



## Corn Cob (*Zea Mays* L.) Bricket with the Addition of Lemongrass (*Cymbopogon Nardus* L.) as a Natural Mosquito Repellent

Ahmadan Ilham Maulana, Elnino Profetika Zarathrustra, Agus Widayoko\*

SMA Trensains Muhammadiyah Sragen

Corresponding author, email: widayokoagus22@gmail.com

Diserahkan: 1 Februari 2022; Direvisi: 10 Februari 2022; Diterima: 13 Februari 2022

### Abstract

*Various alternative materials have been found and utilized by the community, such as biogas and biomass. One of them that has been used is briquettes. The purpose of this study was to determine the manufacturing process and advantages of corn waste briquettes with the addition of lemongrass. This type of research is a combination of descriptive research with literature review. The focus of the research description is the manufacture of mosquito repellent briquettes and strengthened by analysis of literature studies to analyze the content of lemongrass which can repel mosquitoes. This research is the result of observations on the manufacture of corncob briquettes (*Zea Mays* L.) combined with the addition of lemongrass (*Cymbopogon Nardus* L.) with the aim of providing added value to the briquettes, that can also be used to repel mosquitoes. Analysis of the use is that each combustion produces carbon dioxide. By taking advantage of the nature of gas particles whose shape and volume are always changing, researchers add value to the results of the combustion. Thus, the carbon dioxide produced contains active substances contained in lemongrass, namely citronellal, geraniol, and silica from combustion. Silica is toxic when it hits insects (mosquitoes) and can cause death because mosquitoes will lose fluids continuously (dehydration). The aroma of briquette smoke can be used as aroma therapy. Another great benefit is that it can teach the community about making briquettes which can also be used as mosquito repellent.*

**Keywords:** Briquettes; Corn cobs; Lemongrass

### Abstrak

Berbagai bahan alternatif telah ditemukan dan dimanfaatkan oleh masyarakat, seperti biogas dan biomassa. Salah satunya yang telah digunakan adalah briket. Tujuan dari penelitian ini adalah untuk mengetahui proses pembuatan dan keunggulan briket tongkol jagung dengan penambahan serai. Jenis penelitian ini merupakan gabungan dari penelitian deskriptif dengan studi pustaka. Fokus deskripsi penelitian adalah pembuatan briket pengusir nyamuk dan diperkuat dengan analisis studi literatur untuk menganalisis kandungan serai yang dapat mengusir nyamuk. Penelitian ini merupakan hasil pengamatan terhadap pembuatan briket tongkol jagung (*Zea Mays* L.) yang dikombinasikan dengan penambahan serai (*Cymbopogon Nardus* L.) dengan tujuan untuk memberikan nilai tambah pada briket tersebut yaitu dapat digunakan untuk mengusir nyamuk. Analisis penggunaannya adalah setiap pembakaran menghasilkan karbondioksida. Dengan memanfaatkan sifat partikel gas yang bentuk dan volumenya selalu berubah-ubah, peneliti menambah nilai dari hasil pembakaran tersebut. Dengan demikian, karbon dioksida yang dihasilkan mengandung zat aktif yang terkandung dalam serai, yaitu sitronelal, geraniol, dan silika dari hasil pembakaran. Silika bersifat racun bila mengenai serangga (nyamuk) dan dapat menyebabkan kematian karena nyamuk akan kehilangan cairan secara terus menerus (dehidrasi). Aroma asap briket dapat digunakan sebagai aroma terapi. Manfaat besar lainnya adalah dapat mengajarkan masyarakat tentang pembuatan briket yang juga dapat digunakan sebagai pengusir nyamuk.

**Kata kunci:** Briket; Serai; Tongkol jagung

## INTRODUCTION

Currently, various innovations appear to try to replace fuel oil. Various alternative materials have been found and utilized by the community, such as biogas and biomass. One of them that has been used is briquettes. Briquettes are alternative fuels made from non-wood materials (Amalinda, 2019). Making briquettes through the process of carbonization and pyrolysis or combustion without involving oxygen. Various non-wood materials have been widely used to make briquettes. Briquettes that have been used include coal, coconut shells, candlenut

shells, corn cobs, and so on. Corn cob briquettes are a type of briquette that is widely used in Indonesia, this is because corn can be found in various regions in Indonesia (Widarti et al., 2016).

There are many advantages of using corn cobs briquettes, apart from being easy to find, there are many other advantages of corn cobs briquettes such as: making corn cobs briquettes cheaper and more economical (Nasruddin & Affandy, 2011), the heat generated is high and very good for long burning, environmentally friendly and safe for health, does not contain toxic fumes, and is not painful to the eyes when grilling (Haryono, 2020).

By utilizing one of the advantages of corncob briquettes, namely that it does not contain toxic fumes, in this study the researchers tried to combine briquettes with lemongrass plants. The result of this combination is corncob briquettes with smoke produced from burning lemongrass-flavored briquettes. The smell of lemongrass is used to repel or eradicate mosquitoes, because lemongrass contains compounds that are not liked by mosquitoes (A'yun et al., 2020).

The main compounds contained in lemongrass are citronellol, and geraniol. The components of the compounds contained in lemongrass are citronellal 32-45%, geraniol 12-18%, citronellol 11-15%, geraniol acetate 3-8%, citronellol acetate 2-4%, citral, kavikol, eugenol, elemol, kadinol, kadinol, vanillin, limonene, kamfen (Budiasih, 2011). Distillation results from lemongrass can be obtained an essential oil called *Oleum citronellae*, mainly consisting of geraniol and citronellal which can be used to repel mosquitoes (Adiguna & Santoso, 2017).

The results of burning the leaves and stalks of lemongrass (*Cymbopogon Nardus L.*) produce silica. Silica is a compound that can cause desiccation (continuous discharge of body fluids) (Khaerana & Gunawan, 2019). According to how it works, silica is like a contact poison that can give death due to continuous fluid loss, so insects will die of drought or loss of fluids (Sugiyanta et al., 2018).

Based on the background description related to the many benefits of making and adding lemongrass plants to the manufacture of corn cobs briquettes, the researcher intends to study it. The purpose of writing this paper is to examine the use of lemongrass (*Cymbopogon Nardus L.*) in the manufacture of corncob briquettes (*Zea Mays L.*) and to find out the advantages of corncob briquettes (*Zea Mays L.*) combined with lemongrass (*Cymbopogon Nardus L.*).

## RESEARCH METHOD

Research on Adding Lemongrass (*Cymbopogon Nardus L.*) in the Process of Making Adhesive on Corncob Waste Briquettes (*Zea Mays L.*) as an Alternative Fuel and Natural Mosquito Repellent is a descriptive research that can be used to understand the process of utilizing corn cobs (*Zea Mays L.*) and efficacy of lemongrass (*Cymbopogon Nardus L.*). This type of research is a combination of descriptive research with literature review. The focus of the research description is the manufacture of mosquito repellent briquettes and strengthened by analysis of literature studies to analyze the content of lemongrass which can repel mosquitoes. Data collection methods that researchers use in this study include observation, documentation, and literature study. The data analysis technique used is descriptive quantitative, which describes in detail the things that exist in the problem formulation and then elaborated on the results of the discussion. (Sugiyono, 2015). Data analysis is based on the data that has been obtained.

The tools and materials used in the manufacture of corncob briquettes (*Zea Mays L.*) combined with the mixture of lemongrass (*Cymbopogon Nardus L.*) are as follows:

1. Tools: barrels with a diameter of about 30 cm, wood for crushing corn cobs that have been burned into charcoal, matches, molds from bamboo, buckets.
2. Materials: corn cobs, lemongrass (*Cymbopogon Nardus L.*), starch / tapioca, and water.

## RESULT AND DISCUSSION

Corn cobs (*Zea Mays L.*) briquettes combined with lemongrass (*Cymbopogon Nardus L.*) blend is a form of giving more value than briquettes which are usually only used as fuel. The added value that will arise from the addition of lemongrass (*Cymbopogon Nardus L.*) is that the smoke produced from burning can repel mosquitoes and other insects. So, in addition to being used for alternative fuels, it is also used for natural mosquito coils.

The process of making corncob waste briquettes (*Zea Mays L.*) combined with lemongrass (*Cymbopogon Nardus L.*) mixture is as follows:

1. Drying corn cobs (*Zea Mays L.*)

Corn cobs that will be used for briquettes are dried in the sun to dry. The purpose of drying is to facilitate the process of burning into charcoal. The time required in the drying process is approximately two days or until the cobs are completely dry.

## 2. Corncob burning (*Zea Mays L.*)

Briquettes are alternative fuels from non-wood materials made through carbonization and pyrolysis processes. Carbonization is a heating process until a solid is produced in the form of carbon, while pyrolysis is a reaction that takes place at high temperatures in the absence of oxygen. The purpose of the carbonization and pyrolysis processes in the manufacture of briquettes is to obtain charcoal from the combustion process.

The type of combustion used is anaerobic combustion to obtain solids in the form of charcoal (carbon). The tool used in this combustion process is a barrel with a diameter of approximately 30 cm with the bottom closed and the top open. The technique of burning corn cobs is to burn it continuously or periodically, in the following way:

- a. Put some corn cobs into the barrel, flush with a little kerosene then burn,
- b. add another corncob if the corncobs that were inserted the first time have all burned, do it periodically, little by little,
- c. make sure all the corncobs are completely burnt. A sign if everything is burned, namely the fire will decrease as a sign that the burning process is complete and the corn cobs have become charcoal,
- d. flush with water so that the smoldering charcoal does not turn to ashes,
- e. roll over the drum and remove the charcoal.

Some things to note during the combustion process:

- a. thin smoke and reduced flames indicate the combustion process is almost complete,
- b. thick yellow smoke, indicating the carbonization process has taken place, and
- c. thick white smoke, a marker that there are some corn cobs that have not dried so that the drying process occurs.

## 3. Corncob charcoal refining (*Zea Mays L.*)

The adhesive that will be used in making this briquette is a heated starch solution. Before heating, the starch solution is mixed with pieces of lemongrass (*Cymbopogon Nardus L.*). So, the resulting adhesive smells like lemongrass (Aryani & Edie, 2017). There are two stages of the adhesive manufacturing process as follows:

### a. Lemongrass cutting (*Cymbopogon Nardus L.*)

The lemongrass that will be used in this experiment is cut or chopped in such a way that the content contained in the lemongrass can be easily mixed with the starch solution.

### b. Heating adhesive

At this stage, the chopped lemongrass is mixed with starch and water, with the composition of starch: water is 1: 5. To get a good starch solution, mix the lemongrass mixture, starch, and water. After the dough is smooth, heat it until it boils.

## 4. Printing dough

The dough is still sticky immediately print into the mold that has been provided. The mold used in this experiment was a piece of bamboo with a diameter of 6-8 cm and a height of 10 cm. The thing that needs to be considered in the printing process is the amount of pressure used. The greater the pressure, the denser the briquettes produced.

## 5. Drying

Drying is done in the sun to dry. The drying time is approximately 1 to 2 days. The dried briquettes are ready to use.

## 6. Testing

At this stage of testing, what is tested is the quality of the flame, the length of the flame, and the aroma of lemongrass. In this testing process, the quality of the fire is obtained with a bluish red flame. The length of the flame for 1 briquette with the size of the mold is approximately 2-3 hours. While the aroma of lemongrass wafted with a distinctive lemongrass aroma. The product is also tested for durability. The endurance test was carried out by dropping the product from a height of 2 meters to determine the strength of the briquettes. The added value obtained from the addition of lemongrass (*Cymbopogon Nardus L.*) is:

- a. The smell of lemongrass that can repel insects
- b. The smell of lemongrass can be used as aroma therapy.
- c. People can make their own mosquito repellent, including.

This research is the result of observations on the manufacture of corncob briquettes (*Zea Mays L.*) combined with the addition of lemongrass (*Cymbopogon Nardus L.*) with the purpose of providing added value to the briquettes, namely in addition to alternative fuels, it can also be used for mosquito coils. The purpose of this

study was to examine the use of lemongrass (*Cymbopogon Nardus L.*) in the manufacture of corncob briquettes (*Zea Mays L.*) and to determine the advantages of corncob briquettes (*Zea Mays L.*) combined with lemongrass (*Cymbopogon Nardus L.*) briquettes. Meanwhile, the expected benefit from writing this paper is that it can be used as a multi-purpose alternative fuel, because in addition to being an efficient fuel, it can also be used for natural mosquito coils and provides business opportunities for the community to produce corncob briquettes (*Zea Mays L.*) combined with the addition of lemongrass (*Cymbopogon Nardus L.*) which can improve the community's economy.

Corn cob briquettes (*Zea Mays L.*) combined with the addition of lemongrass (*Cymbopogon Nardus L.*) in the manufacture of the adhesive is one form of innovation from corncob briquettes to increase the use value of the briquettes. The additional use value expected from the addition of lemongrass is that the smoke produced from burning lemongrass-flavored briquettes can repel mosquitoes and other insects. The idea of combining corncob briquettes with lemongrass originated from the idea that lemongrass (*Cymbopogon Nardus L.*) is one of the plants that can repel mosquitoes, because it contains the active ingredients citronellol and geraniol which can repel mosquitoes. In addition, the combustion of the leaves and stalks of lemongrass (*Cymbopogon Nardus L.*) produces silica. Silica is a compound that can cause desiccation (continuous discharge of body fluids). According to how it works, silica is like a contact poison that can give death due to continuous fluid loss, so that insects will die of drought or loss of fluids (dehydration).

Briquette is an alternative fuel with various advantages, including: durable, smoke is not thick, and the resulting fire is stable. By taking advantage of the advantages of these briquettes, the researcher seeks to add more value to these briquettes. Analysis of the utilization of corncob briquettes with a combination of lemongrass is that each combustion produces carbon dioxide. Carbon dioxide is a gas. By utilizing the nature of gas particles whose shape and volume are always changing, the authors add the use value of the combustion results. Thus, the carbon dioxide produced contains active substances contained in lemongrass, namely citronellol, geraniol, and silica from combustion.

The advantage of using this briquette is that the aroma released is the fresh aroma of lemongrass (*Cymbopogon Nardus L.*). Another plus is that the smoke produced is harmless to humans. When compared to the active compounds found in mosquito coils, the active ingredients in briquettes are safer. Briquette smoke containing citronellol and geraniol will repel mosquitoes. Citronellol makes mosquitoes poisoned which results in hissing (continuous loss of fluids). In addition, the ash from burning briquettes contains silica which can kill mosquitoes and other insects in the same way. The aroma of briquette smoke can be used as aroma therapy. Another great benefit is that it can teach the community about making briquettes which can also be used as mosquito repellent.

## CONCLUSION

Based on the results and discussion in the previous chapter, the following conclusions can be drawn. The use of lemon grass (*Cymbopogon Nardus L.*) in the manufacture of corn cob briquettes (*Zea Mays L.*) is to mix lemongrass in a starch solution at the stage of the adhesive manufacturing process, then mix it with corn charcoal that has been mashed before printing. The advantages of corn cobs (*Zea Mays L.*) briquettes combined with lemongrass (*Cymbopogon Nardus L.*) briquettes can repel mosquitoes, have a therapeutic aroma, and can provide opportunities for the community to create briquettes as well as mosquito repellent. Suggestions for further research is that it is necessary to develop briquettes from other materials besides corn cobs. In addition, a more accurate effectiveness test can be carried out.

## ACKNOWLEDGEMENT

As a research team, we would like to express our deepest gratitude and appreciation to Agus Widayoko as a teacher and mentor.

## REFERENCES

- A'yun, Q., Hermana, B., & Kalsum, U. (2020). ANALISIS RENDEMEN MINYAK ATSIRI SERAI WANGI (*Cymbopogon nardus* (L.) PADA BEBERAPA VARIETAS. *Jurnal Pertanian Presisi (Journal of Precision Agriculture)*, 4(2), 160–173. <https://doi.org/10.35760/jpp.2020.v4i2.3343>
- Adiguna, P., & Santoso, O. (2017). Pengaruh Ekstrak Daun Serai (*Cymbopogon Citratus*) Pada Berbagai Konsentrasi Terhadap Viabilitas Bakteri *Streptococcus Mutans*. *Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro)*, 6(4), 1543–1550.
- Amalinda, F. (2019). Efektivitas Briket Bioarang Tabingga dan Tongkol Jagung sebagai Sumber Energi Alternatif. *JST (Jurnal Sains Terapan)*, 5(2), 137–142. <https://doi.org/10.32487/jst.v5i2.726>
- Aryani, N. P., & Edie, S. S. (2017). Pengembangan Briket Bonggol Jagung sebagai Sumber Energi Terbarukan. *Jurnal Mipa*, 40(1), 20–23.
- Budiasih, S. (2011). Pemanfaatan Beberapa Tanaman yang Berpotensi sebagai Bahan Anti Nyamuk. Universitas Negeri Yogyakarta.
- Haryono, H. (2020). Uji Kualitas Briket dari Tongkol Jagung dengan Perekat Kanji/PET dan Komposisi Gas Buang Pembakarannya. *Jurnal Ilmu Dan Inovasi Fisika*, 4(2), 131–139. <https://doi.org/10.24198/jiif.v4i2.28606>
- Khaerana, K., & Gunawan, A. (2019). Pengaruh Aplikasi Pupuk Silika Dalam Pengendalian Tungro. *Jurnal Pertanian*, 10(1), 1. <https://doi.org/10.30997/jp.v10i1.1687>
- Nasruddin, & Affandy, R. (2011). Karakteristik Briket Dari Tongkol Jagung Dengan Perekat Tetes Tebu Dan Kanji. *Jurnal Dinamika Penelitian Industri*, 22(2), 1–10.
- Sugiyanta, Dharmika, I. M., & Mulyani, D. S. (2018). Application of Liquid Silica Fertilizer to Increase Growth, Yield, and Drought Tolerance in Rice. *Indonesian Journal of Agronomy*, 46(2), 153–160. [https://www.researchgate.net/publication/328142944\\_Pemberian\\_Pupuk\\_Silika\\_Cair\\_untuk\\_Meningkatkan\\_Pertumbuhan\\_Hasil\\_dan\\_Toleransi\\_Kekeringan\\_Padi\\_Sawah](https://www.researchgate.net/publication/328142944_Pemberian_Pupuk_Silika_Cair_untuk_Meningkatkan_Pertumbuhan_Hasil_dan_Toleransi_Kekeringan_Padi_Sawah)
- Sugiyono. (2015). Metode Penelitian Kombinasi. Alfabeta.
- Widarti, B. N., Sihotang, P., & Sarwono, E. (2016). Penggunaan tongkol jagung akan meningkatkan nilai kalor pada briket. *Jurnal Integrasi Proses*, 6(1), 16–21. <http://jurnal.untirta.ac.id/index.php/jip>



This work is licensed under a [Creative Commons Attribution Non-Commercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)