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HEALTHY AND FUNCTIONAL FOODS: A DIDACTIC AND APPLIED APPROACH IN POPULAR EDUCATION

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Abstract: Food, in its most varied complexity and diversity, permeates life in a broad and complete way, from nutrition to centralizing social life, whether in the family, in relationships with friends or at work. The dissemination and training of healthier forms of nutrition and behavior towards food is a promising aspect in university extension, with knowledge sharing, exchange of experiences and scientific dissemination, in a simple and direct way. Theory allied to practice leads to new ways of relating to food, as a way of disease prevention perspectives. This way, the Extension Program for Medicinal Plants, of the Federal Institute of Rio Grande do Sul - Campus Bento Gonçalves, promoted the extension course Health and Functional Foods, promoting and fostering knowledge of a healthier and more harmonious relationship with food, focusing on the diversity of functional foods and their bioactive compounds, as a way to prevent non-communicable chronic diseases related to poor eating habits. The course was offered in 2021, in an online format, for the public internal and external to the institution, through the Google Meet platform, in addition to other resources and digital interaction tools, such as Mentimeter. Twenty people were trained in the course, who actively participated and evaluated the course positively. The course contributed to the dissemination of food science, disassociating the population from the practice of common sense, with health promotion, citizens' constitutional right, raising awareness about good choices and seeking reflection on the myths involving the world of food, with an approach simple and affordable.

Keywords: bioactive compounds; health; immunity, well-being.

INTRODUCTION

The Extension Program of Medicinal Plants (PEPM), of the Federal Institute of Education, Science and Technology of Rio Grande do Sul IFRS - Campus Bento Gonçalves (IFRS -BG), started its actions in 2009 and, since then, offers actions for the health and well-being of the population. Faced with the Global Syndemic pointed out by the report of the Commission of The Lancet Magazine (2019), which unites aspects of three pandemics - obesity, malnutrition and climate change - the program's actions sought to systematize popular education with food and nutrition security, through the approach to topics such as full use of food and the inclusion of functional foods in the diet.

Faced with the numerous chronic diseases resulting from poor eating habits, whether due to lack of knowledge or food insecurity, due to lack of access to healthy foods, micro actions are proposed that bring knowledge to the population and decode scientific concepts. Thus, demystifying food myths and focusing on healthy attitudes and actions in the daily lives of families, in addition to taking advantage of food sources that are often discarded in the trash.

Following this theme, there is a fine line between healthy eating and sustainability, therefore, small, medium and large actions in this area have positive results. In the publication ``Alimento Planeta Saúde``, by the EAT-Lancet Commission, Professor Walter Willet MD stated that:

“The transformation to healthy diets by 2050 will require substantial dietary changes. Overall consumption of fruits, vegetables, nuts and legumes will have to double and consumption of foods like red meat and sugar will have to be reduced by more than 50%. A diet rich in plant-based foods and with less animal-based foods confers health and environmental benefits (WILLET, 2020)”

In addition, plant-based foods are rich in various compounds, which have proven to act in the prevention of non-communicable chronic diseases (NCDs).

These compounds, called bioactives, are chemical substances present in food, capable of modulating functions in the body in order to optimize these activities and/or contribute to reducing the risk of diseases. Studies related to the specificities of each compound are always advancing and drive the search for the production of functional foods (PIMENTEL et al., 2019).

Therefore, in view of the context of the Covid 19 pandemic, with face-to-face activities suspended, social networks and virtual platforms were the alternatives for the PEMP to promote rapprochement with the population and disseminate knowledge related to food. With this publicity and awareness plan in hand, a bridge was created between academic and informal knowledge. In this pandemic scenario, the use of digital media was intensified and the dissemination of materials through them increased access to information for the population, enabling new means of learning and providing a network of contacts between students, teachers and the community, as demonstrated by the study by Munhoz et al. (2021).

The actions aimed to clarify, in a simple and accessible way for people, healthy lifestyles and well-being combined with a diet rich in nutrients and bioactive compounds. When formulating a course in this regard, it was proposed to unite theory and practice, bringing scientific knowledge to the population translated into a more accessible and compatible format for the lay public, with regard to the relationship with food and functions in the body. Also, a relaxed format was proposed, but maintaining the seriousness that the subject deserves.

In this context, the Saudability and

Functional Food Course was a project designed and thought to take place virtually, but engaged in taking filmed and previously recorded practices, recipes with functional foods and beverages, in addition to a vast introduction to the concept of healthy living as one all.

METHODOLOGY

The Saudability and Functional Food Course took place in virtual format, through the Google Meet platform, in the period between August 2021 and January 2022. The disclosure was carried out on the website and social networks of the Federal Institute of Rio Grande do Sul – Campus Bento Gonçalves and on the official Instagram page of the Medicinal Plants Extension Program.

The course's target audience was social movements, community groups, trade union organizations, members of public educational institutions and the general population. It consisted of four synchronous meetings and one asynchronous meeting, with theoretical and practical classes that were recorded and explained live.

Written materials were produced, such as infographics and gifs (*Graphics Interchange Format*) containing additional information and recipes, using the digital tool Canva. The videos with the recipes were created with the Adobe Spark digital tool. Presentations with information and classes from the first two meetings were produced with the help of the digital tool Canva. In order to increase the interaction with the participants, the Mentimeter digital tool was also used.

All meetings were recorded and made available to participants via the e-mails registered when enrolling in the course. The content covered topics such as: healthy living habits and social relationships with food; energy and nutrition; digestion of food; water; food composition; food myths and

truths; processed and ultra-processed foods; chemical x natural (chemophobia); food balance (pleasure x nourishment); indulgence and wholesomeness; sugar and salt; diet and light; additives and sweeteners; regime x diet; food guide; claims and clean label; glycemic index of foods; functional foods and their bioactive compounds; pre and probiotics – brain and gut relationship; functional drinks; functional cakes and snacks and functional creams. At the end, participants received a form to evaluate the course.

RESULTS

The United Nations (UN) proposed for the year 2021, the *Internacional Year of Fruits and Vegetables*, with the emblem, '*Fruits and Vegetables: your Dietary Essentials*'. The guidelines proposed by the UN were: to raise awareness of the nutritional benefits of fruit and vegetable consumption; to promote diverse, balanced and healthy diet and lifestyles and to reduce food loss and waste; boost innovation and better infrastructure for smallholder fruit and vegetable production; encourage the local production of specific, typical and regional foods.

Following these UN guidelines, the initial focus of the course was healthiness in the most varied forms in which it appears, ranging from a balanced diet to social well-being, with food having a central role in these two axes, based on the Food Guide for Brazilian Population (2014), followed by the approach of functional foods and their bioactive compounds.

This way, users had contact with live theoretical classes on all subjects/contents explained in the methodology, which were held in the first two meetings of the course. Figure 1 presents a diagram of some slides from these classes and the way in which they were mentioned.

The proposal was first to present a deepening of the concept of healthiness, also explaining

the food intrinsically, as well as its relationship in the human organism, always respecting the interlocutor about their previous knowledge. From this, classes on functional foods and their bioactive compounds followed.

In addition, the course provided a vast production of audiovisual and written materials, totaling in the demonstration and explanation of a total of 33 recipes and two general information on food. It must be noted that in addition to explaining the recipe itself, users were informed of the importance and function of each added functional ingredient, as well as the principles of each bioactive compound present in the ingredient. Chart 1 presents the explanation of the recipe, the ingredients that contain the highlighted bioactive compounds, the source used (some recipes with adaptations), as well as the digital format that was made available to the course user.

The bioactive compounds highlighted in Table 1, as well as the explanation of their antioxidant nature and specific beneficial effects in the human body, were based on studies by Pimentel et al. (2019), Salgado (2017) and Wenzel (2012). It is inferred that the bioactive compounds that were found in greater quantity in the ingredient added to the recipe were highlighted, but it is known that there are many other bioactive compounds in the same food matrix that were not mentioned.

The chemical and biochemical approach to food was based on the books by Campbell (2011) and Koblitz (2015), translated into less academic and more playful formats, aiming at retaining information. An effort was made to diversify the recipes, looking for beverage options: juices, smoothies, vegetable extracts, coffees and teas; of creams: with savory options – mayonnaise, pastes and sauces, and sweet – fruit creams; cakes: large recipe options and small cakes like muffins; grain and vegetable snacks; bars and cookies. A highlight for

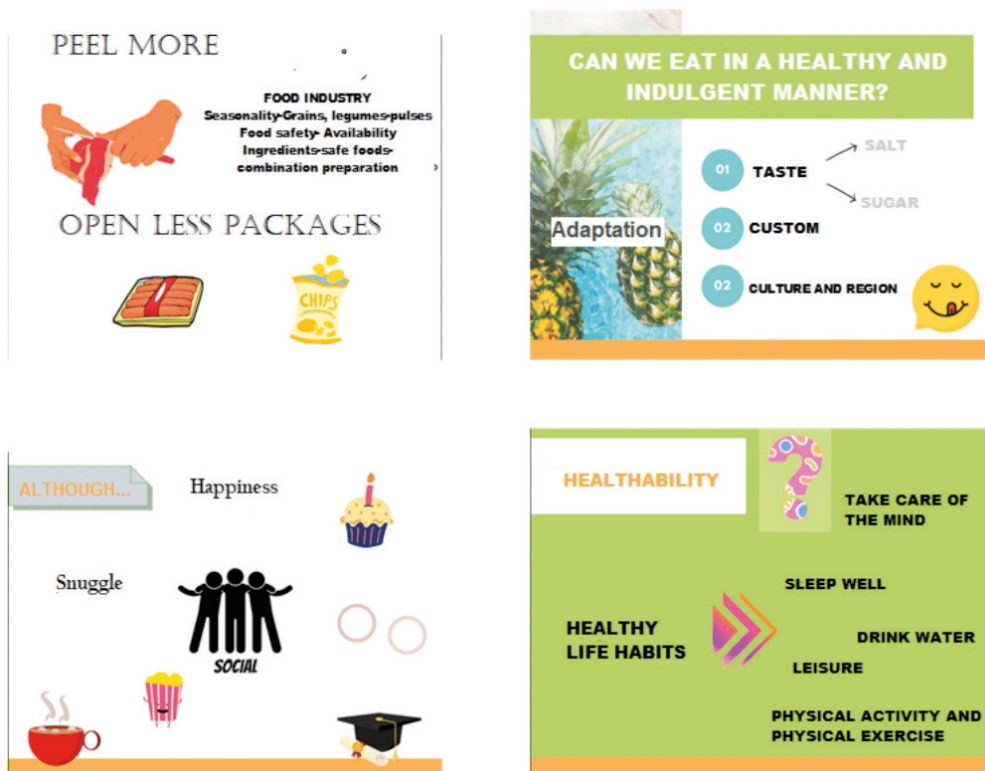


Figure 1. Examples of slides containing the covered content.

Recipe	Ingredient	Ingredient bioactive compound	recipe source	digital format
Cardamom and orange/vanilla bar	Cocoa Cardamom Nuts	Catechins curcumins Soluble fiber, Omega 3	Vogel, 2019.	Video (.mp4) Figure (.png)
Cookie oatmeal and chocolate without baking	Cocoa Oat	Catechins Betaglucan	Vogel, 2019.	Video (.mp4) Figure (.png)
Green banana biomass rustic pie	Green banana Chestnut of Pará	resistant starch Selenium	Dal Pont, 2016.	Video (.mp4) Figure (.png)
Crispy Chickpeas	Chickpea	Fitoesteroids	Dal Pont, 2016	Video (.mp4) Figure (.png)
green cabbage chips	white cabbage	Lutein and zeaxanthin	Own income	Video (.mp4)
Green Banana biomass	Green banana	resistant starch	Sena <i>et al.</i> , 2020.	Video (.mp4)
Muffin of allspice	Allspice golden linseed	Eugenol, quercetin, bioactive minerals Omega 3, lignan, fiber	Vogel, 2019.	Video (.mp4) Infographic (.png)
Muffin of cinnamon and flax seeds	Cinnamon Linseed	Polifenóis Ômega 3	Vogel, 2019.	Video (.mp4) Figure (.png)
functional oat cake	Oat Quinoa	Soluble fiber – fiber and insoluble beta glucans Bioactive Minerals, Vitamin E, Quercetin and Kaempferol	Dal Pont, 2016.	Video (.mp4) Figure (.png)
Functional oatmeal and date cake	Oat	Betaglucans	Dal Pont, 2016.	Figure (.png)

Banana, oat and flaxseed cake	Oat Linseed	Betaglucans Omega 3	Dal Pont, 2016.	Video (.mp4)
Tahini	Sesame	Fiber, tryptophan, bioactive minerals, unsaturated fatty acids	Vogel, 2019.	Video (.mp4)
Milk and garlic mayonnaise	garlic	allicin	Own income	Video (.mp4)
cashew nut paste	Cashew nut	Fitoesteroids	Pimentel <i>et al.</i> , 2019.	Video (.mp4)
avocado mayonnaise	Avocado	Omega 3, sterols	Vogel, 2019.	Video (.mp4)
Mango cream	Mango cacao nibs Ginger	Carotenoids Catechins gengirol	Own income	Video (.mp4)
Chia pudding	Chia	Soluble fiber, selenium, zinc	Own income	Video (.mp4)
Cashew nut plant extract	Cashew nut	Fitoesteroids	Pimentel <i>et al.</i> , 2019.	Infographic (.png)
Cashew nut residue pâté	Cashew nut waste	insoluble fiber	Pimentel <i>et al.</i> , 2019.	Infographic (.png)
Guidelines for preparing plant extracts	x	x	Vogel, 2019.	Infographic (.png)
Guidelines for the preparation of functional juices	x	x	Vogel, 2019.	Infographic (.png)
Benefits functional juices	x	x	Compiled	Gif (.png)
Functional smoothie of yellow fruits with oats	mango, carrot Passion fruit Oat Banana	Carotenoids Flavonoids, carotenoids, soluble fiber Betaglucans Phenolic compounds and tannins	Own income	Video (.mp4)
plant extract of chestnut of Pará	chestnut of Pará	Selenium	Vogel, 2019.	Video (.mp4)
Sunflower Seed Plant Extract	Sunflower seeds	Omeegas 3 and 9 fibers Vitamin E	Vogel, 2019.	Video (.mp4)
Functional fruit juice with hibiscus and ginger	purple hibiscus watermelon ginger Litter Strawberry Blueberry	Antocianinas Gengirol Lycopeno Epicatequinas Antocianianas Antocianinas	Own income	Video (.mp4)
Smoothie of chia and lemon	chia Lemon Litter Basil	Omega 3 and 6, soluble and insoluble fiber limonoids Epicatechins eugenol	Own income	Video (.mp4)
Green juice	Orange Pineapple Green cabbage pink pepper Cucumber papaya seed	Hesperidin Phenolic compounds and carotenoids Carotenoids Phenolic compounds and carotenoids Carotenoids Carpain	Own income	Video (.mp4)

Antioxidant red fruit juice	Blueberry Raspberry Ginger Strawberry Beet	anthocyanins anthocyanins gengirol anthocyanins betalains	Own income	Video (.mp4)
Grape and Strawberry Juice	Grape Strawberry	Resveratrol, anthocyanins anthocyanins	Own income	Video (.mp4)
Turbocharged latte	Coffee plant extract vegetable butter Cardamom Cinnamon	Chlorogenic and caffeic acid omegas and selenium omegas and selenium Curcumina Polifenóis	Vogel, 2019.	Video (.mp4)
Green tea with coconut	Green Tea Ginger Lemon juice Coconut milk	Catequinas Gengirol Limonoides Fitosteróis e tocoferóis	Vogel, 2019.	Video (.mp4)
Golden milk	Coffee	Chlorogenic and caffeic acid	Vogel, 2019.	Video (.mp4)
Iced tea with vinegar	Green tea	Catechins	Vogel, 2019.	Video (.mp4)
Food safety vs food safety	x	x	AFEBRAS, 2020.	Infographic (.png)

Table 1. Presentation of the recipes, the respective functional ingredient, the bioactive compound, digital format in which the recipe was made available and source.



Figure 2. Sections of the digital materials produced for the course.

the preparation of green banana biomass and its correct storage, since it appears as an extremely diversified ingredient, making the recipe a functional food. Figure 2 shows clips of videos and materials produced and made available to users during the course.

The course had the participation of twenty people, who actively participated and evaluated the course positively, having an approval of 70% as excellent and 30% varying between Very good and Good. Still, in the evaluation, there was a space for comments, between the highlight 'I appreciate the opportunity to participate and the approach to a subject that is so important nowadays'; 'It was wonderful! Congratulations!'; 'The course has been very informative, great.' The course contributed to the dissemination of the characteristics of functional foods and their possibilities for use in cooking, promoting health, raising awareness about good food choices and seeking to reflect on the myths involving the world of food, with a simple and accessible approach.

It is noteworthy that studies on behavior and perception of healthy eating tips have positive results, as stated by Greene and White (2016), in research carried out with university students. The students who participated in the study were encouraged to consume vegetables and fruits through tips and guidance and, subsequently, significantly increased their consumption. Healthy and sustainable food policies have gained relevance and, when based on realistic data, drive effective actions, as they understand the complexity of human behavior and the diversity of related factors (LOO, HOEFKENS and VERBEKE, 2017).

When consumers are informed about the nature, presence and benefits of foods, they start to make more assertive decisions when choosing what they will eat. Also, factors such as credibility and attractiveness of the message, as well as motivation and personal ability,

are important to trigger changes in eating habits (LOO, HOEFKENS and VERBEKE, 2017). This way, courses approaching these themes are extremely relevant and encourage positivist attitudes.

During the course, tips for maintaining nutrients and non-nutrients (bioactive compounds) during home processing were discussed. Highlighting forms, uses and modifications that can lead to better bioavailability and bioaccessibility of nutrients, since many plant foods contain antinutritional factors. It is inferred that the concepts addressed were always explained in order to internalize the message to the course user.

Studies project increased production of plant-based foods and clean label products with a view to a diet richer in phytochemical compounds, which reduce adverse health effects by increasing levels associated with beneficial effects (McCLEMENTS, 2023; NOGUEROL et al., 2021). Commonly to this, they imply greater awareness of the population's food choices and knowledge about these choices, for the maintenance of a food balance. At this moment, extensionist actions gain significant body and importance, in the most varied spheres, governmental, non-governmental and academic (MUNIALO and ANDREI, 2023).

A study in Minnesota concluded that for a good part of the population, federal programs strongly contribute to the promotion of healthy eating, including popular education of families as a strong point of this impulse (EIKENBERRY and SMITH, 2004). Therefore, when promoting courses on good eating habits, not only the course user is reached, but other members of their families and social circles, as this knowledge is multiplied by the user.

FINAL CONSIDERATIONS

The Medicinal Plants Extension Program aimed to contribute with actions aimed at Food and Nutritional Security, in line with the Food and Agriculture Organization of the United Nations, whose key themes in 2021 were sustainability linked to food insecurity, as well as encouraging the consumption of fruits and vegetables.

The richness of the exchanges of experiences that took place in the course and in the digital media indicates that it is possible to conceive an extensionist practice in the model of popular education, even through the internet, with the dissemination of quality content, making the interaction and the offer of courses viable, disseminating and encouraging healthy living habits, thus contributing to the promotion of health in the general population.

REFERENCES

- AFREBRAS. **Saiba diferenças entre segurança de alimentos e segurança alimentar**. Portal de Bebidas Brasileiras. 2020. Disponível em: <<https://afrebras.org.br/noticias/saiba-diferencas-entre-seguranca-de-alimentos-e-segurancaalimentar/#:~:text=Depois%20de%20abordar%20a%20defini%C3%A7%C3%A3o,%C3%A0%20alimenta%C3%A7%C3%A3o%20para%20as%20popula%C3%A7%C3%B5es>>. Acesso em: 30 julho 2023.
- BRASIL. ANVISA. MINISTÉRIO DA SAÚDE. Secretaria de Atenção à Saúde. **Guia Alimentar para População Brasileira**. 2 ed. Brasília: Ministério da Saúde, 2014. 156 p.
- CAMPBELL, Mary K.; FARREL, Shawn O. **Bioquímica**. Volume 1. São Paulo: Cengage Learning, 2011.
- DAL PONT, Maria Beatriz. **Nós amamos grãos: propriedades, usos e receitas**. Caxias do Sul, RS: Editora São Miguel, 2016.
- EAT – *Lancet*. **Alimento Planeta Saúde**. 2020. Disponível em: <https://eatforum.org/content/uploads/2019/07/EATLancet_Commission_Summary_Report_Portugese.pdf>. Acesso em: 28 julho 2023.
- EIKENBERRY, Nicole; SMITH, Cherry. **Healthful Eating: Perceptions, Motivations, Barriers, and Promoters in Low-Income Minnesota Communities**. Journal of the American Dietetic Association. Volume 104. Issue 7. July 2004. Pages 1158-1161. Disponível em: <<https://doi.org/10.1016/j.jada.2004.04.023>>. Acesso em 08 agosto 2023.
- GREENE, G.; WHITE J. **Perceptions of Healthful Eating Cues Impact Fruit and Vegetable Intake in College Students**. Journal of The Academy of Nutrition and Dietetics. September 2016. Issue 9. Volume 116. Number 9. Poster Session: Professional Skills; Nutrition Assessment; Medical Nutrition Therapy. Disponível em: <<https://doi.org/10.1016/j.jand.2016.06.320>>. Acesso em: 31 julho 2023.
- KOBLITZ, Maria Gabriela Bello. **Bioquímica de Alimentos**. Rio de Janeiro: Guanabara Koogan, 2015.
- LOO, Ellen J. Van; HOEFKENS, Christine; VERBEKE, Win. **Healthy, sustainable and plant-based eating: Perceived (mis) match and involvement-based consumer segments as targets for future policy**. Food Policy. Volume 69. May 2017. Pages 46-57. Disponível em: <<https://doi.org/10.1016/j.foodpol.2017.03.001>>. Acesso em 31 julho 2023.
- McCLEMENTS, Isabelle Farrel; McCLEMENTS, David Julian. **Designing healthier plant-based foods: Fortification, digestion, and bioavailability**. Food Research International. Volume 169. July 2023. 112853. Disponível em: <<https://doi.org/10.1016/j.foodres.2023.112853>>. Acesso em 31 julho 2023.
- MUNHOZ, Tiago Neuenfeld *et al.* **A utilização de mídias digitais para divulgação do conhecimento científico sobre saúde mental durante a pandemia do COVID-19**. Expressa Extensão. v. 26. n. 1. p. 182-192. 2021. Disponível em: <<https://doi.org/10.15210/ee.v26i1.19667>>. Acesso em: 28 julho 2023.
- MUNIALO, Claire D.; ANDREI, Mihaela. **Chapter 2 - General health benefits and sensory perception of plant-based foods**. Engineering Plant-based Food Systems. 2023. Pages 13-26. Disponível em: <<https://doi.org/10.1016/B978-0-323-89842-3.00017-8>>. Acesso em: 01 agosto 2023.

NOGUEROL, Ana Teresa *et al.* **Green or clean? Perception of clean label plant-based products by omnivorous, vegan, vegetarian and flexitarian consumers.** Food Research International. Volume 149. November 2021, 110652. Disponível em: <<https://doi.org/10.1016/j.foodres.2021.110652>>. Acesso em: 01 agosto 2023.

ONU/FAO. **Internacional Year of Fruits and Vegetables 2021. Fruits and Vegetables: your Dietary Essentials.** Disponível em: <<https://www.fao.org/3/cb2395en/online/cb2395en.html>>. Acesso em: 01 agosto 2023.

PIMENTEL, Carolina Vieira de Mello Barros *et al.* **Alimentos Funcionais e compostos bioativos.** 1 ed. Barueri, SP: Manole, 2019.

SAAD, Susana Marta Isay; CRUZ, Adriano Gomes da; FARIA, José de Assis Fonseca. **Probióticos e Prébióticos em alimentos: fundamentos e aplicações tecnológicas.** Editora Varela, 2011. 669 p.

SALGADO, Joicelem. **Alimentos funcionais.** 1 ed. São Paulo: Oficina de Textos, 2017.

SENA, Luise de Oliveira. **Produção de biomassa de banana verde.** Comunicado Técnico 171. Cruz das Almas, BA. Março, 2020. Embrapa. Disponível em: <<https://ainfo.cnptia.embrapa.br/digital/bitstream/item/211941/1/ComunicadoTecnico171-Eliseth-AINFO.pdf>>. Acesso em: 31 julho 2023.

The Lancet. **A Sindemia global da obesidade, desnutrição e mudanças climáticas.** Relatório da Comissão The Lancet. Jan. 2019. Disponível em: <<file:///C:/Users/Veronica%20Baroni/Desktop/Projeto%20PANC/Curso/Refer%C3%A4ncias/Relat%C3%B3rio-Completo-The-Lancet.pdf>>. Acesso em: 28 julho 2023. Vogel, Leane.

VOGEL, Leanne. **Low Carb: a dieta cetogênica (125 receitas).** 1 ed. São Paulo: Faro Editorial, 2019. 304 p.

WENZEL, Guido Edgar. **Radicais livres, antioxidantes nutracêuticos: fenólicos e polifenólicos vegetais.** São Leopoldo: Ed. UNISINOS, 2012.