# INNOVATIVE USES OF CASSAVA STARCH WASTE FROM JAMAICAN AGRO-PROCESSORS

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## BACKGROUND

Cassava (*Manihot esculenta*) also known as tapioca, is a key agricultural crop in Jamaica, valued for its potential in value-added products like known as Bammy, Pancake Mix, Cassava Chips, and Bammy Sticks. However, the production of these items generates significant waste, including peelings (20-30% of the tuber weight), fibrous by-products (pulp waste), starch residue, and wastewater.

There are several local companies that produce Bammy and other cassava products, but they all dispose of the starch-containing waste while purchasing glues for labeling cans, jars, and sealing cartons.

Utilizing cassava waste to produce glue could be economically beneficial, reducing the need to purchase starch and potentially generating revenue by selling the glue to other businesses.

Cassava starch has several other uses which is currently being explored by local researchers, to utilize this current waste for value added products.

## BAMMY PRODUCTION

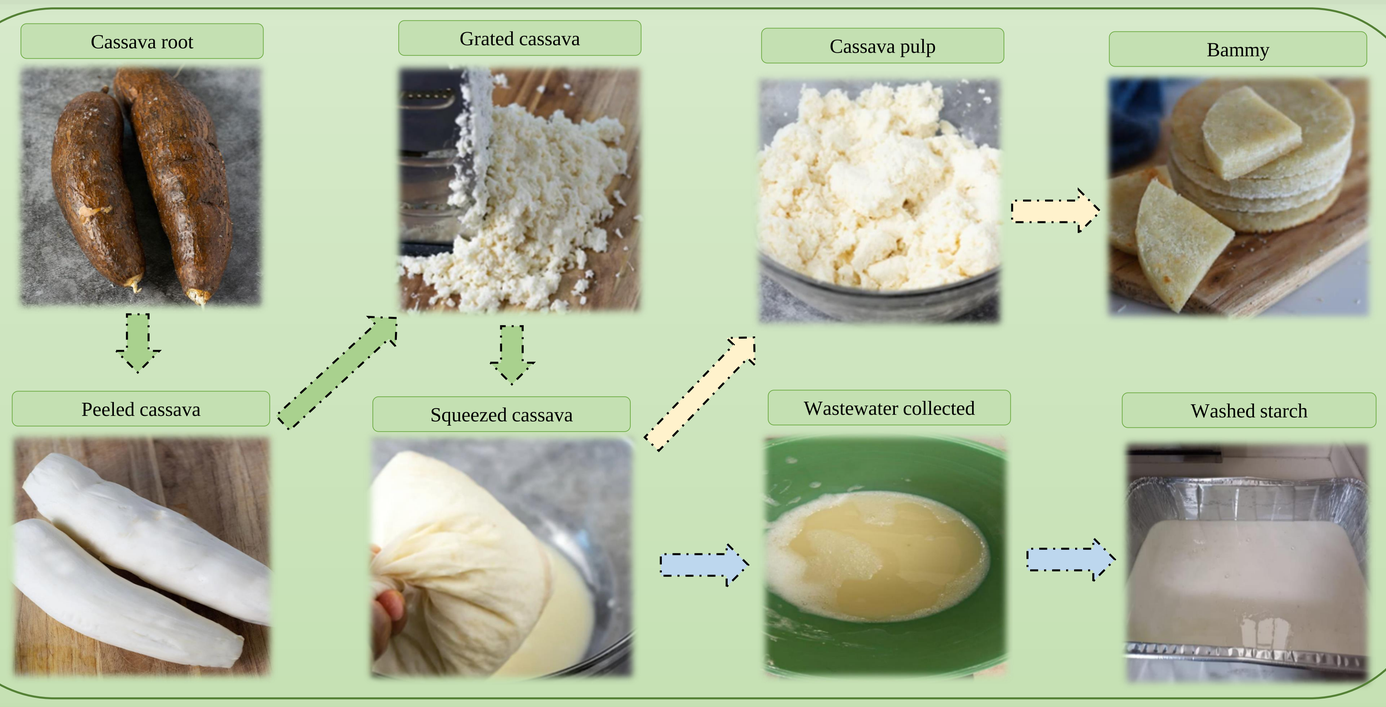



Figure 1. The separation of cassava starch wastewater during the bammy-making process

## CASSAVA STARCH WASTE FOR ADHESIVE GLUE PRODUCTION

Figure 2. The development of glue from starch extracted from wastewater during bammy making

Figure 3. Dried cassava starch

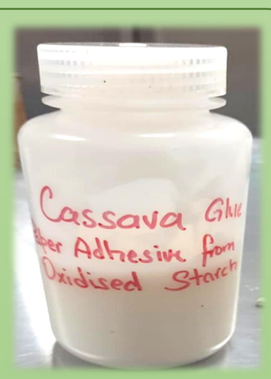



Figure 4. Glue developed from Method E

**Method A:** involves allowing 2L of cassava wastewater to sit for 24 hours to settle the starch. The starch is dried at 50°C for 8 hours, then dissolved in 20mL water with 0.5g NaOH. The solution is heated to 70°C, and 0.016g borax is added for stabilization. After stirring, 2mL HCl is added for neutralization, followed by glycerol and formaldehyde as preservatives.

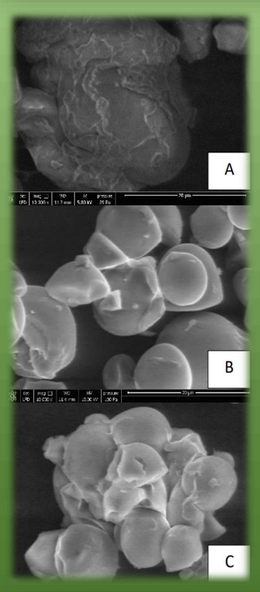
**Method B:** also starts by settling starch from 2L cassava wastewater for 24 hours, decanting, and drying it at 60°C for 8 hours. The dried starch is dissolved in 50mL 0.1M NaOH, heated to 80°C, and stabilized with 0.2g borax. The mixture is stirred until the glue forms and then left to cool.

**Method C:** follows the same initial steps as the previous methods. After drying the starch, 15g is suspended in 40mL water and stirred with 2g NaOH until it gels. 4mL of 2M HCl is added for neutralization, then glycerol and formaldehyde are added as preservatives before cooling.

**Method D:** begins with the same starch settling and drying process. The dried starch is mixed with 2.5mL 0.1M HCl, roasted, ground, and added to 75mL water at 70°C with 1mL NaOH. Borax and formalin are added, and the mixture is left to cool.

**Method E:** The dried starch is mixed with sodium carbonate and $H_2O_2$for 30 minutes, then suspended in 25mL water and treated with NaOH. After neutralizing with HCl, glycerol and formaldehyde are added as preservatives and cooled.

## SUSTAINED RELEASE GELS




- Hydrogels are highly biocompatible, flexible, and deformable, making them suitable for a wide range of applications, including drug delivery. Soft gels, a type of hydrogel, are faster to produce than liquid-filled capsules and are useful for delivering biopharmaceuticals like insulin without injections.
- Due to these advantages, cassava starch forms gels with similar properties, shows potential as a natural polymer for hydrogel development.
- Additionally the functional properties of acetylated cassava starch derivatives differ significantly from that of the native cassava starches, thus increasing the range of functionality of cassava-based starches which aids in the sustained release of an active

Figure 4. SEM images of acetylated starch (A) MCOL-22 starch, (B) CM-849 starch, and (C) Rockwood starch at 0.2 DS (magnification = 10,000x)

## FOOD COATINGS

- The starch extracted from cassava can be used as an egg coating to enhance shelf life, improve quality, and enable more effective preservation.
- Ongoing research is exploring the potential of using this starch-based coating to extend the shelf life of popular seasonal fruits in Jamaica, such as Otaheite apples and naseberries.
- This application could significantly improve the preservation and quality of these fruits, making them more suitable for export.

Figure 5.. Glue developed from Method E

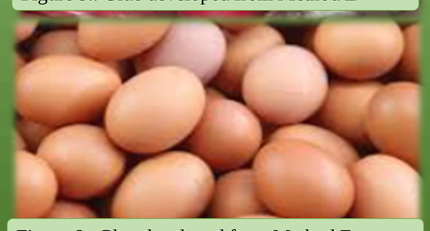


Figure 6.. Glue developed from Method E

## CONCLUSIONS

- Cassava starch is a cost-effective, easily accessible, and simple alternative to starches from rice, wheat, and corn.
- The cassava-based glues developed demonstrated shorter drying times compared to those currently used in food processing facilities in Jamaica.
- The adhesive performed well on glass, paper, and paperboard materials. Utilizing this waste material not only reduces landfill waste but also generates additional income, diversifies businesses, and creates employment opportunities.
- Additionally, starch extracted from wastewater during the bammy-making process has multiple applications, such as in sustained release gels, food coatings, biodegradable plastics, and pharmaceutical excipients, contributing to several Sustainable Development Goals (SDGs).

## ACKNOWLEDGEMENTS

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