



Chemical characteristics focusing on dietary fibre content and composition of meals derived from winter rapeseed differ in colour of seeds

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Introduction

The relatively low concentration of metabolisable energy, associated with a high content of dietary fibre, in double improved rapeseed cultivars has been considered a major factor limiting the higher use of rapeseed meal in the rations for monogastric animals. Development of triple low cultivars with yellow colour of seeds and concomitantly decreased content of dietary fibre has become very important breeding task world-wide, also in Poland. Several advanced yellow-seeded lines of winter oilseed rape have recently been developed in Poland with the yield and quality comparable to that of standard black-seeded cultivars.

Aim of the study was to determine the variability of basic chemical components of meals produced from oilseed rape (*Brassica napus* L.) differing in the colour of seeds with focus directed at dietary fibre and its constituents.

Materials and Methods

At least nineteen rapeseed lines varying in the shades of yellowness together with some black-seeded cultivars were analyzed annually within the years 2007-2009. All seeds were produced in the same environmental conditions. These seed colour, mass of thousand seeds and lipids content were examined in full-fat rapeseeds. Meals were laboratory prepared with hot hexane extraction. Meals derived from these lines were analyzed for the contents of protein, ash, lipid residues, sucrose and total dietary fibre (TDF) with detailed characteristics of its constituents, i.e. nonstarch polysaccharides (NSP), oligosaccharides, uronic acids and Klason lignin. The standard approved methods were applied for analyzing all these components (AACC, 2000). Analyses were carried out in duplicate and the results were recalculated on fat-free dry matter.

Results

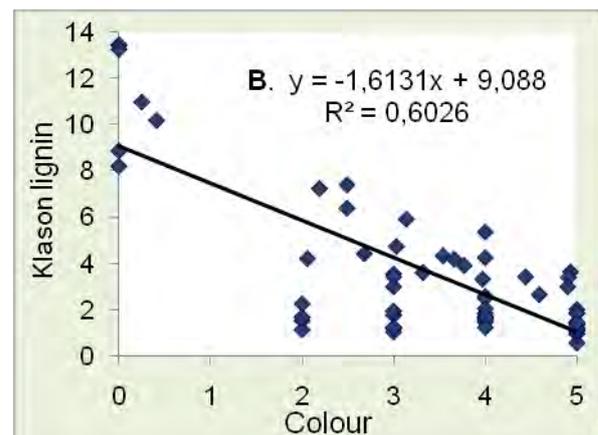
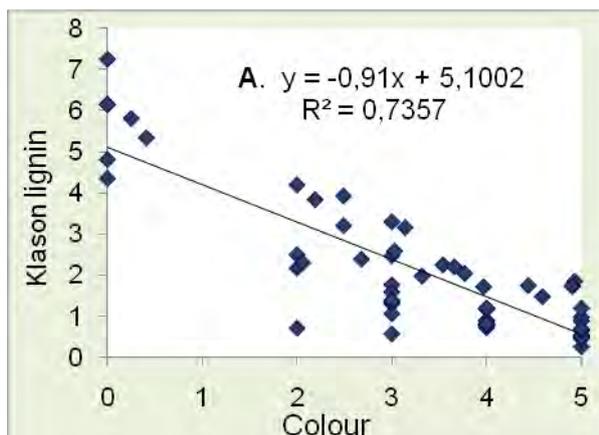


Figure 1. **Relationship between colour of rapeseed seeds and content of Klason lignin in seeds (A) and meals (B) derived from these seeds.**

All lines characterized with a high degree of yellowness, on average 3.9, on a scale of 1-5 (grade 0 means black; grade 5 very yellow colour of seeds), (Figure 1). Colour of seeds was not associated ($P>0.05$) with any qualitative trait of seeds, except for seed weight and lignin content. More yellow seeds showed ($P<0.05$) lower thousand weight and particularly lower content of lignin. Relationship between colour of seeds and content of lignin was highly significant either in seeds ($r = -0.86$) or meals ($r=-0.78$) derived from these seeds.

Table 1. **Chemical characteristics of rapeseed meals derived from seeds harvested within the years 2006-2008 [% fat-free DM]**

Type of meal	No of lines	Year	Protein		Ash		Sucrose	
			mean	range	mean	range	mean	range
Yellow	19	2006	46.7	44.0-49.1	8.2	7.6-8.7	10.5	9.8-11.9
	20	2007	49.3	41.2-55.1	8.9	8.5-9.5	8.7	7.7-10.7
	19	2008	45.4	41.0-50.3	8.4	7.7-9.2	9.7	8.9-10.7
	mean		47.2 ± 3.2		8.5 ± 0.5		9.6 ± 1.0	
Black	1	2006	38.6		6.9		8.6	
	5	2008	43.8	38.5-46.9	8.1	7.7-8.3	8.7	7.5-10.0
	mean		42.3 ± 3.8		7.8 ± 0.6		8.6 ± 0.8	

There was relatively small difference in the contents of protein, ash and sucrose between black and yellow types of rapeseed meal (Table 1). All these components were higher in the yellow-seeded meals, by 12, 9 and 12%, respectively.

Lignin was the only component considerably differentiating chemically various types of rapeseed meal (Table 2). Yellow-seeded meals contained on average 4-fold less lignin than its black-seeded counterpart. Lignin content resulted also in the lower amount of TDF in yellow-seeded meals, near 25% lower than in black-seeded meals (27.5 vs. 37.6%). There was no big difference in contents of the remaining fibre constituents, such as NSP (18.6 vs. 18.2%), uronic acids (5.3 vs. 6.3%) and oligosaccharides (1.3 vs. 1.9%) between these two types of rapeseed meal.

Table 2. **Content and composition of dietary fibre in rapeseed meals [% fat-free DM]**

Type of meal	Year	NSP	Uronic acid	Klason lignin		Oligo-sugars	TDF	
				mean	range		mean	range
Yellow	2006	21.5	4.4	1.4	0.5-2.6	1.4	28.7	26.7-30.3
	2007	16.3	5.8	2.2	1.0-5.3	0.7	24.9	20.2-32.1
	2008	17.3	5.6	4.2	2.6-7.2	2.0	29.1	25.4-34.8
	mean	18.6 ± 2.6	5.3 ± 0.9	2.6 ± 1.6		1.3 ± 0.6	27.5 ± 3.2	
Black	2006	22.3	4.6	13.4		1.5	41.7	
	2008	16.6	7.0	10.3	8.2-13.2	2.1	35.9	31.9-43.1
	mean	18.2 ± 3.1	6.3 ± 1.6	11.2 ± 2.2		1.9 ± 0.5	37.6 ± 4.6	

Conclusions

The results of this study showed that meals derived from winter type of the triple improved yellow-seeded rapeseed have similar but relatively high level of major dietary fibre fraction, which is NSP, although its lignin content is much lower. The question remains whether this change in the chemical composition of oilseed rape is satisfactory for the improvement of nutritive value of its meal. If not then which component as a next should be taken into account in the breeding efforts.

References

AACC, 2000. American Association of Cereal Chemists Inc., St. Paul, MN.