Feeding quality of faba bean for poultry

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This practice note provides an overview of the components and feed value of faba bean. Faba bean (*Vicia faba* L.), also called field bean, is rich in protein and energy. The high content of lysine means faba bean complements cereals in feed. Faba bean can replace or supplement soy. The feed value of faba bean for poultry is determined by the metabolisable energy and the digestibility of the amino acids in the protein. Cultivars such as Tiffany that have low levels of vicine-convicine can be included up to 20% of the ration. Cultivars that are also low in tannin (white flowering cultivars such as Bianca) can be included at rates above 20%. For using faba bean on-farm, the feed value must be determined for each batch so that the use can be targeted.

Faba bean can be sold into the compound feed industry. On-farm use often gives the grower a higher return than from selling to the trade. Domestic grain legumes are an important component of GMO-free feed rations.

Applicability

Theme: Feeding faba bean for layers and broilers

For: Farmer and compound feed producers

Where: At farm level or in the feed industry

Equipment: Storage, crushing and mixing equipment

Follow-up: best practice cases

Impact: Increasing market-value and self-sufficiency, GMO-free feeding

Nutritional components

The nutritional components of faba bean are summarised in Table 1.

Grain legumes are used in livestock feed primarily for their protein content. Faba bean with 12% moisture is about 26% protein.

Faba bean in the field. Photograph: Thorsten Haase (LLH)

Table 1. Nutritional components of faba bean and pea compared to soybean meal (88% dry matter)

Feed constituent		Faba bean	Pea	Soybean meal 43*
Metabolic energy for poultry	MJ/kg	10.8	11.0	9.8
Crude protein (CP)	g/kg	263	228	442
Crude fat	g/kg	14	13	12
Crude fibre	g/kg	79	57	70
Starch	g/kg	362	420	62
Sugar	g/kg	35	54	95
Ash	g/kg	35	31	59
Calcium	g/kg	1.4	0.8	2.7
Phosphorus	g/kg	4.2	4.2	5.7
Sodium	g/kg	0.2	0.2	0.3
Potassium	g/kg	11.4	9.7	19.0
Copper	mg/kg	11	7	17
Zinc	mg/kg	40	21	62
Lysine	% of CP	6.4	6.0	10.2
Methionine	% of CP	0.8	0.8	2.2
Cystine	% of CP	1.2	1.3	2.5
Threonine	% of CP	3.5	3.1	6.5
Tryptophan	% of CP	0.9	0.8	2.2

*43% crude protein
Sources: LfL, 2012; Bellof et al., 2013; Weindl and Bellof, 2016; supplemented with data from Vogt-Kaute, W., 2016

In addition to crude protein, faba bean is high in carbohydrate, especially starch, contributing to the metabolisable energy. The nutrient content of faba bean is influenced by growing condition and the cultivar used.

The protein digestibility and amino acid profile are the major determinants of the feeding value. The protein is highly digestible. On the amino acid profile side, faba bean is rich in lysine, but relatively low in methionine and cystine. The limiting factor for the use of faba bean in poultry rations is the low content of methionine.

The mineral contents are similar to that of cereals. Faba bean contains less phosphorus than soy and rapeseed meal. The phosphorus is partially bound to phytic acid which reduces phosphorus absorption without the addition of the enzyme phytase.

Anti-nutritional factors

Anti-nutritional components adversely affect digestion and animal health. Vicine/convicine and tannins are the most important anti-nutritive substances in faba bean, followed by protease inhibitors, lectins and saponins.

For poultry feed, only low vicine/convicine faba bean cultivars should be used. Using standard vicine/convicine containing cultivars, there is a decline in performance when inclusion rates exceed 10%.

In addition, tannins found in the seed coat of dark seeds from dark flowering cultivars reduce food intake due to their bitter taste. Cultivars containing tannins are easily recognisable by their purple flowers, but also by a black spot on the stipules and a darker grain colour. Tannin-related effects on protein digestibility and enzyme binding play a role only at high inclusion rates (>20%).

Table 2. Digestibility of selected amino acids in pea, faba bean and soybean meal (%)

Species	Lysine	Methionine	Cysteine	Threonine	Tryptophan
Pea	88	80	70	78	75
Faba bean	80	75	60	70	70
Soybean meal	85	85	75	80	80

Sources: Bellof, Halle and Rodehutscord, 2016

Other anti-nutritive ingredients such as protease inhibitors, lectins and saponins are present in only small amounts in faba bean and have no adverse effects at typical rates of inclusion.

Feed value

The feeding value depends on the quantity of protein, the nutritional quality of that protein, and the energy feed values determined by the digestibility of the nutrients. Protein quality in poultry nutrition is characterised by the content of the most important essential amino acids, namely lysine, methionine and cysteine, threonine and tryptophan. The digestibility of the amino acids is also important, which varies both, between amino acids and between different grain legumes (Table 2).

Maximum rates of inclusion of faba bean in poultry feed

The quantities used depend on age and performance phase of the poultry. The use of faba bean for poultry is limited by the methionine content (Figure 2). But the levels of vicine/convicine of cultivars also limit use to maximum 10% in feed ration (Table 3). Nevertheless, the methionine content of field bean is more than 20% higher than that of most cereals. This means that faba bean can be used to replace other protein-rich components, e.g., oilseed meals and corn gluten, and synthetic amino acids. A higher proportion of own or domestic raw materials can be used.

Laying hen Lohmann Brown. Photograph: AMA

Further information

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Table 3. Maximum inclusion rates of faba bean in different feed types as affected by bean type. This only applies to the low vicine types. For standard vicine types a maximum of 10% inclusion rate should not be exceeded.

Feed type	Purple-flowering faba bean	White-flowering faba bean
Laying hen feed	5-20	5-20
Broiler feed	10-20	20-25
Feed for fattenting turkeys	5-15	15-20

Sources: Bellof, Halle and Rodehutscord, 2016; Nolte et al., 2020

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