INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 24, No. 3, p. 150-156, 2024

RESEARCH PAPER OPEN ACCESS

Development and acceptability of Soursop *(Annona muricata)* as alternative fruit syrup in food service industry

Michael Bhobet B. Baluyot*

Technological University of the Philippines, Manila, Philippines

Key words: Soursop, Syrup, Acceptability, Product development, *Annona muricata*

http://dx.doi.org/10.12692/ijb/24.3.150-156 Article published on March 08, 2024

Abstract

Going green is rapidly being acknowledged as a favorable competitive strategy in the hospitality sector, notably on the supply side of the tourism industry, which is seeking to incorporate sustainable practices. Soursop *(Annona muricata)* also known as Guyabano is one of the tropical fruit in the Philippines which is considered underutilized fruit with high concentration of flavonoid, a phytochemical that has been shown to impede and even stop the spread of viruses, carcinogens, and allergens. Therefore, this study aims to develop an alternative fruit syrup using soursop and test its acceptability. The main components of soursop syrup are soursop, sugar, water, glycerin and agar-agar. The study conducted microbial and physicochemical analysis. In terms of microbial analysis, the test resulted to standard plate count of 10 CFU/g, coliform count <10 CFU/g and yeast and mold count <10 CFU/g which proves that the product is safe to consume. On the other hand, in terms of physicochemical analysis, it was found out that the viscosity test resulted to 10 points score via analytical method of measurement using Brookfield Viscometer at 25° Celsius. In addition, the soursop syrup has an acceptable pH value resulted to 4.48 at 25°C. Based on the acceptability evaluation conducted, soursop syrup overall general acceptability score is 8.27 with descriptive rating of "Like Very Much". This leads to the conclusion that soursop syrup is suitable, safe for consumption, and can be used as alternative fruit syrup in the food service industry.

* **Corresponding Author:** Michael Bhobet B. Baluyot ✉ michaelbhobet_baluyot@tup.edu.ph

Introduction

Despite research efforts focusing on various sustainable practices in hospitality, such as recycling programs, energy efficiency, water conservation, and waste management, the topic of food sustainability remains unexplored in this context, even though the phenomenon is highly relevant given the experiential nature of the services and products offered in the industry. In addition, food waste is a complex issue influenced by various factors, including post-harvest losses, consumer preferences, and supply chain inefficiencies. In the Philippines, much of the research on food waste is focused on broader categories, such as fruits and vegetables.

This study aims to address this current scenario by conducting product development using underutilized fruit which is soursop (*Annona muricata*) into an alternative fruit syrup to be used by the hospitality industry, particularly the food and beverage industry. Although it is difficult to get precise information on production numbers, De Lima, and Alves (2011) claim that Mexico, Puerto Rico, Venezuela, and Costa Rica are the top exporters of soursop goods, primarily in the form of frozen pulp and fresh fruit. The primary producers of soursop in South America are Brazil, Colombia, and Venezuela, with Venezuela being the biggest producer in this region. Brazil comes in third place globally in terms of output, after Mexico. Fresh fruit and frozen pulp consumption predominates in these nations.

The soursop tree, or *Annona muricata*, is a member of the family *Annonaceae* and is cultivated for the enormous, tasty fruits it bears. Spencer *et al.* (2017) discussed that soursop is often utilized in the creation of a wide variety of items, including meals, drinks, and other goods. While there is limited specific research available on soursop food waste in the Philippines, the issue of food waste in the country is a concern, and soursop, like other perishable fruits, is not exempt from this problem. Food waste is a complex issue influenced by various factors, including post-harvest losses, consumer preferences, and supply chain inefficiencies.

As a perceived solution to this problem, the study aims to create a new variety of syrup that will be used as a food and beverage enhancer using soursop (*Annona muricata*) as the primary raw material because currently in the Philippines, there is no existing syrup product using soursop as flavor. The utilization of soursop in the development of new fruit-based syrup will benefit both the consumer and the hospitality industry, particularly the beverage industry, as well as maximize and utilize the soursop in the market. Furthermore, this will help to reduce waste and prevent the underuse of the soursop (*Annona muricata*).

This study focuses on an all-encompassing notion of "green food" that takes several aspects of "greenness" into account. In light of this, it is reasonable to infer that the idea of "green food" consists of two key elements: locally sourced food, and food sustainability. Local food is considered to be produced and consumed within a specific geographic area. On the other hand, food sustainability refers to the ethical production, distribution, and use of food that ensures the planet's and its people' long-term health and wellbeing. It includes a wide range of methods and ideas designed to strike a balance between social, environmental, and economic aspects of the food system. In this study, soursop *(Annona muricata)* also known as Guyabano is one of the tropical fruit in the Philippines which is considered underutilized fruit and therefore, use to develop an alternative syrup product that will beneficial to the food and beverage industry.

Based on Medenilla (2022), Guyabano also known as soursop, is a small tropical fruit tree that produces green heart-shaped and maybe oblong fruits with soft spikes on top. It has a sour-tasting, soft pulp that is high in carbohydrates and Vitamin C. Lachica (2020) mentioned that it is high in carbohydrates, dietary fiber, and Vitamins C, B1, and B2. Guyabano contains a high concentration of flavonoid, a phytochemical that has been shown to impede and even stop the spread of viruses, carcinogens, and allergens. Fresco (2016) stated that Guyabano has grown in popularity

in alternative healthcare and medicine due to various health claims and its purported ability to fight and kill cancer cells. However, because there has been very little scientific research on guyabano, its therapeutic cases are not scientifically proven.

Since the fruit is fragile, its pulp is produced instead, making it the most lucrative commercial form. Fresh soursop fruit is a market favorite due to its pleasant and sweet flavor. Sacramento *et al.* (2003) estimate a pulp yield of 83.12% to 85.85%, however Nolasco-González *et al.* (2019) assert values of 46.8% to 80.6%. Changes in the location of the fruit's production can be used to explain the authors' statement of a yield variation. The pulp's ability to be both stiff and soft makes it suitable for freezing and subsequent commercialization. From this, we may produce derivative goods like juice, nectar, ice cream, jam, and yogurt.

Fruit-based syrup is one of the food components that has gained popularity among consumers since it is good for taste enhancers. As stated by the flavored syrup market analysis report by Grand View Research Inc. (2022), the value of the global market of flavored syrups reached USD 46.3 billion in 2018 and is further expected to grow at a CAGR of 5.1 percent between 2019 and 2025. Fruit-flavored syrups have led the market due to their widespread use in beverage products. It is primarily used as a topping ingredient in both hot and cold beverages, particularly alcoholic and non-alcoholic beverages, as an alternative sweetener, and as a flavoring enhancer. The massive consumption of non-alcoholic and alcoholic beverages, flavored syrup continues to grow in the global market due to its widespread use (Fact. MR, 2021). By flavored syrup industry research, it increased household consumption for several ingredients or flavorings, that are mostly purchased by beverage manufacturers, hotels, and restaurants. Flavored syrup helps the hospitality industry which offers only limited variety of flavored fruit syrup.

As stated by bridge market research by CDN Newswire (2022), there is only common flavored fruit-based syrup here in the Philippines including mango, lemon, raspberry, orange and grapes. Therefore, the consumer demands a new variety of flavors that will satisfy the needs and cravings of the consumers since it is used to innovate dishes and beverages. The researchers wanted to develop a new variety of fruit-based syrup using soursop (*Annona muricata*) as the main ingredient since the soursop is often overlooked because it is not very well known and because of its texture and aroma. Makebe *et al.* (2020) mentioned that soursop, also known as *Annona muricata* is a tropical and subtropical fruit that is not used enough due to its high perishability, this fruit suffers massive post-harvest losses. The endless number of weight and tons of food being wasted is one of the major problems in every country, lack of information about food preservation, lack of food management, and even lack of environmental projects that focus on production of the consumption food products.

Market analysis report by Grand View Research (2022), the increasing demand for a new variety of flavors of fruit-based syrup in the food and beverage industry is continuing to drive market growth. Flavored syrup manufacturers are enhancing the development of innovative flavors by utilizing underutilized-fruit and honey-containing syrups to satisfy the consumers' continuously changing taste preferences, thereby contributing to the global market growth. The use of flavored syrups as a flavor enhancer and sweetener is gaining popularity among manufacturers across the industry. The beverage category, which includes a wide range of liquid syrups in various flavors, has contributed the most to market demand. Some individuals use fruit-based syrup to enhance the flavor of their beverages. However, because the market only has common flavored syrup, consumers are searching for innovative and unique flavors. Rising sugar consumption awareness, rapidly changing taste and flavor preferences, and increasing demand for food items packed with unique, natural, and authentic flavors are certain key factors driving market revenue growth (Reports and Data, 2021). As a result, consumers may be eager to try new innovative products.

Materials and methods

Fig. 1 shows the conceptual model of the study. Input part of the model composed of knowledge requirement, tools and equipment and raw materials. Output part of the model discussed the different processes in the development of the soursop syrup and the output part of the model indicated the end-product of the study. Through a sensory evaluation and a 9-point hedonic scale, the evaluation component is tested to determine whether or not it is acceptable to consumers. The assessment form was used to evaluate the descriptive and qualifying characteristics in terms of taste, texture, color, appearance, and overall acceptance.

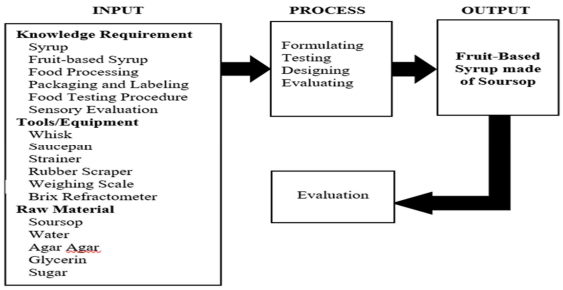

Fig. 1. Conceptual model of the study

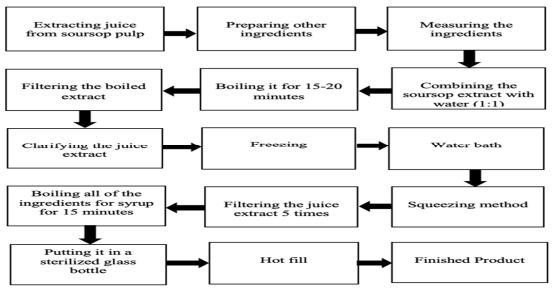

Fig. 2. Process flow chart in making soursop syrup

Fig. 2 presents the process flow chart in making Soursop Syrup which is composed of 1 liter of soursop extract, 1 liter of water, 20 grams of agar-agar, and 276 grams of refined sugar. The first step is to extract the juice from soursop. Second is to prepare other ingredients which are water, refined sugar, and agar-agar. Followed by the measurement of all ingredients according to the exact measurements of formulation 21. Fourth is, combining the soursop extract with water (1:1). Fifth, boiling it for 15-20 minutes. Sixth, is the filtering method, to filter the pulp of the soursop extract. Next is clarifying the extract using agar-agar by mixing and boiling it in the juice extract. Then, cool it down first before putting it in the freezer overnight. After that, water bath the frozen juice extract for 30 minutes then squeeze it so that the clear juice comes out. Then, filter it again for five times using a coffee filter to make it totally clear. Next is, combining all the ingredients for syrup, and boil it for 60 minutes or until it thickens like the consistency of other beverage syrup. Lastly, apply the hot fill method, the syrup must be placed immediately in a sterilized glass bottle, and it should be properly sealed before soaking it in ice water.

The study conducted different laboratory analyses which are microbial analysis, pH analysis, viscosity analysis and total soluble solid analysis. In addition, the study conducted a sensory evaluation procedure to measure the acceptability of soursop syrup using 9-point hedonic scale.

Results

Table 1 presents the summary of results of microbial analysis of soursop syrup. The quantity of standard plate count resulted to 10 CFU/g which is categorized as safe to consume. This is with reference to the Food and Drug Administration Circular No. 2022 s. 12 which stated that the acceptable microbial concentrations can range from 10 colony forming units per ml (CFU/ml). This was examined using the petrifilm plate method. The table also indicates <10 CFU/g result in coliform count and yeast and mold count test and it is resulted as safe to consume, due to the low levels of pathogens found in soursop and will not have any negative effects on consumers.

Table 2 presents the result of the Physico-Chemical Analysis of soursop. Based on the analysis, the soursop syrup has an acceptable pH value which is 4.48 pH values per 300 grams. The results of the viscosity analysis and total soluble solid analysis were compared to the existing syrup in the market. The viscosity analysis resulted to 10.0 at 25°C which is within the acceptable range for the viscosity of beverage syrup. The total soluble solid (TSS) resulted to 51.2 per 300 grams which is within the acceptable range for TSS based on the analysis of Philippine Institute of Pure and Applied Chemistry (2022).

Table 1. Summary of results of microbial analysis of soursop syrup

Analysis	Result	Unit	Method
Standard Plate Count	10	CFU/g	Petrifilm Method
Yeast and Mold Count Yeast	<10	CFU/g	Petrifilm Method
Coliform Count	<10	CFU/g	Petrifilm Method

Source: Intertek Testing Services Philippines, Inc.

Table 2. Summary of results of physico-chemical analysis of soursop syrup

Analysis	Result	Unit	Method
pH Value	4.48	g/300g	By Glass Electrode
Viscosity	10.0	at 25°C (cP)	Brookfield Viscometer
Total Soluble Solid	51.2	g/300g	By Enzymatic-Gravimetric

Source: Intertek Testing Services Philippines, Inc. and Philippine Institute of Pure and Applied Chemistry

Table 3. Summary of mean scores of the respondent's evaluation using the 9-point hedonic scale rating

Quality Attributes	Mean	Descriptive evaluation
Appearance	8.32	Like Very Much
Color	8.32	Like Very Much
Texture	8.38	Like Very Much
Aroma	8.04	Like Very Much
Taste	8.26	Like Very Much
General Acceptability	8.3	Like Very Much

Table 3 depicts the summary of the soursop syrup sensory evaluation using the 9-Point hedonic scale. The quality attribute of appearance obtained an average mean score of 8.32, which is equivalent to "Like Very Much" based on descriptive rating. The product's color obtained an average mean score of 8.32, which is equivalent to "Like Very Much " based on descriptive evaluation. The texture quality attribute obtained an average mean score of 8.38, which is equivalent to "Like Very Much" in a descriptive evaluation. The quality attribute of aroma obtained an average mean score of 8.04, which is equivalent to "Like Very Much" on descriptive rating, and the quality attribute of taste obtained an average mean score of 8.26, which is also equivalent to "Like Very Much" based on the descriptive evaluation. The general acceptability of soursop syrup obtained an average mean score of 8.3, which is equivalent to a "Like Very Much" on descriptive evaluation. This only implies that the soursop syrup passed the acceptability of the selected respondents and has high probability to use in the food and beverage industry as alternative fruit syrup.

Discussion

After a thorough conduct of research, analysis, measurements, observations, and development of the product, the researchers concluded that soursop also known as *Annona muricata* is acceptable to consume and use as alternative to fruit syrup. In the process of making soursop syrup, it involves several steps which are extraction, clarification, filtering, and hot filling. The entire process of making soursop syrup is important for ensuring the safety and quality of the final product, as well as its stability. Microbial analysis and physicochemical analysis were conducted to soursop syrup to identify its various compositions. Based on the analysis, soursop syrup is safe to consume in reference to negative detection of coliform, and yeast and mold count. Soursop syrup is also within the standard range of SPC, pH value, total soluble solids, and viscosity. Based on acceptability analysis using sensory evaluation, it was found out that the soursop syrup has a general acceptability of 8.3 which implies that the product is recommended to use in the food and beverage industry as alternative fruit syrup.

While the current research has shed some lights on several significant results, there are some limitations that reveal the opportunity for future studies. First, future studies should include other analysis for further comparisons since the study focus only on a limited laboratory analysis only.

Second, it is important to note that the current research developed alternative fruit syrup for beverage use only, which do not necessarily lead to other possible use of soursop syrup such as food menus. In particular, for future studies, a valuable attempt would be represented by the investigation of more wider and diverse respondents to evaluate the sensory quality of soursop syrup. In addition, since from the literature the concept of local source food and food sustainability embeds two main components, future research should investigate the influential power of each specific dimension of greenness in promoting food sustainability in the hotel industry.

References

Agu KC, Okolie NP, Falodun A, Erharuyi O, Igbe I, Elekofehinti OO, Edosa RO, Oghagbon SE. 2017. Isolation and elucidation of 15-acetylguanacone from Soursop (*Annona muricata* Linn) fruit and molecular docking experiments. Journal of Applied Sciences and Environmental Management. Retrieved from https://www.ajol.info/index.php/jasem/article/view/155467

Badrie N, Schauss AG. 2016. Soursop (*Annona muricata* L.). Bioactive Foods in Promoting Health, 621–643. https://doi.org/10.1016/b978-0-12-374628-3.000396

Barrios HA, Esguerra EB. 2016. Postharvest behavior of Biriba [*Rollinia mucosa* (Jacq.) Baill.] fruits at different storage temperatures. AGRIS. Retrieved from https://agris.fao.org/agris-search/search.do?recordID=PH2022000115

Bingtao L, Gilbert MG. 2019. Flora of China Volume 19 - eFloras.org Home. Retrieved from http://flora.huh.harvard.edu/china/mss/volume19/Flora_of_China_Volume_19_Acanthaceae.pdf

Cardinal S, Azelmat J, Grenier D, Voyer N. 2016. Anti-inflammatory properties of Quebecol and its derivatives. Bioorganic & Medicinal Chemistry Letters **26**(2), 440–444. https://doi.org/10.1016/j.bmcl.2015.11.096

Chhaya A, Jogawat P, Gnanasekaran P, Kumari N, Lakra SK, Lal J, Pawar OP. 2021. An overview of recent advancement in phytohormones-mediated stress management and drought tolerance in crop plants. Plant Gene **25**, 100264. https://doi.org/10.1016/j.plgene.2020.100264

Data RA. 2021. Food flavors market revenue growth driven by rising demand for organic and natural flavoring ingredients and safer and more healthy products: Reports and Data. Food Flavors Market Revenue Growth Driven By Rising Demand For Organic And Natural Flavoring Ingredients And Safer And More Healthy Products: Reports and Data. Retrieved from https://www.prnewswire.com/news-releases/food-flavors-market-revenue-growth-driven-by-rising-demand-for-organic-and-natural-flavoring-ingredients-and-safer-and-more-healthy-products-reports-and-data-301380370.html

De Lima MC, Alves RE. 2011. Soursop (*annona muricata* L.). In postharvest biology and technology of tropical and subtropical fruits. 363-391. https://doi.org/10.1533/9780857092618.363

Fact MR. 2021. Flavored syrup market share & trends analysis, by flavor (fruit flavored, chocolate flavored, vanilla flavored syrup), by end-use (household consumption of flavored syrup, flavored syrup for bakery and confectionery), by Sales Channel & by region- global insights to 2031. Fact.MR, Market Research Company. Retrieved from www.factmr.com/report/flavored-syrup-market

Lešková E, Kubíková J, Kováčiková E, Košická M, Porubská J, Holčíková K. 2006. Vitamin losses: Retention during heat treatment and continual changes expressed by mathematical models. Journal of Food Composition and Analysis https://doi.org/10.1016/j.jfca.2005.04.014

Fact MR. 2021. Fruit flavored syrup remains highly sought-after among end users, accounting for 38% of revenue share: Fact.MR. Fruit Flavored Syrup Remains Highly Sought-After Among End Users, Accounting For 38% of Revenue Share: Fact.MR. Retrieved from https://www.prnewswire.com/news-releases/fruit-flavored-syrup-remains-highly-sought-after-among-end-users-accounting-for-38-of-revenue-share-factmr-301334691.html

Flavored Syrups Market Size, Share, Global Industry Report, 2019-2025. 2022. Flavored syrups market size, share: Global Industry Report, 2019-2025. Retrieved from https://www.grandviewresearch.com/industry-analysis/flavored-syrups-market

Future Market Insights. (2019). Flavored syrups market. Retrieved from https://www.futuremarketinsights.com/reports/flavored-syrups-market

Lazaya Preserved Fruits. 2017. Fruits in syrup delight the most demanding palates. Lazaya Preserved Fruits. Retrieved from https://www.lazayafruits.com/preserved-fruit/fruits-in-syrup

Love K, Paull RE. 2022. Soursop - CTAHR website. Retrieved from https://www.ctahr.hawaii.edu/oc/freepubs/pdf/F_N-22.pdf Peroxide value.

Newswire BCDN. 2022. Flavored syrups market growth statistics industry demand, share evaluation, prominent players strategies, size, SWOT analysis, forthcoming developments, upcoming investments. Digital Journal. Retrieved from https://www.digitaljournal.com/pr/flavored-syrups-market-growth-statistics-industry-demand-share-evaluation-prominent-players-strategies-size-swot-analysis-forthcoming-developments-upcoming-investments

Nolasco-González Y, Hernández-Fuentes LM, Montalvo González E. 2019. Caracterización morfológica y fisicoquímica de frutos de accesiones de guanábanas seleccionadas en Nayarit. https://doi.org/10.29312/remexca.voi23.2023

Quintana SE, Pardo A, Castellon S, Gonzalez-Cuello RE, Garcia-Zapateiro LA. 2018. Effect of blend of hydrocolloids and sugar concentration on the viscoelastic properties of soursop (*Annona muricata*) jam. Contemporary Engineering Sciences **11**(17), 815-824. Retrieved from https://doi.org/10.12988/ces.2018.8377

Rady I, Bloch MB, Chamcheu R-CN, Banang Mbeumi S, Anwar MR, Mohamed H, Babatunde AS, Kuiate J-R, Noubissi FK, El Sayed KA, Whitfield GK, Chamcheu JC. 2018. Anticancer properties of Graviola (*Annona muricata*): A comprehensive mechanistic review. Oxidative Medicine and Cellular Longevity. Retrieved from https://doi.org/10.1155/2018/1826170

Syrup Market Size, Share, Industry Analysis 2022-27. 2022. Syrup market size, share: Industry Analysis 2022-27. Retrieved from https://www.mordorintelligence.com/industry-reports/syrups-market#:~:text=Market%20Overview,halt%20and%20strict%20government%20restrictions.

Syrup market: Share, Size, Growth and Forecast 2022-2027. 2022. Syrup market: Global industry trends, share, size, growth, opportunity and forecast 2022-2027. Retrieved from https://www.imarcgroup.com/syrup-market

Vantage Market Research. 2022. Global flavored syrup market size to grow by USD 58.8 billion: Revenue forecast, company ranking, competitive landscape, growth factors, and trends: Vantage market research. GlobeNewswire News Room. Retrieved from https://www.globenewswire.com/en/news-release/2022/06/03/2456022/0/en/Global-Flavored-Syrup-Market-Size-to-Grow-by-USD-58-8-Billion-Revenue-Forecast-Company-Ranking-Competitive-Landscape-Growth-Factors-And-Trend