

From Waste to Value: Production, Characteristics, and Market Potential of Sustainable Candles Made from Coconut Shell Scrap Charcoal Briquettes

Mariah Ghiven N. Bumolo

Mary Rose Guantia

Jhisselle Tupal

Vicky Tumnog

Melanie Tonjoc

Nina C. Apusaga

College of Engineering, Industrial Engineering Department,
Quezon City University
Quezon City, Philippines

ABSTRACT

This study aims to investigate the production, characteristics, and market potential of sustainable candles made from coconut shell scrap charcoal briquettes. Coconut shell scrap, an abundant agricultural waste generated from the processing of coconuts, offers an eco-friendly alternative to traditional paraffin-based candles. By transforming this waste material into charcoal briquettes and incorporating it into candles, this research seeks to develop an innovative solution for cleaner-burning, environmentally friendly candles while reducing waste and promoting sustainability.

The production process involves converting coconut shell scrap into charcoal briquettes, followed by blending the briquettes with coconut wax and beeswax to create the candles. This study examines the resulting candles' characteristics, including burning time, emissions, scent retention, and overall performance, comparing them to traditional paraffin-based candles.

In addition to the production and performance analysis, this research conducts a market study to assess consumer preferences, potential demand, and market opportunities for these sustainable candles. By analysing market trends, consumer preferences, and competitor products, the study aims to evaluate the commercial viability of these eco-friendly candles and identify strategies for successful market entry.

The findings of this research contribute to a better understanding of the potential of coconut shell scrap charcoal briquettes in sustainable candle production, providing valuable insights for manufacturers and entrepreneurs interested in developing and marketing environmentally friendly products. Furthermore, the study highlights the importance of waste-to-value initiatives in promoting sustainability and resource conservation.

Keywords: Sustainable candles, Coconut shell scrap charcoal briquettes, Market potential

INTRODUCTION

This study focuses on investigating the potential of using coconut shell scrap to produce sustainable candles as an environmentally friendly alternative to traditional candles. The study will evaluate the production process, characteristics of the candles, and their market potential. The goal is to contribute to waste reduction, environmental preservation, and the promotion of sustainable candle production practices. The findings of this research will shed light on the feasibility of using coconut shell scrap in candle production, which is crucial in meeting the demand for sustainable products.

METHODOLOGY

The methodology for this study involves two main approaches. Firstly, an observation was conducted to produce sustainable candles using coconut shell scrap charcoal briquettes, coconut wax, and beeswax. The characteristics of the resulting candles were evaluated and analysed using IE tool methods. Secondly, a survey was conducted by conveniently selecting 400 respondents with consent from Quezon City, District V, and the data collected were analysed using SWOT analysis and presented using pie charts to show the highest and lowest percentages of the respondents' age, gender, employment status, and interest in buying sustainable candles.

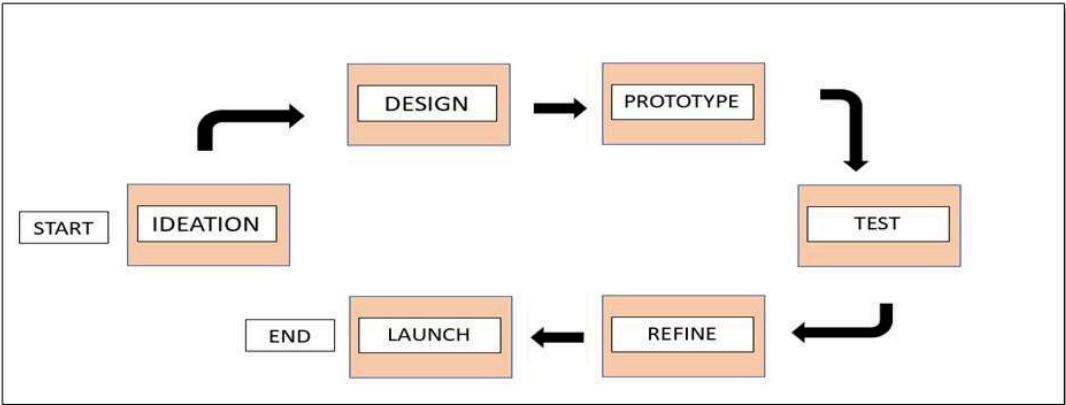


FIGURE I: PROCESS DIAGRAM

Employment Status	Frequency	Percentage
Student	148	37%
Worker	212	53%
Housewife	40	10%
Total	400	100%

TABLE I: Distribution of Respondents by Employment Status

We used survey forms to get the demand for its products, we conducted the survey in Quezon City, District V with population of 596,047 and growth rate of 2.25%, using the Slovin’s Formula. The number of respondents for the survey was determined:

$$N = \frac{N}{1 + Ne^2}$$

$$N = \frac{596,047}{1 + 596.047(0.05)^2}$$

$$N = 399.73 \approx 400 \text{ respondents}$$

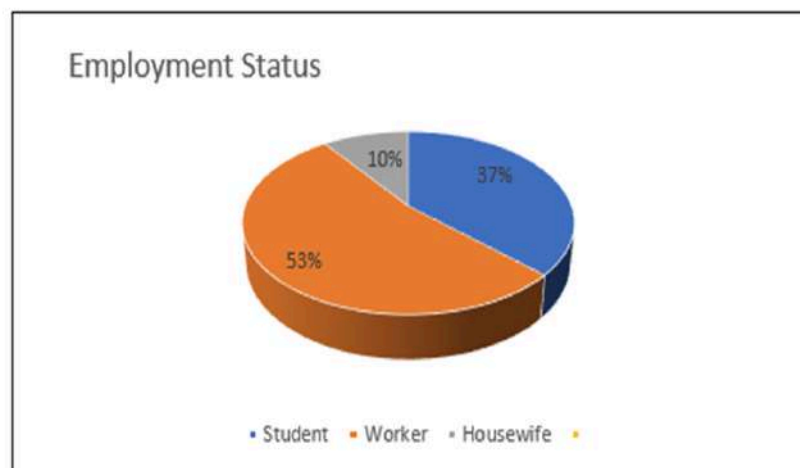


FIGURE II: CHART DISTRIBUTION OF EMPLOYMENT STATUS

Strength - Eco-friendly and sustainable - Unique appearance and scent: - Long-lasting - Health benefits	Weakness - Limited market - Fragility:
Opportunities - Growing demand for eco-friendly products - Diversification	Threats - Competition - Fluctuating prices of raw materials:

FIGURE III: SWOT ANALYSIS

MIXTURE	WAX COMPOSITION	WICK TYPE	FLAME SIZE	WAX MELTING POINT	BURN TIME	SMOKE COLOR	SCENTED OIL
Mixture 1	Soy Wax, Coconut Wax, Coconut Charcoal	Cotton	Small, Low	Quick Dissolving	1 minute	White	Yes
Mixture 2	Soy Wax, Bees Wax, Coconut Charcoal	Cotton	Normal	Slow Dissolving	1-2 minute	White	Yes
Mixture 3	Bees Wax, Coconut Wax, Coconut Charcoal	Cotton	Steady, Stronger	Slow Evaporating	Variable (based on usage)	White	Yes

TABLE II: CANDLE DEVELOPMENT

RESULTS AND DISCUSSIONS

The results of the study showed a high level of interest in sustainable candles made from coconut shell scrap charcoal briquettes, particularly among individuals aged 15-35 years old who are employed or pursuing education. Mixture 1, composed of soy wax, coconut wax, coconut shell charcoal, cotton wick, and scented oil, exhibited a small and low flame, quickly dissolving wax, and a burn time of only 1 minute, with white smoke. Mixture 2, containing soy wax, beeswax, coconut shell charcoal, cotton wick, and scented oil, displayed a normal flame, slower wax melting, and a burn time of 1-2 minutes, also producing white smoke. Mixture 3, consisting of beeswax, coconut wax, coconut shell charcoal, thread wick, and scented oil, demonstrated a steady, stronger flame, slow wax dissolution and evaporation, and a longer burn time, with white smoke and a specific scent. The results indicate that Mixture 3, which combines beeswax, coconut wax, coconut shell charcoal, thread wick, and scented oil, has the most promising characteristics for sustainable candle production. It presents a steady flame, slow wax melting, and a longer burn time compared to the other mixtures. These characteristics suggest that coconut shell scrap charcoal briquettes can be a viable option for sustainable candle production. The consumer attitudes survey revealed a general interest in sustainable candles, with respondents showing a willingness to pay a premium for eco-friendly products. This finding suggests that there is potential for developing a market for sustainable candles in Quezon City, District V.

CONCLUSION AND FUTURE WORDS

This study demonstrates the feasibility of using coconut shell scrap charcoal briquettes in sustainable candle production, with Mixture 3 presenting the most promising characteristics. The positive consumer attitudes towards sustainable candles, as evidenced by the survey results, indicate potential for market development in Quezon City, District V. In the survey, 37% of respondents were students, 53% were workers, and 10% were housewives, totalling 400 participants. This diverse demographic representation further suggests that sustainable candles could appeal to a broad audience.

ACKNOWLEDGEMENT

The author wishes to extend their sincere and heartfelt gratitude to Quezon City University.

REFERENCES

- Sekar, A., & Kandasamy, G. (2019). Study on durability properties of coconut shell concrete with coconut fiber. *Buildings*, 9(5), 107.
- Tabaka, G. A. (2008). Analysis and measurement of candle flame shapes (Master's thesis).
- Baladiang, M., Cachuela, M. A., Co, J., Dayunot, E. III, De Guzman, P. B., Gatchalian, R. J., Kho, O., Ricafort, M. L., & Salazar, D. M. (2000). A feasibility study on candle's light (Candle Republic Inc.) (Bachelor's thesis). Ramon V. Del Rosario College of Business,
- Raju, M. P. (Year). Heat and mass transport inside a candle wick (Doctoral dissertation). Department of Mechanical and Aerospace Engineering, Case Western Reserve University,