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Study of physicochemical properties of foods that influence the glycaemic responses

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The carbohydrate foods of diverse nature exhibit different postprandial blood glucose responses. Thus, the concept of Glycaemic Index (GI) was introduced to rank starchy foods depending on their blood glucose raising potentials. The GI values have been identified to be influenced by various physicochemical properties of the food items. Therefore, this study was designed to analyse the effects of certain physical properties of the starch/granule (granular structure, degree of gelatinization), chemical properties of foods (amylose) on some published and unpublished GI values.

Table 1: Food items analysed, GI values (n=10), water absorption indices (WAI), water solubility indices (WSI) (n =6), amylose (n=3), granular structure.

Food	GI±SEM	Amylose (g/100g starch)	WAI±SD	WSI±SD	Granular structure
Red rice (cooked) – (*RR*)	99[1]±8	34	2.9± 0.0	6.9± 0.6	a, b, c
White sliced bread - (*WSB*)	100[1]	35	3.0± 0.2	17.7± 0.3	a, b, c
String hopper (red rice flour)– (*SHR*)	103±10	29	3.5± 0.1	3.4± 0.2	b, c
Wholmeal bread - (*WB*)	103[1]±7	28	2.8± 0.1	14.5± 0.3	a, b, c
String hopper (wheat flour)– (*SHW*)	104[1]±12	24	4.2± 0.1	9.2± 0.8	b, c
Ordinary bakery bread - (*OBB*)	114[1]±9	32	3.4± 0.1	13.0± 0.3	b, c.
Manioc	120±8	45	3.7± 0.1	4.4± 0.1	b, c

[1] Published data (Proceedings of SLAAS 2008, pp 164-166); a –Intact; b- swollen; c- disintegrated.

The WAI is an indicator of the gelling capacity of the starchy source. *SHW* had the highest WAI followed by manioc. WSI expresses the amount of soluble substances dissolved in the medium. The bread varieties have high WSI values indicating hydrolysis and leaching of more soluble substances (proteins, amylose) during cooking. When the starch granules were examined under light microscope some intact granules were observed only with *WSB, WB* and *RR*. All the others had extensively swollen or disintegrated granules. The percentage of amylose is reported to be inversely associated with the glycaemic responses. However, manioc with the highest amylose content showed the highest GI. This could be explained by its high WAI and extensive disintegration of granules. All the cooked foods have significantly higher ($p<0.05$) WAI and WSI contents than their corresponding raw flour except the high WSI in raw manioc flour. The amylose contents of cooked flour were significantly higher only in wheat flour preparations and manioc ($p<0.05$). The increase in WAI, WSI and amylose could be due to gelatinization during cooking process and breakdown of amylopectin to amylose. According to the present study the degree of gelatinization has played the major role in influencing the glycaemic responses of foods.

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