



DEVELOPMENT OF AN IMMUNITY BOOSTER

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ABSTRACT

The Philippines ranked third of the countries that is vulnerable to climate change causing increased susceptibility to various diseases due to sudden change of weather brought by monsoon rains. Supplements are consumed to resist infections and meet the health needs. This research is focused on the development of an immunity booster utilizing the calamansi, carrots and broccoli which all contains restorative properties both known in the field of nutrition and culinary. Process involved selection of raw materials, extraction, freeze drying, formulation, tableting, packaging and labeling. The product was evaluated by 50 panelists to determine the product's general acceptability using hedonic rating scale. Laboratory testing results showed that product yields 52 calories per 15 grams of serving with 12.30mcg Vitamin A, 109.20mg Vitamin C, 5.10mg Vitamin D, 17.40mg Vitamin E, and 4.90mg Zinc, therefore exceeds the required nutrient intake per day as set by PDRI, except for Zinc that only attained 88%. Product also has very low moisture content and free of pathogens that proved it is safe and can last for a month at room temperature. Sensory evaluation obtained a mean rating of 8.06 or "Like Very Much" by the respondents; therefore, product is acceptable and promotes good immune system.

Keywords: *Immunity boosters, supplements, freeze drying, tableting, immune system*

1. INTRODUCTION

Food supplements provide nutrients to those who have inadequate and need quantities of it. It can be vitamins, minerals, amino acids, fatty acids, and other substances in the form of pills, tablet, capsules and also powders added to water (Maixent, 2012). In the European Union, it is regulated as foods and not as drugs. There should be sources of nutrients to it with a nutritional, immunologic and physiological effect and not just only by adding another ingredient. Furthermore, it is also proven that food supplements are widely used by millions of people around the world to meet their health needs. Likewise, Immunity Booster is one of the food supplements for keeping our immune system healthy.

Immunity Booster is a food supplement that helps your body to lift up the health of the immune system. Based on the Academy of Nutrition and Dietetics, there are top five essential nutrients needed to boost and strengthen the immunity of the body, it includes Vitamin A, D, C, E, and Zinc (Terrie, 2017). Moreover, the human immune system is also an interface across which many climate changes sensitive exposures can affect health outcomes (Swaminathan, Lucas, Harley & McMichael, 2014). An important determinant of climate change from various illnesses caused by pathogens and parasites in human populations, diarrhea, enteric diseases and certain waterborne diseases as stated by the World Health Organization (n.d). Therefore, low immunity is a significant threat to human life's that may lead to death.

Climate change is happening now. It is one of the most fundamental challenges ever to confront humanity. The Philippines experienced natural disasters enough to place it among the countries that are most vulnerable to the adverse effects of climate change (World Health Organization, 2019). According to the Time Magazine article in 2013, More than 20 storms enter in the Philippine Area of Responsibility every year. It could be one of the reasons why there is low immunity since this weather in the Philippines brings health risks to our bodies.



The World Health Organization estimated that over 150,000 people died yearly because of climate change and environmental pollutants for the past 30 years (Patz, Lendrum, Holloway, & Foley, 2005). A recent survey by HSBC Climate Research, 2018, India ranked first as the most vulnerable to climate change, second the country of Pakistan, then the Philippines ranked as third followed by Bangladesh. Pakistan, Bangladesh, and the Philippines are susceptible to extreme weather events, such as storms and flooding (Flores, 2018). Due to these cases, people are still starting to get ill that caused to decrease their immunity levels.

The world has been warned about dangerous changes in the atmosphere for more than three decades. Until there is such time that there are uncertain predictions and warnings regarded to possible problems in the future (Tacio, 2010). It was Hansen (2005), of the US National Aeronautics and Space Administration (NASA), who first raised the problem of global warming. He told that the greenhouse effect is changing our climate now. The warming of our atmosphere It is likewise evident that Philippines has been affected by climate change, and one devastating effect is an increase in the number of tropical cyclones and storms. When heavy rains pours, excessive high flood peaks, and generalized flooding occur, the stagnant pools of flood water serve as ideal breeding grounds for pathogens that result in diarrhea and water-borne diseases. Therefore, the Department of Health accurately calls these changes of weather as WILD diseases. W.I.L.D. stands for waterborne diseases, Influenza, Leptospirosis, and Dengue. To avoid the outbreak of these diseases, the DOH recommends drinking potable water, avoiding wading in floods, reducing extensive collections of water, and maintaining a robust immune system.

Hence, to address the low immunity due to monsoon weather, the researchers proposed a new variety of immunity booster in effervescent tablet form that helps to improve the immune system, made from readily available fruits and vegetable using freeze-drying technology.

2. MATERIALS AND METHODS

Product Development

The research study was focused on the development of an immunity booster drink in effervescent tablet form using the local produce namely: calamansi, carrots, and broccoli. The natural medicinal properties of these crops can intensify the immunity of individuals who tend to have lower resistance due to changes in climate. The product contains five essential nutrients needed to boost the immunity such as vitamins A, C, E, Zinc. Vitamin D, on the other hand, is added synthetically called Vitamin D3 since this nutrient is naturally acquired from sun. The effervescent tablet creates a fizzy effect upon dilution in a cup of water which ease the nutrient absorption in the body. It is clear juice drink with a prominent citrus flavor. Finished product undergoes laboratory testing such as microbiological, proximate, and nutritional analyses to ensure safety, as well as identification of the nutritional value of the food before the conduct of sensory evaluation. Moreover, the study employed the consumer preference test as to be perceived by 10 trained professionals and 40 random students to determine the product acceptability through sensory evaluation further using 9-point Hedonic Scale assessing the product attributes in terms of appearance, flavor, texture, aroma and general acceptability.



Methodology

The whole process of making the product is presented in this section. The major process flow chart illustrated the procedures that were applied to the calamansi, carrots and broccoli.

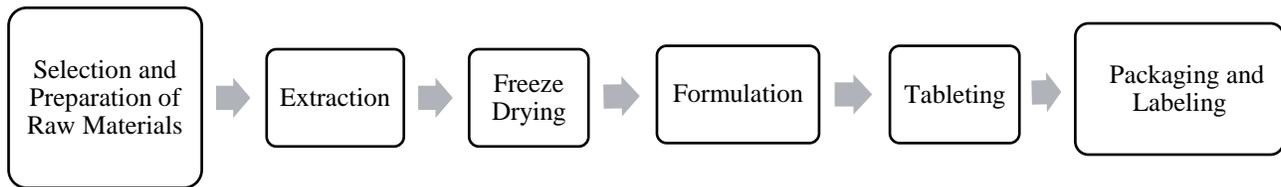
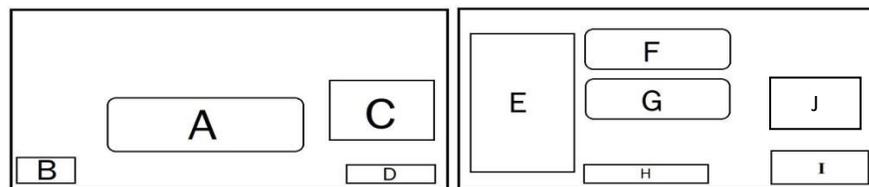


Figure 1. Process Flow Chart initially includes the selection and preparation of the raw materials. Each main ingredient was extracted separately, contained in a food grade material, then subjected to freeze drying using manifold freeze dryer to produce powdered substances. Formulation requires additives to prolong its shelf life, facilitate the tableting, and achieve the desired product outcome. Lastly, the final product is packed in a clear blister primary packaging, packed in cartons (secondary package) then labelled in accordance to the mandatory Food and Drug Administration requirements.



- | | |
|------------------------|----------------------------------|
| A. Product's Name | F. Instruction |
| B. Number of tablets | G. Ingredients |
| C. Product description | H. Manufacturing date and expiry |
| D. Net Weight in grams | I. Barcode |
| E. Supplement Facts | J. Manufacturer and address |

Figure 2 Product Label Layout (Front and back) illustrated the parts of the label design for the Immunity Booster Tablet. The Front label has the product's name at the center, beside is the product description, net weight on the lower right side, then yield is written oppositely. At the back of the label includes the ingredients, instruction upon usage, manufacturer's name, manufacturer's address, barcode, nutritional facts and manufacturing date and its expiry.



3. RESULTS AND DISCUSSION

a. Test Results

Table 1 Nutrition Facts of the Immunity Booster Tablet

Serving Size:		15grams (3 tablets)	
Serving per packaging:		7	
Amount per serving			
Calories		52	Calories per 15g
	Fat		0
	Carbohydrates		40
	Protein		12
%RENI*			
Calories from Fat and Carbohydrates			2.1
Total Fat	0 g		
Total Carbohydrates	10g		
Calories from Protein			4.0
Total Protein	3 g		
Amount per Serving			%PDRI*
Vitamin A	(12.30mg)		1892%
Vitamin C	(109.20mg)		168%
Vitamin D	(5.10mg)		102%
Vitamin E	(17.40mg)		174%
Zinc	(4.90mg)		5

*Based on RENI 2002 (FNRI-DOST) for male ages 19-29

*Based on PDRI 2015 (FNRI-DOST) for male and female ages 19-29

Immunity booster tablet yields 52 calories per 15 gram of serving containing exceeding amounts of Vitamin A, C, D, E based on the PDRI table for male and female aged 19-29. The amount of Zinc of attained only 88% of the recommended nutrient intake per day . Overall, the product can intensify the immune system.

Table 2 Summary of Results of Proximate and Microbiological Analyses of Immunity Booster Tablet

Proximate Analytes/ Parameters	Results	Methods
Ash	8.32 %	Gravimetric
Moisture	4.19 %	Air-Oven
Crude Protein	18.17%	Kjeldahl
Crude Fat	0.1 %	Soxhlet
Staphylococcus	negative	BAM Chapter 12
Escherichia Coli	<1.1 MPN/g	BAM Chapter 4

Analyses result shows that the product contains very low moisture content and capable to last for a month if stored under proper storage conditions. Much lower moisture content with approximately 2% will be ideal for long term storage of effervescent tablets. On the same table, microbial tests revealed that product is safe to consume.



b. Sensory Evaluation

Table 3 Summary of Mean Results of 50 Evaluators

Quality Attributes	Mean	Descriptive
Appearance	7.70	Like Moderately
Texture	8.00	Like Very Much
Flavor	7.70	Like Moderately
Aroma	7.46	Like Moderately
General Acceptability	8.06	Like Very Much

The product is evaluated by 10 trained panelists from The Maya Kitchen Culinary Arts and 40 students ranging from 19-29 years old. The evaluation determined the acceptability of the product in terms of its quality attributes where results revealed that appearance obtained a mean of 7.7 or "Like Moderately," texture with a mean rating of 8.0 or "Like Very Much," flavor with a mean rating of 7.7. aroma with a mean of 7.46 or both interpreted as "Like Moderately". Lastly, general acceptability with mean rating 8.06 or "Like Very Much". The evaluators commented that Immunity Booster Tablet dissolved in water has a refreshing flavor.

4. CONCLUSION

Based on the results of the evaluation conducted the following findings were derived: Processing the raw materials through freeze-drying retains much of its nutrients essential for the product formulation; clear blister packaging helps to preserve the attributes of the product and label is directly printed on the folded cartons for the product information and convenience; analyses show that the product is safe for consumption and contains ample amount of nutrients needed to boost immune system; lastly, the product attained an overall mean of 8.06 interpreted as "Like Very Much" thereby, indicates that the product is acceptable.

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