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1. PRODUÇÃO CIENTÍFICA

1.1 – Postharvest Biology and Technology - Qualis A1

Referência Completa: Pedrosa, Vanessa Maria Dantas ; Izidoro, Maiqui ; Da Silva, Maryelle Barros ; Lossolli, Nathalia Aparecida Barbosa ; Cecílio Filho, Arthur Bernardes ; Carvalho, Rogério Falleiros ; Bacha, Allan Lopes ; Teixeira, Gustavo Henrique De Almeida . Far-red LED light treatment at harvest and during storage to control sprouting in 'Asterix' potatoes. **Postharvest Biology and Technology**, v. 230, p. 113722, 2025.

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Periódico: Postharvest Biology and Technology (Qualis A1)



Far-red LED light treatment at harvest and during storage to control sprouting in 'Asterix' potatoes

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ARTICLE INFO

Keywords:
Domancy
Ecodormancy
Light-emitting diode
Sprout development
Starch
Carbohydrates

ABSTRACT

The application of light-emitting diode (LED) light at different wavelengths has shown promising potential in reducing sprout growth in stored potatoes, where continuous exposure to high irradiance, such as far-red LED light at $5 \mu\text{mol m}^{-2} \text{s}^{-1}$, has been shown to be most effective in suppressing sprout development. However, it may not be practical for sprout management, as potatoes are typically stored in bulk. Therefore, the objective of this study was to assess the feasibility of applying $5 \mu\text{mol m}^{-2} \text{s}^{-1}$ of far-red LED light prior to storage and to investigate the photomorphogenic and metabolic responses to these treatments throughout storage. Potato tubers of the Asterix cultivar were exposed to far-red LED light before storage (for 0, 2, or 4 min) or continuously during storage (24 h a day), and compared with untreated potatoes (control) and potatoes treated with chloropham (CIPC), a sprouting inhibitor. Tubers continuously exposed to far-red LED light had fewer and less developed sprouts, while the application of the pre-storage treatment for 4 min was effective for up to 55 d in storage. However, far-red LED light did not inhibit sprouting during storage. Tubers treated with far-red LED light had lower dry matter, starch, and total soluble sugar levels compared to those treated with CIPC but showed no differences in reducing sugar levels. Although promising, the far-red LED light treatment prior to storage was not fully effective in inhibiting sprouting, necessitating further studies to elucidate the mechanisms involved in tuber responses to light during storage.

1. Introduction

Sprouting is one of the primary causes of postharvest potato losses during storage (Jaiswal et al., 2023), despite the common use of various chemical sprout suppressants (Daniel-Lake et al., 2011; Visse-Mansiaux et al., 2021). Irradiation using X-rays, electron beams, or gamma rays is among physical treatments reported as effective for suppressing sprouting (Son et al., 2022). Similarly, visible light has been reported to reduce sprout development by influencing bud photomorphogenesis (Huang et al., 2018; Liu et al., 2022; Melmann and Johansen, 2020).

Regarding visible light, a groundbreaking study on potato sprouts continuously exposed to red and far-red light showed reduced growth due to the inhibition of plumular hook formation and shortening of the hypocotyl, when present in the sprout (Withrow, 1941). McGee et al. (1987) found that 12-hour photoperiod light treatments for 23 d could inhibit sprout growth in seed potatoes of the cultivars Desiree and Maris Piper using red, far-red (707 nm), or blue (<500 nm) fluorescent lamps with low fluence (10–20 $\mu\text{mol m}^{-2} \text{s}^{-1}$). Responses to red and far-red light are mediated by phytochrome, which regulates high-irradiance inhibition, while responses to blue and ultraviolet (UV) light involve

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1.2 – Journal of Food Composition and Analysis - Qualis A2

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Feasibility of near-infrared spectroscopy as a tool to estimate carotenoid content in 'IAC Rurik' specialty potato cultivar

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Solanum tuberosum L.
Chemometrics
Multivariate analysis
Total carotenoids

ABSTRACT

The study explores the use of NIR spectroscopy with chemometric techniques as a non-destructive method to determine carotenoids in fresh 'IAC Rurik,' a new yellow potato rich in these compounds. Tubers were harvested in 2022 and in 2023. Reflectance FT-NIR spectra were acquired on the periderm of 200 tubers, in two positions. Spectra were pre-processed and regression models were developed using partial least square (PLS), support vector (SVR), ridge regression, k-nearest neighbors (KNN), interval-partial least squares (iPLS), and kernel-partial least squares (kPLS) regressions. Multivariate classification was carried out by applying principal component analysis with linear discriminant analysis (PCA-LDA) and partial least squares discriminant analysis (PLS-DA). Carotenoid content prediction was better obtained using mean-centered spectra and ridge regression (RMSEP = 0.0028 g kg⁻¹, R² = 0.90, RPD = 2.57, RER = 4.21 %). The classification of three groups (low = 0.031-0.045 g kg⁻¹; average = 0.045-0.065 g kg⁻¹; and high = 0.065-0.078 g kg⁻¹) was possible by applying PLS-DA with a correct classification of 93 %, 70 %, and 96 %, respectively for low, average, and high carotenoid content. Thus, NIR spectroscopy can be used as a non-destructive method to predict carotenoids and classify 'IAC Rurik' tubers based on their carotenoid content.

1. Introduction

Specialty potatoes are distinct from standard cultivars found in the market due to their unique skin and/or flesh color (Lamont Jr., 2020). In the United States of America (USA) it is the fastest-growing fresh potato sales segment, according to Potatoes USA (2024). While russet-type potatoes showed a reduction of 0.2 % in dollar sales, Petite, Medley, Fingerling, and Purples showed increases of 1.1 %, 9.0 %, 3.4 %, and 12.4 %, respectively (Potatoes USA, 2024). Specialty potatoes are also

gaining popularity not only for their appealing colors and shapes but also for their culinary uses and higher levels of phytochemicals, which are associated with a wide range of health benefits (Andre et al., 2007; Oertel et al., 2017; Beals, 2019). Therefore, research programs have been developing specialty potato cultivars with the interest of increasing their nutritional properties (Durham et al., 2015).

Despite the limited genetic diversity in current commercial cultivars, cultivated potatoes are systematically bred to encompass a broad spectrum of market classes. Before 1950, only round white and red-skinned

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5.2 – American Journal of Potato Research - Qualis A4

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SHORT COMMUNICATION



The Relationship Between Respiration Rate and Quality Parameters of Russet Potatoes During Long-Term Storage

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Abstract

Understanding the storage requirements of emerging potato cultivars is paramount for effective storage management. Thus, the objective of this study was to quantify the respiration rates of the standard Russet Burbank, and the new cultivars Ivory Russet, Dakota Russet, and Rainier Russet potatoes to understand the relationship between respiration rate and quality parameters during storage. Tubers were cured at 12.8 °C and 95% relative humidity (RH) for 14 days before gradually transitioning to 5.5, 7.2, or 8.9 °C (95% RH). Lower respiration rates were observed at 5.5 °C, with comparable rates at 7.2–8.9 °C. Dakota Russet had lower respiration rates (0.95 mg CO₂ kg⁻¹ h⁻¹) while Rainier Russet the highest (1.29 mg CO₂ kg⁻¹ h⁻¹). Sucrose content was negatively affected by respiration of Ivory Russet, Rainier Russet, and Russet Burbank, glucose content was affected by all cultivars, though. Fry color (Photovolt reflectance) was positively correlated to the respiration rates of all cultivars. The respiration rates had low correlations with all quality parameters.

Resumen

Comprender los requisitos de almacenamiento de las variedades de papa emergentes es primordial para un manejo eficaz del almacenamiento. Por lo tanto, el objetivo de este estudio fue cuantificar las tasas de respiración de las papas Russet Burbank estándar y los nuevos cultivares Ivory Russet, Dakota Russet y Rainier Russet para comprender la relación entre la tasa de respiración y los parámetros de calidad durante el almacenamiento. Los tubérculos se curaron a 12,8 °C y 95% de humedad relativa (HR) durante 14 días antes de pasar gradualmente a 5,5, 7,2 u 8,9 °C (95% HR). Se observaron tasas respiratorias más bajas a 5,5 °C, con tasas comparables a 7,2 °C u 8,9 °C. Dakota Russet tuvo tasas respiratorias más bajas (0,95 mg CO₂ kg⁻¹ h⁻¹) mientras que Rainier Russet la más alta (1,29 mg CO₂ kg⁻¹ h⁻¹). El contenido de sacarosa se vio afectado negativamente por la respiración de Ivory Russet, Rainier Russet y Russet Burbank, sin embargo, el contenido de glucosa se vio afectado por todas las variedades. El color del freído (reflectancia fotovolt) se correlacionó positivamente con las tasas de respiración de todas las variedades. Las tasas de respiración tuvieron correlaciones bajas con todos los parámetros de calidad.

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5.3 – Food Science and Technology International - Qualis A3

Referência Completa: Lossolli, N. A. B., Leonel, M., Leonel, S., Izidoro, M., Cândido, H. T., Assis, J. L. D. J., Oliveira, L. A. D.. Exploring differences in the physicochemical and nutritional properties of mango flours and starches. **Food Science and Technology International**, 10820132241259055,2024.

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Periódico: *Food Science and Technology International* (Qualis A3)

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Original Research Article

FOOD SCIENCE AND TECHNOLOGY INTERNATIONAL

Exploring differences in the physicochemical and nutritional properties of mango flours and starches

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Abstract

Mangoes contain several components that are beneficial for health, in addition to being potential sources of starch for the food industry. However, a substantial amount of fruit is lost in the field because it does not meet commercial standards, resulting in food losses and environmental damage. Herein, the physicochemical properties of mango flours and starches obtained from different parts of the fruit of two cultivars were evaluated. Mango peel flours have higher levels of proteins, fibers, minerals, carotenoids, ascorbic acid, and antioxidant activity than pulp flours, in addition to a higher yellowing index and water and oil-holding capacity, and can be used as a functional flour. The pulp flours, with the higher starch content, showed characteristics that make them valuable as a potential ingredient in soft baking and gluten-free products. Mango starches have circular and oval shapes, with a bimodal distribution. All starches showed an A-type crystallinity pattern. Pulp starches showed a higher peak viscosity and breakdown, with a lower setback, and can be used as a thickening or gelling agent. The higher thermal stability of kernel starch suggests its application in sauces, baking, dairy products, and canned foods.

Keywords

Mangifera indica, agri-food loss, chemical components, starch properties

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INTRODUCTION

A large amount of food is lost or turned into waste along the agri-food supply chain in the world. Around 14% of the world's food is lost before reaching the retail level (FAO, 2019). Due to the short post-harvest shelf life, the fruit production chain is among those with the highest losses, with emphasis on the rate of waste generation during processing (Garcia-Herrero et al., 2018; Facchini et al., 2023).

Mango is one of the most popular edible fruits, with a taste and aroma that is highly appreciated by consumers. The world production of mango, mangosteen, and guava in 2021 was 57.01 million tons (FAO, 2023), with Brazil

being among the world's largest producers of mango, producing 1.51 million tons of this fruit in 2021 in an area of 76.06 thousand hectares (IBGE, 2023) majority in the Northeast and Southeast regions of the country.

Two important cultivars produced in Brazil are Bourbon and IAC 103 Espada Vermelha. The cultivar IAC 130 Espada Vermelha is a cultivar of national origin developed by the Agronomic Institute of Campinas (IAC), descended from the Carabao variety, which originated in the Philippines. With growing production in the state of São

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5.4 – *Horticulturae* - Qualis A3

Referência Completa: Da Silva, M. B., Pedrosa, V. M. D., **Izidoro, M.**, Balbuena, T. S., Sanches, A. G., & de Almeida Teixeira, G. H.. Controlled Atmosphere Storage and Sorbitol Dipping Minimize Chilling Injuries in ‘Palmer’ Mangoes. *Horticulturae*, 10(4), 354, 2024.

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Periódico: *Horticulturae* (Qualis A3)

Primeira Página



horticulturae



Article

Controlled Atmosphere Storage and Sorbitol Dipping Minimize Chilling Injuries in ‘Palmer’ Mangoes

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Abstract: Our previous studies have shown that ‘Palmer’ mangoes immersed in solutions containing 2.5% sorbitol and stored under a controlled atmosphere (CA) at 8 °C for 30 days had fewer symptoms of a chilling injury. However, there is no information regarding the effectiveness of sorbitol treatment in other atmospheres and/or in combination with lower temperatures. Thus, the objective of this study was to assess the impact of dipping ‘Palmer’ mangoes in 0.1% and 2.5% (*w/v*) sorbitol solutions and storing the fruit under a CA without atmosphere modification (21 kPa O₂ + 0.03 kPa CO₂) at 8 °C/95% relative humidity (RH) or with 5 kPa O₂ + 5 kPa CO₂ at 4 °C/95% RH for 28 days. The fruits were evaluated periodically for chilling injuries, quality, and oxidative metabolism. A chilling injury (CI) was correlated with increased fresh weight loss (FWL) and changes in the color of the epicarp (*L*_{peel}, *h*_{peel}, and *C*_{peel}) and mesocarp (*L*_{pulp}). Lipid peroxidation (*LP*_{pulp} and *LP*_{peel}) and the hydrogen peroxide content (*H*₂O₂_{peel} and *H*₂O₂_{pulp}) were associated with the development of a CI, particularly after being transferred to ambient. The treatment with 2.5% sorbitol was more effective in minimizing the chilling injury symptoms and did not compromise the fruit quality, especially when it was stored at 4 °C in association with a CA containing 5 kPa O₂ + 5 kPa CO₂. This treatment reduced lipid peroxidation and increased the activities of the superoxide dismutase (SOD) and ascorbate peroxidase (APX) enzymes in the epicarp and mesocarp, providing greater cold tolerance. The use of 2.5% sorbitol has been identified as the most efficacious approach for mitigating the adverse impacts of chilling injuries, preserving the fruit quality, and enhancing oxidative metabolism, even at lower temperatures. Thus, this treatment represents a viable alternative for managing chilling injuries in mangoes.

Keywords: *Mangifera indica* L.; polyols; oxidative metabolism; SOD; APX



Citation: da Silva, M.B.; Pedrosa, V.M.D.; Izidoro, M.; Balbuena, T.S.; Sanches, A.G.; de Almeida Teixeira, G.H. Controlled Atmosphere Storage and Sorbitol Dipping Minimize Chilling Injuries in ‘Palmer’ Mangoes. *Horticulturae* 2024, 10, 354. <https://doi.org/10.3390/horticulturae10040354>

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1. Introduction

As observed in other horticultural products, cold storage is the primary post-harvest technology used to extend the shelf life of mangoes because low temperatures reduce their metabolic activity [1]. Mangoes stored at temperatures between 8 and 13 °C have a post-harvest shelf life of up to 21–30 days, depending on the cultivar and fruit maturity [2,3]. However, prolonged storage at temperatures below 13 °C can lead to the development of a physiological disorder known as a chilling injury (CI), resulting in qualitative and quantitative losses [4,5].

The symptoms of a CI in mangoes are most evident in the epicarp and are characterized by the presence of dark, sunken spots resembling burns, which can hinder the marketing

5.5 – Horticulturae - Qualis A3

Referência Completa: Lossolli, N. A. B., Leonel, M., Leonel, S., **Izidoro, M.**, de Paula, G. V., dos Santos, T. P. R., de Oliveira, L. A. Cultivars and fruit part as differentiating factors of physicochemical characteristics of mango starches. *Horticulturae*, v. 9, n. 1, p. 69, 2023.

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Periódico (Qualis A3)

Primeira Página



horticulturae



Article

Cultivars and Fruit Part as Differentiating Factors of Physicochemical Characteristics of Mango Starches

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Abstract: Fruit production has increased, which has led to an increase in fruit wastage, opening up new opportunities for the use of non-standard fruits as starch sources. Herein, the physicochemical properties of mango starches isolated from the pulp and kernel of four cultivars were investigated. The pulp starches showed higher purity with total starch ranging from 97.84 to 98.09% (dry basis). The kernel starches had a higher percentage of other components (ash, fiber, lipids, protein, sugars). The main mineral in the starches was potassium (0.37 to 1.32 g/kg). Pulp starches were circular and smaller (15–79 to 16.70 µm) and kernel starches were oval and larger (19.75 to 25.33 µm). Differential scanning calorimetry and rapid viscosity studies showed that the kernel starches had higher gelatinization properties. The mango starches were A-type with varying crystallinity levels (28.37–32.35%). PCA analysis showed the greater impact of gelatinization properties on the grouping of cultivars. These findings would be useful for adding commercial value to mango agricultural and industrial waste and for industries in terms of using the starch as an ingredient in food products and other industrial applications.

Keywords: *Mangifera indica* L.; mesocarp; kernel; fruit starch; structure; chemical composition; technological properties



Citation: Lossolli, N.A.B.; Leonel, M.; Leonel, S.; Izidoro, M.; de Paula, G.V.; dos Santos, T.P.R.; de Oliveira, L.A. Cultivars and Fruit Part as Differentiating Factors of Physicochemical Characteristics of Mango Starches. *Horticulturae* **2023**, *9*, 69. <https://doi.org/10.3390/horticulturae9010069>

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1. Introduction

The starch market is continuously growing owing to the intrinsic characteristics of the applications of this polymer in different industrial sectors. According to Mordor Intelligence, the global industrial starches market was valued at USD 51,496.8 million in 2021, and it is projected to reach USD 70,469 million in 2027, registering a CAGR of 5.40% during the forecast period (2022–2027) [1]. Associated with this growth is the search for starches with different properties, which, in large proportion, have been met by different modification techniques. However, more attention has been paid to starches obtained from non-conventional sources owing to the issue of clean label food products and sustainability aspects, including fruits and residues of industrial processing [2,3].

The starch market for the food industry involves the differentiation of chemically modified starches as additives, and physically modified or natural starches as ingredients. Therefore, in parallel with the growth of the starch market, the clean label food ingredients market is expected to reach \$47.50 billion by 2023 with a compound annual growth rate of 6.8%, which values natural starches with differentiated properties [3].

Mango (*Mangifera indica* L.) is an important tropical commercial fruit. Brazil stands out among the world's major producers, with the production of 1.57 million tons of fruit harvested in an area of 71,800 hectares in 2020. In Brazil, mango is cultivated in 21 states, with

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Nutritional and technological properties of pulp and peel flours from different mango cultivars

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Abstract

Global mango production generates significant agricultural and industrial waste, including non-standard fruits and peels. Herein, flours obtained from the immature fruits of four mango cultivars (Haden, Keitt, Parwin, and Tommy Atkins) were characterized for their physicochemical properties with the goal of valorization as an ingredient in functional food products. Regardless of cultivar, the peel flours represented excellent sources of fiber, with notable calcium, magnesium, manganese, carotenoids, and antioxidant contents as well as high percentage of large particles and good water retention capacity. Pulp flours exhibit high starch content, light color, and fine granulometry. The mango cultivars strongly interfered with the differentiation of the mango peel and pulp flours. The results presented herein show that understanding the characteristics of flours obtained by processing different parts of the fruits of various cultivars can produce composite mango flours with different nutritional and technological properties, expanding their possible uses in food products and driving sustainable agricultural production in terms of efficient crop waste management.

Keywords: proximate composition; minerals; carotenoids; microstructure; technological properties.

Practical Application: Mango flours can be used as functional flours in food formulations. Mango peel flours have the potential to be used as sources of dietary fiber, and can contribute to increased bioactive compounds and minerals intake. Pulp flours can be used in the development of gluten-free products to increase their nutritional value.

1 Introduction

Mangoes are widely produced and consumed fruits that are enjoyed worldwide. The world production of mangoes, mangosteens, and guava in 2020 was 54.83 million tons, with 72.5% of the production located in Asia. India is the largest producer worldwide (24.7 million tons) while Brazil is the largest producer in South America (2.13 million tons) (Food and Agriculture Research of United Nations, 2022). The isolated Brazilian mango production in 2020 was 1.57 million tons, cultivated over an area of 72,000 ha with the states of Pernambuco, Bahia, Minas Gerais, and São Paulo producing the vast majority (Instituto Brasileiro de Geografia e Estatística, 2022).

The mango fruit is a drupe with different shapes (round, oval, elliptical, and heart-shaped), consisting of skin (epicarp), pulp (mesocarp), and seed kernels (endocarp). The fruits vary in size (3–26 cm length; 1.5–10 cm width) and weight (132–702 g) according to cultivar and growing conditions (Silva et al., 2014).

Most mango is sold as fresh fruit, but mango agro-industrialization generates several highly appreciated products including juices, nectar, jellies, and ice creams. The Brazilian domestic market for mangoes is unattractive because of its low profit margin and not all producers have access to export markets, which are more profitable and feature high demand and favorable exchange rate scenarios. In 2021, Brazil exported 244,840 tons of fruit (Hortifruti Brasil, 2022).

To improve the domestic Brazilian mango market, varietal diversification must be achieved to obtain better yields and expand growing regions, as well as to reduce post-harvest losses and limit agro-industrial residues. A large number of unsuitable fruits for the fresh market, together with those discarded in industrial operations represent significant economic and environmental losses (Serna-Cock et al., 2016; Castro-Vargas et al., 2019; Wall-Medrano et al., 2020; Safdar et al., 2022).

The production of flour from fruits that do not reach commercial quality is an alternative method to reduce post-harvest losses (Amorim et al., 2022). The production of mango flour reduces free water, resulting in an increased time-to-market and concentrating health-promoting nutrients. Green mango fruits represent a promising source of vitamins, essential minerals, bioactive compounds, proteins, dietary fiber, and starch (Oak et al., 2019; Patiño-Rodríguez et al., 2020; Gupta et al., 2022).

The functional flour market, which includes fruit flours, has grown considerably due to consumer awareness of health benefits and lifestyle changes that promote consumption of gluten-free and vegan products. According to Industry ARC™ (2022), the market for functional flours is estimated to reach US\$82.7 billion by 2027, growing at a CAGR of 7.3% (2022–2027).

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ORIGINAL ARTICLE

Green banana and ora-pro-nóbis mixed flours: nutritional and technological characteristics

Farinhas mistas de banana verde e ora-pro-nóbis: características nutricionais e tecnológicas

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Abstract

The constant need for innovation in the food industries to meet the demands of consumers and the growing market for gluten-free and high-protein products have driven studies of mixed flour. In this study, 'BRS Platina' banana fruits were processed to obtain Whole Green Banana Flour (WGBF) and Green Banana Pulp Flour (GBPF) as well as leaves of Ora-pro-nóbis Flour (OPNF). Mixed flours were prepared by blending banana flours (WGBF or GBPF) with increasing levels of OPNF (from 5 to 25%). Flours were analyzed for physicochemical characteristics, mineral contents, Water Absorption Index (WAI), Water Solubility Index (WSI), and color. The main component of banana flours was starch, in which GBPF has the highest content. The WGBF had a higher mineral content, and in both flours, the potassium was at a greater level. OPNF showed the highest protein and mineral contents. Independent of the type of banana flour, mixed flours were darker, and had higher WAI and considerable increases in Mg, Fe, and Zn than no mixed ones. The blend of banana flours and Ora-pro-nóbis leaf flour can be a viable combination for preparing a variety of food products, due to its nutritional and technological properties.

Keywords: *Pereskia aculeata*; *Musa* spp.; Starch; Protein; Minerals; Gluten-free.

Resumo

A constante necessidade de inovação nas indústrias alimentícias para atender às demandas dos consumidores e o crescente mercado de produtos sem glúten e com alto teor proteico têm impulsionado os estudos de farinhas mistas. Neste estudo, frutos de banana 'BRS Platina' foram processados para obtenção de farinha integral de banana

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Ionizing radiation from Cobalt-60 in coffee beans (*Coffea arabica*): physical and chemical evaluation

Izidor, Maiqui; Barbosa Lossolli, Nathalia Aparecida; Toledo Marzullo, Yasmine Ohanna; Leonel, Magali; Balbino da Silva, João Paulo; Oliveira de Aparecido, Lucas Eduardo; de Franqueiro Toledo Sartori, Tais Carolina

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