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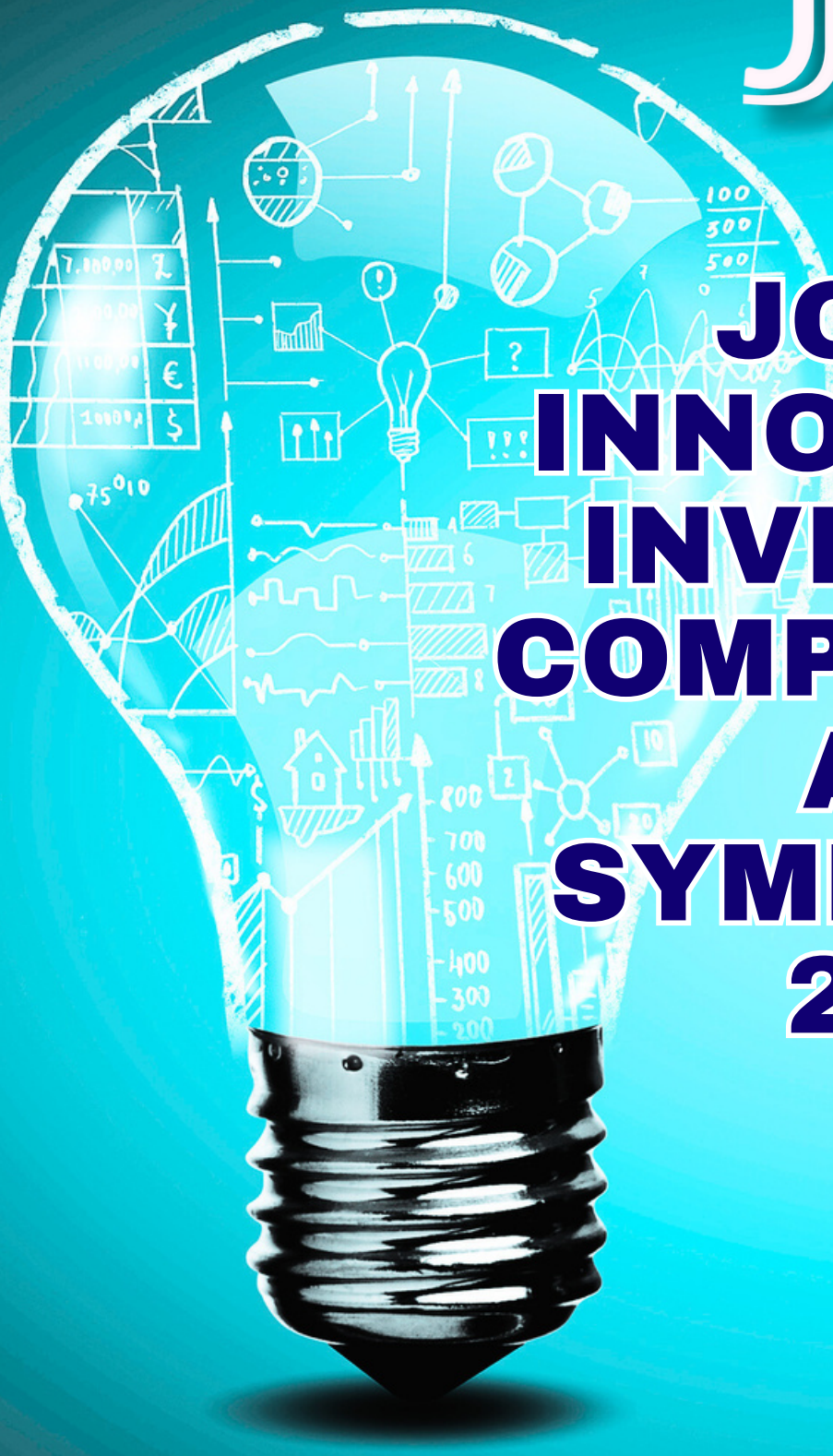

JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023

" Innovation Inspires a Society to be Critical and Creative"

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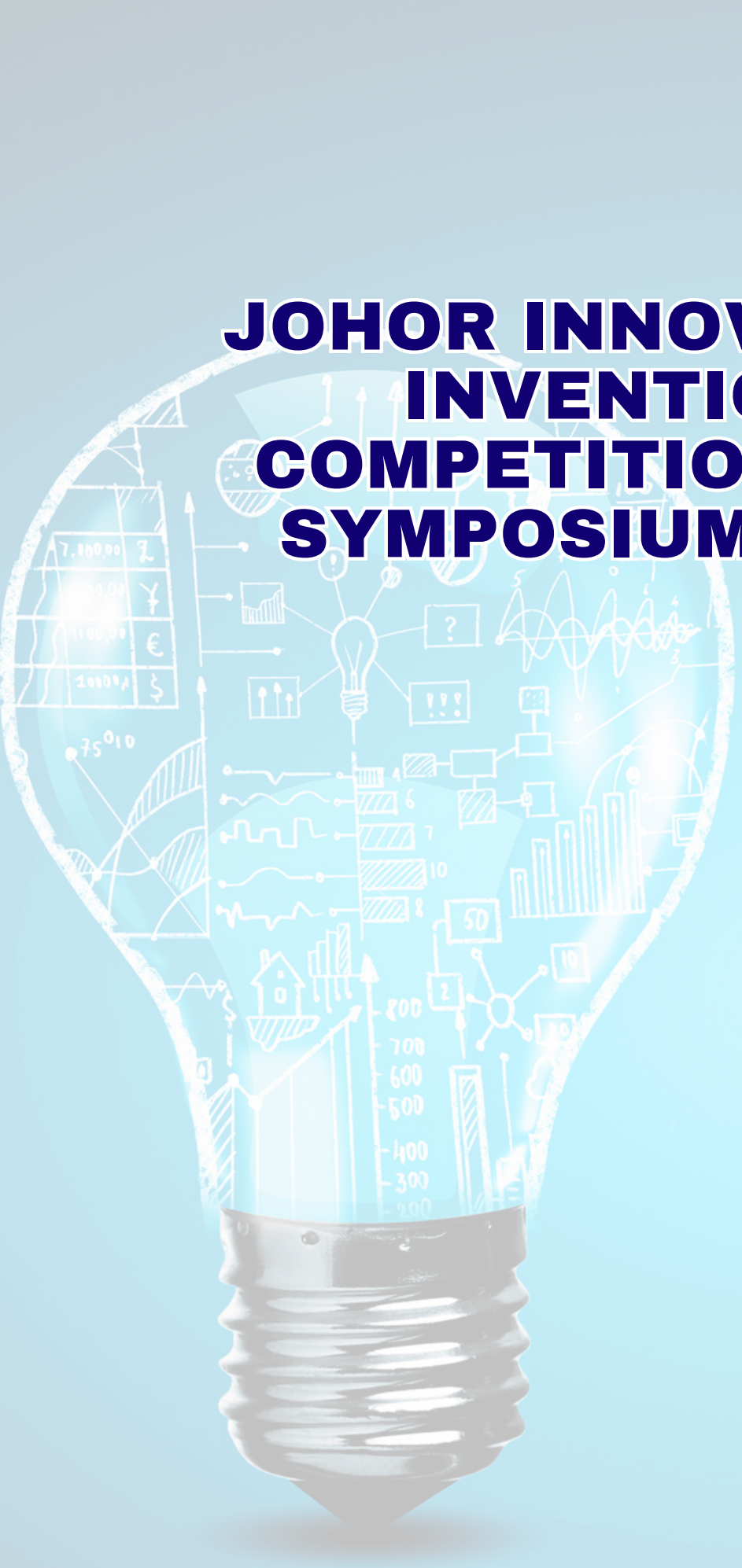

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Editors-in-Chief

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor Innovation Invention Competition and Symposium 2023 (JIICaS2023), where JIICaS2023 is a virtual platform for all creative minds to share and present their invention and innovation. The extended abstracts are divided into two categories, which are Category A (Higher Educational Student/ Any Recognized Institutional Students in Malaysia) and Category B (Primary/ Secondary School Students / Special Education School Students in Johor). Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students from both categories and get some ideas to develop future innovation products.

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ECO-ENZYME: FERMENTED ORGANIC WASTE AS MULTIPURPOSE CLEANER

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ABSTRACT

Majority of bleaching agents contain hydrogen peroxide and are based on chemical detergency process. The excessive uses of chemical substance in daily routine such as detergent and chemical pesticide may lead to worse. In Malaysia, solid waste management is also a big environmental issue. Urban people consumption patterns have shifted, resulting in an overabundance of municipal solid garbage. Eco-enzyme is a magic liquid resulted from fermentation of organic kitchen wastes, such as fruit peels and leftover vegetable that have not been cooked and are not rotten, together with sugar and clean water. Eco-enzyme is very easy and simple to produce, but the benefits of eco enzyme are numerous. The benefits of this eco-enzyme are as DIY multipurpose cleaner using kitchen waste, as an air purifier, and also as plant fertilizer and pesticide. It is non-toxic, non-irritating, non-flammable, and typically safe to human. The enzymes are derived from living organisms and harmless to human. By making eco-enzyme, it is one of the solution to manage most of our wastes, reduce landfill burden, and reduce the production of synthetic wastes from the packaging of manufactured household products. This natural fermentation waste is suitable to be marketed, especially in the cleaning industry. The significance of the usage of fermented organic wastes are to replace commercial product that may contain chemical which are harmful to the environment.

Keywords: Enzyme, Fermentation, Organic Waste.

1.0 INTRODUCTION

Rapid population today has led to the increasing daily life cost. The usage of commercialized cleaning products made with chemicals also is polluting the river and the surrounding ecosystems. Thus the idea of creating a DIY cleaning substance by using only organic waste was conceived. For that purpose, fermentation of waste organic compounds to produce alcohol as our primary cleaning agents have been done. The significance of the usage of fermented organic wastes are to replace commercial products that may contain chemical which are harmful to the environment. Moreover, they help to upcycle food wastes and they are environmental friendly. Every time using the cleaning products made with chemicals, we are actually polluting the underground water, rivers and the surrounding eco-system. Conventional cleaning products contain phosphate, nitrates, ammonia, chlorine and many other harmful chemicals. The accumulated effects of these chemicals that are released from every households contaminates the environment [1].

This eco enzyme is produced by the fermentation of kitchen scraps (fruit and vegetable waste only) with water and brown sugar. When activated, enzymes attack or digest the amino and fatty acids that bond the films of dirt together. They also emulsify them so they can be completely removed from the surface. Put another way, enzymes are chemical catalysts that accelerate the natural biodegrading, or breaking down, of organic substrate, which comprises most soils. Enzymes dissolve and break down protein and organic matter, diminishing odors caused by staining agents such as urine, feces, vomit, pet odors, spoiled foods and mildew. Enzymes are derived from living organisms and are harmless to humans, animals, marine life and general ecology. They are non-toxic, non-irritating, non-gaseous, non-flammable, non-pathogenic and typically safe to use. Since an enzyme that breaks down proteins (protease) will not react on fats or oils, and effective enzymatic cleaning system must contain enough different classes and types of enzymes to assure proper catalytic reaction. In concentrated form, this greatly speed up the natural “dust to dust” process [2].

The garbage enzyme is a fermentation product based on vegetable-based kitchen waste such as fruit peels and vegetable trimmings, water and brown sugar. Methods for production of the garbage enzyme have been studied [3]. Sugar is used frequently as a substrate in fermentation processes; in the production of lactic acid, polyhydroxybutyrate, ethanol, pullulan, xanthan gum, and molasses has been widely used as a substrate in fermentation processes. The proponents of the garbage enzyme describe it as a complex organic substance of protein chains, mineral salts and juvenile hormones, and also claim that it functions to decompose, transform as well as catalyze reactions. It is also claimed that the garbage enzyme functions differently in different concentrations [4], [5].

2.0 OBJECTIVE

The aims of the study are to create the fermentation of fruit peel, vegetable wastes, and rice water as cleaning products, and also to compare the effectiveness of fruit peel, vegetable wastes, and the rice water to clean oily surfaces. The product has applications as a natural fertilizer and pesticide and an additive to animal feed. Not only then is it a way of using up old food waste, it takes the place of several harmful chemicals.

3.0 DESCRIPTION OF INNOVATION/METHODOLOGY

The methodology includes the preparation of three types of fermentation, which are fermentation of fruit peels, vegetable wastes, and rice water, analyzing in cleaning the oily surface, and determination of oil absorbed by oil absorbent paper.

3.1 The fermentation of fruit peels and vegetable wastes

500 g fruit peels collected such as orange, lemon and markisa fruit were put into the 1.5 liter plastic bottle, labelled as ‘Fruit Peels’. One liter of water was poured into the bottle and 5 spoons of sugar were added into the bottle. The bottle was stirred and shaken to mix the water with the fruit peels. 500 g vegetable wastes such as onion, cucumber, cabbage and other green vegetables were collected and were put into the 1.5 liter plastic bottle, labelled as ‘Vegetable Wastes’. One liter of water was poured into the bottle mixed with 5 spoons of sugar. The bottle was stirred and shaken to mix the water with the vegetable wastes. In a duration of two months, those fermentations were kept in a dark cool place with good ventilation.

3.2 The fermentation of rice water

One liter of the rice water was poured into the 1.5 liter plastic bottle, labelled as ‘Rice Water’. Five spoons of sugar were added into the bottle and stirred. The fermentation was kept in a dark cool place with good ventilation for two months.

3.3 Determination of Oil Absorbed using Oil Absorbent Paper

A layer of oil was poured onto the polystyrene plate. The plate was rinsed for the first time with water. The oil left on the plate was then washed by using the fermented fruit peels. The plate again was rinsed with water for the second time and was left until it dried. Then, 9×5cm oil absorbent paper was used to wipe out all of oil remains on the plate. The area of oil absorbed by the oil absorbent then been measured using the paper grid with the measurement of 1cm² × 1cm² as shown in Figure 1. The steps were repeated three times. The processes were replicated using fermented vegetable waste, rice water and tap water as in control group. The data collected then analyzed to obtain the average results.

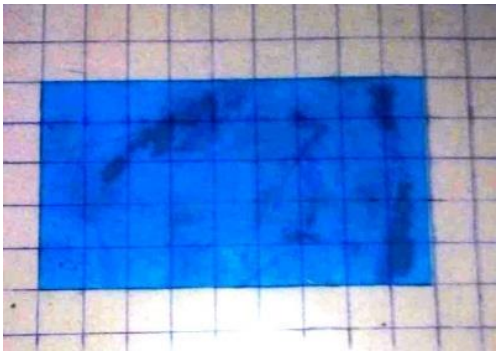

Figure 1: The area of oil absorbed on the oil absorbent paper was measured using the paper grid

4.0 ADVANTAGE/IMPACT/RESULTS/NOVELTY

The result reveals fermented fruit peels as the best oil cleaning agent due to the contents composed of highest level of sorbitol and xylitol compared to other fermented organic wastes. These act as the energy source for yeast to transform the sugar into alcohols and carbon dioxide. Then, the alcohols were used to clean the oil by getting in between the long fatty acid chains. This situation was the key point in liquefying the grease because the long fatty chains that were packed together will make the grease to solidify and hard to clean on any surface.

4.1 Area of oil absorbed on oil absorbent

Based on Figure 2, the result shows that the fermented fruit peel was most effective in cleaning oily surface with only 19.3cm^2 area of oil absorbent affected by the oil, followed by fermented rice water with 28.3cm^2, fermented vegetable wastes with 30.7cm^2 and the least effective is tap water which the absorbent was fully covered with oil (45cm^2).

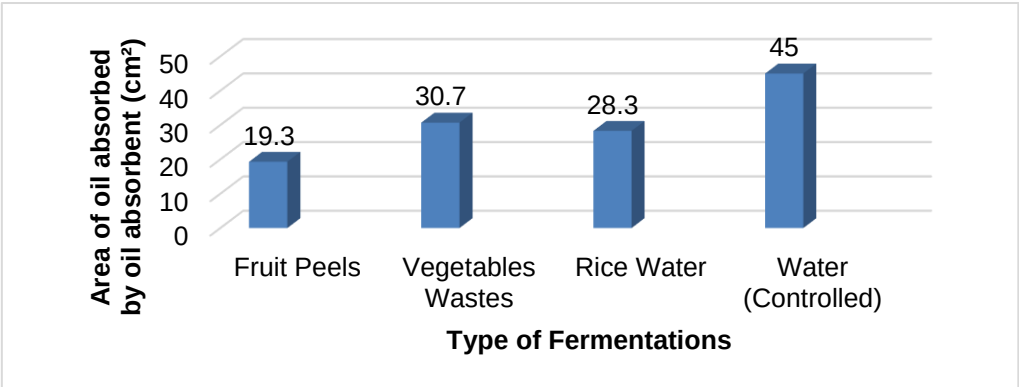

Figure 2: Type of Fermentations against Area of Oil absorbed by Oil Absorbent

4.2 Fourier Transform Infrared Spectroscopy analysis

A Fourier Transform Infrared Spectroscopy which also known as FTIR Analysis or FTIR Spectroscopy was done to identify the chemicals present in the fermentation. Based on the FTIR analysis done, it appeared that each of the organic waste fermentations consist of almost the same chemicals with the same shape of the peak obtained in the spectroscopy. The chemicals are polyacrylamide, carboxyl modified-low carboxyl content, streptomycin sulphate, nitromethane, naringin, guanidine thiocyanate, DL-6,8-thioctic acidamide, kappa-carrageenan, anthranilic acid amide and pectin ex apples.

4.3 Fermentation and sugar added

The main reason on adding sugar to the fermentations was to produce more alcohol products in each of the fermentations in order to make the fermentations more effective in cleaning the oily surface. The products between the fermentations and the added sugar were organic acids, gases, or alcohol as yeasts feed on sugars and starches. They turn the added sugar into energy and release alcohol and carbon dioxide (CO_2) as a result. The produced CO_2 then bubbled up through the liquid and dissipated into the air making it fizzy while alcohol remained in the liquid improved the effectiveness of the organic waste fermentations in cleaning oily surface due to their effective cleaning and disinfecting properties and fast drying rates.

5.0 CONCLUSION

From the results obtained, it can be concluded that the fermented fruit peels is the best organic product in cleaning oily surface area followed by the fermented rice water and the fermented vegetable wastes as the fermented fruit peels produces much more alcohol compared to other fermented samples. It can be known that the alcohols have polar and non-polar parts. The non-polar part will dissolve in the oil, hence the oil can be eliminated. When rinse with water, the polar part will dissolve in the water, so it can wash away the oil.

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