15th International Rapeseed Congress
Berlin 16.-19.06.2019

Rapeseed feeds for swine - Recent studies and perspectives

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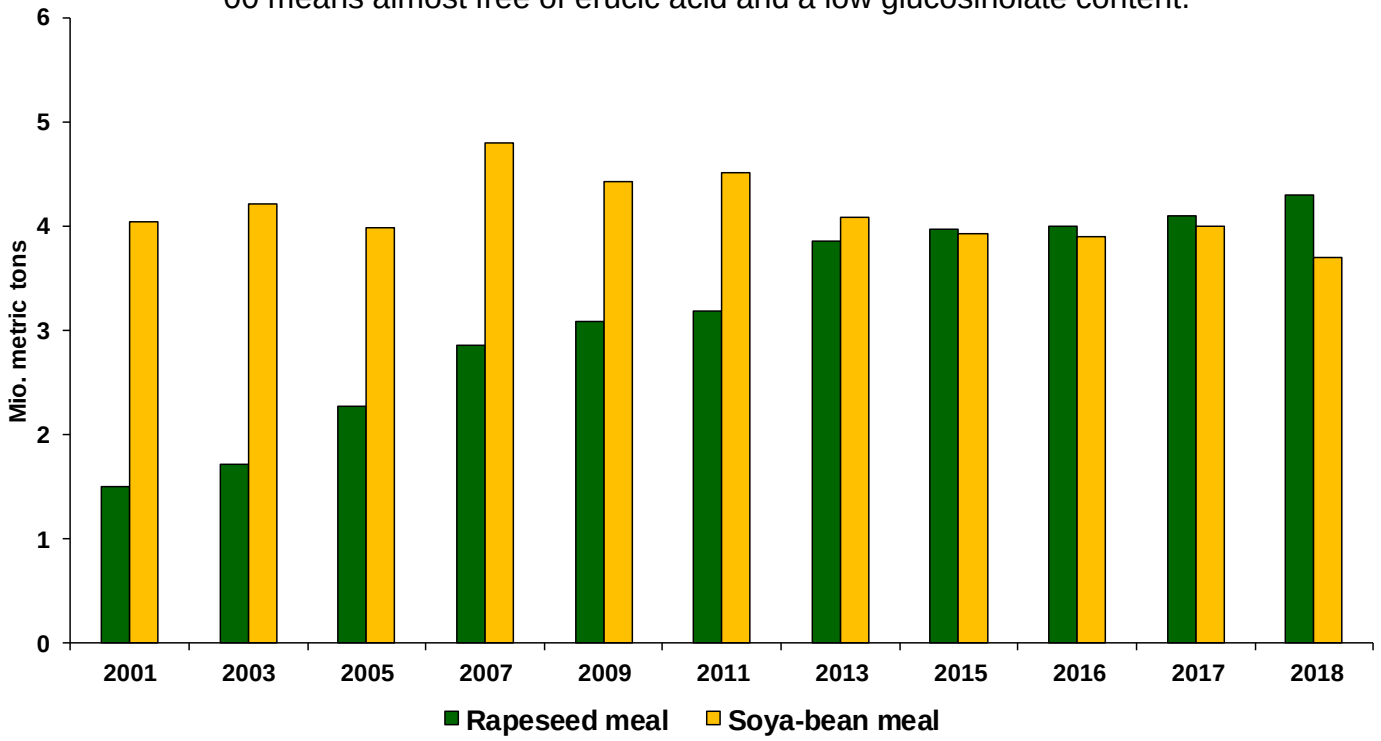
Use of rapeseed meal and soya-bean meal in Germany

(OVID Assoc. of Oilseed Processing Industry D)

Since the 1990s only 00 rapeseed is grown and processed in Germany.
00 means almost free of erucic acid and a low glucosinolate content.



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https://www.ovid-verband.de/positionen-und-fakten/ovid-diagramme/#gallery-32

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Pig performance data yesterday and at present in Germany

- data from > 100,000 fattening pigs, > 1 mio. sows and litters -

	1998	2018
Fattening pigs, 28-115 kg live weight		
-Weight gain, g/day	699	834
-Feed: gain ratio, kg/kg	2.98	2.78
Farrowing performance		
-piglets born alive per litter	10.3	14.7
-piglets weaned per litter	8.9	12.9
Performance weaned piglets up to 28 kg live weight		
-Weight gain, g/day	no data*	434
-Feed: gain ratio, kg/kg	no data*	1.70

*400 g/day and 1.90 as results in former piglet experiments

https://erzeugerring.info/

Rapeseed feeds – Rapeseed meal, solvent extracted (RSM) and rapeseed press cake/ expeller

1. Production (00 Quality) and pig yield levels
2. Fiber and available energy
3. Protein quality and toasting
4. Acceptance/performance and thyroid health of g/f pigs and sows – Is there a glucosinolate problem, also now?
5. Phosphorus and phytase
6. Recommendations and conclusions

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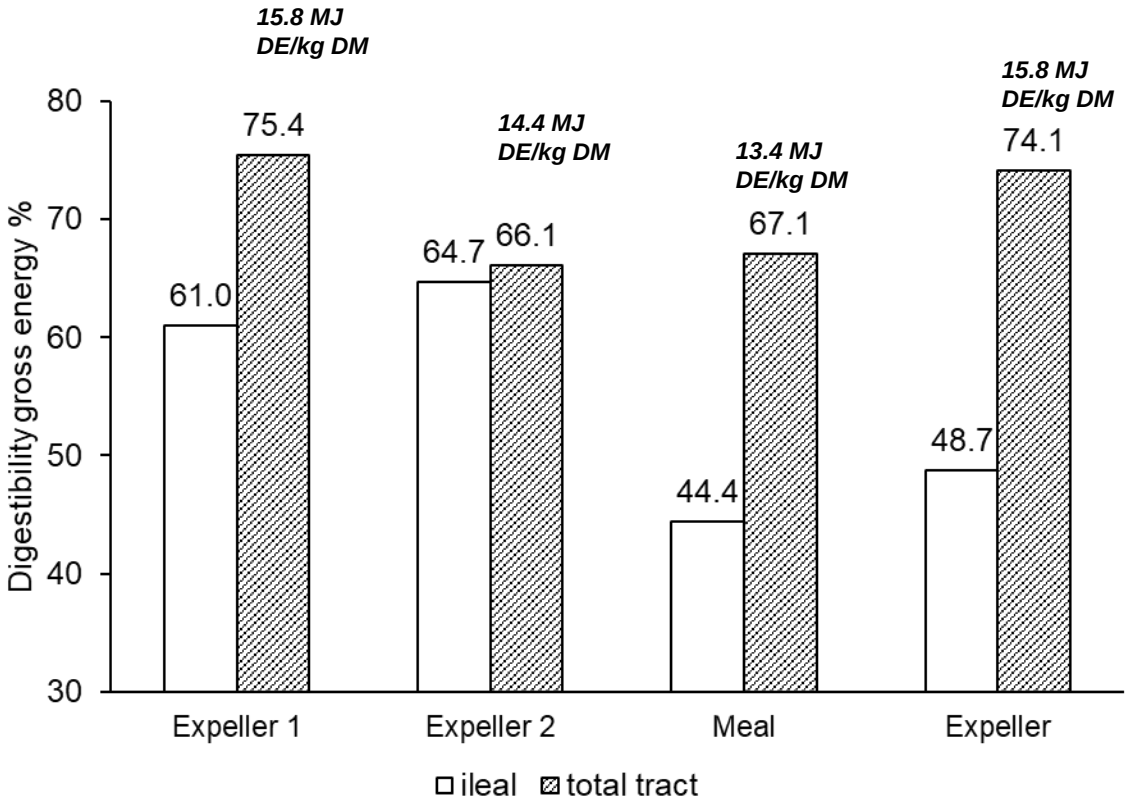
Rapeseed meal/Canola meal solvent extracted (RSM/CM) vs. soya-bean meal (SBM) – Fiber and Energy

(Basis 89% dry matter, DM)

		RSM[1)] 34% CP, 3% fat	CM[2)] 36% CP, 3 fat	SBM[2)] 44% CP, 1.2% fat
Acid detergent fiber	g/kg	206	150	67
Acid detergent lignin	g/kg	85	?33?	16 [3)]
Digestibility energy	%	67 [3)]	76	86
Metabolisable energy	MJ/kg	10	12.3	14.2

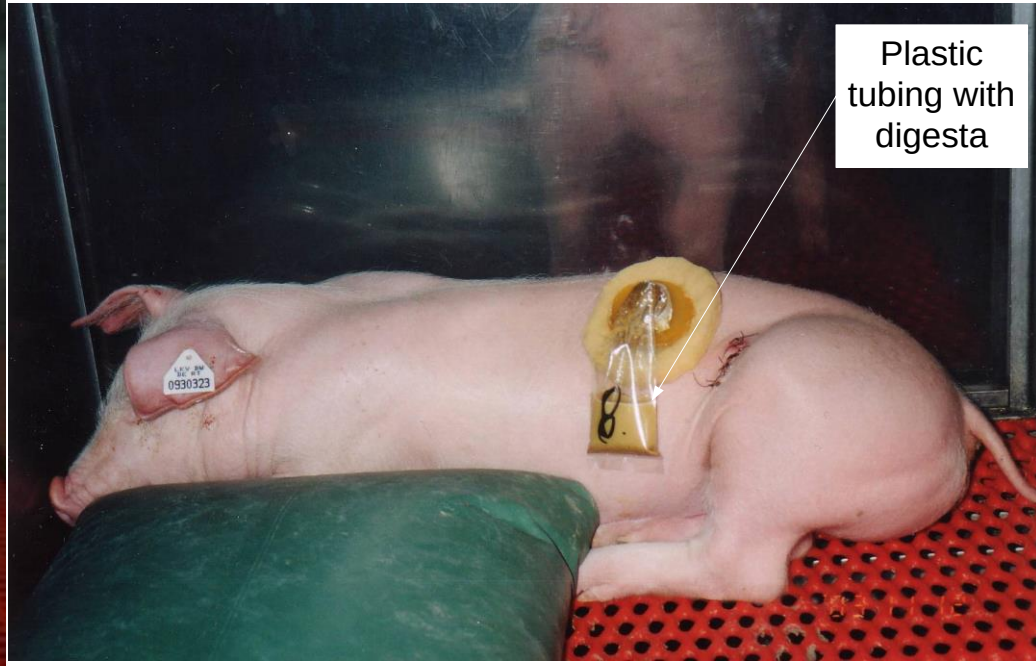
[1)] UFOP monitoring (Weber, M. 15th IRC Berlin 2019, Poster 514)
[2)] NRC: Nutrient requirements of swine. 11th rev. ed. Natl. Acad. Press, Washington, DC. 2012
[3)] digestible org. matter (DLG-Futterwerttabellen SCHWEINE, DLG Feed-Tables Swine, 7th Ed., Frankfurt, M. 2014)

Digestibility of energy (DE) of two batches expeller pressed B. napus canola 13.3 and 13.8% fat and of canola meal, solvent extracted, 3.2 % fat vs. expeller, 10.9 % fat according to three studies with cannulated pigs



Seneviratne et al. (2010):J. Anim. Sci. 88, 2073-83// Seneviratne et al. 2011:J. Anim. Sci. 89, 2452-61

Woyengo et al. (2016): Anim. Feed Sci. Technol. 222, 7-16

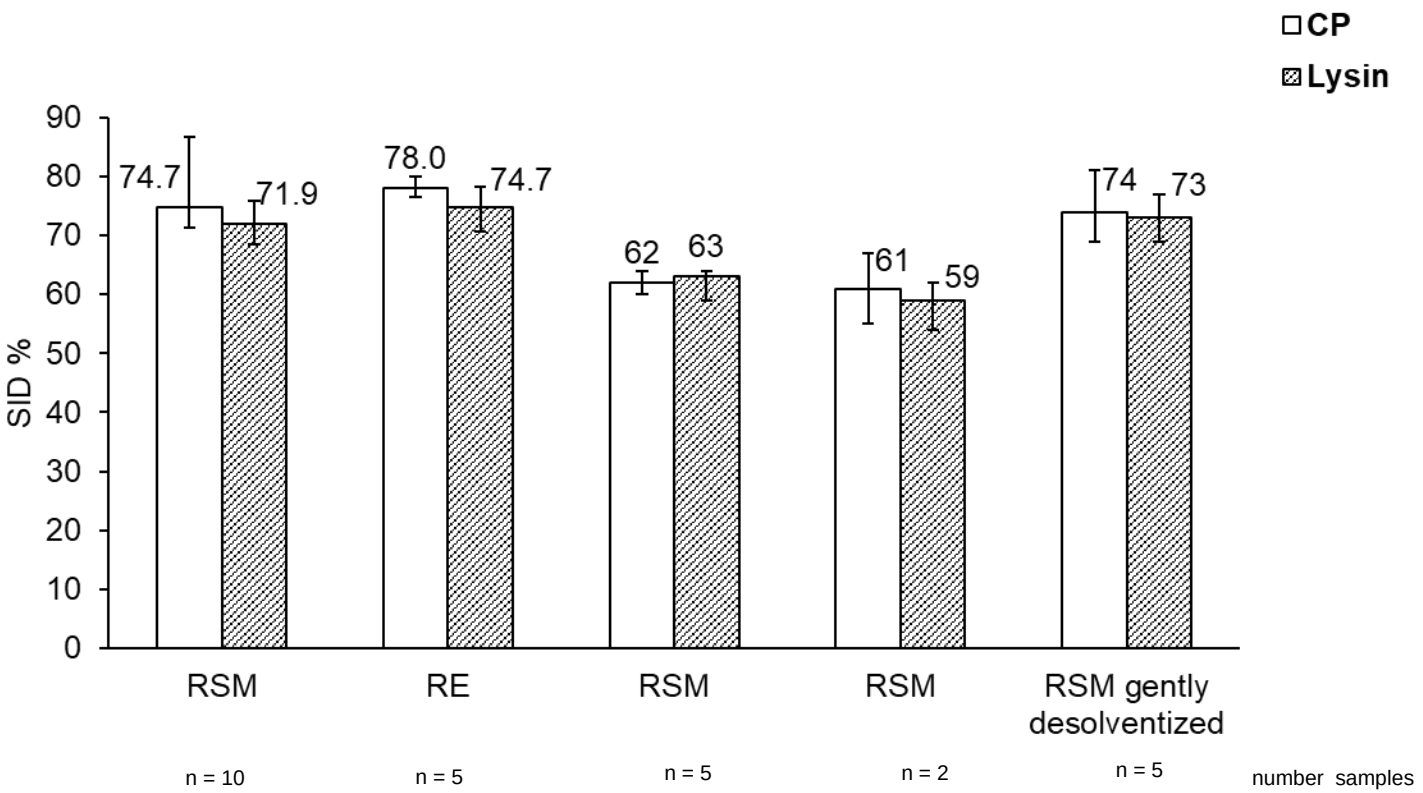


Simple ileal T-cannula for digesta collection and digestibility studies

by courtesy of R. Mosenthin

Standardized ileal digestibility (SIS) of crude protein (CP) and lysine in European rapeseed meal, solvent extracted (RSM) and rapeseed expeller (RE).

Mean and max.-min. range

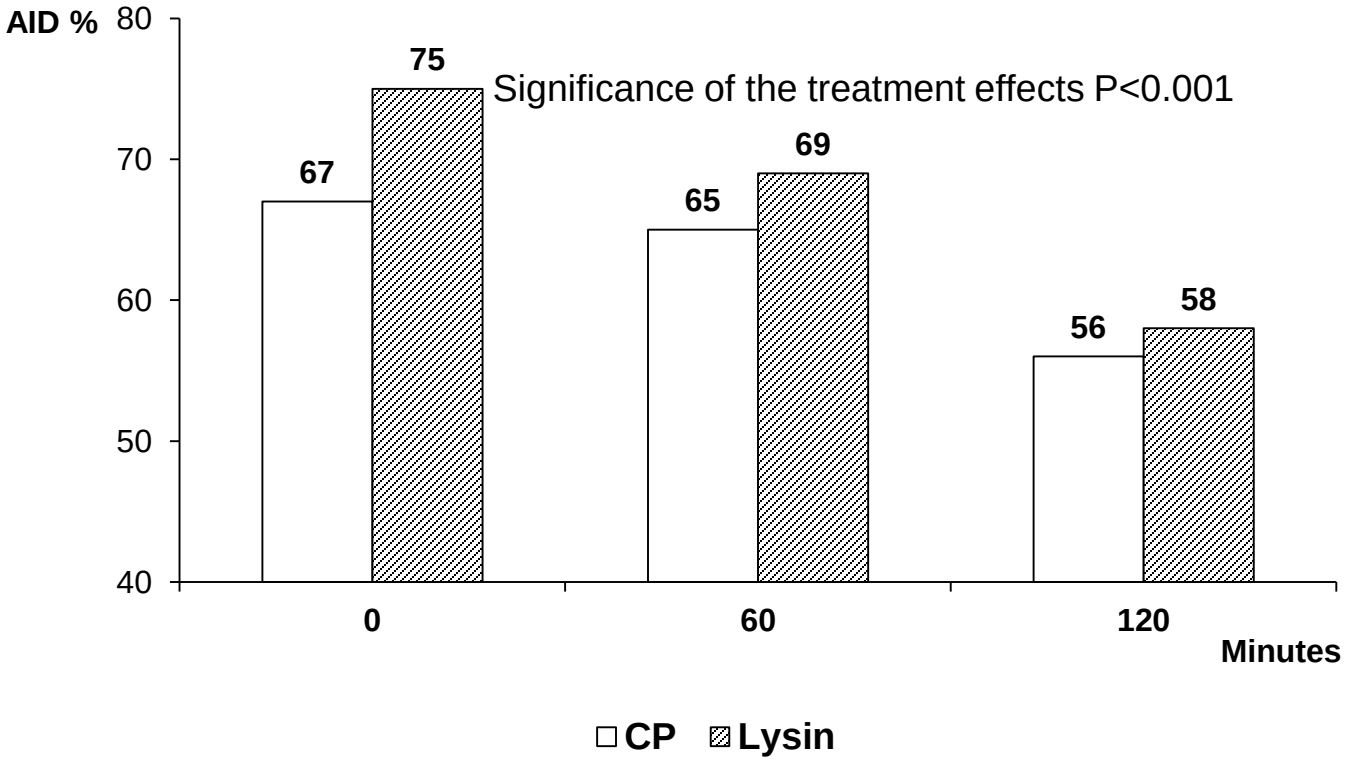


Maison and Stein (2014):J. Anim. Sci. 92:3502–3514

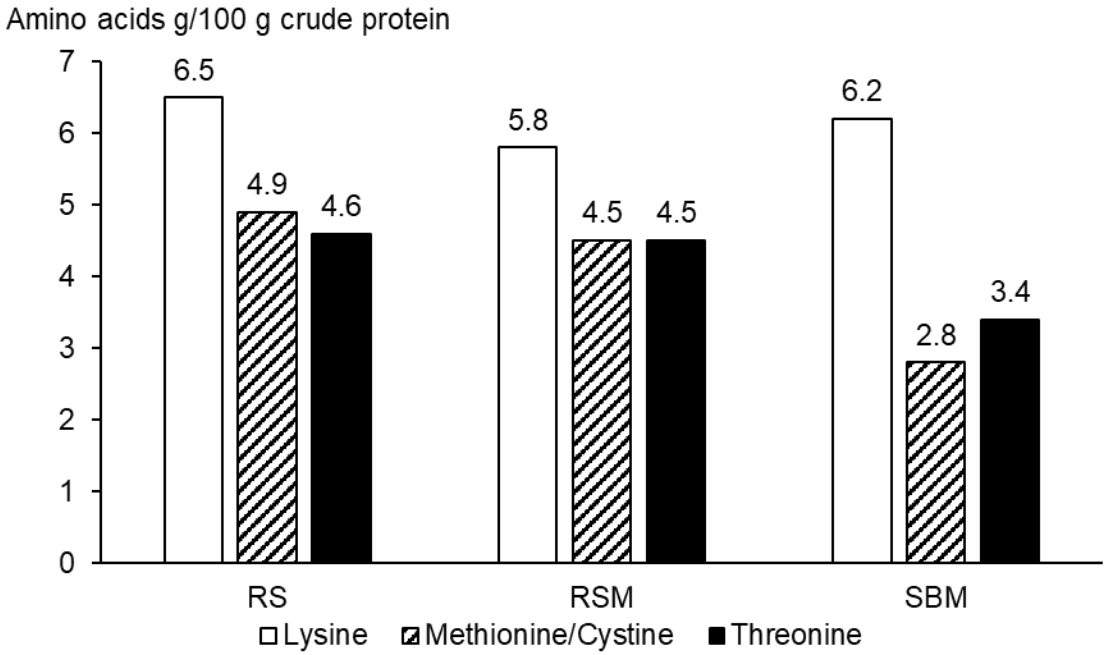
Messerschmidt et al. (2014): Anim. Feed Sci. Technol. 187:68–76

Kasprzak et al. (2017): Live-stock Sci 208, 2018, 22-27

Toasting intensity and apparent ileal digestibility (AID) of crude protein (CP) and lysine (Salazar-Villanea et al. 2018: Animal 12, 950-958. *doi*: *10.1017/S175173111700247)*



Protein quality of rapeseed (RS) from Thuringian harvest 2017 and 2018 and solvent extracted rapeseed meal (RSM) as well as soya bean meal (SBM)



RSM solvent extracted for sows in two long-term experiments in France and Germany

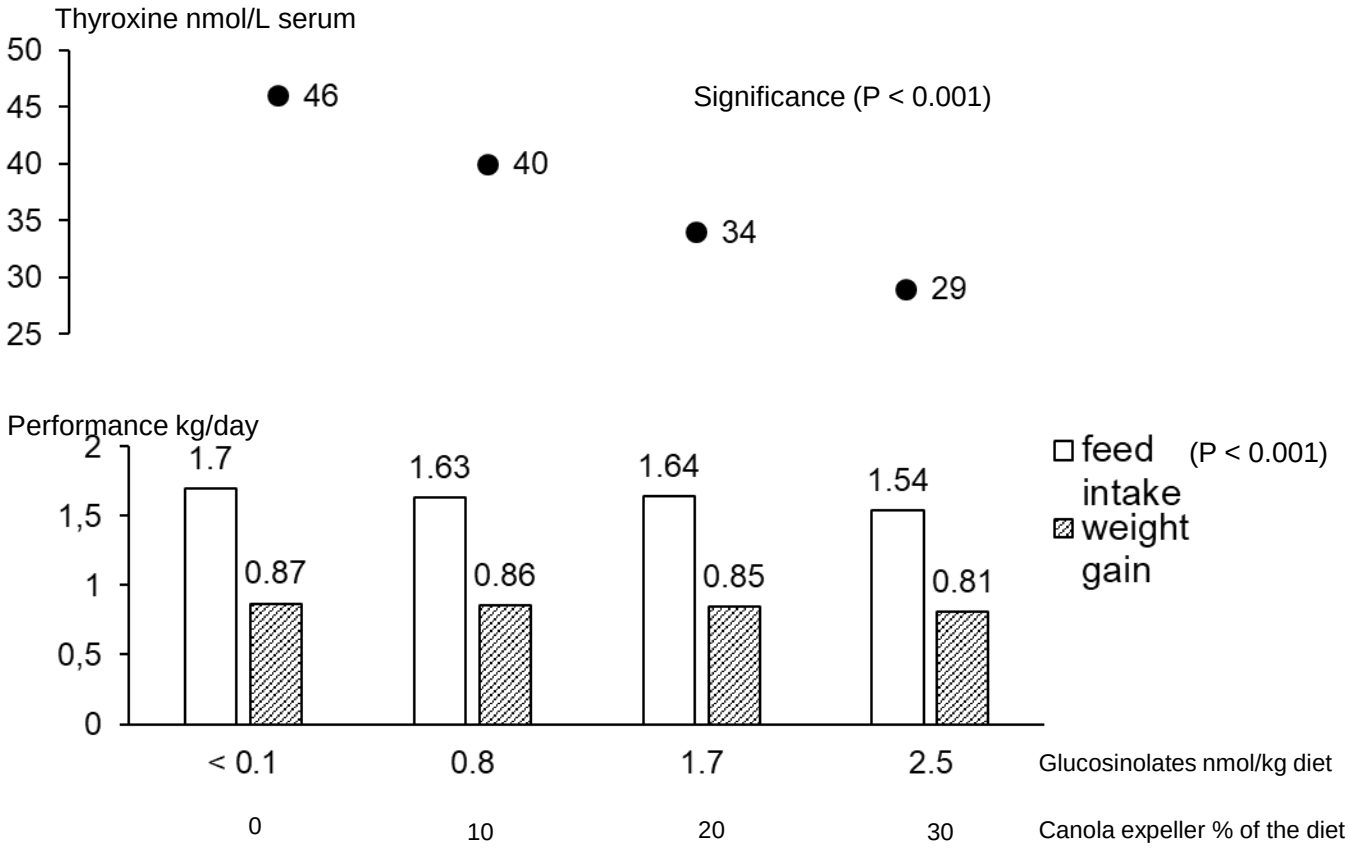
F: Quiniou et al. (2012) 25-27 sows per group in 3 reproduction cycles 28 days per lactation, D: Preißinger et al. (2014) 24 sows per group in 4 reproduction cycles, 26-28 days per lactation

		Quiniou et al. 2012		Preißinger et al. (2014)	
		Control	**10%RSM**	**Control**	**15%RSM**
Per litter - piglets born alive	n	12.2	12.2	12,9	12,4
- piglets weaned	n	10.7	10.9	11,8	11,2
Weaning weight per piglet	kg	9.4	9.4	8,05	7,94
Weight gain - per piglet	g/d	282	282	238	236
- per litter	kg/d	2.79	2.89	2,82	2,66

Quiniou et al. 2012: Can. J. Anim. Sci. 92, 523-524, doi:10.4141/CJAS2012-039
Preißinger et al. 2014:UFOP-SCHRIFTEN | AGRAR
https://www.ufop.de/files/6714/3887/5150/RZ_UFOP_1263_Schriften_Agrar_Zuchtsauen_150521.pdf

Canola expeller in a four-week trial with 4x12 pigs, initial body weight 20 kg, 0.4 mg iodine/kg diet

Velayudhan et al.: J. Anim. Sci. 95 (2017) 302-307



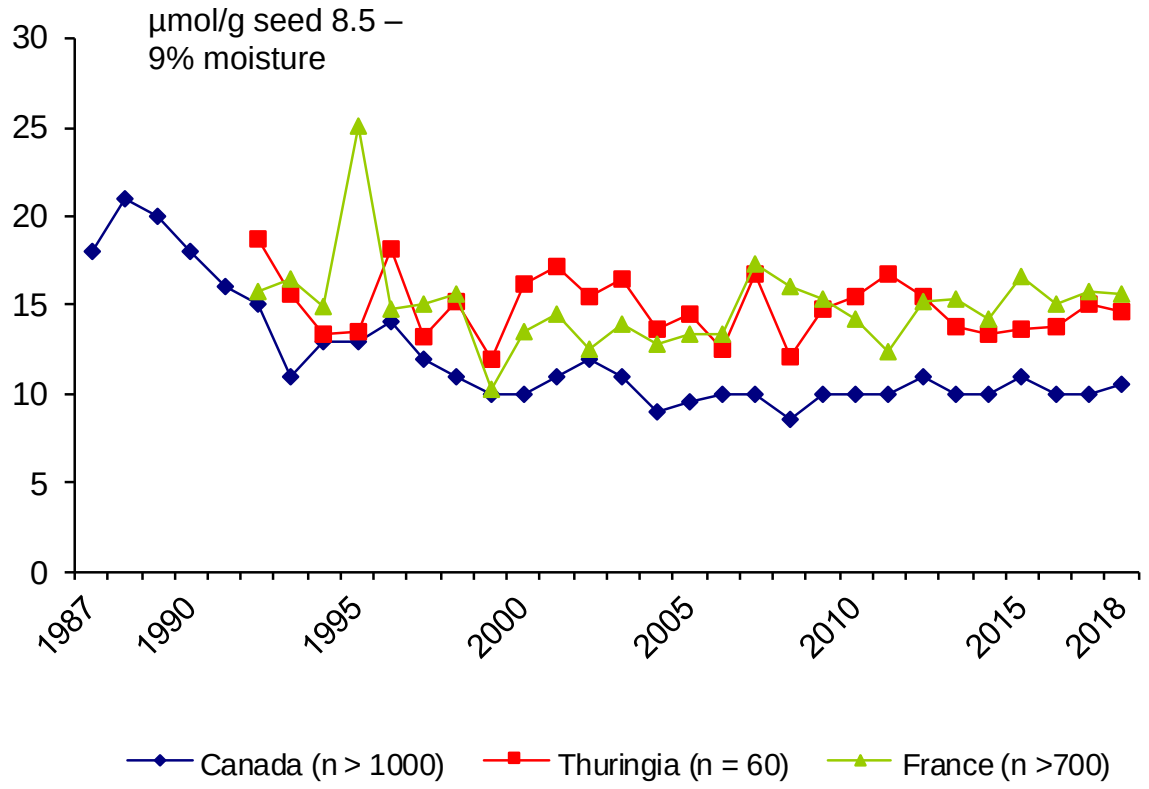
Perfomance and health of pigs in dependence on the glucosinolate content of the diet

Endocrinol. Exp. 24 (1990) 415-427; Fat Sci. Technol. 95 (1993) 147-154; Anim. Feed Sci. Technol. 62 (1996) 97-110; J. Sci. Food Agric. 74 (1997) 69 – 80; Br. J. Nutr. 78 (1997) 947-962; Arch. Anim. Nutr. 55 (2001) 333-350; Meat Science 72 (2006) 365 – 372

	Glucosinolates mmol/kg diet			
	0	0.5 – 1[1)]	1.5	3.0
Feed intake, weight gain				↓
SCN^- im Serum		(↑)	↑ ↑	↑ ↑
Thyroxine Serum			(↓)	↓ ↓
Thyroid weight			↑	↑ ↑
Iodine in the thyroid		↓	↓ ↓	↓ ↓

[1)] per kg diet 100 g RSM with <10 mmol Glucosinolaten/kg

Mean glucosinolate content of harvested 00-rapeseed from three long-term monitorings [1)]

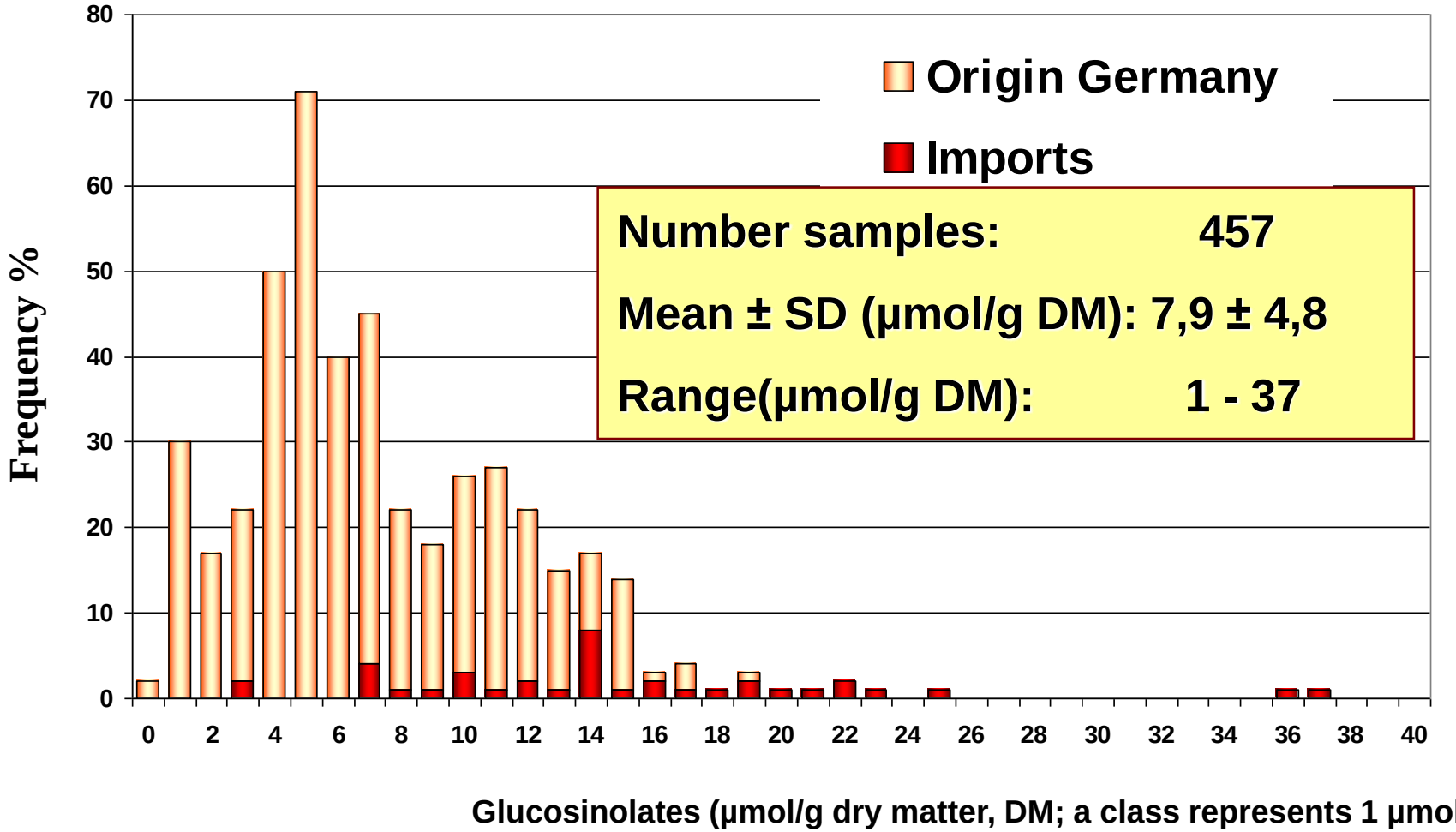


[1)] Number samples per year in brackets; in Canada started the 00-quality (spring rapeseed!) growing sooner than in France or in Germany

Lit.: Canadian Grain Commission, 1987 – 2018: Reports on the quality of Western Canadian Canola.

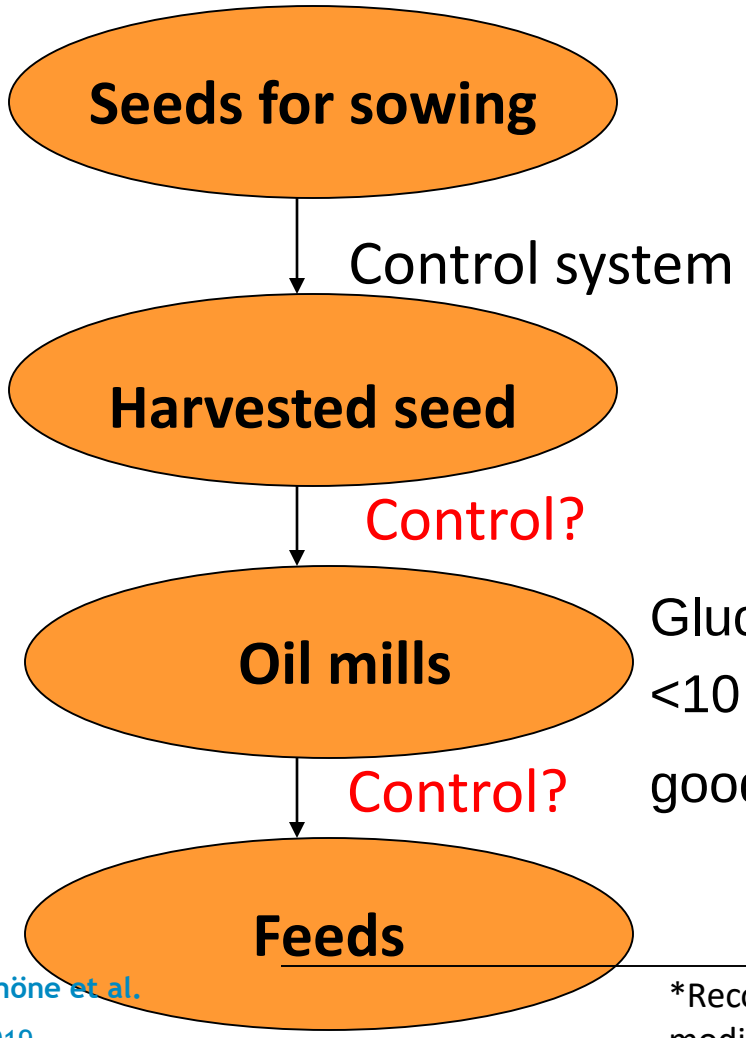
•Thuringian dates from official varieties tests and research, France: Labalette F. *et al*.. 2011. Glucosinolates content, an important quality parameter monitored at each stage of the French rapeseed production chain. *Proc. 13th Int. Rapeseed Congress*, Prague, 2011, 438-442., and recent data from Terres Univia – Terres Inovia (http://www.terresunivia.fr/sites/default/files/articles/publications/cultures_utilisations/qualite_graines/QG_colza_2018.pdf)

Glucosinolate content of rapeseed meals from 28 compound feed plants (Schumann, 2005)[1)]



[1)] Glucosinolatgehalt von in Deutschland erzeugten und verarbeiteten Rapssaaten und Rapsfuttermitteln. UFOP-Schriften, Heft 27, 69 Seiten, https://www.ufop.de/files/9513/3922/7312/Glucosinolatgehalt_Bericht.pdf

Rapeseed Quality Chain*



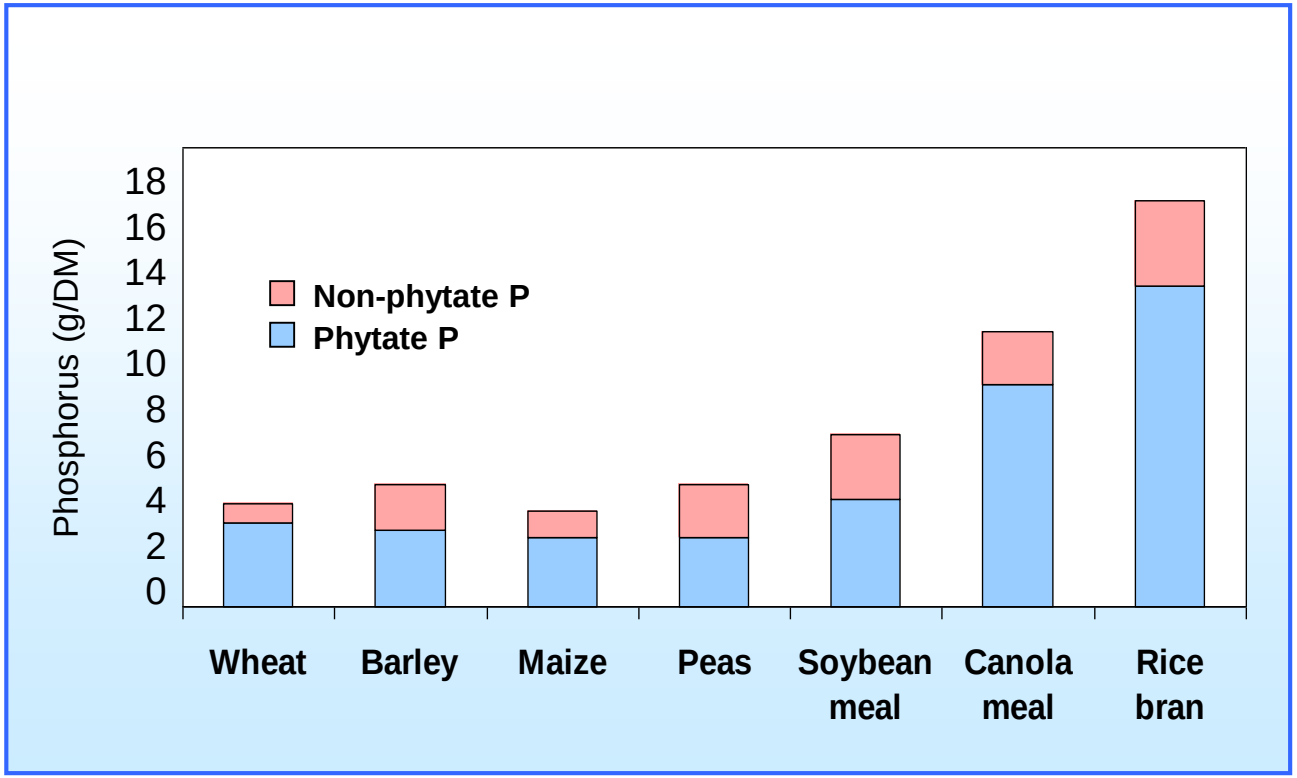
Glucosinolates µmol/g seed

EU: 25 Germany: 18 Canada: 12

Glucosinolates mmol/kg solvent extracted meal

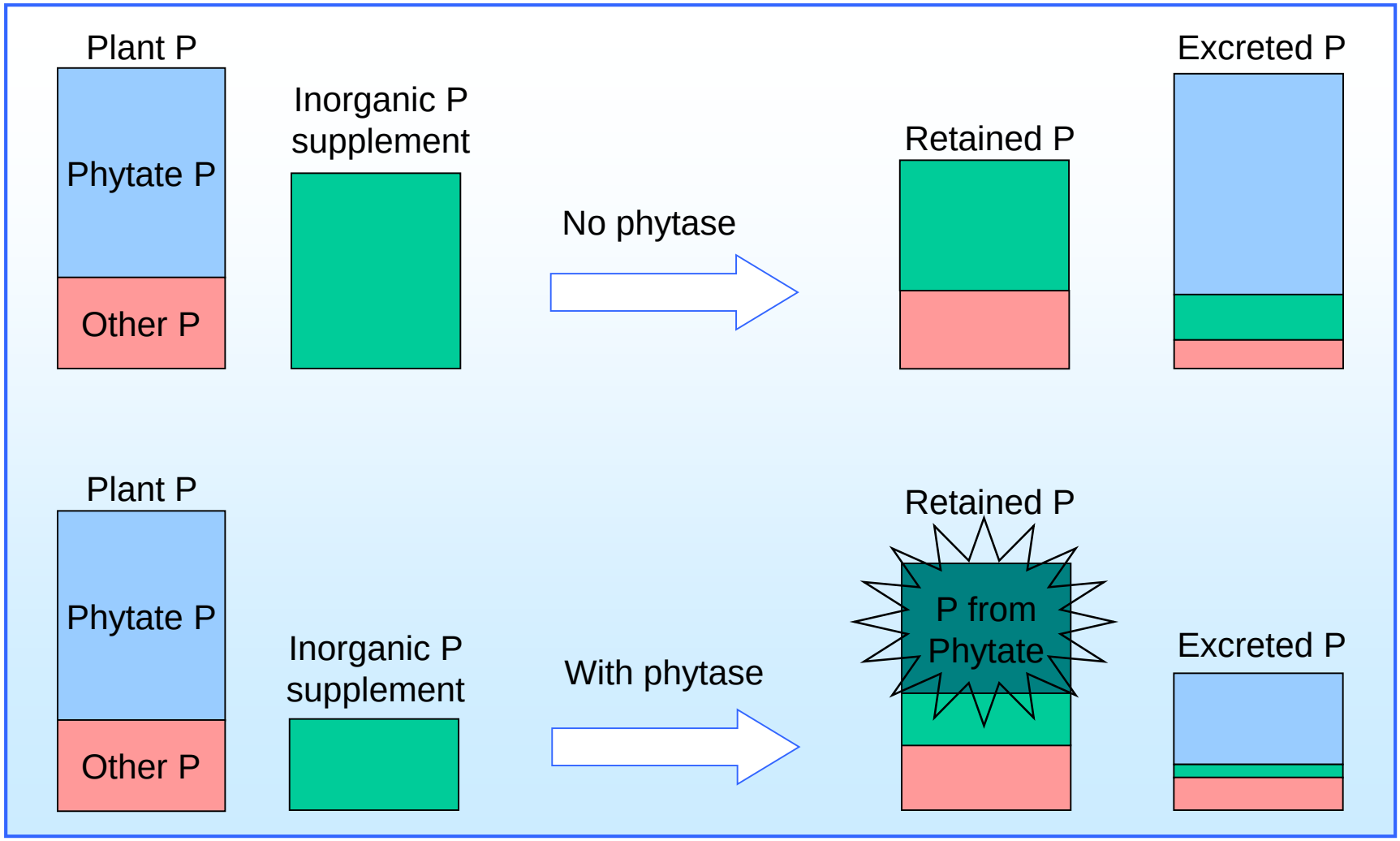
<10	10-15	15-20	>20
good	satisfying	not satisfying	not acceptable

*Recommendations 11th Int. Rapeseed Congress Copenhagen 2003 modified.



Phosphorus content of selected feedstuffs (ALTEMUELLER and CAMPBELL 2009, mod.)

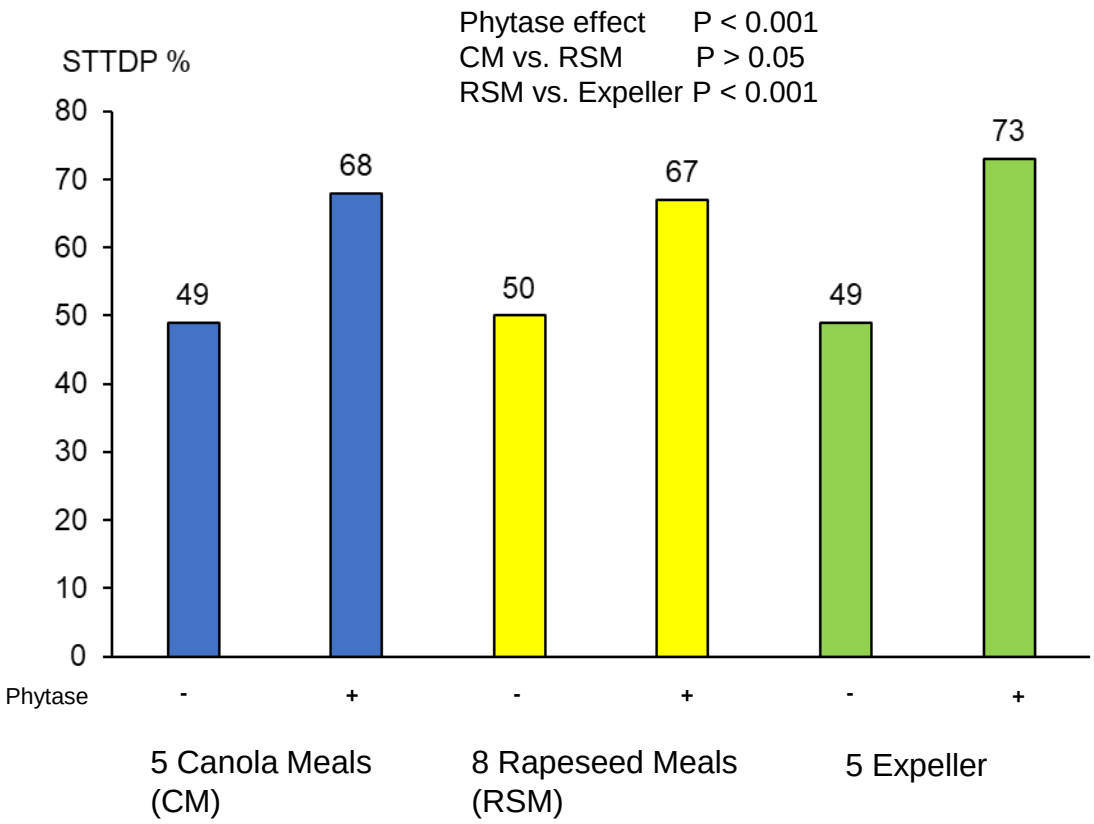
Int. Pig Topics 2009 Vol.24, No.7, 7-9.
https://www.yumpu.com/en/document/view/23123628/download

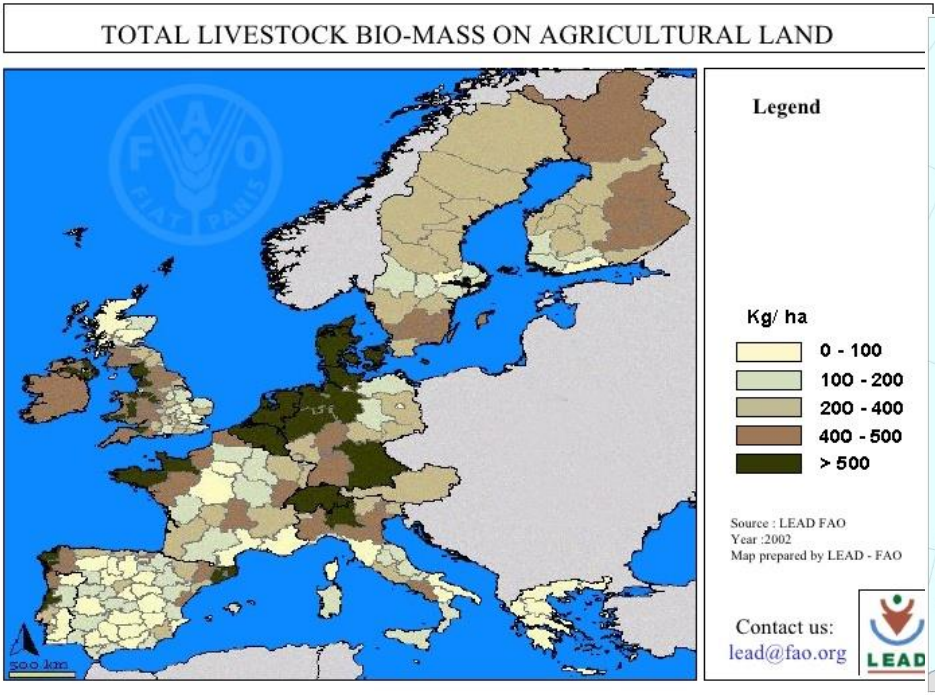


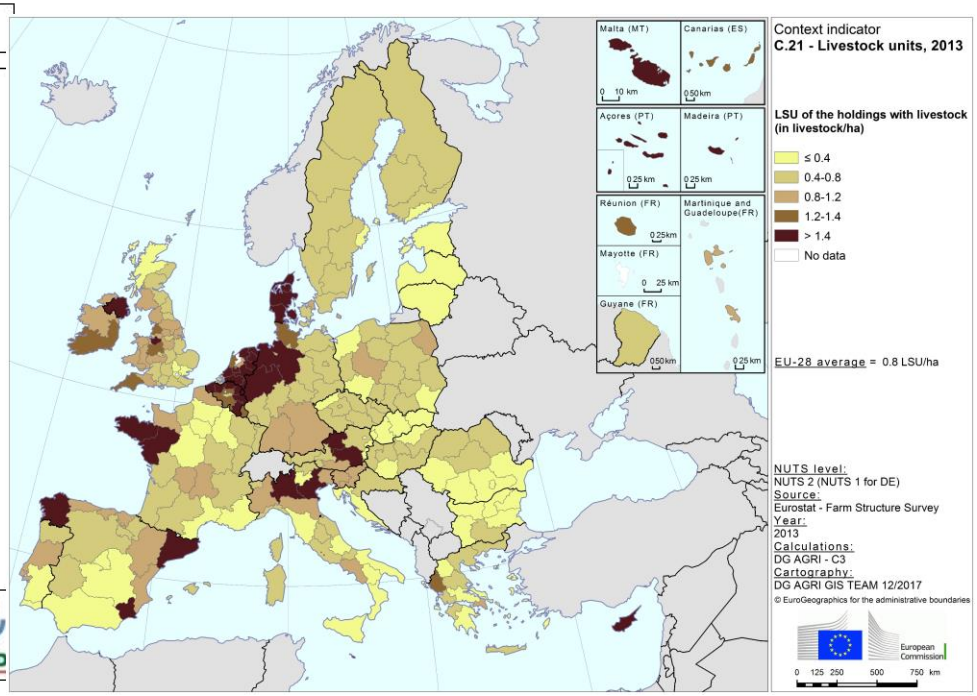
The principle of phytase addition (ALTEMUELLER and CAMPBELL 2009)
Int. Pig Topics 2009 Vol.24, No.7, 7-9.
https://www.yumpu.com/en/document/view/23123628/download

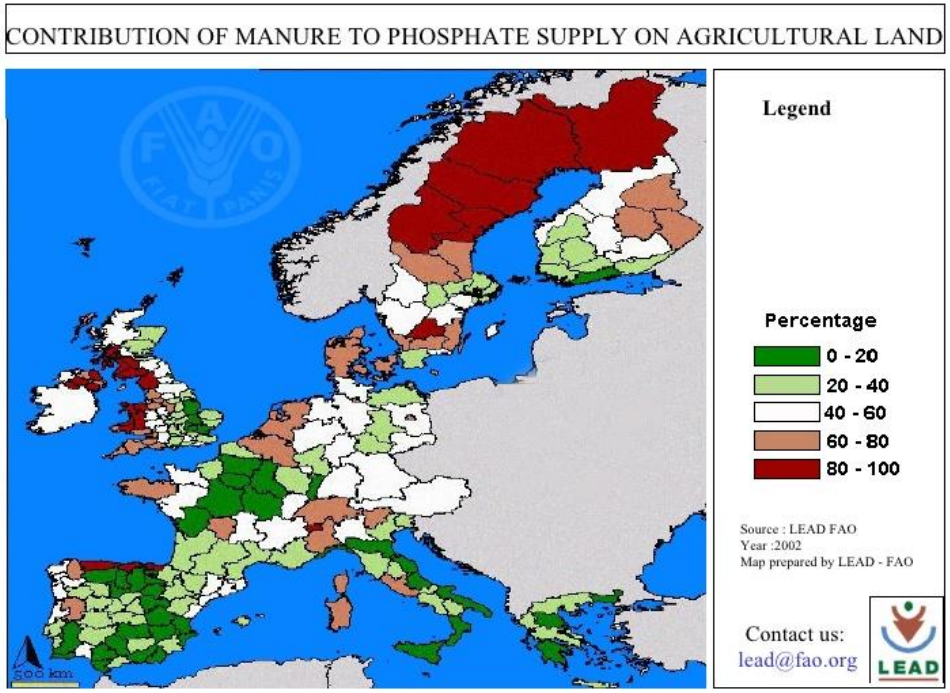
Standardized total tract digestibility of phosphorus (STTDP) of rapeseed feeds without vs. with added phytase (1500 U/kg diet)

Testing of 2X18 diets, each with 40% RF as sole phosphorus source, in 36X6 barrows over 12 days
(Maison et al. 2015: J. Anim. Sci. 93, 3494-3502)









High livestock density with high nitrogen and phoshorus load in benelux and in the north-western region of Germany.

In spite the high P content of the manure extra P via mineral ferilizers is applied.

1 LSU refers to a cow with 500-700 kg body weight. Livestock dependent on species and age is aggregated by using respective conversion factors, e.g. for g/f pigs 0.3 and breeding sows 0.5 LSU.

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Maximum inclusion levels for solvent extracted rapeseed meal (RSM) as compared with CM

Even low percentages of rapeseed feeds require additional iodine.

	UFOP (Weber and Preißinger 2014, Weber et al. 2016)	Canola meal feeding guide 2015
	% of the diet	
Pig growth		
Weaned piglets (wk. 5-10; 42-45 d)	5-10	20
Growing pigs	10	25
Finishing pigs	15	25
Breeding sows		
low pregnancy	5	-
high pregnancy and lactation	10	20

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Weber and Preißinger, 2014: Rapsextraktionsschrot in der Sauen- und Ferkelfütterung. https://www.ufop.de/files/7414/1465/6616/RZ_UFOP_1240_Praxis_RES_Ferkel-WEB.pdf

Weber et al., 2016: Rapsextraktionsschrot in der Schweinemast https://www.ufop.de/files/1514/5682/7726/RZ_Web_UFOP_1366_Praxisinfo_010316.pdf

Canola Council of Canada, 2015: CANOLA MEAL FEEDING GUIDE, FEED INDUSTRY GUIDE • 5th EDITION. https://www.canolacouncil.org/media/516716/2015_canola_meal_feed_industry_guide.pdf

Conclusions

Need for valid data of fiber contents and standardized ileal energy digestibility (SIED) related to RS breeding and processing

Future calculation of ME and NE from SIED data

Need for data of AA availability related to RS breeding and processing

Glucosinolates redistribute the organism´s iodine with less in thyroid and milk and more in extrathyroid and extramammary tissues, urine and faeces. More iodine added to feed for compensation!

Establishing a quality chain for RS and derived RSM and RPC by using GSL analysis

High P content may be beneficial by making the dominating phytate P bioavailable via phytase addition to the feed