G-Tech : Jurnal Teknologi Terapan
Vol. 9, No. 2, 2025, p. 779-788
E-ISSN: 2623-064X | P-ISSN: 2580-8737

Analysis of Corn Cob Briquette Characteristics Using Different Adhesives in the Pyrolysis Process

David Mangallo[1]✉, Thomas Pagasis[2], Rombe Allo[3], Mickael Ruben Kaiway[4], Enos Tambing[5], Selyus Rantepulung[6]

[1, 2, 3, 4, 5, 6] Department of Mechanical Engineering, Faculty of Engineering, Universitas Cenderawasih, Indonesia

✉ **Corresponding Author :** David Mangallo (e-mail: david_mangallo@ftuncen.ac.id)

Article Information

Article History

Received : February 13, 2025
Revised : March 12, 2025
Published : April 10, 2025

***Keywords*:**

Corn cobs;
Briquette characteristics;
Alternative energy;
Adhesive;
WBT.

ABSTRACT

Corn cobs, an abundant agricultural waste, represent a promising alternative energy source when converted into briquettes. This study aimed to characterize corn cob briquettes and determine the optimal adhesive type and concentration for enhanced performance. Charcoal was produced from corn cobs via pyrolysis in repurposed oil drums, then ground and sieved through a 60-mesh screen. The resultant charcoal was combined with either starch or sago starch adhesives at concentrations of 7.5%, 10%, 12.5%, and 15% and subsequently molded into honeycomb briquettes using a 4-inch diameter mold with 16 perforations, fabricated from galvanized iron pipes and operated with a hydraulic jack. Proximate analysis indicated moisture levels of 5.37–6.71%, ash levels of 30.64–39.16%, volatile matter levels of 20.61–23.07%, fixed carbon proportions of 32.53–42.44%, and calorific values between 2893 and 3727 kcal/kg. A Water Boiling Test conducted with 1 liter of water demonstrated that briquettes incorporating 7.5% sago starch adhesive achieved boiling within 36 minutes, indicating superior combustion efficiency. These findings confirm the potential of corn cob briquettes as a renewable energy source and underscore the critical role of adhesive formulation in optimizing biomass fuel performance.

INTRODUCTION

Corn cobs are organic agricultural waste with great potential and one of the biomass wastes found in the environment. This waste is very abundant, but its utilization is still not optimal so much of it is wasted (Kaur et al., 2023). So far, people have tended to use corn cob waste only as animal feed or fuel, so to avoid this, there is a need to reform the use of corn cob waste. One of them is used as raw material for making activated charcoal (Haryanto et al., 2024).

Making charcoal from corn cob waste is carried out using a pyrolysis combustion process, there are several phases, namely the drying phase; occurs at a temperature of 200°C (Yunusa, Mamoon, & Muktar, 2023). The pyrolysis phase is at a temperature of 200 - 500°C, and the gas evolution phase: occurs at a temperature of 500 - 2000°C. Based on (Setiawan, Himawanto, Budiana, & Widodo, 2016), the characteristics of mixed pyrolysis display 3 types of pyrolysis characteristic graphs, namely mass, mass reduction rate and temperature. The first stage of drying is characterized by a slow decrease in mass. The second stage of devolatilization is characterized by a very rapid decrease in mass. The third stage of carbonation is marked by a decrease in mass which slows down again.

This is an open access article under the CC BY license

The characteristics of corn cob briquettes produced through the pyrolysis process are greatly influenced by the type and percentage of binder used (Mari Selvam, Janakiraman, & Paramasivan, 2021; Napitupulu et al., 2020). Binders play a significant role in determining the physical, combustion and environmental properties of the briquettes. A higher percentage of binder, typically ranging from 10% to 20%, increases the density of the briquettes, making them denser and more durable. Starch-based binders, such as cassava or corn starch, increase strength and reduce brittleness better than clay or lignin-based binders (Mae, Seguenza, & Bongay, 2022; Wirabuana & Alwi, 2021). Moisture content is another important factor, as lower moisture content (below 10%) contributes to efficient combustion. The choice of binder also affects the calorific value, with organic binders maintaining higher energy output compared to inorganic alternatives. However, excessive binder content can slow down the combustion rate and increase ash formation, especially with clay-based binders (Finney, Sharifi, & Swithenbank, 2009; Muliani, Pangga, & Ahzan, 2024). Environmentally, natural binders help minimize smoke emissions, making them a more sustainable and cost-effective option. Selecting the right binder ensures optimal briquette performance while maintaining economic and environmental viability (Wang et al., 2022).

The results of previous research by Yunusa, et al (2023) who used the same material with a carbonization temperature of 200-250°C, showed that the highest calorific value contained in composition briquettes (75% corn cobs 25% rice husks) was 22343.78 kJ/kg or 5336.720 cal/g, and only this calorific value was included in the briquette quality standard according to SNI 1-6235-2000 concerning briquettes wood charcoal. This research will utilize corn cob waste through a pyrolysis process which is then made into honeycomb briquettes which have 16 holes in the middle. It is hoped that the resulting briquettes can be used for daily needs in households or small industries.

Nasruddin and Risman Affandy (2011) conducted research entitled Characteristics of Briquettes from Corn Cobs Using Molasses and Starch Adhesive. The percentage of adhesive used in making briquettes is 4% and 7% respectively from 20 grams of corn cobs. The briquetting process is carried out by varying the compression process with a compressive force of 1, 2, 3, 6 and 10 tons. Based on the results of research conducted by Nasruddin and Risman Affandy, the best characteristics of briquettes were obtained, namely briquettes that used 7% starch adhesive with a pressing force of 10 tons. The weakness in this research is that the percentage of adhesive material is too large. Apart from that, the briquettes produced are not charcoaled first so that when used automatically they will produce smoke. To overcome this weakness, in this study the corn cobs used as material for making briquettes were first roasted using a pyrolysis process. The percentage of adhesive used in gluing corncob charcoal in this study was varied to obtain the best adhesive composition.

Apart from that, based on research conducted by Saragih *et al.*, (2024) uses tapioca flour and wheat flour adhesive with a percentage of 5%, 10%, and 15% of the total weight of the raw materials. This research produced corn cob organic waste charcoal briquettes with tapioca flour adhesive which had better quality when compared to wheat flour adhesive, corn cob organic waste charcoal briquettes for each type of adhesive with a 5% adhesive percentage had better quality in terms of water content, evaporative substance content, ash content, bound carbon content and calorific value when compared with 10% and 15% adhesive percentages. The weakness in this research is that it does not explain the composing process used in making charcoal. This research also does not explain the type of briquettes produced.

Based on research conducted by Fachruzzaki *et al.*, (2025), it shows that the adhesive material has an influence on the quality of corncob charcoal briquettes. The types of adhesive used in this research were tapioca flour and wheat flour. Tapioca adhesive is commonly used as an adhesive for charcoal briquettes because it is widely available on the market and the price is relatively cheap. When used, this adhesive produces relatively little smoke compared to other materials. From the results of his research, it was found that corncob charcoal briquettes with 10% starch adhesive had the lowest water content and ash content and the highest calorific value, namely 5484.54 kcal/kg, compared to sago adhesive.

Research conducted by Pulungan *et al* (2023), varying the adhesive 7%, 10% and 15%, shows that the percentage of adhesive has an influence on the water content, ash content, volatile matter content, bound carbon content and the calorific value of charcoal briquettes. The influence of adhesive percentage was also shown in the results of research conducted by Rindayatno *et al* (2024), with adhesive variations of 30%, 35%, 40% and 45%. In this research, adhesive percentage variations were carried out at 5%, 10% and 15% of the total weight of the raw material. The solvent used is water.

RESEARCH METHODS

This research utilized a modified 200 L lightweight stainless steel drum, featuring a 1.25 mm thickness as the pyrolysis reactor, which incorporated a centrally welded Y-shaped pipe (100 mm diameter, 1.5 mm thickness) to mitigate leakage, and assessed its efficacy for charcoal production using 21 kg of corn cob waste as feedstock under controlled conditions. Temperature data were acquired via a K-type thermocouple affixed to the reactor's outer wall and cover, linked to a data logger equipped with dual analog input channels that sampled at intervals ranging from 0 milliseconds to 1 hour (resolution of 10 to 50 milliseconds) and supported an input voltage spectrum of 20 to 500 millivolts, including a humidity range of 0 to 100% RH; with operation in the range of -100°C < TS ≤ 1370°C, measurement accuracy was upheld within ±0.05% of the temperature plus 1.0°C, while a digital scale with a capacity of 150 kg and a precision of 100 g was utilized for weighing the feedstock. Moreover, the carbonization reactor employed 40 kg of fuel sourced from waste wood chips at the processing facility as its thermal energy provider.

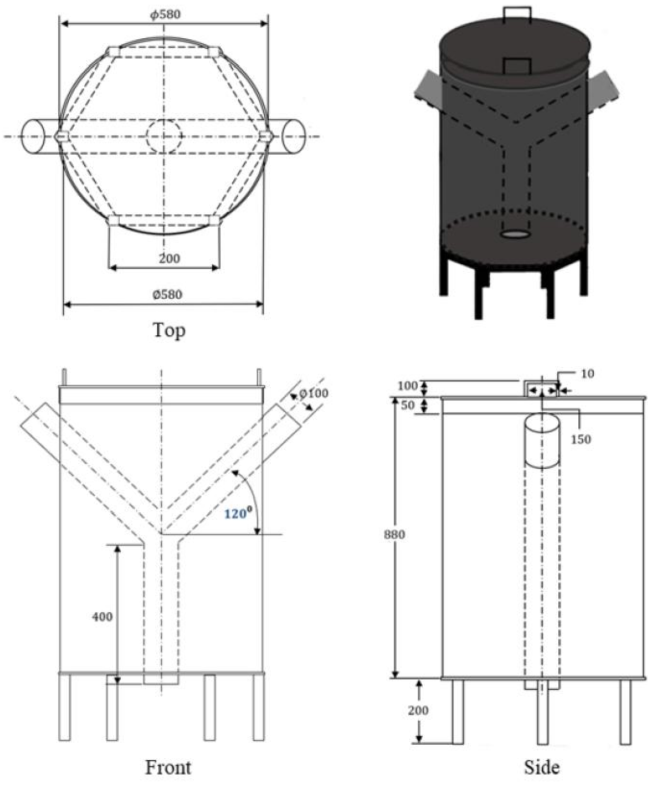

Figure 1. Construction of the pyrolysis reactor

Making Charcoal

The raw material used in this research is corn cob waste which comes from shelling corn. Corncob waste that will be charcoaled using the pyrolysis process is first dried by drying it in the sun (Fig. 2).

Figure 2. Charcoal Making Process

Briquette making

The corncob charcoal obtained from the pyrolysis process is then crushed and filtered using a 60 mesh sieve. The charcoal powder is then mixed with sago starch adhesive and tapioca flour according to the specified mixture composition (Fig. 3).

Figure 3. Process of mixing charcoal powder with adhesive

The composition of corn cob charcoal powder and adhesive used in this research is based on Table 1 below.

Table 1. Composition of Briquette Materials

No.	Adhesive Type	Adhesive Composition (%)	Corncob Charcoal Composition (%)
1.	Sago flour	7.5	92.5
		10	90
		12.5	87.5
		15	85
2.	Tapioca flour	7,5	92.5
		10	90
		12.5	87.5
		15	85

The corn cob charcoal powder and adhesive material that have been mixed evenly are then molded into briquettes using a honeycomb briquette mold. The resulting briquette mold is shown in Figure 4 below.

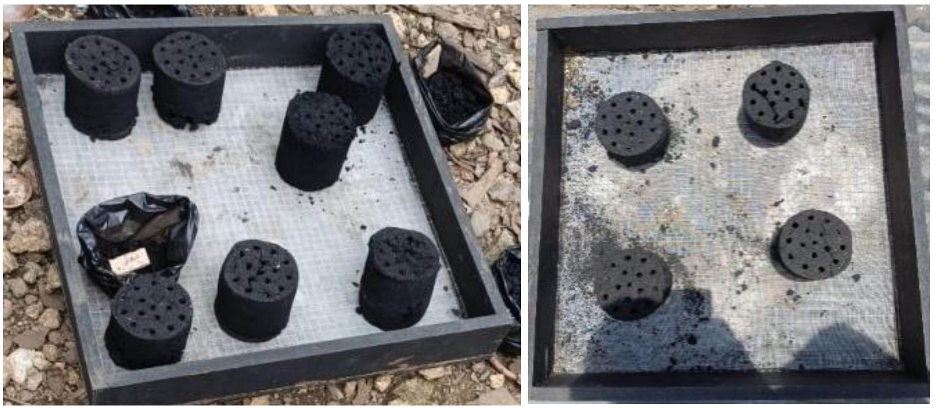

Figure 4. Corn Cob Charcoal Briquettes

The molded corn cob charcoal briquettes are then dried in the sun until completely dry so that the water content of the briquettes is as minimum as possible.

Proximate and Ultimate Briquette Analysis Testing

Proximate and ultimate briquette analysis testing aims to determine the characteristics of the corn cob charcoal briquettes produced in this research. The results of this test include the percentage of water content, ash content, volatile matter, fixed carbon, and heating value.

WBT Testing (Water Boiling Test)

Testing using the WBT method aims to determine how well heat is transferred from the fuel (briquettes) to the pan, in this case boiling water (Fig. 5).

Figure 5. WBT testing

RESULTS AND DISCUSSION

The water content will affect whether or not the briquettes are easy to burn. The higher the water content, the more difficult it will be to burn the briquettes, so the heat produced will also be lower (Ding & Yue, 2018). From Figure 6 above, the water content of corncob charcoal briquettes with sago starch adhesive is 5.37% to 6.27%, while corncob charcoal briquettes with tapioca flour adhesive is 5.48% to 6.71%. Based on the two types of adhesive used in making briquettes, it can be seen that the adhesive from sago flour has a lower water content than the adhesive from tapioca flour. From the test results data, it was found that the water content of all corncob charcoal briquettes met the SNI 01-6235-2000 standard, namely below 8% (Kiang, 2018).

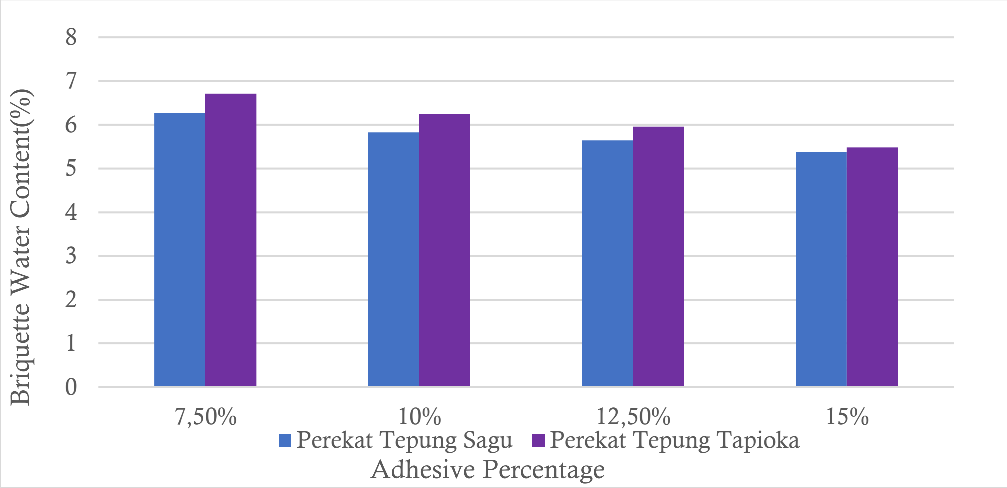

Figure 6. Relationship between type and percentage of adhesive on briquette moisture content

Ash content is the percentage of substances remaining from the combustion process and which no longer contain the carbon element (Kilpimaa, Kuokkanen, & Lassi, 2013). The higher the ash content in a briquette, the lower the quality of the briquette, because high ash content can reduce the calorific value of the briquette. Based on Figure 7 above, the ash content of corncob charcoal briquettes with sago starch adhesive is 30.64% to 35.68%, while corncob charcoal briquettes with tapioca flour adhesive is 32.18% to 39.16%. Based on the two types of adhesive used in making briquettes, it can be seen that the adhesive from sago flour has a lower ash content than the adhesive from tapioca flour.

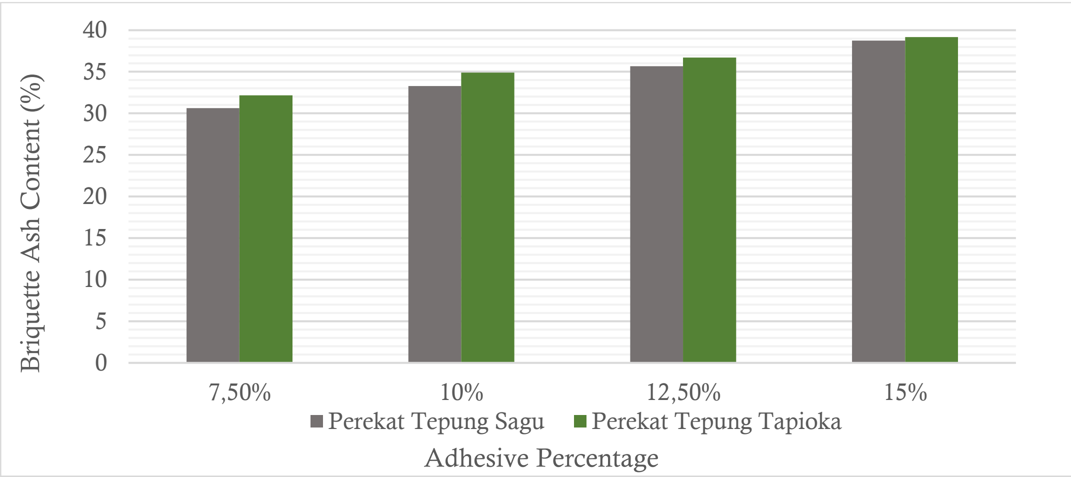

Figure 7. Relationship between type and percentage of adhesive on briquette ash content

The high volatile matter content in charcoal briquettes will cause more smoke when the briquettes are lit, due to the reaction between carbon monoxide (Inegbedion, 2022). Based on Figure 8 above, the volatile matter content of corncob charcoal briquettes with sago starch adhesive is 21.61% to 21.87%, while corncob charcoal briquettes with tapioca flour adhesive is 22.17% to 23.07%. Based on the two types of adhesive used in making briquettes, it can be seen that the adhesive from sago flour has a lower volatile matter content than the adhesive from tapioca flour.

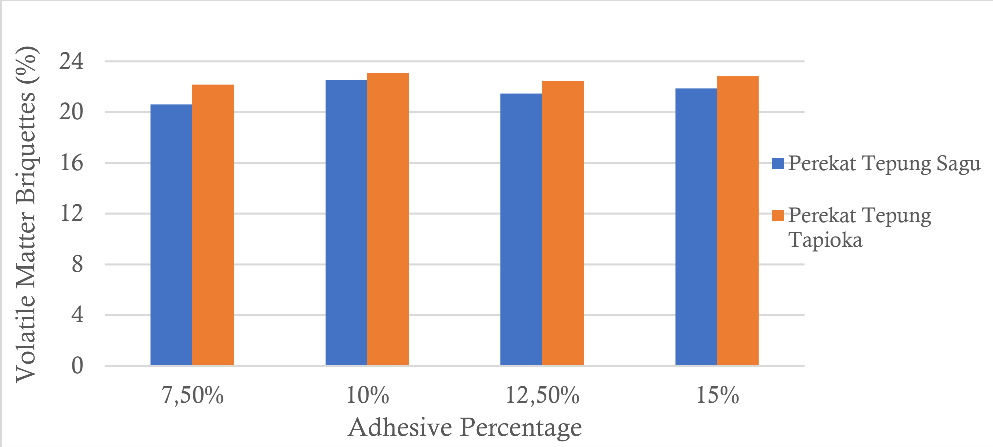

Figure 8. Relationship between Type and Percentage of Adhesive to Volatile Matter Briquettes

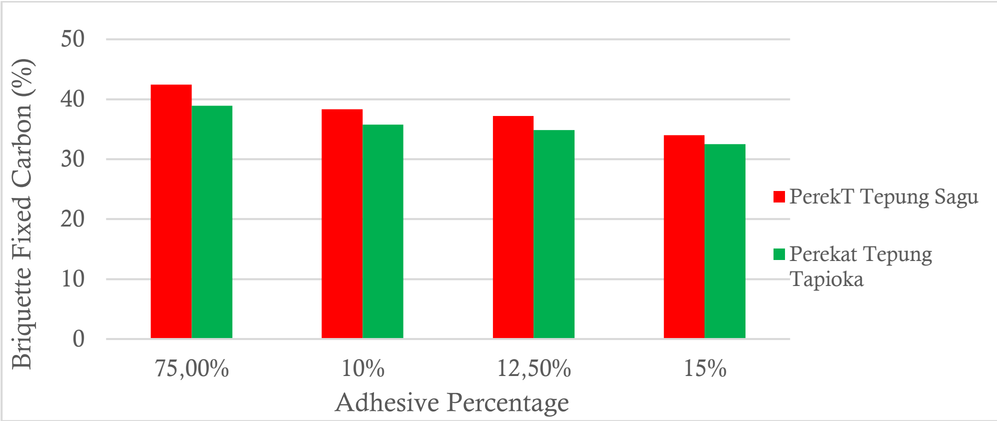

Figure 9. Relationship between Type and Percentage of Adhesive to Fixed Carbon Briquettes

The bound carbon content (fixed carbon) is one of the parameters used to determine the quality of briquettes, where the higher the fixed carbon content, the better the quality of the briquettes produced, because high fixed carbon levels will produce briquettes that have minimal smoke (Inegbedion & Ikpoza, 2022). Based on Figure 9 above, the fixed carbon content of corncob charcoal briquettes with sago starch adhesive is 33.99% to 42.44%, while corncob charcoal briquettes with tapioca flour adhesive is 32.53% to 38.94%. Based on the two types of adhesive used in making briquettes, it can be seen that the adhesive from sago starch has a higher fixed carbon content than the adhesive from tapioca flour.

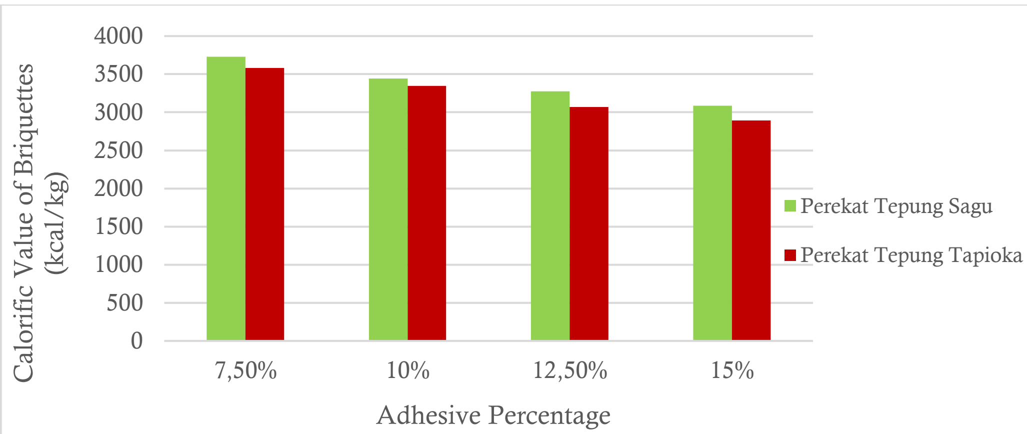

Figure 9. Relationship between Type and Percentage of Adhesive on the Calorific Value of Briquettes

The quality of charcoal briquettes is determined by the high heating value, the higher the heating value of the briquettes, the better the quality of the briquettes. Based on figure 9 above, the fixed carbon content of corncob charcoal briquettes with sago starch adhesive is 3084 kcal/kg to 3727 kcal/kg, while corncob charcoal briquettes with tapioca flour adhesive is 2893 kcal/kg to 3582 kcal/kg. Based on the two types of adhesive used in making briquettes, it can be seen that the adhesive from sago flour has a higher calorific value than the adhesive from tapioca flour.

As an example of the calculation, 1 kg (1 liter) of water is boiled using briquettes with 7.5% sago starch adhesive as shown below (Arora, Das, Jain, & Kishore, 2014), and the calculation results can be seen in Table 2 and Table 3.

- Rate of boiling of water

$$\dot{m} = \frac{1\ kg}{2160\ s}$$

$$= 4.63 \text{ x } 10^{-4} \text{ kg/s}$$

- Specific fuel flow rate

$$FCR = \frac{m_{bb}}{t}$$

$$= \frac{0.126\ kg}{2160\ s}$$

$$= 5.833\ x10^{-5}\ kg/s$$

- The heat absorbed in the process of boiling 1 kg of water is:

$$Q_{out} = m_a \cdot c_{p,a} \cdot (T_m - T_a) + m_p \cdot c_{p,p} \cdot (T_m - T_a)$$

$$= 1 \text{ x } 4.217 \text{ x } (100 - 25.7) + 0.367 \text{ x } 0.903 \text{ x } (100 - 25.7)$$

$$= 313.323 + 24.623$$

$$= 337.946 \text{ kJ}$$

Table 2. WBT Test Calculation Results for Sago Flour Adhesive

No.	7.5 %			10 %			12.5 %			15 %		
	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)
1	4.63E-4	5.37E-5	337.946	3.79E-4	4.58E-5	336.582	3.62E-4	4.09E-5	336,582	3.47E-4	3,61E-5	332.033
2	5. 21E-4	4.64E-5	337.946	4.63E-4	4.86E-5	336.582	4.17E-4	3.46E-5	336,583	3.79E-4	3,92E-5	332.033

Table 3. WBT Test Calculation Results for Tapioca Flour Adhesive

No.	7.5 %			10 %			12.5 %			15 %		
	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Qout (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Qout (kJ)	$\dot{m}$ (kg/s)	FCR (kg/s)	Q_{out} (kJ)
1	3.85E-4	4.38E-5	332.033	3.79E-4	4,09E-5	332.033	3.33E-4	3.53E-5	332.033	3.21E-4	3.30E-5	332.033
2	4.90E-4	4.12E-5	332.033	4.39E-4	3.90E-5	332.033	4.39E-4	3.33E-5	332.033	4.07E-4	3.21E-5	332.033

CONCLUSION

Based on the comprehensive research and analysis undertaken, it can be inferred that the briquettes fabricated utilizing sago starch and tapioca flour as binding agents manifest unique attributes concerning proximate composition and energy content. The results from the proximate analysis reveal that these briquettes show moisture levels between 5.37% and 6.71%, ash concentrations varying from 30.64% to 39.16%, volatile substances ranging from 20.61% to 23.07%, fixed carbon percentages oscillating between 32.53% and 42.44%, and energy values spanning from 2893 to 3727 kcal/kg. Among the binding agents assessed, sago starch at a 7.5% concentration emerged as the most efficacious, achieving the minimal ash content (30.64%) and volatile matter content (20.61%), whilst yielding the maximum fixed carbon content (42.44%) and calorific value (3727 kcal/kg). These characteristics imply that briquettes produced with 7.5% sago starch adhesive provide enhanced combustion efficiency and are anticipated to result in a reduced boiling time owing to their elevated energy output. The ramifications of these findings are considerable for utilizing corn cob briquettes as a renewable energy source, especially within domestic and industrial contexts. It is advisable that subsequent research investigates additional variables that may influence briquette properties, such as binder mixing methodologies, briquetting pressure, moisture regulation during processing, and the long-term stability of the briquettes during storage, to further optimize performance and scalability.

ACKNOWLEDGEMENTS

We would like to thank all parties who have provided support, especially the Head of LPPM Cenderawasih University for the support of research funds in 2024, and friends who have worked well together for this research.

REFERENCES

Arora, P., Das, P., Jain, S., & Kishore, V. V. N. (2014). A laboratory based comparative study of Indian biomass cookstove testing protocol and Water Boiling Test. *Energy for Sustainable Development*, *21*, 81–88. doi: 10.1016/j.esd.2014.06.001

Ding, Y., & Yue, Z. Q. (2018). An experimental investigation of the roles of water content and gas decompression rate for outburst in coal briquettes. *Fuel*, *234*, 1221–1228. doi: 10.1016/j.fuel.2018.07.143

Fachruzzaki, Lestari, R., & Aminah, S. (2025). A Study on the Effect of Rice Husk Charcoal Mix on Coal Briquettes Using the Carbonization Method with Tapioca Flour Adhesive. *IOP Conference Series: Earth and Environmental Science*, *1451*(1), 012024. doi: 10.1088/1755-1315/1451/1/012024

Finney, K. N., Sharifi, V. N., & Swithenbank, J. (2009). Fuel Pelletization with a Binder: Part II — The Impacts of Binders on the Combustion of Spent Mushroom Compost−Coal Tailing Pellets. *Energy & Fuels*, *23*(6), 3203–3210. doi: 10.1021/ef900021t

Haryanto, B., Hutagaol, L. N., Sianturi, N. C., Fazira, M., Sitorus, J., & Alexander, V. (2024). Purification of used cooking oil using natural corn cob and carbon corn cob as adsorbent with batch operation. *IOP Conference Series: Earth and Environmental Science*, *1302*(1), 012067. doi: 10.1088/1755-1315/1302/1/012067

Inegbedïon, F. (2022). Estimation of the moisture content, volatile matter, ash content, fixed carbon and calorific values of saw dust briquettes. *MANAS Journal of Engineering*, *10*(1), 17–20. doi: 10.51354/mjen.940760

Inegbedion, F., & Ikpoza, E. (2022). Estimation of the Moisture Content, Volatile Matter, Ash Content, Fixed Carbon and Calorific Values of Rice Husk Briquettes. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 1–9. Nsukka, Nigeria: IEOM Society International. doi: 10.46254/AF03.20220100

Johanes Saragih, K., A. Abdullah, N., & Bahri Widodo, S. (2024). Effect of Carbonization Temperature of Charcoal Briquettes from Corn Cob with Gondorukem (Resina

Colophonium) Adhesive On Briquette Quality Standards. *JURUTERA - Jurnal Umum Teknik Terapan*, *11*(02), 83–91. doi: 10.55377/jurutera.v11i02.10364

Kaur, P., Singh, J., Kaur, M., Rasane, P., Kaur, S., Kaur, J., … Sowdhanya, D. (2023). Corn Silk as an Agricultural Waste: A Comprehensive Review on Its Nutritional Composition and Bioactive Potential. *Waste and Biomass Valorization*, *14*(5), 1413–1432. doi: 10.1007/s12649-022-02016-0

Kiang, Y.-H. (2018). Database and analysis of fuel properties, fossil fuel, biomass, refuse-derived fuel, waste, biosludge and biocarbon. In *Fuel Property Estimation and Combustion Process Characterization* (pp. 67–169). Elsevier. doi: 10.1016/B978-0-12-813473-3.00004-0

Kilpimaa, S., Kuokkanen, T., & Lassi, U. (2013). Characterization and Utilization Potential of Wood Ash from Combustion Process and Carbon Residue from Gasification Process. *BioResources*, *8*(1), 1011–1027. doi: 10.15376/biores.8.1.1011-1027

Mae, A. I., Seguenza, J., & Bongay, C. (2022). Determination of physical and combustion properties of corncobs/rice bran briquettes with cassava and corn starch binder. *Journal of Biofuels*, *13*(1), 16–27. doi: 10.5958/0976-4763.2022.00003.4

Mari Selvam, S., Janakiraman, T., & Paramasivan, B. (2021). Characterization of engineered corn cob biochar produced in allothermal pyrolysis reactor. *Materials Today: Proceedings*, *47*, 312–317. doi: 10.1016/j.matpr.2021.04.469

Muliani, M., Pangga, D., & Ahzan, S. (2024). Optimization of Binder Percentage in Organic Waste-Based Briquettes: Impact on Calorific Value and Combustion Rate. *Lensa: Jurnal Kependidikan Fisika*, *12*(2), 229. doi: 10.33394/j-lkf.v12i2.13314

Napitupulu, R. A. M., Ginting, S., Naibaho, W., Sihombing, S., Tarigan, N., & Kabutey, A. (2020). The effect of used lubricating oil volume as a binder on the characteristics of briquettes made from corn cob and coconut shell. *IOP Conference Series: Materials Science and Engineering*, *725*(1), 012010. doi: 10.1088/1757-899X/725/1/012010

Nasruddin, N., & Affandy, R. (2011). *Karakteristik Briket dari Tongkol Jagung dengan Perekat Tetes Tebu dan Kanji*. *22*(2), 1–10. doi: https://doi.org/10.28959/jdpi.v22i2.541

Pulungan, M. A., Siahaan, S., & Benu, S. M. (2023). Analysis of the Effect of Tapioca Flour Adhesive on the Characteristics of Palm Oli Empty Charcoal Briquettes. *International Journal of Research in Vocational Studies (IJRVOCAS)*, *2*(4), 8–12. doi: 10.53893/ijrvocas.v2i4.156

Rindayatno, Rosdiana, & Agung Priyo Hutomo. (2024). The Effect of Adhesive Ratio on the Quality of Charcoal Briquettes. *International Journal of Scientific Multidisciplinary Research*, *2*(10), 1453–1462. doi: 10.55927/ijsmr.v2i10.11987

Setiawan, B., Himawanto, D. A., Budiana, E. P., & Widodo, P. J. (2016). Analisa Thermogravimetry Pada Pirolisis Limbah Pertanian. *ETHOS (Jurnal Penelitian Dan Pengabdian)*, 49. doi: 10.29313/ethos.v0i0.1704

Wang, L., Wang, S., Zhou, J., Xie, L., Qin, H., & Ma, H. (2022). A Scientometric Review: Biomass Gasification Study from 2006 to 2020. *ACS Omega*, *7*(43), 38246–38253. doi: 10.1021/acsomega.2c05527

Wirabuana, A. D., & Alwi, R. S. (2021). *Influence of starch binders composition on properties of biomomass briquettes from Durian peel (Durio kutejensis Becc)*. 020020. Surabaya, Indonesia. doi: 10.1063/5.0051733

Yunusa, N., Mamoon, A., & Muktar, M. (2023). Production and Characterization of Bio-Briquette Produced from Rice Husk, Corn Cob and Charcoal Dust. *International Journal of Scientific Engineering and Research*, *11*(9), 1–5. doi: 10.70729/SE23904185558