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The characterization of functional properties of aromatic herbs used in a hospital specialized in cardiopneumology

Caracterização das propriedades funcionais das ervas aromáticas utilizadas em um hospital especializado em cardiopneumologia

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Abstract

One ways of improving food acceptance from hospital meals is using spices and aromatic herbs in the food preparations. Many aromatic herbs, which can be used daily, have functional properties and over power free radicals in the cardiovascular system. The aim of the present study is to characterize aromatic herbs used in a cardiopulmonary hospital, as well as its benefits and functional properties, in order to suggest new forms of application in the food preparation. A research was done in electronic data basis SciELO, MEDLINE and PubMed, in the period from Jan./ 2000 to June/2015, about spices and herbs available in the institution. The present hospital provides, in its preparation schedule, the following seasonings: oregano, bay, cinnamon, turmeric, cloves, paprika, nutmeg, saffron, thyme, coriander, basil, rosemary, garlic, onions, chives and parsley. Chives, oregano, turmeric, thyme, basil and nutmeg have anti-inflammatory power. Among the herbs and spices that have hypoglycaemic effect are: garlic, coriander, cinnamon, onion, cloves, basil, parsley, turmeric and bay. Besides, coriander, bay, basil, nutmeg, cloves, parsley, turmeric, onion, cinnamon and garlic have proven effective for the treatment of dyslipidaemia. Furthermore, coriander is also effective for the treatment of lung diseases such as asthma and bronchitis. Onion, garlic, paprika, turmeric, parsley and basil can also aid in the treatment of hypertension. In other words, the condiments found at the institution have beneficial effects as natural antioxidants in

the cardiovascular system, what can be an alternative way of prevention or as a complement in the hospital treatment.

Keywords: Spice. Condiments. Antioxidant. Cardiovascular diseases. Food Service, Hospital.

Resumo

Uma forma de se aumentar a aceitação alimentar das refeições hospitalares seria utilizando ervas aromáticas nas preparações. Muitos compostos aromáticos têm propriedades funcionais para combater os danos ocasionados pelo estresse oxidativo no sistema cardiovascular e podem ser usados em preparações do dia a dia. O presente estudo tem como objetivo caracterizar ervas aromáticas utilizadas em um hospital especializado em cardiopneumologia, bem como seus benefícios e propriedades funcionais, com a finalidade de sugerir novas formas de aplicação em suas preparações culinárias. Realizou-se uma busca bibliográfica nas bases de dados eletrônicas SciELO, Medline e PubMed, no período de jan./2000 a jun./2015, dos condimentos e ervas disponíveis no hospital. O hospital disponibiliza as seguintes ervas aromáticas: orégano, louro, canela, cúrcuma, cravo, páprica, noz-moscada, açafrão, tomilho, coentro, manjericão, alecrim, alho, cebola, cebolinha e salsa. A cebolinha, o orégano, o açafrão-da-terra, o tomilho, o manjericão e a noz-moscada possuem poder anti-inflamatório. Já as ervas e condimentos que possuem efeito hipoglicemiante são: alho, coentro, canela, cebola, cravo, manjericão, salsa, cúrcuma e louro. Ainda, o coentro, o louro, o manjericão, a noz-moscada, o cravo, a salsa, a cúrcuma, a cebola, a canela e o alho têm se mostrado eficazes para o tratamento das dislipidemias. Além disso, o coentro também é eficaz para o tratamento de doenças pulmonares como asma e bronquite. A cebola, o alho, a páprica, a cúrcuma, a salsa e o manjericão também podem auxiliar na terapêutica da hipertensão. Conclui-se que os condimentos identificados na instituição apresentam efeitos benéficos como antioxidantes naturais no sistema cardiovascular, podendo ser uma forma viável de utilização na prevenção ou na forma adjunta da terapêutica de doenças no âmbito hospitalar.

Palavras-chaves: Especiarias. Condimentos. Antioxidantes. Doenças cardiovasculares. Serviço Hospitalar de Nutrição.

Introduction

Hospital food exerts a strong influence in the treatment of patients hospitalized, where the nutritional status is directly influenced.[1]

Therefore, for an improvement in nutritional behavior, greater attention should be given to actions favoring the acceptance of hospital diets.

An example of this type of action would be the nutrition service of a hospital specializing in cardiovascular diseases that uses herbs at the time of preparation of low sodium meals because they could help in the acceptance of preparations.[2]

Around the world, the use of spices is observed first to exalt foods flavor and secondarily for the purpose of preserving them, since they have antimicrobial and antioxidant properties.[3]

The term spice is defined as any aromatic product of plant origin (clove, cinnamon, pepper, nutmeg etc.) used to flavor delicacies.[4]

They are added to food preparations in various forms, such as whole, fresh, dried, as isolated extracts and/or essential oil.[4]

Considering that herbs could help in food acceptance, it would be interesting to use them also taking into account their functional aspects, since cardiovascular diseases have been related to damage caused by oxidative stress.[1,3,5,6]

It has been observed that the consumption of foods containing natural antioxidants is related to some lower incidence of diseases linked to oxidative stress.[3]

According to ANVISA [Brazilian government *Agência Nacional de Vigilância Sanitária* (National Health Surveillance Agency)],[7] some food may be claimed to have functional properties when it has some metabolic or physiological roles in growth, development, maintenance and other normal functions of human organisms.

As herbs and spices are one of the main sources of natural antioxidants in human diets, their functional properties have been studied for prevention and treatment of diseases.[3]

Aromatic herbs antioxidant action comes from oxidation-reduction properties of phenols present. They can act as reducing agents, free radical fighters, transition metal chelators, free radical propagation reactions blockers in lipidic oxidation, medium redox potential modifiers and repairers of lesions of molecules attacked by free radicals.[3,8]

In recent decades, several epidemiological evidences have been demonstrated, indicating an inverse relationship between flavonoid consumption and mortality due to cardiovascular diseases.[6]

Flavonoids are also responsible for inhibition of linolenic acid oxidation, LDL (low-density lipoprotein) oxidation, membrane phospholipid peroxidation, microsomal and mitochondrial lipidic peroxidation, erythrocyte peroxidation and chloroplast photooxidation and peroxidation.[9]

Thus, the need to combat oxidative stress in cardiac patients and patients with simplified actions is observed, such as in reformulation of standard prescriptions, using spices and herbs in culinary preparations to improve acceptance for hospital diets.

The present study aims to characterize aromatic herbs used in a hospital specializing in cardiopulmonary disorders as well as their functional benefits and properties with the purpose of suggesting new forms of application in culinary preparations.

Methodology

Research location: *NUTRITION AND DIETARY SERVICE AT BRAZILIAN HEART INSTITUTE – HCFMUSP*

At [one of the clinical institutes of the central University's teaching hospital (*Hospital de Clínicas da Universidade de São Paulo*)] Heart Institute, University of São Paulo (*Instituto do Coração da Universidade de São Paulo*, or InCor), patients with heart disease, such as arrhythmias, aneurysms, heart failure or who have had a stroke or have undergone heart transplantation are hospitalized. In addition to cardiopathy, InCor also serves patients with pneumopathies or who have to undergo pulmonary surgeries.

Eight hundred meals a day are produced for inpatients, counting only lunch and dinner. Such diets follow a pattern whose characteristics and consistencies are modified according to patients' physical and clinical states. They may be, for example, low sodium ones, without added sugar, low fat ones and have soft, pasty or liquid consistency.

All modifications are made to better adapt diets to inpatients since the goal is to individualize care for better recovery of nutritional status and consequently patients' clinical situations.

Nutrition and Dietetics Services use some five-week rotating menu, which is adapted and revised by the receiving service nutrition technique. Preparations modifications occur due to products seasonality, quantity stored in surplus and delivery or even quality problems of processed products.

Aiming at flavoring for better palatability and acceptance of diets, especially sodium restriction diets, the hospital uses herbs and spices in their menus, those being: oregano, bay laurel, cinnamon, turmeric, clove, paprika, nutmeg, saffron, thyme, coriander, basil, rosemary, garlic, onion, chives and parsley.

Data search

A survey of the most commonly used herbs was done at the institution's food storage. From this, a bibliographic search was carried out in electronic bibliographic databases *Scientific Electronic Library Online* (SciELO), *Medical Literature Analysis and Retrieval System Online* (MEDLINE) and *Public Medical* (PubMed) on condiments and herbs available in the hospital. The period delimited for researching the articles was from January/2000 to June/2015. The following descriptors were used: spices, antioxidants, cardiovascular diseases and their English versions, according to health terminology from DeCS (*Descritores em Ciências da Saúde*; Health Science Descriptors), on Virtual Health Library. For search in the (free search engine) PubMed database, the following (comprehensive controlled vocabulary for the purpose of indexing journal articles and books in the life sciences) MeSH (*Medical Subject Headings*) terms were used: *spices*, *condiments* and *antioxidants*. In the search, 57 references were identified, including 52 scientific articles, 2 books, 2 guides and 1 technical regulation.

Results and Discussions

From the results found in the present review, different ways of using functional herbs and condiments in culinary preparations were suggested to adapt the institution's menu in order to make more pleasant the preparations taste and to decrease the amount of salt used in them.

Next, we shall provide details about each herb or condiment, with their main characteristics, where they originate from, the active principles found in each one of them and what recent studies indicate about their health benefits, as well as suggested use provided to the institution.

Cilantro

Cilantro *(Coriandrum sativum L.)* is one of the most studied bioactive components. It is an herbaceous plant, originating in the Mediterranean region and extensively cultivated in North Africa, Central Europe and Asia. In gastronomy it is used as an aromatic herb. It can be used fresh. In the Mediterranean region its dry seeds are used, like condiment/pepper. In Brazil, the form commonly found is in dehydrated leaves and dried seeds. This herb is used to aromatize various dishes such as meats, fish and confectionery. Fresh leaves are used to mask the odor of certain preparations.[10] It is one of the most commonly used medicinal compounds and its nutritional and pharmaceutical properties stand out. Coriander seeds and essential oil have antimicrobial, antioxidant, hypoglycemic, antihyperlipidemic, analgesic, anti-inflammatory, anticonvulsant and

anticancer activities, among others. Recent studies have tried to prove its efficacy for treatment of pulmonary diseases such as asthma and bronchitis.[10,11]

This compound has been shown to be effective for treatment of lipidemia. Some studies[10,11] have investigated the effects of coriander administration in various aspects on lipid metabolism. Its antihyperlipidemic activity is due to its bioactive compounds present in the seeds. In addition, the fatty acids present in coriander – oleic acid, palmitic acid, stearic acid and ascorbic acid – have been shown to reduce cholesterol levels in the bloodstream. They are also responsible for decreasing the deposition of fat on the arteries and veins interior walls. In addition, the reduction of serum and tissue cholesterol levels by consumption of coriander seeds by rats seems likely to be mediated through the rate of degradation increase in bile acids and neutral sterols.[10]

Thus, coriander has the potential to be popularized as a functional food aggregate with preventive and curative effects against dyslipidemia.[11]

Coriander antioxidant activity is attributed to the presence of phenolic constituents, carotenoids, tannins, flavonoids, coumarins, saponins and terpenes, being more effective in the form of extract in animal experiments.[12,13]

Suggested use:[14] It has a refreshing aroma and a remarkable flavor. It goes well with fish, seafood, chicken and vegetables. Its seeds are used to season marinades.

Bay laurel

Bay laurel (*Laurus nobilis* L.) is a large aromatic shrub, native from Asia Minor and grown in southern and southeastern Brazil. Its leaves are widely employed in the cuisine of several countries as condiment for both sweet and salty dishes.[15]

Although the causes of type 2 diabetes mellitus (DM2) and cardiovascular diseases are multifactorial, diet plays an important role in control and prevention of these diseases. Nutritional components present in diets have a beneficial role for prevention and treatment, although the mechanisms by which they act are not well defined. However, it is known that certain condiments play an important role in this control.

Laurel leaves, for example, in an in vitro study, have demonstrated an anti-inflammatory and antioxidant power, with improvement of glucose metabolism, as well as lipid metabolism.[15]

In the same study, Khan[15] has tested laurel leaves in subjects with DM2 and after 30 days of consumption (1 to 3 g/day) a decrease of blood glucose was observed in around 26%. This study has demonstrated that laurel leaves are responsible for lowering total cholesterol, LDL and triglycerides, in addition to increasing HDL (high-density lipoproteins) in patients with DM2.

Suggested use:[14] The leaf is one of the components of *bouquet garni* (French for "garnished bouquet," a bundle of herbs usually tied together with string and mainly used to prepare soup, stock and various stews). It goes well with soups, fish, meats and poultry. One leaf is enough to flavor dishes.

Holy basil

Around the world, various types of basil are grown and used in cooking and as medicinal plants. It is an important herb in gastronomy, found both in fresh form as in whole dried or ground leaves.

Basil (*Ocimum sanctum* Linn.), also known as Indian holy basil, is a plant of the mint family, very common in India, Africa and the Mediterranean region. Being one of the pillars of India's holistic health system (Ayurvedic), it is widely used in the treatment of systemic diseases such as respiratory infections, bronchitis, skin diseases, malaria, etc., besides having a strong antimicrobial power.[16]

A study with *Ocimum sanctum* Linn. has demonstrated the presence of several bioactive compounds in basil, including (phenylpropene, an allyl chain-substituted guaiacol) eugenol. The extract of this one has been used in the study and appeared to decrease the expression of cytokine and chemokine genes (IL-6, TNF-α, MIP-1α, MCP-1), in addition to inhibiting the differentiation of monocytes into macrophages and the expression of inflammatory markers genes such as CD14, TLR2 and TLR4, which shows the strong anti-inflammatory power of basil in a model of acute inflammations.[17]

Another kind of basil (*Ocimum basilicum* Linn.), or sweet basil, is widely used in Chinese medicine for the treatment of cardiovascular diseases, including hypertension. Studies with rats have demonstrated the antihypertensive effect of basil, lowering both systolic and diastolic pressure, in addition to decreasing cardiac hypertrophy, angiotensin levels[18] and having an antithrombotic effect.[19]

Another study in mice has shown that basil (*Ocimum basilicum* Linn.) has wide benefits in pharmacological levels for neurological protection due to the presence of phenolic compounds, flavonoids and tannins and its consequent recovery of endogenous antioxidants.[20]

Suggested use:[14] As the heat diminishes its aroma, it is preferable to add it at the end of the recipe.

Nutmeg

Nutmeg (*Myristica fragrans*) is the seed of the nutmeg tree fruit, a tree that can reach 20 meters in height. The fruit is yellowish or reddish and when ripe it opens and exposes a seed covered by reddish fibers. Nutmeg seed is given to rabbits to prevent atherosclerosis because of its ability to reduce atheromatous plaque size and serum levels of total cholesterol, LDL and VLDL (very-low-

density lipoprotein), as well as increase HDL levels.[21] It also prevents deposition of cholesterol, phospholipids and triglycerides in the liver, heart and aorta, besides dissolving the atheroma plaque in animal models.[22]

Nutmeg is also used as a condiment in the preparation of food, in which it is possible to obtain beneficial effects as its anti-inflammatory and antimicrobial activities in animals.[22]

Suggested use:[14] It is used in candy fillings, béchamel sauces, vegetable seasoning, egg dishes or in preparation of breads, cookies, drinks and cocktails.

Clove

Clove (*Syzygium aromaticum* L.) is an aromatic flower bud commonly used in Africa, Asia and other parts of the world in the preparation of various dishes ranging from meats and salad dressings to desserts.[23] In addition to its culinary uses, clove and its essential oil have abundant use in medicinal form, since they present therapeutic effects in control of diabetes, such as reduction of blood glucose, triglycerides and total cholesterol, both in in vitro and in animals studies.[23,24]

There is extensive evidence that diabetic complications are associated with increased free radicals and reduced antioxidant power, a result also from chronic effect of hyperglycemia. Search for compounds that normalize hyperglycemia and metabolic stress is a vital strategy for prevention of complications associated with diabetes.[23] Although its mechanisms are still poorly understood, clove extract is able to significantly reduce glucose levels in animal models, comparable to that of insulin.[24] In addition, garlic essential oil is able to block lipidic peroxidation, in addition to having an hepato-protective effect against liver damage in rats.[23]

Oregano

Currently, the genus *Origanum* has several different species, subspecies and hybrid plants. Two of the most known species are marjoram (*Origanum majorana*) and oregano (*Origanum vulgare* L.).[25] They have been widely used in agricultural, pharmaceutical and cosmetic industries, in addition to being known as culinary herbs and widely used as a flavoring substance in food products, alcoholic beverages and perfumery due to their spicy fragrance.[25]

Although the chemical composition depends on species, climate, altitude and time in which the plant is harvested, all the species of the *Origanum* genus are rich in several phenolic compounds, lipids and fatty acids, flavonoids and anthocyanins, which are important allies in prevention of cardiovascular diseases due to their antioxidant role.[26]

The most important components of this herb are limonene, beta-caryophyllene, p-cymene, linalool and alpha-pinene. Specially in the *Origanum vulgare* species it is possible to find: p-hydroxybenzoic acid, o-Coumaric acid, ferulic acid, caffeic acid, rosmarinic acid and vanillic acid.[25]

A study[27] has observed antimicrobial and antioxidant potential of oregano (*Origanum vulgare* L.), demonstrating that this herb has activity against many pathogens resistant to chemical antibiotics.

Suggested use:[14] It goes well with tomatoes, peppers, zucchini and pasta, plus white meats such as veal and chicken.

Thyme

Thyme (*Thymus vulgaris* L.) is a medicinal, aromatic and spice plant, also belonging to the *Lamiaceae* family, originating in Europe and grown in the south and southeast of Brazil. The biological activity of thyme essential oil is related to thymol and carvacrol,[28] its main constituents, with thymol being the major compound, followed by carvacrol. Thymol has demonstrated antifungal, antibacterial and anthelmintic effects. As for carvacrol, it has been studied for its bactericidal effects.

An in vitro study has demonstrated antitumor activities of thyme essential oils for their cytotoxic effect on mast cell but proliferative in normal human peripheral blood mononuclear cells,[29] besides being widely used in Moroccan popular medicine as antioxidants, anti-inflammatory and antinociceptive agents.[29,30]

Suggested use:[14] An important element of *bouquet garni*. It goes very well with soups, tomato sauces, vegetables in general and red meats.

Parsley

Parsley (*Petroselinum crispum*), belonging to the *Umbeliferae* family, is a plant originated in the Mediterranean region but today it is cultivated worldwide. It is used for different medical purposes in different countries, including antimicrobial, antiseptic, digestive, sedative and used in cases of gastrointestinal problems, inflammation, halitosis, kidney stones and amenorrhea in traditional Iranian medicine.[31]

Studies[31-33] also show that parsley can be an important source of beneficial antiplatelet compounds, decreasing platelet aggregation and consequently reducing thrombosis and increasing bleeding time in animals, because it has antiaggregant polyphenols and anti-adhesive activity.

Turmeric

Turmeric is obtained from *Curcuma longa L.*, which is a member of the ginger family. In India, China, Polynesia and Malaysia this rhizome is popularly used as a culinary ingredient. In several Asian countries, turmeric has been used with medicinal functions for over 2500 years.[34]

Curcumin is a lipophilic polyphenol, almost insoluble in water but stable in the stomach acidic pH. This polyphenol can modulate a number of signaling pathways, having a role in the suppression of platelet aggregation, in oxidative processes, production of inflammatory cytokines and in myocardial infarction, as observed in a rodent study.[34]

Curcumin antioxidant and anti-inflammatory effects seem to be linked to its hydroxyl and methoxy groups, whose functions end up giving a negative feedback in pro-inflammatory regulation of interleukins (IL-1,-2,-6,-8,-12) and cytokines (TNF-α, MCP1) of enzymes and genes of pro-inflammatory cytokines. TNF-α is known for its role in regulating induction of expression genes of several pro-inflammatory cytokines that have some cause and effect association with diseases such as hypertension, obesity, fasting glucose increase, decreased insulin sensitivity, DM2 and cardiovascular diseases.[34]

Curcumin also stimulates Nrf2 gene expression, which is considered to be the main responsible one for the expression of detoxification genes, which are the basis for antioxidant response elements. However, the most evidenced property of curcumin is its ability to improve cellular insulin signaling in rodents, helping to control blood glucose.[35]

In addition, curcumin is also described as preventing cardiomyocyte hypertrophy caused by hyperglycemia in rats[35] and reducing neural tube malformations caused by hyperglycemia in mouse embryos.[36]

Suggested use:[14] Having a strong aroma and pleasant taste, it is slightly bitter. It is used in dishes based on rice, chicken, fish and crustaceans, as well as risottos, breads, cookies and sweets.

Chives

Chives (*Allium schoenoprasum*) is a seasoning widely used in Brazil in various culinary preparations. It is a plant whose antimicrobial and antifungal effects are used to relieve the pain of sunburn and sore throat.[37]

There are not many studies addressing the benefits of medicinal use of chives, but an in vitro study has shown that the plant contains phenolic compounds in its leaves that give it anti-inflammatory properties by inhibiting phagocytosis and reducing oxidative stress.[37]

Actually, all parts of *A. schoenoprasum* (bulb, leaves and stalks) contain some antioxidant activity but the roots are the most affected by its antioxidant activity.[37]

Other properties attributed to garlic are prevention of tumor growth and processes related to free radicals such as cardiovascular diseases and aging.[38]

Suggested use:[14] It enhances salads, eggs and omelets and sauces. It is part of fine herbs like parsley and tarragon.

Onion

Onions (*Allium cepa L.*) are part of the Allium family and are among the most consumed vegetables in the world. Several studies have confirmed the antioxidant effects of its extract in several pathologies such as nephropathies in rats,[39] coronary diseases in humans[40] and reduced risk of cardiovascular diseases, as it helps to lower blood cholesterol and blood pressure, as seen in a randomized, double-early, placebo-controlled trial by Kim et al.[41]

Some bioactive compounds found in onion skin (quercetin, kaempferol and epicatechin) promote improvement of lipidic profile and an antioxidant effect in in vitro and animal studies.[42-44] Supplementation of onion skin extract (44 mg/day) may bring about an increase in HDL cholesterol and a decrease in total cholesterol and LDL cholesterol.[41]

In addition, quercetin decreases triglycerides and VLDL by suppressing activities of transferases and acetylases without inhibiting the activity of HMG-CoA reductase.[41]

Suggested use:[14] It is present in dishes with more striking spicy taste. It can be used raw in meats, salads, sauces and vinaigrettes. Cooked or braised it goes well with rice, meats, omelets, soups, vegetables and greens.

Cinnamon

Cinnamon *is a spice used in both sweet and salty preparations. It is extracted from the bark of cinnamon tree* (*Cinnamomum zeylanicum).*

In one study, cinnamon aqueous extracts have been shown to increase in vitro glucose uptake and glycogen synthesis, as well as increase phosphorylation of insulin receptors and trigger the cascade system of insulin.[45]

Cinnamon supplements (from 1 to 6 g/day) have shown significant decreases in blood glucose levels. And the longer the supplementation time, the lower the triglyceride values in blood.[45]

Another study has demonstrated the long-lasting antihypertensive effect of cinnamon extract administration (5, 10 and 20 mg/kg) in a rat model, as well as significantly lower levels of triglycerides, total cholesterol, LDL cholesterol and increased HDL cholesterol in plasma.[46]

Suggested use:[14] Having some sweet and strong aroma, it can be found in bark sticks or powdered bark. It can be used in pickles, breads, cakes, sweet vegetables, salty dishes and sprinkled on baked fruits.

Garlic

Various cultures throughout history have already recognized the potential of garlic in treatment and prevention of various diseases. It has already been used to help treat breathing and digestion problems; infestations of parasites, leprosy, arthritis, toothache, chronic cough, constipation, venomous stings; gynecological diseases and as an antibiotic for several contagious diseases.[47] There are several garlic (*Allium sativum L.*) components which may be related to cardiovascular diseases decrease or have antitumor and antimicrobial activities.[47]

The main bioactive compound of garlic aqueous extract or homogenized raw garlic is called allicin (allyl 2-propene thiosulfinate or diallyl thiosulfinate).[47] The exact mechanism of all its components as well as the long-term effects are not yet fully known but several studies describe its main benefits as reducing risks of cardiovascular disease and cancer in humans.[47]

In vivo studies also show that aged garlic extract lowers both systolic and diastolic blood pressure by stimulating the production of NO (nitric oxide),[47] which, together with decrease in cholesterol, platelet aggregation and adhesion, vascular calcification and increased vasodilation, prevention of hyperlipidemia and inhibition of angiogenesis demonstrated in animals (both in vitro and in vivo), shows its importance in prevention of cardiovascular diseases.[48-50]

Suggested use:[14] Very versatile, its flavor goes well with meats, fish and vegetables. Whole and peeled cloves can be used to flavor vegetable oils.

Rosemary

Rosemary (*Rosmarinus officinalis* L.) is a member of the *Labiatae* family. It is used in cooking preparations and has antioxidant properties that have been attributed to a variety of phenolic compounds. Such compounds are able to react with free radicals and eliminate reactive oxygen species (ROS), thus avoiding oxidative stress.[51]

Some in vitro studies show that the aqueous extract of rosemary also has an anti-inflammatory action.[52,53] And the concentration of 50mg/kg has decreased the percentage of glycated hemoglobin and increased the activity of catalase and glutathione peroxidase enzymes in the liver and superoxide dismutase in brains of diabetic rats.[54] This demonstrates that it is efficient in attenuating oxidative stress present in experimental diabetes.

Its antioxidant action may be related to its isoprenoid quinone compounds, phenolic diterpenes such as carnosic acid and carnosol, rosmarinic acid, as well as additional antioxidants including phenolic acids and flavonoids, which are able to capture reactive oxygen species, thus preventing lipidic oxidation.[55]

Furthermore, its bioactive compounds have antimicrobial, antitumor and chemo-preventive activities by regulating activity and/or expression of certain enzymatic systems related to apoptotic processes, tumor promotion and translation of intracellular signals.[55]

Suggested use:[14] Having some refreshing flavor and a very intense aroma, it should be used in small amounts. Its aroma goes very well with beef, poultry and fish, with fillings and breads, soups and some sauces, in addition to vegetables. It is also used to flavor vinegar or olive oil.

Paprika

Paprika (*Capsicum annuum* L.) is the main ingredient of chili, known worldwide for its spicy taste. It comes from ground and dried red pepper. Of European origin, it is widely used in chorizos, sausages and ham.[56]

Paprika is known to reduce myocardial blood pressure during an infarction through TRPV1 (capsaicin receptor), which activates kinase A protein. This condiment is also related to the protective effects of the cardiovascular system, such as vasoconstrictor, vasodilator of neural and vascular activation. Recent in vitro studies suggest that paprika is responsible for inhibiting platelet aggregation.[56,57]

Suggested use:[14] It has some sweet aroma and taste ranging from mild to spicy. It is used in dishes based on pork, poultry, cheese, soups and salad dressings.

Conclusion

It is concluded that the condiments described in this literature review are beneficial due to having antioxidant, hypolipidemic, hypoglycemic and anti-inflammatory effects from natural herbs and spices on the cardiovascular system and can be used preventively or adjunct in therapy

for diseases. However, most of the studies described were conducted in animal experimentation, which emphasizes the importance of further studies in humans to clarify the effects observed. However, such condiments are already widely used in world cuisine with no side effects and their culinary use is feasible in hospital settings.

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