Effectiveness of Corn (*Zea mays)* Husk Extract as an Alternative Culture Media for the Growth of *Staphylococci aureus* and *Escherichia coli*

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Abstract:
Isolating and identification of different microorganisms helps the laboratory scientists diagnose pathogenic causing bacteria. The use of agar as a culture medium, together with its different nutritional additives differentiates various types of bacteria, hence this study aimed to create an effective alternative culture medium to the commercial Nutrient Agar which can benefit for the growth of *Staphylococcus aureus* and *Escherichia coli*. The organisms were inoculated on the test sample and control culture media. After 24 hours of incubation, colonial growth was observed on both the Nutrient Agar and Corn Husk Agar. The colonies were sub-cultured on selective media for the efficacy of the test material. The results found out that the Corn Husk Agar exhibits same results compared with from the Nutrient Agar. Hence, Corn Husk Agar can be used as an alternative agar to *Staphylococcus aureus* and *Escherichia coli*. By this, the researchers recommend to further test the Corn Husk Agar to other microorganisms to analyze its full potential to be an alternative nonselective culture media against Nutrient Agar.

Keywords: Culture media, Corn Husk, Zea mays, Staphylococcus aureus and Escherichia coli

INTRODUCTION

Agar is the most commonly used solidifying agents and used in the laboratory to grow bacteria and other microorganisms. It acts as a culture that provides nutrients and a place for these items to grow, but since it is indigestible to the microorganisms, they cannot eat and destroy it (Spilatro, n.d) Staphylococcus aureus is a gram-positive round shaped bacterium. It is a virulent pathogen that is currently the most common cause of infections in hospitalized patients and frequently found in upper respiratory tract and on the skin. It will grow on general culture media therefore can be isolated from direct plating of chemical specimens (Ondusko, 2018).

When studying microorganisms, the use of culture media is needed. Improving digital culture technology and social approaches have taken essential parts of this field's development. For certain purposes and applications, microbiologists use bacterial culture media. Media are used to isolate and recognize bacteria, expose their metabolic properties and allow pure culture to be stored in the long term. In addition, different media styles can be used to think about bacteria's properties. It is used to cultivate bacteria to macroscopically analyze their morphological characteristics (Spilatro, n.d). This study specifically seeks the answers to the following problems:

1. What are the phytochemical components of corn husks extract that will support the growth of some selected bacteria?
2. What are the bacterial growth of *Escherichia coli* and *Staphylococcus aureus* in:
   2.1 12mL of corn in 6g of agar
   2.2 24mL of corn in 6g of agar
   2.3 36mL of corn in 6g of agar
3. Is there a significant difference in the growth characteristics of the bacteria used compared to the standard agar culture media?
4. Is there a significant difference in the bacterial growth of *S. aureus* and *E. coli* treated in different concentration of corn husk extract?
5. Is the corn husk extract effective as an alternative culture media with the nutrient agar?

METHODOLOGY

Research Design

The study used the experimental method of research. This research is a systematic and scientific approach in which the researcher manipulates one or more variables, uses controls, and measures any change in another variable, called independent variables, that affects the experimental group. The media prepared in the experiment was correlated with the control media, which was the nutrient agar as positive control.

Locale of the Study

The researchers collected the corn husk from a market at Limay, Bataan. The study was conducted in the Laboratory of St. Jude College – PHINMA Manila Campus which is located at Manila, Philippines. The plant authentication was done in Bureau of Plant Industry. Phytochemical analysis and grinding of sample were made in the Department of Science and Technology.

Collection and Authentication of Samples

The researchers collected the corn husk from a market at Limay, Bataan. The corn husk was authenticated at the Bureau of Plant and Industry. A certificate was given by the institute to prove the plant's authenticity.

Phytochemical Analysis

A kilo of corn husk was brought to Department of Science and Technology (DOST) at Bicutan, Taguig, Metro Manila for phytochemical analysis. It was conveyed to check for existence

of substance phytochemicals in the corn husk that would bring nutrients for bacteria, analysis corn husk, upon extraction, as a viable general-purpose culture medium.

Extraction of Corn Husk

The researchers went to the Department of Science and Technology (DOST) for the extraction of corn husk to become a powder. After getting the powdered corn husk, researchers added amount of distilled water to grease the mixture and used a filter paper to filter out the extract from the powdered corn husk.

After filtration, the mixture was placed on a clean flask and proceeded on preparation of culture medium.

Preparation of Media

The media used were nutrient agar as positive control and corn husk extract agar as test control. In order to test the effectiveness of corn husk extract as an alternative component of a culture medium, the necessary components of nutrient agar were recovered by corn husk. The researchers combined the nutrient agar powder with distilled water. They heated and stirred it until they were completely dissolved and autoclaved at 121C for 15 minutes. The researchers used agar-agar in the same process and combined it with corn husk extract to create the experimental medium, the corn husk extract agar.

Preparation of Test Organisms

The researchers adopt two organisms which prepared as test organisms for the experiment. The organisms were accessed from infected wound and contaminated water.

Staphylococcus aureus served as the representative of gram-positive cocci. *Escherichia coli* is the representative of gram-negative rods.

Experimental Procedure

Streaking in Nutrient Agar (Positive Control) and Corn Husk Agar (Test Control). After the control and experimental media were sterilized and prepared, the prepared bacteria were streaked on these media. 3 Nutrient agar plates are prepared by the researchers. Two were streaked with test organisms and the other was used as a negative control where no organism was streaked. Same method was followed for the corn husk extract agar. 3 plates were prepared for each formula made, estimate to total of 9 corn husk extract agars. Plate was incubated at 35-37C for 24 hours after inoculation. Colonial growth was observed, and results were reported after the incubation period.

RESULTS AND DISCUSSION

The experiment findings are discussed in the different tables. Table I shows the different concentrations used by the researchers.

Table 1 Formulation of different concentration of the corn husk extract

Components	METHOD 1	METHOD 2	METHOD 3
CORN HUSK EXTRACT	12mL	24mL	36mL
DISTILLED WATER	250mL	250mL	250mL
AGAR-AGAR	6 grams	6 grams	6 grams

There were three distinct methods for the researchers:

- In 250ml of distilled water and 6 grams of agar agar, the first method was 12 ml of corn husk extract.
- The second method was 24 ml extract of corn husk in 250 ml distilled water and 6 grams of agar-agar.
- In 250ml of distilled water and 6 grams of agar-agar, the third method was 36 ml of corn husk extract.

Table 2 Results Demonstrated by the Test Organisms on the Control Media

Bacteria	NA	12mL CA	24mL CA	36mL CA
S. aureus	Strong growth of large colonies; Creamy-Yellow	Large colonies with creamy colored	Large colonies with creamy colored	Large colonies with creamy colored
E. coli	Strong growth of Grayish-white colonies	Growth of White colonies	Growth of White colonies	Growth of White colonies

Table 2 presents findings of nutrient agar which is applied as positive control recovery from Staphylococcus aureus and Escherichia coli along with three separate corn husk agar extract methods. This shows that the test organism can grow on the test control media.

The initial isolation of *Staphylococcus aureus* and *Escherichia coli* was accomplished by inoculating these organisms on the control media. During isolation, two types of media are prepared and used. For the corn husk extract agar, total of 5 test control media. Nutrient agar has been used as the positive control tool.

SUMMARY OF FINDINGS

1. In the phytochemicals present in corn (Zea mays) husk, sterols in the corn husk were found to be the phytochemical abundant.
2. On the positive control medium and on the three test control media types, growth on *Staphylococcus aureus* and *Escherichia coli* was observed. *Escherichia coli*'s bacterial development in:

    12grams, 24grams and 36grams of corn husk extract in 6grams of agar – Whitish colonies

    The bacterial growth of Staphylococcus aureus in:

    12grams, 24grams and 36grams of corn in 6grams of agar -- creamy colored large colonies.

3.The corn husk extract is effective as an alternative culture media.

CONCLUSION AND RECOMMENDATIONS

The researchers conclude that the corn husk extract agar is an effective alternative culture medium for the growth of *Staphylococcus aureus* and *Escherichia coli*. There is a difference in the growth characteristics of the bacteria used inoculated to the Nutrient Agar and in Corn Husk Agar.

This research proved that corn husk extract can be used as an alternative culture medium, however to further improve several procedures and considerations, the following are recommended:

1. The researchers would like to recommend using the Corn Husk to be in freeze dried form and added to as the nutrient source of agar.
2. To add an inhibitor to the culture media for the selective growth and specific identification of bacteria

3. To test Corn Husk Agar as an nonselective agar to other microorganisms.

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