i-SPiKE 2023

INTERNATIONAL EXHIBITION & SYMPOSIUM ON PRODUCTIVITY, INNOVATION, KNOWLEDGE & EDUCATION

"Optimizing Innovation in Knowledge, Education and Design"

EXTENDED ABSTRACT

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CATEGORY: CSC YOUNG INVENTOR

Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality . I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

Professor Dr. Roshima Haji Said
RECTOR
UiTM KEDAH BRANCH

WELCOME MESSAGE (i-SPiKE 2023 CHAIR)

We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPiKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPiKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail
Chair
3rdInternational Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPiKE 2023)

CENTENNIAL GARDEN
'THE SMART WAY FOR GREEN PLANTING'

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ABSTRACT

Today, Malaysian agriculture uses too many chemicals, water, and space. Unfortunately, cropyields are damaged and of poor quality due to the uncontrolled use of chemical pesticides on ecosystems. In addition, the growing population size has contributed to the increase in domesticwaste such as food waste, plastic waste, toxic waste and so on. Thus, the Centennial Garden innovation project, was inspired to a smaller scale by focusing on excess food waste and limitedspace for planting activities. Centennial Park is an innovation for improvements to all of the problems mentioned earlier. The purpose of this Centennial Garden is to harvest nature's bio by using food waste as bio compost, hand washing water to avoid water wastage. In addition, we reused plastic bottles as base pots for planting, and our garden was designed using the vertical garden method. The combination of these elements will save space, improve the qualityof gardening in the school, and be able to avoid wastage of plastic bottles around the school. In addition, we combined two crop systems called fertigation and hydroponics into one systematic system for crops.

Keywords: fertigation, hydroponic, vertical concepts, bio-compost fertiliser, smart garden

INTRODUCTION

In Malaysia, most of the people are farming in traditional ways which use land and large areas depending on the shape of the earth and soil conditions. However, in foreign countries like the United States of America, we can see many people or companies use moderntechniques and technologies without the need for large areas, low cost and save time as they reap a bountiful harvest. Based in New Jersey, US, AeroFarms claims its methods use 95% less water than standard arable farming (James Murray, 2020).

The objectives this innovation project conducted is to: - 1) identify the appropriate way to make use of excessive waste in school in environmentally friendly way; 2) identify the most effective way to run a plantation despite limited space in school; and; 3) measure the efficiencyof bio-compost based on food waste in plant growth.

Hence, Centennial Garden is created to solve the problems identified. The project applied the vertical concept for planting to utilize the narrow spaces in the school like the walls as vertical

gardening is an innovative, effortless and highly productive growing system (Derek Fell,2021). The project also uses recycled food leftovers that we collect from our dining hall to produce homemade bio-compost fertiliser. Compared to chemical fertiliser, bio-compost fertilisers improve the soil texture, allowing it to hold water longer, and increase the bacterial and fungal activity in the soil (Kellogg Garden, 2021). Fertigation and hydroponics concepts are also implemented to take the advantage of waste products. Fertigation is cultivation of plants using irrigation and fertilization systems while hydroponics is a method of cultivation by placing plant roots into fertiliser water without using soil. Therefore, we have used waste products as the main material to produce fertigation and hydroponic structures. This proves that our innovation is environmentally friendly and saves money because it is made from waste materials.

METHODOLOGY

There are 4 components that we need to make it ready in order to build the Centennial Garden, which are **1) bio-compost fertiliser; 2) hydroponic technique; 3) fertigation** and; **4) vertical concept.** The process and instrumentation of the project are as elaborated below.

Figure 1: Centennial Garden project model

Bio-compost fertilisers contain plant or animal-based materials that are either a by-product or end product of naturally occurring processes, such as animal manure and composted organic materials (Fruit Crops, 2020). In this study, the fertiliser is created using kitchen and yard waste added alternately together with water and molasses in each layer; into selected plastic containers. The ingredients are mixed and left for a month in a tightly closed tank to let reaction occur where gas produced needs to be released every 3 days before it can be harvested and used.

Figure 2.1 Bio-compost fertiliser making process

Hydroponic systems work by allowing minute control over environmental conditions like temperature and pH balance and maximized exposure to nutrients and water and we use deep water culture water systems as it only requires low maintenance (John Woodard, 2019). In the

study, waste water is utilized as the irrigation medium in which water used by the students in school is reused in the irrigation system. The strings connected to the containers will absorb nutrients and water through the pipe.

Fertigation increases the efficient use of fertilisers and nutrient availability at root level, and Edition), 2014). Hence, it is implemented to the project conducted where fertiliser is flowed evenly on each container by controlling the concentration of liquid.

Figure 2.2 Fertigation technique implementation

Vertical technique is applied here by making use of the walls in the school's building as a green wall. The main advantage of utilizing vertical farming technologies is the increased crop yield that comes with a smaller unit area of land requirement. Also, green walls can absorb heated gas in the air, lower both indoor and outdoor temperature, providing a healthier indoor air quality as well as a more beautiful space (Yeh, 2012).

Figure 2.3 Vertical concept implemented for planting technique

The innovation project is then experimented to study the seedling germination length and the height of seedlings using bio-compost fertiliser and chemical fertiliser. The tests were conducted in 8 days for seed germination and 6 weeks for height of seedlings where the germination rate and height are recorded daily at fixed time

FINDINGS

Data in table 1 shows differences in the length of seedlings germination. The differences in length started to show on the sixth day where the length of the seedling using the bio-compost fertiliser is 0.8 cm as with chemical fertiliser is 0.7 cm.

Table 1: Seedlings Germination Test

DAYS	PROTOTYPE 1 (CHEMICAL FERTILISER)	PROTOTYPE 2 (BIO-COMPOST FERTILISER)
	SEEDLINGS GERMINATION(cm)	
1	0	0
2	0	0
3	0.2	0.2
4	0.4	0.4
5	0.5	0.5
6	0.7	0.8
7	1.0	1.2
8	1.1	1.4

Meanwhile, in table 2, data shows differences in the height of seedlings germination using different types of fertiliser. After 6 weeks, by using bio-compost fertiliser, the height of the seedling is 7.5 cm as by using compost fertiliser, the height of the seedling is 6.4 cm.

Table 2: Height of Seedlings Test

WEEKS	PROTOTYPE 1 (CHEMICAL FERTILISER)	PROTOTYPE 2 (BIO-COMPOST FERTILISER)
	HEIGHT OF SEEDLINGS(cm)	
1	1.0	1.2
2	1.9	2.2
3	2.8	3.0
4	3.9	4.3
5	5.3	5.8
6	6.4	7.5

Indices in table 1 and table 2 indicated that seedlings that use bio-compost fertiliser are longer and taller than seedlings' length that use chemical fertiliser. This is supported by past research that such organic fertilisers can be an effective alternative to chemical fertilisers as they contain high levels of nutrients and organic matter (Shabani et al., 2011).

CONCLUSION

Based on the finding, it can be concluded that the use of a vertical garden clearly helped in overcoming and making use of limited spaces in the school compound, in general limited land as well overpopulated buildings in Malaysia. The application of Centennial Garden with the implementation of the four components solve the problem of limited spaces for farming or gardening; as well as could be a stepping stone in reducing the waste products in the country, especially the excessive leftover foods and water waste. This will also help to reduce the use of chemical fertilisers that can lead to environmental pollution by agricultural activities.

However, there are limitations that can be identified throughout conducting the study. Firstly,we can't control the population of pests such as caterpillars that eat leaves and containers become a breeding ground for mosquitoes. The precaution that can be taken is that we can install nets on the entire plant to prevent pests and put some mosquito repellent into the containers.

In addition, the cost of electricity consumption is high as we use it daily. Hence, it is recommended that solar energy is used to generate electricity given our country receives constant sunlight throughout the year. Next, limited space exposed to sunlight for cultivation could be a limitation to this study. Thus, adding rechargeable sensor light from a type of fluorescent and LED's can be used for the next study as improvement.

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