

Assessment of Cassava Starch as a Substitute for Agarose in DNA Gel Electrophoresis

By

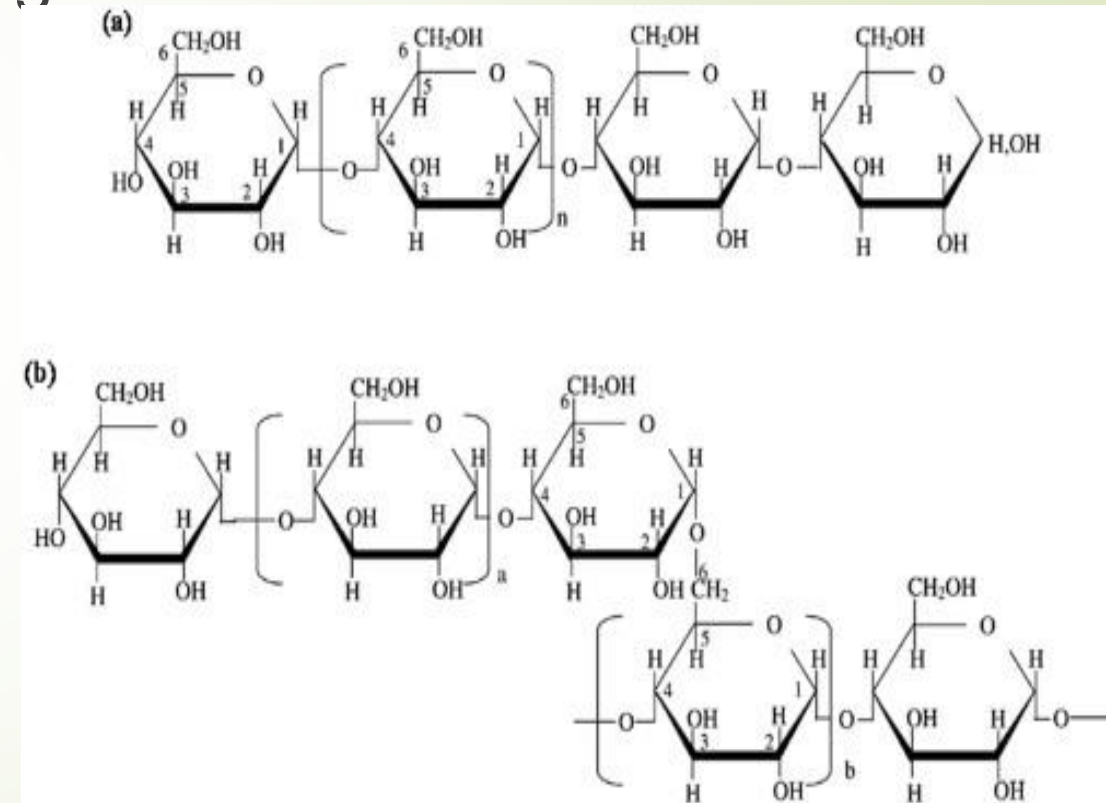
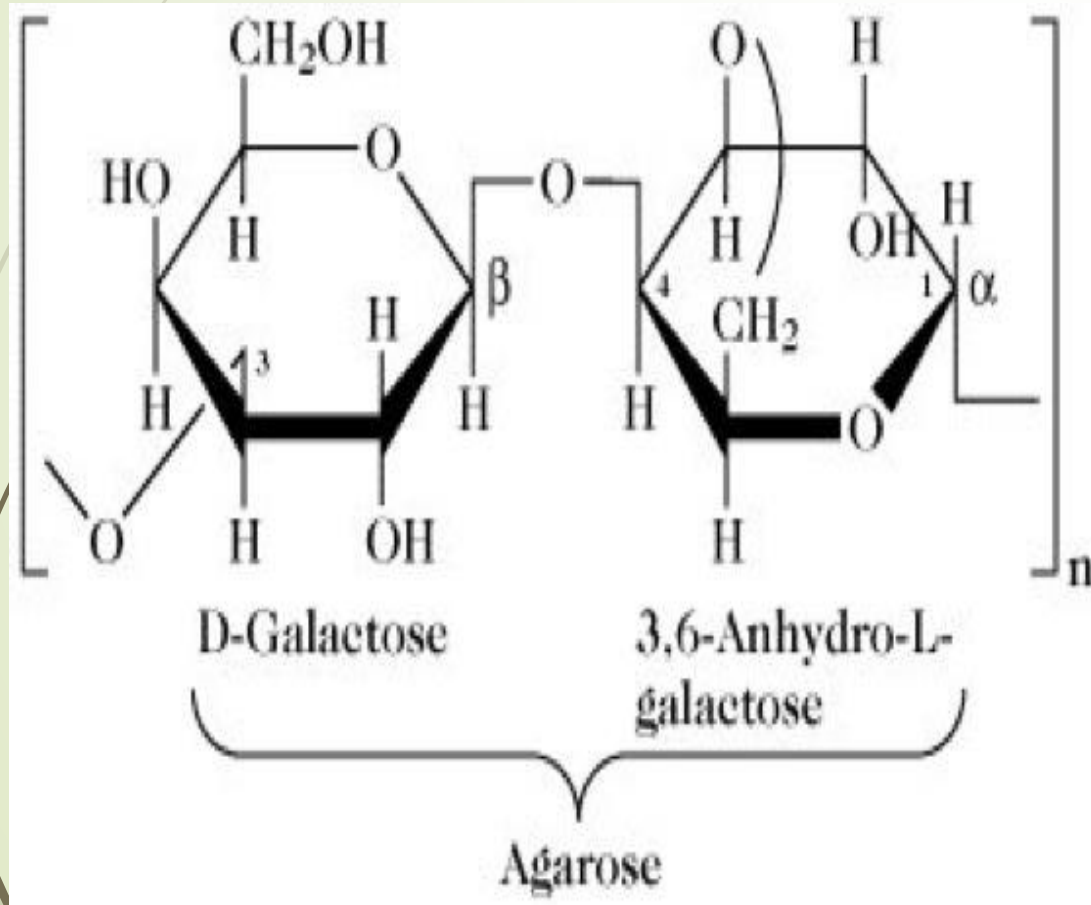
Gideon Akuamoah Wiafe

Outline

- Introduction
- Aim
- Objectives
- Hypothesis
- Method
- Results
- Discussion
- Conclusion

Introduction

- Electrophoresis is a technique used to separate charged molecules such as DNA according to their sizes.



- ▶ Smithies(1955) began starch gel electrophoresis
 - ▶ experimenting on zone electrophoresis where he grouped variations -in the serum proteins of normal human adults in a starch gel.

- Agarose is used for the separation of DNA, RNA and proteins fragments in the laboratory but it is very expensive. Agarose is also not readily available in the Ghanaian/African markets. Hence agarose needs to be imported for every experiment involving its use. This tends to delay research works.
- Agarose gel electrophoresis is needed for;
 - Molecular cloning
 - Genetic fingerprinting
 - Diagnostics
- Therefore assessing starch as a substitute for agarose will help reduce the cost of research in Ghana significantly.

Aim

- To optimize and use cassava starch for DNA gel electrophoresis.

Specific objectives

- To prepare corn starch gel
- To run gel electrophoresis using the corn starch gel
- To compare the efficiency of electrophoresis on starch gel and agarose gel

Hypothesis

- Modified cassava starch will be a good substitute for agarose in DNA gel electrophoresis.

Methodology

- Amplification of genomic DNA extracted from *Plasmodium falciparum*
- Agarose gel electrophoresis
- Modification of industrialized starch using sodium borate buffer
- Preparation of starch gel and
- Starch gel electrophoresis

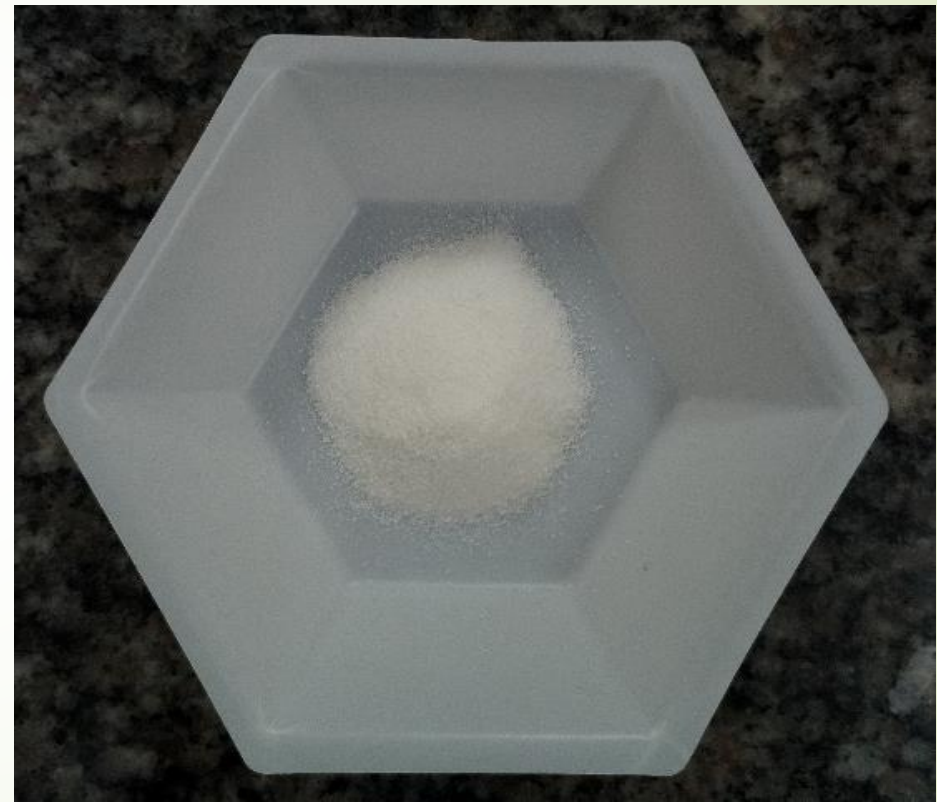
Results

a



Modified cassava starch

b



Agarose powder

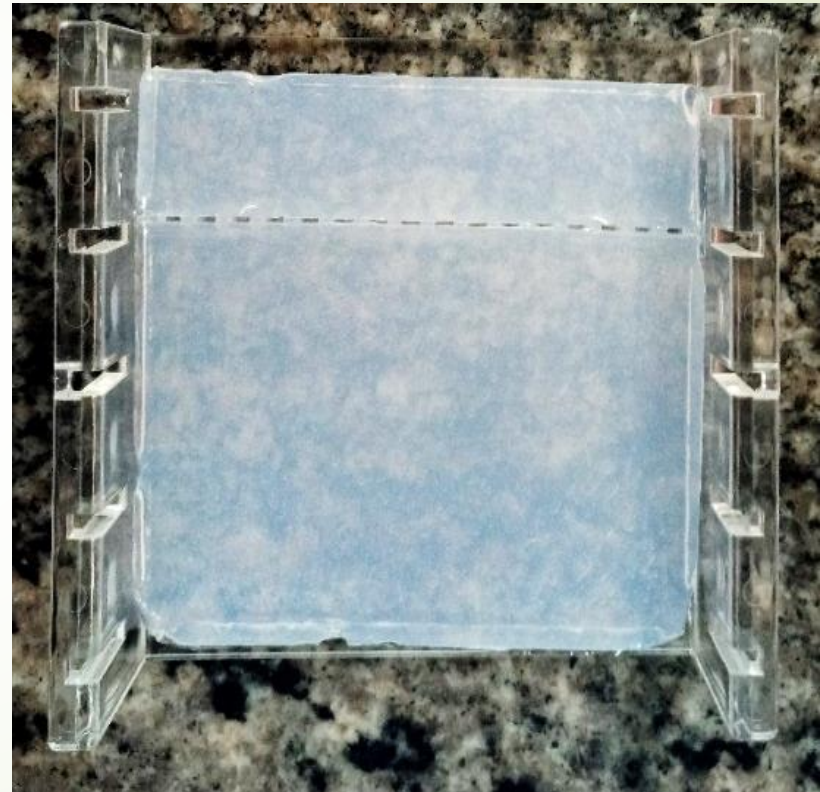
Cont

c



Cassava starch gel

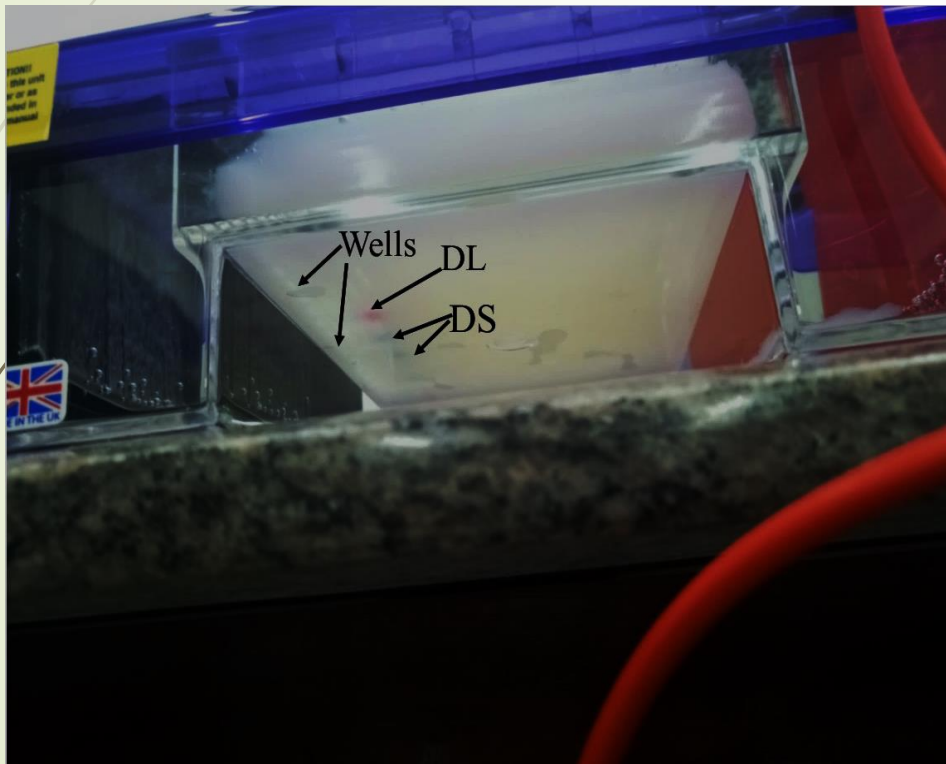
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Agarose gel

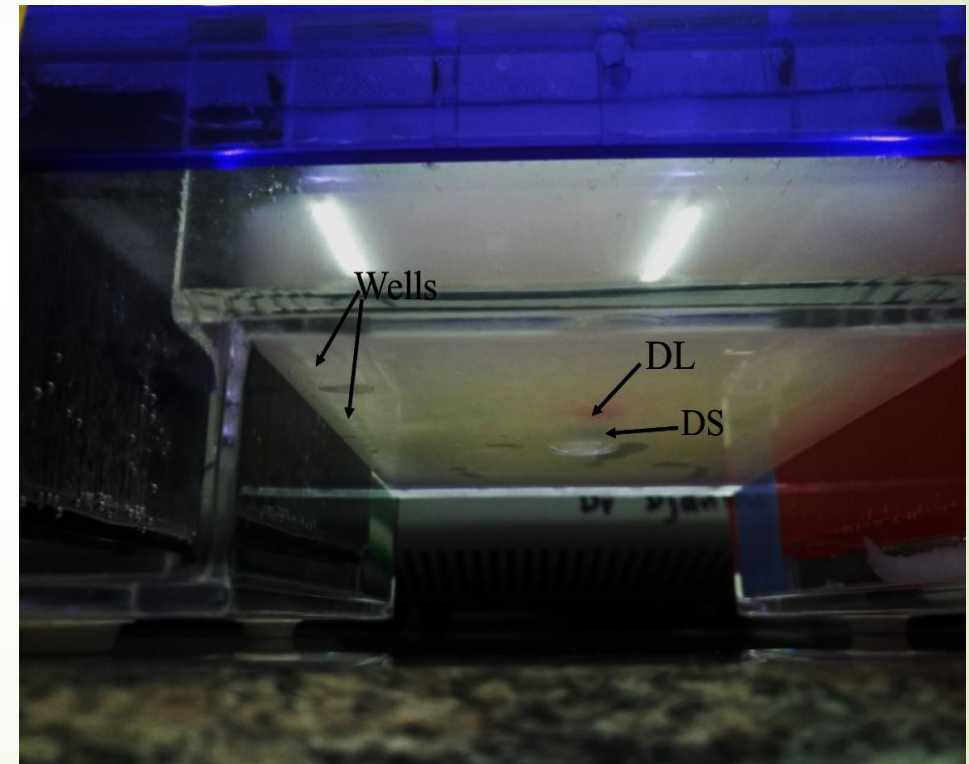
Migrations of the DNA sample and Ladder

e



Migration after 20 minutes

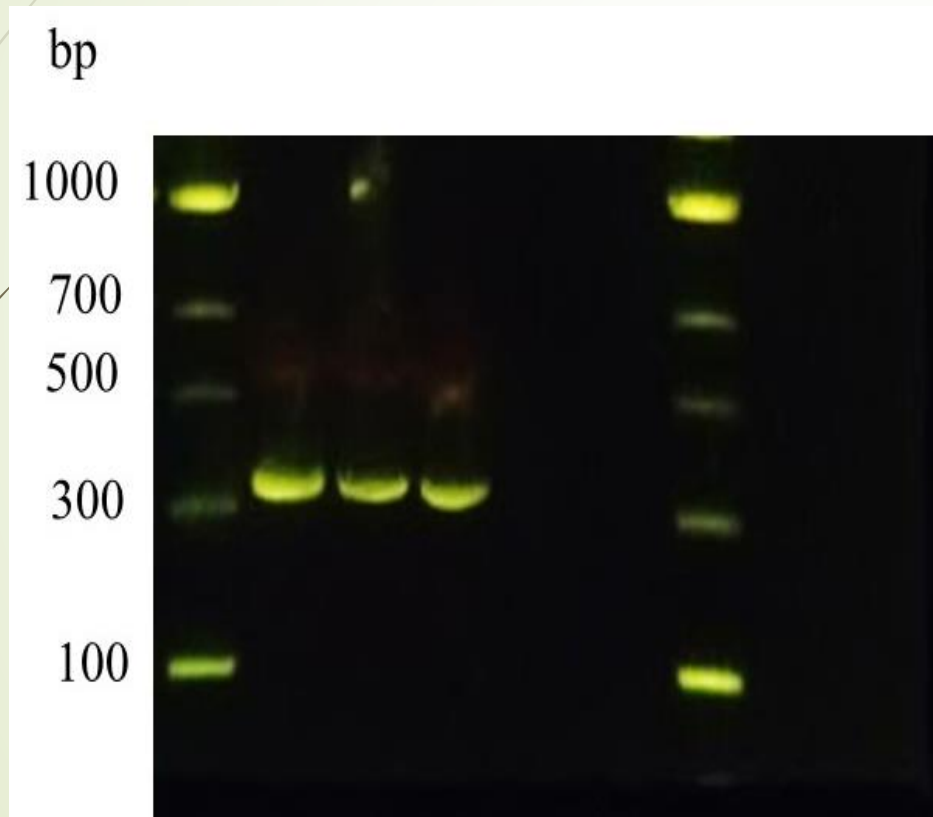
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Migration after 45 minutes

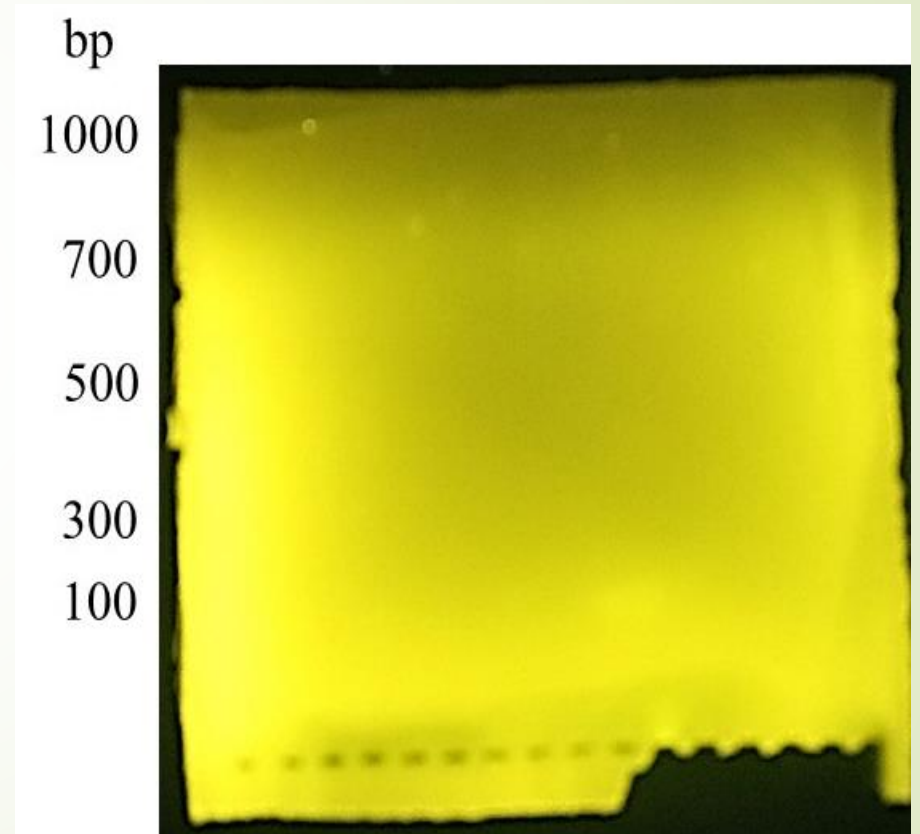
Visualization of Gels Under Blue-Light

g



Agarose gel

h



Starch gel

Discussion

- Starch gel prepared from the modified starch appeared a little cloudy and opaque compared with that of agarose.
- It also appeared fragile and contained some amount of water which may be caused by the buildup of bubbles during heating.

- The inability of visualizing the bands of the ladder and migration of the DNA samples could be because of the cloudiness of the starch compared with that of agarose and therefore will need a more advanced imager.
- The cassava starch gel allows migration of DNA and ladder.
- The DNA and the ladder were not visible under UV and blue light.

Conclusion and Recommendations

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- Cassava starch has been modified successfully and electrophoresis run through the starch gel but the bands of the DNA sample and ladder were not visible.
- Troubleshooting the methods used in this experimental project for visibility of the bands.
- Starch modification needs some improvement to optimize the gelling properties to replace agarose.

References

- Barril, P., & Nates, S. (2012). Introduction to Agarose and Polyacrylamide Gel Electrophoresis Matrices with Respect to Their Detection Sensitivities. In S. Magdeldin (Ed.), *Gel Electrophoresis - Principles and Basics*.
<https://doi.org/10.5772/38573>
- Agarose | Sigma-Aldrich. (n.d.). Retrieved May 28, 2019, from <https://www.sigmaaldrich.com/catalog/substance/agarose12345901236611?lang=en®ion=GH>
- Smithies, O. (1955, April 4). *Zone Electrophoresis in Starch Gels: Group Variations -in the Serum Proteins of Normal Human Adults*.
- Smithies, O. (1958, August 14). *An Improved Procedure for Starch-gel Electrophoresis: Further Variations in the Serum Proteins of Normal Individuals*.