

PRO1523: Effects of faba bean fractions in novel food products on glycemia, appetite, and metabolic control

Overall Objective: To describe the effect and mechanisms of action of commercially prepared foods with faba bean flours of high macronutrient content (whole faba bean flour, high faba bean protein flours, and high faba bean starch flour) on glucose and insulin homeostasis, food intake, satiety, and metabolic regulation in young adults.

Hypothesis: Faba bean flours used as value-added ingredients in breakfast smoothies, snacks (crackers), and whole foods (pasta) will increase satiety, decrease food intake, and improve control of postprandial glycemia in comparison to foods prepared in the absence of these ingredients.

Study Design: Three separate activities were being carried out in this study and each activity was comprised of two randomized, cross over, repeated measures experiments (n=60 per activity).

Treatments: Each activity was comprised of five treatments (one control and four faba bean treatments): (Activity 1) 330 mL breakfast smoothies alone (control) or with the addition of 32 g of one of the following flours: faba bean protein isolate (85% protein), faba bean protein concentrate (60% protein), faba bean starch, or whole faba bean flour.

(Activity 2) 60 g crackers prepared with 100% whole wheat flour (control) or 40% replacement of whole wheat flour with faba bean 85% protein flour, faba bean 60% protein flour, high starch faba bean flour, or whole faba bean flour.

(Activity 3) 85 g pasta prepared with 100% durum wheat semolina (control) or 25% replacement of durum wheat semolina with faba bean 85% protein flour, faba bean 60% protein flour, high starch faba bean flour, or whole faba bean flour.

Treatment consumption was followed by serving the participants an ad libitum pizza meal (exp-1) and fixed-energy pizza meal (12 kcal/kg body weight; exp-2), 120 minutes following the treatments. Subjective appetite (using visual analogue scales), BG, gut hormones (markers of metabolic control), and gastric emptying rates are being measured during both pre-meal (0-120 min) and post-meal periods (140-200 min).

A secondary objective of this study was to conduct structural and physicochemical characterization of the isolated faba bean flours as well as the final products (breakfast smoothies, crackers, and pasta) in order to gain a better understanding of structure-function relationships pertaining to technological functionality in food systems as well as physiological functionality.

Brief Summary of Findings:

(Activity 1) An effect of treatment on both pre-meal ($p < 0.0001$), post-meal ($p = 0.007$), and total ($p = 0.003$) BG iAUC were observed. All faba bean flours led to lower ($p < 0.05$) pre-pizza blood glucose iAUC compared with control. However, post-meal blood glucose iAUC was lower ($p < 0.05$) following faba bean protein concentrate compared to faba bean starch smoothie. Total blood glucose iAUC was lower ($p < 0.05$) following faba bean protein concentrate and faba bean protein isolate smoothies compared to control.

(Activity 2) Faba bean protein concentrate and faba bean protein isolate led to lower pre-meal BG iAUC compared to whole wheat flour crackers, and faba bean protein isolate compared to faba bean starch. Total BG iAUC (0-200 min) was lower following the faba protein isolate compared to whole wheat flour crackers ($p < 0.001$).

Conclusion: Addition of faba bean flours to foods may aid in control of postprandial glycemia and utilization of faba beans as value-added ingredients may broaden their application as well as other pulses.