfR were lower (see **Table 2**).

Table 2: Effect of partial dehulling on crude nutrients in barley varieties (g/kg DM)

	Two-row barley		Six-row barley	
	TRB	TRB-H	SRB	SRB-H
Organic matter	977	980	977	980
Crude protein [a]	152	156	140	146
Ether extract	25	27	26	26
Crude fiber	44	40	63	45
Acid detergent fiber	52	45	61	58
Neutral detergent fiber	236	200	213	207
N-free extracts	756	757	748	763
Sugar	39	49	37	35
Starch	680	639	656	633
N-free residuals	81	109	118	140

[a] Nitrogen × 6.25

The fecal digestibility (D, %) of OM, CP, EE, and NfE was higher in TRB than in SRB. Consequently, the ME content was also higher in TRB than in SRB as shown in **Table 3**. In the TRB-H the ME content was higher than in SRB-H due to higher nutrient digestibilities.
Due to dehulling the D of OM, EE, NfE, and NfR were elevated. Consequently, **considering changes in both crude nutrients and in digestibility associated with dehulling the ME contents were increased**.

Table 3: Fecal digestibility of nutrients and ME contents in barleys

	Two-row barley		Six-row barley		*P* values	
Treatment	TRB	TRB-H	SRB	SRB-H	Variety	Treatment
Nutrient digestibility (%) of barley [a]:						
OM	88.9	90.7	85.4	86.5	0.002	0.034
CP	87.0	87.4	83.8	85.9	0.004	0.177
EE	73.9	60.6	63.3	59.1	0.001	0.001
CF	36.8	53.9	34.6	23.5	0.005	0.306
NfE	92.7	94.3	90.7	91.3	0.004	0.021
NfR	0.0	43.7	6.8	28.5	0.509	0.001
Contents of ME (MJ/kg DM):						
ME [a, b]	15.8	16.1	15.1	15.4	0.001	0.033

[a] Values are Last Square Means (LSM); each LSM represents 5 pigs.
[b] Based on fecal digestible nutrients using following equation according to Hoffmann et al. (1993):
ME (MJ/kg DM) = (0.0205 × digested CP) + (0.0398 × digested EE) + (0.0173 × digested starch) + (0.0160 × digested sugar) + (0.0170 × digested N-free residuals); all nutrients are given in g × kg^{-1} DM.
Starch and sugar are assumed to be 100% digestible.

Implication: **TRB was characterized by a higher feeding value concerning digestible nutrients and energy than SRB. Dehulling could be an alternative to improve the feed value and might be responsible for the positive growth response of piglets fed dehulled barley as previously found by others (Jung et al., 1986).**