

## **Protease/trypsin inhibitors**

### Description

Protease inhibitors are protein-based molecules (Tacon, 1997). In soybean, there are two main groups of trypsin inhibitors: the heat-labile Kunitz<sup>1</sup> inhibitors blocking mainly trypsin, and the Bowman-Birk inhibitors inhibiting either trypsin or chymotrypsin (Tacon, 1997; Francis *et al.*, 2001). The protein digestibility is directly reduced.

After a certain period a compensation process stimulates trypsin secretion and it seems that with trypsin inhibitors levels below 5 mg/g, most cultured fish are able to compensate (Francis *et al.*, 2001). However, in many fish species, it leads to pancreas hypertrophy (Guillaume *et al.*, 1999).

### Occurrences

Protease inhibitors are widespread within the plant kingdom (Tacon, 1997). While their concentration is negligible in cereals, they can be highly concentrated in some legumes such as soybean (Guillaume *et al.*, 1999) with trypsin inhibitors ranging between 2 to 6 mg/g (Francis *et al.*, 2001).

### Treatment

Most protease inhibitors are readily destroyed by heat. Moist heat treatment (autoclaving at 121° C for 15-30 min) or aqueous heat treatment (100° C for 10 min) is recommended (Norton, 1991; Armour *et al.*, 1999).

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<sup>1</sup> Two classes of the protease inhibitors exist in the soybean: the Kunitz inhibitors have a molecular weight of 20,000 with two disulfide bonds, and the Bowman-Birk inhibitors have a molecular weight of 8000 with seven disulfide bonds. The disulfide bonds provide structural stability to the molecules and Bowman-Birk inhibitors are therefore more stable towards heat, acids and alkalis (Grant, 1991).