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Coconut Palm Sap: A Possible Source of Potential Strategies for the Treatment and Prevention of Chronic Non-Communicable Diseases

Editorial

Noncommunicable diseases (NCDs) are a group of conditions that originate from long-term health events, which requires treatment over a long period of time. Among these NCDs we find cancer, diabetes, cardiovascular diseases, and chronic lung diseases. NCDs are responsible for about 41 million deaths per year according to the World Health Organization. Inside these risk factors are considered the lack of physical activity, the use of alcohol and cigarettes, as well as an unhealthy diet [1].

Fermented beverages are part of the customs and traditions in many countries, in addition to the fact that many of them are a source of macro and micronutrients. Currently, in the field of nutrition there is a new trend to generate diets related to each patient according to their metabolic needs coupled with easy economic access. In this new nutritional trend, foods from popular cuisine and local gastronomy that benefit and provide components of high nutritional value and abundant in the region are being considered. These new challenges in the field of food will allow the generation of data that resolves the questions about the consumption and use of these products, allowing the establishment of effective and healthy consumption doses for society. In the Asia-Pacific region it is possible to find fermented beverages derived from the plant species *Cocosnucifera* [2].

Cocosnucifera is a plant species that grows in tropical and sub-tropical climates, it is commonly known as coconut tree. In Mexico, the species is used for its fruits, which are used for the food and tourism industry, in tropical areas. In addition, a mixture of oils is obtained from the peel of the fruit, which is destined for the cosmetic and food industry worldwide. Meanwhile, the leaves of the palm tree are used to obtain fibers for textiles and fodder as well as handicraft products with wide distribution in the Mexican region [3]. One of the parts of the coconut tree used in traditional cooking is the inflorescence of the palm from which a kind of sap is obtained. This coconut palm sap has been consumed as a traditional drink “palm wine” for more than 500 years in Asian and African Pacific areas. In Mexico, the cultivation and exploitation of the coconut palm was introduced at the time of colonization by ships from the Philippines; where the consumption of coconut palm sap was promoted, generating acceptance by the population for being a low-cost non-alcoholic beverage [3].

In the Western Mexico region, the coconut palm sap is obtained by an artisanal process inherited from father to son. In this process, the tip of the inflorescence is cut, and the sap is collected through, containers or vessels tied to the coconut tree.

This process of obtaining and cutting the inflorescence is carried out daily to prevent the decrease in the sap production which promotes that the same palm tree

Editorial Article

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produces between 1 to 1.5 liters of sap per day. The sap obtaining is influenced by environmental and biological factors, that favors its fermentation process [4]. The fermentation of coconut palm sap results in a locally consumed drink known as “tuba” that is then marketed in the population accompanied by other fruits such as strawberry or apple, hibiscus flower, peanuts or consumed in its native state of obtainment [3].

The traditional marketing of this drink is already known, however there are few studies on the physical, microbiological, and molecular characterization of the coconut sap in the Mexican Pacific. Previous chemical studies on coconut palm sap carried out on coconut palms in the region of Southeast Asian when this product it is used as a drink rich in sugars, fibers and organic acids (lactic and acetic acids) [5].

Some studies have been carried out related to the fermentation process of the palm sap obtained in Indonesia and Thailand. Saputro et al. reported that the palm sap recently obtained is rich in sugars such as glucose, fructose, and sucrose, as well as some fructooligosaccharides (FOS), which over time are metabolized by microorganisms present in the environment. This fermentative process was explored by some authors is evidenced in physical and chemical changes in the sap in a period of 12 to 24 hours [2]. It has been found that some of these FOS are important factors in the prevention of some types of cancer, such as colon, besides has been observed been observed that they generate an important strategy for patients with carbohydrate metabolism disorders [5]. Other metabolites that have been identified are some aminoacids like glutamic acid, threonine, tryptophan, and serine, which have promoted the incorporation of coconut palm sap as a functional food. Likewise, some components with antioxidant activity such as vitamin C have been detected, as well as some vitamins such as A, D, E, K, B1, B2, B3, B4 and B10 [6,7].

Regarding the microbiological composition, studies from the Southeast Asian have found that the palm sap is rich in lactobacilli and yeasts. Some of the principal microorganisms that have been isolated are *lactobacillus sp*, *leuconostocsp*, *Bacillus cereus*, *Saccharomyces chevalieri*, *Acetobacteraceti*, *Enterobactersp* among others. In a study of a sample of coconut palm sap obtained in the Philippines, it was found that the population dynamics of the microorganisms present in the sample depends from some factors like: 1) the environmental factors (rain, irrigation of the palms, humidity, temperature) found in the collection area, 2) the influence of the containers used to store and collect the sap and 3) the fauna that feeds on the coconut tree (insects and mammals such as bats). These factors are different between the pacific countries and affects the microbiological dynamics modifying the concentration of products obtained, which makes the fermentation of the sap a multifactorial process. Considering the above, it is important to carry out a multifactorial analysis taking in account these factors in the analysis of coconut palm sap from the Mexican Pacific areas allowing to establish physicochemical and microbiological characteristics, as well as the marker metabolites of the sap obtained from the plant species.

Another aspect that is important to know is the total of chemical composition of this drink, that is, not only the primary metabolism (sugars, lipids, and proteins). There is currently an important gap regarding the secondary metabolites that have been identified in coconut sap. In the case of other fermented beverages, some metabolites have been identified and isolated, which have had relevant importance in the treatment of NCDs. An example are the different species of Agave, which in Mexico has been used for generations to obtain aplenty of traditional drinks such as “pulque”, “mezcal” and “aguamiel”. In respect of the “pulque” obtained from *Agave salmiana*, phytochemical studies have been carried out in order to detect secondary metabolites present in the plant species, finding flavonols and saponins that have exhibited antioxidant capacity [8]. On the other hand, it has been found that the “aguamiel” obtained from different species of agave is rich in saponin glycosides that have exhibited cicatrizing and anti-inflammatory activity in pharmaceutical formulations for topical use [8,9]. In the same way, and linked to its FOS content, its use as a complementary drink to the diet for patients with type II diabetes is being explored. Likewise, its antiproliferative capacity has been studied in colon cancer cell lines, and it has also been found to possess antioxidant and antimicrobial activity.

There are some possible technological challenges to study coconut palm sap. In first there is the standardization of the conditions for obtaining the sap together with the characterization of the predominant microbial consortium in the area, which would influence the chemical composition of the sap. Obtaining and isolating the secondary metabolites present in the palm sap is an even greater challenge since a methodological strategy must be generated to separate these from the carbohydrate matrix present and subsequent biological evaluation; At the same time, the hypothesis that the possible biological activity of the sap depends on the mixture of mono, di, tetra and polysaccharides that increase the beneficial biological activity or play a role against it should not be discarded.

Additionally, it is important to highlight the mechanisms involved in the maintenance and effects of the intestinal microbiome itself, which have shown a regulation in the effect of some drugs, in which this traditional drink could be involved, subject to previous reports that indicate factors pre and probiotics present.

The coconut palm sap is traditionally drink consumed in the Mexican Pacific region and corresponds to a source of new knowledge that will allow finding new strategies to combat, mitigate or prevent NCDs in the population which Mexico stands out among the first places. Likewise, derived from its protein and amino acid analysis, some components could be detected that would allow its application as a functional food incorporated into the diets of people with protein deficiency or socio-behavioural alterations. The use of ancestral foods and beverages corresponds to an important contribution to science since they could be the answer to current problems as protective agents against national and global health emergencies.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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