

Sugars to lower glycaemia

Arabinose: acute effects on postprandial glycaemia

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Background

Diets that induce high fluctuations in postprandial plasma glucose and insulin concentrations are linked to obesity and type 2 diabetes [1]. L-arabinose and D-xylose are pentoses which are hypothesized to inhibit intestinal sucrase activity on the brush border of the small intestine and therefore delay sucrose digestion and lower postprandial glycaemic and insulinemic responses [2,3].

Objective

To investigate the effect of addition of

- L-arabinose or D-xylose to a liquid product, and of
 - L-arabinose to a solid product,
- on glycaemic and insulinemic responses.

Methods

15 healthy male subjects (age: 23.4 ± 3.0 y; BMI: 22.3 ± 1.6 kg/m²) participated in 2 double-blind randomized cross-over experiments.

Experiment A, fruit-flavored beverages of 500ml were tested

(50g available carbohydrates):

- 38g sucrose with 3.6g L-arabinose,
- 38g sucrose with 3.5g D-xylose, and
- 41g sucrose.

Experiment B, muffins of 115g containing 23g sucrose were tested

(50g available carbohydrates):

- 2.3g added L-arabinose, and
- no L-arabinose addition.



Figure 1. Experiment A Beverage



Figure 2. Experiment B Muffins

Results Experiment A: Beverages

- Peaks in glucose and insulin were significantly lower after L-arabinose and D-xylose compared to the control drink ($p < 0.01$).
- After 90 minutes glucose is significantly higher for the L-arabinose beverage compared to the control (1.0 mmol/L; $p = 0.03$).
- After 30 minutes insulin is significantly lower for the L-arabinose beverage (-12.0 mU/L) and D-xylose (-8.3 mU/L) compared to the control ($p = 0.005$).

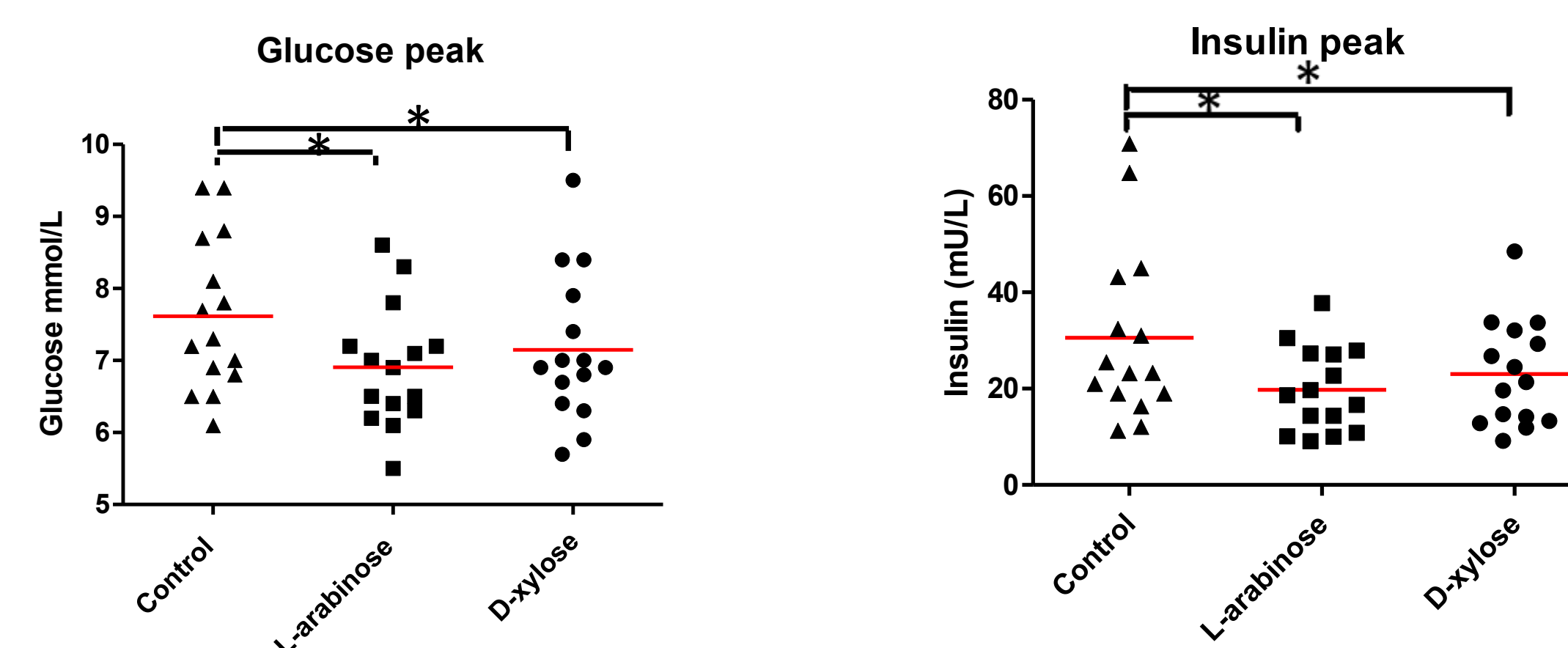


Figure 3. Plasma glucose and insulin peaks. Values are individual replicates and means.

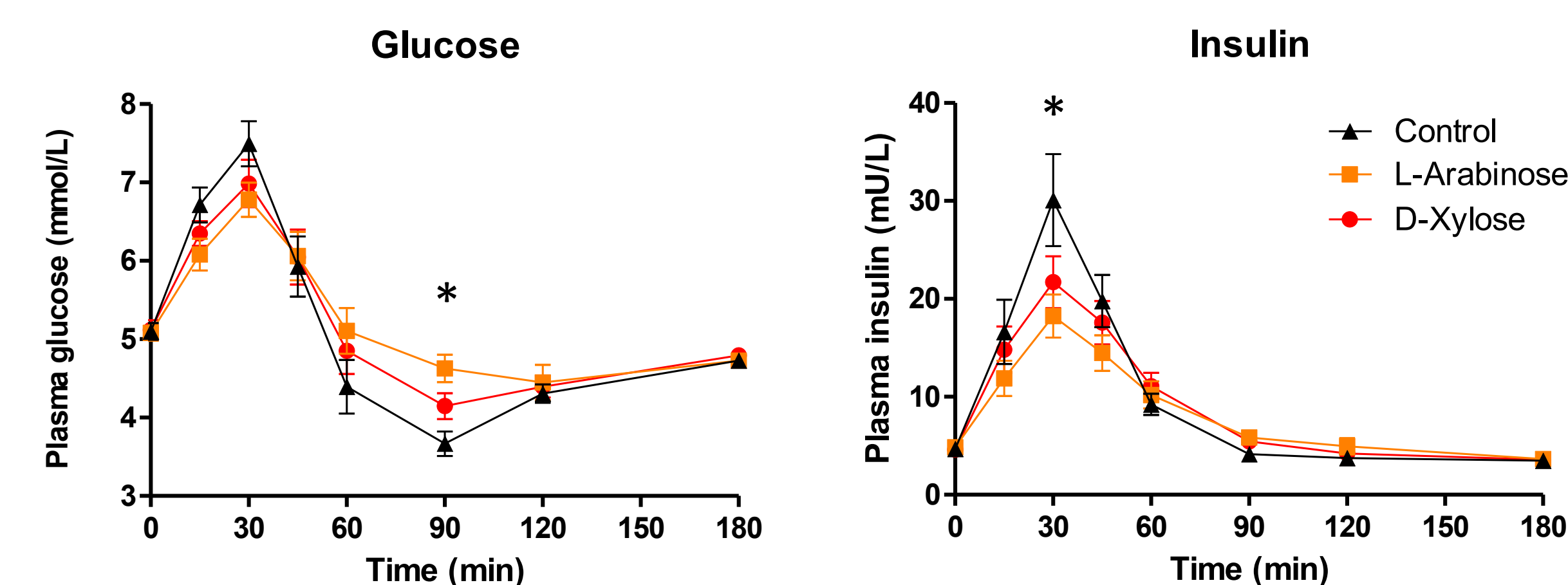


Figure 4. Plasma glucose and insulin responses of Experiment A. Values are means \pm SEM.

Results Experiment B: Muffins

- Glucose responses were similar after both muffins, however the insulin peak tended to be lower for the muffin with L-arabinose ($p = 0.06$).
- No differences per time point on glucose or insulin ($p > 0.05$).

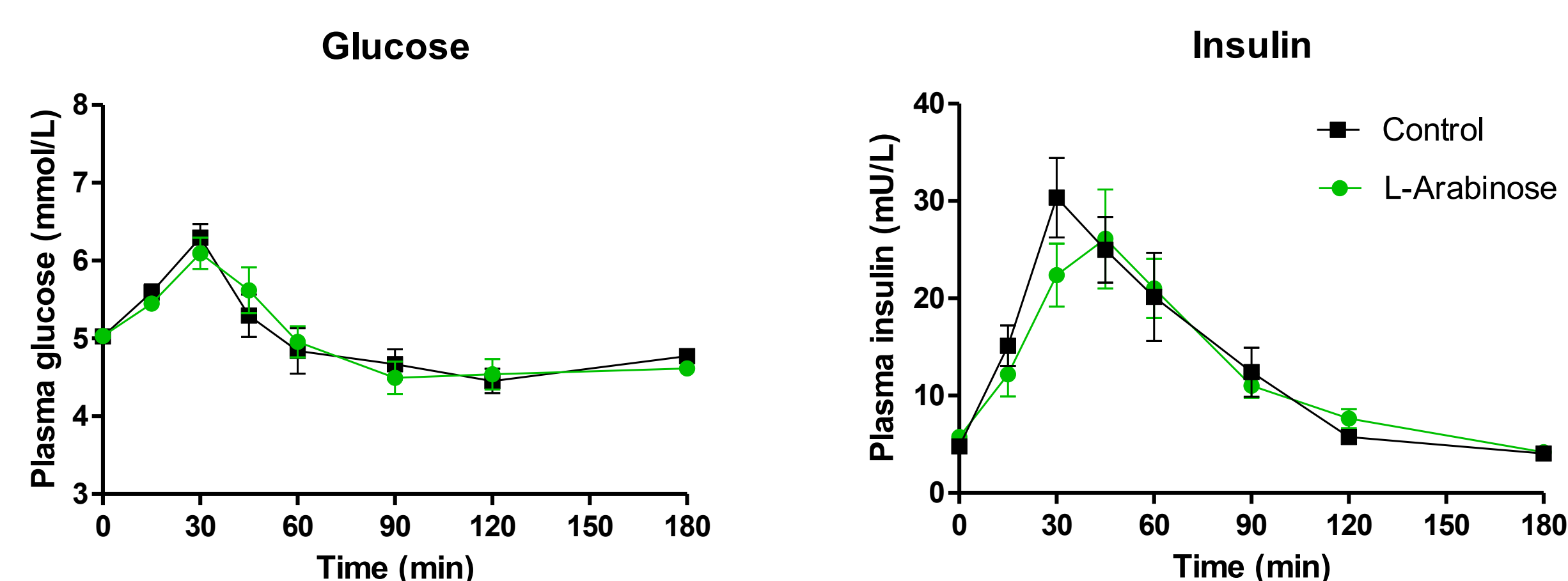


Figure 5. Plasma glucose and insulin responses of Experiment B. Values are means \pm SEM.

Conclusions

- L-arabinose and D-xylose are potent functional ingredients to reduce glycaemic and insulin responses.
- The effect for L-arabinose seems more pronounced in simple liquids compared to more complex solid foods.
- Further studies should investigate the dose-response, applications in other foods and other study populations.

Results Appetite

- Subsequent *ad libitum* energy intake was not different between the different types of beverages and muffins.
- Hunger, fullness, desire to eat, or prospective food consumption were not different.

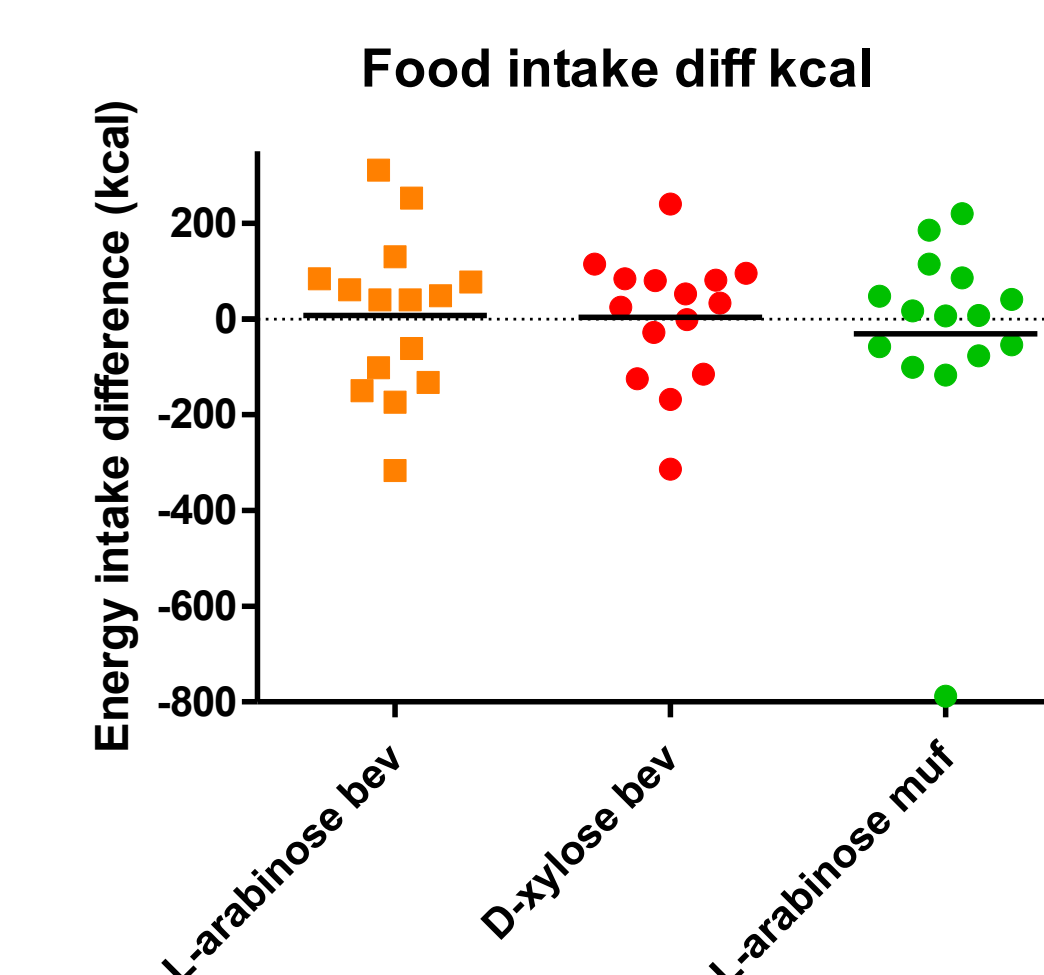


Figure 6. *Ad libitum* food intake (pasta) after 240 min. ranged between 530 – 1320 kcal. Mean intake was 930 kcal. No differences. Individual observations subtracted by the control beverage or muffin.

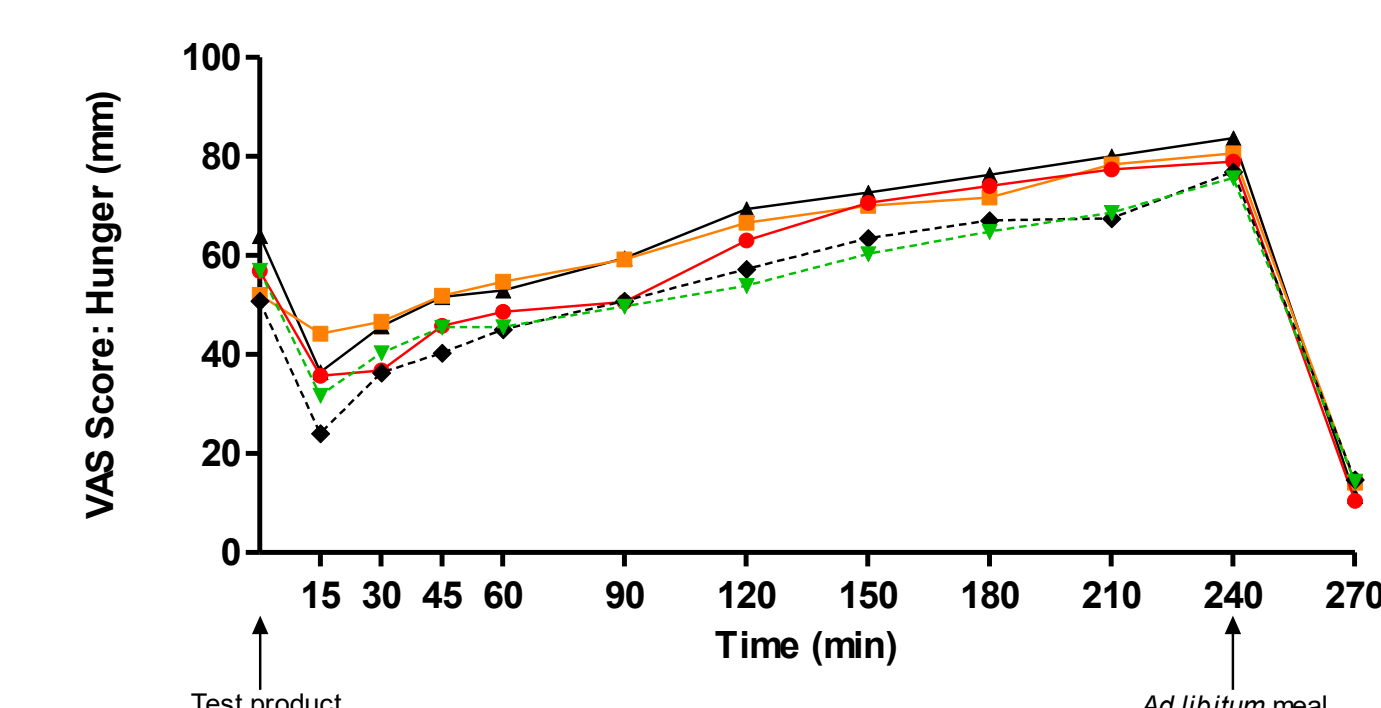


Figure 7. Appetite ratings: Hunger. (Mean scores)

References

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