Progress in Engineering Application and Technology Vol. 2 No. 2 (2021) 1140-1148

PEAT

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/peat
e-ISSN : 2773-5303

Survey Data of Water Bioremediation by Microalgae *Botryococcus* sp. at Taman Dagang Jaya, Selangor

Yuvanesrao A/L Apparao[1], Norshuhaila Mohamed Sunar[1*], Najeeha Apandi[1], Mimi Suliza Muhamad[1]

[1]Department of Civil Engineering Technology, Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia, 84600 Pagoh, Johor, MALAYSIA

*Corresponding Author Designation

DOI: https://doi.org/10.30880/peat.2021.02.02.102
Received 04 January 2021; Accepted 02 November 2021; Available online 02 December 2021

Abstract: This paper presents data collected from a survey on the bioremediational water treatment using immobilized microalgae. This study is aimed to evaluate and investigate the knowledge of the respondents at a residential area on the level of knowledge and the acceptance rate on the bioremediation process as water treatment. The data of 50 respondents representing 77.60 % of the respondent would recommend this study to others and 62.00 % would switch to this process due to cost effective and environmentally friendly. The results also indicated that 57.00 % of the respondent had no information and knowledge about bioremediation that already being conducted globally. The data are provided in a way to establish design criteria for further experiment in water treatment using immobilized microalgae at residential community.

Keywords: Microalgae, Bioremediation, Residential

1. Introduction

Water contamination is one of the significant issues by the individuals, sea-going life and nature. Reasons for water contaminations are human exercises such as enterprises, horticulture and normal occasion. The water pollution is the contamination degradation occurs when the pollutants are directly or indirectly discharged into water bodies without proper and adequate treatment to remove harmful chemicals and compounds [1]. As Earth's population continues to grow, people are putting ever increasing pressure on the planet's water resources. In a sense, our oceans, rivers, and other inland waters are being "squeezed" by human activities not so they take up less room, but so their quality is reduced.

Bioremediation is a process of using specific microorganisms to transform hazardous contaminations in water to non-hazardous waste products [3]. Thus, bioremediation techniques to

*Corresponding author: shuhaila@uthm.edu.my

assimilate that toxic have a high potential to be applied in wastewater treatment [4]. In bioremediation process, it uses various microorganisms including fungi, microalgae and bacteria. At a residential area, water usage for household purposes is high and the wastewater discharged after usage does not contain heavy metals contaminants. Bioremediation water treatment method is the most suitable water treatment method to be used at a residential area as bioremediation is a powerful device to treat the contaminated wastewater to levels beneath fixation limits set up by regulatory authorities. Bioremediation has extraordinary potential for managing sorts of site pollution where the microorganisms should enzymatically empower the contaminations and convert them to organic compound [5-6]. Bioremediation water treatment method are more economical than conventional water treatment techniques; allowed microbial development and natural conditions, its application frequently includes the control of ecological boundaries to permit microbial development and degradation to continue at a faster rate [7-8]. These days, bioremediation is one of the most quickly emerging technology of ecological reclamation, which use microorganisms to decrease the toxicity and contamination of different chemical pollutants. In addition, biological wastewater treatment utilizing microalgae is a safe method due to its high photosynthesis capacity and growth rates.

In the present study, microalgae were selected for bioremediation of water due to their capability of transforming inorganic matter into organic using the solar energy during the process of photosynthesis. Microalgae is an essential competitive advantage over fungi and bacteria to degrade organic pollutants [9]. This questionnaire is intent ended to investigate the level of knowledge of public on process of bioremediation as a natural water treatment process. In addition, this questionnaire helps to introduce and improvise the level of knowledge of residents of Taman Dagang Jaya on the process of bioremediation as a low cost and natural water treatment process. The residents frequently use conventional water treatment process rather than bioremediation for two reasons which are lack of knowledge and wrong perception (perception that bioremediation is a costly, complicated and chemical infected water treatment process).

2. Materials and Methods

This survey was conducted at a residential area in Taman Dagang, Ampang Selangor Malaysia (3.1478° N, 101.7578° E) with random respondents of people of various age level and gender were chosen to answer the questionnaire. The specified residential area is selected as according to Majlis Perbandaran Ampang (MPAJ), Taman Dagang Jaya has the highest water usage rate among the other residential area in Ampang. A total of 60.00 % which is 30 respondents from gender of male were chosen and answered the survey. Other than that, remaining 40.00 % which is 20 respondents were from gender of female. Respondents from different age level were chosen to take part in the survey to ensure a precise and genuine level of knowledge and acceptance rate of respondents for bioremediation as water treatment process at their home. The age level of 21-25 consists of 14.00 % (7 respondents) while 22.00 % (11 respondents) were chosen from the age level of 26-30. Next, 14.00 % (7 respondents) from the age level of 31-35 has took part on the survey. Other than that, a sum of 30.00 % (15) and 20.00 % (10 respondents) from the age level of 36-40 and above 40 years old also responded to the survey.

3. Results and Discussion

The purpose of the research is to investigate the level of knowledge and the acceptance rate of residents of Taman Dagang Jaya on bioremediation water treatment using immobillised freshwater green microalgae, *Botryococcus* sp. The survey consists of 50 respondents from Taman Dagang Jaya has been conducted to achieve the objectives of research. The survey explore about the existing type of water treatment methods are currently being used at respondent home. The data obtained shows that majority of the respondents which is 46.00 % (23 respondents) do not possess a water treatment system at home while 10.00 % (5 respondents) were not sure that if a water treatment system is placed at their home (Figure 1). This group of respondents are vulnerable to higher risk of drinking polluted water than the number of 44.00 % (22 respondents) who has equipped their home with a water treatment system.

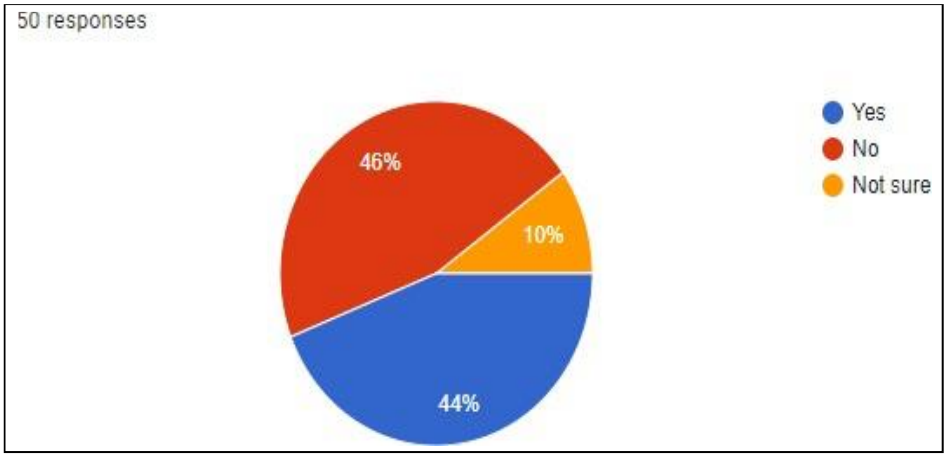

Figure 1: Respondent answer for their knowledge about existing type of water treatment method at their house

Water treatment eliminates undesirable components, and contaminants that the water becomes free of pollutants. This treatment is important to human health and allows humans to benefit from both drinking and irrigation use. The majority of 80.00 % (40) of the respondents have shown that they understand the importance of water treatment. Meanwhile,12.00 % (6) of the respondents have stated that they are undecided on the importance of water treatment and 8.00 % (4) of the respondents have the perception that water treatment is not important (Figure 2). This is because the residents have a moderate knowledge on the awareness of water treatment process.

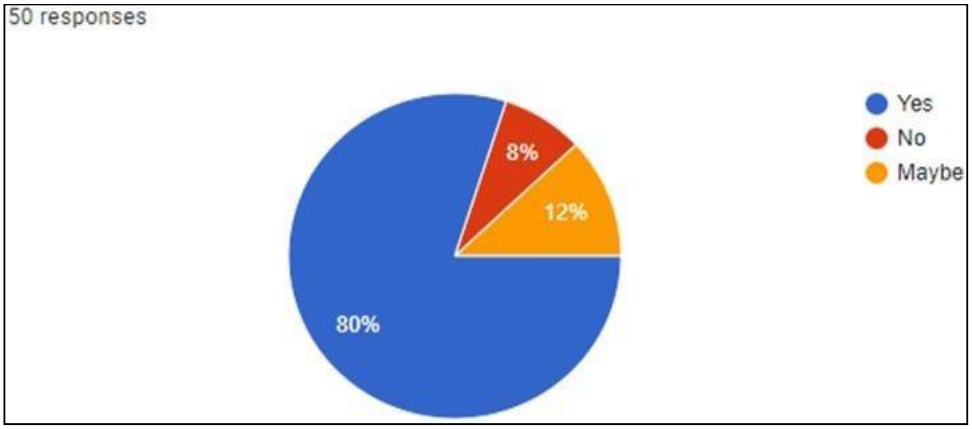

Figure 2: Respondent answer for the importance of water treatment

Bioremediation is a usage of either deliberately introduced or naturally occurring microorganisms to consume and break down environmental pollutants, to clean a polluted site. Preponderance of respondents on the bioremediation understanding which is 59.00 % (29 respondents) have stated the right answer for the question. A group of 32.00 % (17) respondents were uncertain with the term of 'bioremediation' and 8.00 % (4) have stated the wrong answer for the question (Figure 3).

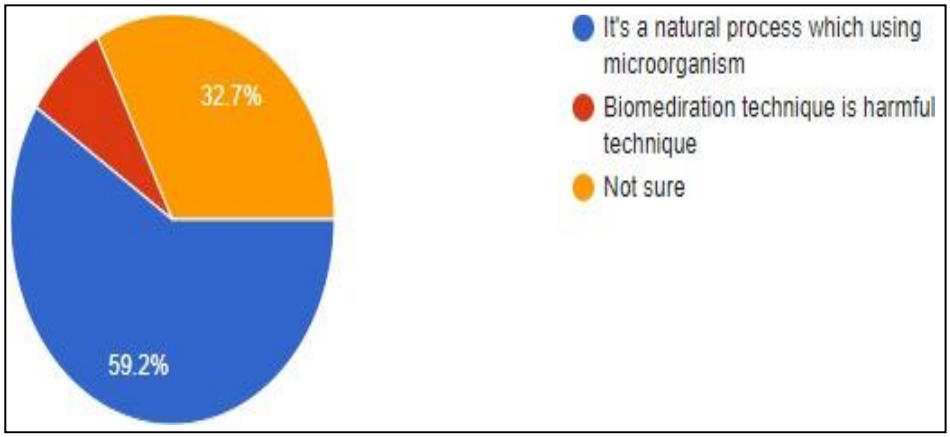

Figure 3: Respondent answer for understanding of bioremediation

The biggest benefit from using bioremediation processes is its contribution to the environment. Bioremediation uses nature to fix nature. Properly applied by knowledgeable people using specialized equipment designed for bioremediation, this is the safest and least invasive soil and groundwater cleanup available. The data obtained shows that majority of the respondents which is 40.00 % (20) respondents has the knowledge on benefits of bioremediation while 36.00 % (18) respondents were not sure on benefits of remediation. A group of 24.00 % (12 respondents) has no knowledge on benefits of remediation (refer to Figure 4)

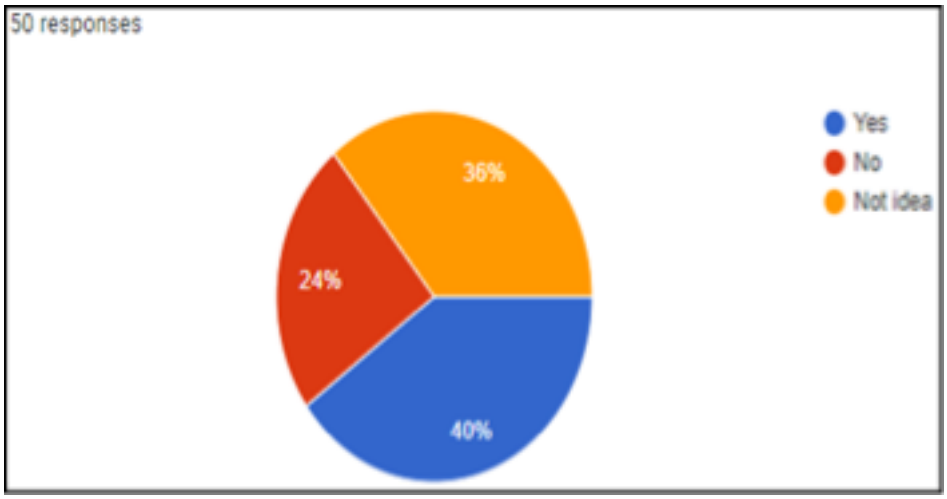

Figure 4: Respondent answer for knowledge of the benefits of bioremediation

The bioremediation process is a biological process that stimulates helpful microbes to use harmful contaminants as their source of food and energy. Certain microorganisms consumed toxic chemicals and pathogens, digesting them and eliminating through changing their composition into harmless gases like ethane and carbon dioxide. Some contaminated soil and water conditions already have the right counter-microbes. In the present study, human intervention can speed up the natural remediation by boosting microbial action. This data shows that 46.00 % (23) respondents have knowledge on process of bioremediation while another 46.00 % (23) have obtained no knowledge on process of bioremediation and 8.00 % (4) respondents have an uncertain knowledge on process of bioremediation (refer to Figure 5).

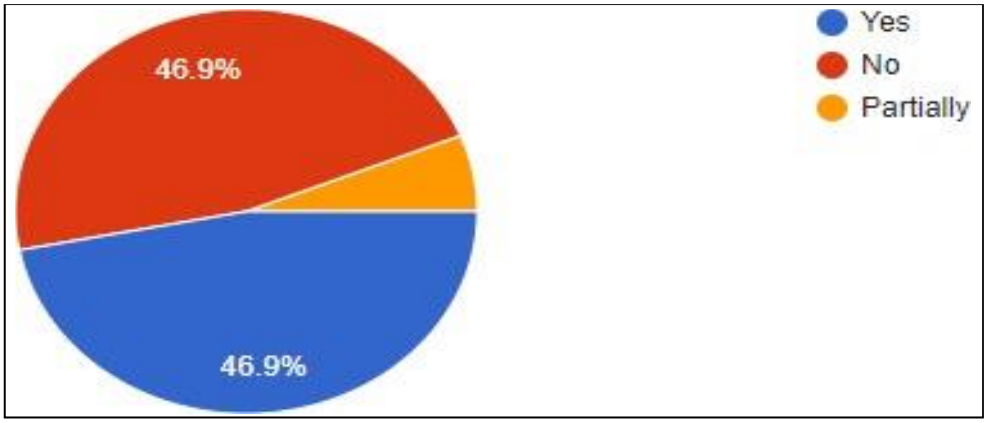

Figure 5: Respondent answer for knowledge of process of bioremediation using microalgae

Bioremediation is a cost-effective water treatment process. Most of the respondents which is 38.00 % (19 respondents) were very sure that the process of water treatment using bioremediation will be costly and 32.00 % (16 respondents) were not sure if the process of water treatment will be costly. This clearly shows that the knowledge on the cost of bioremediation process is inadequate among the residents of Taman Dagang Jaya because only 30.00 % (15) of the respondents were confident that the process of water treatment using bioremediation (refer to Figure 6). Majority of the respondents which is 57.00 % (28) had no idea that such research on bioremediation being conducted globally (Figure 7).

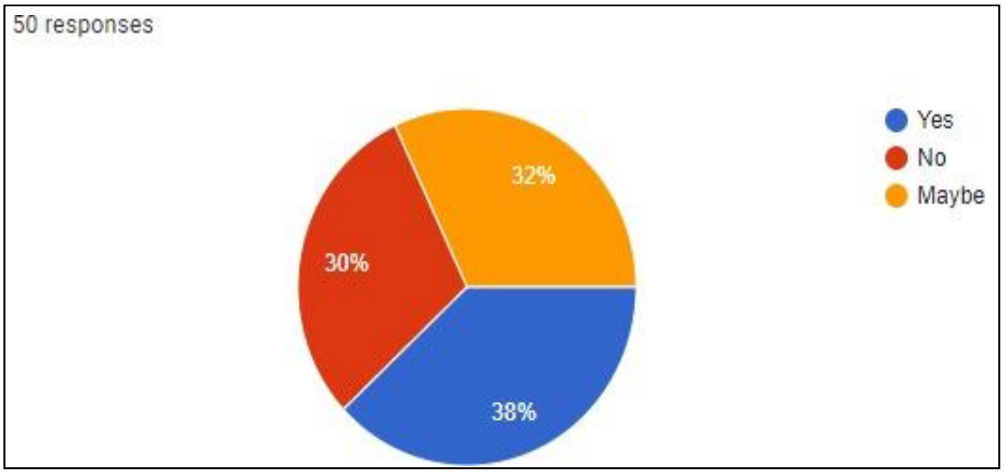

Figure 6: Respondent answer about the cost wise of bioremediation process

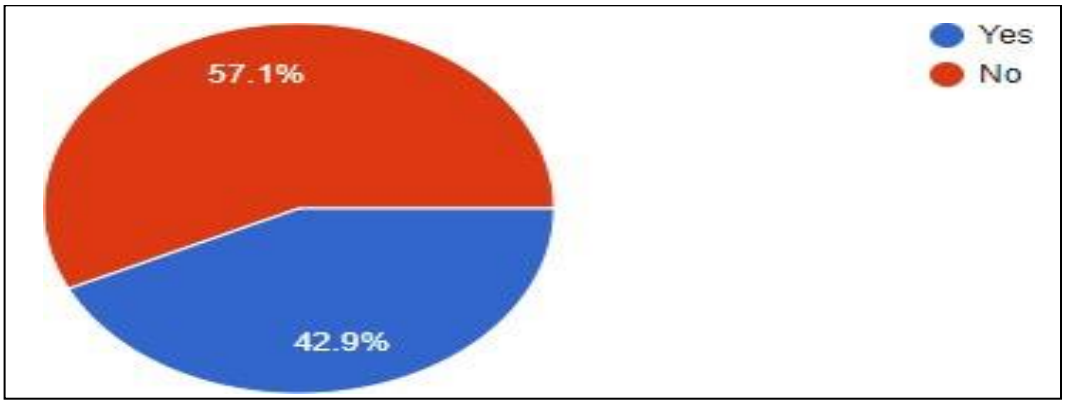

Figure 7: Respondent answer for knowledge if that research are conducted to use microalgae for bioremediation

Most of the respondents which is 62.00 % (31) were very sure that they will grab the chance to

learn and gain experience more about bioremediation and 32.00 % (16) respondents were not sure if they want to learn more about bioremediation. Only 5.00 % (3) of the respondents were certain that they do not want to learn more on bioremediation (refer to Figure 8).

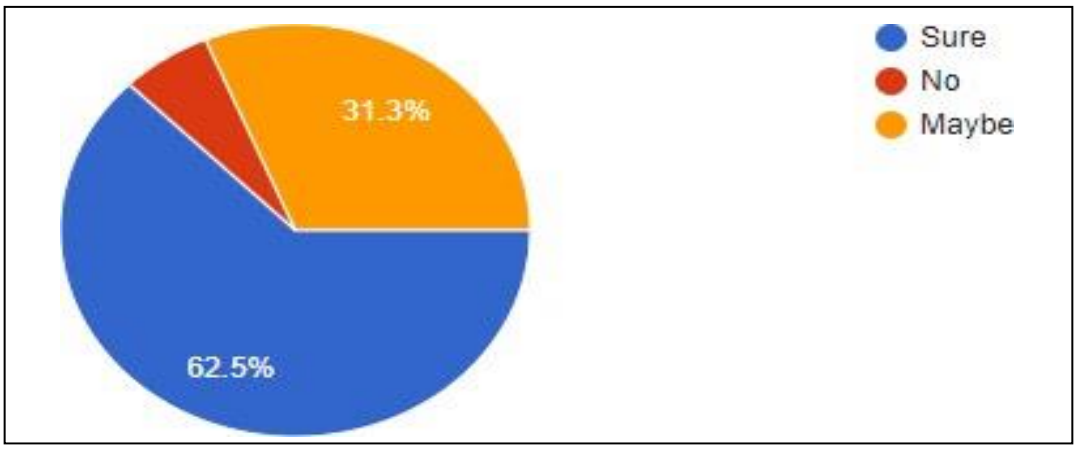

Figure 8: Respondent answer for a chance to learn more about bioremediation and experiences

Bioremediation is a water treatment process that unharm the nature, remove the pollutants completely, and most importantly cost saving. This shows that 57.00 % of the respondents have answered the questions correctly, while 14% of the respondents have answered the question wrongly. A group of respondents 29.00 % have no idea on why people are switching to bioremediation for water treatment process (refer to Figure 9). Other than that, the level of knowledge on bioremediation among the residents is very poor.

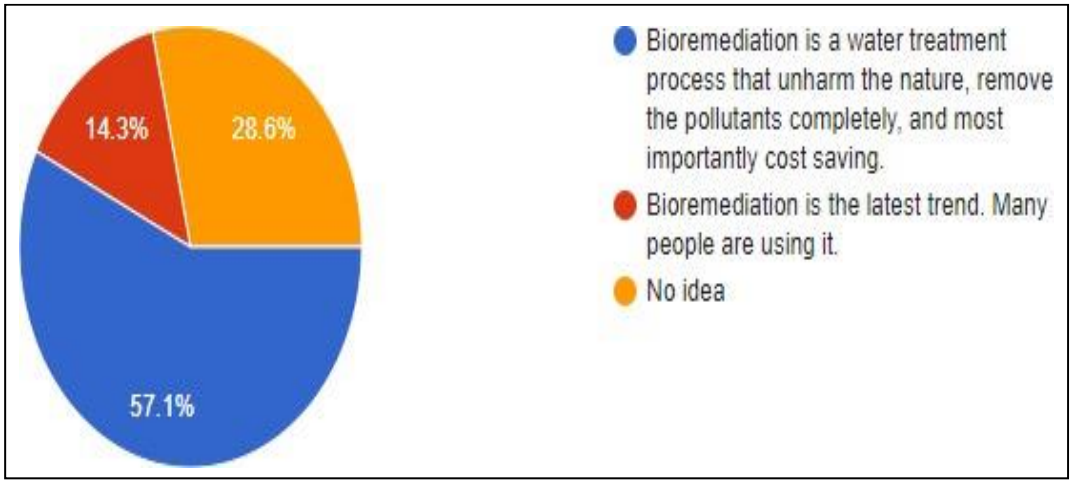

Figure 9: Respondent answer about switching from their conventional type water treatment methods into bioremediation

Bioremediation technique uses microalgae such as '*Botryococcus* sp.' to treat polluted water. This shows that only 36.00 % (18) respondents have answered the question correctly. Other respondents have placed the wrong answers for the question such as 24.00 % (12) of the respondents have stated that microalgae and bacteria are used in bioremediation, 4.00 % (2) of the respondents stated that only bacteria used in bioremediation and 36.00 % (18) of the respondents have no idea on the microorganisms used in bioremediation (Figure 10).

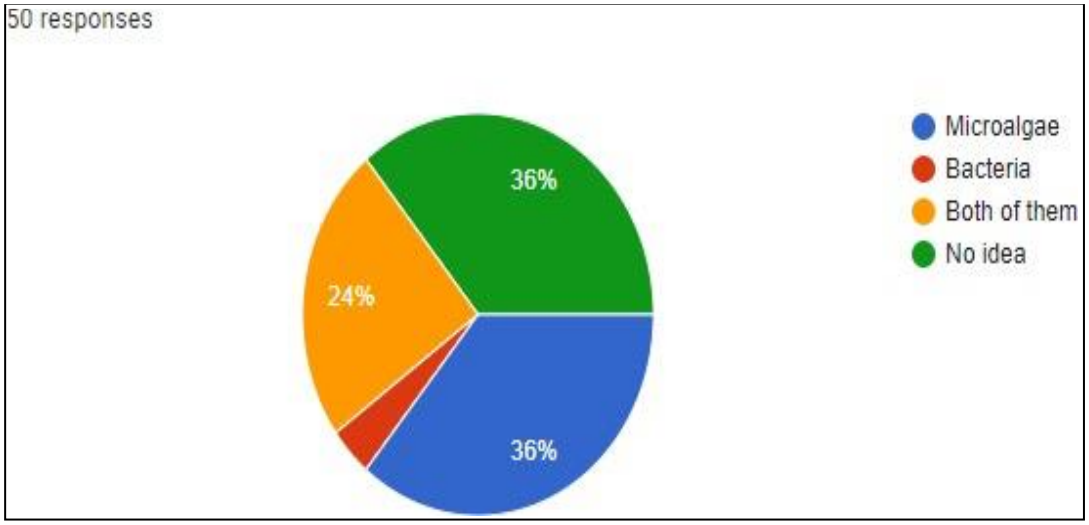

Figure 10: Respondent answer for type of microorganism are used in bioremediation

From the data, it clearly shows that majority 62.00 % (31 respondents) of the respondents are ready to switch to bioremediation for a cost effective and environmentally friendly water treatment system. It is also stated that 28.00 % (14) of the respondents are undecided on switching to bioremediation. It is also known that, only 10.00 % (5 respondents) do not wish to change the bioremediation (Figure 11)

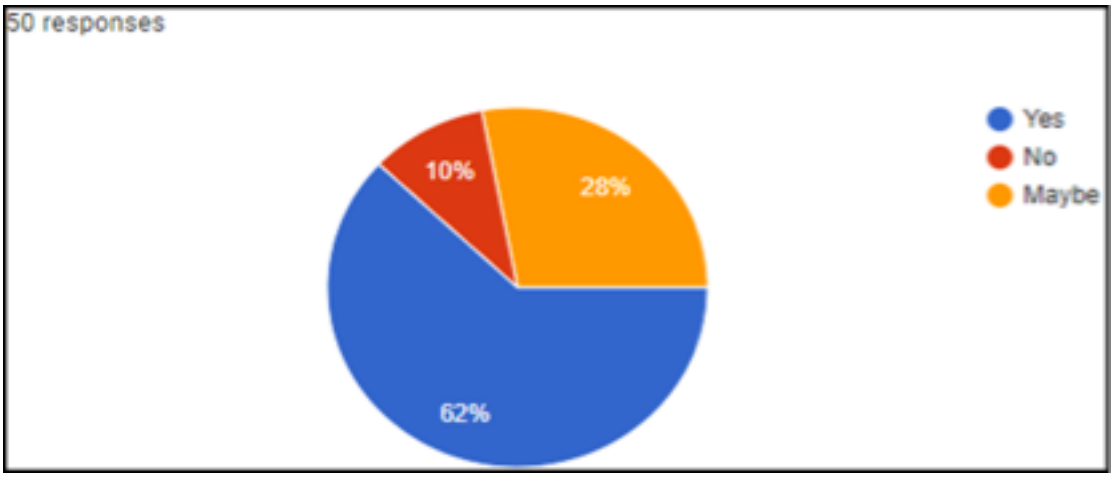

Figure 11: Respondent answer for bioremediation is a method to treat water using microalgae such as Botryococcus.sp.

The majority of 78.00 % (39) of the respondents have stated that they would recommended the process of bioremediation to their friends and family. Meanwhile, 20.00 % (10 respondents) have stated that they are undecided on the recommendation of bioremediation to their friends and family and only 2.00 % (1) of the respondents have stated that they will not recommend bioremediation to their friends and family (refer to Figure 12). The level of knowledge respondents possesses on bioremediation is not up to satisfactory. With proper guidance and the interest, the knowledge on bioremediation can be served to the residents of Taman Dagang because it is stated that majority of the respondents would like to learn more on the bioremediation process.

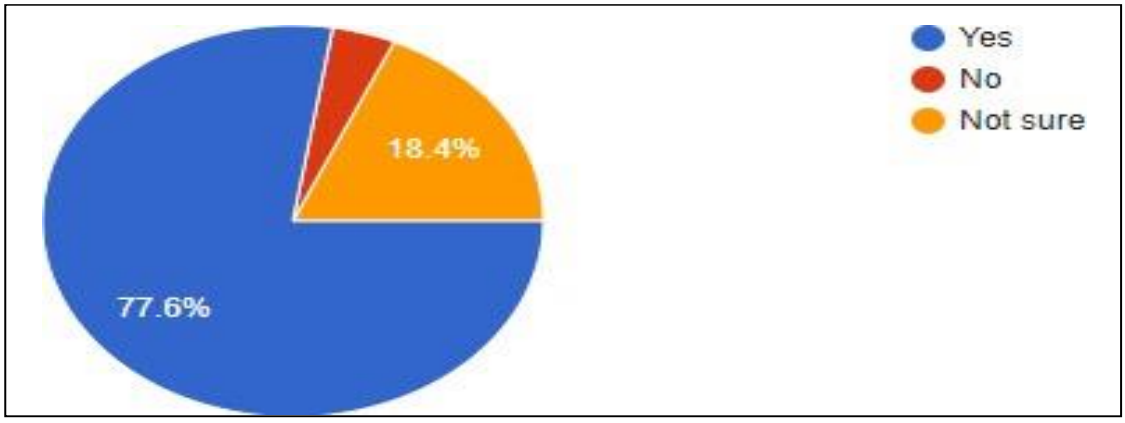

Figure 12: Respondent answer for if they would suggest water treatment by process of bioremediation to your friends and family

4. Conclusion

This survey helps to investigate the knowledge and acceptance rate of residents of Taman Dagang for bioremediation by using microalgae, *Botryococcus* sp. as water treatment process. According to the data extracted, the respondents from Taman Dagang, answered fifteen questions to state their knowledge and accepatance rate of bioremediation.The analysed data clearly shows that most of the respondents has lack of knowledge on bioremediation by using microalgae, *Botryococcus* sp. for the water treatment process. The respondents clearly show the interest of learning and experiencing more on bioremediation process. With a proper guidance and knowledge on bioremediation,the acceptance rate and knowledge on bioremendation by using microalgae, *Botryococcus* sp. for the water treatment process will be accepted eventually. Most of the respondents are ready to accept the process of bioremediation at their home if the bioremediation process possesses the characteristics of environmentally free, low on cost and has no side effects.

Acknowledgement

This work was supported by the Universiti Tun Hussein Onn Malaysia under project grant No. B098 with the grant title 'Algae Super Beads Wastewater Treatment System" and GPPS (H733) with the grant title 'Development of Green Wastewater Treatment System Via Microalgae Beads Technology.

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