

# A Comprehensive Review on the Pharmacological Activities of *Hylocereus Polyrhizus* and *Ananas Comosus*

S. Swetha\*, M. Gopi, M. Gowri, V. Govarthini, K. Gowtham,

Aadhi Bhagawan College of Pharmacy, Rantham, Thiruvannamalai, Tamilnadu

## ABSTRACT

This comprehensive review explores the pharmacological properties of two tropical fruits—Red Dragon Fruit (*Hylocereus polyrhizus*) and Pineapple (*Ananas comosus*)—focusing on their phytochemical composition and therapeutic potential. Red Dragon Fruit is rich in antioxidants such as betacyanins, flavonoids, and phenolic compounds, demonstrating significant anti-inflammatory, anticancer, antidiabetic, antimicrobial, and cardioprotective effects. Its prebiotic properties and ulcer-healing capabilities further support its role in gastrointestinal health and metabolic regulation. Pineapple, known for its proteolytic enzyme bromelain, exhibits anti-inflammatory, antioxidant, anticoagulant, anticancer, and wound-healing activities. Both fruits also show promise in treating ulcers and microbial infections. Various in-vitro and in-vivo studies confirm the efficacy of different extracts (methanolic, ethanolic, aqueous, etc.) in addressing multiple health disorders, highlighting their potential as nutraceuticals and therapeutic agents. However, despite strong preclinical evidence, more clinical trials and standardization of dosages are required for effective medical application.

**Keywords:** *Hylocereus polyrhizus*, *Ananas comosus*, Red Dragon Fruit, Pineapple, Herbal Medicine, Functional Foods, Natural Remedies

## INTRODUCTION

Fruits are integral components of the human diet, not only because of their palatability and nutritional value but also due to their medicinal properties. Among the wide variety of fruits consumed globally, Red Dragon Fruit (*Hylocereus* spp.) and Pineapple (*Ananas comosus*) have gained prominence due to their vibrant appearance, rich phytochemical content, and diverse pharmacological activities. These tropical fruits are cultivated in many regions of the world and are appreciated not only for their exotic flavor and texture but also for their functional and therapeutic benefits. Red Dragon Fruit (*Hylocereus* spp.), also known as pitaya or pitahaya, is a tropical fruit belonging to the Cactaceae family. It is widely cultivated in Southeast Asia, Central and South America, and more recently, in parts of India and Australia. The fruit originates from several species within the genus *Hylocereus*, with the most commonly cultivated being *Hylocereus undatus*, *Hylocereus polyrhizus*, and *Hylocereus costaricensis*. Types and Color Variants Red dragon fruit can be broadly classified into the following main types, based on the color of the skin and pulp: White-

fleshed Dragon Fruit (*Hylocereus undatus*) – This variety has a bright pink or red peel with white flesh and small black seeds. It is the most commonly available type in the global market. Red-fleshed Dragon Fruit (*Hylocereus costaricensis* / *Hylocereus polyrhizus*) – Characterized by both red skin and deep red to magenta-colored pulp. This type is rich in betalains, giving it its distinctive hue and superior antioxidant potential. Yellow Dragon Fruit (*Selenicereus megalanthus*) – Though technically from a different genus, this variety has a yellow peel with white pulp and is known for its higher sweetness and lower acidity. The intense coloration in red and yellow varieties is due to natural pigments such as betalains, anthocyanins, and carotenoids, which not only contribute to the fruit's visual appeal but also enhance its pharmacological efficacy, particularly its antioxidant, anti-inflammatory, and anticancer properties. Pineapple (*Ananas comosus*), a tropical fruit belonging to the family Bromeliaceae, is native to South America and is now widely cultivated across tropical and subtropical regions around the world. It is valued not only for its unique sweet-tart flavor and juicy texture but also for its rich phytochemical profile

**Relevant conflicts of interest/financial disclosures:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



and medicinal properties that support various pharmacological applications. Traditionally used in folk medicine, pineapple has garnered scientific attention due to its potent anti-inflammatory, antioxidant, antimicrobial, anticoagulant, and anticancer effects. Pineapple fruits are cylindrical or conical in shape, composed of fused berries, and exhibit a vibrant yellow to golden flesh when ripe. The skin may range from green to reddish-brown, depending on the maturity and cultivar. The edible pulp is succulent, fibrous, and aromatic, with the characteristic sweet acidity attributed to the presence of organic acids such as citric and malic acids. Several varieties or cultivars of pineapple are cultivated globally, including:

- Smooth Cayenne – the most common commercial variety, known for its juiciness and high sugar-acid balance.
- Queen – smaller in size with a more fragrant aroma and deeper yellow flesh.
- Red Spanish – more fibrous and resistant to disease, commonly grown in the Caribbean.
- MD2 (Del Monte Gold) – a newer hybrid known for its sweeter taste, longer shelf life, and higher vitamin C content.

Pineapple is a reservoir of essential nutrients and bioactive compounds, including vitamins (A, B1, B6, C), minerals (calcium, potassium, manganese), and dietary fiber. A key component that distinguishes pineapple from many other fruits is bromelain, a proteolytic enzyme complex predominantly found in the stem and fruit. Bromelain exhibits wide-ranging therapeutic effects, such as anti-inflammatory, antithrombotic, fibrinolytic, and digestive properties, making pineapple highly relevant in nutraceutical and pharmaceutical formulations.

## 1. Plant Profile:

### 1.1 Red Dragon:

Red dragon fruit, also called *Hylocereus polyrhizus*, is a tropical fruit with bright red flesh. It is grown in many countries, including India. The peel of the fruit contains natural compounds like antioxidants and flavonoids, which help protect the stomach lining. Because of these properties, red dragon fruit is studied for its ability to prevent and heal stomach ulcers.



**Fig: 1 Red Dragon Fruit**

- **Synonym:** *Hylocereus Monacanthus*, *Cereus Monacanthus*, *Hylocereus Triangularis*, *Varmonacanthus*, *Selenicereus Triangularis*, *Var. Monacanthus*.
- **Biological Source:** The biological source of Red Dragon fruit is *Hylocereus polyrhizus*

- **Family:** Cactaceae.

### 2.1.1 Taxonomy Classification:

- **Kingdom:** Plantae (Plants)
- **Clade:** Tracheophytes
- **Clade:** Angiosperms
- **Clade:** Eudicots
- **Order:** Caryophyllales

- **Family:** Cacteaceae
- **Genus:** Selenicereus
- **Species:** Selenicereus monacanthus

### 2.1.2 Vernacular names:

- **Spanish:** Pitahaya Roja
- **Peru:** Pitahaya silvestre
- **English:** Red Dragon Fruit
- **Tamil:** சிவப்பு டிராகன் பழம்

### 2.1.3 Description:

Red dragon fruit (Hylocereus polyrhizus) is a bright pink fruit with red flesh and tiny black seeds. It is rich in antioxidants, vitamins, and fiber, and grows on a climbing cactus plant.

### 2.1.4 Morphology:

Plant type– Selenicereus monacanthus is a climbing, epiphytic cactus with triangular green stems and small spines along its ribs. It produces large, fragrant, white night-blooming flowers. The fruit is red-skinned with vibrant red pulp and edible black seeds. Aerial roots help the plant cling to surfaces. It is widely cultivated for its fruit, known as red dragon fruit.

**Habit:** Selenicereus monacanthus (Lem.) D.R. Huntisa climbing, epiphytic actus with fleshy,

green,3-angled(occasionally4-angled)stems,2–4cm wide, bearing undulate ribs with small areoles and 1–3 short, stiff spines

**Leaves:** Selenicereus Monacanthus does not have true leaves. Like most cacti, it has highly reduced leaves that are modified into spines, which emerge from small areoles along the stem ribs. The green, fleshy stems function as the main photo synthetic organs and are often mistaken for leaves due to their flattened, ribbed appearance.

**Fruit:** The fruit is a fleshy, oval to oblong berry, typically red or reddish-pink on the outside with scaly bracts (small leaf-like structures). The inner pulp is bright red to magenta, juicy, and contains numerous small black seeds. The fruit is edible, sweet, and commonly marketed as red dragon fruit. It develops after successful pollination of the large, nocturnal flowers.

**Seed:** Seeds are tiny, black, and embedded in the red, juicy pulp of the fruit. They are numerous and dispersed along with the edible flesh. Red dragon Fruit Peel, the Americas, and parts of Australia and Israel. The plant is drought-tolerant and well-suited to tropical and subtropical regions.



Fig: 2 Different Types of Red Dragon Fruit

### 2.1.5 Chemical Consituents:

**Betacyanins:** such as betanin and Phyllocactin exhibit strong antioxidant properties, reducing oxidative stress in gastric tissues—a key factor in ulcer pathogenesis.

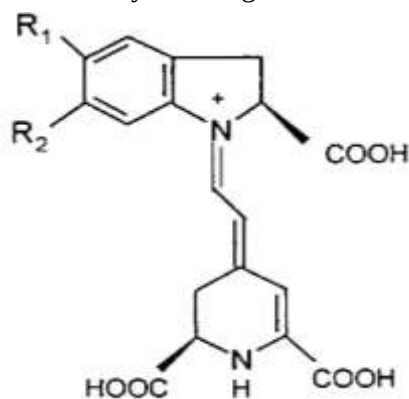
**Flavonoids:** like quercetin and kaempferol modulate gastric acid secretion, inhibit the  $H^+/K^+$ -ATPase pump, and enhance mucosal defenses.

**Phenolic:** compounds such as gallic acid and ferulic acid further contribute by reducing inflammation and

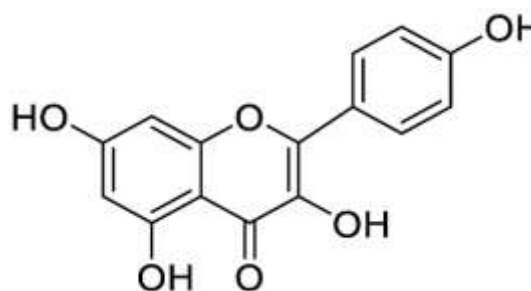
scavenging reactive oxygen species (ROS). Additionally, ascorbic acid (Vitamin C) plays a role in mucosal healing and collagen synthesis, accelerating ulcer repair.

**Tannins:** form protective layers on the gastric lining, helping resist irritants such as NSAIDs.

### 2.1.6 Chemical Structure:



**Betacyanins**



**Flavanoids**

**Fig: 3 Chemical Structure**

### 2.1.7 Medicinal Uses:

- **Anti-Ulcer**-Protects gastric mucosa, enhances mucus secretion, reduces acid and inflammation.
- **Antioxidant**-High in Betacyanins, flavonoids, and vitamin C — fights oxidative stress.
- **Anti-Inflammatory**-Reduces inflammation in tissues by suppressing pro-inflammatory cytokines.
- **Antibacterial** -Inhibits bacteria including *Helicobacter pylori* and other pathogens.
- **Antidiabetic**- Regulates blood glucose levels and improves insulin sensitivity.
- **Anticancer**-Exhibits cytotoxic effects on cancer cell lines due to polyphenols and flavonoids.

- **Cardioprotective**-Improves lipid profile, reduces LDL cholesterol, and supports heart health.
- **Hepatoprotective**-Protects liver from toxins and supports detoxification.
- **Wound healing** -Accelerates healing due to antioxidants and vitamin C.

### 1.2 Pineapple:

Pineapple leaf comes from *Ananas comosus*, a tropical plant of the Bromeliaceae family. It contains natural compounds like bromelain and flavonoids. These leaves are used in traditional medicine for their anti-ulcer, antioxidant, and healing properties.



**Fig: 4 Pine Apple**

- **Synonyms:** Ananas, Ananas comosus, Pina, pine apple, Nanas
- **Biological Source:** The Biological source of Ananas Comosus
- **Family:** Bromeliaceae
- **Oriya (Odia):** Ananāsa
- **Sanskrit:** Madhuphala
- **English:** Pineapple
- **Spanish:** Piña
- **French:** Ananas

#### 2.2.1 Taxonomy Classification:

- **Kingdom:** Plantae
- **Clade:** Angiosperms
- **Clade:** Monocots
- **Order:** Poales
- **Family:** Bromeliaceae
- **Genus:** Ananas
- **Species:** Ananas comosus

#### 2.2.2. Vernacular Names:

- **Hindi:** Ananas
- **Tamil:** அன்னாசி
- **Telugu:** Anāsa Pandu
- **Kannada:** Ananas Hannu
- **Malayalam:** Ananās

#### 2.2.3 Description:

Pineapple (Ananas comosus) is a tropical fruit with a rough, spiky outer skin and sweet, juicy yellow flesh.

#### MORPHOLOGY:

**Leaves:** The inflorescence is a terminal spike bearing small purple or Pineapple (Ananas comosus) is an herbaceous perennial with a short stem and a rosette of long, spiny, linear reddish flowers. Fruits are formed by the fusion of individual berries into a large, compound fruit. The plant grows about 1–1.5 meters tall. It belongs to the family Bromeliaceae.

**Fruit:** The pineapple fruit is a multiple fruit (also called a syncarp), formed by the fusion of individual berries from many flowers in a compact inflorescence. Each eye on the surface represents a single flower. The fruit is fleshy, juicy, and scented, with a tough, spiny outer rind and a central fibrous core.



**Fig: 5 Different Types of Pine Apple**

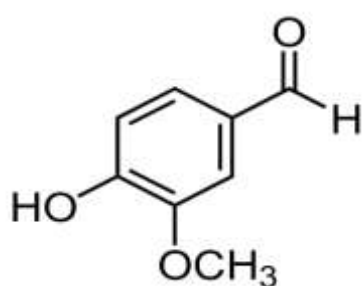
### 2.2.5 Composition of Phytochemicals:

Pineapple is rich in a variety of bioactive phytochemicals that contribute to its nutritional and medicinal value. The most notable compound is bromelain, a proteolytic enzyme complex found mainly in the stem and fruit, known for its anti-inflammatory. Bromelain – A digestive enzyme with anti-inflammatory and wound-healing properties.

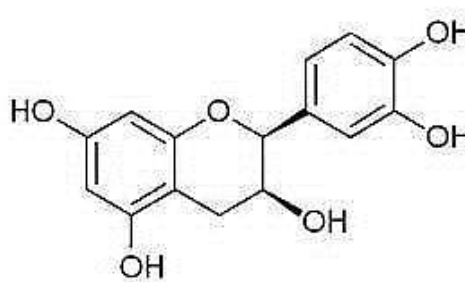
- **Bromelain** – A digestive enzyme with anti-inflammatory and wound-healing properties.

- **Vitamin C** – A strong antioxidant that boosts immunity and supports skin and tissue repair.
- **Flavonoids** – Compounds like quercetin and kaempferol that protect against oxidative stress.
- **Phenolic Acids** – Includes gallic and ferulic acids; they have antioxidant and anti-ulcer effects.

### 2.2.6 Chemical Structure:



**Vannillin**



**Epicatechin**

**Fig: 6 Chemical Structure**

### 2.2.7 Medicinal Uses:

- **Digestive Aid:** Pineapple contains bromelain, a proteolytic enzyme that helps in digestion by breaking down proteins, reducing bloating, and improving gut health.
- **Anti-inflammatory Properties:** Bromelain also has anti-inflammatory and analgesic effects,

useful in reducing swelling, arthritis pain, and sinusitis.

- **Immune System Booster:** Rich in vitamin C, pineapple helps strengthen the immune system and protects against infections and common colds.

- **Wound Healing:** The antioxidants and enzymes in pineapple promote faster healing of wounds and post-surgical recovery.
- **Antioxidant and Anti-cancer Effects:** Contains flavonoids and phenolic compounds that help in neutralizing free radicals and may reduce the risk of some cancers.
- **Cardiovascular Health:** Pineapple helps in reducing blood clot formation and may support heart health by reducing blood pressure and improving circulation.
- **Anti-ulcer Activity:** Some studies have shown pineapple may help protect the gastric mucosa and reduce ulcer formation, possibly due to its antioxidant and anti-inflammatory properties.
- **Anti-microbial Activity:** Pineapple extract exhibits antibacterial and antifungal effects against certain pathogens.

## LITERATURE REVIEW:

### 3.1 Review for Red Dragon Fruit:

| Sr. No | Plant Name/Part       | Solvent      | Activity         | Result (Conclusion)                                                                                                                                                                                                                                                                     | Reference                                  |
|--------|-----------------------|--------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| 1.     | Hylocereus Polyrhizus | Methanol     | Anti-Bacterial   | The extracts responded differently toward different types of bacteria. The extracts exhibited antibacterial activity. It can concluded that the pigment and the extracts from the peel.                                                                                                 | Rudi Hendra et al.,2019 J.                 |
| 2.     | Hylocereus Polyrhizus | Methanol     | Anti-Oxidant     | Red dragon fruit peel extract at a concentration of up to 40% was ineffective in increasing the reddish intensity of beef sausages, but it was capable of improving the yellow color in beef sausage.                                                                                   | F. M. Manihuruka et al.,2016               |
| 3.     | Hylocereus Polyrhizus | Ethanol      | Anti-diabetic    | The ethanol extraction of the red dragon fruit peel may decline blood glucose levels in rats with diabetes mellitus, and the anti-diabetic activity of the red dragon fruit peel dose 74.88 mg/200 g bodyweight is statistically equal to Glibenclamide dose 0.09 mg/200 g body weight. | Ruqiah Ganda Putri Panjaitan* et al.,2021, |
| 4.     | Hylocereus Polyrhizus | Ethanol      | Anti-microbial   | Red Dragon Fruit Peel extracts in the control of burn infection resistant bacteria which are becoming a threat to human health and the aqueous extracts of peels are reported to have therapeutic properties.                                                                           | Yogita Temak, et al.,2018                  |
| 5.     | Hylocereus Polyrhizus | Ethylacetate | Anti-fungal      | The extracts from the peel can be classified as a moderate source of potent natural antifungal agents and it might be abundant of phenolic and flavonoids compounds.                                                                                                                    | Rudi Hendra et al, 2020                    |
| 6.     | Hylocereus Polyrhizus | Ethanol      | Hyper-lipidaemia | Red dragon fruit peel powders can be consumed as a supplement in foods that are expected to maintain a healthy body and prevent hyperlipidemia.                                                                                                                                         | Hernawati*, N A et Al.,2018                |
| 7.     | Hylocereus Polyrhizus | Methanol     | Anti-cancer      | The fruit pulp extracts of H. Undatus have demonstrated promising anticancer and anti-apoptotic properties against human liver cancer (HepG-2) cells by an in-vitro method.                                                                                                             | K. Padmavathy , et al., 2021               |

|     |                       |                                  |                   |                                                                                                                                                                                                                                                          |                                |
|-----|-----------------------|----------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| 8.  | Hylocereus Polyrhizus | Ethanollic And Aqueous Extracts. | Anxiolytic        | The extracts showed no toxicity in the fish model and exerted significant anxiolytic effects as the fish reduced their permanence in the clear zone of the experimentation area compared to controls.                                                    | Lira, S.M et al. 2020          |
| 9.  | Hylocereus Polyrhizus | Aqueous Extract.                 | Wound-Healing     | The use of the extract facilitated wound healing by enhancing tensile strength, hydroxyproline, DNA,mtotal proteins, collagen content, and epithelization.                                                                                               | Song, H et al., 2016           |
| 10. | Hylocereus Polyrhizus | Methanolic Extracts.             | Anti-Viral        | The extract was considered non-toxic for the cells at concentrations below 2.50 mg·mL <sup>-1</sup> . The most prominent anti-viral potential (95.0% virus inhibition) against the denv-2 was achieved at concentrations of 126.70 µg mL <sup>-1</sup> . | Chang, Y.J et al.,2020,        |
| 11. | Hylocereus Polyrhizus | The Compound Was Dry Isolated    | Immuno Modulatory | The terpenoid lupeol isolated from the mice was effectively associated with the increase of macrophage phagocytosis of latex beads, demonstrating potent immune modulatory effects.                                                                      | Wahdaningsih, S et al., 2020,  |
| 12. | Hylocereus Polyrhizus | Chloroform Extract.              | Anti-Glycation    | The studied triterpenes could inhibit protein glycation at multiple stages, decreasing protein oxidation and protecting against diabetic-related complications.                                                                                          | Rosa Martha, P.G et al,2018    |
| 13. | Hylocereus Polyrhizus | Ethyl Acetate                    | Anti-Plasmodium   | The dichloromethane extract demonstrated the most prominent anti-plasmodium activity at concentrations of 2.13 ± 0.42 µg/mL. The extracts showed cytotoxicity against the cancer cells at final concentrations of more than 1000 µg/mL.                  | Hendra, R.; et al, 2021        |
| 14. | Hylocereus Polyrhizus | Ethanollic Extract               | Gastro intestinal | The extract exerted anti-inflammatory (decreases in the Ikb-a degradation and nuclear NF-kb protein levels) effects and prevented colitis development (reduced histological damage score) in the treated mice.                                           | Song,H.; Chu, Q. et al, 2016   |
| 15. | Hylocereus Polyrhizus | Aqueous Extract                  | Metabolic Effects | The treated rats had reduced blood pressure, pulse wave velocities, and pulse pressures                                                                                                                                                                  | Anand Swarup, K.R. et al.,2010 |

**Table: 1 Review of Red Dragon Fruit**

| Sr. No | Plant Name     | Solvent Used       | Activity       | Result (Conclusion)                                                                                                                                                                                                                          | Reference                   |
|--------|----------------|--------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1.     | Ananas Comosus | Methanolic Extract | Anti-Microbial | Its rich phytochemical bromelain, flavonoids, polyphenols contributes to its diverse therapeutic effects. Ananas comosus as a valuable resource in herbal medicine and highlight its potential contribution to global health and well-being. | Ankit Sharma*, et al., 2024 |

|     |                |                                     |                   |                                                                                                                                                                                                                                                                                                                                                   |                                          |
|-----|----------------|-------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 2.  | Ananas Comosus | Ethyl Acetate, Methanol and Aqueous | Anti-bacterial    | Ananas comosus with IC <sub>50</sub> 46.49 µg/mL. However, the antibacterial activity showed that those extracts expressed the inhibition activity against <i>B. subtilis</i> and <i>P. aeruginosa</i> using broth dillution method.                                                                                                              | Devi Anggraini Putri, *et al.,2018       |
| 3.  | Ananas Comosus | Methanol                            | Anti-oxidant      | Phenolic compounds present in different pineapples will allow better understanding of the antioxidant activity of the fruits. Further study can be done using different antioxidant assays such as the oxygen absorbance capacity (ORAC) assay and the ABTS radical cation scavenging assay.                                                      | Anynda Yuris et al.,2014                 |
| 4.  | Ananas Comosus | Aqueous Extract                     | Anti-urolithiatic | It is also comparable with the standard drug, cystone. This might be because of the strongly presence of saponin, phenols, and terpenoids in <i>A. nanus</i> extract due to the dissolution and inhibition activity of CaOx stones.                                                                                                               | N F A Rahim et al., 2018                 |
| 5.  | Ananas Comosus | Methanol                            | Anti-Depression   | Its rich phytochemical composition, including bromelain, flavonoids, polyphenols, and other bioactive compounds, contributes to its diverse therapeutic effects. Moreover, its nutritional value and traditional uses further enhance its significance as a natural remedy.                                                                       | Ankit Sharma*, et al., 2024              |
| 6.  | Ananas Comosus | Methanol                            | Anti-cancer       | The extracts of pineapple leaves (field-grown and in vitro) displayed weak radical scavenging activities, low reducing power and were less effective to inhibit human breast cancer MCF-7 and human ovarian cancer SKOV-3 cell proliferations.                                                                                                    | Nur Asniyati Abdul Halim , et al.,2018   |
| 7.  | Ananas Comosus | Ethanol                             | Anti-fungal       | <i>A. sativum</i> and <i>S. aromaticum</i> showed high antifungal activity gainst the pathogen which was not significantly different from the positive control with Mancozeb. Ethanolic extracts of <i>A. sativum</i> and <i>S. aromaticum</i> showed a total antifungal activity at all the concentrations tested against <i>P. microspora</i> . | YAOUBA Aoudou .et al.,2021.              |
| 8.  | Ananas Comosus | Ethanol                             | Anti-parasitic    | Several research groups have been working with plant species due to the interest in the scientific confirmation and validation of the effect of medicinal plants used in folk medicine. requiring further studies that prove mechanism of action and establish safe conditions for use.                                                           | José Fernando de Araújo Neto et al.,2021 |
| 9.  | Ananas Comosus | Ethanol                             | Cardio-protective | It can be concluded that HEAC possess cardio protective activity against Isoproterenol induced myocardial infarction in rats.                                                                                                                                                                                                                     | Priya Saxena* et al.,2014                |
| 10. | Ananas Comosus | Methanol                            | Wound Healing     | The production of reactive nitrogen species (NO), while only acerola inhibited the expression of COX-2 and significantly enhanced the migration of HDFa cells. the consistent antioxidant, anti-inflammatory activities and enhanced fibroblast migration observed in this study.                                                                 | Francisca Pereira de Moraes, et al.,2020 |
| 11. | Ananas Comosus | Methanol                            | Antimalarial      | There was no significant difference in mean percent parasitemia between infected untreated control group and infected groups treated with PEAC (100, 200, 400 mg/kg). However, <i>P.</i>                                                                                                                                                          | Abayomi M. Ajayi a et al.,2022           |

|     |                |          |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                      |
|-----|----------------|----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
|     |                |          |                 | beighei infected mice treated with chloroquine & artemether lumefantrine showed suppressed parasitemia in mice.                                                                                                                                                                                                                                                                                                                                                                          |                                      |
| 12. | Ananas Comosus | Methanol | Anti-Rheumatic  | The MEFP of <i>A. comosus</i> exhibited anti-rheumatic activity by increasing the levels of SOD, CAT and GPx in liver, kidney and spleen, and by decreasing the levels of CRP and PGE 2 prostaglan-din in serum of arthritic rats.                                                                                                                                                                                                                                                       | Samira Kargutkar and S. et al.,2016  |
| 13. | Ananas Comosus | Aqueous  | Diuretics       | <i>A. comosus</i> and <i>C. papaya</i> are paralleled and totally agree with the ethnomedical information for those plants that used for dysuria treatment. However, both extracts also increased serum level of albumin, BUN and creatinine indicating potential nephrotoxic effects.                                                                                                                                                                                                   | A. Zurainia *et al.,2013             |
| 14. | Ananas Comosus | Ethanol  | Anti-tumoral    | Each animal received approximately 105 cells suspended of in RPMI-1640 medium containing 10% FBS (Gibco Life Technologies; Gaithersburg, MD, USA) in a volume equivalent to 1% of an-imal weight, regardless of the tumor type. The fifth group received 20 mg/kg of 5-fluoruracil (5-FU) from Shanghai Pharmamceutical In The drugs were given in-traperitoneally in a volume equivalent to 1% of the animal's weight diluted in sterile water at a concentration equivalent to saline. | Roxana Báez <sup>1</sup> et al.,2007 |
| 15. | Ananas Comosus | Ethanol  | Anti-coagulants | The four extraction methods 95% ethanol and Expression yielded significant volumes of extract. Expression with spiral twist yielded an extract comparable to EDTA in preventing blood coagulation & maintaining red blood cell integrity.                                                                                                                                                                                                                                                | Badar S, Azarkan M, et al.2021       |

### 3.2 Review for Pine Apple:

**Table: 2 Review of Pine Apple**

#### DISCUSSION:

The comprehensive review of the pharmacological activities of red dragon fruit (*Hylocereus* spp.) and pineapple (*Ananas comosus*) reveals their exceptional therapeutic potential and validates their traditional usage in various medicinal practices. These tropical fruits are not only nutritionally rich but are also loaded with bioactive compounds such as flavonoids, phenolic acids, tannins, anthocyanins, bromelain, and betalains, which contribute to a wide array of pharmacological effects. Red dragon fruit, known for its striking color and antioxidant-rich profile, demonstrates significant anti-inflammatory, anticancer, antimicrobial, hepatoprotective, antidiabetic, and cardioprotective properties. Its high content of polyphenols, betalains, and dietary fiber

also supports its role in metabolic regulation, making it beneficial in preventing chronic diseases such as obesity and type 2 diabetes. Moreover, its prebiotic effect on gut microbiota adds further value to its functional food status. The presence of natural pigments also opens opportunities for its application in cosmeceuticals and natural coloring industries. Pineapple, widely consumed across the globe, contains the unique enzyme bromelain, which contributes to its well-documented anti-inflammatory, anticancer, antithrombotic, and digestive properties. Bromelain has been extensively studied for its role in wound healing, tissue regeneration, and modulation of immune responses. Additionally, pineapple exhibits significant antioxidant activity owing to its vitamin C content and polyphenols, playing a role in combating oxidative stress and associated disorders. The peel, a common agro-waste, also shows promise in pharmacological research, particularly in its anti-ulcer and antimicrobial properties. Together, these

fruits demonstrate synergistic health benefits that support their inclusion in dietary interventions and nutraceutical formulations. While preclinical and in vitro studies strongly support their efficacy, there is still a gap in large-scale clinical trials that could translate these findings into definitive therapeutic applications. Moreover, standardization of extract concentrations, mechanisms of action, and safety profiles remains an area for future research.

## CONCLUSION:

In conclusion, red dragon fruit and pineapple stand as valuable medicinal fruits with a multitude of pharmacological benefits. Their accessibility, low toxicity, and broad biological activity make them suitable candidates for developing natural remedies and functional products. Continued interdisciplinary research, particularly in pharmacognosy, biotechnology, and food science, is essential to fully harness their therapeutic potential and integrate them into evidence-based medical and health care systems.

## REFERENCE

- Burke, A., Smyth, E., & FitzGerald, G.A. Analgesic antipyretic agents; pharmacotherapy of gout. In L.B. Brunton, J.S. Lazo & K.L. Parker (Ed.) Goodman & Gilman's the Pharmacological Basis of Therapeutics (pp. 671-715). New York: McGraw-Hill. 2005
- Nadkarni AK. Indian Materia Medica. Popular Press Bldg. 2000. [www.ijapbc.com](http://www.ijapbc.com)
- Landen NX, Li Dongqing, Stahle M. Transition from inflammation to proliferation: acritical step during wound healing. *Cell Mol Life Sci* 2016;73(20):3861–85. [www.elsevier.com/locate/jtv](http://www.elsevier.com/locate/jtv).
- Chedea VS, Jisaka M. Inhibition of soybean lipooxygenases-structural and activity models for the lipooxygenase isoenzymes family: recent trends for enhancing the diversity and quality of soybean products. In *Tech.*, 2005; 6: 100–13. <http://iamjournal.com>
- Akansha Shandarkar, Nikita Pawar, Arundhati Kore, Jagruti Shelar, Anti-inflammatory Agents: A review on herbs that reduces inflammation, *international journal of pharmaceutical sciences*. Sci 2025, vol.3, issue 6. 444-401. <https://www.wijpsjournal.com>.
- Lindley LE, Stojadinovic O, Pastar I, Tomic-Canic M. Biology and biomarkers for wound healing. *Plast Reconstr Surg* 2016;138(Suppl. 3):18Se28S.
- Gauglitz GG, Korting HC, Pavicic T, Ruzicka T, Jeschke MG. Hypertrophic scarring and keloids: pathomechanisms and current and emerging treatment strategies. *Mol Med* 2011; 17:113e25.
- Berman B, Maderal A, Raphael B. Keloids and hypertrophic scars: pathophysiology, classification, and treatment. *Dermatol Surg* 2017;43(Suppl. 1): S3e18
- Lindholm, C.; Searle, R. Wound management for the 21st century: Combining effectiveness and efficiency. *Int. Wound J.* 2016, 13, 5–15. [CrossRef]
- Mustoe, T. Understanding chronic wounds: A unifying hypothesis on their pathogenesis and implications for therapy. *Am. J. Surg.* 2004, 187 (Suppl. 1), S65–S70. [CrossRef]
- James, G.A.; Swogger, E.; Wolcott, R.; Pulcini, E.D.; Secor, P.; Sestrich, J.; Costerton, J.W.; Stewart, P.S. Biofilms in chronic wounds. *Wound Repair Regen.* 2008, 16, 37–44. [CrossRef]
- McCarty, S.M.; Percival, S.L. Proteases and Delayed Wound Healing. *Adv. Wound Care* 2013, 2, 438–447. [CrossRef]
- Ben-Porath, I.; Weinberg, R.A. The signals and pathways activating cellular senescence. *Int. J. Biochem. Cell Biol.* 2005, 37, 961–976. [CrossRef] [PubMed]
- Schultz, G.S.; Sibbald, R.G.; Falanga, V.; Ayello, E.A.; Dowsett, C.; Harding, K.; Romanelli, M.; Stacey, M.C.; Teot, L.; Vanscheidt, W. Wound bed preparation: A systematic approach to wound management. *Wound Repair Re.* 2003, 11 (Suppl. 1), S1–S28. [CrossRef] [PubMed]
- Loots, M.A.; Lamme, E.N.; Zeegelaar, J.; Mekkes, J.R.; Bos, J.D.; Middelkoop, E. Differences in cellular infiltrate and extracellular matrix of chronic diabetic and venous ulcers versus acute wounds. *J. Investig. Dermatol.* 1998, 111, 850–857. [CrossRef] [PubMed]
- Kuo, P.-C.; Kao, C.-H.; Chen, J.-K. Glycated type 1 collagen induces endothelial dysfunction in culture. *In Vitro Cell. Dev. Biol. Anim.* 2007, 43, 338–343. [CrossRef] [PubMed]
- Widgerow, A.D.; King, K.; Tocco-Tussardi, I.; Banyard, D.A.; Chiang, R.; Awad, A.; Afzel, H.;

- Bhatnager, S.;9. Priyadarsini K.I. The chemistry of curcumin: From extraction to Therapeutic agent. *Molecules*. 2014; 19:20091-20112 <https://doi.org/10.3390/molecules191220091>
18. Aggarwal BB, Kumar A and Bharti AC: Anticancer potential of Curcumin. *Preclinical and clinical studies*. *Anticancer Research*. 2003; 23(1/A):363-398
19. Rathore S, Mukim M, Curcumin: A Review for Health Benefits, *International Journal of Research and Review* 2020; 7(1).
20. Lestari M.L., Indrayanto G. Curcumin. *Profiles Drug Subst. Excip. Relat. Methodol*. 2014; 39:113-204. <https://doi.org/10.1016/B978-0-12-800173-8.00003-9>.
21. Gamage K, Dissanayake C, Angoda W, Waliwita LC, A Review on Medicinal Uses of Zingiber officinale (Ginger), *International Journal of Health Sciences and Research*, 2020; 10(6).
22. Potential health benefits and scientific review of ginger Najim A. Jabir Al-Awwadi College of Pharmacy, Thi-Qar University, Iraq. 2017; 9(7):111-116. <https://doi.org/10.5897/JPP2017.0459>
23. <https://draxe.com/Nutrition/anti-inflammatory-herbs/>.
24. Rathod GB, Parmar P. Study of association of thrombocytopenia with plasmodium vivax infection. *Indian J of Med Sciences*, 2017; 69: 33-35.
25. Sahu A., Rawal N., Pangburn M. K. Inhibition of complement by covalent attachment of rosmarinic acid to activated C3b. *Biochemical Pharmacology*, 1999; 57(12): 1439–1446. doi: 10.1016/S0006-2952(99)00044-1.
26. Amaral G. P., de Carvalho N. R., Barcelos R. P., et al. Protective action of ethanolic extract of Rosmarinus officinalis L. in gastric ulcer prevention induced by ethanol in rats. *Food and Chemical Toxicology*, 2013; 55: 48–55. doi: 10.1016/j.fct.2012.12.038.
27. Jucelia pizzetti Beninca, Julliana Bastos Dalmarlo, Moacir Geraldo pizzolatti, Tonia silvia frode, Analysis of the Anti-inflammatory properties of Rosmorinus officinalis L. In mice. *Food chemistry* 124(2011) 468-475. [www.elsevier-com/locate/food-chem](http://www.elsevier-com/locate/food-chem).
28. The culinary institute of America (2011). *The professional chef*(athed).Hobaken,new sersey : wiley.p, 180. ISBN.978-0-42 135-8
29. Rosemary, Drug.Com, 24 june.2024, Retrieved 22 march 2025.
30. Nair R, Sellaturay S, Sriprasad S. The history of ginseng in the management of erectile dysfunction in ancient China (3500–2600 BCE). *Indian J Urol* 2012;28:
31. Fenton WN. Lafitau, Joseph-François'. *Dictionary of Canadian Biography*, 3; 1974:1741–70.
32. Jia L, Zhao Y. Current evaluation of the millennium phytomedicine-ginseng (I): etymology, pharmacognosy, phytochemistry, market and regulations. *Curr MedChem* 2009; 16:2475.
33. Lee C, Wen J. Phylogeny of Panax using chloroplast trnC–trnD intergenic region and the utility of trnC–trnD in interspecific studies of plants. *Mol Phylogenet Evol* 2004; 31:894–903.
34. Kim KH, Lee D, Lee HL, Kim CE, Jung K, Kang KS. Beneficial effects of Panax ginseng for the treatment and prevention of neurodegenerative diseases: past findings and future directions. *J Ginseng Res* 2018; 42:239e47.
35. Wahid F, Khan T, Subhan F, Khan M, Kim Y. Ginseng pharmacology: multiple molecular targets and recent clinical trials. *Drugs Future* 2010; 35:399e407.
36. Shim JS, Song MY, Yim SV, Lee SE, Park KS. Global analysis of ginsenoside Rg1 protective effects in beta-amyloid-treated neuronal cells. *J Ginseng Res* 2017; 41:566e71.
37. P. Pushpagadan & S.K. Tiwari, *Peppermint handbook of herb & species*, National Botanical Research institute, India, page no:460-478.
38. Abid aslam maon, Akmal nazir, Muhammad Kashif iqbal khan, Tabir ahmad, Rabia zia, murid, Muhammad Abrar, *The therapeutic properties & applications of aloevera: a review journal of herbal medicine*, Vol. 4, page no:1-39.
39. J. Hall, R. Bravo -clovzet, *Anti-inflammatory Herbs for Arthritis, bioactive Food as Diatery Interventions for Arthritis & related Inflammato Disease*, Chapter -46, <https://dx.doi.org/10.1016/B978-0-12-397156-2-00253.2>

40. Deepika Singh, prabir k. Chaudhari, A review on phytochemical & pharmacological properties of Holybasil, industrial crops & products. [www.Elsevier.com/locate/incrop](http://www.Elsevier.com/locate/incrop).
41. Vats, V., Yadav, S.P., Grover, J.K., 2004. Ethanolic extract of *Ocimum sanctum* leave partially attenuates streptozotocin-induced alterations in glycogen content and carbohydrate metabolism in rats. *J. Ethnopharmacol.* 90, 155–160.
42. Maria. G. Goni, sara k. Roura, Alejandra. G. Ponce, Maria.R. Moreira, Clove (*Syzygium aromaticum*) oils, Essential oils in food preservation, flavor & safety, chapter -39, <https://dx.doi.org/10.1016/B978+0-12-416641-7-000.39-0>
43. Health Benefits of Cloves: Uses, Benefits & Side Effects  
<https://share.google/TWhs5I58AHM5Gk90l>
44. What is cardamom? Benefits and uses of cardamom spice,  
<https://www.mastervlass.com/articles/what-is-cardamom-benefits-and-uses-of-what-is-cardamom-benefits-and-uses-ofcardamom-spice#what-is-cardamom>, Accessed: July 15, 2021.
45. 10 Health Benefits of Cardamom, Backed by Science,  
<https://www.healthline.com/nutrition/cardamom-benefits>, Accessed: July 15, 2021.
46. A.C. Gonçalves, S. Castro, J. Paiva, C. Santos, P. Silveira, Taxonomic revision of the genus *Calendula* (Asteraceae) in the Iberian Peninsula and the Balearic Islands, *Phytotaxa* 352 (1) (2018) 1, <https://doi.org/10.11646/Phytotaxa.352.1.1>.
47. Tutin TG, Heywood VH, Burges NA, Valentine DH, Walters SM, Webb DA (Eds.), *Flora Europaea: Plantaginaceae to Compositae (and Rubiaceae)*, 4, Cambridge University Press, Cambridge, 1964, p. 207.
48. C. Ao, Comparative anatomy of bisexual and female florets, embryology in *Calendula officinalis* (Asteraceae), a naturalized horticultural plant, *Sci. Hortic.* 114 (3) (2007) 214–219,  
<https://doi.org/10.1016/j.scienta.2007.06.019>
49. Herbal formulations containing herbal additives.  
<https://share.google/snJxwOFawfxWpBsOy>.

**HOW TO CITE:** S. Swetha\*, M. Gopi, M. Gowri, V. Govarthini, K. Gowtham, A Comprehensive Review on the Pharmacological Activities of *Hylocereus Polyrhizus* and *Ananas Comosus*, *Int. J. Sci. R. Tech.*, 2025, 2 (8), 381-393.  
<https://doi.org/10.5281/zenodo.16919826>