



HOLY CROSS COLLEGE OF CALINAN, INC
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**THE FEASIBILITY OF CORN HUSK (*Zea Maize*) AS AN
ALTERNATIVE PAPER EGG TRAY**

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THE FEASIBILITY OF CORN HUSK (ZEA MAIZE) AS AN ALTERNATIVE PAPER EGG TRAY

A Science Investigatory Project
Presented to the faculty of the Basic Education Department
of the Holy Cross College of Calinan, Inc.

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ABSTRACT

This study investigates the feasibility of utilizing corn husk (*Zea Maize*) as an alternative material for manufacturing paper egg trays. With the increasing concerns surrounding environmental sustainability and the adverse effects of plastic packaging, there is a growing demand for eco-friendly alternatives in various industries. Corn husk, a readily available agricultural byproduct, possesses promising characteristics such as high cellulose content and strength, suggesting its potential as a viable alternative to traditional paper pulp in egg tray production. This study aims to determine the feasibility of making paper egg trays using corn husks in terms of ease of production, resource availability, and cost-effectiveness. Further, it assesses whether there exists a significant difference between paper egg trays made from corn husk and commercial paper egg trays concerning texture, durability, and cost. The research methodology involves the collection and preparation of the corn husks, experimentation with different kinds of husks, and observation of the finished product's durability, moisture resistance, and overall performance. Through incorporating trials and providing evidence, this study demonstrates that utilizing corn husk as an alternative material for paper egg tray production is a feasible and effective solution, highlighting its positive impact on environmental conservation.

Keywords: *corn husk, paper egg tray, cellulose, agricultural waste, environmental conservation*

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INTRODUCTION

Background of the Study

With the increase in agricultural production, there has also been a significant increase in agricultural waste, specifically fruit peelings, husks, wheat straws, and bagasse that are frequently left untreated and inadequately disposed of which might pose serious threats to human health due to environmental contamination. Therefore, before it decays, it should be converted to a usable form to minimize the pollution level as well as to help generate employment and make an eco-friendly environment (Adajumo and Adebisi, 2020).

In recent years, more and more poultry farmers turned to recycled paper egg trays as a sustainable and eco-friendly solution. As more and more poultry farmers embrace sustainable solutions, recycled paper egg trays will become the future of the poultry industry. It becomes an increasingly popular and eco-friendly alternative to plastic egg packaging. Thus, offering environmental, economic, health, and aesthetic benefits that traditional egg trays made from plastic cannot match (Agico, 2022).

On the other hand, corn husks (*Zea Maize*), a lignocellulosic fiber, generally discarded as waste, has the potential of being explored as a textile fiber. Corn or maize is the second-largest agricultural crop in the world. It has high cellulose content of 80–87%, making it a suitable raw material for the production of paper. Also, corn husk ash has a SiO₂ (*silicon dioxide*) content of 47.40%. Moreover, silica which is also found in corn husk is a compound that adds strength and rigidity. This silica content can make corn husks less prone to tearing compared to some other cellulose materials (Wijiawati, 2016). The fabric

produced from corn husk fiber has the distinctive advantage of moderate strength, toughness and high elongation with high durability, pliability and softness. These properties make corn husk a desired fiber for apparel, home furnishings and similar applications (Chaudhary, Parmar and Kaur, 2017).

Statement of the Problem

This study aims to determine the feasibility of making paper egg trays using corn husk (*Zea Maize*). Specifically, it seeks to answer the following questions:

1. Is producing paper egg tray made from corn husk (*Zea Maize*) feasible in terms of:
 - 1.1 ease in production;
 - 1.2 availability of resources; and
 - 1.3 cost

2. Is there a significant difference between paper egg tray made from corn husk (*Zea Maize*) and the commercial paper egg tray in terms of:
 - 2.1 texture;
 - 2.2 durability; and
 - 2.3 cost

Hypothesis

Corn Husks (*Zea Maize*) can serve as a substitute raw material for producing paper egg trays and are comparable to commercially produced egg trays, providing an eco-friendly alternative.

MATERIALS AND METHODS

This study is composed of three phases: Phase I - Collection and Preparation of the Corn Husks, Phase II - Experimentation of the Making of the Paper Egg Tray, and Phase 3 – Product Observation. All experimental procedures will be done in Holy Cross College of Calinan, Inc., Davao City. The independent variable in this experiment is the corn husk and the dependent variable is the color, texture, and durability.

Phase I – Collection and Preparation of the Corn Husks

The corn husks (*Zea Maize*) were collected from the local market in Calinan, Davao City. The corn husk that will be collected weighs 1 kilogram. The corn husks will be cleansed thoroughly with tap water to remove any stubborn dirt and debris. The following materials were used during the preparation and production of the by-product:



Corn husks



Egg tray molder



Blender



Baking soda



Mortar and pestle



Tong, mixing bowl, spoon



Cooking pot

Phase II - Experimentation of the Making of the Paper Egg Tray

There will be 2 setups: the commercial paper egg tray for the controlled group and the corn husk paper egg tray for the experimental group. The corn husks will be placed in a bowl pan with water and will be boiled. After 5 minutes of boiling, add 135 grams of Sodium bicarbonate (NaHCO_3) to lower the pH level of the corn husk fibers. Wait for 2 hours to boil the husks. After 2 hours of boiling, rinse the husks with clean water. Cut the husks into smaller pieces, to make it easier to blend. If the corn husk is not yet ground thoroughly, use mortar and pestle to thin out the husks. After grinding the husks, place the husks into an egg tray mold. Mold the ground husks into the egg tray mold.



Step 1



Step 2



Step 3



Step 4



Step 5



Step 6

Phase III – Product Observation

After 3 days, the finished product will be observed. Texture, deformities, and durability will be observed and recorded. An observation of the egg tray will be done to verify that the ingredients used in the study are suitable for the making of the alternative paper egg tray.



Trial 1



Trial 2

RESULTS

This study determined the feasibility of corn husks as an alternative paper egg tray.




In this section, the observations from the different setups are presented in the following form:

Table 1: Process of Production

SET UP	EASE IN PRODUCTION	AVAILABILITY OF RESOURCES	COST
HOMEMADE	Time: Boiling husks – 2 hours Blending husks – 1 hour Drying – 48 hours Total: 51 hours	The corn husks and materials that were used in the process of making are available in local markets. It was given for free.	Baking Soda – ₱40.00 Corn husks – ₱0.00 Total: ₱40.00

The results in Table 1 show that the homemade egg tray is feasible in terms of availability and cost. Further, since there are plenty of resources, the raw material used in the experiment, which is corn husk, was given for free from a vendor in the local market. Hence, the total expense for producing homemade paper egg trays amounts to ₱40.00 because of the material used. However, compared to commercially manufactured paper egg trays, the production of alternative paper egg trays takes a total of 51 hours, which presents challenges in production, demanding time due to the absence of automated machinery.

Table 2: Differences between paper egg tray made from corn husk (*Zea Maize*) and the commercial paper egg tray

SET UP		TEXTURE	DURABILITY		COST
HOMEMADE	Trial 1 (Dried corn husks)	The texture of the homemade egg tray is rough.	It cannot carry more than 2 eggs. 	The egg tray hardened after 24 hours in the fridge.	The materials for the paper egg tray costs ₱40.00.
	Trial 2 (Freshly dried corn husk)	The texture of the homemade egg tray is smooth but needs polishing	The homemade egg tray can hold 25 pieces of egg. 	The egg tray hardened after 24 hours in the fridge.	The materials for the paper egg tray costs ₱40.00.
COMMERCIAL		The texture of the commercial egg tray is smooth and has a pulp paper texture.	The commercial egg tray can hold 30 pieces of egg. 	The commercial egg tray has no effect after 24 hours in the fridge.	A commercial paper egg tray costs ₱5.00.

The results presented the difference between the homemade egg tray and the commercial egg tray in terms of texture, durability, and cost. In the first trial, the researchers utilized dried corn husks that had been exposed to the air for several weeks and were no longer fresh. In trial 2, the researchers used freshly dried corn husks. In terms of texture, the trial 1 egg tray is rough, while on another trial it is smooth, but needs polishing. Further, trial 1 indicates that the homemade egg tray exhibits fragility, while trial 2 demonstrates durability as it can hold enough eggs. In terms of the cost, the overall cost for the homemade paper egg tray totals ₱40.00 because of the material used in production.

DISCUSSIONS

The results of this study show that corn husks are feasible in making an alternative paper egg tray and are comparable to commercial paper egg trays.

The egg tray that was made of dried corn husks displayed fragility. Conversely, the egg tray made with freshly dried corn husks by the researchers exhibited durability. This is in connection with the study of Ahmed (2023), that corn husks hold slight moisture, aiding in maintaining their flexibility and pliability. As the husks dry out, their moisture content decreases, causing them to become brittle and prone to breaking. These results not only affirm the feasibility of utilizing corn husks in the manufacturing process of paper egg trays but also highlight the significance of considering the moisture content of the husks in determining the final product's structural strength and durability.

Moreover, as stated by Yu, Prabhakar, and Song (2022), commercial paper egg trays include nano-cellulose, offering attributes such as durability, flexibility, and high absorption quality. Similarly, the alternative paper egg tray produced also contains cellulose content, exhibiting similar properties. The results show that using corn husk as a substitute material for manufacturing paper egg trays is both feasible and effective, emphasizing its beneficial contribution to environmental preservation.

CONCLUSION AND RECOMMENDATIONS

This study investigated the feasibility of Corn Husk (*Zea Maize*) as an alternative paper egg tray. In this section, the key insights of this study are discussed. The findings of this study conclude that Corn Husk (*Zea Maize*) can serve as a viable substitute raw material for the production of alternative paper egg trays and are comparable to commercial egg trays, thereby accepting the hypothesis. Through experimentation and analysis, it has been demonstrated that the resulting byproduct is feasible in terms of availability of resources and cost-effectiveness. Further, the byproduct exhibits comparable qualities to commercial paper egg trays, specifically, texture and durability. These findings highlight the potential of corn husks as a sustainable and economically available option in egg tray production, suggesting adoption in eco-friendly practices.

RECOMMENDATIONS

The researchers recommend to the future researchers:

- 1.) To experiment without using baking soda
- 2.) To use yeast as an alternative to baking soda
- 3.) To use flour as an alternative to baking soda
- 4.) To soak the corn husks in warm water overnight

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