PRACTICE ABSTRACT

Heat treatment and dehulling effects on feed value of faba beans

Problem

Beans are commonly grown in rotation as a fertility-building cash crop, but they contain antinutritional factors, which limit their inclusion in monogastric rations. Processing the beans to remove antinutritional factors could increase the use and value of a product which is readily available in organic farming.

Solution

Toasting and dehulling beans reduce the levels of antinutritional factors. Toasting beans reduces the level of trypsin inhibitors. Dehulling reduces the tannin levels.

Benefits

Reducing antinutritional factors would allow a higher inclusion of pulses in feed rations. Adding a simple treatment would increase feed inclusion, product value and reduce the need for imported protein. High tannin bean varieties are already used for human consumption and ruminants. TIA and tannin removal make them better suited to monogastric diets and would improve markets for all bean varieties.

Applicability box

Theme
Pigs, Broilers, Layers, Feeding and ration planning, Processing and handling of harvested feed

Context
All regions where beans are grown in rotation

Application time
All year

Required time
Treatment time- 15 minutes heating. Heating and dehulling can both be incorporated into handling during feed processing

Period of impact
Beans can be stored after treatment but dehulled beans are more prone to rancidity

Equipment
Heating source and dehulling equipment required

Best in
Small scale poultry flocks. Growing and finishing pig herds.

Description of the tested method

- Samples of Beans were heated to 150°C for 15 minutes in a conventional electric oven (Picture 1).
- Beans were also dehulled manually and through separation from the bulk sample (picture 2) and were sent to an independent laboratory for analysis (Sciantec, UK)

In order to assess benefits for monogastrics, analysis included Crude Protein, Trypsin Inhibitor activity and amino-acid make-up of the untreated, heat treated and dehulled beans.

Figure 1 Heat treated beans Photo: Jerry Alford

Figure 2 Dehulled beans Photo: Jerry Alford

Practical recommendations

- The test showed that dehulling increased crude protein by 6.66% but increased TIA by 112.5%
- Toasting increased Protein content by 2% but reduced TIA by 37% (pictures 3 and 4)

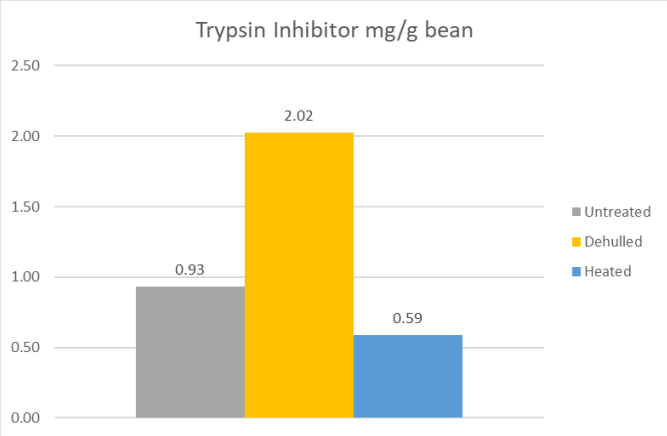

Figure 3 Trypsin inhibitor activity mg/g

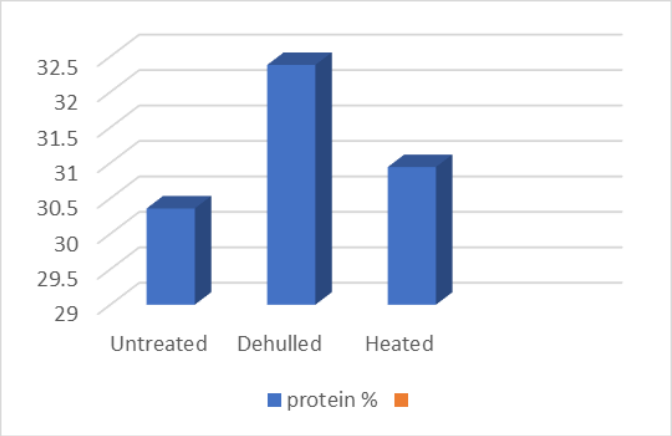

Figure 4 Crude protein levels

Amino Acid analysis showed that there was very little change in the amino acid profile following treatments (picture 5)

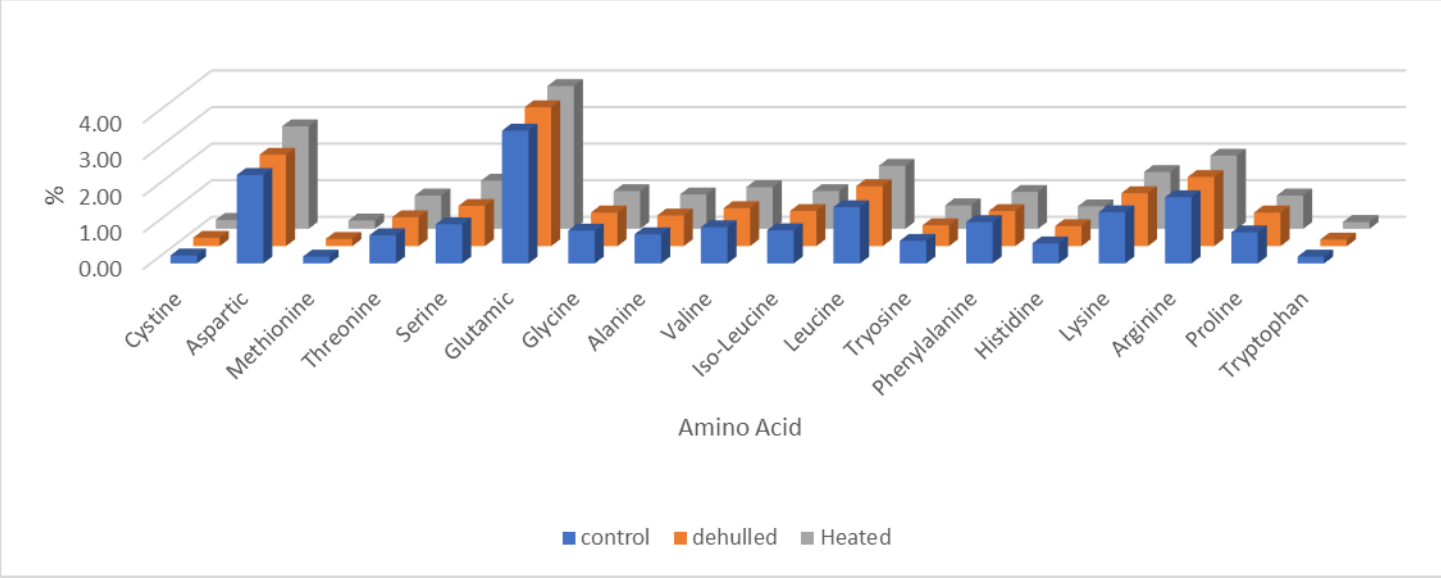

Figure 5 % amino acid contents

The test has shown that dehulling can increase protein content but doesn't reduce trypsin inhibitor activity, but heat treating does, combining the two has the potential to allow increased inclusions of beans into rations. Neither treatment affects amino acid contents.

- Tannins are the antinutritional factors that are most detrimental to pig nutrition.
- Current recommendations are for inclusions of up to 10% beans in sow rations and up to 20% for growing and fattening pigs, although up to 30% has been used successfully where low tannin varieties are used.
- For poultry, TIA is more detrimental than tannins though both are important.

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- Inclusion rates of 5-7% beans are common in poultry rations but where beans are processed (heated, de-hulled, extruded or pelleted) to increase their digestibility it is possible to increase inclusion up to 25%.

Faba beans need to be rolled or milled prior to being fed so additional processes can be added into the handling system. Processes such as micronizing (infra-red heating) and steaming are practised but are not practical on an on-farm situation. Heat treating equipment, such as augers fitted with heating elements, are common in USA and Europe for toasting whole soya beans. These systems could be employed with on farm mills in the UK with stored, untreated beans being processed prior to milling.

Dehulling Equipment is available for other grains and can be adapted for beans.

Note: conventional batch or continuous flow grain driers do not increase temperature sufficiently to affect trypsin inhibitor activity.

Further information

Video

- Check the video "How to increase the nutritional value of beans for pig and poultry diets".

Further reading

- Nixey, C., Little, T. (2013): Making organic poultry feed more sustainable: Dehulling homegrown protein crops. Organic Centre Wales. Available at http://www.organiccentrewales.org.uk/uploads/dehulling__final_report.pdf
- Yu-Wei Luo & Wei-Hua Xie (2013): Effect of different processing methods oncertain antinutritional factors and protein digestibility in green and white faba bean (Vicia faba L.),CyTA - Journal of Food, 11:1, 43-49, DOI: 10.1080/19476337.2012.681705

Weblinks

- Feedipedia entry on Faba bean (Vicia faba)
- Trial report on the Innovative Farmers website
- Guide for farms to plan small scale soya bean processing equipment (OK-Net EcoFeed Practice Abstract) on Organic Farm Knowledge.

About this practice abstract and OK-Net EcoFeed

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