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Evaluation of effects of increasing molar substitution of hydroxypropylene on physicochemical, functional and morphological properties of starch from water yam (*dioscorea alata*)

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Statement of the problem: Amidst rising demand for modified starch, hydroxypropylated derivatives from water yam, an underutilized tropical botanical source remains unexplored. The objective of this work therefore is to extract starch from water yam, modify same by hydroxypropylation and determine their physicochemical, functional and morphological characteristics.

Methodology: Extraction of starch was carried out by blending peeled water yam previously soaked in 0.2%(w/v) $NaHSO_3$ solution and filtering the resulting slurry. The filterate was next suspended in 0.2% NaOH solution, allowed to sediment and the supernatant oven-dried (40°C) for 24 hrs. The dried product was subjected to hydroxypropylation (HP) (propylene oxide 4-12%/100g starch) and extent of molar substitution (MS) determined.The native and Hydroxypropylated starch (HPS) were evaluated for physicochemical, functional and morphological characteristics following standard methods. Pasting properties were analysed using Rapid Visco Analyzer (RVA) and elucidation of inherent functional groups was carried out by analyzing the FTIR Spectrum.

Findings: A Starch yield of 84.2% (dry wt. basis) and molar substitution (0.0024-0.05) of HPS were established. Bulk density increased (0.4988-0.6005g/cm^3) with MS. There was significant (p=0.05) increase in the degree of Whiteness (W) (42.4-63.6%) . Although granule size reduction was evident (33.88-33.43µm), hydroxypropylation did not affect their morphology. There was decline in concentrations of crude protein (0.18-0.01%), ash (1.35-0.34%) and amylose (44.19-37.48%) as MS rose. In contrast, there was significant (p=0.05) increase in water (1.76-2.66g/g) and oil absorption capacities (0.72-1.42g/g) swelling power (1.54-4.19g/g) and solubility (3.17-5.84g/g) at 50°C. Freeze thaw cycles showed marked reduction in syneresis (10.3-1.09%) as MS increased. PeakViscosity, pasting temperature and peak time of the HPS ranged from 297.83-583.6 , 81.9-86.4°C, and 4.5-7.0 mins respectively. FTIR band spectra indicated the presence of hydroxypropyl substituent groups in the modified starch

Conclusion and significance: Hydroxypropylated starch (from water yam) at different molar substitution has been characterised and its properties established with strong potentials for wider applications in food systems.

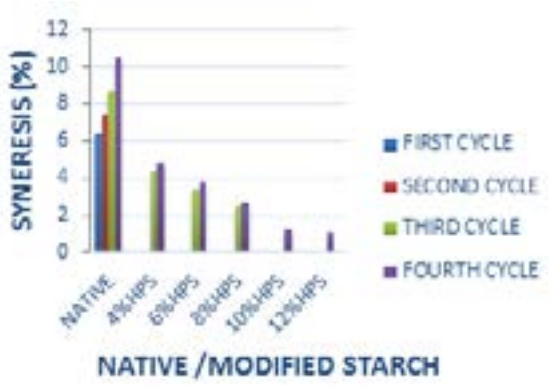

Figure 1 Freeze thaw stability of native and hydroxypropylated water yam starch.

Notes/Comments:

Hydroxypropylation reduced percentage syneresis of native water yam starch and is a function of number of freeze – thaw cycles.

Recent Publications

1. Alobo A.P., and **Arueya G.L.,** (2017). Physical, functional and chemical properties of Grewia venusta (ururu) mucilage extract. *International Food Research Journal* (in press)

2. **Arueya G.L.,** and Oyewale T.M (2015). Effect of Varying degrees of Succinylation on the functional and morphological properties of starch from acha (*Digitaria exilis kippis stapf*). *Food chemistry* 177:258-266.

3. Alobo A.P., and **Arueya G.L.,** (2015). Effect of Grewia venusta ('ururu') mucilage in the physico – chemical and Sensory properties of fried cake ('akara') prepared from bambara groundnut seed flour. *African Journal of Food science and Technology Vol.* 6(1): 12-17.

4. **Arueya, G.L.,** and Akomolafe B.O. (2014). Stability Studies of Micro encapsulated Anthocyanins of Roselle (Hibiscus Sabdariffa L) in Native starch and its potential application in Jam Production. *IOSR Journal of Environmental Science, Toxicology and Food Technology*. Vol. 8(7): 112-122.

5. **Arueya G.L.,** and Osundahunsi O.F. (2015). Determination of the functional and keeping qualities of extruded Soy-cocoa and Corn Starch based complementary food. *Sky Journal of Food Science* 4(5): 67-77.

Biography

Gibson Arueya has been quite active in studies of native and chemically modified hydrocolloids – mucilages and starches including their application in selected food systems. Robust expertise have also been demonstrated at extracting, characterizing, purifying and grading of gums and pectins from indigenous tropical plants (neglected and underutilized) aimed at reducing dependence on imported food hydrocolloids (often used as thickners, stabilizers, gelling and bulking agents).

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