



### PHYSICOCHEMICAL AND DIGESTIBILITY PROPERTIES OF DOUBLE-MODIFIED BANANA (*MUSA PARADISIACA* L.) STARCHES.

#### ABSTRACT

Banana starch was chemically modified using single (esterification or cross-linking) and dual modification (esterification-cross-linking and cross-linking-esterification), with the objective to increase the slowly digestible starch (SDS) and resistant starch (RS) concentrations. Physicochemical properties and in vitro digestibility were analyzed. The degree of substitution of the esterified samples ranged from 0.006 to 0.020. The X-ray diffraction pattern of the modified samples did not show change; however, an increase in crystallinity level was determined (from 23.79 to 32.76%). The ungelatinized samples had low rapidly digestible starch (RDS) (4.23–9.19%), whereas the modified starches showed an increase in SDS (from 10.79 to 16.79%) and had high RS content (74.07–85.07%). In the cooked samples, the esterified starch increased the SDS content (21.32%), followed by cross-linked starch (15.13%). Dual modified starch (cross-linked-esterified) had the lowest SDS content, but the highest RS amount. The esterified and cross-linked-esterified samples had higher peak viscosity than cross-linked and esterified-cross-linked. This characteristic is due to the fact that in dual modification, the groups introduced in the first modification are replaced by the functional group of the second modification. Temperature and enthalpy of gelatinization decreased in modified starches (from 75.37 to 74.02 °C and from 10.42 to 8.68 J/g, respectively), compared with their unmodified starch (76.15 °C and 11.05 J/g). Cross-linked-esterified starch showed the lowest enthalpy of gelatinization (8.68 J/g). Retrogradation temperature decreased in modified starches compared with unmodified (59.04–57.47 °C), but no significant differences were found among the modified samples.

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