

# Potential Role of Avocado (*Persea americana*)



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## Abstract

*Persea Americana* commonly called as avocado, belongs to family *lauraceae* is a species of *P. americana*. It is native to the Americas and was first domesticated by Mesoamerican. It is a medicinal fruit and used traditionally to treat various diseases like cancer, viral, diarrheal, fungal, microbial infection, skin diseases, ulcer, brain disorder and inflammation. The chemical constituents obtained from different parts of fruit include fibre, carbohydrates, fatty acids. These chemical constituents are mostly responsible for the pharmacological actions. In recent in-vivo and in-vitro studies shows that *persea americana* have anti-inflammatory, analgesic, insecticidal, anti-cancer, antioxidant, antifungal, antiviral, antidiarrheal, and anticonvulsant properties. However, immediate efforts must be made to determine its mode of action, efficacy, dose range, and safety in addressing various disease situations. The current review summarized and presented an up-to-date article on the medicinal uses, phytochemistry and biological activities of *persea americana* (avocado) fruit.

**Keywords:** Avocado; Pharmacological activity; *Persea Americana*; Fatty acids

## Introduction

With industrialization or urbanisation, the medical system gains a lot of importance as per World Health Organization (WHO), the herbal medicine constitutes 80% of the health care system. It has been already known to the world that herbal medicines gain importance because of their possess efficacy, quality, and safety. Evidence indicated that *Persea Americana Mill*, commonly known as Avocado constitute about 25% of USA medication. Morphologically it is oval, glossy and has evergreen leaves that ranges from 4 to 8 and are 10 to 20cm long. Further it possesses larger, thicker branches and have a fruit of great therapeutic potential. Numerous varieties are available but the Mexican-Guatemalan hybrid Fuerte, with smooth-skinned, shiny-green, pears-shaped fruits is widely grown [1] *P. Americana Mill*, is a tropical native fruit of America and belongs to Lauralee family [2].

## Botanical description [2]

Kingdom: *Plantae*

Order: *Lurales*

Family: *Lauraceae*

Genus: *Persea*

Species: *P. americana*

Synonym: *Lauruspersea L.*

For the first time in 1922 the nutritional value of avocado fruits was explored by various researchers. Nutritional aspects of Avocado have been already collated in many foods composition as it is regarded as a superior source of fatty acids, vitamins, and energy. Further, according to the United States Department of Agriculture (USDA) National Nutritional Database for Standard Reference and Nutrient Data Laboratory, Food and Nutrition Information Center (FNIC) Nutritional content of 100 gm of avocado is already mentioned (Table 1 & 2) [3,4].

## Pharmacogonostical profile of AVOCADO

Avocado trees grew into a tall tree with elliptic to elliptical leaves that ranges from 10-30cm (4-12 inch) long. It has been documented that the fruit has no petals but have 9 stamens arranged in series of three and an acellular ovary. Moreover, On the basis of tracheophyte, avocado has two flowers: A and B that are dichogamous (the male and female parts develop independently),

and only one flower opens twice. Blood group (B) flowers has been found to open as functionally male in the afternoon of the next day after closing as functionally feminine at noon. In addition, Blood

type flowers are functionally masculine in the morning, and then become functionally feminine in the afternoon and evening [5]. Figure 1 indicates the avocado.

**Table 1:** Composition of avocado fruit.

| Constituents | Quantity (%) |
|--------------|--------------|
| Water        | 74.40%       |
| Lipids       | 20.60%       |
| Protein      | 1.80%        |
| Fibre        | 1.40%        |
| Ash          | 1.20%        |

**Table 2:** Nutritional content of 100g Avocado fruit [4].

| General Nutritional Constituents            |        |
|---|--------|
| Energy                                      | 160kcl |
| Water                                       | 73.23g |
| Protein                                     | 2.00g  |
| Total lipids                                | 14.66g |
| Carbohydrates                               | 8.53g  |
| Total dietary fibre                         | 6.70g  |
| Sugar                                       | 0.66g  |
| Fatty Acids                                 |        |
| Saturated fatty acids                       | 2.13g  |
| Monounsaturated fatty acids                 | 9.80g  |
| Unsaturated fatty acids                     | 1.82g  |
| Vitamins                                    |        |
| Vitamin C (ascorbic acid)                   | 10.00g |
| Thiamine (B1)                               | 0.07g  |
| Riboflavin (B2)                             | 0.13g  |
| Niacin (B3)                                 | 1.74g  |
| Pyridoxine (B6)                             | 0.26g  |
| Folate (DDE) dietary folate equivalents     | 89µg   |
| Vitamin A(RAE) retinol activity equivalents | 7µg    |
| Vitamin E (α- tocopherol)                   | 2.07mg |
| Vitamin K (phylloquinone)                   | 21µg   |
| Minerals                                    |        |
| Calcium (Ca)                                | 12mg   |
| Iron (Fe)                                   | 0.55mg |
| Magnesium (Mg)                              | 29mg   |
| Phosphorus (P)                              | 52mg   |
| Potassium (K)                               | 485mg  |
| Sodium (Na)                                 | 7mg    |
| Zinc (Zn)                                   | 0.64mg |



Figure 1: Avocado fruit (*Persea Americana*).

## Pharmacological Activities

### Vasorelaxant activity

Researchers indicated the vasorelaxant effects of avocado leaf extract on isolated rat aorta, via releasing endothelium-derived relaxing factors (EDRFs) and the release of prostanoids. Further, the treatment with the extract decreases vasoconstriction by suppressing the influx of calcium ions ( $Ca^{2+}$ ) [6,7].

### Anti Inflammatory activity

Prostaglandins and leukotrienes, which are produced by the

enzymes cyclo-oxygenase and lipoxygenase, are two members of the broad family of chemicals known as eicosanoids that are formed from arachidonic acid [8,9]. The most important function in pathology and physiology is played by eicosanoids, which also mediate inflammation [10,11]. Figure 2 indicate that the avocado seed has anti-inflammatory effect. Phospholipase ( $PLA_2$ ) is the enzyme that play an important role in inflammation by releasing arachidonic acid from membrane phospholipids Lipidic polyols were isolated from avocado seed which has tendency to inhibit  $PLA_2$  activity and in result act as a anti-inflammatory activity.

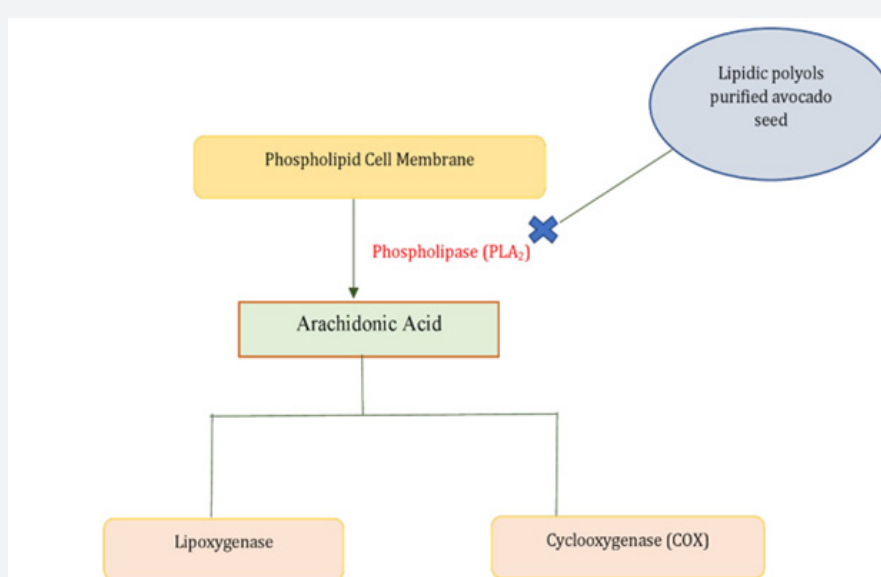


Figure 2: Anti-inflammatory effect of avocado seed.

### Hypotensive potential

Avocado (*persea americana*) seed extract is used in Nigeria for the treatment of hypertension. An aqueous seed extract from Fuerte avocados (200-600mg/kg bw) significantly reduced the blood pressure in NaCl-induced hypertensive rats after 4 weeks of treatment. A reduction in plasma triglycerides (TG), total serum cholesterol (TC) and serum low density lipoprotein-associated cholesterol (LDL-C) levels was also observed at doses of 500mg/kg bw and higher [12]. In a similar study 200 - 600mg/kg bw aqueous avocado seed extract dose-dependently reduced blood pressure, cholesterol, glucose, urea and sodium levels in hypertensive rats after 5 weeks [13]. Acute treatment of acetylcholine-induced hypertensive rats with aqueous seed extract (260mg/kg bw) for 10 d led to a reduction in mean arterial pressure (37 - 43% reduction) and heart rate (9.3-19.7% reduction) [14].

### Anticonvulsant activity

Aqueous *P. americana* leaf extract has anticonvulsant effects in mice. Because the plant extract worked so well in the experimental convulsion model, it is likely possible to treat both petit mal and grand mal epilepsy with it. Pentylentetrazol (PTZ) and picrotoxin (PCT)-induced convulsions responded to the plant's leaf extract more effectively than bicuculline (BCL)-induced seizures. In general, the average convulsion's start and duration were noticeably delayed and shortened, respectively. These results seem to suggest that *P. americana* leaf aqueous extract may have prevented or reduced the mice's susceptibility to PTZ, PCT, and BCL-induced seizures by boosting, or maybe by inhibiting, GABAergic activity and/or neurotransmission in brain [15].

### Antioxidant activity

Avocado oil has antioxidant activity by reducing the formation of ROS in the damaged mitochondria. Based on the data that avocado oil favourably changed hepatic indicators in rats given sugar, which had altered hepatic markers, it has been claimed that avocado oil is an effective dietary supplement for managing metabolic diseases. Additionally, it promotes liver regeneration [16].

### Antidiabetic activity

In laboratory models, avocado seed extracts have been demonstrated to lower blood sugar and improve diabetes. Experimentally, it has been found that 14-day treatment with ethanolic seed extract (450 or 900 mg/kg bw) to lower blood glucose levels by 47 to 55% In Alloxan-induced diabetic. Histopathological studies indicated that the extract has protective effect on pancreatic islet cells [17]. Edem et al. [18] discovered that treatment with aqueous seed extract (300 or 600mg/kg bw) for 21 days decreased plasma glucose concentrations by 73 and 78%, respectively. The presence of insulin-mimetic compounds in the extract, which promote insulin secretion by B cells or improve

glucose utilisation, is thought to be the cause of the extract's hypoglycaemic effects, according to the scientists.

### Anticancer activity

The role of avocado seed and peel extracts against cancer have only been documented via activation of in caspase-3, caspase-7, and poly (ADP ribose) polymerase cleavage. Moreover, it has been explained that treatment with the methanolic extract of avocado seed (100µg/ml) stimulates Apoptosis in MDA-MB-231 human breast cancer cells. In comparison to the seeds, the peel has been reported to have more content of total phenolic compounds and total flavonoids [19].

### Effect on body weight

According to Brail et al.'s [20,21] study, administration of *P. Americana* leaf extracts in aqueous and methanolic form resulted in a decrease in body weight when compared to hyper lipidemic controls. It's possible that *P. americana* leaf extracts boost the breakdown of lipids gathered in adipose tissue, causing a drop in the average body weight.

### Analgesic

According to one study, giving mice an aqueous leaf extract of avocado at a dose of 1600mg/kg significantly decreased the writhing that acetic acid injection causes in mice. The hot plate test revealed that it may also raise the threshold for pain by 87.2% with administration of 800mg/kg and block both stages of formalin-induced pain in a dose-dependent manner. These outcomes were comparable to those attained in the mice writhing assay and hot plate test, respectively, following the administration of medicines such acetylsalicylic acid and morphine. The analgesic effect of the extract on mice was demonstrated by the results, which also showed that formalin-induced pain was inhibited [22].

### Miscellaneous

**Antiviral activity:** *In vitro* viral replication inhibitory effects of the *P. americana* dry leaf infusion and ethanol extract has been reported to have inhibitory effect on viral activity when screened via *in vitro* methods [23].

**Wound healing activity:** Rats treated with oral, or topically administered *P. americana* fruit extract (300mg/kg/day) showed full epithelialization (total healing) on average by day 14 in the excision wound model. The controls, on the other hand, took around 17 days to fully heal. It was discovered that the extract-treated wounds epithelialized more quickly than the controls. The tissue taken from extract-treated animals utilised in the dead space wound model had significantly greater wet and dry granulation tissue weight and hydroxyproline content than that of the controls [24].

**Osteoarthritis:** Blend of soyabean and avocado oil piacledine has been implicated in the management of Osteoarthritis. Various research has been carried out that indicated the role of medication

in reducing the production of fibronectin and increasing proteoglycan and collagen synthesis. However, it too reduced the activity and release of metalloproteinases and pro-inflammatory cytokines, which are crucial in the progression of osteoarthritis [25,26].

**Anti diarrheal:** Bioactive substances found in avocado seeds have been shown to have anti-diarrheal properties. The wetness of the faeces was significantly reduced in a dose-dependent manner when these seeds' chloroform-methanolic extracts were administered to rats with castor oil-induced diarrhoea [27].

**Anti-fungal:** The fruit of the avocado contains a substance called (E, Z, Z)-1-Acetoxy-2-hydroxy-4-oxoheneicosa-5,12,15-triene, that possess anti-fungal properties against the fungus *Collet otrichumgloeo sporioides* and thereby preventing spore germination [28,29].

**Dermatological effect:** Keratinocyte development may be encouraged by avocado seed components. In comparison to vehicle-treated controls, keratinocytes pre-treated with avocado seed-derived PFAs had higher cell viability after UVB exposure [30,31]. Along with improving DNA repair and reducing the release of pro-inflammatory mediators like IL-6 and PGE2, the therapy significantly decreased the number of burnt cells in human skin explants. Treatment with a water-ethyl acetate extract of avocado seed at a concentration of 10 ug/mL similarly increased keratinocyte proliferation and cell viability [32]. Based on several research, avocado seed unsaponifiable fatty acids (UFA) have been acceptable for usage in a cosmetic basis to enhance skin quality in human subjects. In the first research, stretch marks and keratoses on 28 out of 40 participants improved mildly or moderately following a six-week topical therapy. In a second research, four weeks of UFA therapy reduced stretch marks compared to the control group. According to a third research, therapy dramatically decreased redness, hypopigmentation, hyperpigmentation, and ridging. After two weeks of UFA treatment, a fourth trial found that skin moisture retention increased by 33% and skin elasticity increased by 8% when compared to the control. Metal chelators were added, which enhanced the effects of UFA on the damaged [33]. It has been demonstrated that the avocado seed oil's unsaponifiable component prevents lysyl oxidase from working. This enzyme starts the cross-linking process in collagen, and too many cross-links lead to wrinkles and a lack of skin suppleness [34]. The treatment group of hairless mice received 3% natural or synthetic separated linoleic acid-acid conjugated furan for 14 days, which boosted metabolic activity in the skin, increased flexibility, protein content, DNA content, and epidermal thickness. Similar-looking compounds that had at least 9 carbon units linked to the furan ring's number 2 position were similarly deemed efficient. Two patents have been filed in relation to the compounds [35,36].

## Conclusion

Avocado (*Persea Americana*) are tropical fruits native to Mexico

and Central America. Avocados has numerous properties such as increasing absorption of lipid -soluble bioactive phytonutrients such as carotenoids, enhancing the absorption of lycopene and  $\beta$ -carotene, increases absorption of  $\alpha$ -carotene,  $\beta$ -carotene, and lutein. This review gives a glimpse of overall research conducted worldwide to explore the therapeutic potential of the fruit that can be used in the management of various diseases. Research must be carried out to scrutinize more pathways that can be targeted by the various extracts of Avocado.

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