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Resistant starch structure, food processing, and glycaemic control: investigating how the synergy of starch synthesis variation and processing influences glycaemia

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The maintenance of glycaemic homeostasis is critical to lifelong health, with poor glycaemic control being responsible for 4 million premature deaths globally[1]. Evidence suggests that abnormal postprandial blood glucose (PPG) is a significant driver of non-communicable diseases and consumption of carbohydrate rich foods is a major determinant of abnormal PPG. An effective strategy to decrease the risk is to reduce the glycaemic impact of commonly consumed foods. One possibility would be to reduce starch digestibility either via utilising variation in starch synthesis *in planta* or via specific processing methods. The aim of this study was to use mutant whole pea seeds and pea pasta (30% mutant pea flour) as vehicles to understand their effects on glycaemic parameters.

Specifically, we explored the effects of a natural mutation found in Pisum Sativum (rr peas), which provides a unique form of starch synthesis exhibiting higher resistant starch content, and *rr* enriched pea flour pasta, and investigated their glycaemic properties and their impact on postprandial glycaemia and insulinaemia in 11 healthy subjects. We ran a randomized, open labelled, crossover study involving five visits and we used standard GI methodology[2]. The test treatments included: glucose drink, wild type *RR* peas (control peas), mutant *rr* peas, mutant *rr* pea pasta (30% *rr* pea flour-70% durum wheat flour) and plain pasta (durum wheat). Blood samples were collected over a 3 h period to determine the GI, plasma glucose and serum insulin levels. Appetite and sensory characteristics were determined for each tested meal/visit.

Results indicated that the GI of *rr* pea pasta was lower than plain pasta but significantly higher than whole *rr* peas (*rr* pea pasta: 65 ± 16; plain pasta: 90 ± 21; GI *rr* peas: 15 ± 4; *RR* peas: 31 ± 10). Consumption of *rr* pea pasta resulted in lower postprandial glucose $iAUC^{0–180min}$ and significantly lower insulin $iAUC^{0–180min}$ than plain pasta ($p = 0.08$, $p < 0.05$ respectively). The glucose $iAUC^{0–180min}$ of *rr* pea pasta was higher than that of whole *rr* peas but the insulin $iAUC^{0–180min}$ was significantly lower ($p < 0.05$, $p < 0.05$ respectively). Substituting durum wheat flour with *rr* pea flour to produce pasta did not have an effect on appetite or sensory characteristics against plain pasta.

Our results indicate that the synergy between *rr* enriched pea flour and wheat flour can alter the GI of pasta and reduce postprandial glycaemia and insulinaemia in healthy subjects without altering appetite and sensory characteristic measures. This effect increases the potential for *rr* pea wheat pasta to be a consumer-friendly functional staple food with increased consumer acceptance. These results suggest that using pea variants to produce new, functional ingredients and to design commonly consumed foods can play an effective role in reducing the risk of non-communicable diseases.

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References

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