Biological value of sausages fortified by dietary fibers

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We have studed the biological value of sausages fortified by several fibers and control sausage sample without added fibers. The basic sausage batter (BSB) contained (%w/w) beef (27.0), pork (19.0), lard (17.0), protein emulsion (8.0) blood-plasma (4.0), water (26.0) and salt mixture. The control sausage (CS) contained (%w/w) only BSB (100.0). The wheat bran (1) fortified sausage (FS1) contained (%w/w) BSB (80.0), water (16.0), wheat bran (4.0). The yellow pea hull (2) fortified sausage (FS2) contained (%w/w) BSB (80.0), water (16.0), yellow pea hull (4.0). The mushroom (3) fortified sausage (FS3) contained (%w/w) FS1 (49.0) FS2 (49.0), canned mushroom (2.0). The sausages were frozen and lyophilised. The in vivo biological value was characterized by Pepsin-Pancreatin Digest Index (Petres's, CS, FS1, FS2, FS3) (PPDS). Total Dietary Fiber (TDF) content, Water Insoluble Dietary Fiber (WIDF), and Water Soluble Dietary Fiber (WSDF) content of additive fibers (1,2,3) and sausage samples (CS, FS1, FS2, FS3) were determined by modified Hellendoorn's method. The in vivo biological value (Hegedűs's, CS, FS1, FS2, FS3) was determined by animal feeding experiments on growing male rats. Changes of Net Protein Utilization (NPU) were determinded by the direct measure of body-nitrogen, and the True Digestibility (TD) with balance-method. Groups of four Spraque-Dawley CFY male rats each weighing approximately 40-50 g were used. The preliminary period lasted for four days and the experiment period for ten days. The diet for feeding of rats contained (%w/w) protein (10.0), sunflower oil (10.0), glucose (15.0), salt mixture (3.0), vitamin mixture (0.5), potato starch (10.0), corn starch (ad 100). For control diet a N-free mixture was used. The rats were placed in individual metabolic cages.

Results:

The values of dietary fiber contents of additives are in table 1.

Table 1.

Dietary fiber content of additives

$\bar{x} \pm s$; n=3

g/100 g sample

Sample	Water Soluble Dietary Fiber	Water Insoluble Dietary Fiber	Total Dietary Fiber
Whet bran	5.6±0.4	53.2±0.8	58.8±0.7
Yellow pea hull	4.7±0.6	75.4±2.6	80.1±2.3
Mushroom	0.2±0.02	4.3±0.03	4.5±0.03

Yellow pea hull contained the highest Total Dietary Fiber (80.1), and TDF content of wheat bran was also high (58.8)
Chemical composition of sausages can be seen in table 2.

Chemical Composition of sausages

$\bar{x} \pm s$; n=3

g/100 g sample

Table 2.

Sample	Protein	Water	Fat	Other N-free rest
CS	12.7±0.1	65.4±0.3	18.9±0.2	3.0
FS1	11.5±0.2	67.2±0.2	16.2±0.3	5.1
FS2	10.4±0.1	67.4±0.2	16.8±0.2	5.4
FS3	10.0±0.1	71.1±0.1	13.4±0.1	5.5

Dietary fiber contents of sausages are shown in table 3.

Dietary fiber content of sausages

g/100 g sample

Sample	Water Soluble Dietary Fiber	Water Insoluble Dietary Fiber	Total Dietary Fiber
CS	0.2	1.8	2.0
FS1	0.4	2.8	3.2
FS2	0.8	3.8	4.6
FS3	0.4	3.2	3.6

Sausage FS2, fortified by yellow pea hull contained the highest Total Dietary Fiber (4.6). The values of TDF in the fortified sausages were 3-5 % w/w and the WISF values were higher (3-4 % w/w) than the values of WSDF (0.4-0.8 % w/w). The biological values (NPU, BV, TD and PPDI) of sausages can be seen in table 4.

Table 4.

Biological values of sausages

$\bar{x} \pm s$; n=4

Sample	BV	NPU	TD	PPDI
CS	83.1±1.5	75.8±3.3	90.6±2.8	97.3±0.9
FS1	83.2±11.2	79.6±10.7	90.1±1.9	96.6±0.9
FS2	58.3±13.7	56.0±13.8	96.8±2.3	96.7±1.0
FS3	66.4±6.5	74.8±1.8	90.5±2.1	97.5±0.3

The BV and NPU values of sausage FS2 fortified by yellow pea hull were significantly lower ($P < 0.05$) than BV and NPU values of control sample. The BV and NPU values of sausage FS1, containing wheat bran were not lower ($P < 0.05$) than BV and NPU values of control sample. The BV of FS3 significantly lower ($P < 0.05$) than for CS. There were no significant differences ($P < 0.05$) between PPDI values of sausages. The TD values of samples were similar except for TD of ISZ.
It is concluded that yellow pea hull effects on BV and NPU and wheat bran in added quantity had no effect on biological values of sausage.