

Soya Quality Control Tests

Introduction

Processing conditions of full fat soya beans can be highly variable and as such the nutritional value of the final product can be affected quite significantly.

There are various that can be used to provide an estimate of the effectiveness or adequacy of processing.



Trypsin Inhibitor Activity (TIA)

This test specifically estimates the level of one of the major anti-nutritional components that is remaining in the beans following processing.

In raw soya beans, the TIA value can be very high. Upon processing i.e. heating, this value will reduce significantly although it is only with prolonged heating that the value will be reduced to negligible amounts approaching zero with prolonged heating however there is the risk that the protein will be damaged.

There is some debate about what constitutes a suitable final level of TIA but as a guide FEFAC, the European Federation of Feed Manufacturers proposed:

% Protein in the Sample	Trypsin Inhibitor Activity
50	5
40	4
30	3

It is worth noting that there are several analytical procedures that can be employed to determine TIA, which along with the fact that trypsin inhibitor content can be expressed in two ways i.e.

- As mg of Trypsin inhibited per g/kg of the sample
- As mg per g or kg of nitrogen

It is therefore essential that information relating to TIA is placed alongside the actual method used in its determination.

Urease Test or Urease Activity

This test is used as an indicator of the degree of processing (heating) that the raw soya beans have been subject to. It indirectly estimates the reduction in urease activity that occurs when processing is undertaken.

As a guide, it is generally taken that:

Soybean Product	Urease Activity (mg N/min at 30°C)
Overcooked	<0.05
Well cooked	0.1 – 0.3
Under cooked	0.3 – 0.5
Raw	>0.5

There are two routine methods most commonly employed:

- The AOCS BA 9 -58 (2009) - Critical Processing Factors in Desolventizing-Toasting Soybean Meal for Feed
- The EEC (Official journal of the European Communities)

It should be noted however that there is some question as to its value as a reliable indicator of the adequacy of heat processing. Particularly since the test is based on a reduction in pH, which can be affected by any prior treatment e.g. treatment with inhibitors such as organic acids that the raw soybeans have been subject to.

Additionally, there is some debate whether there is any relationship between activity and observed biological value.

Cresol Red Test

This is a quick and reasonably reliable test for measuring the amount of heating of a soya bean product. It is based on the amount of cresol red dye absorbed by the soya bean protein.

As an indirect test, it does not actually measure nutritional factor activity. As a guide the following is a reasonable rule of thumb

Soybean Product	Dye Absorbed (mg/g)
Undercooked	<3.4
Slightly undercooked	3.4 – 3.7
Well cooked	3.7 – 4.3
Slightly overcooked	4.3 – 4.5

Available Lysine

Availability of lysine in soybean is related to the degree of heating. Chemical tests are available, but they are sometimes complicated and sometimes do not correlate very well with lysine availability in the animal. The easier and quicker cresol red test is performed.

PDI Protein Dispersibility Index

The PDI test is more reliable than the urease test in detecting the over-processing of soybean. Urease values are of greater value in determining under-processing of soybean products.

$$\text{PDI} = \frac{\% \text{ of water dispersible protein}}{\% \text{ of total protein}}$$

The higher this value, the less adequate the heating. Raw soya is c. 90%

The method of Araba & Dale (1990) measures the dispersion of soybean proteins in KOH and the determination of the nitrogen (protein) in the supernatant layer.

The Protein Dispersibility in processed full fat soybeans is a very important indicator of quality.

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