

Monitoring of rapeseeds with consideration of the produced feed

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In rapeseed (RS) breeding and production, oil is the main constituent whose concentration affects that of the non-fat constituents occurring in solvent extracted rapeseed meal (RSM). Representative numbers of rapeseed batches should be investigated with calculations of the feed-relevant constituents in the non-fat part.

Methods: Samples originated from the Thuringian harvest of 2017 (n=79) and 2018 (n=75). The content of dry matter (DM), fat, protein and glucosinolates (GSL) was determined by the NIRS technique, that of P and S by ICP-AES after pressure digestion (DIN EN15621).

Results: In the RS, the studied compounds represented a high variance (Table 1) in a similar magnitude between the two years. Considering the limited GSL tolerance mainly of pigs, 18 mmol/kg RS represent an upper limit. This was exceeded by 11 samples in 2017 and by 6 samples in 2018. There was a highly significant linear relationship between the GSL and S content in RS with coefficients of determination of 0.7 for both harvest years (P<0.001).

Table 1: Content of the main constituents analysed in the rapeseed batches from two harvests in Thuringia, mean ± SD (min. - max.)

Year	n	Dry matter (DM) (% of the seed)	Ether extract (% DM)	Crude protein (% DM)	Phosphorus (g/kg DM)	Sulfur (g/kg DM)	Glucosinolates (mmol/kg DM)
2017	79	92.7 ± 1.1 (87.4 – 94.4)	48.4 ± 1.5 (43.8 – 51.2)	19.5 ± 1.4 (16.7 – 23.9)	7.0 ± 0.9 (4.9 – 8.8)	4.1 ± 0.4 (3.2 – 5.7)	16.8 ± 3.3 (10.8 - 32)
2018	75	93.4 ± 0.9 (90.2 – 95.6)	47.2 ± 1.8 (42.2 – 50.9)	20.1 ± 1.4 (16.1 – 24.1)	6.8 ± 0.9 (4.8 – 9.2)	4.3 ± 0.4 (3.3 – 6.1)	16.2 ± 3.4 (8.5 – 34.7)

Negative linear relationships were confirmed between the fat and the protein content of the RS harvested in 2017 (Figure) and 2018 (not shown), with coefficients of determination of 0.6 and 0.7 (P<0.001). More fat results in less protein and vice versa.

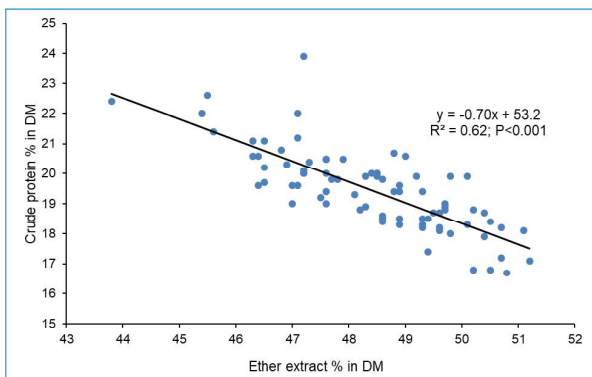


Figure: Relationship between the content of oil and crude protein in rapeseed from the 2017 harvest (n=79)

Higher content of lysine (Table 3) and further amino acids in the fat-free DM of the RS compared with RSM and therefore higher protein quality than RSM.

Table 3: Lysine in the rapeseed (RS) from the harvests 2017 and 2018 on basis dry matter (DM), fat-free DM and g/100 g crude protein (CP) as expression for protein quality (21 samples per year, each 3x7 with low, intermediate and high content of CP (mean ± standard deviation, min.-max. range in brackets) as compared with the RS and rapeseed meal, solvent extracted (RSM) according to UFOP monitoring of rapeseed feeds (Weber 2015)

Calculation basis	Lysine in RS Studied 2017	Lysine in RS Studied 2018	Lysine in RS (DLG 2014)	Lysine in RSM (Weber et al. 2016)
DM, g/kg	13.0 ± 1.0 (11.3-14.7)	13.0 ± 1.2 (11.1-14.7)	14.0	22.1
FFDM, g/kg	25.0 ± 1.1 (23.2-26.8)	24.4 ± 1.2 (21.8-26.4)	25.5	22.8
CP, g/100g ¹⁾	6.6 ± 0.3 (5.7-7.0)	6.5 ± 0.2 (6.1-6.9)	6.1	5.8

¹⁾ criterion of protein quality

References

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In the RS varying on DM basis between 42 % fat with 23.7 % protein and 52 % fat with 17 % protein, one percent fat was associated with a changed protein content by 0.7 (2017) and 0.6 % (2018) in the DM (Table 2). In the RSM (similar to fat-free DM in the RS), the protein content would range from 35 to 40 % of the DM.

Table 2: Crude protein (CP), ether extract and metabolizable energy of the rapeseed meal, solvent extracted (RSM) theoretically made from rapeseed (RS) with low, intermediate and high oil content (transition of 10 g oil/kg dry matter, DM into the „rest“) – Calculation of the Metabolizable Energy; ME (pigs) according to the German Feed Tables (DLG, 2014)

	RS, ether extract % in DM		
	42	47	52
Oil extracted (g/kg DM)	410	460	510
RSM with 10 g fat (DM)	590	540	490
- thereof CP (g)	237	203	170
	Resulting RSM		
- CP (g/kg DM)	402	376	347
- ether extract (g/kg DM)	17	19	21
- ME, pigs (MJ/kg DM)	12.45	12.36	12.28

Considering the P on basis of the RS-fat-free DM (Table 4), there is a similar content in the 2018 harvest than that of the RSM in the feed tables (DLG 2014, FEEDIPEDIA 2018), whereas for 2017 the mean was somewhat higher. In general, the P content of RS-fat-free DM varied stronger than that of RSM from the French data collection.

Table 4: Phosphorus (P) in the rapeseed (RS) from the harvests 2017 and 2018 on basis fat-free DM¹⁾ (mean ± standard deviation, min.-max. range in brackets) as compared with the RS and rapeseed meal, solvent extracted (RSM) according to German Feed Tables (DLG, 2014) and French Feed Tables (FEEDIPEDIA 2018)

P in RS Studied 2017	P in RS Studied 2018	P in RSM (DLG 2014)	P in RSM (FEEDIPEDIA 2018 ²⁾)
FFDM, g/kg		DM, g/kg	
13,6 ± 1,8 (9.4-17.2)	12,9 ± 1,7 (8.8-17.1)	12,0	12,7 ± 0,9 10,5-14,7

¹⁾ for the P in the RS DM see Table 11, ²⁾ solvent extracted, ³⁾ n=526

Conclusion: Studying the crude protein and phosphorus as content in rapeseed fat-free matter, gave a good prediction for their contents in RSM depicted in the feed tables. The GSL need further attention, due to their degradation during the toasting in the oilmills.