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Postprandial glycemic response to thermally processed rice: experimental basis for metabolic predictability and stability assessment

Răspunsul glicemic postprandial la orez procesat termic: bază experimentală pentru evaluarea predictibilității și stabilității metabolice

Postprandial glycemic response is strongly influenced not only by food composition but also by technological processing conditions applied prior to consumption. Rice represents an appropriate experimental model for investigating how domestic thermal processing affects metabolic responses. The aim of this study was to experimentally evaluate the effect of cooking duration on postprandial glycemic response and to establish an in vivo experimental basis for assessing metabolic variability, stability, and predictability. Four rice varieties differing in structural characteristics (three refined varieties and one whole-grain variety) were analysed under two cooking regimes: recommended cooking time and prolonged cooking (+10 min), simulating thermal overprocessing. An in vivo study involving ten healthy participants was conducted. Glycemic response was assessed using glycemic index (GI), incremental area under the glycemic curve ($iAUC_{0–120}$), postprandial glycemic dynamics (0–120 min), and glycemic load (GL) of a standard 300 g portion. Statistical evaluation was performed using two-factor ANOVA to determine the effects of rice variety and cooking duration. Results showed systematic increases in GI and $iAUC_{0–120}$ for refined rice varieties following prolonged cooking, indicating enhanced starch digestibility and increased glycemic exposure. In contrast, whole-grain long-grain rice exhibited a differentiated response characterized by reduced iAUC values and maintenance of moderate glycemic load despite extended thermal treatment. ANOVA

analysis confirmed significant effects of both variety ($F=48.84$, $p<0.001$) and cooking duration ($F=7.14$, $p=0.009$), as well as a significant interaction between factors, demonstrating that technological processing effects are variety-dependent. Extended cooking also reduced interindividual variability for some varieties, suggesting partial convergence of metabolic responses. Cooking duration acts as a critical technological determinant of both intensity and stability of postprandial glycemic response. The experimental protocol proved sensitive to technological modification, providing a validated basis for predictive modelling of glycemic response.

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