



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

# IJDR

International Journal of Development Research

Vol. 14, Issue, 04, pp. 65430-65434, April, 2024

<https://doi.org/10.37118/ijdr.27843.04.2024>



RESEARCH ARTICLE

OPEN ACCESS

## SENSORY ANALYSIS AND ACCEPTABILITY OF VITEX NEGUNDO L. GUMMIES

\*Belarmino Harold B., Buraga Erickson P., De Leon Jomari C., Elimanco Aldrin John P., Masa Jan Racky A. and Palacol John Carlo B.

LPU-Laguna, Philippines

### ARTICLE INFO

#### Article History:

Received 11<sup>th</sup> January, 2024  
Received in revised form  
19<sup>th</sup> February, 2024  
Accepted 24<sup>th</sup> March, 2024  
Published online 30<sup>th</sup> April, 2024

#### Key Words:

Vitex Negundo L., Functional Gummies, Gelling Agent, Honey Sweetener, Gummies

#### \*Corresponding author:

Belarmino Harold B.,

### ABSTRACT

Candy is a popular treat for all ages and genders, with gummies being a well-known category known for their translucent, gel-like texture achieved through various ingredients. Concerns about high sugar and synthetic components in traditional gummies have led to research on healthier alternatives like honey-infused functional gummies, aligning with the health-conscious consumer trend. This study focuses on creating functional gummies flavored with Vitex Negundo L. and sweetened with honey, addressing the importance of consumer acceptance through sensory evaluation. Confectionery manufacturers aiming to cater to evolving consumer preferences by using natural ingredients may benefit from this study. The findings suggest that Vitex Negundo L. has potential as a natural component for appealing Lagundi-flavored gummies, with color playing a significant role in sensory appeal. Consumers prefer gummies with a touch of honey-induced sweetness, emphasizing the importance of sensory aspects in product development. The results indicate that gummies containing Vitex Negundo have potential due to improved color, aroma, and taste. To maximize the product's appeal, targeting the right market and combining microbiological analysis and palatability assessment is crucial. This study highlights the versatility of Vitex Negundo L. as an ingredient, extending its use beyond traditional medicine, potentially appealing to health-conscious individuals and nutrition-focused women.

Copyright©2024, Belarmino Harold B et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Belarmino Harold B., Buraga Erickson P., De Leon Jomari C., Elimanco Aldrin John P., Masa Jan Racky A. and Palacol John Carlo B. 2024. "Sensory analysis and acceptability of Vitex Negundo l. gummies". International Journal of Development Research, 14, (04), 65430-65434.

## INTRODUCTION

Candy is highly popular with all ages and all genders (Egunjobi, 2021). Candies can be classified namely as hard candy and chewy candy. Jelly candy or gummies belong to chewy candy which is made from water or contains juice and a gel-like forming structure that looks translucent with a texture and elasticity, it is incorporated with gelling agents, acids, fragrance, and food colorants (Hidayati & Pereira, 2017; Teixeira-Lemos et al., 2021). It is widely consumed due to its chewable texture and sweetness. However, excessive intake of gummies has been reported that it could have a negative impact on human health due to having high amounts of sugar and food additives, including also the non-desirable compounds produced by the heat treatment (Cano-Lamadrid et al., 2020; de Moura et al., 2019). With this, replacing sugar with other types of sweetener products such as honey could be a healthier alternative in the production of gummies (Mutlu et al., 2018). Functional gummies are a kind of candy that is new. It is made with natural ingredients without added sugar, which labels them a healthy alternative to the traditional gummies available (Marwa, 2022). Consumers are increasingly engaging in foods with functional properties that are good for the body and support a healthy lifestyle, with this confectionary market influences to improve and enhance their products with ingredients to better satisfy consumer demands (Yadav et al., 2021). Several studies established that the production of gummies with added healthier ingredients is accepted as an engaging,

palatable, and healthier alternative rather than the available gummies in the market (Achumi et al., 2018; Gaytos et al., 2019; Guine et al., 2018; Rivero et al., 2020; Teixeira-Lemos et al., 2021). Taking this into account, this study aims to develop functional gummies made with Vitex Negundo L. as flavor and honey as the type of sweetener. Acceptance of consumers is the central key in food development with this, a sensory evaluation will be accomplished to allow concluding the possibility of acceptance of this innovative product. The results could be useful for other confectionary companies producing and selling gummies to improve and take into consideration using natural ingredients to meet consumer demands.

## METHODOLOGY

This study utilized a true experimental research design, combining laboratory analysis with sensory acceptability evaluations during the development of Vitex Negundo L. gummy bears. The controlled variables were honey and water, while the manipulated variables involved the Vitex Negundo L. extract. A trial-and-error approach was employed to determine the appropriate ingredient quantities, desired texture, and flavor of the gummies. To assess the acceptability of different formulations, a 9-point Hedonic scale was used with subjects aged 18 and above who resided in various locations in Laguna. The sensory panelists were required to be in good physical health without allergies, taste or smell impairments, or medications

affecting bodily functions. The sample size included 136 respondents, selected based on specific parameters and health criteria, ensuring their suitability for participation in the study. This research employs two data gathering methods: Primary Data Gathering Method, including surveys and taste tests, and Secondary Data Gathering Method, involving existing data and sources.

Data analysis involves a sample size of 136, using a 0.10 alpha error, 0.90 power, and a 0.30 effect size. Microbiological and sensory tests will be conducted for product development. Statistical tools, such as frequency/percentage, Kolmogorov-Smirnov Test, and ANOVA, will be employed to assess demographic profiles and significant differences based on hedonic scale results. Microbiological analysis will be conducted with the assistance of the Lipa Quality Control Center.

## RESULTS AND DISCUSSION

In Figure 15, three different Vitex Negundo L. flavor gummy bear formulas were evaluated. Formula C was the top choice in terms of appearance, with an average score of 8.04, while Formula A scored lower at 7.85. This preference for Formula C aligns with the importance of color in sensory evaluation, as found by Hidayati& Pereira (2017). For smell, the three formulas had no significant difference, with Formula B scoring the highest at 5.99 and Formula A scoring the lowest at 5.79. Subjects preferred the aroma of Formula B, consistent with Maina's insights (2018) on smell and food edibility. In terms of texture, subjects favored Formula B, scoring 7.76, while Formula A received the lowest score at 7.68. Texture is crucial in sensory evaluation, with subjects valuing the firmness and chewability of Formula B, in line with Mahat et al.'s findings (2020). Taste is a critical factor for overall acceptability, with Formula C being the top choice at 7.79, and Formula A scoring the lowest at 7.49. Taste is typically prioritized in food evaluation, as noted by Byrne and An (2020). As indicated in Table 1, the majority of participants fell into the Gen Z category (ages 18-22), comprising 48.5% of the total, followed by Millennials (ages 23-41) at 38.2%. Gen X (ages 42-57) made up 11.8% of the participants, while only 1.5% belonged to the Boomer generation (ages 59-97). The study required that participants met certain criteria, such as not taking medications and having no allergies, ageusia, color blindness, or anosmia. Individuals with comorbidities were excluded. Table 2 shows the frequency and percent distribution of the respondents'



Primary data is gathered through a letter of intent submitted to the College of International Tourism and Hospitality Management, ensuring clear and controlled information collection. Secondary data is sourced from articles, books, and internet food statistics, providing comprehensive product information. In terms of ethics, subjects are informed about the research process, and their consent is obtained through a letter that explains the study's objectives and confidentiality of their data. Participants have the right to withdraw at any time.

**Table 1. Demographic Profile in terms of Age**

Age group	Frequency	Percent	Rank
Gen Z (18-22)	66	48.5	1
Millennials (23-41)	52	38.2	2
Gen X (42-57)	16	11.8	3
Boomers (59-97)	2	1.5	4

**Table 2. Demographic profile in terms of gender**

Sex	Frequency	Percent
Male	71	52.2
Female	65	47.8
Total	136	100

**Table 3. Preferred formulation**

Preference	Frequency	Percent
Formula A (501)	56	41.2
Formula B (702)	35	25.7
Formula C (903)	45	33.1
Total	136	100

**Table 4. Preferred Formulation in terms of Age Group**

Age Group	Sample 501		Sample 702		Sample 903	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gen Z (18-22)	25	18.4	14	10.3	27	19.9
Millennials (23-41)	23	16.9	15	11.0	14	10.3
Gen X (42-57)	7	5.1	5	3.7	4	2.9
Boomers (58-97)	1	0.7	1	0.7	0	0
Total	56	41.2	35	25.7	45	33.1

profiles in terms of sex. Most of the participants in the study were male with a total number of 71 (52.2%). On the other hand, there were 65 female respondents (47.8%). In total, 136 individuals participated in the experimental research on Vitex Negundo L. flavor of gummy bears. The majority of the respondents were men. As shown in Table 2, more male participants agreed to be part of the study than females. Nevertheless, (Livingstone et al., 2020), in a related study, found that more females preferred nutritional value over other elements. Thus, the researchers could not verify the stated conclusion as the current study has more male respondents. The table illustrates the preferences of respondents for Vitex Negundo L. Flavor Gummy bears. Formula A (501) was the most preferred, with 41.2% of respondents favoring it, followed by Formula C (903) at 33.1%, and Formula B (702) at 25.7%. In this sensory evaluation, Formula A (501) was the top choice, indicating that it was well-received across all four senses. Appearance and taste are crucial factors in food preference. Table 4 displays the preferred Vitex Negundo gummy bear formulations among different age groups. Among Gen Z (18-22 years old), the majority (19.9%) preferred sample 903, followed by (18.4%) who preferred sample 501, while a lower percentage (10.3%) favored sample 702. In the Millennial group (23-41 years old), (16.9%) preferred sample 501, followed by (11%) who preferred sample 702, with (10.3%) indicating a preference for sample 903. For the Gen X group (42-57 years old), (5.1%) favored sample 501, (3.7%) preferred sample 702, and (2.9%) chose sample 903 as their preferred formulation. Among the Boomer group (58-97 years old), the preferences for sample 501 and sample 702 were the same at (0.7%), while none of the respondents from this age group preferred sample 903.

## REFERENCES

- Achumi, L. v., Shanta Peter, E., Das, A., & Lovito Achumi, C. v. (2018). Studies on preparation of gummy candy using pineapple juice and carrot juice. ~ 1015 ~ *International Journal of Chemical Studies*, 6(5).
- Adams, A. (2022, September 15). *What Is Agar-Agar?* <https://www.thespruceeats.com/what-is-agar-agar-p2-1000960>
- Alegado-Bagaosian, D. M., Castro, M. C. R., & Purificacion, J. M. (2020a). A Systematic Review on Vitex negundo (NIRPROMP formulations) for the Treatment of Acute Cough of Mild to Moderate Severity in Pediatric Patients. *Acta Medica Philippina*, 54(1), 36–43. <https://doi.org/10.47895/AMP.V54I1.1096>
- Alegado-Bagaosian, D. M., Castro, M. C. R., & Purificacion, J. M. (2020b). A Systematic Review on Vitex negundo (NIRPROMP formulations) for the Treatment of Acute Cough of Mild to Moderate Severity in Pediatric Patients. *Acta Medica Philippina*, 54(1), 36–43. <https://doi.org/10.47895/AMP.V54I1.1096>
- Ambika, S., & Sundrarajan, M. (2016). Green biosynthesis of ZnO nanoparticles using Vitex negundo L. extract: Spectroscopic investigation of interaction between ZnO nanoparticles and human serum albumin. *Journal of Photochemistry and Photobiology B: Biology*, 149(1), 143–148. <https://doi.org/10.1016/J.JPHOTOBIO.2015.05.004>
- Bandyopadhyay, A., & Guha, A. (2017, March). (PDF) *Demographic Profile of a Munda village in Sundarban, West Bengal*. [https://www.researchgate.net/publication/319087771\\_Demographic\\_Profile\\_of\\_a\\_Munda\\_village\\_in\\_Sundarban\\_West\\_Bengal](https://www.researchgate.net/publication/319087771_Demographic_Profile_of_a_Munda_village_in_Sundarban_West_Bengal)
- Besarab, A., & Hemmerich, S. (2018). Iron-Deficiency Anemia. *Management of Anemia*, 11–29. [https://doi.org/10.1007/978-1-4939-7360-6\\_2](https://doi.org/10.1007/978-1-4939-7360-6_2)
- Britannica. (2021, September 1). *honey*. <https://www.britannica.com/topic/honey>
- Butler, N. (2018, August 14). *Calcium: 8 Fast Facts You Should Know*. [https://www.healthline.com/health/8-fast-facts-about-calcium#TOC\\_TITLE\\_HDR\\_1](https://www.healthline.com/health/8-fast-facts-about-calcium#TOC_TITLE_HDR_1)
- Byrne, D., & An, C. (2020, December). (PDF) *Consumer Preference and Acceptance of Food Products*. [https://www.researchgate.net/publication/346677307\\_Consumer\\_Preference\\_and\\_Acceptance\\_of\\_Food\\_Products](https://www.researchgate.net/publication/346677307_Consumer_Preference_and_Acceptance_of_Food_Products)
- Cano-Lamadrid, M., Calín-Sánchez, Á., Clemente-Villalba, J., Hernández, F., Carbonell-Barrachina, Á. A., Sendra, E., & Wojdyło, A. (2020). Quality Parameters and Consumer Acceptance of Jelly Candies Based on Pomegranate Juice “Mollar de Elche.” *Foods* 2020, Vol. 9, Page 516, 9(4), 516. <https://doi.org/10.3390/FOODS9040516>
- Cha, M. J., & Lee, J. H. (2018). Quality and antioxidant properties of jelly incorporated with corn concentrate. *Korean Journal of Food Preservation*, 25(4), 436–440. <https://doi.org/10.11002/KJFP.2018.25.4.436>
- Čižauskaite, U., Jakubaityte, G., Žitkevičius, V., & Kasparavičienė, G. (2019). Natural Ingredients-Based Gummy Bear Composition Designed According to Texture Analysis and Sensory Evaluation In Vivo. *Molecules*, 24(7). <https://doi.org/10.3390/MOLECULES24071442>
- Cleave, P. (2020, December 1). *Why Ask For Survey Respondents' Age? - SmartSurvey*. <https://www.smartsurvey.co.uk/blog/why-ask-for-survey-respondents-age>
- Dass, K. (2021). *Staying Hydrated When You're Sick | Theraflu*. <https://www.theraflu.com/treating-cold-flu/why-drink-fluids-when-sick/>
- de Moura, S. C. S. R., Berling, C. L., Garcia, A. O., Queiroz, M. B., Alvim, I. D., & Hubinger, M. D. (2019). Release of anthocyanins from the hibiscus extract encapsulated by ionic gelation and application of microparticles in jelly candy. *Food Research International*, 121, 542–552. <https://doi.org/10.1016/J.FOODRES.2018.12.010>
- Denayer, S., Delbrassinne, L., Nia, Y., & Botteldoorn, N. (2017). *Food-Borne Outbreak Investigation and Molecular Typing: High Diversity of Staphylococcus aureus Strains and Importance of Toxin Detection*. <https://doi.org/10.3390/toxins9120407>
- Diep, C. (2022, January 21). • *Japan: gummy candy consumption frequency 2017 | Statista*. <https://www.statista.com/statistics/860409/japan-gummy-candy-consumption-frequency/>
- Ding, T., Suo, Y., Xiang, Q., Zhao, X., Chen, S., Ye, X., & Liu, D. (2017). Significance of Viable but Nonculturable Escherichia coli: Induction, Detection, and Control. *J. Microbiol. Biotechnol.*, 27(3), 417–428. <https://doi.org/10.4014/JMB.1609.09063>
- DOH. (2004, September 16). *Guidelines on the Registration of Herbal Medicines*. [https://www.fda.gov.ph/wp-content/uploads/2021/04/Administrative-Order-No.-172-s-2004.pdf?fbclid=IwAR2ZdMXsNyPfvbAeaxbNYsDZrRq4\\_mjI32DEiKKWIR-YNTmuDU9rFmQ6wzq](https://www.fda.gov.ph/wp-content/uploads/2021/04/Administrative-Order-No.-172-s-2004.pdf?fbclid=IwAR2ZdMXsNyPfvbAeaxbNYsDZrRq4_mjI32DEiKKWIR-YNTmuDU9rFmQ6wzq)
- DOST. (2021, November 30). *www.dost.gov.ph - Lagundi and VCO studies show encouraging results against COVID*. <https://www.dost.gov.ph/knowledge-resources/news/72-2021-news/2573-lagundi-and-vco-studies-show-encouraging-results-against-covid.html>
- Egunjobi, J. P. (2021, June). (PDF) *Candy Consumption - An Inquiry on the Candy Crush Hypothesis*. [https://www.researchgate.net/publication/353806708\\_Candy\\_Consumption\\_-\\_An\\_Inquiry\\_on\\_the\\_Candy\\_Crush\\_Hypothesis](https://www.researchgate.net/publication/353806708_Candy_Consumption_-_An_Inquiry_on_the_Candy_Crush_Hypothesis)
- Ehuwa, O., Jaiswal, A. K., & Jaiswal, S. (2021). Salmonella, Food Safety and Food Handling Practices. *Foods*, 10(5). <https://doi.org/10.3390/FOODS10050907>
- Ekici, G., & Dümen, E. (2019). Escherichia coli and Food Safety. *The Universe of Escherichia Coli [Working Title]*. <https://doi.org/10.5772/INTECHOPEN.82375>
- Fiorentini, M., Kinchla, A. J., & Nolden, A. A. (2020). Role of Sensory Evaluation in Consumer Acceptance of Plant-Based Meat Analogs and Meat Extenders: A Scoping Review. *Foods* 2020, Vol. 9, Page 1334, 9(9), 1334. <https://doi.org/10.3390/FOODS9091334>
- Gabriel, A. A., Fernandez, C. P., & Tiangson-Bayaga, C. L. P. (2005). Consumer acceptance of Philippine orange drink as an iron-fortified beverage for filipino women. *Food Science and Technology Research*, 11(3), 269–277. <https://doi.org/10.3136/FSTR.11.269>
- Gayton, C. E. G., Abalorio, J., Lavilla, I., & Abalorio, L. (2019). Acceptability of Bilimbi (Averrhoa Bilimbi) Candy. *SSRN Electronic Journal*. <https://doi.org/10.2139/SSRN.3432417>
- Gioele, C., Marilena, S., Valbona, A., Nunziacarla, S., Andrea, S., & Antonio, M. (2017). *Gracilariagracilis*, Source of Agar: A Short

- Review. *Current Organic Chemistry*, 21(5), 380–386. <https://doi.org/10.2174/1385272820666161017164605>
- Giorgi, G. (2019). *Lagundi - Arca del Gusto - Slow Food Foundation*. <https://www.fondazioneSlowFood.com/en/ark-of-taste-slow-food/lagundi/?fbclid=IwAR0GLZ3ZCHVHAHMvFHMdwWSAiBiOiw6T-tB3v8li5kgtJpJRjYIPYN3LuLc>
- Graboski, A. M., Ballen, S. C., Manzoli, A., Shimizu, F. M., Zakrzewski, C. A., Steffens, J., & Steffens, C. (2018). Array of Different Polyaniline-Based Sensors for Detection of Volatile Compounds in Gummy Candy. *Food Analytical Methods*, 11(1), 77–87. <https://doi.org/10.1007/S12161-017-0977-0>
- Guine, R. P. F., Correia, P. M. R., & Florenca, S. G. (2018, October). (PDF) DEVELOPMENT OF JELLY GUMS WITH FRUITS AND HERBS: COLOUR AND SENSORY EVALUATION. [https://www.researchgate.net/publication/328225431\\_DEVELOPMENT\\_OF\\_JELLY\\_GUMS\\_WITH\\_FRUITS\\_AND\\_HERBS\\_COLOUR\\_AND\\_SENSORY\\_EVALUATION](https://www.researchgate.net/publication/328225431_DEVELOPMENT_OF_JELLY_GUMS_WITH_FRUITS_AND_HERBS_COLOUR_AND_SENSORY_EVALUATION)
- Harvard. (2020, March 25). *How much water should you drink? - Harvard Health*. <https://www.health.harvard.edu/staying-healthy/how-much-water-should-you-drink>
- Hidayati, L., & Pereira, O. C. (2017). *The Quality Evaluation Of Bilimbi Jelly Candy*. 112, 89–92. <https://doi.org/10.2991/ICONHOMECS-17.2018.21>
- Húngaro, H. M., Peña, W. E. L., Silva, N. B. M., Carvalho, R. v., Alvarenga, V. O., & Sant'Ana, A. S. (2018). Food Microbiology. *Encyclopedia of Agriculture and Food Systems*, 213–231. <https://doi.org/10.1016/B978-0-444-52512-3.00059-0>
- Ibrahim, M. (2018, November). (PDF) Analysis of heavy metals and mineral elements in Morinda tinctoria Roxb. Vitex negundo L. and Elicostema littorale Blume. Leaves extracts: A traditional wound healing plants. [https://www.researchgate.net/publication/329175372\\_Analysis\\_of\\_heavy\\_metals\\_and\\_mineral\\_elements\\_in\\_Morinda\\_tinctoria\\_Roxb\\_Vitex\\_negundo\\_L\\_and\\_Elicostema\\_littorale\\_Blume\\_Leaves\\_extract\\_A\\_traditional\\_wound\\_healing\\_plants](https://www.researchgate.net/publication/329175372_Analysis_of_heavy_metals_and_mineral_elements_in_Morinda_tinctoria_Roxb_Vitex_negundo_L_and_Elicostema_littorale_Blume_Leaves_extract_A_traditional_wound_healing_plants)
- Idrus, R. B. H., Sainik, N. Q. A. V., Nordin, A., bin Saim, A., & Sulaiman, N. (2020). Cardioprotective Effects of Honey and Its Constituent: An Evidence-Based Review of Laboratory Studies and Clinical Trials. *International Journal of Environmental Research and Public Health*, 17(10). <https://doi.org/10.3390/IJERPH17103613>
- Iliades, C. (2018, March 13). *The Science of Taste – Food Insight*. [https://foodinsight.org/the-science-of-taste/?fbclid=IwAR1u\\_vmtYA9Ag0YVicGAR3Ui8SAvAyc7k3X7m504cl8X3Q8J9MuFtgNE\\_Qk](https://foodinsight.org/the-science-of-taste/?fbclid=IwAR1u_vmtYA9Ag0YVicGAR3Ui8SAvAyc7k3X7m504cl8X3Q8J9MuFtgNE_Qk)
- Koirala, N., Dhakal, C., Munankarmi, N. N., Ali, S. W., Arif, A. M., Hanif, M. S., Basnyat, R. C., & Salehi, B. (2020, June 25). *Vitex negundo Linn.: phytochemical composition, nutritional analysis, and antioxidant and antimicrobial activity - PubMed*. <https://pubmed.ncbi.nlm.nih.gov/32583767/>
- Livingstone, K. M., Lamb, K. E., Abbott, G., Worsley, T., & McNaughton, S. A. (2020). Ranking of meal preferences and interactions with demographic characteristics: a discrete choice experiment in young adults. *International Journal of Behavioral Nutrition and Physical Activity*, 17(1), 1–12. <https://doi.org/10.1186/S12966-020-01059-7/FIGURES/2>
- Mahat, M. M., Sabere, A. S. M., Shafiee, S., 'Arifin, Nawawi, M. A., Hamzah, H. H., Jamil, M. A. F. M., Roslan, N. C., Halim, M. I. A., & Safian, M. F. (2020a). *The Sensory Evaluation and Mechanical Properties of Functional Gummy in the Malaysian Market*. <https://doi.org/10.20944/PREPRINTS202010.0213.V1>
- Mahat, M. M., Sabere, A. S. M., Shafiee, S., 'Arifin, Nawawi, M. A., Hamzah, H. H., Jamil, M. A. F. M., Roslan, N. C., Halim, M. I. A., & Safian, M. F. (2020b). *The Sensory Evaluation and Mechanical Properties of Functional Gummy in the Malaysian Market*. <https://doi.org/10.20944/PREPRINTS202010.0213.V1>
- Maina, J. W. (2018, April 15). *Analysis of the factors that determine food acceptability*. The Pharma Innovation Journal. <https://www.thepharmajournal.com/archives/2018/vol7issue5/Par7D/7-4-84-339.pdf>
- Marshall, J. B. (10 C.E., Summer). *8 Fun Facts About Gummies | Mental Floss*. 2021. <https://www.mentalfloss.com/article/53251/8-fun-facts-about-gummies?fbclid=IwAR0XpvkHfeLOirNLNa3RNLMMQ1nwkJ-QvxFV1XZaa85GuLlshstewLSAD8>
- Marwa, S. (2022, July 18). *Are Functional Gummies market the Future of Nutrition? - EIN Presswire*. [https://www.einnews.com/pr\\_news/581767140/are-functional-gummies-market-the-future-of-nutrition](https://www.einnews.com/pr_news/581767140/are-functional-gummies-market-the-future-of-nutrition)
- Microbiological Guidelines for food. (2014). *Microbiological Guidelines for Food*.
- Mihafu, F. D., Issa, J. Y., & Kamiyango, M. W. (2020). Implication of sensory evaluation and quality assessment in food product development: A review. *Current Research in Nutrition and Food Science*, 8(3), 690–702. <https://doi.org/10.12944/CRNFSJ.8.3.03>
- Morais Ferreira, J. M., Azevedo, B. M., Luccas, V., & Bolini, H. M. A. (2017). Sensory Profile and Consumer Acceptability of Prebiotic White Chocolate with Sucrose Substitutes and the Addition of Goji Berry (Lyciumbarbarum). *Journal of Food Science*, 82(3), 818–824. <https://doi.org/10.1111/1750-3841.13632>
- Mutlu, C., Tontul, S. A., & Erbaş, M. (2018). Production of a minimally processed jelly candy for children using honey instead of sugar. *LWT*, 93, 499–505. <https://doi.org/10.1016/J.LWT.2018.03.064>
- Naveed, A. (2022, January 31). *How To Use Agar-Agar Powder? – Recette Magazine*. <https://blog.suvie.com/how-to-use-agar-agar-powder/?fbclid=IwAR2tbWerNW9pcWffdkXuhjS6gyq-F11962D5AGW7ibfz54w15-pF3JtU6cU>
- Newman, T. (2020, January 28). *Calcium: Health benefits, foods, and deficiency*. <https://www.medicalnewstoday.com/articles/248958>
- Nordqvist, J. (2021, January 27). *Zinc: Benefits, intake, sources, deficiency, and side effects*. [https://www.medicalnewstoday.com/articles/263176#\\_noHeaderPrefixedContent](https://www.medicalnewstoday.com/articles/263176#_noHeaderPrefixedContent)
- O'donnell, K., & Parrish, C. R. (2020). Copper Deficiency: Like a Bad Penny. *Practical Gastroenterology*.
- Paniel, N., & Noguer, T. (2019). Detection of Salmonella in Food Matrices, from Conventional Methods to Recent Aptamer-Sensing Technologies. *Foods 2019, Vol. 8, Page 371, 8(9)*, 371. <https://doi.org/10.3390/FOODS8090371>
- Park, J. Y., & Seo, K. S. (2022). Staphylococcus Aureus. *Food Microbiology: Fundamentals and Frontiers*, 555–584. <https://doi.org/10.1128/9781555819972.ch21>
- Petre, A. (2019, February 5). *Can You Eat Honeycomb? Benefits, Uses, and Dangers*. <https://www.healthline.com/nutrition/raw-honeycomb>
- Pires, S. M., Majowicz, S., Gill, A., & Devleeschauwer, B. (2019). Global and regional source attribution of Shiga toxin-producing Escherichia coli infections using analysis of outbreak surveillance data. *Epidemiology and Infection*, 147. <https://doi.org/10.1017/S095026881900116X>
- Porretta, S. (2021). Chapter 1 Food Development: The Sensory & Consumer Approach. *Consumer-Based New Product Development for the Food Industry*, 1–20. <https://doi.org/10.1039/9781839163333-00001>
- Raman, R. (2017, September 9). *What Does Potassium Do for Your Body? A Detailed Review*. <https://www.healthline.com/nutrition/what-does-potassium-do>
- Rivero, R., Archaina, D., Sosa, N., Leiva, G., Baldi Coronel, B., & Schebor, C. (2020). Development of healthy gummy jellies containing honey and propolis. *Journal of the Science of Food and Agriculture*, 100(3), 1030–1037. <https://doi.org/10.1002/JJFA.10107>
- Ross, C. F. (2021). Considerations of the use of the electronic tongue in sensory science. *Current Opinion in Food Science*, 40, 87–93. <https://doi.org/10.1016/J.COFS.2021.01.011>
- Rustagi, S. (2020). Food Texture and Its Perception, Acceptance and Evaluation. *Biosciences Biotechnology Research Asia*, 17(03), 651–658. <https://doi.org/10.13005/BBRA/2869>
- Sagan, D. (2022, January 27). *life | Definition, Origin, Evolution, Diversity, & Facts | Britannica*. <https://www.britannica.com/science/life>
- Sharif, M. K., Butt, M. S., Sharif, H. R., & Nasir, M. (2017, October). (PDF) *Sensory Evaluation and Consumer Acceptability*.

- [https://www.researchgate.net/publication/320466080\\_Sensory\\_Evaluation\\_and\\_Consumer\\_Acceptability](https://www.researchgate.net/publication/320466080_Sensory_Evaluation_and_Consumer_Acceptability)
- Shoemaker, S. (2021, November). 7 *Unique Health Benefits of Honey*. [https://www.healthline.com/nutrition/benefits-of-honey#TOC\\_TITLE\\_HDR\\_10](https://www.healthline.com/nutrition/benefits-of-honey#TOC_TITLE_HDR_10)
- Singh-Ackbarali, D., & Maharaj, R. (2018). Sensory Evaluation as a Tool in Determining Acceptability of Innovative Products Developed by Undergraduate Students in Food Science and Technology at The University of Trinidad and Tobago. *Journal of Curriculum and Teaching*, 3(1). <https://doi.org/10.5430/JCT.V3N1P10>
- Sousa, C., Moutinho, C., Vinha, A., & Matos, C. (2019, September 30). *Trace Minerals in Human Health: Iron, Zinc, Copper, Manganese and Fluorine*. <https://core.ac.uk/download/pdf/227979202.pdf>
- Sultana, M., Anwar Hossain, M., Jahangir Alam, M., Latiful Bari, M., Liu huanliliu, H., Baoguang Li, fdahhsgov, Liu, H., Whitehouse, C. A., & Li, B. (2018). Article 159 B (2018) Presence and Persistence of Salmonella in Water: The Impact on Microbial Quality of Water and Food Safety. *Front. Public Health*, 6, 159. <https://doi.org/10.3389/fpubh.2018.00159>
- Tallent, S., Hait, J., Bennett, R. W., & Lancette, G. A. (2019, December 16). *BAM Chapter 12: Staphylococcus aureus* | FDA. <https://www.fda.gov/food/laboratory-methods-food/bam-chapter-12-staphylococcus-aureus>
- Tan, L. S., Leila, M., & Rabeta, M. S. (2018). Development and characterisation of *Vitex negundo* Linn. noodles. *Journal Homepage*, 2(1), 68–75. [https://doi.org/10.26656/fr.2017.2\(1\).228](https://doi.org/10.26656/fr.2017.2(1).228)
- Teixeira-Lemos, E., Almeida, A. R., Vouga, B., Morais, C., Correia, I., Pereira, P., & Guiné, R. P. F. (2021). Development and characterization of healthy gummy jellies containing natural fruits. *Open Agriculture*, 6(1), 466–478. <https://doi.org/10.1515/OPAG-2021-0029/MACHINEREADABLECITATION/RIS>
- Tejero, L. M. S. (2020, June 9). *Lagundi: Anti-cough and anti-asthma medicine*. <https://www.pchrd.dost.gov.ph/programs-and-services/create-article/6560-lagundi-anti-cough-and-anti-asthma-medicine>
- Tharani devi, N., Janci Rani, P. R., Theivaprakasham, H., Arumugam, S., & Vignesh Nachiappan, R. M. (2016). Estimation of Micronutrients in *Vitex negundo* L. (Karunochi) Leaves. *FoodSci: Indian Journal of Research in Food Science and Nutrition*, 3(1), 13. <https://doi.org/10.15613/FIJRFN/2016/V3I1/108901>
- Thompson, A. (2020, July 13). *2020 State of the Confectionery Industry: Gummies drive growth in chewy candy category | 2020-07-13 | Candy Industry*. <https://www.candyindustry.com/articles/89217-2020-state-of-the-confectionery-industry-gummies-drive-growth-in-chewy-candy-category>
- Tupas, G. D., & Gido, L. J. F. J. (2021). Perspective on herbal medicine in the Philippines, economic demands, quality control, and regulation. *Preparation of Phytopharmaceuticals for the Management of Disorders*, 475–482. <https://doi.org/10.1016/B978-0-12-820284-5.00009-5>
- UPM TTBD0. (2020). *Lagundi for Cough and Asthma – UP Manila TTBD0*. <https://ttbdo.upm.edu.ph/lagundi-for-cough-and-asthma/>
- Vorage, L., Wiseman, N., Graca, J., & Harris, N. (2020). The Association of Demographic Characteristics and Food Choice Motives with the Consumption of Functional Foods in Emerging Adults. *Nutrients*, 12(9), 1–14. <https://doi.org/10.3390/NU12092582>
- Ware, M. (2017, October 23). *Copper: Health benefits, recommended intake, sources, and risks*. <https://www.medicalnewstoday.com/articles/288165>
- Ware, M. (2018, February 23). *Iron: Recommended intake, benefits, and food sources*. <https://www.medicalnewstoday.com/articles/287228>
- Ware, M. (2021, March 10). *Potassium: Health benefits and recommended intake*. <https://www.medicalnewstoday.com/articles/287212>
- Yadav, N., Kumari, A., Chauhan, A. K., & Verma, T. (2021). Development of Functional Candy with Banana, Ginger and Skim Milk Powder as a source of Phenolics and Antioxidants. *Current Research in Nutrition and Food Science*, 9(3), 855–865. <https://doi.org/10.12944/CRNFSJ.9.3.13>
- Yusof, N., Jaswir, I., Jamal, P., & Saedi Jami, M. (2019). Texture Profile Analysis (TPA) of the jelly dessert prepared from halal gelatin extracted using High Pressure Processing (HPP). / *Malaysian Journal of Fundamental and Applied Sciences*, 15(4), 604–608.

\*\*\*\*\*