



In vitro Digestibility of Cassava, Corn, Arenga and Sago Starches Modified with Green Tea and Red Guava Leaf Extracts

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ABSTRACT

The aim of this study was to modify cassava, corn, arenga and sago starches with 58-62°Brix (0, 4, 6 and 8%) green tea and red guava leaf extracts, in order to decrease the digestibility. Starch digestibility were analyzed *in vitro*. The type of extract did not significantly affect *in vitro* digestibility of modified starches. The digestibility of both modified starches was lower than the native starch, but not different from modified starch without the extract (0%). The digestibility of modified starches was only influenced by the type of starch. Corn and arenga staches modified by 4% green tea and red guava leaf extracts had the lowest digestibility with 83.42 and 82.67% respectively.

Keywords: Cassava, corn, arenga, sago modified starches, green tea, red guava leaf, in vitro starch digestibility, polyphenol

INTRODUCTION

The high digestibility of native starches could be lowered by physical and chemical modification. The modification could be done by soaking the starch in green tea and red guava leaf extracts that rich with polyphenolic compounds. Polyphenolic compounds were known having ability to inhibit the activity of digestive enzymes and reduce the digestibility of starches. The starches possibly formed inclusion complexes with phenolics compound resembling amylose-lipid complexes. These complexes could not be recognized by the digestive enzyme¹. Polyphenols (flavonoids) inhibit the activity of α -amylase through two mecha-nisms: (1) Formation of hydrogen bond between the hydroxyl groups of the polyphenols ligands and the catalytic residues of the enzyme binding site (2) Formation of a conjugated π -system that stabilizes the interaction with the active site enzyme, between the AC ring polyphenols and Trp⁵⁹ indole ring ligand α -amylase². FAO/WHO recommended intake of low digested carbohydrates because proven role in the prevention and treatment of diabetes mellitus.

OBJECTIVE

The objective of this study was to determine the digestibility of starch modified with green tea extract and red guava leaf extract at several concentrations

MATERIAL AND METHOD

- Material: Cassava (*Manihot esculenta* Crantz), corn (*Zea mays*), arenga (*Arenga pinnata* (Wurmb) Merr) and sago molat (*Metroxylon sagus* Rottbal) starches, super peko green tea and young red guava leaf.
 - Green tea and red guava leaf were extracted with water according to Widowati (2007)³ and Nantitanon *et al.* (2010)⁴ modified method .
 - Starch digestibility were analyzed by *in vitro* enzymatic method
- Starch modification process show In **Figure 1**

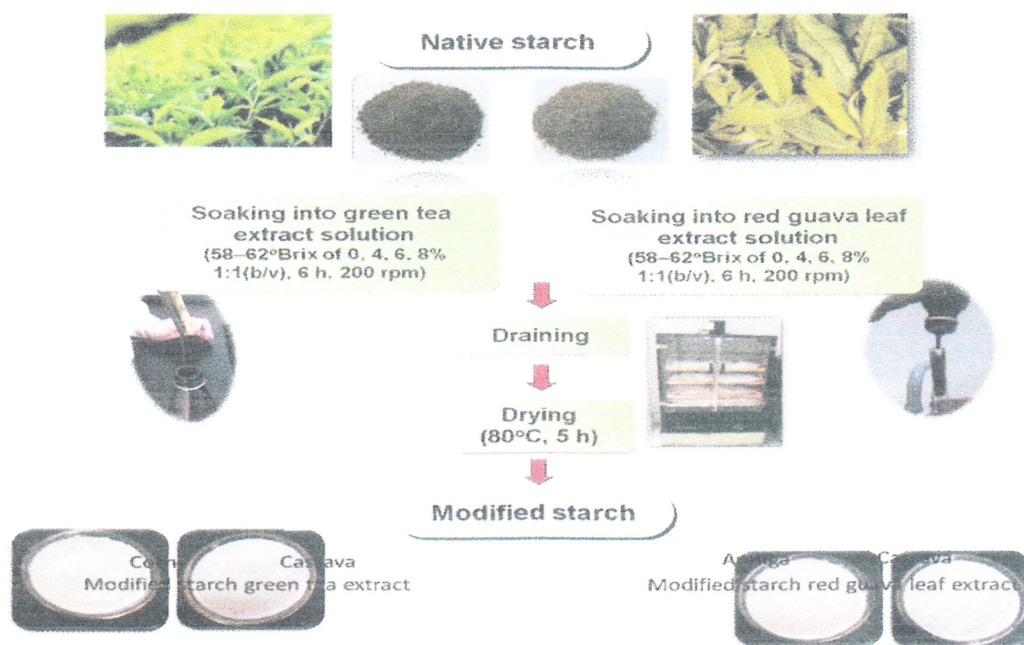


Figure 1 Starch modification process

RESULT AND DISCUSSION

The digestibility of modified starches were only influenced by the type of the starch. Concentration of both extracts, interaction between type of starches and concentration of each extract, type of extracts did not significantly affected *in vitro* digestibility of modified starches. This probably due to the low concentration of extracts added and the analysis that only used a single enzyme (α -amylase) which led to inconsistencies in the test results of *in vitro* starch digestibility. The digestibility of modified starches with both extracts was significantly lower than the native starch 3.60-15.22% (modified with green tea extracts) and 4.07-13.65% (modified with red guava leaf extract), but not significantly different from modified starch without extract (0%). This suggests that the decrease in *in vitro* starch digestibility of modified starches was also influenced by heat. Modified starches were processed by heat moisture treatment (HMT). HMT Processing has a role in lowering starch digestibility. Corn and arenga modified with 58–62°Brix of 4% green tea and red guava leaf extracts had the lowest digestibility (83.42 and 82.67% respectively) (Table 1 & 2).

Table 1 Digestibility of starches modified with green tea extract

Type of Starch	<i>in vitro</i> starch digestibility (%)					
	Native Starch	concentrations of green tea extract solution				Average ²
		58 – 62 °Brix (%)				
		0 ¹	4	6	8	
Cassava	99.36±0.91	86.55±6.45	84.61±0.71	82.91 ±0.07	82.88±0.11	84.24±1.74 ^a
Corn	89.64±1.42	84.85±1.42	83.48±1.11	81.93±0.58	83.44±2.97	83.42±1.19 ^a
Arenga	90.55±0.75	84.91±2.31	84.19±1.59	85.75±1.91	86.65±1.54	85.37±1.06 ^{ab}
Sago	90.48±4.77	88.12±0.44	87.29±4.04	88.79±0.44	84.68±1.93	87.22±1.80 ^b

Average³ 92.51±4.58^a 86.11±1.56^b 84.89±1.67^b 84.85±3.09^b 84.41±1.67^b

Table 2 Digestibility of starches modified with red guava leaf extract

Type of Starch	<i>in vitro</i> starch digestibility (%)						Average ²
	Native starch	concentrations of red guava leaf extract solution					
		58 – 62 °Brix (%)					
	0 ¹	4	6	8			
Cassava	99.36±0.91	86.55±6.45	85.51±1.72	84.65±4.60	86.49±0.49	85.80±0.91 ^{bc}	
Corn	89.64±1.42	84.85±1.42	83.45±0.45	82.67±1.29	82.82±3.93	83.45±1.00 ^{ab}	
Arenga	90.55±0.75	84.91±2.32	82.75±2.59	81.68±0.43	81.33±1.52	82.67±1.61 ^a	
Sago	90.48±4.77	88.12±0.44	86.08±0.07	86.15±4.08	86.87±0.89	86.80±0.95 ^c	
Average ³	92.51±4.58 ^a	86.11±1.56 ^b	84.45±1.60 ^b	83.78±2.00 ^b	84.38±2.73 ^b		

¹Modified starches without added the extract treatment ² Means in a column with different superscript letters are significantly different (p>0.05) (ANOVA method). ³ Means in a row with different superscript letters are significantly different, (p>0.05) (ANOVA method).

CONCLUSION

The digestibility of modified starches with green tea and red guava leaf extracts were significantly lower than the native starch, but not significantly different from modified starch without the extract (0%). The digestibility of modified starches was only influenced by the type of starch. Corn and arenga modified with 58–62°Brix of 4% green tea and red guava leaf extracts has the lowest digestibility.

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