

# Recording the growth of bean sprouts exposed to a cell phone's electromagnetic energy.

Chia-Yu Tsao

Department of Electrical Engineering  
Hwa Hsia University of Technology

No. 111, Gongzhuang Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)  
Taipei City, Taiwan, R.O.C  
Cocco0511@gmail.com

Jwo-Shiun Sun

Department of Electric Engineering,  
National Taipei University of Technology

No.1, Sec. 3, Zhongxiao E. Rd., Taipei 10608 Taiwan, R.O.C  
Taipei City, Taiwan, R.O.C  
jssun@ntut.edu.tw

Guan-Yu Chen

Department of Electric Engineering,  
National Taipei University of Technology

No.1, Sec. 3, Zhongxiao E. Rd., Taipei 10608 Taiwan, R.O.C  
Taipei City, Taiwan, R.O.C  
s1669012@ntut.org.tw

*Abstract:* - This study aimed to measure and record the harm on the human body associated with cell phone usage over a long period of time. This study analysed growth measurements recorded from red beans, green beans, black beans and soy beans exposed to persistent screen light from a 3C product (computers, communications and consumer electronics), in this case a cell phone. The experimental findings and the respective growth recordings revealed that organisms (plants) demonstrated different rates of growth when under the influence of long periods of screen light exposure from a cell phone device.

*Key-Words:* - Electromagnetic field, Bean sprouts growth, Screen light exposure

## 1 Introduction

Due to the popularity of 3C products, which includes computers, communications and consumer electronics, and the increased convenience of using the internet functions of modern cell phones, the time now spent on the internet by individuals would likely surpass the usage of TV, which can mean that half of the time when people are awake is spent staring at electronic screens

In this study, the environment where an organism's growth occurred was manipulated in order to study the potential impact of electromagnetic energy on human bodies [1] [2]. The experiment used an old-model 3C cell phone with a 24/7 standby mode, which ensured constant exposure to the emitted screen light, as well as close exposure to the

radiation energy [3], to observe the recorded effect on the bean sprouts growth and development, in order to delineate whether exposure to electromagnetic energy is one of the factors that can influence the development of biological organisms.

## 2 Objectives

This study's main observational emphasis was recording the growth of organisms exposed to long periods of screen light from a cell phone device. It further compared the results obtained from the experimental conditions to explore whether electromagnetic energy is able to influence developmental factors [4]. The implication of any observed impact would be to purposefully limit long periods of exposure to TV, computers and cell phone devices that emit an electromagnetic field [5].

Due to rapid technological development and associated societal changes of the modern era, people have become excessively dependent on 3C products. Although this new era of development has improved convenience, it has also unintentionally exposed organisms to hazardous electromagnetic energy environments.

### 3 Method

In order to analyze the recorded differences between the control and experimental groups, the test subjects were divided into groups that were subjected to conditions where they were either exposed to screen light from a 3C electromagnetic field environment, or not exposed to screen light where natural environmental conditions were simulated. The comparison between the two conditions was then used to indicate and decide whether the light from the screen of a cell phone [6] could potentially

#### 3.1 Procedural Flow

Ten different bean varieties were grouped as one unit, and distributed into different transparent plastic containers functioning as culture dishes. One piece of tissue was used as a soil medium in each container. During the 6-day experimental period, watering of the beans was conducted at regular intervals, as showed in Fig1.

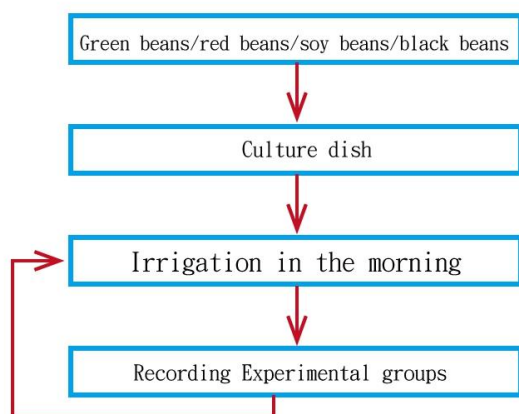


Fig 1. process description

#### 3.2 Electromagnetic environment design

For the group exposed to the cell phone screen light conditions, the associated environmental equipment included an extension cord, phone charger, and phone stand. The positions of the bean sprouts' culture dishes was fixed to facilitate experimental observations and to ensure environmental conditions were maintained, where the phone screen produced sufficient lighting for 24 hours. A description of the

equipment employed for the exposed conditions is listed below and showed in Fig 2.

1. Cell phone
2. Cell phone charge
3. Cell phone stand
4. Environmental setting



Fig 2. Process Environmental setting

### 4 Experimental equipment introductions

This experiment was designed to collect and analyse the growth of bean sprouts subjected to cell phone screen light exposure. Relevant factors that were observed and recorded included the type of technology and equipment used, the procedure implemented, and other related factors. The equipment and procedures employed in the experiment are defined in Table 4.1. The experimental equipment listed in this table defined the experimenter's needs.

#### 4.1 Equipment List

Equipment	Description
Hand-written notebook	Experimental time recorded during experimental period from 12 June, 2019 - 17 June, 2019
Culture dish (transparent plastic cup)	Experimental groups (experimental group exposed to screen light and control group exposed to simulated natural conditions).  Each group had 4 dishes, with 10 beans in each dish.

Watering syringe	The amount of water was standardized, each morning one syringe of water (syringe was marked to show volume) was administered containing approximately 5 mL (5cc).
Green beans/red beans/soy beans/black beans	500g red beans, green beans, black beans and soy beans were obtained from commercially available sources.
Tissue	The tissue paper was standardized as a single piece, one piece was used for each culture dish as a soil medium.
Charger	Cell phone charger (Samsung cell phone cord)
Second-hand cell phone	Sony Xperia
Cell phone stand	Muji wooden stand
Desk	A computer desk that was approximately 90 cm in length, 70 cm in width and 60cm in height, was positioned facing a window

#### 4.2 Bean sprouts experimental materials

Red beans, green beans, soy beans and black beans were stored at room temperature and placed in water to facilitate growth[7]. Sprouting was observed to start after the first day and continue over the following days.

Red beans are a nutritious food that is high in protein and low in fat. Green beans prefer warmer temperature, and short periods of exposure to sunlight and their seeds and stem are widely consumed. Soy beans are a type of widely consumed and extracted legumes that contains abundant levels of protein. Black beans, although a different coloured variety, belong to the soy bean family as well. The anthocyanin that black beans

contains is a powerful antioxidant [8] as showed in Fig3.



Fig3. Green beans/red beans/soy beans/black beans in the case

#### 4.3 Watering with syringe

The volume of water collected in the syringe volumes was undertaken in accordance with Pascal's law. Whereby, applying pressure to one plunger in the hydraulic system subsequently created the same pressure increase in the other plunger. The syringe contained a small aperture on the tip and a matching plunger and showed in Fig4.



Fig 4. Needle tube

#### 4.4 Using a Sony cellphone as source of electromagnetic energy

Sony Xperia (Fig 5) is a product sold under Sony's mobile communication consumer electronics product line.

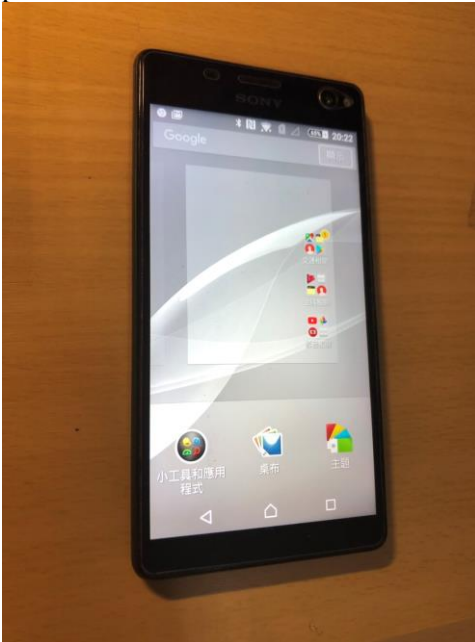


Fig 5. Sony Cell Phone

#### 4.5 Growth recording environmental conditions

In this study, the bean sprouts were exposed to persistent screen light from the Sony cell phone. Immediately upon confirming that there was no error with the phone (Fig6), the period of light exposure would commence and photos of the bean sprouts would be recorded each morning of the experimental period at 8:00 am.



Fig 6. Growth environment

## 5 Application

Before conducting the experiment, a procedure needed to be established in order to define the scope of each task. Meanwhile, standardized methods of

operation needed to be maintained throughout the experiment. Throughout the experiment, accurate recordings of observations made along with the start and end of each task needed to be documented. Finally, the data relating to the bean sprouts growth recording and experimental questions were combined to obtain the experimental results.

### 5.1 Procedure

Use of control groups and experimental groups that were exposed under sunlight during a long period of time were employed to observe and record the time needed for the beans to develop from seeds and then to sprout and grow. Use of a cell phone's screen light as the main light source for the experimental culture dishes group defined the exposed group conditions from the control group, which was not exposed to the cell phone screen light. In this study, the screen light for the exposed group was maintained for 24 hrs every day for consecutive six days. Photos were taken every morning at 8:00 am, as showed in Fig7.

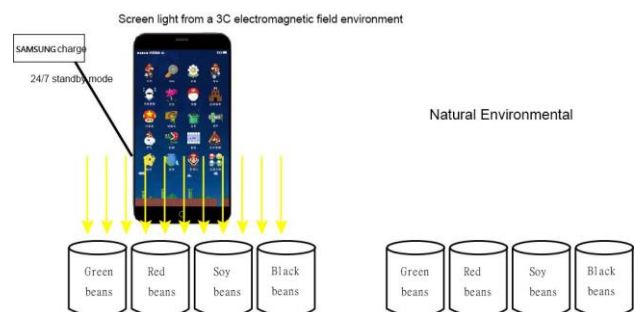


Fig 7. Infrastructure flow

### 5.2 Organism measurement recordings

For six consecutive days, bean sprouts were divided into exposed and non exposed conditions, and were located in the same area, with the same amount of irrigation and in identical natural environments. From the experiment we can see that the left hand side was subject to the control group condition (with no cell phone exposure) and the right hand side was subject to the experimental conditions (exposed to the cell phone screen light and charger). The growth of the bean sprouts and related observations were recorded under the same conditions each day. From the 12 June, 2019 to the 17 June, 2019 photos were taken each morning at 8:00am. spanning day 1 to day 6 are displayed as showed in Fig 8-Fig 14.

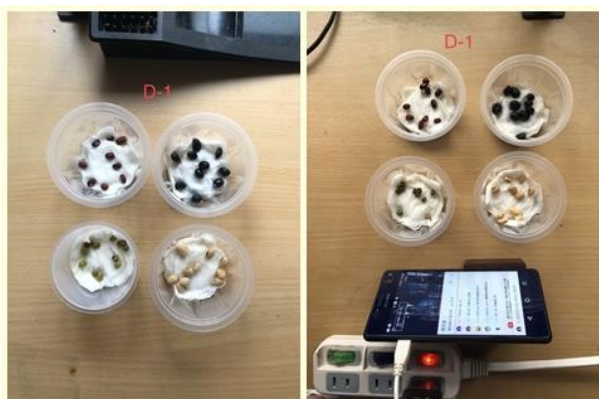


Fig8. Day 1 Equipment was arranged to observe the growth of bean sprouts

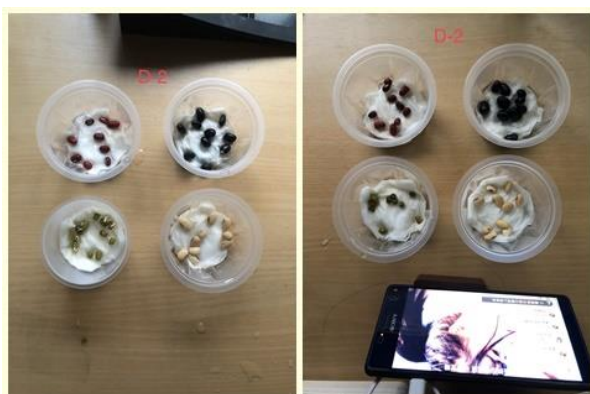


Fig9. Day 2 The differences in growth between the groups was observed



Fig10. Day 3 The growth of bean sprouts in the two groups was observed and recorded

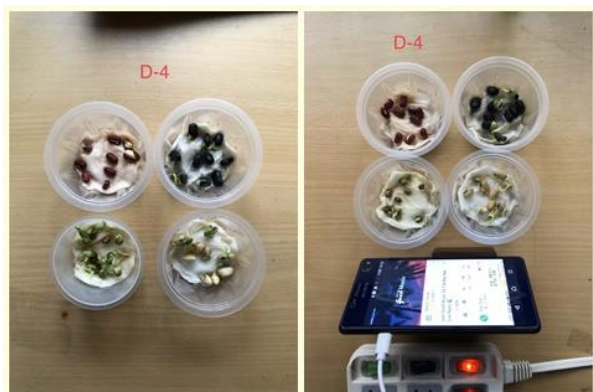


Fig11. Day 4 The bean sprouts subject to the non-exposure conditions had improved growth relative to the cell phone exposed conditions. The growth observed for the cell phone exposed group was unhealthy



Fig 12. Day 5 Comparing the growth situation of the bean sprouts, green beans grew better under non-exposed conditions. Furthermore, the other beans were observed to have improved sprouting under non-exposed condition. Many beans were unable to sprout under the exposed conditions.



Fig13. Day 6 Comparing the growth of the bean sprouts, those in the non-exposed group grew better than those in the exposure group. The growth of green beans demonstrated the biggest differences between the groups. During the initial sprouting period, beans subject to the exposed conditions had slower and less healthy development, whereas the growth of beans subject to the non-exposed conditions was normal.



Fig14. From the observational recordings, we could see that under persistent cell phone screen light exposure, bean sprouts grew slower and growth was disrupted relative to bean sprouts that were not exposed to the screen light. The growth curve for the exposed group was found to be relatively slow and unhealthy.

## 6 Conclusion

In this study, an easily established experimental framework employing screen light from a cell phone to record the effect of 24 hours of exposure to screen light was used to culture and record the growth of bean sprouts, which demonstrated that prolonged screen light exposure has the ability to influence an organism's growth[9]. These findings support the implication that electromagnetic energy should be avoided, or long periods of exposure to electronics emitting electromagnetic energy should be prevented. The most radical solution to avoid any harmful effects is to not use any electronics. However, when facing this rapidly developing era, to accomplish avoidance is very difficult. Thus, we need to learn to cope with electromagnetic field energy, avoiding long periods of exposure that may create dangerous conditions [10] and using cell phones moderately in order to reduce the impacts of electromagnetic fields on our body and the environment.

### References:

- [1] He Hong, Du Mingxing, Zhihong Zhang, "*Principle of Electromagnetic Compatibility*", Tsinghua University Press, January 2017.
- [2] Ni Zesi, "*Modern Physics*", Wu-Nan Book Inc., December 2013.
- [3] Huang Yinnian, "*Antennas and Radio Propagation*", Wu-Nan Book Inc, September 2007.
- [4] Huang Guangzhi, "*Electro-Wave Engineering*" San Min Book, January 1986.

[5] Wang Wei, "*Introduction to Microelectronics Physics*", Science Press, June 2015.

[6] Endo Masamori, "*The World's Simplest Electromagnetics*", Shimao Publishing House, May 2013.

[7] Fujishima Kazuhiro "*The World's Simplest Electromagnetics Theory*", Shimao Publishing House, May 2009

[8] Good food research team "*The most complete 1000 full-food nutrition book in history*" Peace International, June, 2018.

[9] Chaudhuri, MD, FACP, FACNM, Prof Tapan K., Chowdhury MS, PhD, Prof Tushar K., et al. "

*Electromagnetic Energy of the Human Mind: Physics of the Mind*" CreateSpace Independent Publishing Platform, December 20, 2017.

[10] Riadh Habash "*Bioeffects and Therapeutic Applications of Electromagnetic Energy*" CRC Press, November 19, 2007.