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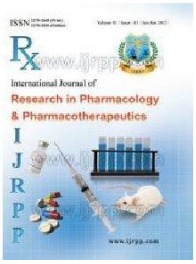

ISSN Print: 2278-2648 *IJRPP |Vol.5 | Issue 2 | April- June - 2016*
ISSN Online: 2278-2656 *Journal Home page: www.ijrpp.com*

Research article *Open Access*

Health benefits and pharmacology of *Persea americana mill. (*Avocado)

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ABSTRACT

The *Persea Americana*, also called avocado or Alligator pear is a tropical native fruit that has originated from America. The fruit, a popular food, and a good source of potassium and vitamin D, fatty acids, vitamins, carotenoids and other phytochemicals. The fruit, leaves, seeds, is used to formulate medicine. Avocado is used to lower cholesterol levels and boost sexual longing, and to arouse menstrual flow. The oils of avocado are used to delight osteoarthritis and can be used as an alternate dietary supplement. Avocado and its oil acquire several salutary properties and hence they have been traditionally used for the treatment of different ailments and disorders. Avocado a nutrient-dense fruit that play an important role in healthy diets, containing almost 20 vitamins, nutrients and phytonutrients. In total avocados are brilliant sources of healthy monounsaturated fats and have naturally low levels of sugars and sodium. Avocados are an important dietary source of the vitamin B group, folate which is an essential nutrient for cell division, heart health, blood production, and during pregnancy. Adequate folate is critical for the prevention of foetal neural tube defects. It has identified as part of a healthy diet, this natural whole food may play a role in helping to manage conditions such as high blood cholesterol, low LDL level and weight management and eye health and decrease blood glucose level and use type 2 diabetes.

Keywords: *Persea Americana* mill, Avocado, Nutritive food, Dietary supplement.

INTRODUCTION

The avocado (*Persea americana*) is a tree national to Central America and Mexico and commercially valuable and are cultured in humid and Mediterranean climates throughout the world[1], family Lauraceae along with cinnamon, camphor and baylaurel. The alligator pear Also known as fruit, and a large berry that contains a single seed [2].The avocado is assumed to have originated in the circumstances of Mexico and Puebla, They have a green-skinned, fleshy body that may be pear shaped or spherical egg shaped. Commercially, they grow after harvesting, Avocado trees are moderately self-pollinating and frequently are propagated from end to end grafting to maintain a predictable quality and quantity of the fruit [3]. Though fossil evidence suggests similar species were much more wide spread millions of years ago, happening as far north as California at a time when the weather of that county was more hospitable to them [4].The native, undomesticated variety is known as a *criollo*, and is small, with dark black skin, and

contains a large seed[5]. It probably coevolved with wiped out mega fauna[6].The oldest confirmation of avocado was found in a cave located in Coxcatlán, Puebla, Mexico, that dates to around 10,000 BC [3].The avocado fruit, is an edible fruit from Central America which is easily adjustable in tropical regions [7]. The avocado has an olive-green peel and thick, pale yellow pulp that is rich in fatty acids such as, oleic, palmitic, linoleic, capric, stearic, linolenic, and myristic acids. This avocado fruit is normally used for human consumption, but it also used as a medicinal plant in Mexico and in another place in the world [8]. The avocado seed represents 13–18% of the fruit, and it is a byproduct normally not exploited. The seed is redundant during the processing of the pulp. The seed waste may represent a severe ecological problem [9]. Though, at the same time, it may be of interest to industry as a source of bioactive compounds. Its chemical composition is comprised of phytosterols, fatty acids ,triterpenes, and two new glucosides of abscisic acid [10].Several biological activities of the avocado seed have been reported such as antioxidant, antihypertensive, fungicidal, larvicidal, hypolipidemic, and recently amoebicidal and giardicidal activities [11–14]. Avocado leaves showed cardiotoxic effects in mammals and birds [16–19]. Correspondingly, the mutagenicity of fruit and leaf extracts in human lymphocytes has been assessed [20].

Scientific classification [21]

Kingdom : Plants –Plantae
Subkingdom : Vascular plants- Tracheobionta
Superdivision : Spermatophyta - Seed plants
Division : Flowering plants -Magnoliophyta
Class : Dicotyledons- Magnoliopsida
Subclass : Magnoliidae
Order : Laurales
Family : Laurel family- Lauraceae
Genus : *Persea* Mill. – bay
Species : *Persea americana* Mill. – avocado

Vernacular names

Chinese : Zhang li, huang you li, lao li, xi yin du lao li
Burmese : Htaw bat
Croatian : Americhki avokado.
Danish : Avocado, avogatpære.
French : Avocat, Avocatier.
Dutch : Advocaat.
German : Alligatorbirne, avocadobaum, avocado, avocadobirne, avocato-birne
Hungarian : Avokado.
Japanese : Abokado, perusea.
Korean : Ah bo k'a do
Italian : Avocato.
Khmer : Avôkaa.
Malay : Adpukat, bash apukaod, aviokad, buah mantega, buah apokat, avocad
Norwegian : Avokado
Russian : Avokado
Portuguese : Abacate, abacateiro.
Spanish : Aguacate, cura,devora, cupandra, okh, palta, sikia
Vietnamese : Bó, lê daù
Thai : Awokhado.

Fig.1. *Persea americana* (Avocado)

Botany

The avocado grows as a large tree height of 15 to 18 meters. It bears a hefty fleshy fruit that is spherical or oval in shape, the skin of the fruit can be thick and timbered. Although the plant is native to tropical America (Central America and Mexico), numerous varieties are now widely distributed throughout the world [22].

Table 1 Nutrients of Avocado [23].

S.No.	Analyte	Quantity (g)	S.No.	Analyte	Quantity (g)
1.	Total sugar	0.2	11.	Vitamin B-6	0.2 mg
2.	High-monounsaturated fatty acids	6.7 g or 114 kcal	12.	Niacin	1.3 mg
3.	Sodium	5.5 mg	13.	Pantothenic acid	1.0 Mg
4.	Potassium	345 mg	14.	Riboflavin	0.1 mg
5.	Magnesium	19.5 mg	15.	Choline	10 mg
6.	Vitamin A	43 µg	16.	Lutein/Zeaxanthin	85 µg
7.	Vitamin C	6.0 mg	17.	Phytosterols	57 mg
8.	Vitamin E	1.3 mg	18.	Dietary fiber	4.6 g
9.	Vitamin K1	14 µg			
10.	Folate	60 mg			

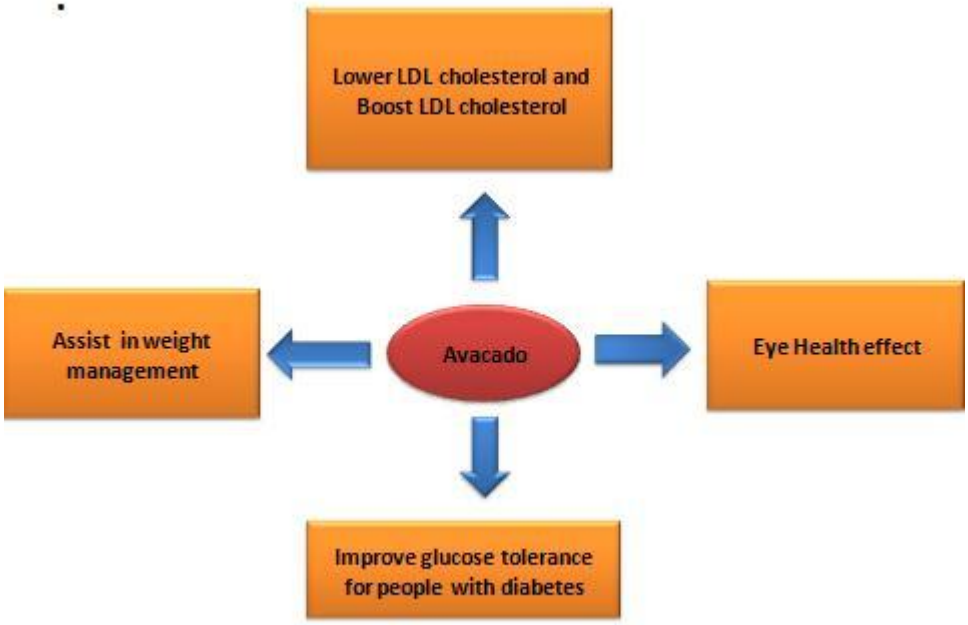
Composition of avocado oil

This oil is rich in monounsaturated fatty acids with oleic acid content being the highest. The fatty acid distribution in the Avocado oil is listed in Table 2 [24,25].

Table 2. Fatty acid composition of Avocado oil

Fatty acid	Quantity (%)
Palmitic acid	28.21
Palmitoleic acid	5.69
Stearic acid	0.69
Oleic acid	50.95
Linoleic acid	13.87
Linolenic acid	0.58

Health benefits



Lower LDL cholesterol and boost HDL cholesterol, contributing to cardiovascular health

The Clinical study on avocado diets has always confirmed that positive heart health effect, including on blood lipid profiles. This is principally because of the whole food effects of this nutrient-dense fruit [26]. Healthy fats in foods are always a mixture of unsaturated fat and saturated, but one type predominates. The fats in avocados, like other plant foods, are mostly healthy monounsaturated fats. As well as providing fat-soluble vitamins, the monounsaturated fats in avocados help to control cholesterol production and may reduce the risk of cardiovascular disease [27]. In foods diets high that contain monounsaturated fats, such as a Mediterranean diet with its olive oil and nuts, have also been shown to reduce the risk of cardiovascular disease [28, 29]. The extensive body of research behind the cardiovascular benefits of monounsaturated and polyunsaturated fats result in recommending avocado as a healthy fat alternative to saturated fat spreads. The Australian Dietary Guidelines - Guideline 3 swap high fat foods that contain predominately saturated fat, such as butter, cream, cooking margarine, coconut and palm oil with foods that contain predominantly polyunsaturated and monounsaturated fats such as oils, spreads, pastes, nut butters and avocado [30]. A healthy varied diet that contains a high intake of both vegetables and fruits, such as avocado, reduces the risk of heart disease.

Plant sterols

The Plant sterols help reduces cholesterol re-absorption in the intestine, increasing the amount of cholesterol excreted from the body [31]. Assured butter spreads, milks and other foods can have added plant sterols. Avocados logically contain small quantities of plant sterols, around 40mg in a part of an avocado [32].

Soluble fibers

Avocado provides around 2 gram total fibers per 50gram serve with two thirds soluble fiber. In a similar manner to plant sterols, soluble fibers can lower cholesterol re-absorption from the intestine [33].

Antioxidants

The Polyphenols Vitamin C, carotenoids, vitamin E are compounds with antioxidant effects that help to protect cells from free radical harm. These compounds also have anti-inflammatory effects that may help prevent atherosclerosis or the thickening and hardening of the arteries associated with heart disease [34]. Reducing sodium and maintaining an adequate intake of potassium can help to guard against high blood pressure, heart disease and stroke. A 50gram serve of avocado contributes less than 2mg of sodium and 245mg of potassium. A healthy diet, which is also low in sodium and contains a variety of foods, can reduce soaring blood pressure [35].

Cholesterol

A part of a healthy diet when eating avocados may lower total and LDL (bad) cholesterol [36-38]. Which has major danger factors for heart disease. Avocado clinical trials have every time exposed positive effects on blood lipids in studied using a variety of diets and on a range of participants, including healthy, obese or overweight, hypercholesterolemic and participants with type 2 diabetes mellitus. Additional larger, longer-term study are required, particularly in those with type 2 diabetes and Avocado intake in those with standard cholesterol can significantly diminish total and LDL cholesterol, as well as maintain High Density Lipid cholesterol. An Australian studied, followed 15 women consuming avocados a day as part of a high carbohydrate diet. After three weeks, noted a decrease in total cholesterol and no modify to High Density Lipid cholesterol. However, the no avocado control diet reduced High Density Lipid cholesterol by 14%. Another study, followed 16 healthy volunteers intense a high carbohydrate, reasonable fat diet for two weeks. It is found, that their total Low Density Lipid cholesterol was reduced while High Density Lipid was maintained, whereas the low saturated fat control diet reduced High Density Lipid [39].

Participants with high cholesterol or type 2 diabetes

A current randomized controlled trial, found that when 45 obese or overweight people with high Low Density Lipid cholesterol eat an avocado a day for five weeks as part of a judicious fat diet, their Low Density, Low cholesterol level, particle size, number and small dense Low Density Lipid as well as LDL: HDL ratio were all drastically reduced [40]. A study demonstrated that a high diet enriched with avocado could notably worse cholesterol in a week. The 30 participants with normal cholesterol and 37 participants with placid to high cholesterol (15 of whom had type 2 diabetes) were placed on a diet enriched with 300g avocado to replace all other fats each day. At the end of a week, those with normal cholesterol reported a decline in total cholesterol, while those with mild to high cholesterol reported a reduction in total cholesterol, a 23% reduce in Low Density Lipid cholesterol and an increase in good HDL cholesterol. Those with type 2 diabetes motto reductions in total and Low Density Lipid cholesterol [41]. Since heart disease possibility is increased in those with type 2 diabetes, including avocado in their diets may be decreased. Another small, randomized study examines the possessions of avocado as a source of monounsaturated fat on serum lipids. Thirteen people with high cholesterol were randomly assigned one of three lacto-vegetarian diets. Those consuming the vegetarian diet with 30% of energy from fats (the majority from avocado), after four weeks, had extensively reduced Low Density Lipid cholesterol [42].

Assist in weight management

The three studied looking the effect of avocado on a portion of weight management. The first study, examined the effects of avocados as part of an energy-confidential diet on serum lipids, weight loss, and vascular function in 55 overweight and obese people. The participants were randomly divided into two groups – one group consuming an energy restricted diet including 200g of avocado a day in place of 30g of other dietary fats, another group consuming an energy restricted control diet. Following six weeks, body weight, body mass index, and percentage of body fat all decrease drastically in both diet groups. The researchers concluded that 200g a day of avocado could be consumed in an energy-restricted diet without compromising weight loss when substituted for 30g of other dietary fats. A randomized crossover study found that overweight people adding half an avocado in lunch to increase

their satiety by 25% and decreased their desire to eat by 30% for 3-5 hours next the meal. The 25 Adding avocado to lunch may help reduce mid meal snacking. A recent US analysis, found that avocado consumers had a lower body weight, Body Mass Index and waist fringe compared to those who did not eat avocado [43-44]. The long-term trials as well as identify mechanisms for the role of avocados in weight management. The extract of avocado fruit inhibits the action of acetyl-CoA carboxylase, a key enzyme in the production of fat in the body [45].

Improve glucose tolerance for people with diabetes type 2 diabetes

The two studied that the effects of avocado in those with type 2 diabetes mellitus, were reduced blood glucose levels in 13 out of the 15 participants with Type 2 diabetes, and noted only five of the 15 had clinically significant reductions. A small randomised crossover study involving 12 women with Type 2Dibetes, found that after four weeks each of a high monounsaturated fat diet (with an avocado a day, eating a third at each meal) and a high carbohydrate diet, both diets caused a minor cholesterol lowering effect with no major changes in High Density Lipid cholesterol. The avocado diet was associated with a greater decrease in blood triglycerides and glycemic control was similar with both diets. Researchers concluded that including avocado in the diet of those with T2D could help reduce cholesterol and triglycerides without compromising blood glucose control [46]. Clearly, more research in the area of Type 2 diabetes is needed, but there have also been interesting Type 2 diabetes, preliminary animal studies that suggest that extracts of avocado leaf and seed may improve blood glucose control [47-48].

Help the absorption of colorful carotenoids necessary for eye health

The macula lutea is a “yellow spot” in the center of the retina responsible for central vision. Macular degeneration is the result of age related damage and it impacts central vision. The macula is yellow because it is rich in lutein, carotenoids and zeaxanthin that are thought to combat light-induced damage caused by free radicals. Carotenoids help to reduce the risk of macular degeneration and are transported to the macula by High Density Lipid cholesterol [49,51]. Avocados provide a affluence of benefits as they contain carotenoids and help to boost High Density Lipid cholesterol and their healthy fats absorb fat soluble carotenoids from other foods. Research shows that avocado to a salad or salsa increases the absorption of carotenoids from other salad vegetables fivefold [52]. Carotenoids are considered to be pro Vitamin A and converted to vitamin A in the body. Vitamin A is a necessary fat-soluble vitamin that is required for normal reproduction, vision and immune function. In animal products Preformed vitamin A is found while carotenoids are largely found in plant foods and eggs [53]. The recently exposed that eating of avocado with other vegetables rich in carotenoids boosts both the absorption of carotenoids and their conversion to vitamin A. Particularly, avocado improved the absorption of beta carotene from tomatoes and enhanced the efficiency of conversion to vitamin A. In the case of carrots, absorption was increased sixfold and the efficiency of conversion of vitamin A [54].

Dosage

Given by mouth Avocado oil/soy oil unsaponifiable fraction has been studied for osteoarthritis treatment of the knee at 300 to 600 mg daily dosage and osteoarthritis treatments use at 300 mg/day in 2 other studies where indicative relief was obtained [55].

Interactions

The Warfarin (Coumadin) interacts with avocado which is used to slow blood clotting. Avocado has been reported to decrease the effectiveness of warfarin (Coumadin). Decreasing the effectiveness of warfarin (Coumadin) might increase the risk of clotting.. After the avocado ingestion decrease in the anticoagulant effect of warfarin. Based on their international normalized ratio (INR). The patients practiced a fall in their INR during consumption of avocado (100 and 200 g daily). When avocado was eliminated from their diets, the INR increased and adequate anticoagulation was restored. One patient ate avocado again and qualified a decrease in INR, which increased when she stopped eating avocado [56].

Adverse reactions

The Manifestation allergy of avocado may be limited to the throat and mouth (oral allergy syndrome, itching mouth, swollen tongue, and throat) or oral symptoms with generalized symptoms (eg, wheezing, abdominal cramping, chest tightness, diarrhoea) [57]. Cross-sensitivity has been shown with melons (eg, cantaloupe), peaches, tomatoes, potatoes, bananas, chestnuts and kiwi fruits. Cross-sensitivity has also been seen in patients with natural rubber latex (e.g. latex gloves) allergy and avocados [58 ,59]. This cross-sensitivity is called the "latex-fruit syndrome" [60]. An IgE-mediated inflammatory mechanism has been shown to be similar in producing an allergic reaction to latex, bananas, and avocados [61-62].

Side effect and safety

Avocado is mostly **safe** for most people when the fruit is eaten in food average amounts. When taken by mouth seems to be possibly safe as a medicine for up to 2 years or when applied to the skin for up to 3 months. It normally has few side effects, and those people who used a specific avocado, vitamin B12, cream for psoriasis reported mild eager. Remain in mind that avocado has a lot of calories because of its fat content.

Pregnancy and breast-feeding

There is not adequate steadfast in sequence about the protection of taking avocado as medicine if you are pregnant or breastfeeding. Stay on the safe side and a stick of to the foods amount.

Latex allergy

The People who are sensitive to latex can have an allergic reaction to avocado.

Toxicology

The avocado ingested in grazing animal produce poisons, and this toxicity also has been observed in species as diverse as fish and birds [63]. Nonetheless, only a small number of reports of toxicity caused by avocado have been available over the past 50 years. The amount of avocado ingested ranged from 10 to 14 g. Signs of toxicity became apparent after 2 to 3 days and the animals commonly died within the next 24 hours. Gross findings included the flow of blood into the brain, and liver, lungs, in goats and cattle, acute toxicity has been characterized by a cessation of milk flow and nonbacterial mastitis [64]. Although the mechanism of toxicity is dense, leaves fed to goat decreased milk production and increased AST and LDH enzyme levels.

Conclusion

The avocado plant has a wide range of nutrients and composition of avocado fruit plants. Which is important in addition to a healthy diet. Avocado eaters consume extensively more of several input nutrients together with dietary fibre, vitamin A, vitamin K, vitamin E, Lutein, potassium, phytosterol and magnesium, Choline. While the technical evidence recommends avocado consumption has health benefits for weight management, and assisting people with type 2 diabetes, eye health, and it has a potential role in lowering cholesterol and LDL and use for heart health. Avocados also are an important nutritional source of folate, which is essential during pregnancy for healthy foetal development.

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