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The use of complexing index methods to examine the production of amylose-lipid complexes from potato starch

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Dietary carbohydrates in starchy food may influence human health due to interactions with other food components, including lipids (resulting in the formation of amylose-lipid complexes). Amylose-lipid complexes (ALCs) are classified as type-5 resistant starch (RS-5). ALCs are reported to reduce postprandial glycaemic responses *via* slower digestibility and absorption. Resistant starches may positively benefit the control of type 2 diabetes and cardiovascular diseases[(1)]. Therefore, optimising the formation of ALCs in starchy foods, such as potatoes, could positively impact public health. Different methods have been used to produce ALCs from starches[(2,3,4)]. However, there is limited information about the formation of ALCs from potato starch.

This study investigated the formation and quantification of ALCs obtained from potato starch and palmitic acid (PA). Palmitic acid was selected based on preliminary results and is one of the free fatty acids naturally present in cooking oils. Our hypothesis was that the quantity of potato ALCs formed would depend on the method used.

Three methods were evaluated for ALC formation: (i) potato starch prepared in dimethyl-sulfoxide (DMSO) and water (DGS); (ii) DMSO and ethanol (PS); (iii) water and then Pullulanase debranching enzyme (PGS). For each method, PA was dissolved in DMSO or ethanol (six treatment combinations in total). Potato starch and PA mixtures were heated and cooled, then aliquots were combined with distilled water and iodine solution. Absorbance was measured at 690 nm. Data are presented as the mean and standard deviation of three independent measurements. Statistically significant differences among means of experimental data were evaluated by two-way analysis of variance with differences between groups considered significant at $P < 0.05$.

The degree of ALC formation between starch and lipid was calculated as "per cent complexing index (%CI)". Higher %CI values represented greater complexation. Generally, the %CI values obtained ranged from 6.66 ± 1.4% to 49.41 ± 14.0%. The lowest values were obtained from the PS method with PA dissolved in DMSO, and the highest values were obtained from the PGS method with PA dissolved in ethanol. Generally, the PA dissolved in ethanol formed significantly more ALC compared with PA dissolved in DMSO ($p = 0.0048$). The %CI obtained for each method (i.e., DGS, PS, PGS) were significantly different ($p = 0.00038$).

This study provided insights into factors for optimising the formation of ALC from potato starch. It showed that different methods could significantly impact the formation of ALC from potato starch. Further studies may explore methods that simulate the production and cooking of potato-based meals. *In vitro* and *in vivo* digestibility experiments may provide an understanding of the nutritional and functional benefits of potato ALC.

References

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