Glycemic index of buckwheat bread

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Introduction.

About half of the Finnish adult population is overweight or obese and the incidences of conjoining diseases like type 2 diabetes (T2D) are increasing continuously. According to the current estimate more than 500 000 people suffer from T2D in Finland – nearly half of them are not diagnosed. Preventing or alleviating obesity related diseases would save considerable costs to the health care system and decrease side effects associated with the use of medicines.

Buckwheat (*Fagopyrum esculentum* Moench) is one of the oldest crops in Finland, traditionally used as cooked or baked. It is gluten free and thus suitable also for people suffering of celiac disease. Further, the increased use of buckwheat would have significant positive effects on environment because of its low demand of fertilizers. Buckwheat contains flavonoids like quercetin that influence T2D (Li et al. 2009) and protein components that reduce perturbations in lipid metabolism (Tomotake et al. 2006). Processing like hydrolysis of buckwheat affects these actions. Buckwheat is also a good source for antioxidants (Gorinstein et al. 2007, Jiang et al. 2007). Animal trials have shown that the health effects of buckwheat are associated especially with sugars and fiber. A diet rich in buckwheat fiber reduced many overweight related risk factors of cardiovascular diseases in rats (Son et al. 2008).
Generally, diets rich in dietary fiber decrease risk of non-communicable life-style diseases like cardiovascular diseases, metabolic disorder, and T2D (Barclay et al. 2008). Soluble fibers may slow transit of food materials through the small intestine, and thus lower the dietary glucose and insulin responses. Dietary fiber can support the regulation of energy intake and satiety. Greater satiety may result from the physical properties of dietary fiber, modulation of gastric motor function, and weakening of glucose and insulin responses (Papathanasopoulos and Camilleri 2010).

Health effects of fiber can be substantiated only when the intake is high enough – for healthy adults the amount seems to be 25 -38 g/d (Slavin et al. 2009). Average fiber intakes for Finnish people are far from the recommended levels (Finravinto 2007). However, increasing intake of dietary fiber has been difficult even in intensive interventions (Lindström et al. 2006) and there is a great need for fiber rich foods with pleasant sensory properties. Consumers need more pleasant easy-to-use alternatives.

Methods

Glycemic responses (two hour tolerance test) of buckwheat bread containing buckwheat and oat flour and control bread containing oat flour only were measured in clinical studies according to FAO/WHO recommendations noticing the recent improvements in the methods; A standard evening meal (supper) was be provided for each test person for the nights before tests, and test persons got exact orders for the exercise on the test morning. Test persons (10) fasted 8-12 hours before each test. They ate a portion of bread or glucose containing 50 g available carbohydrates (Table 1). A two hour measurement system with 7 micro blood samples applied,

three basic glucose tolerances included, and the order of tests was randomized. Between every test there was at least three days wash out period to eliminate the possible long term effects of the fasting or buckwheat. The glucose level of serum was measured using quantitative colorimetric glucose assay kit (Biochain, Hayward, CA, USA) at 650 nm. Glycemic index was calculated as relative area of glucose response caused by buckwheat bread or control bread as compared to glucose.
The research plan for the clinical study was approved by the ethical board of Kanta-Hämeen Keskussairaala before starting the study.

Table 1. Carbohydrate sources of the test breads.

Calculated content per portion	soluble carbohydrates (g)	fiber (g)	Fiber source (%)		
			Buckwheat	Oats	CMC
Buckwheat bread	50	9	30	35	35
Control bread	50	9	0	64	36

Results

The GI values of buckwheat bread and control bread will be shown in poster. The preliminary results of six test persons show that buckwheat bread has a slower but longer lasting glycemic effect than glucose (Figure 1). In addition, test persons commented in their questionnaires that the buckwheat bread kept feel of hunger away efficiently.

Conclusions

According to the preliminary results, buckwheat bread seems to be a good choice to stabilize blood glucose levels after meal.

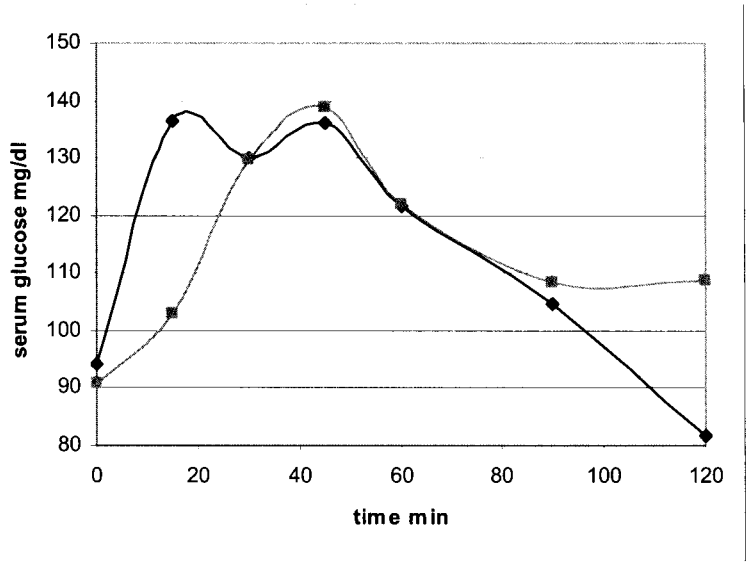

Figure 1. Serum glycemic response of glucose (◇) and buckwheat bread (□) as an average of six test persons.

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