Final Project Summary

Project title	Home-grown oilseed rape meal and oil seed rape products as protein sources for pigs and poultry		
Project number	RD-2113-0010	**Final Project Report**	PR580
Start date	April 2013	**End date**	October 2016
AHDB Cereals & Oilseeds funding	£352,312	**Total cost**	£352,312

What was the challenge/demand for the work?

Oilseed rape (OSR) meal and other OSR products are potential home-grown protein sources that may reduce the UK feed industry reliance on imported soya bean meal. However, it was considered that currently used nutritional values and maximum inclusions in pig and poultry feed for OSR meal in the UK are out of date; this arose from the observation that higher inclusion levels in younger pigs without detrimental impact on growth performance have been shown elsewhere. Thus, it was timely to revisit nutritional value and recommended upper inclusion levels of current varieties of OSR meal under UK conditions for pigs and poultry, together with a systematic investigation into nutritional and anti-nutritional factor levels, composition and variation in modern varieties. The expectation was that this would result in tools to inform breeders on variety choice for improved OSR meal nutritional value and increase confidence for feed producers in using OSR meal in pig and poultry diets as home-grown alternatives for soya bean meal.

How did the project address this?

Cold-pressed rapeseed expeller (RSE), hexane-extracted rapeseed meal under reduced (soft) heat intensity (sRSM) and under standard heat intensity (RSM) were prepared from OSR batches of known varieties. Animal studies assessed their standardised ileal digestible amino acids, apparent metabolizable energy and P bioavailability, and were underpinned with a systematic biochemical investigation into OSR co-product composition. The latter aimed to identify variation in glucosinolates, tannins, sinapine, phytic acid and fibre, and whether nutritional value was correlated to these biochemical parameters, traditionally known as anti-nutritional factors. Digestibility studies were followed by growth performance trials with broilers and fattening pigs to re-assess upper inclusion levels of RSM as soya bean meal replacer.

What outputs has the project delivered?

The large amount of data collated over three harvest seasons from almost 30 varieties of OSR indicated that meals from modern OSR varieties continue to display significant variation in nutritional factors (levels amino acid and residual oil) but also in tannins, phytic acid, glucosinolate, sinapine and fibre. However, variation in protein quality in terms of amino acids composition was rather small. We also observed significant variation between OSR varieties in terms of amino acid digestibility, energy metabolisability and P bioavailability. However, with the exception of fibre, OSR co-product biochemistry did not consistently correlate with amino acid or energy digestibility, indicating that between-variety variation in tannin, phytic acid, glucosinolate and sinapine in modern OSR varieties is likely below a threshold to negatively impact nutritional value. Therefore, amino acid and energy availability largely depends on their content in OSR co-products, although reducing fibre levels in OSR meals would be expected to improve nutritional quality, especially for pigs. The comparison between RSE, sRSM and

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RSM confirmed that nutritional value reduces as heat intensity increases during processing. Inclusion of RSM reduced feed intake in broilers and growing pigs, most clearly above a threshold of 100 g/kg for broilers and 50 g/kg for growing pigs, but not for finishing pigs fed RSM up to 250 g/kg diet. However, both broilers and pigs all performed above breed and commercial targets at any RSM inclusion level.

Who will benefit from this project and why?

The overall implications of our work are that there is opportunity to improve nutritional value of OSR meals through amending oil extraction processes and variety selection, with key informants being amino acid, residual oil and fibre levels, as classically considered key plant secondary metabolites did not inform on digestibility within currently available and tested varieties. Provided yield is not compromised, breeders may target varieties with greater than average levels of amino acids, rather than manipulating the latter through fertiliser management. In the long run, breeders may benefit from higher OSR prices, if such benefits on the resulting RSM co-products are consistent, and recognized as added value is returned to the breeders. The crushing industry may benefit from greater co-product nutritional value, provided the trade-off between oil yield and co-product value outweighs current practice and added value is returned to crushers. Lastly, we observed that intake constraints remain for the more sensitive stock, indicating upper limits for broilers to be ~100 g/kg and for growing pigs between 50 and 150 g/kg. However, for finishing pigs, upper limit may be well above 250 g/kg. This would benefit the UK feed producers, as such data should provide greater confidence in using RSM as home-grown alternative to imported soya bean meal, especially for finishing pigs.

If the challenge has not been specifically met, state why and how this could be overcome

The overall challenge of the project was met. However, the data did not support the view that RSM biochemistry correlated with amino acid or energy digestibility. Whilst this may indicate that between-variety variation in e.g. tannin, phytic acid, individual and total glucosinolate, and sinapine is below a threshold, going forward, future work may require a focus on glucosinolate breakdown products. Furthermore, whilst our performance trials indicated greater than traditionally considered levels of RSM may be used as an alternative to soya bean meal, especially for finishing pigs, such outcome uptake and a greater confidence in RSM may be assisted from a translation of our experimental findings to applicable management strategies by undertaking large-scale demonstration trials.

Lead partner	SRUC
Scientific partners	University of Nottingham, NIAB
Industry partners	-
Government sponsor	-