

EFFECT OF HEAT TREATMENT ON THE NUTRITIVE VALUE OF NAVY BEAN

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In an investigation of the effects of heat treatment on the nutritive value of navy bean (*Phaseolus vulgaris*), reject navy bean (NB) and soya-bean (SOY) were autoclaved and evaluated when fed as a source of protein to rats. The digestibility of NB after heat treatment by autoclaving or by extrusion as a blend with SOY was also determined in pigs.

In experiment 1, NB and solvent extracted SOY (S-SOY) were autoclaved at 126°C for either 0, 30, 60 or 90 min. Diets were formulated to contain equal contributions of wheat (65%) and a micro-nutrient premix (5%) with the test protein sources, NB and S-SOY, being included at the expense of tapioca starch at approximately isonitrogenous amounts of 30 and 16.9% respectively. The diets were fed *ad libitum* for three weeks to 48 male Wistar rats, 46 (SD± 4.0) g initial live weight. Daily growth rate (DGR) and gain to feed ratio (GFR) of the rats and the determined digestible (D) dry matter (DM), nitrogen (N) and energy (E) coefficients are given below.

Item	Autoclaving time (min) and protein source								±SEM
	0		30		60		90		
	NB	S-SOY	NB	S-SOY	NB	S-SOY	NB	S-SOY	
DGR (g)	0.2 ^e	4.6 ^a	3.7 ^b	3.7 ^b	3.5 ^{bc}	3.0 ^c	2.2 ^d	2.1 ^d	0.17
GFR (g)	0.03 ^e	0.35 ^a	0.30 ^b	0.30 ^b	0.29 ^{bc}	0.26 ^c	0.21 ^d	0.21 ^d	0.01
DDM (%)	79.7 ^d	85.7 ^{ab}	84.3 ^{bc}	86.4 ^a	83.6 ^{bc}	85.2 ^{abc}	82.8 ^c	85.2 ^{abc}	0.63
DN (%)	64.4 ^f	82.9 ^a	78.2 ^{bcd}	81.9 ^{ab}	76.3 ^d	79.8 ^{bc}	69.5 ^e	77.5 ^{cd}	0.94
DE (%)	78.5 ^e	86.1 ^{ab}	84.5 ^{bc}	86.5 ^a	83.8 ^{cd}	85.6 ^{abc}	82.2 ^d	85.1 ^{abc}	0.63

Subscripts denote significant differences (P<0.05).

Autoclaving improved the utilization of the diet only in the case of NB and then only with the 30 min. treatment. Prolonged autoclaving markedly reduced the nutritive value of each of the two test proteins.

The digestibility of two 90°C extruded protein sources - full energy SOY either alone (FE-SOY) or as a 45:55 blend with NB (SOY-NB) - and NB autoclaved at 126°C for 15 minutes (NB-A) was determined in experiment 2. A basal diet and three test diets in which the respective test protein sources replaced 25% of the basal diet were fed to eight male pigs in accordance with a replicated 4x4 latin square design. Total collections of faeces were made over 5d periods and a similar period was allowed between diet changes. The DM, organic matter (OX), N and E content and apparent digestibility (AD) of the test proteins are given below.

Test protein	DM		OM		N		E	
	Content	AD	Content	AD	Content	AD	Content	AD
	(%)	(%)	(%)	(%)	(%)	(%)	MJ/kg	(%)
FE-SOY	95.9	93	93.9	94	6.14	97	21.96	94
SOY-NB	92.1	84	94.8	86	5.13	87	19.40	85
NB-A	88.7	94	95.6	94	4.52	94	16.83	93

All protein sources were highly digestible although the extrusion process appeared to be not entirely adequate for the NB.

The results show that NB has to be adequately heat treated before being fed; however, severe damage can occur if heating is excessive.

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