IMPACT OF WHEAT FRACTIONS DIFFERING BY THEIR DIETARY FIBER CONTENT AND INCORPORATED IN SEVERAL CEREAL FOODS ON THEIR GLYCAEMIC AND INSULINAEMIC RESPONSES

A. Meynier[1], M. Champ[2,3], P. Chauveau[4], C. Barron[5], L. Saulnier[6] and S. Vinoy[1]

[1] Mondelez France R&D, Saclay, France; [2] CRNH Ouest, Nantes, France; [3] UMR 1280 PhAN INRA, Nantes University, Nantes, France; [4] Biofortis, Nantes, France; [5] UMR 1208 IATE INRA, UMII, Cirad, Montpellier Supagro 2, Montpellier, France; [6] UR 1268 BIA INRA, Nantes, France

Background and Objectives:

The concept of glycemic Index developed in 1981 by Jenkins *et al*. allows to describe the variations in physiological responses produced by different carbohydrate-containing foods. Low Glycemic Index (GI) diets have been shown beneficial effects on the prevention of metabolic diseases such as cardio-vascular disease, type 2 diabetes and some types of cancers (Blaak et al, 2012). For cereal products, several studies have linked glycaemic response to the nutritional composition (lipid, protein and dietary fiber contents) and the digestibility rate of starch fraction (Meynier et al, 2015).

The objective of the present study was to measure GI and Insulin Index (II) of different cereal food products enriched or not with two different wheat fractions differing by the fermentescibility of the dietary fiber (DF) fraction they contain.

Methods:

3 types of cereal products (bread, biscuits and pasta) have been prepared incorporating only refined wheat (reference products R) or two wheat fractions differing by the fermentescibility of the fiber they contain: one fraction containing mainly pericarp (products F-) and one fraction rich in aleurone layer (products F+). The composition and portion tested for each product is presented in Table 1.

Table 1 : **Composition and portion size of the 9 tested cereal products to provide 50g of available CHO.**

Products	Moisture (g/portion)	Proteins (g/portion)	Lipids (g/portion)	Sugars (g/portion)	Dietary fibers (g/portion)	Available starch (g/portion)	Slowly Digestible Starch (g/portion)	Tested portion (g)
Bread R	36	7	1	3	**3**	43	1	**95**
Bread F-	49	10	2	3	**8**	42	1	**119**
Bread F+	53	11	2	4	**6**	42	1	**123**
Pasta R	126	11	2	1	**3**	44	20	**195**
Pasta F-	126	10	2	1	**6**	45	9	**192**
Pasta F+	121	11	2	1	**5**	45	16	**190**
Biscuits R	1	4	12	15	**2**	31	13	**69**
Biscuits F-	1	5	12	18	**5**	28	13	**73**
Biscuits F+	1	7	14	20	**5**	27	10	**78**

GI was measured according to the standard methodology (Brouns et al, 2005, ISO 26642-2010) using glucose solution as reference food tested on 3 separate occasions. Eighteen healthy normal-weight volunteers have been recruited for the study and 17 completed the 12 sessions. Glucose and Insulin concentrations have been measured on capillary blood samples at -5, 0, 15, 30, 45, 60, 90 and 120 minutes after eating commenced. Blood glucose concentrations have been measured using a Roche/Hitachi 912® automatic spectrophotometer employing the GOD-PAP method. Insulin has been quantified using a commercial insulin EIA kit (Insulin EIA kit, Alpco).

Results:

The 18 subjects recruited in the present study were aged between 20 – 34 years with BMI ranging from 19.1 to 25.0 kg/m². This population was recruited with a low HOMA-IR value ranging from 0.6 to 1.6.

The glycemic Index (Figure 1) of the products ranged between 44 and 74 with the biscuits having the lowest indexes (around 45). Unfortunately, no significant difference was observed between the fractions for a same type of cereal food product. On the other hand, significant differences were obtained between bread and biscuits for fractions R and F+ and between biscuits and pasta for fractions R and F+. Interestingly, pastas display quite high GI values despite their high content of Slowly Digestible Starch.

The Insulin Index ranged between 57 and 91. No difference was observed between the fractions for a same type of food product. Significant differences were observed between bread and biscuits and between bread and pasta incorporating fraction F-.

Figure 1 : **Glycemic Index obtained for the 9 tested cereal products.**

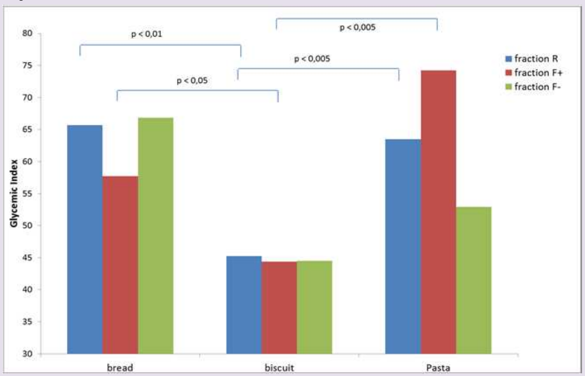
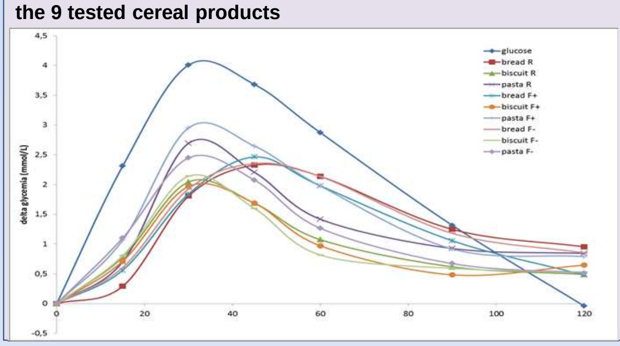


Figure 1 : **Kinetics of glycaemia following the ingestion of the 9 tested cereal products**



Glycaemic responses following the 9 cereal products are all lower than the one obtained after the intake of the glucose solution. Kinetics of glycaemia confirm the ranking observed with GI values. However, peak values obtained with breads were lower than those following the ingestion of pastas and were delayed by about 15 minutes. Globally, kinetics of glycaemia were more spread over time with breads compared to the other cereal products. This lead to incremental Area Under the Curve values similar with breads and pastas and thus to similar values of GI.

Conclusions :

Significant differences were observed on GI, II and glycaemic and insulinaemic responses between the different cereal foods matrixes studied. However, high-fiber wheat fractions did not induced significant effects within a same food matrix. The level of enrichment in fibers (from 3 to 5g/portion) above the control products was potentially too low to obtain a significant difference in GI. Further investigations are necessary to understand the reasons for delayed and spread kinetics observed following bread ingestion. Moreover, it appears interesting to investigate the impact of such glycaemic response profile on health.

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