A scientific peak into the health benefits of pecan nuts

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Introduction

Over the past few decades the world has undergone a nutrition transition and individuals are more aware of the benefits and necessity of a healthy lifestyle, which includes predominantly eating less saturated fats and making healthier food choices (Moodley *et al*, 2007). Plant foods, such as nuts have been identified as contributors in disease prevention and an important part of a healthy diet (Moodley *et al*, 2007:1573). Tree nuts have a wide range of health benefits, which include reducing the risk for coronary heart disease, hypertension, type II diabetes and obesity (O'Neil *et al*., 2010:142). Pecan nuts, as well as almonds, Brazil nuts, cashews, hazelnuts, macadamia nuts, pine nuts, pistachios and walnuts are defined as tree nuts.

Composition and properties of pecan nuts

Nuts are high in energy, unsaturated fatty acids (monounsaturated (MUFA) and polyunsaturated fatty acids (PUFAs)), plant protein, dietary fiber, antioxidants, vitamins (vitamin E, tocopherols), vitamin K, folate, minerals (magnesium, copper, selenium and potassium); and are rich sources of the phytonutrients: phytosterols, flavonoids and proanthocyanidins (Afshin *et al*, 2014:278 ; O'Neil *et al*., 2010:142). Many of these compounds have anti-inflammatory properties and are thought to be the main contributors to the health benefits associated with consumption of tree nuts (O'Neil *et al*., 2010:142).

Fat

The word 'dietary fat' is commonly associated with obesity and heart disease among the general public. The fat content of nuts is typically high and consequently, nuts are traditionally avoided in a low fat diet in an attempt to aid weight loss and lower blood cholesterol and the risk of coronary heart disease (CHD). Growing evidence however suggests that diets that include nuts, do not negatively influence body weight and waist circumference and may indeed have cardio-protective effects (Ryan *et al*., 2006:1573).

The beneficial effects of nut consumption, observed in epidemiologic and clinical studies, highlighted the importance of differentiating the types of fat, rather than the amount, as the type of fat influences blood cholesterol levels to a greater extend (Hu *et al*. 2001:5).

Although nuts are known to have a high fat content the predominant types of fat in nuts are MUFAs and PUFAs. On average the fat found in nuts consists of 59% MUFAs, 27% PUFAs and 14% saturated fat (Ryan *et al*., 2006:1573). Analysis of the fatty acid profile of nuts indicate that pecan nuts have the highest unsaturated/saturated ratio due to their greater content of total unsaturated fatty acids (93.1%). Linoleic acid (Omega-6 fatty acid) is an essential fatty acid, meaning that the body is not able to produce it in sufficient amounts to meet physiological needs, it should therefore be supplied by the diet. Oil extracted from the pecan nut was found to contain the greatest amount of PUFAs (51%), primarily linoleic acid (Ryan *et al*., 2006:1573).

Polyphenols

Pecan nuts provide the body with polyphenols, which are important phytonutrients, well known to reduce the risk for cardiovascular disease (CVD) and have important cancer prevention properties (Andriantisitohaina *et al*., 2012: 1532).

Phytosterols

Pecan nuts are a major source of dietary phytosterols. The amount present in pecan nuts is adequate to provide the body with the required benefits (Bouali *et al*., 2014: 309), such as cholesterol-lowering ability, as well as anti-inflammatory, and anti-diabetic properties (Santas *et al*., 2013:3437).

Vitamins and minerals

Most vitamins with the exception of vitamin C are present in tree nuts, with especially high levels of vitamin E found in pecan nuts, when compared to other tree nuts and most other foods.

A large amount of literature exists suggesting a neuroprotective role of vitamin E (Martha *et al*., 2015:1015-1022). Vitamin E is a very powerful antioxidant, strongly linked to brain health (Thalheimer, 2015:10). Antioxidants are substances that may protect cells from the damaging effects of free radicals (Venes, 2009:152) and may help delay the progression of age-related neurodegeneration (Suchy *et al*., 2010:45). Pecan nuts among all nuts and all food categories are classified as one of the foods containing the highest amount of antioxidants (Tan, 2011:Online).

The human body relies on certain essential trace elements to serve as co-factors for physiological and metabolic functions, which include; chromium, copper, iron, manganese, selenium and zinc. Recent research findings confirm that these trace elements are found in nuts consumed in South Africa, where the concentrations of each element in the type of nut vary accordingly (Moodley *et al*, 2007:1573).

Fiber

Pecan nuts are rich in fiber and provide 2.7 gram (g) of fiber per serving (30g), which is about 10% of the recommended Dietary Reference Intake (DRI) (Tan, 2011: Online ; O'Neil, 2010:147). Many well-known health benefits are associated with dietary fiber intake including improved weight status, blood cholesterol control, blood pressure and blood sugar control as well as lower levels of certain inflammatory markers (O'Neil, 2010:147).

Health benefits provided by pecan nuts

Cardiovascular disease

Nuts are recognised for their health-promoting aspects, particularly for their role in reducing CVD risk. This may be due to the favourable lipid profile and low glycaemic nature of nuts. Other evidence suggests that increased consumption of nuts increases antioxidant defence and reduces inflammation in populations with increased risk for CVD (Alaslvar & Bolling, 2015: 68).

Women who consumed nuts five or more times per week were reported to have a 35% lower risk of coronary heart disease (CHD) as compared with women who seldom ate nuts as reported from the Nurses' Health Study (Hu *et al*. 1998). Likewise, the Physicians Health Study (Albert *et al*. 2002) and the Adventist Health Study (Fraser *et al*. 1992) strongly support the link between consumption of nuts and the reduced risk for CVD. Furthermore, several clinical studies have evaluated the effect of diets high in nuts on blood lipids. A cholesterol-lowering effect was observed for diets supplemented with pecan nuts (Rajaram *et al*. 2001).

MUFAs and PUFAs, found in pecan nuts have proven to lower LDL- cholesterol, total cholesterol and triglycerides when replacing saturated fat in the diet, all of which produce cardio-protective qualities (Raymond & Couch, 2012: 755).

It is well established that high cholesterol levels are associated with increased risk for CVD (Kirkegaard *et al*., 2013:1). Consumption of pecan nuts has been correlated with a reduction in blood cholesterol levels and reducing the risk of chronic disease such as CVD (Bouali *et al*., 2014: 309). According to a study published in the Journal of Nutrition, a pecan nut-enriched diet lowered total cholesterol by 11.3% and LDL cholesterol by 16.5% (Tan, 2011: Online).

Diabetes and glycemic control

Evidence from different studies shows that diets high in tree nuts improve glycemic control in individuals with type II diabetes, supporting the inclusion of nuts in a healthy diet (Viguiliouk *et al*., 2014: 2). Insulin resistance is associated with an increased risk for type II diabetes (Taylor, 2012:778). Dietary fiber as found in nuts decreases insulin resistance and is inversely associated with the risk of type II diabetes (O'Neil, 2014: 147).

Weight management

There is sufficient scientific evidence indicating that nut consumption is not associated with higher body weight. A lower body mass index (BMI) was observed in individuals who consume nuts, compared to non-consumers (Mattes and Dreher, 2010:137). According to research published in the American Journal of Clinical Nutrition nuts, like pecan nuts, may indeed aid in weight-loss and maintenance by increasing metabolic rates and enhancing satiety. Although nuts have a high-fat content, the majority of fat are unsaturated fatty acids and actually induce energy expenditure by thermogenesis. Additionally, because of the high energy, protein and fiber content, nuts increase satiety (Vadivel *et al*., 2012: 1089).

Neurological protection

Protection against age-related disorders and prevention of a decline in cognitive function is linked with the consumption of antioxidant-rich foods, of which nuts are a significant source (Suchy *et al*., 2010:45). In a recent study, mice were supplemented with pecan nuts and the effect on their motor neuron function assessed. In this study the earliest detectable aspects of motor neuro function was evidently delayed in the mice that were supplemented with pecan nuts. The desired neuroprotective effect however was only present when large quantities of pecan nuts were consumed (Suchy *et al*., 2010).

The Mediterranean-Dietary Approach to Systolic Hypertension (DASH) diet intervention for neurodegenerative delay (MIND) diet is known for its associated protection against neurodegeneration and reduced risk for developing Alzheimer's disease (Morris *et al*., 2014:166). This diet specifically recommends nut consumption at least three times per week amongst other recommendations (Hiscott, 2015:12). Individuals who followed the MIND diet meticulously had a 53% reduction in the risk for developing Alzheimer's disease (Hiscott, 2015:12-13).

Conclusion

Before scientific evidence were available, nuts were considered to be a food extremely high in fat that may favour weight gain. However consumption of tree nuts is associated with a reduced risk of CVD, type II diabetes, and neurodegeneration and may actually improve weight management. Such beneficial effects from tree nuts are largely due to their high antioxidant, fiber, unsaturated fatty acid and micronutrient content. It is therefore important that nuts should be consumed on a regular, if not daily basis. Pecan nuts, among all nuts contain the highest amount of antioxidants and can offer many valuable nutritional benefits to improve health and well-being (Tan, 2011:Online).

Reference list

Andriantsitohaina, R., Auger, C., Chataigneau, T., Étienne-Selloum, N., Li, H., Martínez, M.C., Schini-Kerth, V.B. and Laher, I., 2012. Molecular mechanisms of the cardiovascular protective effects of polyphenols. *British Journal of Nutrition*, 108(09):1532-1549.

Alasalvar, C. and Bolling, B.W., 2015. Review of nut phytochemicals, fat-soluble bioactives, antioxidant components and health effects. *British Journal of Nutrition*, 113(S2):S68-S78.

Hu., Fb, Mansen, JE, Willett WC. 2001. Type of dietary fat and risk of coronary heart disease: a critical review. *The Journal of the American College of Nutrition*, 20(1):5-19.

O'Neil, C.E., Keast, D.R., Fulgoni, V.L. and Nicklas, T.A., 2010. Tree nut consumption improves nutrient intake and diet quality in US adults: an analysis of National Health and Nutrition Examination Survey (NHANES) 1999-2004. *Asia Pacific journal of clinical nutrition*, *19*(1):142.

Ryan, E., Galvin, K., O'Connor, T.P., Maguire, A.R. and O'Brien, N.M., 2006. Fatty acid profile, tocopherol, squalene and phytosterol content of brazil, pecan, pine, pistachio and cashew nuts. *International journal of food sciences and nutrition*, *57*(3-4):219-228.

Santas, J., Codony, R. and Rafecas, M., 2013. Phytosterols: beneficial effects. In Natural products (pp. 3437-3464). Springer Berlin Heidelberg.

Vadivel, V., Kunyanga, C.N. and Biesalski, H.K., 2012. Health benefits of nut consumption with special reference to body weight control. *Nutrition*, 28(11):1089-1097

Viguiliouk, E., Kendall, C.W., Mejia, S.B., Cozma, A.I., Ha, V., Mirrahimi, A., Jayalath, V.H., Augustin, L.S., Chiavaroli, L., Leiter, L.A. and de Souza, R.J., 2014. Effect of tree nuts on glycemic control in diabetes: a systematic review and meta-analysis of randomized controlled dietary trials. *PloS one*, 9(7):103376.

Viguiliouk, E., Kendall, C., Mejia, S.B., Cozma, A., Ha, V., Mirrahimi, A., Jayalath, V., Augustin, L., Chiavaroli, L., Leiter, L. and De Souza, R., 2015. Tree Nuts Improve Glycemic Control: A Systematic Review and Meta-Analysis of Randomized Controlled Dietary Trials. *The FASEB Journal*, 29(1 Supplement), 383-1.

Venes D., 2009. Taber's Cyclopaedic Medical Dictionary. F. A Davis Company. Philadelphia.

Yang, J., 2009. Brazil nuts and associated health benefits: A review. *LWT-Food Science and Technology*, 42(10):1573-1580.