

# [Postprandial effects of pecan nuts ingestion on plasma level of nutrients](https://assignbuster.com/postprandial-effects-of-pecan-nuts-ingestion-on-plasma-level-of-nutrients/)

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A. Statement of the Problem Studies through the years have suggested the health benefits that can be derived from incorporating nuts in daily diet of humans. Pecans are rich sources of phytochemicals such as vitamin E, calcium, magnesium, potassium, zinc and fiber (Morgan, Bevwrly, & Clayshulte, 2000), as well as antioxidants that can have a unique effect on the body (Yochum, Folsom, & Kushi, 2000). Vitamin E in the form of tocopherol comes in different forms in pecan nuts, which protects fats from oxidation.

The most abundant form is the gamma-tocopherol and an increase in concentration of gamma-tocopherol in the blood subsequently can reduce oxidation (Haddad, PJambazina, Tanzman, & Sabate, 2006). In addition gamma-tocopherol has a protective effect against prostate cancer and may protect the intestine and this health benefits areas well accounted with its antioxidative properties. Pecans are also good sources of omega-3 fatty acids which plays several important roles in brain function such as prevention of depression, which can interfere with brain function. One study reported that pecans rank highest among all nuts and are among the top category of foods to contain the highest total anti-oxidant capacity (TCA) (Xianli et al., 2004). It is observed that 28. 4 g (1 oz) of pecans had 5, 095 TAC (Beans Blast Blueberries To Gain Antioxidant Crown, 2004), and a dietary fiber 9. 00 g/100 g (Feldman, 2002).

Plant sterols are also present in pecan nuts and these compounds are capable of lowering the cholesterol in the body. Pecan nuts contain about 95 milligrams plant sterols per 100 grams and most are in the form of beta-sitosterol. Beta-sitosterol lowers the level of blood cholesterol level through competing with cholesterol absorption in the body. Thus, an increase in an intake of pecan nuts may also increase the amount of plant sterols in the body which in turn could benefit ones health (Eitenmiller, Rye, & Koehler, 2000). Nuts such as the pecan contain naturally a class of phytochemicals which are known as natural polyphenols. Structurally polyphenols have one or more aromatic rings while functionally they help protect the plants against plant diseases and diseases associated with ultraviolet exposure Polyphenols also has an important role in preventing oxidation of cells hence it is one example of antioxidants. Antioxidants prevent oxidation of compounds and in the process prevents the occurrence of an oxidative stress which is a condition wherein there is an excessive amount of species compounds reactive to oxygen (Scalbert, Johnson, & Saltmarsh, 2005).

Biologically, oxidation may disrupt the integrity of cell membrane and may also interfere with the normal processing of DNA oxidative agents are considered as a potent danger to the body system. Natural polyphenols occur into different groups such as flavanoids, vitamins, phenolic acids, ellagic acid and many others. An example of a polyphenol vitamin found among pecan nuts is gamma-tocopherol (Kim & Lee, 2004). In a certain study conducted to compare the effect of a pecan diet on blood level of gamma-tocopherol compared with that of AHA Step I diet, it was found out that pecan diet resulted into a greater increase in the serum blood level of the gamma-tocopherol (Haddad, PJambazina, Tanzman, & Sabate, 2006).

The AHA Step I diet is the diet designed by the American Heart Association as part of the treatment among patients with elevated levels of blood cholesterol. Also in the same research it was found out that the pecan diet increased the percentage of fat in stool hence it was suggested that the structure of the lipid-storing granules and fiber components in the pecan nuts do not permit a ready and easy absorption. In another research study, it was discovered that the pecan diet can also control biomarkers of heart disease risk just as effective as the AHA Step 1 diet. Moreover, it was found out that the participants who took the pecan diet have a marked increase in the level of dietary fiber, thiamin magnesium, copper and manganese and the pecan diet even resulted into adequate levels of magnesium intake as compared to the AHA Step 1 diet (Barloon et al., 2001).

The significance of this research is to help elucidate the health benefits that can be derived from including pecan nuts in the normal diets of humans. In line with this, this will enlighten some key concepts and mechanisms involves as to why pecan nuts have related health benefits particularly that of its antioxidative property as a product of its active components like polyphenols specifically gamma-tocopherol. This research proves to be noteworthy undertaking since the health effects that can be derived from pecan nuts are in indeed very helpful especially in preventing circulatory-related diseases. Ultimately, this research offers knowledge as to how the antioxidative properties of pecan nuts may reduce or prevent progression of disease which develops as a result of cellular oxidation. B. Purpose of the Study This research primarily aims to provide a greater knowledge about the polyphenols and their role in helping the body maintain oxidative balance.

Specifically, the mechanism by which polyphenols protect the body against disease progression through examining the effect of nut consumption on in vivo changes in lipid peroxidation and antioxidant markers will be answered. Secondly, this study will also see the change in the bioavailability of polyphenols in pecans. Finally, time trend of plasma total polyphenol levels before and after ingestion of nut-containing meal in order to obtain plasma peak concentration will as well be investigated in this study.

C. Research Questions 1. After pecan consumption is there any increase in plasma polyphenol concentration? 2. When is the peak concentration for polyphenols in plasma after consumption of pecan-containing meal? 3. After nut consumption is there any increase in plasma antioxidant capacity? Based from the study conducted by (Haddad, PJambazina, Tanzman, & Sabate, 2006) which was previously mentioned above pecan-enriched diet increased the level of gamma-tocopherol. Measurement of the cholesterol-adjusted plasma gamma-tocopherol revealed a 10. 1% increase among the blood samples of the participants after eating the pecan-enriched diet

. This therefore proves the statement that pecan consumption can raise the plasma polyphenol level concentration since it was earlier mentioned that gamma-tocopherol is an example of polyphenol that falls under vitamin category. In the same study, the lipid oxidation was significantly reduced by 7. 4% when compared with the Step 1 diet. Hence, this finding shows that after administration of the pecan-enriched diet can increase the plasma antioxidant capacity.

D. Theoretical Justification [or Mechanisms] The associated protective effect of pecan nuts against oxidation is accounted for the presence of antioxidants. Pecans as mentioned above contain various forms of vitamins in the form of tocopherols, gamma-tocopherol being the most predominant. Vitamins, in turn are one of the categories of natural polyphenols which are known for their antioxidative properties. It was thought before that polyphenols and other antioxidants scavenge free radicals thus protecting the cell against oxidation but this mechanism is thought to be oversimplified (Davies & Kelly, 2004)

The metabolic processes in the body result into the formation of by-products which could as free radicals. Among the reactive species that may be produced are hydroxyl radicals (. OH), superoxide anions (O2-), singlet oxygen(1O2), hydrogen peroxides (H2O2), organic peroxides (R-OOH), nitric oxide and peroxynitrite (Milner). These reactive molecules lack stability and greatly reactive thus may disrupt the stability of lipid membranes the different organelles in side cell even the DNA and may also disrupt the integrity of the cell membrane. These reactive species may be acted upon by antioxidants through four ways: (1) chain breaking; (2) reducing the concentration of reactive oxygen species; (3) scavenging initiating radicals, and (4) chelating the transition metal catalysts. Polyphenols such as gamma-tocopherol which is present in pecan nuts act by chain breaking reactions and they act in liquid phase to trap “ ROD” radical (Fouad).

Structurally, gamma-tocopherol does not posses one of the electron-donating methyl groups on its chromosomal ring making it a weaker antioxidant than alpha-tocopherol which is also present among pecan nuts. Gamma-tocopherol on the other hand is more efficient in trapping nitrogen-based free radicals called reactive nitrogen oxide species (RNOS) such as peroxynitrite and nitrogen dioxide. Moreover, gamma-tocopherol can act against lipid peroxidation by donating a hydrogen atom to radicals. In addition, cells may react with polyphenols through reactions involving receptors or enzymes enabling signal transduction. In turn this results into modification of the redox status of the cell which may result into subsequent reactions of redox-dependent reaction (Halliwell, Rafter, & Jenner, 2005; Moskaug, Myhrstad, & Blomhoff, 2005; Rachmiel et al., 1996).

This in turn may return the balance of the charge state of the cells thereby preventing the occurrence of oxidation such that of lipid peroxidation which is triggered by hydroxyl ions. E. Significance to [Nutrition]: Essentially, the increased level of polyphenols in the blood such that of gamma-tocopherol present in pecan nuts may lead into many health benefits. On top of this is the prevention and protection against diseases which are eventually formed in consequence of oxidative stress. Through scientific studies it was known that pecan nuts may help prevent stroke by preventing formation of atherosclerosis which in turn is a consequence of oxidation of low density lipoprotein (LDL) (Yochum, Folsom, & Kushi, 2000). Hence it has been associated with protective effects against the formation of cardio-related diseases.

Another health benefit that may be derived from pecan nuts may be protection against cancer since polyphenols are established to prevent oxidation of free radical which may trigger the formation of cancer. It was known from one study that polyphenols have anti-proliferative effects against growth of cancer cells in the breast (Damianaki & Bakogeorgou, 2000). Another study also reported that oral cavity-related cancer may as well be prevented by polyphenols (Sakagami & Oi, 1999). Still some studies assert the importance of polyphenol in achievement of normal brain function since it has been reported that Alzheimer’s disease may be associated with inadequacy of antioxidants. Thus with all of these benefits, antioxidants such as polyphenols are important parts of our diet in order to achieve a healthy system.

Since it has been proven from one study the pecan nuts are indeed rich source of gamma-tocopherol it is therefore beneficial to include them as part of the daily diet.