

EVALUATION OF FUNCTIONAL AND PHYSICAL CHARACTERISTICS OF PRE-GELATINIZED CASSAVA (*Manihot esculenta* Crantz) STARCH FOR PHARMACEUTICAL TABLET COMPRESSION

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Outline

- Introduction
- Materials and Methods
- Results and Discussion
- Conclusions and Recommendations

Cassava

- Nigeria, world's leading producer (FAOSTAT, 2010)
- Important staple crop

Cassava root utilization

- Intermediate and finished food products like chips, High Quality Cassava Flour, starch, gari, bio-fuel and syrup (Etudaiye *et al.*, 2009)



Native starch

- Natural separation from grains, roots and tubers
- Limitations (Singh *et al.*, 2010)

Modified starches

- Alteration (Physical, Chemical, Enzymatic)
- Better alternatives (Omojola *et al.*, 2011)

Problem Statements

- Cyclic glut in cassava marketing (Ituen and Ituen, 2011)
- Wastages and losses
- Native starches have a lot of limitations (Singh *et al.*, 2010)
- Importation of potato and corn starches for food and drug uses (Choo *et al.*, 2010)

Aim and objectives

The aim of the study was

- to modify and evaluate cassava starch using pre-gelatinization method for pharmaceutical applications

The specific objectives of the study were to

- determine physical and functional properties of both native and pre-gelatinized starches
- determine tableting properties of native and pre-gelatinized starches

Justification

- Value addition to cassava starch
- Prevention of cassava glut
- Job creation and increased farmers' income
- Generation of baseline information

Materials

- Three varieties of Cassava Mosaic Disease (CMD) resistant cassava (TME 419, TMS 98/0505 and TMS 98/0581) from IITA, Ibadan, Analytical reagents,

Methods

Sample preparation

Extraction of native starch (Sanni *et al.*, 2006)

Modification Procedures:

- Pre-gelatinization at varying concentrations (25%, 30% and 35%) (Herman *et al.*, 1989)

- Tablet compression from native and pre-gelatinized starches (Olu-Owolabi *et al.*, 2010)

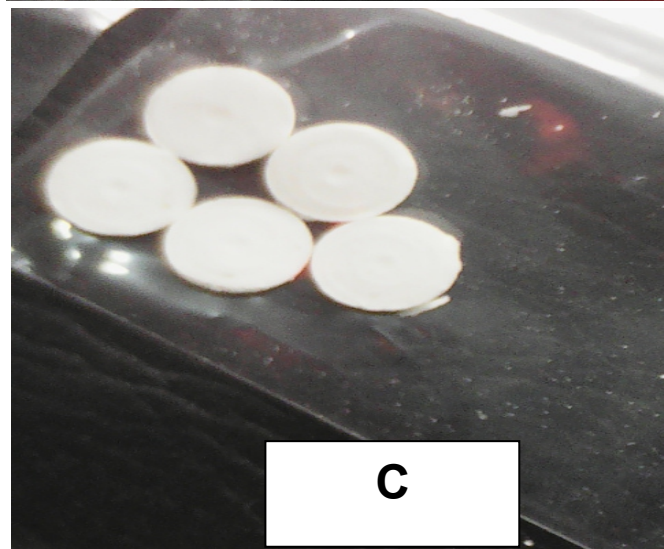
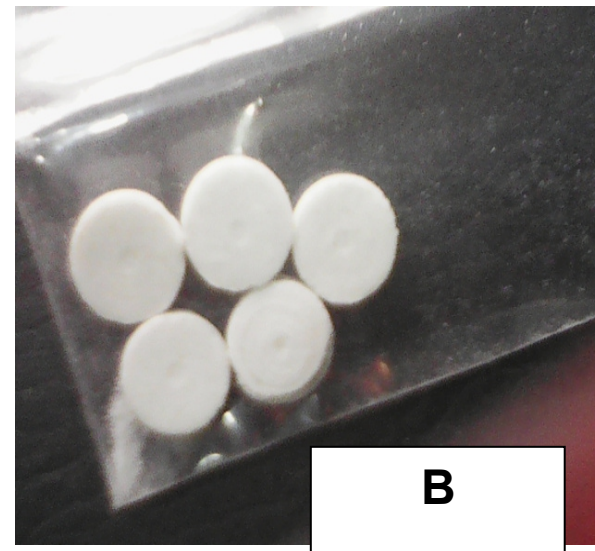


Plate 1: Photograph showing tablet compacts from native and pre-gelatinized cassava starches (A = Native, B = 25%, C = 30% d = 35%)

Functional Properties of modified starches

- Water absorption capacity (Nuwamanya *et al.*, 2011)
- Hydration capacity (Nuwamanya *et al.*, 2011)
- Swelling capacity (Hung *et al.*, 2007)

Flow properties of native and pre-gelatinized starches

- Carr Index (Picker-Freyer and Bring, 2006)
- Hausner's ratio (Picker-Freyer and Brink, 2006)
- Angle of repose (Shah *et al.*, 2008)

Statistical analysis

- Data generated in three replicates were analysed using SAS (version 8.2 of SAS Institute Inc., 1999)
- Significant Difference among the samples was determined using ANOVA

Results and Discussion

Table 1: Functional characteristics of pre-gelatinized cassava starches from TME 419 variety as affected by concentration

Sample concentration (g/100ml)	Water Absorption Capacity (%)	Hydration Capacity (%)	Swelling Capacity (%)
Native	13.33b	203.33b	115.00b
25	50.00a	603.33a	321.66a
30	48.33a	533.33a	315.00a
35	53.33a	580.00a	321.67a

Mean with same letters along same column are not significantly ($p>0.05$) different

Table 2: Functional characteristics of pre-gelatinized cassava starches from TMS 98/0505 variety as affected by concentration

Sample concentration (g/100ml)	Water Absorption Capacity (%)	Hydration Capacity (%)	Swelling Capacity (%)
Native	16.66b	136.67c	108.33c
25	51.66a	563.33a	338.33a
30	55.00a	603.33a	321.66b
35	46.66a	506.67b	323.33b

Mean with same letters along same column are not significantly ($p>0.05$) different

Table 3: Functional characteristics of pre-gelatinized cassava starches from TMS 98/0581 variety as affected by concentration

Sample concentration (g/100ml)	Water Absorption Capacity (%)	Hydration Capacity (%)	Swelling Capacity (%)
Native	15.00c	193.33c	130.00c
25	56.67a	660.00a	331.67a
30	55.33a	653.33a	340.00a
35	41.67b	516.67b	316.67b

Mean with same letters along same column are not significantly ($p>0.05$) different

Table 13: Flow characteristics of pre-gelatinized cassava starches from TME 419 variety as affected by concentration

Sample concentrations (g/100ml)	Carr index (%)	Hausner's ratio	Angle of repose (°)	Flow rate (g/s)
Native	18.61b	1.22a	36.85a	2.46d
25	20.30a	1.25a	20.89b	6.67c
30	15.78c	1.42a	24.28b	7.77b
35	13.73d	1.15a	24.04b	10.52a

Mean values with the same letters within columns are not significantly ($p > 0.05$) different

Table 14: Flow characteristics of pre-gelatinized cassava starches from TMS 98/0505 variety as affected by concentration

Sample concentrations (g/100ml)	Carr index (%)	Hausner's ratio	Angle of repose (°)	Flow rate (g/s)
Native	20.45a	1.25a	34.29a	2.31d
25	18.24ab	1.22ab	21.61b	7.53c
30	15.41b	1.18b	27.42ab	11.11b
35	15.87b	1.18b	19.98b	13.31a

Mean values with the same letters within columns are not significantly ($p>0.05$) different

Table 15: Flow characteristics of pre-gelatinized cassava starches from TMS 98/0581 variety as affected by concentration

Sample concentrations (g/100ml)	Carr index (%)	Hausner's ratio	Angle of repose (°)	Flow rate (g/s)
Native	22.78a	1.20ab	35.73a	2.81d
25	13.67b	1.15b	22.50c	7.50c
30	23.13a	1.30a	29.50b	12.08b
35	14.39b	1.68b	24.63b	13.91a

Mean values with the same letters within columns are not significantly ($p > 0.05$) different

Conclusion and Recommendations

- Plastic deformation of pre-gelatinized starches and harder compacts
- Further studies to evaluate dissolution characteristics of pre-gelatinized cassava starches

Contribution to knowledge

- Data as baseline information
- Appropriate modification conditions established

***THANK YOU FOR
LISTENING***