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## The Application of Jack D' Pack Energy Kit in Bio-Battery

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### ABSTRACT

The main objective of this project is to produce an environmentally friendly bio-battery product or kit from two types of fruit waste, namely jackfruit (*Artocarpus heterophyllus*) and durian (*Durio zibethhinus*), and also to explain the bio-battery application of the Jack D' Pack Energy Kit. The arrival of this season is eagerly awaited by Malaysians to taste the delicious pulp of jackfruits and durian. However, only the juicy pulp of jackfruits and durians is consumed and the peel (the green peel) is thrown away. To solve this problem, an electrochemical concept was introduced to prevent this issue. Electrochemistry is a relationship between electricity and chemical changes. It results from the outcome of the chemical reaction. In this project, we developed an alternative to use jackfruit and durian fruit waste by generating energy for electricity. Durian and jackfruit waste have the potential to generate energy because the peel structure of durian and jackfruit is similar. Both types of fruit have one thing in common: a pungent aroma strong smell. This kind of indicator will show great potential in producing bio-battery and producing it as a product or kit for marketing.

**Keywords:** Bio-battery; electrochemical; renewable energy; fruit waste

### INTRODUCTION

The Jack D' Pack is a combination of two types of fruits. They are the jackfruit (*Artocarpus heterophyllus*) and the durian (*Durio zibethhinus*). Jackfruit is the largest edible fruit in the world [1]. Jackfruit is a multiple fruits consisting of edible (pulp and seed) and non-edible (peel and rachis) parts. The tender green fruit is used as a vegetable and the juicy pulp of the ripe fruit is eaten fresh as a dessert [2]. Durian is known as the king of fruits. It has a prickly texture (thorny skin), and the inside is yellow, soft, and has a very pungent aroma. However, despite the deliciousness of the durian fruit, the durian fruit also has another advantage, which is that the skin of the durian fruit can produce energy. Fruits and vegetables can be used as alternative renewable energy sources in the form of bio-batteries as a substitute for conventional batteries because they have electrical properties that contain a lot of electrolytes [8].

Every year the jackfruit and durian seasons occur from July to December. There is a lot of jackfruit and durian waste in the garbage. Converting food waste into value-added products will not only improve the overall economy but also reduce environmental pollution [3]. For this reason, the main objective of this project is to produce a fruit waste battery eco-friendly product or kit. Secondly, to provide an explanation of the application of the product Jack D' Pack Energy Kit in Bio-Battery. To solve the problem, a few concepts were introduced to prevent this matter. One of the concepts is electrochemical. Electrochemistry is a relationship between electricity and chemical changes. It's come from the result of the chemical reaction. An electrochemical reaction also can be produced through a chemical reaction that occurs as an

electric current such as electrolysis. So, in this project, we devise a way to use jackfruit and durian fruit waste to create energy for electricity. The durian and jackfruit waste has the potential to generate energy storage because of the peel structure of durian and jackfruit. Both types of fruit have a similarity that is an unspeakably strong smell. This kind of indicator will show a big potential in producing bio-battery.

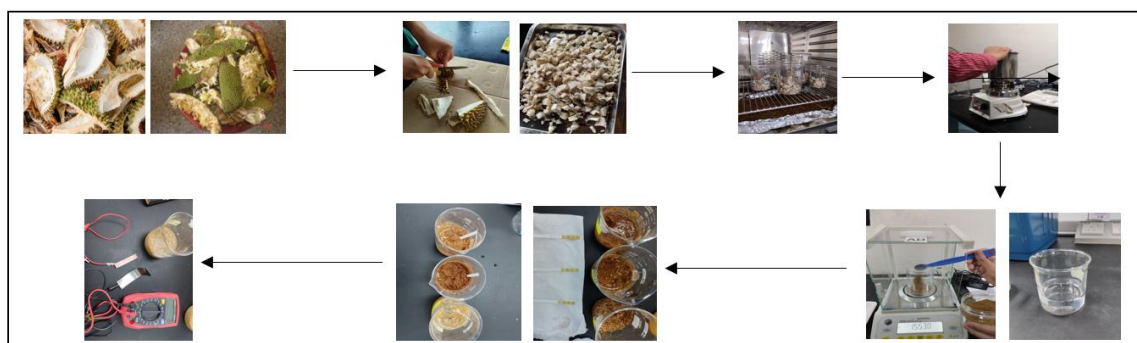
A bio-battery is a technology that produces electrical energy using components sourced from living beings [7]. It is a device that generates electricity from organic compounds. Bio-batteries have three major parts, an anode, a cathode, and an electrolyte. Here, the electrolytes were used for bio-fuel cells instead of chemical fuel cells. The glucose biofuel cell has become one of the most important potential energy sources. One of the substances that has the most potential for usage in bio-batteries is fruit [7,1]. Fruits and plants that contain sugar were recommended due to the fact that they have sufficient chemical energy that can be converted into electrical energy. [4]

## INNOVATION DEVELOPMENT

The Jack D'Pack is a battery that can produce an electric current. It allowed students or others to learn the concept of electrochemistry by building an electric circuit using the powder (containing fruit waste) without using dangerous chemicals because the Jack D'Pack comes from organic compounds. The waste fruit cores of durian (*Durio zibethinus*) and jackfruit (*Artocarpus heterophyllus*) were selected as candidates based on their structures and their prospect of intrinsic nitrogen doping [3,2].

Materials used in this project included jackfruit and durian waste, sterile water, copper electrodes, magnesium electrodes, copper electrical wire, alligator clips, and beakers. Equipment used in this project included an electronic blender (GMC Dry & Wet Mill BL -001), an electronic scale, a digital ammeter, and a decade resistor.

All of the following problem solving procedures are illustrated in the following figure 1.



**Figure 1:** The procedure show the existence of energy.

Figure 1 above shows the procedure used to test the presence of energy in jackfruit and durian waste from jackfruit and durian waste. We conducted the project in 6 steps. First, we collected the fruit waste of jackfruit and durian, then we cut the jackfruit and durian peel into small pieces and put them in the oven for one day at the temperature. Weigh 10 g of jackfruit and durian powder, add 100 ml of water and stir, wait for 15 minutes, then put in the pH paper and note the pH value. Clamp the magnesium metal to the negative terminal and the copper to the positive terminal, and dip into the beaker every 5 minutes for 1 hour and record the reading.

Since, the procedure above success show the existence of energy. To strengthen this statement according to other researchers, the outstanding electrochemical performance of durian and jackfruit waste electrodes is attributed to the large surface areas and desirable mesoporous structures as they facilitate improve diffusion of ions through the electrode, also enhances electronic conductivity [3,3].

To improve this project to the next level, we applied the powder (extract from durian and jackfruit) will packaging in one pack as a product. This product namely as Jack D' Pack. In that pack it contains jackfruit and durian powder, wire clamp, 2 iron plates (copper), 2 iron plates (magnesium) and sandpaper together with the instructions.



**Figure 2:** Innovation Product - Jack D' Pack

## COMMERCIAL POTENTIAL

This product is one of the application of Jack D' Pack. It can be used as a teaching tool especially for parents. It can be done at home together with the children. At the same time, it can arouse children's interest especially in the field of science at an early age. Science is very interesting subject. Science subjects should also arouse curiosity in children to ask questions and explore [5]. All these elements are naturally present in children [5]. It is also able to introduce children to electrochemistry and much more.

Attach here Intellectual Property Recognition (IPR) by our intuition about this project.

## CONCLUSION

All the objectives of this project were successfully achieved. The use of fruit waste from jackfruit and durian waste has been fully exploited, and the successful environmentally friendly products or kits from fruit waste batteries have been successfully produced. The product can be used as a teaching tool for children to introduce them to bio-battery. In the future, this product can be commercialised with more design and technology aspects to make it accessible to children in school. To improve the product, perhaps we can use different kinds of fruits that have a pungent smell.

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## REFERENCES

- [1] Naik, K. C., 1949. South Indian Fruits and Their Culture. P. Varadachery & Co, Madras, pp. 300-302.
- [2] Chayon, G., & Rakhi, C. (2016). Nutritional Composition of Fruit Cultivars: Jackfruit (*Artocarpus heterophyllus*), 317-318. <https://dx.doi.org/10.1016/B978-0-12-408117-8.000014-3>.
- [3] Keeny. L., Luba, S., Shaikh, N. F., Van, C. H., & Vincent. G. G. (2019). Aerogel from Biowaste Produces Ultracapacitor with High Energy Density and Stability. <https://doi.org/10.1016/j.est.2019.101152>
- [4] E Haryati, K Dahlan. (2019). 7th Asian Physics Symposium. Characterization of Bio-battery from Tropical Almond Paste, 3-36. <https://iopscience.iop.org/article/10.1088/1742-6596/1204/1/012036>
- [5] Hasbullah. S. S., Abu. B. K., & Othman. N. (2020). Early Science Learning and Preschool Children's Sosial and Emotional Competencies. 55-70. <https://doi.org/10.17576/akad-2020-90IK3-05>
- [6] Jirout, J. & Zimmerman, C. 2015. Development of Science process skills in the early childhood years. In Research in Early Childhood Science Education , edited by K. C. Trundle and M. Sackes, 143-165.
- [7] Fauzia. S., Ashiddidi. M. A. H., & Khotimah. A. W. K. (2019). Fruit and Vegetable as a Potential Source of Alternative Energy. <http://www.researchgates.net/publication/337021497>.pp 161-167.
- [8] Jauharah, Wira Dian. 2013. Analysis of Electricity Produced by Fruit Waste and Vegetables as Alternative Energy Bio-Batteries. (Thesis). University of Jember. East Java (In Indonesian).