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## Research Article

# Persea Americana Mill: A Brief Pharmacological Review

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### ABSTRACT

Herbal medicine, also known as phytotherapy or botanical medicine, leverages the healing potential of herbs to prevent, alleviate, or treat a wide range of health conditions. Unlike conventional pharmaceuticals synthesized in laboratories, herbal remedies are derived directly from nature, embodying a holistic approach to health that aligns with the interconnectedness of the human body and the environment. Persea americana, also known as avocado belonging to the family lauraceae, is a native plant. It is found in the tropical and sub-tropical regions of Southern Asia as well as in Central America and Mexico. It is used as a traditional medicinal plant which can be used to treat different diseases such as parasitic infection, diarrhoea, ulcer, etc. Different parts of the plant contain different chemical constituents such as tannins, flavonoids and terpenoids. In vivo and in vitro studies have shown that avocado fruits, seeds, pulp and leaves have anti-ulcer, anthelmintic, anti-inflammatory, anti-diabetic, anti-convulsant and many other activities.

### INTRODUCTION

Herbs and herbal medicine have been integral components of human healthcare for millennia, tracing back to ancient civilizations where the healing power of plants was revered and harnessed. From the soothing properties of chamomile to the immune-boosting effects of echinacea, herbs have played diverse roles in promoting health and well-being across cultures and generations<sup>1</sup>. Herbs, often referred to as

botanicals or medicinal plants, encompass a vast array of plant species valued for their therapeutic properties. These botanical wonders offer a rich reservoir of bioactive compounds, including alkaloids, flavonoids, terpenes, and polyphenols, which exert various physiological effects when consumed or applied<sup>2</sup>. Various parts of the plant Persea americana and avocado plant have been used since ancient times to treat various diseases. Aqueous and alcoholic extracts of avocado leaves

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and seeds have been used in traditional medicine due to their anthelmintic, anti-inflammatory, anti-diabetic, anti-oxidant, cytotoxic, and hypoglycemic properties in which some of the pharmacological activities have not yet been discovered. These properties may be due to the presence of polyphenolic compounds. Various studies have shown the presence of flavonoids, tannins and terpenoids<sup>3</sup>. It is the dicotyledonous tree of family Lauraceae<sup>4</sup>. Trees of avocado plants are found in Central America and Mexico. It is presently cultivated in different countries like Brazil and India. The avocado fruit is found in Southern America which is considered to be the most nutritious of all fruits. Along with its unique texture, exquisite taste, aroma and nutritional profile it also has numerous health benefits. Due to these properties, avocado has worldwide recognition and its consumption has seen a considerable growth in the last few years<sup>5</sup>. Over 500 species of avocado plants have been found, one of which is a Fuerte and Mexican-Guatemalan hybrid which has a good appearance. Avocados contain lutein carotenoids, alpha carotene, beta carotene, zeaxanthin, neoxanthin and various other carotenoids present in small quantities. These lipophilic carotenoids may have potential anti-carcinogenic effects, as reported<sup>6</sup>. Avocados are a Native American fruit belonging to Lauraceae's family. Avocados are derived from the Aztec word "ahucatl." It has various medicinal purposes because of its high nutritional content and therapeutic properties<sup>7</sup>.

### Plant Profile<sup>7</sup>

Kingdom	The plantae
Class	Magnoliopsida
Order	Lurales
Family	Laura Ceae
Genus	Persea
Species	Persea americana

### Synonyms<sup>5</sup>

Laurus Persea L., Persea Drymifolia Sachlet. Cham, Persea Gratissima Gaertn.f., Persea Nubigena.

### Vernacular name<sup>5</sup>

Amharic	Avocado
Burmese	Htaw bat, kyese
Creole	Zaboka
English	Alligator pear, avocatier, zabelbok, zaboka
Filipino	Avocado
French	Avocat, avocatier, avocadobrine
German	Alligatorbirne, Avokad
Indonesia	Adpukat and Avokad
Khmer	Avokaa
Malay	Apukoda, Avocado
Mandin ka	Avocado
Pindgin English	Bata
Spanish	Aguacate, Pagua
Swahili	Mparachichi, mpea, mwembemafuta
Thai	aw ok ado
Trade name	Medang
Vietnamese	Bo, le, dau

### Biological Description-

*P. americana* is a large tree with a height of 9-20 cm. The tree has shiny elliptical leaves that are 10-20 cm long and have 4-8 leaves. Flowers are yellowish green with 1-1.3 cm in diameter. The various skin have varied thickness and texture. It is considered as evergreen though in some varieties it loses its leaves before flowering for a short time<sup>5</sup>. It has an olive-green peel along with a thick pale-yellow pulp<sup>8</sup>. The skin of an avocado varies in thickness and texture<sup>5</sup>.

### Fruit

The fruit is a berry with a weight of 2.3 kg. It has a single seed which is surrounded by a buttery pulp<sup>5</sup>. It has no petals but contains 9 stamens arranged in series of 3. It also has an acellular ovary<sup>8</sup>. The shape of the fruit is spherical or pyriform. The colors of a mature fruit are green, black, purple or reddish<sup>5</sup>. The fruit's length lies between 7-19cm and a diameter of 7-9 cm<sup>9</sup>.



**Figure 1: Avocado Tree**



**Figure 2: Avocado Fruit.**

### Leaves

Leaves are 10-20 cm long and of various shapes such as elliptic, oval, and lanceolate. The young leaves are often pubescent and reddish, and the mature leaves are smooth, leathery and dark green<sup>5</sup>.



**Figure 3 : Avocado Leaf**

### Flowers

The flowers of avocado plant are yellowish green in color with a diameter of 1-1.3cm. The tree bears many flowered inflorescences in a pseudo-terminal position<sup>5</sup>.

### Seed

The seeds of avocado vary, such as broadly ovated, base flattened and conical apexes, base flattened and rounded apexes, cordiform and ellipsoid. In some seeds cotyledons are also attached to the seeds. The seed has a weight of 25-125g. The diameter of the seed cavity ranges from 4-10cm and the length of the seed ranges from 2-8cm<sup>5,10</sup>.

### Trunk

The circumference of the trunks ranges from 46.30 – 283.10cm<sup>9</sup>.

### Phytochemical Composition

There are various types of phytoconstituents identified in avocado plants. Various types of flavonoids, terpenoids, alkaloids, saponins, phenolic compounds, carbohydrates, and tannins are present in different parts of the plant such as leaves, fruits, seeds, etc. The fruit is rich in oleic acids and palmitic acids. The seed extract contains palmitic, linoleic, stearic, palmitoleic, alpha linoleic acids<sup>11</sup>. The avocado fruit contains saturated, unsaturated and monounsaturated fatty acids, vitamin C, A, E, K, thiamine B1, riboflavin, niacin, calcium, iron, magnesium, sodium, zinc, potassium<sup>12</sup>. Avocados are high in fatty acids, namely linoleic, oleic, palmitic, stearic, linolenic, capric, and myristic acids<sup>9</sup>.

Some specific Phytoconstituents present:

#### 1. Fatty Alcohol

Parts of the plant	Compounds present
Pulp and seeds <sup>13,14</sup>	(2R,4R)-1,2,4-trihydroxyheptadec-16-yne[Avocadyne] 1,2,4-trihydroxyheptadec-16-ene 2,4-methylene-dioxyheptadec-16-ene-1-ol 1-acetoxy-2,4-dihydroxyheptadec-16-yne (2R,4R)1,2,4-Nonadecanetriol. (2R,4R,6E)-6-Nonadecene-1,2,4-triol (2R,4R,16E)-16-

	Nonadecene-1,2,4-triol[AvocadenolD]
Leaves <sup>13</sup>	1-Hydroxy-2,5,12,15-heneicosatetraen-4-one 1-Hydroxy-2,12,15-heneicosatrien-4-one
Bark <sup>15</sup>	Secosubamolide

## 2. Phenols

Parts of the plant	Compounds present
Seeds <sup>16</sup>	Proanthocyanidins B1, B2 and A-typetrimer Tocopherols (Vitamin)
Pulp Oil <sup>17</sup>	Gallic acid 3,4-Dihydroxy phenyl acetic acid 4-Hydroxybenzoic acid Vanillic acid p-Coumaric acid Ferulic acid Quercetin

## 3. Carbohydrates

Parts of the plant	Compounds present
Pulp <sup>18,19</sup>	d-erythro-l-galacto-Nonulose d-erythro-l-gluco-Nonulose

## Pharmacological Activity

### 1. Anti-oxidant activity

Avocados serve as a plausible source of natural anti-oxidants. The peel of the fruit contains superoxide dismutase (SOD) which is considered as an important source of anti-oxidant<sup>20</sup>. The presence of persone A and B in avocado fruit clarifies its anti-oxidant property<sup>8</sup>. *Persea americana* is a potent agent against liver diseases and other conditions related to oxidative stress due to the presence of its anti-oxidant property and hepatoprotective action against acute paracetamol toxicity<sup>11</sup>.

### 2. Anti-inflammatory activity

Isolated lipids from *P. americana* fruit and seed demonstrated significant potential for anti-inflammatory effects, nevertheless the extent of this potential differs. This anti-inflammatory is due to the presence of a high percentage of hydrocarbons, sterols and unsaturated fatty acids<sup>11</sup>. 1600 mg/kg of extract provided an

inhibition that was equivalent to 100 mg/kg of acetylsalicylic acid (57.2% and 58.0%, respectively). The extract at 800 mg/kg exhibited the same 87.0% inhibition as morphine (2 mg/kg). The extract significantly impeded both stages in a dose-dependent way. In phase II of the test, the extract (800 mg/kg) produced a stronger inhibition of (77.1%) than acetylsalicylic acid (68%)<sup>21</sup>.

### 3. Anti-diabetic activity

The primary objective of treating hyperglycemia is the treatment of diabetes mellitus. One of the most significant and beneficial approaches is to reduce postprandial hyperglycemia by impeding the digestion and absorption of glucose<sup>22</sup>. It has been documented that avocado seed extracts can improve diabetes while decreasing blood sugar. A 14-day course of ethanolic seed extract (450 or 900 mg/kg bw) has been found to decrease blood glucose levels by 47–55% in diabetics caused by alloxan<sup>23</sup>. After 21 days of treatment with aqueous seed extract (300 or 600 mg/kg bw), plasma glucose concentrations decreased by 73 and 78%, respectively<sup>24</sup>.

### 4. Anti-convulsant activity

Different phytochemicals found in plants have the potential to be potent anticonvulsants. Some plants have demonstrated anticonvulsant properties: *Annona diversifolia* (Plamitone), *B. diffusa* (Liriodendrin), *P. caerulea* (chrysin), *P. americana* (leaf aqueous extract), and *A. suaveolens* (essential oil). Thus, these plants could be used as an AED alternative<sup>25</sup>. The mice's susceptibility to PTZ, PCT, and BCL-induced seizures may have been mitigated or diminished by the *P. americana* leaf aqueous extract via escalating, or presumably by inhibiting, the brain's GABAergic activity and/or neurotransmission<sup>26</sup>.



## 5. Anti-ulcer activity

The main objective of the study was to have a look at *P. americana* leaf extract in aqueous form to assess its antiulcer activities. The plant's aqueous leaf extract was administered orally to groups of albino rats before the administration of the ulcer-causing medications ethanol and indomethacin. In rats with ulcers caused by ethanol and indomethacin, the extract exhibited significant and dose-dependent anti-ulcer efficacy<sup>27</sup>

## 6. Anti-mycobacterial activity

Avocado plants are known to have antimycobacterial activity. The CHCl<sub>3</sub> extract of avocado seed inhibits the growth of *M. tuberculosis* H37Rv, MDR *M. tuberculosis* SIN 4. The hexanic and NaOH extract from stems and leaves inhibits the growth of *M. tuberculosis* H37Rv and *M. tuberculosis* H37Ra strains<sup>28</sup>.

## 7. Osteoarthritis

A combination of avocado and soy oil called piascledine has been associated with the condition's treatment. Multiple investigations have been performed that suggest the potential effect of medicine in decreasing fibronectin formation while promoting the synthesis of collagen and proteoglycan. But it also lessened the release and activity of pro-inflammatory cytokines and metalloproteinases, which are essential for the development of osteoarthritis<sup>29</sup>.

## 8. Anti-cancer

The sole way that avocado seed and peel extracts have been shown to protect against cancer is by activating caspase-3, caspase-7, and poly (ADP ribose) polymerase cleavage. Furthermore, the administration of 100µg/ml of avocado seed methanolic extract has been shown to induce apoptosis in MDA-MB-231 human breast cancer cells. Total flavonoids and total phenolic compounds have been reported to be higher in the peel than in the seeds<sup>30</sup>.

## 9. Hypotensive activity

Hypertension is treated in Nigeria with extracts from the seeds of avocados (*Persea americana*). Four weeks after NaCl-induced hypertension rats were treated, an aqueous seed extracted from Fuerte avocados (200-600 mg/kg bw) effectively lowered blood pressure. At dosages of 500mg/kg bw and above, a decrease in serum levels of low density lipoprotein-associated cholesterol (LDL-C), total serum cholesterol (TC), and plasma triglycerides (TG) was also noted<sup>8</sup>. In rats with hypertension, 200–600 mg/kg bw aqueous avocado seed extract dose-dependently lowered blood pressure, cholesterol, glucose, urea, and salt levels after five weeks<sup>9</sup>. Heart rate (reduction of 9.3-19.7%) and mean arterial pressure (reduction of 37-43%) were the results of a 10-day acute administration of aqueous seed extract (260 mg/kg bw) in rats provoked with hypertension using acetylcholine<sup>31</sup>.

## 10. Anti-diarrhoeal activity

Studies have demonstrated the anti-diarrheal effects of bioactive compounds present in avocado seeds. Rats with castor oil-induced diarrhea received chloroform-methanolic extracts from these seeds, which significantly and dose-dependently decreased the amount of moisture in their feces<sup>32</sup>.

## CONCLUSION

Avocado i.e. *Persea Americana* is a deciduous tree having wide-range of disease management activities. Traditionally as well as scientifically various experiments has confirmed that avocado has potential role in diseases cure. In light of the review, it can be inferred that *P. americana* possesses significant advantageous biological activities. Further investigations can confirm these findings in a therapeutic context.

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