



# **CACAO (*Theobroma cacao*) and JACKFRUIT (*Artocarpus heterophyllus*) SEEDS AS AN ALTERNATIVE CHOCOLATE DRINKS**

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## **ABSTRACT**

*The study sought to determine the acceptability of cacao and jackfruit on their sensory qualities as to appearance, aroma, taste, and solubility and another finished product be produced and, in some manner, help chocolate lovers, teachers, and children be healthy through diet and boost energy levels. It involved the process of making Cacao and jackfruit seeds as an alternative chocolate drink. It also ascertained the difference in the level of acceptability and the ratings given by a group of respondents in terms of its sensory qualities such as appearance, aroma, taste, and solubility. Using the experimental method of research, a checklist survey questionnaire and sensory quality evaluation sheet data were gathered from 30 selected chocolate lovers, selected teachers, and selected children as well. Weighted mean, standard deviation, and t-test were also used to analyze the statistical data gathered in the study. It was revealed that Cacao and Jackfruit seeds have a high level of acceptability in appearance, aroma taste, and solubility. Further, there was no significant difference in the group of respondents on the acceptability of cacao and jackfruit seeds as alternative chocolate drinks. Thus, the finished product Cacao and Jackfruit Seeds as an alternative chocolate drink was evaluated as highly acceptable in all its parameters. The researchers used Cacao and jackfruit seeds in the alternative chocolate drink as a healthy drink and can be of great help for chocolate lovers, teachers, and children as well.*

**KEYWORDS:** *Cacao Seeds, Jackfruit Seeds, Chocolate drinks, Appearance, Aroma, Solubility*

## **1. INTRODUCTION**

The Philippines is one of the blessed countries. Many nutritious fruits can be found here because of their good climate. And have you ever wondered why your child's coach tells young athletes to drink chocolate milk after a hard practice? It may sound a bit strange, but actually, chocolate low-fat milk has been shown to help young athletes recover needed nutrition. Cacao (*Theobroma cacao*) and Jackfruit (*Artocarpus heterophyllus*) are two good examples of nutritious fruits in this country that can be used as alternative chocolate drinks which are cheaper and readily available. Cacao also called cocoa, a tropical evergreen tree grown for its edible seeds whose scientific name means "food of the gods" in Greek. Its seeds called cocoa beans are processed into cocoa powder, cocoa butter, and chocolate. Jackfruit, on the other hand, locally known as langka or nangka is recognized as the "jack of all fruits" because of its enormous benefits. Almost all parts of it can be used up except for the seeds which most people considered as waste and just throw it away (Salazar, 2011).

People are unaware of the valuable benefits of these two fruits' seeds. Cacao is high in flavonoids, and antioxidants, and is anti-inflammatory. Cacao protects our heart and cardiovascular system. It is good for the elasticity of our blood vessels and increases blood flow throughout our body including the brain. It is also rich in minerals like potassium, which plays a vital role in our energy production and is found to reduce diabetes. Cacao also has a positive effect on mood, focus, and creativity. It makes us happy, reduces stress, and increases our focus and creative flow. Likewise, jackfruit seeds are high in carbohydrates, dietary fiber, and vitamins A, B, and C. It is also packed with minerals like calcium, zinc, and phosphorus (Readers Digest 2017). In addition, Brusco (2013) reveals the micronutrient contents of jackfruit seeds in a 100-g serving or about 3.5 ounces of jackfruit seeds there are about 184 calories, 7 grams of protein, and 38 grams of carbohydrates, including 1.5 grams of fiber, but has less than 1 gram of fat. Fiber can help to lose weight and may lower the risk of heart disease and high blood pressure.

For these reasons, the researchers will transform cacao seeds and jackfruit seeds into a more useful and profitable product that will surely be beneficial to everyone.

Since the Philippines have plenty of cacao and jackfruit, the researcher utilizes these fruits as the main ingredients of chocolate drinks. This will also help the country to minimize waste management disposal.



### 1.1 Statement of the Problem

The study aims to determine the acceptability of cacao (*Theobroma cacao*) and jackfruit (*Artocarpus heterophyllus*) seeds as an alternative chocolate drink.

Specifically, the study aims to:

1. To determine the level of acceptability of cacao and jackfruit seeds mixture as an alternative chocolate drink in terms of its sensory qualities such as:
  - 1.1. Appearance
  - 1.2. Aroma
  - 1.3. solubility
  - 1.4. taste
2. To determine the overall level of acceptability of cacao and jackfruit seeds as alternative chocolate drinks.
3. To determine the significant difference in the level of acceptability of cacao and jackfruit seeds as an alternative chocolate drink in terms of their sensory qualities as rated by:
  - 3.1. Chocolate lovers
  - 3.2. Teachers
  - 3.3. Children

## 2. METHODOLOGY

### 2.1 Research Design

The experimental method of research is used in the study to determine the acceptability of cacao and jackfruit seeds as an alternative chocolate drink on its sensory qualities as appearance, aroma, taste, and texture as rated by the respondents. The researchers use cacao and jackfruit seeds as an alternative chocolate drink for having available in abundant amounts and at a low price the seeds are very tasty and healthy having high nutritional potential. The methods of preparation are the following:

The first step is the collection of good-quality cacao and jackfruit seeds. Washing of seeds using water to remove foreign objects is the next step. It will be followed by sun-drying of seeds. After drying for 7-10 days, the coat of the seeds is removed, and the seeds are roasted until the color is achieved. Using a blender, mortar, and pestle, grind the seeds and the powdered form of the product obtained. Then with the strainer, sift the cacao and jackfruit powder to eliminate the slightly big granules of jackfruit powder.

Lastly, put the filtered seeds powdered in a resealable plastic and labeled it indicating the name and information of the product.

Table 1 gives the time frame plan for making cacao and jackfruit seeds as an alternative chocolate drink.

### Time Frame Plan

Table 1: Time Frame Plan in Making Cacao and Jackfruit Seeds as an Alternative Chocolate Drink

Steps in making chocolate drinks	Time frame
1. Collection of good-quality cacao and jackfruit seeds.	1 to 2 weeks
2. Sun-drying of cacao and jackfruit seeds	7 – 10 days
3. Removing of seed coat	1 hour
4. Roasting of cacao and jackfruit seeds	1 hour
5. Grinding of roasted cacao and jackfruit seeds with the use of mortar and pestle and blender	1 day
6. Sifting the cacao and jackfruit seeds powder to eliminate the slightly big granules.	1 hour
7. Packaging and labeling the products.	3 hours

**Table 2: Materials, Utensils, and Equipment**

Materials, Tools, Utensils and Equipment	Function
1.cacao seeds, jackfruit seeds	The main ingredients of chocolate drink
2. drying tray or bilao	Use to dry the seeds under the sun.
3.strainer	Use to separate the big granules in the powdered cacao and jackfruit seeds.
4.blender/mortar and pestle	Use to achieve the finest texture of chocolate drink
5. stove/oven	Use to roast cacao and jackfruit seeds in a quick manner.
6. flipper	Utensil use in mixing the cacao and jackfruit in the frying pan.
7. Frying pan	Use in roasting the seeds.
8.Measuring spoon/weighing scale	Use in measuring the amount of sugar/creamer to be added in the chocolate drink

Table 2 shows the materials, tools, and ingredients needed in preparing cacao and jackfruit seeds as an alternative chocolate drink. It also includes the function of the materials. In making the product, use gloves to avoid unwanted microorganisms. Use a mechanical dryer for an easy, convenient, sanitary way of manufacturing chocolate drinks.

**Table 3: Try-outs and Revision of Cacao and Jackfruit Seeds as an Alternative Chocolate Drink**

Trials	Defects	Revision
1	Presence of molds in the seeds when air drying was used	The seeds were dried under the sun
2	Seeds coat did not dissolve completely when mixed with hot water	Removing of seed coat before roasting cacao and jackfruit seeds
3	The chocolate powder did not dissolve completely	Grind the seeds powder for 10 -15 minutes, to attain the fine texture of chocolate
4	Perfectly done	No revisions were made

Table 3 shows defects and revision of cacao and jackfruit chocolate drink. In making cacao and jackfruit chocolate drinks, the researchers encountered some difficulties. Trials and revisions were done to obtain the desired results. Put the cover on the tray while drying the seeds under the sun to avoid contamination

**Table 4. Cost Analysis of Cacao and jackfruit Chocolate Drinks**

Quantity	Unit	Description	Unit Cost	Total Cost
200	grams	Powdered cacao and jackfruit seeds	Php 147.00	Php 147
500	grams	Brown sugar	55 /kg	Php 55.00
450	grams	Creamer	Php78/450g	Php 26.00
30	pcs	Resealable plastic	Php 40/100pcs	Php12.00
		Yield: 30 packs	Php 18/pc	Php 240.00

Table 4 reveals the quantity, unit description, and cost of the ingredients used in the preparation of cacao and jackfruit seeds and chocolate drinks. Cost analysis is needed to find out if the experimental product would meet the economic minimum cost.



### Research Instrument

The sample of cacao and jackfruit seeds as alternative chocolate drinks is rated using the rating scale below to evaluate the product's sensory qualities such as appearance, aroma, taste, and solubility.

Rating Scale.	Remarks	Verbal Interpretation
4.51 - 5.00	Strongly Agree (SA)	Highly Acceptable
3.51 - 4.50	Agree (A)	Acceptable
2.51 - 3.50	Moderately Agree(MA)	Moderately Acceptable
1.51 - 2.50	Less Agree (LA)	Less Acceptable
1.00 - 1.50	Very Less Agree (VLA)	Not Acceptable

### Statistical Treatment

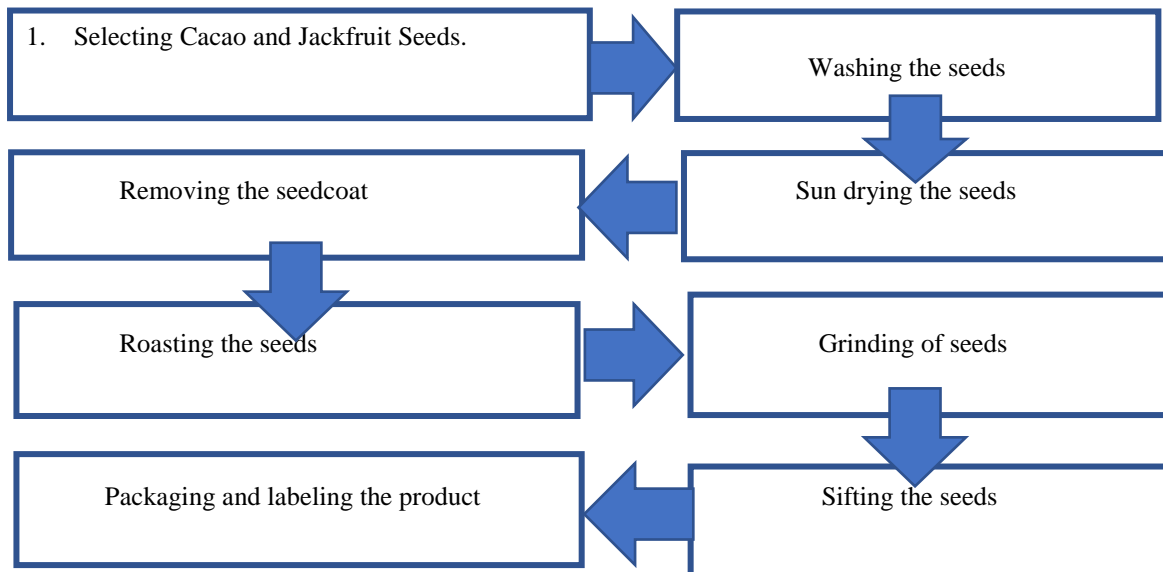
The acceptability of the sample cacao and jackfruit seeds as an alternative chocolate drink was evaluated in terms of appearance, aroma, solubility, and taste. The data gathered was analyzed and interpreted to get the overall rating of the product. The weighted mean and standard deviation was employed to find the level of acceptability of cacao and jackfruit seeds as alternative chocolate drinks.

t-test was used in order to know the significant difference between the ratings of the two groups of respondents

## 3. RESULTS AND DISCUSSION

In this study, data were gathered from the scorecard on the acceptability of Cacao and Jackfruit seeds to their sensory qualities in terms of appearance, aroma, taste, and solubility.

### Methods in Making Cacao and Jackfruit Seeds as an Alternative Chocolate Drink



The methods used in making Cacao and Jackfruit seeds as an alternative chocolate drink were selecting the cacao and jackfruit seeds, washing, sun drying, removing the seed coat, roasting, grinding, sifting, packaging, and labeling the product as to alternative chocolate drink. Compare with other tropical fruits, jackfruit seeds are packed with many important nutrients including resistant starch, protein, thiamine, riboflavin, and antioxidants. In addition, jackfruit seeds were capable of mirroring chocolate aromas and could serve as a viable replacement for the aroma of cocoa powder or chocolate.

On the other hand, the researchers personally added cacao seeds as it provides carbohydrates, fats, protein, and minerals. Its theobromine and caffeine content produce a mildly stimulating effect and makes excellent high-energy food. Studies have shown the many uses of cacao beans processed for obtaining chocolate powder, and solid coated chocolate foods. The beans produce pleasant sharp flavors blending well in many foods and confections.

Acceptability of Cacao and Jackfruit Seeds as Alternative Chocolate Drink in terms of its Appearance.



**Table 5. Acceptability of Cacao and Jackfruit Seeds As An Alternative Chocolate Drink in Terms of its Appearance**

Chocolate Drink...	Chocolate Lovers			Teachers			Children		
	M	SD	R	M	SD	R	M	SD	R
1.is attractive into the eye	4.10	0.91	A	4.45	0.51	A	4.00	0.65	A
2.shows uniqueness	4.10	0.79	A	4.10	0.72	A	4.15	0.81	A
3.looks neat and safe to consume	4.40	0.75	A	4.25	0.75	A	4.20	0.70	A
4.achieved the desired color	4.05	1.15	A	4.30	1.15	A	4.20	0.70	A
5.dissolved completely with hot water	3.15	1.39	MA	3.20	1.39	MA	3.40	1.14	MA
<b>Overall Mean</b>	<b>3.96</b>	<b>1.00</b>		<b>4.06</b>	<b>0.90</b>		<b>3.99</b>	<b>0.80</b>	
<b>Overall Description</b>	<b>Acceptable</b>			<b>Acceptable</b>			<b>Acceptable</b>		

Legend:Scale	Remarks	Descriptions
4.51-5.00	Strongly Agree (SA)	Highly Acceptable (HA)
3.51-4.50	Agree (A)	Acceptable (A)
2.51-3.50	Moderately Agree (MA)	Moderately Acceptable (MA)
1.51-2.50	Less Agree (LA)	Less Acceptable (LA)
1.00-1.50	Very Less Agree (VLA)	Not Acceptable (NA)

In terms of appearance, cacao and jackfruit seeds as an alternative chocolate drink were acceptable as reflected by the weighted mean scores of 3.96, 4.06, and 3.99 with the standard deviation of 1.00, 0.90, and 0.80 respectively. The table above proved that cacao and jackfruit were attractive and show uniqueness to the eye and look neat and safe to drink. However, the data also showed that cacao and jackfruit seeds as alternative chocolate drinks were not completely soluble in hot water which was proven by the ratings given. Morgan (2015) emphasized the main reason why appearance is important in serving food. Eye or sight is one of the five senses that the body has. Stimulation that the eye affects greatly on brain responses and the brain will tell to choose the safest option that people have.

**Table 6. Acceptability of Cacao and Jackfruit Seeds As An Alternative Chocolate Drink in Terms of Aroma**

Chocolate Drink...	Coffee Lovers			Teachers			Children		
	M	SD	R	M	SD	R	M	SD	R
1.is appetizing	4.15	0.88	A	4.30	0.80	A	3.90	0.64	A
2.smells delicious	4.10	0.79	A	4.15	0.81	A	4.20	0.70	A
3.smells relaxing	4.05	0.89	A	3.65	0.93	A	4.15	0.81	A
4.has a strong aroma	3.95	0.94	A	3.65	1.09	A	4.05	0.94	A
5.is dulcified	3.40	0.99	A	3.35	1.18	A	3.60	1.00	A
<b>Overall Mean/SD</b>	<b>3.83</b>	<b>0.90</b>		<b>3.82</b>	<b>0.96</b>		<b>3.98</b>	<b>0.82</b>	
<b>Overall Description</b>	<b>Acceptable</b>			<b>Acceptable</b>			<b>Acceptable</b>		

Legend: Scale	Remarks	Description
4.51 – 5.00	Strongly Agree (SA)	Highly Acceptable (HA)
3.51 – 4.50	Agree (A)	Acceptable (A)
2.51 – 3.50	Moderately Agree (MA).	Moderately Acceptable (MA)
1.51 – 2.50	Less Agree (LA).	Less Acceptable (LA)
1.00 – 1.50	Very Less Agree (VLA).	Not Acceptable (NA)

Table 6 affirms that the aroma of cacao and jackfruit seeds as alternative chocolate drinks was acceptable as assessed by the coffee lovers, teachers, and children with weighted mean scores of 3.83, 3.82, and 3.98 respectively. Therefore, the data above portrayed that cacao and jackfruit seeds as an alternative chocolate drink have an appetizing, relaxing, and dulcified strong aroma based on the evaluation given by the three respondents. Jackfruit seeds create chocolate aroma and has a potential cocoa substitute according to research, that when fermented, roasted, and converted to flour imparts a chocolate aroma.



**Table 7. Acceptability of Cacao and Jackfruit Seeds As Alternative Chocolate Drink in terms of Solubility**

Chocolate Drink...	Coffee Lovers			Teachers			Children		
	M	SD	R	M	SD	R	M	SD	R
1. the powdered cacao and jackfruit seeds chocolate drink relatively dissolved in hot water	2.8	0.56	MA	4.2	0.48	A	4.2	0.48	A
2.No sediments had been seen in the dissolved cacao and jackfruit seeds chocolate drinks.	3.0	0.47	MA	4.2	0.48	A	4.2	0.48	A
Overall Mean/SD	3.83	1.092	A	4.2	0.421	A	4.2	0.421	A

Legend: Scale	Remarks	Description
4.51 – 5.00	Strongly Agree (SA)	Highly Acceptable (HA)
3.51 – 4.50	Agree (A)	Acceptable (A)
2.51 – 3.50	Moderately Agree (MA).	Moderately Acceptable (MA)
1.51 – 2.50	Less Agree (LA).	Less Acceptable (LA)
1.00 – 1.50	Very Less Agree (VLA).	Not Acceptable (NA)

The table revealed that the solubility was acceptable as rated by the respondents that the powdered cacao and jackfruit seeds chocolate drinks relatively dissolved in hot water and no sediments had been seen in the dissolved powdered cacao and jackfruit seeds chocolate drinks. Whether as a perfect to start the day a very special production process, the cocoa is perfectly soluble in both cold and warm milk or milk alternatives.

**Table 8. Acceptability of Cacao and Jackfruit Seeds As Alternative Chocolate Drinks in terms of their taste**

Chocolate Drink	Coffee Lovers			Teachers			Children		
	M	SD	R	M	SD	R	M	SD	R
1.Has an appetizing flavor	4.05	1.19	A	4.30	0.80	A	4.05	0.76	A
2.cacao and jackfruit when combined resemble a balanced flavor	3.45	1.32	A	4.15	0.81	A	3.90	1.17	A
3.the taste resemble the traditional chocolate drinks	3.55	1.18	A	3.80	1.06	A	3.65	1.18	A
4.the finished product had improved taste due to the presence of the ingredients.	4.25	0.91	A	4.50	0.61	A	4.00	0.92	A
Overall Mean/SD	4.13	0.91	A	4.45	0.73	A	4.32	0.70	A

Legend: Scale	Remarks	Description
4.51 – 5.00	Strongly Agree (SA)	Highly Acceptable (HA)
3.51 – 4.50	Agree (A)	Acceptable (A)
2.51 – 3.50	Moderately Agree (MA).	Moderately Acceptable (MA)
1.51 – 2.50	Less Agree (LA).	Less Acceptable (LA)
1.00 – 1.50	Very Less Agree (VLA).	Not Acceptable (NA)

As indicated in the table the cacao and jackfruit seeds as the alternative chocolate drink was acceptable as rated by the three groups of respondents. The table gave an idea that chocolate drink has a well-balanced flavor. The evaluation made on the cacao and jackfruit chocolate drink was related to the findings of Quidlat et al. (2018) on Durian Coffee and proved that Durian was acceptable in terms of its sensory qualities as rated by fourth-year students. The table also reveals that the taste was acceptable as rated by the coffee lovers, teachers, and children which distinguished the real flavor of chocolate and the finished product had improved the taste due to the presence of their ingredients by the computed mean of 4.51 with the standard deviation of 0.91

**Table 9. Test of Significant Difference in the Ratings of the respondents on Cacao and Jackfruit as Alternative Chocolate Drinks in the level of acceptability of Cacao and Jackfruit Seeds as Alternative Chocolate Drinks**

Type of Respondents	Mean (X)	Mean Difference	Computed t-value	Critical t-value	Verbal Interpretation
Coffee Lovers	3.95	0.12	1.664	2.042	Not Significant
Teachers	3.75				
Children	3.83				



The table discusses the difference among the ratings given by the three groups of respondents on the acceptability of the finished product such as cacao and jackfruit as alternative chocolate drinks in terms of their appearance, aroma, solubility, and taste. The table revealed that there was no significant difference between the evaluation made by coffee lovers, teachers, and children on the acceptability of cacao and jackfruit as alternative chocolate drinks. On the other hand, the teachers gave the lowest ratings on the chocolate drinks. This means that the right choice of a group of respondents is very important to have accurate and reliable results. The result was similar to the findings in the study of Alibudbud (2019) entitled "Versatility of Squash" that the ratings given by the students, faculty members, and housewives on the acceptability of squash ice cream in terms of aroma, taste, and appearance have no significant difference at 0.05 level of significance. Another research on 'Malunggay Seeds Coffee, Tea Juice Drink' (Marquez, 2019) indicated that the sensory qualities such as aroma, taste, and texture were acceptable as revealed by the average mean of 4.26, 4.23, and 4.70 with SD of 0.27, and 28 respectively.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

The findings gathered led to the formulation of the conclusion that there is no significant difference in the mean level of acceptability of cacao and jackfruit as alternative chocolate drinks in terms of their sensory qualities such as appearance, aroma, solubility, and tastes assessed by the coffee lovers, teachers, and students

People are unaware of the valuable benefits of these two fruits' seeds. Cacao is high in flavonoids, and antioxidants, and is anti-inflammatory. Cacao protects our heart and cardiovascular system. It is good for the elasticity of our blood vessels and increases blood flow throughout our body including the brain. It is also rich in minerals like potassium, which plays a vital role in our energy production and is found to reduce diabetes. Cacao also has a positive effect on mood, focus, and creativity. It makes us happy, reduces stress, and increases our focus and creative flow. Likewise, jackfruit seeds are high in carbohydrates, dietary fiber, and vitamins A, B, and C. It is also packed with minerals like calcium, zinc, and phosphorus (Readers Digest 2017). In addition, Brusco (2013) reveals the micronutrient contents of jackfruit seeds in a 100-g serving or about 3.5 ounces of jackfruit seeds there are about 184 calories, 7 grams of protein, and 38 grams of carbohydrates, including 1.5 grams of fiber, but has less than 1 gram of fat. Fiber can help to lose weight and may lower the risk of heart disease and high blood pressure.

For the recommendations: 1. Conduct a test on the content of the product and shelf life through the assistance of the Department of Science and technology. 2. Develop the packaging presentation of the product to bring out its best appearance. 3. Future studies should be done along this line considering other locally available solid waste which can be utilized for the benefit of mankind and the environment. 4. Study on the marketability of the product is recommended.

#### REFERENCES

1. Alibudbud, C. F. (2019). "Versatility of Squash (*Cucurbita moschata*)" Master's Thesis Laguna State Polytechnic University
2. Baltazar, E.P. (2014). "Utilization of Jackfruit Seed into a Brittle Type of Candy, University of the Philippines Los Banos – Main Library
3. Borchers, A.T. Keen, C.L. (2018). Cocoa and Chocolate Composition, Bioavailability, and Health Implications. *Journal of Medicinal Food* June 2018, 3(2): 77-105.
4. Del Rosario, C.M.D. (2010). "Development Some Products from Jackfruit Seeds". An Experimental Study. University of the Philippines Los Banos- main library.
5. Matienzo, R.G.et al. (2012). The Acceptability of Cacao Seed (*Theobroma cacao*) Powder" An experimental study. Laguna State Polytechnic University-Main Campus Santa Cruz, Laguna
6. Rusconi, M. (2010). *Theobroma cacao L., The food of the Gods: A scientific approach beyond myths and claims/*, A Conti/Pharmacological Research 61 (2010), 5-13 (14).
7. Salazar, R.M. (2011). "Utilization of Jackfruit Seed for Soymilk-like Product". University of the Philippines Los Banos Main library.
8. "Journal of Food Quality" (2017). Volume 1, Issue 3, pages 267 – 278. University of the Philippines Los Banos – Main Library.