ACTA Traditional Medicine

Review Article: 04 to 07 (2024)
ISSN 2583-7532
https://traditionalmedicine.actabotanica.org/

Bioproducts of Amazonian fruits for the prevention and alternative treatment of noncommunicable diseases

Adele Salomão-Oliveira and Rosany Piccolotto Carvalho

Multi-Institutional Post-Graduate Biotechnology Program, Federal University of Amazonas (FUA), Manaus, Brazil

Citation: Adele Salomão-Oliveira and Rosany Piccolotto Carvalho (2024). Bioproducts of Amazonian fruits for the prevention and alternative treatment of noncommunicable diseases. *Acta Traditional Medicine*.
DOI: https://doi.org/10.51470/ATM.2024.3.1.04

Corresponding Author: **Adele Salomão-Oliveira** | E-Mail: **(adelesalomao@gmail.com)**

Received 07 January 2024 | Revised 06 February 2024 | Accepted 13 March 2024 | Available Online April 04 2024

ABSTRACT

The Amazon biome offers fruits with an exceptional content of bioactive compounds in their chemical composition, including essential fatty acids, tocopherols, carotenoids, ascorbic acid and phenolic compounds, which strengthen the endogenous system by reducing oxidative and inflammatory stress. The technological development of products based on Amazonian fruits stands out as they boost antioxidant and anti-inflammatory content, bioavailability and health safety, characterizing bioproducts with functional property claims as alternative sources in the prevention and treatment of non- communicable diseases. In this context, this brief literature review aims to raise awareness of the use of Amazonian bioproducts to improve the quality of life of the population suffering from non-communicable diseases, especially obesity and its comorbidities, which are of great importance to global public health and which have been increasing in prevalence in all countries, especially middle-income countries and some low-income countries. It is also technologically viable, low-cost and has great potential for the food and pharmaceutical industries, strengthening the bioeconomy.

Keywords: *Amazon fruits, bioproducts, bioactive compounds, noncommunicable diseases, bioeconomy*

Obesity and global health

The prevalence of obesity has increased epidemically, as highlighted in the World Obesity Atlas 2023 [1], with significant socio-economic impacts. By 2035, more than half of the world's population will be overweight considered healthy, representing a major public health problem in the world.

High BMI and the risk of noncommunicable diseases in children and adults

The growing prevalence of overweight and obese adults is verified by statistical projections over the years, as shown below (Table 1).

Table 1. Global estimate (2020) and projected number of adults (2025-2035) bearing high body mass index (BMI ≥ 25 kg/m^2) [1].

	2020	2025	2030	2035
Overweight	1.39 billion	1.52 billion	1.65 billion	1.77 billion
Obesity	0.81 billion	1.01 billion	1.25 billion	1.53 billion
Proportion of overweight or obesity adults worldwide	42%	46%	50%	54%

According to the World Atlas of Obesity [2], projections for 2035, assuming there no effective interventions to reduce overweight and obesity, has been undertaken up to then indicate nearly 27 million children will have hyperglycemia, 68 million from high blood pressure and 76 million from lows levels HDL cholesterol, on account of their high BMI (Fig. 1). Their majority be dwelling in middle-income countries and in most cases, under undetected or untreated conditions.

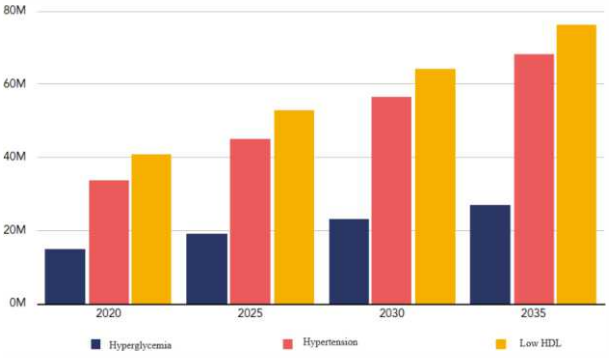

Figure 1. Children with a high BMI show more than one of the first signs of the disease [3].

Projected increase in global overweight and obesity and its impacts Based on data trends projected since 2000, the ineffectiveness of the interventions is evident and reveals the number of children and young people bearing the early signs of noncommunicable diseases (NCDs) which are attributable to overweight and obesity, in addition to the increase on prevalence of adults affected by high BMI. Out of the 41 million annual deaths attributed to NCDs, 5 million are propelled by high BMI (≥ 25 kg/m^2) and, as based on current trends, by 2035, more than 750 million children (aged in between 5 and 19) will have to live overweighted and obese, as measured by their body mass index [2].

According to the study on the Global Burden of Disease [3], recent estimates indicate that more than 56 million people die every year and 2.5 billion years of healthy life are lost due to disease or injury or other causes of ill health or decrease on adult life years (DALYs). Of these, around 41 million adult deaths and 1.6 billion DALYs are caused by chronic non-communicable diseases (NCDs). Two-thirds of these NCDs deaths and 40% of NCDs DALYs are caused by just four conditions: cancer (neoplasms), coronary heart disease, stroke and diabetes. Each of these conditions is associated with and accelerated by overweight and obesity.The above-mentioned study also provides estimates, on the proportion of these deaths and DALYs, for which risk factors are known including the risk factor of high body mass index (BMI ≥ 25kg/m^2). As shown in Table 2, the latter is responsible for between 5% and 42% of adult death and the four main NCDs, for 5% to 52% of DALYs [3].

Table 2. Adult deaths attributable to high BMI (million).

	Total number of deaths in 2019	Deaths due to high BMI
All causes of disease	50.3	5.0 (10%)
NCDs	41.0	5.0 (12%)
The following NCDs:		
Diabetic mellitus (Type 2)	1.47	0.62 (42%)
Coronary disease	9.1	1.7 (19%)
Cancer	9.9	0.46 (5%)
Cerebrovascular disease	6.5	1.1 (17%)

It is worth mentioning that Brazil is one of the 25 countries, that were selected by the WHO Acceleration Plan, to ensure the commitment to implement the Recommendations for the Prevention and Management of Obesity through Life, ranking 5th for adults (55%) and 4th for children (30%) among the Latin American countries holding high prevalence of overweight and obesity [2].

Emerging healthy alternatives to curb the impact of NCDs

Due to the notorious ineffectiveness of conservative treatment, the Amazon fruit-based bioproducts technological development has shown to be effective on the prevention and alternative treatment of obesity and its comorbidities without imparting any side effects, as one may observe in allopathic or invasive treatments [4-6]. It can also serve both as a strategy for adherence to a low-cost alternative treatment that yields both substantial reduction and improvement in anthropometric and biochemical parameters along with, a better quality of life [7-12].

Figure 2, highlights the Amazon fruits' high bioactive compounds and antioxidants levels, their hypolipidemic and anti-inflammatory effects, which are important for the treatment of overweight and obesity, and their comorbidities [13-16]. Whether in the form of extracts, drinks, oils, snacks or in the preparation of nutritional bars, since added valued-bioproducts increase their macro and micronutrients, bioactive compounds and antioxidants content, in addition to avoiding waste, due to keeping fresh for a long time, being available throughout the off-season, enabling access to geographically distant locations, surpassing the unfeasibility of cultivation and, facilitating their distribution and standardization in suitable quantities for human consumption [17-22].

Hence, food technology contributes to palatability, digestibility, nutritional value and bioavailability, by implementing long lasting sanitary quality, through emerging food processing technologies [23-27]. Moreover, the development of new Amazon biodiversity-derived bioproducts and technological applications aims to add value to raw materials and become an alternative for the region's sustainable socioeconomic development, opening great prospects for trade in the food and pharmaceutical industries [28-33].

As a matter of fact, overweight and obesity, is a major global challenge to be faced, however, strategies have been established by the World Health Organization and approved by all governments in 2013, to reduce their harm by 2030. The World Health World Obesity Atlas 2022 [34] has projected global obesity to have probably been doubled over this period. It should be remembered that the individual's environment modulates their lifestyle and is considered one of the main causes of obesity [35].

The impact of overweight and obesity on the poorest communities not only increased vulnerability, in terms of health, but economic and social crises as well, with an economic impact of 2.4% of global GDP in 2020, estimated to rise to 4.32 trillion dollars by 2035 [2].

Conclusion

Bioproducts based on Amazonian fruits are promising for the emerging therapy of obesity with antioxidant and anti-inflammatory effects, aiming for greater reach and impact, associated with psychological support, nutritional therapy, and exercise, for the implementation of effective public health policies applied to food and health, in high, middle or low-income countries and in all populations.

Acknowledgements: The authors thank the Federal University of Amazonas.

Conflicts of Interest: The authors declare no conflicts of interest.

Figure 2. A- Endopleura uchi, B- Myrciaria dubia (H.B.K.) McVaugh, C- Paullinia cupana, D- Euterpe precatória Mart, E- Castanha-de-cutia tree.

REFERENCES

1. World Obesity Federation (WOF). 2023. Data supplied by RTI International (personal communications), London, pp. 232. https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2023

2. World Obesity Federation (WOF). 2024. World Obesity Atlas 2024, London, pp. 237. https://lp2.institutocordial.com.br/pbo-196-atlas-24

3. Institute for Health Metrics and Evaluation (IHME). 2024. Global Burden of Disease.University of Washington. https://vizhub.healthdata.org/gbd-results/

4. Zerrweck, C., & Espinosa, O. 2020. New technologies and advances in weight loss therapy. Revista de Gastroenterologia de México, 85 (4), 452-460. https://doi.org/10.1016/j.rgmx.2020.05.007

5. Oliveira, N.M., & Pereira, J.R. 2023. Possible risks of using medications for obesity. Research, Society and Development, 12 (14), e07121444474. https://doi.org/10.33448/rsd-v12i14.44474

6. Trabulsi, R.K., Oliveira, A.F.S.M., Bezerra, C.M.F.M.C., Lima, J.B., SOUSA, C. E. da S., PACHECO, I. A., GUSMAO, E. E. S., CASTRO, C. de F., SILVA, V. P., DE SOUSA, S. M. C., ÁLVARES, R. F. 2023. The clinical consequences of the use of Ozempic for the treatment of obesity: a literature review. Brazilian Journal of Health Review, 6 (3), 12297-12312. https://doi.org/10.34119/bjhrv6n3-305

7. Yamaguchi, K.K.L., Pereira, L.F.R., Lamarão, C.V., Lima, E.S., Veiga-Junior, V. F.2015. Amazon acai: Chemistry and biological activities: A review. Food Chemistry, 179, 137–151. https://doi.org/10.1016/j.foodchem.2015.01.055

8. Salomão-Oliveira, A., Costa, S.S., Marinho, H.A. 2018. Metabolic syndrome: Intake of Camu-Camu (*Myrciaria dubia* (Kunth) McVaugh). International Journal of Food Science and Nutrition, 3 (6), 5-13.

9. Salomão-Oliveira, A., Lima, E.S., Marinho, H.E., Carvalho, R.P. 2018. Benefits and Effectiveness of Using *Paullinia cupana*: A Review Article. Journal of Food and Nutrition Research, 6 (8), 497-503. https://doi.org/10.12691/jfnr-6-8-2

10. Salomão-Oliveira, A., Pontes, G.C., Dos Santos, K.S.C.R., Lima, E.S., Carvalho, R.P.2020. Amazonian Fruits Antioxidant Capsules: Quality Control and Stability. Journal of Food and Nutrition Research, 8(4),189-194. https://doi.org/10.12691/jfnr-8-4-5

11. Salomão-Oliveira, A., Acho, L.D.R., Magalhães, A.A.S., Sumita, T.C.S., Matos, L.B., Lourenço, G.A., Barcellos, J.F.M., da Silva, F.M.A., Lima, E.S., Carvalho, R.P. 2021. Hypolipidemic Effect of Supplements Containing the Bioactive Compounds Found in Amazonian Fruits. HSOA Journal of Food Science and Nutrition, 7(94), 1- 9. https://doi.org/ 10.24966/FSN-1076/100095

12. Fonseca FCF, Carvalho RP, Salomão-Oliveira A, Barcellos, JFM (2022) inventores; Salomão-Oliveira A, depositante. Processo do efeito protetor da Bergenina e do extrato seco da *Endopleura Uchi* no tratamento da obesidade e da esteatose hepática induzida em camundongos. BR 10 2022 001861 8. 2022 Jan 31.

13. Palacio de Araujo, C., Medeiros Simões, I., Lins Monteiro Rosa, T., de Mello, T., Bravim Canal, G., Ferreira, A., Bestete de Oliveira, J.P., Romais Schmildt, E., Lopes, J.C., da Silva de Souza, T., Otoni, W.C., Pinheiro, P.F., Novaes, F.J.M., Gonçalves, F.G., dos Santos, A.R., Alexandre, R.S. 2023. Functional Fruit Trees from the Atlantic and Amazon Forests: Selection of Potential Chestnut Trees Rich in Antioxidants, Nutrients, and Fatty Acids. Foods, 12 (24), 4422. https://doi.org/10.3390/foods12244422

14. Mittal, M., Siddiqui, M.R., Tran, K., Reddy, S.P., Malik, A.B. 2014. Reactive oxygen species in inflammation and tissue injury. Antioxid. Redox Signal, 20,1126–1167. https://doi.org/10.1089/ars.2012.5149.

15. Orsavova, J., Misurcova, L., Vavra Ambrozova, J., Vicha, R., Mlcek, J. 2015. Fatty acids composition of vegetable oils and its contribution to dietary energy intake and dependence of cardiovascular mortality on dietary intake of fatty acids. Int. J. Mol. Sci., 16 (6), 12871–12890. https://doi.org/10.3390/ijms160612871

16. Salomão-Oliveira, A., Silva, A.M.G., Carvalho, R.P. 2020. Protective Effect of the Castanha-de-cutia (*Couepia edulis* Prance) in Regards to Metabolic Illnesses and Its Socioeconomic Aspects: A Systematic Review. Journal of Agricultural Science 12 (12), 120-133. https://doi.org/10.5539/jas.v12n12p120

17. Bezerra, K., Aguiar, J.P.L., Silva, E.P., Souza, F.C.A. 2021. Effects of water-soluble extract of açaí (*Euterpe oleracea* Mart.) on Wistar rats with induced obesity, diabetes, and cholesterol. Research, Society and Development, 10 (13), e380101320981. https://doi.org/10.33448/rsd-v10i13.20981

18. Aguiar, J.P.L., Yuyama, K., Souza, F.C.A. 2021. Nutritional Value of Camu-Camu (*Myrciaria dubia*), Harvesting and Marketing. Novel Research in Sciences, 9 (4), 1- 2. https://doi.org/10.31031/NRS.2021.09.000718

19. Lima, D.S., Egea, M.B., de Campos Carvalho Cabassa, I., de Almeida, A.B., de Sousa, T.L., de Lima, T.M., Loss, R.A., Volp, A.C.P., de Vasconcelos, L.G., Dall'Oglio, E.L., Hernandes, T., Takeuchi, K.P. 2021. Technological quality and sensory acceptability of nutritive bar produced with Brazil nut and baru almond coproducts. LWT 137, 110467. https://doi.org/10.1016/j.lwt.2020.110467

20. Nasser, B., Sharman, S., Hussain, S.Z., Bora, J. 2022. Development of functional snack food from almond press cake and pearl millet flour. Lett. Appl. NanoBioScience, 11 (1), 3191–3207. https://doi.org/10.33263/LIANBS111.31913207

21. Santos, J.A., Pamungkaningtyas, F.H. 2022. IOP conference series: earth environmental science, 1115 012100. https://doi.org/10.1088/1755-1315/1115/1/012100

22. De Angelis, D., Pasqualone, A., Squeo, G., Summo, C. 2023. Almond okara as a valuable ingredient in biscuit preparation. J. Sci. Food Agric. 103, 1676–1683. https://doi.org/10.1002/jsfa.12286

23. Pan American Health Organization (PAHO). 2019. Conservation technologies applied to food safety. Washington, D.C. https://iris.paho.org/handle/10665.2/51502

24. Garg, A., Sharma, R., Dey, P., Kumar, A. 2022. Chapter1.3 - Food auto- oxidation: An overview. Antioxidants Effects in Health, 43-68. https://doi.org/10.1016/B978-0-12-819096-8.00013-6

25. Fadda, A., Sanna, D., Sakar, E.H., Gharby, S., Mulas, M., Medda, S., Yesilcubuk, N.S., Karaca, A.C., Gozukirmizi, C.K., Lucarini, M., Lombardi-Boccia, G., Diaconeasa, Z., Durazzo, A. 2022. Innovative and sustainable technologies to enhance the oxidative stability of vegetable oils. Sustainability, 14 (2), 849. https://doi.org/10.3390/ su14020849

26. Esparza, I., Jiménez-Moreno, N., Bimbela, F., Ancín-Azpilicueta, C., Gandía, L.M. 2020. Fruit and vegetable waste management: conventional and emerging approaches. J. Environ. Manage, (265), e110510. https://doi.org/10.1016/j. jenvman.2020.110510

27. Gómez-López, V. M., Pataro, G., Tiwari, B., Gozzi, M., Meireles, M. Á. A., et al.2021. Guidelines on reporting treatment conditions for emerging technologies in food processing. Critical Reviews in Food Science and Nutrition, 62 (21), 5925–5949. https://doi.org/10.1080/10408398.2021.1895058

28. Almeida, A.F., Santos, C.C.A.A. 2020. Frutos amazônicos: biotecnologia e sustentabilidade. Portal De Livros Da Editora, 1(24), EDUF, Palmas-TO, Brazil, pp.117. https://sistemas.uft.edu.br/periodicos/index.php/editora/article/view/9233

29. Chandran, H., Meena, M., Barupal, T., Sharma, K. 2020. Plant tissue culture as a perpetual source for production of industrially important bioactive compounds. Biotechnol. Rep. 26, e00450. https://doi.org/10.1016/j.btre.2020.e00450

30. Jiaqi Chen, J., Xia, P. 2024. Health effects of synthetic additives and the substitution potential of plant-based additives. Food Research International, (197), Part 1. https://doi.org/10.1016/j.foodres.2024.115177

31. Aguiar, J.P.L., Souza, F.C.A. 2020. Fruits of the Amazon: a window of opportunity. Horticult Int J 4 (2), 45-46. https://doi.org/10.15406/hij.2020.04.00155

32. Van Emon, J.M. 2020. Omics in fruit nutrition: Concepts and application. Fruit Crops. Diagnosis and Management of Nutrient Constraints, Chapter 10, 121-130. https://doi.org/10.1016/B978-0-12-818732-6.00010-1

33. Pérez-Jiménez, F. 2022. The future of diet: what will we be eating? Clínica e Investigación en Arteriosclerosis, 34, Supplement 1, S17-S22. https://doi.org/10.1016/j.arteri.2021.12.003

34. World Obesity Federation (WOF). 2022. World Obesity Atlas, London, pp. 289. https://data.worldobesity.org/publications/?cat=15

35. da Silva, V.G., Santo, F.H.E., Ribeiro, M.N.S. 2022. Psychological interventions in the treatment of obesity: an integrative review. Research, Society and Development, 11 (9), e18511931689. https://doi.org/10.33448/rsd-v11i9.31689