PLANT SCIENCE TODAY
ISSN 2348-1900 (online)
Vol x(x): xx–xx
https://doi.org/10.14719/pst.4481

HORIZON
e-Publishing Group
HePG

RESEARCH ARTICLE

Development and content analysis of Lubeg jelly

Evelyn B. Cristobal

Teacher Education Program, Isabela State University, San Mariano, Isabela 3332, Philippines

*Email: evelyncristobal101@gmail.com

OPEN ACCESS

ARTICLE HISTORY
Received: 28 July 2024
Accepted: 31 October 2024

Available online
Version 1.0 : 21 November 2024

Check for updates

Additional information

Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://horizonepublishing.com/journals/index.php/PST/open_access_policy

Publisher's Note: Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc
See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

CITE THIS ARTICLE

Cristobal E B. Development and content analysis of Lubeg jelly . Plant Science Today (Early Access). https://doi.org/10.14719/pst.4481

Abstract

Experiments were conducted to develop the Lubeg jelly flavored with honey, cinnamon, and vanilla, to determine its proximate and mineral analysis, and to evaluate the characteristics in terms of appearance, texture/consistency, flavor, and acceptability. Results showed that Lubeg jellies with added vanilla, honey, and cinnamon can enrich the proximate and nutritional composition of the products. During the organoleptic evaluation, the produced Lubeg jelly with vanilla flavor (Sample 4) was deemed to be the best in terms of appearance "dark red", texture/consistency "soft/well spreadable", flavor "sweet", and "like extremely" by the panel of thirty tasters. Lubeg jelly with vanilla taste is widely accepted, and scale production of the product might be a revenue-generating enterprise on campus as well as a possible source of extension's livelihood in the community.

Keywords

Acceptability; appearance; consistency; lubeg; jelly; flavor

Introduction

Fruits often include a high concentration of fiber, water, carbohydrates, and enzymes, and it has been suggested that eating fruits regularly and, in enough quantities, may help reduce the chance of developing cancer, cardiovascular disease, stroke, Alzheimer's disease, cataracts, and other conditions. They are also essential sources of vitamins, which are required in the diet of humans to activate the antibodies and battle illnesses that occur inside the body (1).

Processing fruits not only serves the purpose of preservation but also has several other purposes, such as diversification of the economy, reduction of imports and meeting exports demands, stimulation of agricultural production by obtaining marketable products, generation of employment, reduction of fruit and vegetable losses, and development of new value-added products that are available during off-seasons (2).

Raw fruits that may be eaten are used in the production of a variety of different types of jams, jellies, fruit bars, and marmalades. According to (3), the process of making jams, jellies, and marmalades from fruit involves heating the fruit (pieces, pulps, and/or juice) with sugars, a gelling agent (pectin), and edible or organic acids, and then concentrating the mixture until it reaches a distinctive and acceptable consistency.

Lubeg, also known as *Syzygium lineatum* (Roxb) Merr & Perry, is a species that is often found growing in the Northern Philippines. It is not very well recognized (4). The mature color of a Lubeg fruit may range from white

to red to purple. It is a berry fruit with a fragile peel, an oval shape, and just one seed per fruit. Additionally, it has a good amount of vitamin C and other antioxidants.

The vitamin C included in Lubeg fruit is beneficial in strengthening the immune system. According to (5), the antioxidants that are included in Lubeg fruits may help reduce the likelihood of developing cancer cells in the body. Many Lubeg trees are flourishing in Isabela State University, San Mariano, Philippines, and in the neighboring barangays, and they produce an abundance of fruits when the time is right. Unfortunately, these fruits are being disregarded and thrown away. The fruit in question may be processed, which is one of the factors that can be considered to raise its economic worth and to expose the community to the benefits of this item.

This study sought to make a jelly called Lubeg using vanilla, cinnamon, and honey as flavorings. Its proximate and mineral composition was investigated. Moreover, the study aimed to evaluate the characteristics of these samples, focusing on key attributes such as flavor, appearance, texture/consistency, and overall acceptability. The research was motivated by the nutritious value of the fruits. Furthermore, the study will compare these four samples based on their characteristics to determine any significant differences in their quality and consumer acceptance.

Materials and Methods

Ingredients

The proportion of ingredients used in the preparation of the four Lubeg jelly recipes is shown in Table 1.

Tools, utensils, and equipment used in the conduct of the study

The tools, utensils, and equipment used in the study are measuring cups, measuring spoons, basins, clean cheesecloth, sterilized bottles, a casserole, a wooden ladle, and a gas stove.

The preparation of the Lubeg fruits for extraction started during the harvesting, sorting/selecting sound fruits, washing, and extracting with the use of clean cheesecloth.

After the extraction, measure the Lubeg extract, for every two cups of Lubeg extract, add two cups of sugar and one tablespoon of calamansi juice for sample 1. Stir well to dissolve sugar and strain. Cook until small bubbles disappear and the big bubbles seem to jump out, or until a honey-like consistency is achieved. Remove particles on top and pour them into sterilized bottles.

The same process is used on the other samples (Sample 3 & 4) but with the addition of vanilla and cinnamon bark, respectively. In sample 2, honey is used as a substitute for sugar.

To assess the developed Lubeg jelly, a sensory evaluation was conducted using a 4-point Hedonic Scale Rating, and the determination of proximate and mineral analysis was conducted at the Department of Agriculture, RO2 Regional Food Technology and Incubation Center, Carig, Tuguegarao City, Cagayan (6–8). The 4-point Hedonic Scale is used to evaluate the Lubeg jelly sample's product quality in terms of appearance, texture, flavor, and acceptability. A rating of 1, "Dislike," indicates that the sample is unsatisfactory in one or more sensory attributes. A score of 2, "Slightly Like," suggests the sample is somewhat acceptable but may require improvements in areas such as appearance, texture, flavor, and acceptability. A rating of 3, "Moderately Like," reflects a generally enjoyable sample with good characteristics, though minor improvements might be needed. Finally, a score of 4, "Like Very Much," is reserved for samples that are excellent in all evaluated areas, with a well-balanced profile.

Data Analysis

The data was analyzed using the SPSS version 20. Frequency and percent were used to determine the respondent's profiles regarding sex, civil status, ethnicity, age, and highest educational attainment. Means and standard deviations were calculated to describe the four samples of Lubeg jelly in terms of appearance, texture/consistency, flavor, and acceptability.

The samples were analyzed through the Kjendahl Method-Semi-Automatic for crude protein, ANKOM Filter Bag Method for crude fiber & crude fat, gravimetric method for ash, and titrimetry method for calcium.

The mean scores are described in Table 2. One-way analysis of variance was run to test whether there were differences between the mean scores of the four samples when their appearance, texture/consistency, flavor, and acceptability were compared. The post hoc analysis using

Table 1. The proportion of ingredients used in processing the Lubeg jelly products.

Sample 1 (Control)	Sample 2	Sample 3	Sample 4
2 c. Lubeg extract	2 c. Lubeg extract	2 c. Lubeg extract	2 c. Lubeg extract
2 c. sugar	2 c. honey	2 c. sugar	2 c. sugar
1 T. calamansi juice	1 T. calamansi juice	1 T. calamansi juice	1 T. calamansi juice
		5 pcs. Cinnamon bark	2 T. vanilla

Table 2. Mean and standard deviations of Lubeg jelly.

Mean Score	Standard Deviation	Appearance	Texture/Consistency	Flavor	Acceptability
1.00 to 1.49	1.043	Pale Red	Tough, non-spreadable	Sour	Like Slightly
1.50 to 2.49	2.021	Light Red	Slightly soft/spreadable	Slightly Sweet	Like Moderately
2.50 to 3.49	0.432	Medium Red	Moderately soft/spreadable	Moderately Sweet	Like Much
3.50 to 4.00	0.196	Dark Red	Soft/Well-spreadable	Sweet	Like Extremely

Tukey HSD was set at 5%. Further, the effect sizes were gauged using Partial Eta Squared, which were interpreted based on the guidelines as follows: 0.01 was small; 0.06 was medium, while 0.14 was large.

Results and Discussion

The Lubeg jelly went through several stages of development, beginning with the harvesting of ripe and sound Lubeg fruits, followed by sorting, washing, and extracting the juice of the fruits with clean cheesecloth, measuring the ingredients, mixing, cooking the four samples of Lubeg jelly, labeling, and storing. During these stages of development, careful observation and analysis were carried out to produce Lubeg jelly with various flavors, such as Lubeg jelly plain, Lubeg jelly with honey, Lubeg jelly with cinnamon bark, and Lubeg jelly with vanilla.

Proximate and mineral analysis of Lubeg jelly sample

Table 3 presents the proximate and mineral analysis of four Lubeg jelly samples, with data from the Regional Food Chemical Analysis Laboratory, Department of Agriculture, Region 02, Tuguegarao City, Cagayan. The samples were analyzed for crude protein (Kjeldahl Method - Semi-Automatic), crude fiber and fat (ANKOM Filter Bag Method), ash content (gravimetric method), and calcium (titrimetry method).

The analysis shows that Lubeg jellies with vanilla and cinnamon have higher crude protein levels than the plain Lubeg jelly (control), which contains 0.19% protein. Lubeg jelly with cinnamon has the highest crude fiber content at 0.24%, compared to 0.23% in plain jelly. Lubeg jelly with honey has the highest crude fat (0.24%), followed by cinnamon (0.18%) and vanilla (0.16%) varieties. In terms of moisture, the honey variant is highest at 27.29%, followed by cinnamon (27.00%), plain (23.24%), and vanilla (22.29%). For ash content, both plain and honey jellies are highest at 0.21%, with the vanilla version at 0.17%. Regarding calcium, plain jelly has the highest content (0.35%), while both vanilla and honey jelly contain 0.25%.

The findings indicate that adding vanilla, honey, and cinnamon to Lubeg jelly influences its nutritional composition, enhancing certain nutrients. Specifically, Lubeg jelly with vanilla and cinnamon shows an increase in crude protein content compared to the plain version, suggesting that these added ingredients may contribute to protein enrichment. Lubeg jelly with cinnamon has the highest crude fiber content, which may appeal to consumers seeking added dietary fiber. The honey-infused jelly is notably higher in crude fat (0.24%), likely due to the natural fat content in honey, with cinnamon and vanilla versions following closely. This higher fat content could contribute to a richer texture and flavor profile.

Moisture content is highest in the honey variant (27.29%), followed by cinnamon (27.00%), indicating that honey and cinnamon may help retain more moisture in the jelly. This could improve the jelly's texture and shelf life. The plain Lubeg jelly and the honey variant both show higher ash content (0.21%), with vanilla slightly lower at 0.17%, suggesting that honey may add trace minerals that increase ash content. Interestingly, the plain jelly remains the highest in calcium content (0.35%), even though the vanilla and honey versions also offer a substantial 0.25% calcium.

These results show that enhancing Lubeg jelly with vanilla, honey, or cinnamon can significantly improve its nutritional profile, appealing to health-conscious consumers looking for products with higher protein, fiber, and moisture content. This aligns with previous studies indicating that fortifying fruit products with natural flavor enhancers not only improves taste but also boosts nutritional value (5, 11).

Descriptive assessment of the characteristics of the jellies

Table 4 reveals the descriptive assessment of the characteristics of jelly samples. It is said that appearance plays an important role in the quality of food, for it affects and influences man's judgment of the attributes of the product. The addition of vanilla flavor 'Sample 4' gave the highest score of 3.83, followed by cinnamon bark 'Sample 3' with a score of 3.70, which are both "dark red" color. Although the mean score in Sample 1 'Control' is comparable in mean rating with Sample 3 having 3.70, its color still fell under "dark red". It was noted, however, that Sample 2 obtained the lowest mean score of 3.26, a medium red color. This means that the use of honey as a sweetening agent and cinnamon bark gave an acceptable color to the jelly product.

The mean ratings for the texture/consistency of jelly showed that the mean scores of Samples 4 and 3 were statistically comparable, being 3.83 and 3.63 with an equivalent of "soft/well spreadable, followed by Sample 1 "Control" with a score of 3.43, and lastly, Sample 2 with a mean score of 3.23, both having an equivalent of "moderately soft/spreadable".

The flavor of the food reflects its aroma and taste, which may affect its acceptability (9). Jellies with vanilla flavor "Sample 4" got the highest score of 3.93 rated "sweet", followed by Sample 3 with cinnamon flavor rated

Table 3. Proximate and mineral analysis of Lubeg jelly samples.

Sample Description	Crude Protein	Crude Fiber	Crude Fat	Moisture	Ash	Calcium	Phosphorus
	%	%	%	%	%	%	%
Lubeg jelly (Plain)	0.18	0.23	0.15	23.24	0.21	0.35	0.00
Lubeg jelly w/ honey	0.19	0.22	0.24	27.29	0.21	0.25	0.00
Lubeg jelly w/ cinnamon	0.14	0.24	0.18	27.00	15.76	0.00	0.00
Lubeg jelly w/ vanilla	0.19	0.13	0.16	22.98	0.17	0.25	0.00

Table 4. Descriptive assessment of the characteristics of the jellies.

Criteria	Lubeg jelly	M	SD	Remark
Appearance	Sample1(Control)	3.56	0.5040	Dark Red
	Sample 2	3.26	0.7849	Medium Red
	Sample 3	3.70	0.5959	Dark Red
	Sample 4	3.83	0.4611	Dark Red
Texture/Consistency	Sample1(Control)	3.43	0.5683	Moderately Soft/Spreadable
	Sample 2	3.23	0.6260	Moderately Soft/Spreadable
	Sample 3	3.63	0.5560	Soft/Well Spreadable
	Sample 4	3.83	0.4611	Soft/Well Spreadable
Flavor	Sample1(Control)	3.40	0.6214	Moderately Sweet
	Sample 2	3.36	0.6149	Moderately Sweet
	Sample 3	3.53	0.5074	Sweet
	Sample 4	3.93	0.2537	Sweet
Acceptability	Sample1(Control)	3.43	0.5040	Like much
	Sample 2	3.16	0.6989	Like much
	Sample 3	3.60	0.5632	Like extremely
	Sample 4	3.96	0.1825	Like extremely

3.53 as “sweet”. The jellies in Sample 1 “Control” and Sample 2 had lower ratings of 3.40 and 3.36, respectively, having moderately sweet flavor. The result implies that vanilla is a deliciously used flavoring added to jellies, as evidenced by the evaluation of the 30 panelists. Lubeg has a distinct sweet-sour taste with bignay and strawberry when processed into jam. They appear red to dark red and have a sweet and little sour aroma flavor (10).

In terms of acceptability, Sample 4 was generally acceptable by the tasters, with 3.96 as the mean score, which corresponds to a qualitative description of “like extremely”. Followed by Sample 3 with a mean score of 3.60, “like extremely”. A comparison between Sample 1 and Sample 2 showed no variation “3.43 and 3.16 mean scores” with acceptability of “like much”. The results imply that the addition of vanilla in jellies is agreeable to the panel of tasters. In general, the panelists had the same evaluations on the acceptability of Lubeg jellies. It conforms to the study of (11) in the processing and preservation of dragon fruit jelly. In their study, samples with 1.5% pectin showed a higher score in color, flavor, turbidity, and overall acceptability.

Comparative assessment of the appearance of the jellies

Table 5 shows that there was a significant difference between the appearances of at least one pair of jelly samples, $F = 4.91$, $p < 0.01$. The magnitude of the difference was medium, eta squared = 11.26%. The post hoc analysis revealed (13) that Sample 3 and Sample 4 had a better appearance than Sample 2. On the other hand, the appearance of Sample 2 did not significantly differ from Sample 1, Sample 3, and Sample 4. As stated by (12), jelly quality is dependent on variety, physical properties like fruit weight, and biochemical properties like non-reducing sugars, acidity, pulp weight, and core weight.

Comparative assessment on the texture/consistency of the jellies

It reveals in Table 6 the comparative assessment of the texture/consistency of the four jellies. It shows that at least one pair of jelly samples had a different texture/consistency, $F = 6.47$, $p < 0.01$. The magnitude of their difference was large, eta squared = 14.33%. As indicated by the Tukey HSD analysis, Sample 4 had a higher texture/consistency rating compared to both Sample 1 and Sample 2, although its texture/consistency rating was not significantly different from Sample 3. The result of the study is not similar to the study conducted by (13).

Comparative assessment on the flavor of the jellies

Table 7 shows that there was at least one pair of jelly samples having different flavor ratings, $F = 7.48$, $p < 0.01$. Their difference was large, eta squared = 16.20%. The multiple comparisons using Tukey HSD reported that Sample 4 was sweeter than the other three samples. This implies that the addition of vanilla as a flavoring in Lubeg jellies can make the product more delicious and contribute to the sweetness of the product.

Comparative assessment on the acceptability of the jellies

Table 5. Comparative assessment on the appearance of the jellies.

Lubeg jelly	*M*	*SD*	*F* (3, 116)	*P*	*Eta Squared*
Sample 1(Control)	3.566^{ab}	0.5040	4.907^{**}	0.003	0.1126
Sample 2	3.266^{a}	0.7849			
Sample 3	3.700^{b}	0.5959			
Sample 4	3.833^{b}	0.4611			

Table 6. Comparative assessment on the texture/consistency of the jellies.

Lubeg jelly	*M*	*SD*	*F* (3, 116)	*P*	Eta Squared
Sample 1(Control)	3.43^{ab}	0.5683	6.468**	0.000	0.1433
Sample 2	3.23^{a}	0.6260			
Sample 3	3.63^{bc}	0.5560			
Sample 4	3.83^{c}	0.4611			

Table 7. Comparative assessment on the flavor of the jellies.

Lubeg jelly	*M*	*SD*	*F* (3, 116)	*P*	Eta Squared
Sample 1(Control)	3.40^{a}	0.6214	7.478**	0.000	0.1620
Sample 2	3.36^{a}	0.6149			
Sample 3	3.53^{a}	0.5074			
Sample 4	3.93^{b}	0.2537			

It reveals from Table 8 that the acceptability levels of the jelly samples were significantly and largely different, F = 12.31, p <0.01, eta squared = 24.14%. The conducted post hoc analysis highlighted that Sample 4 with vanilla flavor was the most acceptable while Sample 2 was the least acceptable. This suggests that vanilla can be used satisfactorily as a flavoring in the preparation of Lubeg jelly.

Conclusion

From the result of the study, it can be concluded that there is a good possibility for using vanilla as an added flavouring for the processing of Lubeg jelly. The panelists prefer the Lubeg jelly with vanilla flavor in terms of appearance, texture/consistency, flavor, and overall acceptability. The campus should undertake mass production of Lubeg jelly with a vanilla taste as part of its revenue-generating activity. Training and attendance at trade shows should be used to promote the produced product. Furthermore, Lubeg jelly with a vanilla flavor can be a viable source of income in the community. A similar study should be undertaken on the product's shelf life. The prospect of producing other Lubeg products should be investigated further.

Table 8. Comparative assessment on the acceptability of the jellies.

Lubeg jelly	*M*	*SD*	*F* (3, 116)	*P*	Eta Squared
Sample 1(Control)	3.43^{ab}	0.5040	12.31**	0.000	0.2414
Sample 2	3.16^{a}	0.6989			
Sample 3	3.60^{b}	0.5632			
Sample 4	3.96^{c}	0.1825			

AI Declaration

During the preparation of this work, the author used ChatGPT to improve language and readability. After using this tool/service, the author reviewed and edited the content as needed and took full responsibility for the content of the publication.

Acknowledgements

The author would like to acknowledge the Isabela State University, San Mariano Campus for the support on this endeavour.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None.

References

1. Silva-Espinoza MA, García-Martínez E, Martínez-Navarrete N. Protective capacity of gum Arabic, maltodextrin, different starches and fibers on the bioactive compounds and antioxidant activity of an orange puree (*Citrus sinensis* (L.) Osbeck) against freeze-drying and *in vitro* digestion. Food Chem [Internet]. 2021 Sep;357:129724. https://linkinghub.elsevier.com/retrieve/pii/S0308814621007305
2. Babajanian B. Promoting empowerment? The World Bank's Village Investment Project in Kyrgyzstan. Centr Asian Surv [Internet]. 2015 Oct 2;34(4):499-515. http://www.tandfonline.com/doi/full/10.1080/02634937.2015.1095967
3. Dos Santos Oliveira MO, Dias BB, Pires CRF, Freitas BCB, de Aguiar AO, da Silva JFM, et al. Development of Araticum (*Annona crassiflora* Mart.) jams: evaluation of physical, microbiological and sensorial stability in different packages. J Food Sci Technol [Internet]. 2022 Sep 18;59(9):3399-407. https://link.springer.com/10.1007/s13197-021-05323-x
4. Columna NT. Morphological characterization and chemical composition of Lubeg (Philippine Cherry). JBES. 2019;15:27-30.
5. Baua MA. Development and content analysis of Lubeg (*Syzygium lineatum*). Plant Sci Today [Internet]. 2024 Feb 17; https://horizonepublishing.com/journals/index.php/PST/article/view/2351
6. Mutlu C, Tontul SA, Erbaş M. Production of a minimally processed jelly candy for children using honey instead of sugar. LWT [Internet]. 2018 Jul;93:499-505. https://linkinghub.elsevier.com/retrieve/pii/S0023643818302883

7. Yeasmin F, Khan MJ, Riad MH. Evaluation of quality characteristics and storage stability of mixed fruit jam. Rana MS, editor. Food Res [Internet]. 2020 Dec 27;5(1):225-31. https://www.myfoodresearch.com/uploads/8/4/8/5/84855864/_28__fr-2020-365_rana.pdf

8. Darwish A, Abd El-Wahed A, Shehata M, El-Seedi H, Masry S, Khalifa S, et al. Chemical profiling and nutritional evaluation of bee pollen, bee bread and royal jelly and their role in functional fermented dairy products. Molecules [Internet]. 2022 Dec 27;28 (1):227. https://www.mdpi.com/1420-3049/28/1/227

9. Viviane DNR, Malik PA, Germaine Y, Michelle D. Nutritional characterisation of a Canistel (*Pouteria campechiana*) nectar. Asian J Sci Technol. 2021;12(7):11781-86.

10. Ocampo R, Usita NP. Development of Lubeg (*Syzygium lineatum* (Roxb.) Merr & Perry) processed products. Asia Pacific J Multidiscip Res. 2015;3(4).

11. Islam M, Khan M, Hoque M, Rahman M. Studies on the processing and preservation of Dragon fruit (*Hylocereus undatus*) jelly. Agric [Internet]. 2012 Dec 25;10(2):29-35. https://www.banglajol.info/index.php/AGRIC/article/view/13139

12. Srikanth V, Rajesh GK, Kothakota A, Pandiselvam R, Sagarika N, Manikantan M, et al. Modeling and optimization of developed cocoa beans extractor parameters using box behnken design and artificial neural network. Comput Electron Agric. 2020; https://doi.org/10.1016/j.compag.2020.105715

13. Moon HK, Lee SW, Moon JN, Yoon SJ, Lee S, Kim GY. Quality characteristics of jelly added with mulberry juice. Korean J Food Cook Sci [Internet]. 2012 Dec 31;28(6):797-804. http://koreascience.or.kr/journal/view.jsp?kj=HJRGB8&py=2012&vnc=v28n6&sp=797