



Development of a Suitable Bio-gel Plus Formulation from Bioethanol Bagasse Selected for Use as a Medical Cleaning Agent

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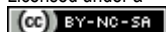
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Abstract: Bagasse was a lignocellulose material that is readily available, inexpensive, and abundant in Thailand. Especially during the fasting months of the three southern provinces. By converting bagasse to sugar that can be fermented into ethanol, the main precursor of the antibacterial bio-gel production. The purpose of this research was to study of an appropriate bio-gel Plus formulas were developed from selected bagasse ethanol production. The highest of Bio Gel Plus was formulas 2, which was 57.25 % compared to Bio Gel Plus formula 1 and 3. Other characteristics, such as appearance, color, odor, and viscosity, were mostly favored by 79.23% of formula 2 overall compared to the same formulation, which had a significant statistical difference ($P < 0.05$). It was very high that the tester prefers Formula 2 because it had a fragrance composition. and does not contain Propylene glycol which results in quick drying and can be developed into products for commercial applications and to enhance income and sustainability for medical cleaning agent product. If there has a future marketing channel, it is the way to create a sustainable income to the community.

1. INTRODUCTION

Infectious disease occurs when the body is infected with pathogens in sufficient quantities to cause disease. Pathogens can enter the body in many ways, including ingestion, breathing, or skin contact. One of the main transmission channels is through inanimate mediums. This can be prevented by keeping the environment clean by using disinfectants to clean it, reducing the risk of infection from the environment. Medical cleaning agents are substances that are used to kill a wide range of microorganisms, are nonspecific and can be applied to living surfaces such as skin. Therefore, it is suitable for use on the surface of various objects. inanimate to stop the spread of infection. It is a substance that has the effect of inhibiting the growth of infection. and used against microorganisms on the skin or tissues. Some substances can be both disinfectant and antiseptic when the concentration changes (Cheetham, & Berentsveig, 2002; Bukalasa, et al., 2019)

Ethanol production had a fermentation process was slow and the ethanol content was low. There are several ways to do this (1) physical, such as grinding and heating, etc. (2) chemical methods such as the use of acid or base solutions, and (3) biological methods such as using cellulose enzymes or together with the above method (Antunes, et al., 2021; Saripan, Reungsang, & Sittijunda, 2021). In these processes, various types of objects can be used, for example: Sugar, starch, lignocellulose (oil palm, water hyacinth, bagasse). Bagasse is the remnants of sugarcane stalks that have been pressed to

remove cane juice or sugar from the logs. When the sugarcane logs pass through the first batch, there may be residual sugarcane juice (Baloch, et al., 2021). There was still a lot of bagasse left. Bagasse is composed of two components: 18% cell pulp and 18% cell wall, 40% cellulose, 29 % hemicellulose, 13 % lignin, and 2 % silica obtained from rice and sugar cane (Shen, et al., 2021). Ethanol fermentation are an important role in the agricultural and medical industries. The study of the ethanol fermentation process is therefore fundamental to understand the role of microorganisms in the ethanol fermentation process and lead to applications such as the selection and improvement of microbial strains suitable for the use of agricultural materials take advantage. Ethanol or ethyl alcohol fermentation process anaerobic breakdown of glucose begins with glycolysis as in anaerobic fermentation, using 1 glucose molecule (Su, et al., 2021). One molecule of glucose breaks down into 2 molecules of pyruvic acid, releasing 2 molecules of ATP and 4 hydrogen atoms. NAD receives hydrogen as $\text{NADH}+\text{H}^+$ and transfers hydrogen atoms to acetaldehyde. It has 2 carbon atoms, so it cannot take the electron energy contained in the hydrogen atoms to create ATP. Therefore, the breakdown of 1 glucose molecule yields only 2 molecules of ATP. Ethanol obtained from the breakdown of glucose If there is a large amount, it will harm the cells. The body therefore has the process of converting ethanol into other substances that are not harmful to cells and excreted from the body by the excretory system. The ethanol production process can be divided into 3 steps: the raw material preparation stage, which, if it is starch or cellulose, must first go through the process of digesting starch or cellulose into sugar by using acids or enzymes when adjusting the concentration to suit. So, it can be fermented (Su, et al., 2021; Tinôco, et al., 2021). Most microorganisms convert sugar to alcohol using yeast. *Saccharomyces* Such yeast must be efficient at converting glucose to ethanol under a pH between 3.0 and 5.0, a temperature between 80-90 °C and has a sugar concentration between 16 – 22 % by volume. The distillation process is the heating process to separate ethanol from the mixture by sequential distillation.

Hand sanitizer has been around since 1966 and was first invented by a Mexican-American nurse named Lupe Hernandez (Gold, & Hitchins, 2013). Hand sanitizer is a product that is used outside the body to clean hands for washing hands. Easy to use, convenient and safe. It contains 75% alcohol, which is effective in killing 99.99% of germs, which can fight bacteria and viruses (Hussein, Mohammed- Salih, & Al-Sheakli, 2022). Alcohol gels are the best option for killing microorganisms on the skin on your hands. Before we touch the face, nose, mouth or do activities such as eating, etc., and can be used for medical purposes.

Coronaviruses are a type of virus. There are many different kinds, and some cause disease. A coronavirus identified in 2019, sars-cov-2, has caused a pandemic of respiratory illness, called covid-19. On the 7th of April 2020, 38 new cases of laboratory-confirmed covid-19 were announced by the ministry of public health of Thailand, bringing the total number of cases to 2,258 of the newly reported cases, three cases were identified in people entering or returning to Thailand; likely reflecting steps taken to reduce the number of people entering the country. A total of 17 of the new cases are close contacts of previously confirmed cases (11 from Bangkok). Only seven new cases are reported in individuals whose work brings them into contact with large numbers of people, suggesting that restrictions on gatherings may be having some effect. Sixty-six to seventy-seven provinces have reported laboratory-confirmed cases of covid-19. An additional 3 healthcare workers are included in the newly reported cases, bringing the total number of healthcare workers infected with covid-19 to 53. To protect healthcare workers and the healthcare system, it is essential that everyone complies with measures to reduce transmission of covid-19. Update from the ministry of public health: expanding laboratory capacity from January to April 2020, a total of 71,860 samples were tested for covid by RT-PCR by university teaching hospitals and laboratories under the ministry of public health, laboratory capacity will be expanded through a project "one lab one province – 24 hour reporting" The current aim is to establish capacity to process 10,000 samples/day for Bangkok and surrounding areas, and 10,000 samples/day for the provinces. The number of certified laboratories (public and private) will be expanded from 80 to 110 by end April 2023. Web-based reporting will notify the emergency operations center of laboratory results within 24 hours. Therefore, this research is to development of suitable Biogel Plus formulation from selected bagasse ethanol. The product was developed for disinfection and medical use.

2. MATERIALS AND METHODS

2.1 Development of suitable Biogel Plus formulations from selectable bagasse ethanol.

The samples were used to develop Biogel Plus formula from selected ethanol and then mixed according to 3 formulas as follows: Formula 1: Prepare Biogel Plus in a volume of 1000 ml as a 6g of carbopol 940, 85% of ethyl alcohol (941.18 ml), 3g of triethanolamine, 49.82 ml of pure water, 2 drops of food coloring; Formula 2: Prepare Biogel Plus in a volume of 1000 ml as Carbopol 940 (Carbopol 940) 5 g, 85% of ethyl alcohol (941.18 ml), 3g of triethanolamine, 48.82 ml of purified water, 2ml of perfume flavored, 4 drops of food coloring; Formula 3: Prepare Biogel Plus in a volume of 1000 ml as Carbopol 940 (Carbopol 940) 5 g, 85% of ethyl alcohol (941.18 ml), 3g of triethanolamine, 43.82 ml of purified water, 5 ml of Propylene glycol, 2 ml of perfume flavored and drops of food coloring (Chretien, et al., 2022; Solopov, et al., 2022). Then take the sensory evaluation test by using 30 trained volunteers.

2.2 Biogel Plus Sensory Assessment Questionnaire

Including of developing a questionnaire to test consumer acceptance of Biogel Plus products. As a Part 1 is details of the respondents; Part 2 is reviews of alcohol-based hand sanitizer products; Part 3 is information about Biogel Plus product testing are three samples of Biogel Plus were tested according to the hedonic scale method, one by one from left to right. Then rate the preferences that match your feelings as follows: 9 = likes most, 8 = like very much, 7 = Like moderately, 6 = Like a little, 5 = passive, 4 = slightly dislikes, 3 = moderately dislike, 2 = Dislike very much and 1 = Dislike most (Ikram, et al., 2021; Yang, et al., 2022).

3. RESULTS AND DISCUSSION

Biogel Plus development study take samples to develop Biogel Plus formula from selected ethanol, then mix according to 3 formulas. A total of 30 sensory assessments were used, comprising 10 males (33.33%) and 20 females (66.67%). The sensory evaluation results from the majority of respondents had a total liking for Formula 2, 57.25%, compared to Formula 1 and Formula 3. When considering other characteristics such as appearance, color, smell, and viscosity, most preferred Formula 2, with an overall average of 79.23 %. Compared to other similar formulas, there are significant statistical differences ($P < 0.05$) as shown in Table 1. Testers liked Formula 2 because Formula 2 had a fragrance composition and does not contain propylene glycol which results in quick drying and can be developed into products for commercial applications and to enhance income and sustainability in the community in the future as shown in Figure 1. In addition, in the possibility of using Biogel Plus obtained from the study process as a guideline to increase the income of the community by utilizing the waste material from the sugarcane crushing process and it can be utilized and strengthened income to the community. The products studied are in line with current situation as the world is facing a medical crisis amid the CoViD-19 epidemic. The role of adequate hygiene and hand sanitizer is inevitable in controlling the spread of infection in public places and nursing homes. The demand for hand sanitizer products has increased dramatically resulting in supply shortages. The consequences of substandard products on the market raise safety concerns (Bukalasa, et al., 2019; Mathangi, & Prakash Maran, 2021). Therefore, the result of the development of Biogel Plus from bagasse can be one of the products and help in cleaning and anti-microbial. From the research results, it can be extended in terms of business foundations in the community to strengthen stability and sustainability in the future.

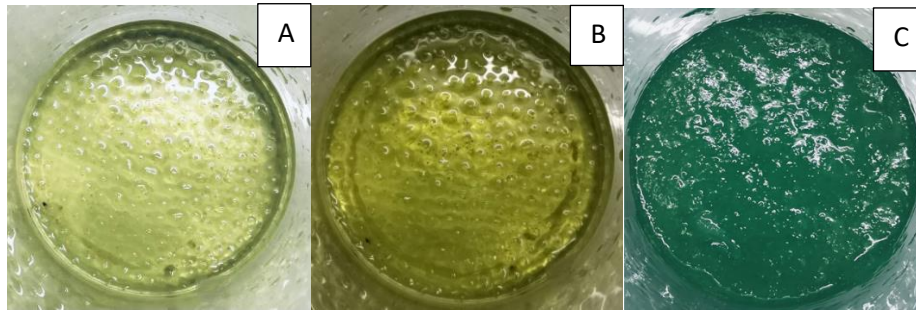


Figure 1. A: Formula 1 (Preparation of Biogel Plus in a volume of 1000 ml) B: Formula 2 (Preparation of Biogel Plus in a volume of 1000 ml); C: Formula 3 (Preparation of Biogel Plus in a volume of 1000 ml)

Table 1: Sensory evaluation results of statistics in optimum biogel plus formulation from selected bagasse ethanol

		Sum of Squares	df	Mean Square	F	Sig.
Appearance PD1	Between Groups	1.350	1	1.350	1.147	.293
	Within Groups	32.950	28	1.177		
	Total	34.300	29			
Appearance PD2	Between Groups	1.067	1	1.067	.667	.421
	Within Groups	44.800	28	1.600		
	Total	45.867	29			
Appearance PD3	Between Groups	.817	1	.817	.858	.362
	Within Groups	26.650	28	.952		
	Total	27.467	29			
Color PD1	Between Groups	16.017	1	16.017	14.260	.001
	Within Groups	31.450	28	1.123		
	Total	47.467	29			
Color PD2	Between Groups	.150	1	.150	.147	.705
	Within Groups	28.650	28	1.023		
	Total	28.800	29			
Color PD3	Between Groups	2.817	1	2.817	1.149	.293
	Within Groups	68.650	28	2.452		
	Total	71.467	29			
Flavor PD1	Between Groups	.267	1	.267	.063	.803
	Within Groups	117.600	28	4.200		
	Total	117.867	29			
Flavor PD2	Between Groups	.600	1	.600	.644	.429
	Within Groups	26.100	28	.932		
	Total	26.700	29			
Flavor PD3	Between Groups	.017	1	.017	.011	.918
	Within Groups	43.450	28	1.552		
	Total	43.467	29			
Viscosity PD1	Between Groups	6.017	1	6.017	1.636	.211
	Within Groups	102.950	28	3.677		
	Total	108.967	29			
Viscosity PD2	Between Groups	.267	1	.267	.122	.729
	Within Groups	61.200	28	2.186		
	Total	61.467	29			
Viscosity PD3	Between Groups	.017	1	.017	.009	.926
	Within Groups	53.450	28	1.909		
	Total	53.467	29			
Total preference PD1	Between Groups	2.817	1	2.817	2.916	.099
	Within Groups	27.050	28	.966		
	Total	29.867	29			
Total preference PD2	Between Groups	.267	1	.267	.354	.557
	Within Groups	21.100	28	.754		
	Total	21.367	29			
Total preference PD3	Between Groups	1.067	1	1.067	.871	.359

	Within Groups	34.300	28	1.225		
	Total	35.367	29			
Consumer	Between Groups	.067	1	.067	.256	.617
Acceptance PD1	Within Groups	7.300	28	.261		
	Total	7.367	29			
Consumer Acceptance	Between Groups	.000	1	.000	.000	1.000
PD2	Within Groups	2.700	28	.096		
	Total	2.700	29			
Consumer Acceptance	Between Groups	.600	1	.600	2.947	.097
PD3	Within Groups	5.700	28	.204		
	Total	6.300	29			

*9 = likes most, 5 = passive and 1 = Dislike most.

4. CONCLUSION

Development of suitable Biogel Plus formulations from selectable bagasse ethanol. It was found that the overall people like to use Biogel Plus in Formula 2 was 57.25 % compared to Biogel Plus Formula 1 and Formula 3. In the future, new formulations for Biogel Plus may be developed to meet higher market and consumer demands for medical cleaning applications.

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