

Bioactive potential extracted from tropical plants: last 5 years

Abstract

Polyphenols are one of the most abundant phytochemicals in the plant kingdom. Due to the oxidative stress in the metabolic pathways, polyphenolics compounds are formed. Those compounds are associated with numerous benefits as antidiabetic, prevention of degenerative diseases, among others, as a result of antioxidant properties present on them. Some cultures used these plants to treat their diseases and *in vivo* assays were positive in animals (mice).

Keywords: polyphenols, antioxidant activity, inhibition, extract

Volume 7 Issue 2 - 2018

Mauricio Vargas Bernal,¹ Javier Jiménez-Forero,² Luis Eduardo Díaz¹

¹Faculty of Engineering, Universidad de La Sabana, Colombia

²Faculty of Agricultural Sciences and Natural Resources, Universidad de Los Llanos, Colombia

Correspondence: Luis Eduardo Díaz, Agroindustrial Process Research Group, Faculty of Engineering, Universidad de La Sabana, Colombia, Email luis.diaz1@unisabana.edu.co

Received: March 03, 2018 | **Published:** April 05, 2018

Introduction

Radical species are harmful for humans. These radical species are taken by the food ingestion and produced in the cellular metabolism. In consequence, oxidations may lead to the production of peroxides, alcohols, aldehydes, free carbonyls and DNA-modifications that could be toxic and destructive in the body.¹ Elevated reactive oxygen species have been involved in the onset of several diseases including: neurodegenerative disorders, cancer, renal diseases, pulmonary diseases, obesity and diabetes,² being cancer a major public health problem. In 2010, cancer treatment cost \$125 billion in the US. That value is expected to further increase in the next years.³ In the same way, diabetes treatment cost \$245 billion in the US in 2012 for the first⁴ and for cardiovascular diseases is expected to increase to 1 trillion in the next decades,⁵ signified by medical care, medications, supplements, among others. These diseases increase the mortality on American continent, reason why it is important to research about alternatives to prevent these illnesses.

Polyphenols are antioxidants compounds classified into flavonoids, phenolic acids and tannins, according to their aromatic structure. The production of these antioxidants are consequence of plant oxidative stress, biosynthesized in complex metabolic pathways.⁶ They can be obtained from leaves, pulp, flowers, seeds and roots through the extraction with polar solvents. There are about 8000 different polyphenols, which are studied because of their properties as antioxidant agents, free radical scavengers, antimicrobial and antiviral inhibition. Tropical fruits are a rich source of those compounds, fruits such as *Musa paradisiaca*, *Averrhoa carambola* L, *Mangifera indica* L, *Passiflora edulis*, *Psidium guajava*, *Rubus sp.*, *Borojoa Patinoi Cuatrec* and *Annona Muricata*, show polyphenolic activity in different assays.⁶

Benefits for consumption

According to the literature, antioxidants have a common benefit; neutralize the free radicals in the human body. Virginia et al., evaluated the extract from *Musa paradisiaca* with different solvents, to determine the benefits of it in mice. The results obtained, demonstrate

the effects of leaves extract on the regulation of glucose homeostasis, due to the existence of the flavonoid rutin. This flavonoid, increases insulin and reduces glycemia. *In vivo* and *in vitro* assays showed the stimulation for insulin secretion by the extracts with water and the n-butanol.⁷ Shanmuga et al.⁸ characterized syringin polyphenol from the tepal of the plants *M. paradisiaca*. The isolation of the molecule was appropriated, as a result of the mice's behavior with the dosage administrated, wherein the glucose in the blood decrease. The isolation of this molecule represents a possible result of the inhibition of free radicals due to his polyphenolic activity.⁸

Star fruit (*Averrhoa carambola*), also present polyphenols in leaves and pulp, the results obtained by Pang et al. were 174.5–293.1mg Gallic acid equivalents per 100 g fresh weight. The results obtained by Xuchao et al. were positive for 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays where the higher activity was for Tecomin.⁹ The previous results represent the total antioxidant activity for ABTS¹⁰ and free radical scavenging for DPPH,¹¹ which means that the extracts has the property to inhibit the free radicals. This fruit also has benefits as antidiabetic, anticancer and important effect in the cardiovascular diseases.¹²

On the other hand, *Mangifera indica* presented 5 benzophenones and 17 flavonoids as *Averrhoa carambola* did. In mango fruit the main constituent was Mangiferin, followed by iriflophene, quercetines and isoswertisin.¹³ Isoswertisin had also a high anti-inflammatory activity. Additionally, 4'-O-p-hydroxybenzoylmangiferin revealed the highest antioxidant activity, *Mangifera*, also presented antioxidant activity, but not as strong as 4'-O-p-hydroxybenzoylmangiferin.¹³ *In vitro* assays, the results revealed biological activity on mice with diabetes that received doses between 88 and 65mg/ml,¹⁴ these results are supported by the report of Pan et al.¹⁴ which characterized the activity and presence of Mangiferin and other polyphenols.

Similar to the fruits reported above, *Psidium guajava* was studied due to its traditional uses in many cultures. Polyphenols were extracted from leaves, show the presence of terpenoids, flavonoids and tannins. In the research by Xiao et al. a new polyphenol called as the

guavinoside was isolated because of its antioxidant activity as radical scavenging.¹⁵ The advantage of Guava fruit its bioaccessibility, since it allows the polyphenols to be absorbed in the intestine. Likewise, the total release rate found in the literature was 10.55mg.min⁻¹ from the whole Guava fruit extract.¹⁶

Finally, in South America there is an important fruit known as *Annona Muricata*, which also presents antioxidant activity and is used in many medical applications. Approximately 37 polyphenolics compounds had been reported, the most important is the quercetin and gallic acid. Regarding the pulp, tocopherols and tocotrienols are the most important antioxidants in the response of bioactivity of the fruit. The soursop, had positive results in DPPH and ABTS.¹⁷ Furthermore a study carried out by Roduan, revealed an incredible result by suppressing DMBA (2,4-Dimethoxybenzaldehyde)/TPA (12-O-tetradecanoylphorbol-13-acetate) induced skin tumor. It is possible that the anti-tumor activity is related to the antioxidant and free radical scavenger activities due to the use of the leave extract from *Annona Muricata*.¹⁸ *A. Muricata* leaves also is used to treat diabetes, stomach diseases and parasitic infections.¹⁷

Discussion

- Some polyphenols found in tropical fruits have attractive properties as antioxidant, and they may possibly be an alternative to prevent degenerative diseases.
- The consumption of the extract from leaves or pulp from tropical plants could reduce the rate of living cells degeneration and improve the health conditions.

Acknowledgements

Agroindustrial Process Research Group, Luis Eduardo Díaz.

Conflict of interest

None of the author has any conflict of interest in the context of this work.

References

- Losada-Barreiro S, Bravo-Díaz C. Free radicals and polyphenols: The redox chemistry of neurodegenerative diseases. *Eur J Med Chem.* 2017;133:379–402.
- Galli F, Piroddi M, Annetti C, et al. Oxidative stress and reactive oxygen species. In: *Cardiovascular Disorders in Hemodialysis*. Karger Publishers; 2005;149:240–260.
- Prasad S, Gupta SC, Tyagi AK. Reactive oxygen species (ROS) and cancer: Role of antioxidative nutraceuticals. *Cancer lett.* 2017;387:95–105.
- American Diabetes Association. *The Cost of Diabetes*. 2017.
- American Heart Association. *Cardiovascular Disease Costs Will Exceed \$1 Trillion by 2035*. 2017.
- Jiménez JA, Díaz LE, Sotelo LI. Oxidative capacity of the enzyme polyphenoloxidase during borojó (borojo apatinoi cuatrec.) ripening. *Acta horticulturae*. 2014.
- Kappel VD, Cazarolli LH, Pereira DF, et al. Beneficial effects of banana leaves (*Musa x paradisiaca*) on glucose homeostasis: multiple sites of action. *Revista Brasileira de Farmacognosia*. 2013;23(4):706–715.
- Krishnan SSC, Subramanian IP, Subramanian SP. Isolation, characterization of syringin, phenylpropanoid glycoside from *Musa paradisiaca* tepal extract and evaluation of its antidiabetic effect in streptozotocin-induced diabetic rats. *Biomedicine & Preventive Nutrition*. 2014;4(2):105–111.
- Jia X, Yang D, Xie H, et al. Non-flavonoid phenolics from Averrhoa carambola fresh fruit. *Journal of Functional Foods*. 2017;32:419–425.
- Kit AA. KF-01-002 250 tests (96 well plate).
- J Prieto. Procedure: Preparation of DPPH Radical, and antioxidant scavenging assay. Microplate Protocol. 2012.
- Soncini R, Santiago MB, Orlandi L, et al. Hypotensive effect of aqueous extract of Averrhoa carambola L.(Oxalidaceae) in rats: An *in vivo* and *in vitro* approach. *J Ethnopharmacol*. 2011;133(2):353–357.
- Pan J, Yi X, Zhang S, et al. Bioactive phenolics from mango leaves (*Mangifera indica* L.). *Industrial Crops and Products*. 2018;111:400–406.
- Fahmy SR, Amien AI, Abd-Elgleel FM, et al. Antihepatotoxic efficacy of *Mangifera indica* L. polysaccharides against cyclophosphamide in rats. *Chem Biol Interact*. 2016;244:113–120.
- Feng XH, Wang ZH, Meng DL, et al. Cytotoxic and antioxidant constituents from the leaves of *Psidium guajava*. *Bioorganic & medicinal chemistry letters*. 2015;25(10):2193–2198.
- Blancas-Benitez FJ, Pérez-Jiménez J, Montalvo-González E, et al. *In vitro* evaluation of the kinetics of the release of phenolic compounds from guava (*Psidium guajava* L.) fruit. *Journal of Functional Foods*. 2018;43:139–145.
- Gavamukulya Y, Wamunyokoli F, El-Shemy HA. *Annona muricata*: Is the natural therapy to most disease conditions including cancer growing in our backyard? A systematic review of its research history and future prospects. *Asian Pac J Trop Med*. 2017;10(9):835–848.
- Roduan MRM, Hamid RA, Sulaiman H, et al. *Annona muricata* leaves extracts prevent DMBA/TPA-induced skin tumorigenesis via modulating antioxidants enzymes system in ICR mice. *Biomed Pharmacother*. 2017;94:481–488.