



EFFICIENCY OF GUAR GUM, PECTIN AND WHEAT BRAN FOR REDUCTION OF OXIDATIVE STRESS IN LABORATORY RATS

Trebušak T., Rezar V., Levart A., Frankič T., Salobir J., Orešnik A., Pirman T.

University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Groblje 3, 1230 Domžale, Slovenia

tina.trebusak@bf.uni-lj.si

Introduction and aim

It is well known that oxidative stress is involved in the etiology of many diseases in humans, for instance coronary heart diseases, asthma, muscular dystrophy and colorectal cancer.

The objective of the present study was to determinate the effect of different source of dietary fibre on the oxidative stress induced by a high fat diet in laboratory rats.

Materials and methods

- ➡ 32 male Wistar rats (30 days old) were individually housed in metabolic cages.
- ➡ Diets were designed according to nutritional requirements of growing rats.
- ➡ Fat requirements were above the nutritional needs in order to cause the oxidative stress with high polyunsaturated fatty acids intake from linseed oil (80 g/kg).
- ➡ In all diets casein was added as a source of protein (120 g/kg).
- ➡ After 3 days adaptation period the animals were divided into four groups: **control (CONT)**, **guar gum (G)**, **pectin (P)** and **wheat bran (WB)**, according to the diet giving them.
- ➡ Experimental diets:

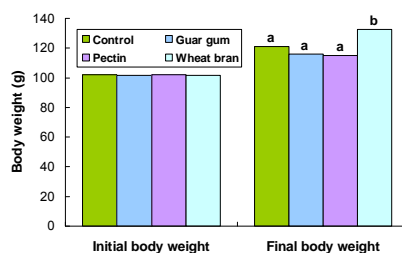
	Control	Guar gum	Pectin	Wheat bran
Guar gum*	/	70	/	/
Apple pectin*	/	/	70	/
Wheat bran*	/	/	/	155
Wheat starch*	695	625	625	540
Dietary fibre**	141.13	177.85	207.75	183.32
Soluble fibre**	40.39	77.26	106.17	25.48
Insoluble fibre**	100.73	100.59	101.58	157.85

* = g/kg; ** = g/kg DM

- ➡ Diets and drinking water were provided *ad libitum*, for 11 or 13 days.
- ➡ Food intake and weights of rats were recorded. 48-h urine, blood and liver samples were collected.
- ➡ Statistical analysis: General linear models (GLM) procedure of the SAS/STAT module.

Results

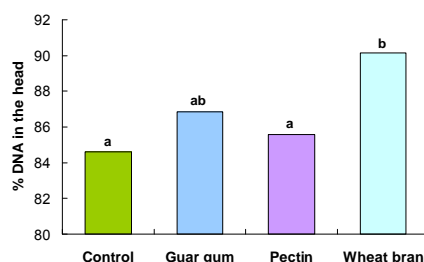
Body growth rate and diet intake



- After experimental period, the average body weight of the WB group was significantly higher.
- The WB group also had higher diet intake and significantly higher growth rate and significantly better feed efficiency compared to the other three groups.

	Control	Guar gum	Pectin	Wheat bran
Diet intake (g/day)	10.1 ± 1.4 ^{ac}	8.1 ± 1.8 ^b	8.7 ± 1.1 ^{bc}	11.3 ± 1.7 ^a
Growth rate (g/day)	1.62 ± 0.35 ^a	1.30 ± 0.57 ^a	1.18 ± 0.59 ^a	2.65 ± 0.66 ^b
Feed efficiency (%)	15.09 ± 3.08 ^a	14.05 ± 5.47 ^a	12.77 ± 5.76 ^a	22.17 ± 4.71 ^b

DNA damage (Comet assay)

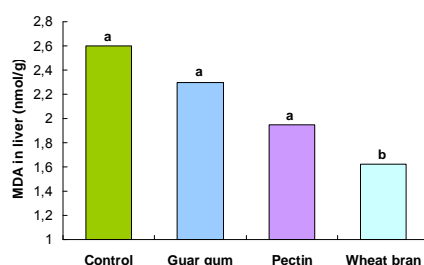


- In the comparison to the CONT group wheat bran significantly increased the percentage of DNA in the head of comet.
- Guar gum and pectin also reduced the amount of DNA damage, but not significantly.

	Control	Guar gum	Pectin	Wheat bran
Olive Tail Moment	6.69 ± 2.06 ^a	5.20 ± 1.61 ^a	5.51 ± 2.64 ^a	2.64 ± 1.12 ^b

- Olive Tail Moment is defined as the product of the amount of DNA in the tail and the mean distance of migration in the tail (higher values represent higher rate of DNA damage).

Urinary and liver MDA concentration



- The analysis of the MDA in liver showed great variability in the fibre treated groups.
- The G and P (soluble fibre) group did not differ significantly from the CONT group, while the WB (insoluble fibre) group significantly reduced the concentration of MDA in liver.

	Control	Guar gum	Pectin	Wheat bran
nmol MDA/24 h	80.22 ± 35.23 ^{ac}	82.38 ± 25.51 ^a	55.15 ± 25.39 ^{bc}	51.29 ± 12.80 ^b

- The 24-h MDA excretion in urine in the P and WB groups were significantly lower while in the G group was in the level of the CONT group.

Conclusions

- The results clearly demonstrate harmful effects of a high fat diet on the oxidative status of the organism.
- The rate of lipid peroxidation and the degree of the leukocyte DNA damage show the protective effect of dietary fibre intake in a high fat diet.
- While the amount of total dietary fibre in the G, P and WB groups was similar, the results showed that the fibre itself (guar gum, pectin) is not as effective in reducing the oxidative stress as fibre mixed with other substances (wheat bran). Wheat bran contains substances with known antioxidative properties: phenolic acids and lignans, which are obviously very important in oxidative stress prevention.