


Nutri Scene
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Polyphenols and

Polyphenols may perform much more important roles than previously thought, from providing basic nutrition to reducing risk against chronic diseases.

POLYPHENOLS are a large group of compounds found in many plant foods such as tea, coffee, nuts and seeds, soya products, cocoa and chocolate, and fruits and vegetables. A large volume of literature has been published on the potential role of polyphenols in the prevention of chronic degenerative diseases, such as cardiovascular diseases and some types of cancers.

A two-day international symposium was recently held in Kuala Lumpur to deliberate on global scientific development of plant polyphenols. In a previous instalment of *NutriScene*, I highlighted some aspects of this symposium,



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focusing on the polyphenols found in tea and coffee. In this write-up, I will continue to share with readers some of the presentations on polyphenols found in a variety of other plant foods.

Polyphenols in nuts and seeds

The distribution, consumption, and evidence for health benefits of polyphenols in nuts and seeds were highlighted by Dr Oliver Chen of Tufts University, US; Dr Karen Lapsley of the Almond Board of California, US; and Dr Karin Wertz of DSM Nutritional Products Ltd, Switzerland.

Commonly consumed nuts and seeds include almonds, Brazil nuts, cashew nuts, chestnuts, hazel nuts, Macadamia nuts, peanuts, pecans, pine nuts, pistachio nuts, and walnuts; and sesame, flax, pumpkin, squash, safflower, sunflower, and watermelon seeds respectively. They are good sources of several nutrients, including vitamins and minerals, unsaturated fatty acids, and fibre. They also contain numerous phytochemicals that may contribute to promoting health and reducing the risk of chronic diseases.

The main classes of phytochemicals include carotenoids, phenols, and phytosterols. Phenols are categorised further into three families, including phenolic acids, flavonoids, and stilbenes. The highest total flavonoid concentrations are found in pecans, almonds, pistachios, and hazelnuts. Flavonoid content in seeds is less well studied.

Several large scale prospective population studies have shown that consuming tree nuts (e.g. walnuts, almonds and hazelnuts) have a protective effect against certain chronic diseases. More data on the consumption patterns of nuts and seeds, especially among Asians, are required to enable a better understanding of the contribution of these important food groups to the health of

various cultures.

The World Health Organisation (WHO) has suggested consuming 30g/day of a combination of nuts, seeds, and pulses as part of overall recommendations to reduce risk of some types of cancer and heart disease.

Dietary guidelines from WHO also encourage replacing dietary saturated fat, found primarily in meat, full-fat dairy, and certain processed foods, with unsaturated fats, such as those found in almonds and nuts.

In 2003, in the United States, a qualified health claim was approved by the FDA for nuts and heart disease, which read, "Scientific evidence suggests but does not prove that eating 42 grams per day of most nuts, such as almonds, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease".

Olives are an important signature foodstuff of the Mediterranean diet, and olive oil is the principal source of fat. Evidence is accumulating that polyphenols are a major source of the health benefit of olives and olive oil. The olive fruit contains a number of phenolic compounds such as cresols, phenolic acids, phenolic alcohols, flavonoids, and secoiridoids. Hydroxytyrosol is the major olive polyphenol consumed and has the highest antioxidant potency.

Olive polyphenols have been shown to beneficially influence risk factors and early markers for cardiovascular disease as well as to possess potent anti-inflammatory activities.

Cocoa and chocolate

Current understanding on health-promoting properties of cocoa and chocolates were presented by Jonathan Hodgson and Kevin Croft of the University of Western Australia; Dr Misnawi Jati of the Indonesian Coffee and Cocoa Research Institute; Dr

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Amin Ismail of Universiti Putra Malaysia; and Dr Roger Bektash of Mars Australia.

Cocoa (*Theobroma cacao L.*) has a long history as a food and beverage. In the past decade, more than 200 studies have been published on the bioactive compounds, chemical compositions, and health benefits of cocoa beans and cocoa products (cocoa powder, cocoa liquor, and dark chocolate). Cocoa beans are rich in polyphenols and the three main groups are catechins or flavan-3-ols, anthocyanins, and proanthocyanidins.

Cocoa is one of the richest known natural dietary sources of flavonoids. However, it is important to differentiate between the natural product cocoa and the processed food product chocolate. Most chocolates are rich in sugar and fat, and quite low in flavonoids. The flavonoids are often lost during the processing of cocoa to chocolate.

However, some chocolates (generally dark chocolates) remain good sources of flavonoids. The challenge is how to preserve the polyphenols in cocoa products so that they give the beneficial effects for health without adversely affecting quality.

Many in vitro studies, studies using animal models and randomised controlled trials in humans, including those conducted in Malaysia, have attempted to fully understand the hypoglycaemic and hypocholesterolaemic effects of cocoa and cocoa flavonoids. Largely consistent evidence suggests that flavonoids and flavonoid-rich cocoa or dark chocolate can improve endothelial function in humans and perhaps other outcomes related to cardiovascular disease risk.

Soya bean and products

Metabolism, efficacy, safety, and health benefits of soya bean and its products were highlighted by Dr Mark Messina of Soy Nutrition Institute, US; Dr Koh Woon Puay of National University of Singapore; and Dr Karl Weingartner, University of Illinois, US.

Soya bean has been the subject of rigorous investigations during the past 20 years. Much of this interest is because this legume is essentially a unique dietary source of isoflavones, diphenolic compounds that possess both hormonal and non-hormonal properties. The two main isoflavones are genistein and daidzein.

Proposed benefits of isoflavones include protection against breast cancer, heart disease and osteoporosis, the alleviation of hot flushes, and the prevention of age-related cognitive decline. In relation to their effects on breast cancer, evidence increasingly suggests that isoflavones are protective against this disease, but that to derive maximum benefit, exposure must occur early in life, that is, during childhood and adolescence.

With regard to safety, recent scientific evidence shows that isoflavones do not affect total or free testosterone levels in men and only very modestly affect reproductive hormone levels in women. Data also show that isoflavones do not affect sperm or semen parameters. There is also no evidence that isoflavones affect thyroid function in euthyroid individuals consuming adequate iodine.

Using data from the Singapore Chinese Health Study, the effects of soy intake on serum oestrogen levels, mammographic densities, and breast cancer risk among middle-aged and elderly women were investigated. These prospective findings strengthen earlier observations from case-control studies and suggest that soy isoflavones may have lasting beneficial effects against breast cancer development. Findings in this cohort also demonstrated that soy intake is inversely related to lung cancer risk in non-smoking women.

Fruits, vegetables, and spices

Phenolic compounds in Asian fruits, vegetables, and spices were highlighted in presentations by Dr Huang De Jian and Mia Isabelle of National University of Singapore; Dr Siriporn Tuntipopipat of Institute of Nutrition, Mahidol University, Thailand; Dr Kamala

Krishnaswamy of National Institute of Nutrition, India; and Dr Myung-Hee Kang of Hannam University, Korea.

The total phenolic compounds and antioxidants and estimated intake of 66 types of vegetables commonly consumed in Singapore were reported. Dark green leafy and brightly-colored vegetables tend to contain a high level of antioxidants. These results substantiate many public health agencies' recommendation to consume more vegetables, particularly the dark green leafy and brightly-colored varieties.

Findings from five different studies performed by supplementing subjects with fruit or vegetable juices such as grape juice, carrot juice, were reported. The studies were focused on smokers, hypertensive subjects and coronary artery disease patients. All studies showed significant improvement in the antioxidant status and the degree of cellular DNA damage of subjects after juice supplementations.

Turmeric, a common spice in Asia, is known as the poor man's saffron and "salt of the orient", indicating its liberal use. It is a rhizomatous herb and belongs to the family zingiberaceae, and the major species of commercial value is genus *Curcuma longa linn*. Its major active constituent is the polyphenol curcumin (diferuloylmethane). It exhibits several molecular targets and is similar to many other phenolic compounds found in other plant spices.

A great deal of research has been conducted on curcuminoids, particularly investigating into their potential role as an anti-inflammatory, antiatherosclerotic and as an anticancer agent.

Polyphenolic compounds are well known inhibitors of dietary iron absorption. Systematic approaches to investigate the impact of polyphenols in common Thai herbs and spices on iron nutrition have been carried out. In vitro iron availability as well as human studies using stable isotope iron were carried out. It was observed that specific types of dietary polyphenols, if consumed in large amounts, may affect iron nutrition through the chelation of non-heme iron with catechol groups of phenolic compounds. On the other hand, their health benefit effects as protective or therapeutic tools to chronic diseases are promising.

Consumer aspects and health claims

Consumer behaviour, health claims, and regulatory aspects were covered in presentations by Dr Trevor Webb of Food Standards Australia New Zealand and Dr ES Tee, Nutrition Society of Malaysia.

It is understandable that the health benefits of bioactive components found in many plant foods, including polyphenols, must be made known to the consumer. Hence the food industry has used various ways of promoting these foods or their ingredients to the consumer.

These could be through advertorials with general write-ups on the potential health benefits of polyphenols. They could also be more direct advertisements in newspapers, magazines, and on TV of the benefits of polyphenols or foods and beverages containing them. With the continued increase of diet-related chronic diseases, and an increasingly health-conscious public, the consumer is certainly attracted to the promise that these potent antioxidants may be beneficial in warding off these ills.

Consumers actively choose their food products and the extent to which claims about antioxidants will influence decisions will vary between individuals and across populations. Demographic characteristics (such as age, gender, socio-economic status, ethnicity) cognitive characteristics (such as nutrition knowledge, food neophobia, motivation, trust) and characteristics of the food product itself may all influence the decision to purchase and consume a particular food product. Key psycho-social models of food choice decisions were presented and the role that claims may play in that process was discussed.

Regulatory agencies are certainly not against informing the consumer of the potential beneficial effects of polyphenols. It is however important that the claims are sufficiently substantiated and within the permitted regulatory system of the country. There are sufficient legal provisions for making health claims on polyphenols, both from an international perspective as well as national authorities in the region.

Codex Guidelines for use of nutrition and health claims 2004 makes a provision for making health claims. In several Asian countries, health claims are permitted and they relate to several bioactive components including several dietary fibres and non-digestible oligosaccharides, and plant sterols. None of the current health claims in the region relate to polyphenols.

■ *NutriScene is a fortnightly column by Dr Tee E Siong, who pens his thoughts as a nutritionist with over 30 years of experience in the research and public health arena. For further information, e-mail starhealth@thestar.com.my.*

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