100% local and organic: closing the protein gap for poultry in the ICOPP Project

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Abstract

A key challenge in improving the sustainability of organic poultry production is meeting the required levels of nutrients from locally sourced organic feeds. 100% organic diets for monogastrics will become compulsory in the EU from 1st January 2015. The ICOPP project brings together knowledge, from 10 EU countries, of local feeds for monogastrics and their wider impact on growth, health and welfare and the environment to identify feeding strategies which comply with organic principles. This poster will report on feeding trials carried out with broilers in the UK by FAI and ORC to investigate the impact of algae, peas and lupins on broiler performance and welfare.

Key words: poultry, broiler, feed, algae,

Introduction

A key challenge in improving the sustainability of organic poultry production is meeting the required levels of nutrients from locally sourced organic feeds. 100% organic diets for monogastrics will become compulsory in the EU from 1st January 2015. There is concern that a move to a 100% organic diet may not supply sufficient essential amino acids, lysine and methionine. Very little soya is grown in the EU, due to climatic conditions, and there are environmental, GM and social concerns about using soya imported from South America, China and India. The ICOPP project brings together knowledge from 10 EU countries of local feeds for monogastrics and their wider impact on growth, health and welfare and the environment to identify feeding strategies which comply with organic principles. Novel concentrates and the use of roughage are investigated in feed trials. This poster will report on feeding trials carried out with broilers in the UK by FAI and ORC to investigate the impact of algae, peas and lupins on broiler performance and welfare.

The Project

This project is important because of the requirement to base the feeding of organically produced poultry and pigs on feed of 100% organic origin from the 1st January 2015, an extention from a previous derogation to 1st January 2012. The derogation was extended due to members states declaring that neither of the poultry or pig industries was in a position to be able to make the move to 100% organic feed. To address these concerns the aim of the project is to produce economically profitable feeding strategies based on 100% organic feed across Europe, which will supply poultry and pigs the required level of nutrients in different phases of production and support high animal health and welfare. This is done on the basis of the following tasks:

- Improved knowledge of availability and nutritional value of underutilized or new organic feed ingredients per animal category with a focus on local feed resources.

- Improved understanding of the possible benefits of roughage inclusion in relation to nutritional and behavioural needs as well as its impact on health and welfare.
- Understanding how direct foraging in the outdoor area can contribute to meeting the animal's nutritional needs.
- Assessing the economic and environmental consequences of increased reliance on local organically produced feed.

The working hypothesis is that it is possible, through an extended knowledge of the characteristics of different local feeds and their wider impact on growth, health and welfare and environment, to produce strategies which comply with the aims for high animal welfare, production economy and environmental concerns. Through co-operation between 15 partners, a range of feeding experiments will be carried out with pigs (sows, piglets and finishers) and poultry (layers and broilers), clustered around concentrate feedstuffs, roughage, and foraging. The insight gained from these activities will be used to analyse and produce feeding strategies, adapted to the differences in local feed supply, the economic impact related to different feed procurement, and variations in production structure in different countries/agroecological zones in Europe.

Up until now organic monogastric production systems have allowed feed ingredients of non-organic origin. There is therefore very little experience and limited information on the implications of a shift in feeding strategy to 100% organic. There is concern that a move to a 100% organic diet may not supply sufficient sources of certain essential amino acids. This is accentuated by the fact that the most obvious and commonly used protein feed source (soybean meal) is not widely grown in Europe due to climatic conditions. There are also concerns about the production systems in, and transport from, the current locations of soya production (primarily South America but also China and India). Therefore it is important that research within the area of organic and innovative monogastric production systems focuses on novel feeding strategies that supply sufficient levels of essential amino acids of organic origin (both bought in and from the production system/range) without oversupply of total protein for poultry and pigs. At the same time it is equally important that the feeds and feeding regimes support the overall health and welfare of the animals and that the environmental impacts of the feed resource is taken into account.

Diet formulation and use of algae, peas and lupins.

In diet formulation, it is generally assumed that diets with the same nutrient contents will lead to similar production results, as far as they are not counteracted by anti nutritional factors (ANF). It has been shown that some new, locally grown protein sources like lupin (*Lupinus albus*, *L. luteus*, *L. angustifolius*) and naked oats (*Avena nuda*) can partly cover nutrient requirements for laying hens and growing pigs. The relatively low methionine content, however, is a limitation and it has been shown that even when accounting for this, inclusion of 25% lupin in the diet reduces daily gain in growing pigs and egg production in laying hens. Thus, before implementing other protein sources there is a need, through digestibility and performance trials, to validate the digestible nutrient content and presence of ANF, respectively. It is also desirable to have a combination of protein sources in order to meet the ideal amino acid profile without oversupply of protein. An oversupply of protein can lead to highly nitrogenous excrement which can in turn lead to welfare problems such as pododermatitis as well as environmental problems including GHG emissions and nitrogen leaching.

Peas are a good seasonal alternate crop for regions not suited to growing soya beans. White flowered varieties do not have high tannin levels and are the most suitable for poultry feed. According to one study, peas appear to be the most promising potential feed ingredient for organic poultry rations. It is likely they can be incorporated in broiler diets at up to 250 to 300 g/kg and in layers diets at up to 150 to 200 g/kg. Some reports suggest that modest levels of sweet lupins (200 g/kg) might also replace soya in layers feeds. Both have high levels of lysine but methionine is still restricted.

Algae is an excellent source of methionine which could replace synthetic amino acids that are used in conventional poultry diet formulation but are prohibited under organic standards.

Local feed suitability

Table 1. Suitability of feed ingredients available in the UK

Feed	UK Total area 2010 Organic & in Conversion		Metabolisable Energy (MJ/kg)	Crude Protein (g/kg)	Methionine (g/kg)	ANF's	Suitability
Wheat	20,959		12.9	135	2.0	N/A	Good
Barley	16,490		11.8	113	2.0	Low levels of β-glucans	Good, more suited to layers than broilers
Oats	12,064		10.7	115	2.2	Low levels of β-glucans	Ok, high fibre and low energy makes them most suitable for pullet diets
		Naked Oats	13.31	98-181		Some β-glucans	Good for all classes of poultry
Rye, mixed corn & Triticale	7,337	Rye	11	118	3.6	β-glucans & arabinoxylans	Significantly reduced due to ANF's
		Triticale	12.7	125	2.0	Low levels	Good especially for home grown and when diet is supplemented with sunflower oil
Maize, Oilseeds & protein crops	2,786	Maize	13.75	83	1.7	N/A	Good for all classes of poultry. High levels of xanthophylls can increase yellow pigmentation of eggs and meat beyond acceptable for some markets. Huge competition from human food and other livestock sectors
		Flax/ Linseed		343	5.8	Linatine and Linamarin	Good particularly for meat birds as meat is healthier. Can cause "fishy eggs". Good especially for home grown when fed as a whole grain
Legumes	1,856	Faba Beans		254	2		
		Field Peas		228	2.1	Many but all at low levels that have little effect	Good for all but very young poultry
		Lupins		349	2.7	Alkaloids and tannins but varieties with low levels available	Good
Other		Algae (*Spirulina platensis*)		490	2.5	N/A	Good for all classes of poultry

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Quality of organic legumes – prediction of main ingredients and amino acids by Near-Infrared Spectroscopy

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Abstract

The analytical potential of Near-Infrared Spectroscopy (NIRS) for predicting the chemical composition and the amino acid contents of grain legumes was evaluated. Pea and bean samples from field trials of different organically-managed experimental locations in Germany were analysed with reference methods. The reference data were used for developing calibration equations for the main ingredients and for the estimation of the amino acids. The calibration equations were validated on a remaining sample set. The statistics of NIRS calibrations showed that the predictions were successful or satisfactory for all main ingredients. The predictions of the essential amino acids were successful and respectively, for cystine in beans satisfactory as well. The obtained results indicated that the NIRS could be successfully used for the prediction of the main ingredients and amino acids in field beans and peas and therefore to evaluate the feed quality quickly and easy. The exact calculation of feed rations seems to be possible if the samples are analysed by NIRS directly after harvesting.

Key words: feed quality, legumes, near-infrared spectroscopy, amino acids, main ingredients

Introduction

The quality evaluation of organic feeds, especially the quick and easy determination of the main ingredients and the amino acid pattern in locally grown legumes, is very important to fulfil the requirements regarding the protein and amino acid supply of organically fed animals, especially monogastric animals. The analytical data of organic feeds, as compared with conventional table values, shows a clear deviation of protein and amino acids between conventional and organic feeds. The standard tabular values (DLG 1991) are not sufficient for the calculation of the feed rations in organic monogastric nutrition. Therefore the ability of NIRS to predict the chemical composition and the amino acids of organically grown legumes was tested.

Material and methodology

Pea and bean samples from field trials of different organically managed experimental locations in Germany, collected over two years, were used for the investigations. The main ingredients of the beans were determined according to VDLUFA methods (VDLUFA 1997) and amino acids by HPLC (EG 1998, Cohen and Michaud 2004). NIRS analysis was carried out with the ground samples using the Fourier-Transform NIR spectrometer (NIRLab N-200, Fa. Büchi, Essen) in the spectral range from 1000 to 2500 nm. Spectral data were exported to the NIRCal chemometric software (Fa. Büchi, Essen) and different mathematical pre-treatments were performed. Calibration equations for crude nutrients and each amino acid were developed by partial least square regression (PLS) on about two-thirds of the pea or bean samples using the results from the analytical reference methods. The calibration equations were than validated on the remaining sample sets (1/3 of pea or bean samples). The performance of the calibrations was evaluated in terms of standard error of prediction and coefficient of determination.