

Nutrient digestibility in poultry

Problem

Producing fully organic poultry feed of regional origin is challenging, particularly for protein sources that offer balanced amino acid profiles. Furthermore, not all nutrients present in feed are available for digestion.

Solution

To optimise feed rations, diets should be based on digestible nutrients, nutrient interactions and the influence of other feed characteristics.

Benefits

Feed rations that consider nutrient digestibility can better utilise regional feedstuffs, optimising health, body maintenance and production requirements. They help to improve animal welfare, lower costs and reduce nitrogen pollution from compensatory feeding.

Applicability box

Theme

Animal husbandry - Feed and nutrition - Production systems - Poultry - Ration planning

Geographical coverage

Global with regional focus

Application time

Year round

Required time

Ongoing

Period of impact

For the life of the bird

Equipment

None

Best in

All poultry systems with a focus on feed of organic and regional origin

Practical Recommendations

- Regular analysis of all dietary components is recommended for a reliable nutrient profile of feed rations.
- To optimise the use of home-grown feed, the nutrient content of forage should be considered in diet formulation (Figure 1).
- High quality protein fulfils amino acid (AA) requirements, particularly lysine, cysteine and methionine.
- Diets formulated on digestible amino acids (DAA) are more effective than those formulated using total AA content.
- Digestibility of AAs is affected by dietary fibre content and the presence of anti-nutritional factors and protease inhibitors.
- Adding permitted enzymes to the diet can stimulate the digestibility of all nutrients, particularly protein and complex carbohydrates. They may also help birds to break down anti-nutritional feed components
- Starch (simple carbohydrates) is the primary energy source for poultry and is generally well digested.
- Complex carbohydrates in grains (wheat, barley, rye and oats) increase viscosity which negatively affects digestive processes and nutrient absorption.
- Fibre is poorly digested but helps to slow down the passage rate of other nutrients in the gut, improving digestion of all nutrients. A high intake of fibre can risk a reduction in total intake so restriction may be necessary.
- Fat digestibility is linked to the presence of other dietary components, and minerals in particular.
- Fat improves feed palatability and is required for energy and the absorption of fat-soluble vitamins A, D, E, and K.
- Age of bird influences fat digestibility with older birds being better able to digest fat than younger birds.
- As with fibre, fat can reduce feed passage rate (influenced by fat type and quantity) through the gut, enhancing digestion of all nutrients.

- Processing feeds can improve overall digestibility although finely milled feed reduces protein digestibility and pancreatic enzyme activity compared to coarser feed (Figure 2).
- Heat treatments can reduce anti-nutritional factors and, e.g., steam pelleting, can improve carbohydrate digestibility.



Figure 1: Nutritional analysis of home-grown forage can help optimise its use in poultry feed. Photo: L Whistance, ORC

Digestibility coefficient		Pancreatic enzymes	
		Crude protein	Amylase
Feed form			
Mash	74.14	2.15 ^b	0.04 ^b
Crumble	74.30	4.16 ^a	0.06 ^a
Particle size			
Fine	73.61 ^b	2.64 ^b	0.05
Coarse	74.83 ^a	3.67 ^a	0.05
^{a,b} Means within columns with different superscripts are different at P < 0.05.			

Figure 2: Influence of feed characteristics on total tract % of crude protein digestibility and enzyme activity ($\mu\text{mol}/\text{min}$) in pullets (Bozkurt et al., 2019, modified).

Further information

Reading

- Blair R. (2016) A practical guide to the feeding of organic farm animals. 5M Publishing Ltd., Sheffield UK.
- Ullah Z., Ali M., Nisa M., Sarwar M. (2015) Review Article. Digestible amino acids: significance and prospects in poultry. *International Journal of Agriculture & Biology*. 17: 851-859.
- Steinfeldt S., Hammershoj M. (2015) Organic egg production. I: Effects of different dietary protein contents and forage material on organic egg production, nitrogen and mineral retention and total tract digestibility of nutrients of two hen genotypes. *Animal Feed Science and Technology*. 209: 186-201.
- Bozkurt M., Koçer B., Ege G., Tüzün AE., Bıyık HH., Poyrazoğlu E. (2019) Influence of the particle size and form of feed on growth performance, digestive tract traits and nutrient digestibility of white egg-laying pullets from 1 to 112 days of age. *Poultry Science* 98: 4016-4029.

Weblinks

- Check the Organic Farm Knowledge platform for more [practical recommendations on animal husbandry](#).

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Project website: <https://ok-net-ecofeed.eu/>

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