

Review Article

A Potential Wound Healing Traditional Plant of *Psidium Guajava* Linn. (Guava) - An Update

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Abstract

The traditional plant *Psidium guajava* Linn is commonly known as Guava in India, belongs to Myrtaceae family. The whole plant is used in traditional medicine [Bark, Leaves, Fruits and Roots] for various types of inflammatory and wound conditions. Phytochemical review showed that the plant was found to contain rich amount of Tannin, a polyphenolic compound. Due to the presence of different types of Tannin, the plant showed a remarkable wound healing property in all types of wounds, it was proved by scientific data. Based on its wide application in local medicine and in Indian system of medicine as anti-inflammatory drug in the treatment of wounds, the present review gives an update on *Psidium guajava* about its wound healing activity by both in-vitro and in-vivo methods.

Keywords: *Psidium guajava*, wound healing, in-vitro and in-vivo methods

Introduction

Medicinal plants are very important for the treatment of diseases. Over the years, research has expanded our knowledge of chemical composition of active ingredients that determine the healing properties of plants. India is an ancient heritage of traditional medicine. Materia medica provides a wealth of information about people's customs and traditional medicine based on various traditional systems, including Ayurveda, Siddha and Unani.¹⁻³ This system aims to promote good health and improve the quality of life, with therapy based on folklore drug use.⁴ The widespread use of plants as herbal medicines, various approaches to detect new bioactive compounds are currently underway.⁵ *Psidium guajava* is commonly known as Guava, is a medicinal plant belong to family Myrtaceae. It is well known traditional medicinal plant used in various systems of traditional medicine and widely used in India.⁶ It is a large evergreen or subdeciduous shrub, sometimes a small tree up to 90cm girth and 7.5m high. Stem irregularly fluted when old shown in Fig no 1. Bark is quite smooth, pale pinkish brown or buff with grey patches, exfoliating in very thin woody plates. (Fig no 2). The flowers are white, in curved petals, 2 or 3 in the leaf axils, the yare fragrant, with four to six petal and yellow anthers.

Calyx-tube adnate to the ovary and produced above it, the upper free portion entire, closed in bud at length bursting irregularly in to lobes. The fruits are small, 3 to 6 cm long, pear-shaped, globose or pyriform berry, reddish-yellow when ripe shown in Fig No 3. The branches are crooked, bringing opposite leaves (Fig no 4). Pharmacological studies shows that bark, fruit and leaves are used as antibacterial, hypoglycemic, anti-inflammatory, antipyretic and anticonvulsant.⁷ In traditional system of medicine the root extracts, bark and leaves are used to treat gastroenteritis, vomiting, diarrhea, wounds, ulcers, toothache, cough, sore throat, inflamed gums and various inflammatory other disorders.⁸⁻⁹ Phytochemical studies of *Psidium guajava* showed the presence of tannins, triterpenes, flavonoids and phenolic compounds.¹⁰⁻¹¹ It has been shown to contain antibacterial, anti-analgesic, anti-inflammatory properties, because of its rich amount of tannins.¹² Wound healing is a recovery process that occurs after injury to the skin and other soft tissues. Many factors can affect wound healing, such as bacterial infections, malnutrition, treatment, sterility, obesity, and injury.¹³ Traditionally, *Psidium guajava* is used to treat wounds. To confirm the claim, this study aims to investigate the potential for wound healing in the over ground part of the *Psidium guajava*. So, the



Figure 1: *Psidiumguajava* Wholeplant



Figure 2: *Psidiumguajava* bark



Figure 3: *Psidiumguajava* flowers and fruits



Figure 4: *Psidiumguajava* leaf twig

present review work focused on the thorough survey on wound healing activity of *psidiumguajava*L., evaluated by both in - vitro and in-vivo methods.

Wound healing – invitro studies

Aman Deep Baghla et al., (2013) reported that the plant catalyzes and GSH activity and TBARS significant merge compared to control. So, they confirmed

wound healing activity may be because of potent antioxidant property.¹⁴

Fagbohun Temitope Richard et al., (2013) investigated the effect of aqueous extract of leaf and bark of guava (*Psidiumguajava*) on fungi *Microsporum-gypseum* and *Trichophytonmentagrophytes*, and bacteria *Staphylococcus aureus* and *Staphylococcus epidermidis*. They reported that both *P.guajava* solutions were effective against inhibiting the growth of bacteria *S.aureus* and *S.epidermidis*, and fungi *M.gypseum* and *T.mentagrophytes*.¹⁵

Bipul Biswas et al., (2013) studied the antimicrobial activities of leaf extracts of Guava (*Psidiumguajava* L.) on two Gram-Negative and Gram-Positive Bacteria. They reported that guava leaf-extract might be a good candidate in the search for a natural antimicrobial agent.¹⁶

M.M.Rahman et al.,(2014) studied the antimicrobial compounds from leaf extracts of *Jatropha curcas*, *Psidiumguajava*, and *Andrographis paniculata*. The leaf extract have the potential as a cut flower solution to minimize microbial populations and extend flower vase life.¹⁷

Prashant P.Bhalchim et al.,(2015) carried out the formulation and evaluation of herbal gel containing *Psidium Guajava* Linn leaves extract and reported to have antimicrobial property.¹⁸

Chamakui Subba Rao et al., (2015) reported Petroleum ether, chloroform, ethanol and water extract of *psidium guajava* have good anti-inflammatory effects. The tannin-rich fraction was found to stabilize the RBC membrane against hypotonicity-induced hemolysis compared to control. This study showed *Psidium guajava* Linn. Tannin fractions and bark tannins fraction have a significant anti-inflammatory effect and showed the significant percentage of wound protection that at the test concentration.¹⁹

Wound healing – in vivo studies

Kristianne Porta Santos Fernandes et al., (2010) This study evaluated the potential for wound healing in-vivo and the in-vitro cytotoxic effects of commonly used *P.guajava* leaf extract and corticosteroids. In vitro the extract caused a decrease in cell viability and growth compared to controls and corticosteroids. Extracts exhibited accelerated wound healing by in-vivo method.²⁰

Aman Deep Baghla et al., (2013) carried out Wound healing activity of aqueous extract of *psidium guajava* leaves were reported by both incision and excision wound made in rat.

The wound healing effect of *Psidium guajava* aqueous extract in the form of ointment at the concentration of (100 mg/500mm²). Topically applied on wound created by both incision and excision method. The wound healing activity results showed that upon application of *P. guajava* ointment there was a decrease in the epithelization period, along with a visibly decreased scar area and showed significant increase in tensile strength in gram, it exhibited statistically significant difference in comparison with control group.²¹

Vamsi .S. Beetal., (2014) Formulated and Evaluated Polyherbal Wound Healing Ointment. They found that the synergetic effect of the phytoconstituents like tannins, saponins, curcumin, alkaloids present in those plants extracts which help to establish these formulations clinically effective in the wound healing management.²²

Jang Metal., (2014) studied anti-inflammatory effects of an ethanolic extract of guava (*Psidium guajava* L.) leaves in vitro and in vivo. The IR results demonstrated that guava leaf extract (GLE) significantly inhibited lipo polysaccharide (LPS) induced production of nitric oxide and prostaglandin E₂ in a dose dependent manner. GLE suppressed

the expression and activity of both inducible nitric oxide synthase and cyclooxygenase 2 in part through the down regulation of ERK 1/2 activation in RAW2647 macrophages. Furthermore, GLE exhibited significant anti-inflammatory activity in 2 different animal models Freund's complete adjuvant induced hyper algesia in the rat and LPS induced endotoxic shock in mice.²³

Neelam Skasar et al., (2016) studied wound healing activity of *Psidium guajava* leaves extract in animal models and they found that formulated herbal gel shows significant improvement in wound contraction.²⁴

S. Jaya Kumari et al., (2018) Gel of tannin rich fraction of *psidium guajava* was formulated and evaluated for various healing properties by excision wounds model using albino wistar rats. This composition was evaluated for healing activities of diabetes animals. Wound healing involves several phases, including contractions, epithelialization, and fibrosis. The diabetic excision wound model was performed to examine the effect of the wound of *P. guajava* leaves. The results of this study indicate that the gel of *P. guajava* leaves fractionated by tannin fraction showed significant to high levels of diabetes healing activities of the concentration of (5% and 10%). However, this effect was found to be associated with concentrations dependent where 10% of the gel showed significant diabetes activity by increasing cell proliferation, granulation tissue formation, collagen synthesis, and by increasing the rate of wound contraction compared to diabetes control.²⁵

Steve Endeguele Ekomet al., (2018) studied Methanol extract of *Psidium guajava* leaves for antibacterial activity and wound healing by excision model, wound was infected by *Staphylococcus aureus* wounds using the Wistar mouse model. Plant extracts showed antibacterial activity (MIC = 256-1024 mg), which varied depending on the species tested. *Psidium guajava* and baneocin ointment showed the shortest Epithelization and highest compression level and highest weight and highest granulation of total tissue protein content compared to negative controls. The wound healing activity of *psidium guajava* methanolic extract in the model of excision wounds showed that increased contraction of wounds that were dependent on concentration increased in percent.²⁶

Tonny Cortis Maigoda et al., (2019) studied wound healing and blood sugar effect of *Psidium guajava* L. Leaves and *Melastoma malabathricum* L. Leaves on rats with diabetic foot ulcer. The results concluded that the mixed of both the leaves significantly reduced the blood glucose levels and reduce the area of injury in rat foot.²⁷

Discussion

The presented review report states that the evaluation of *Psidium guajava* in wound healing properties by various methods both *in vivo* and *in vitro*. The plant extract catalyses GSH activity and TBARS significant and possess good antioxidant properties due to presence of tannin, it promotes the wound healing by astringent action and the leaf extract showed significant antibacterial activity against tested bacteria which cause surgical wounds. It was reported that the stabilization of RBC membrane against hypotonicity induced hemolysis by using aqueous extract of the plant *Psidium guajava* by both incision and excision method in rat. Methanol extract of *Psidium guajava* also showed good antibacterial and healing properties. The formulated gel of tannin fraction of *Psidium guajava* leaves was evaluated that various physicochemical properties for wound healing by excision wound model using male albino wistar rat in diabetes condition. It showed significant effect as compared to standard. This update concluded that all parts of the plant *Psidium guajava* showed significant effect on wounds and its associated conditions as antimicrobial activity, antioxidant and anti-inflammatory properties.

Conclusion

From this study, it was concluded that updated knowledge on wound healing activity of *Psidium guajava* L., has significant anti-inflammatory, antibacterial, and antioxidant activities in both *in-vitro* and *in-vivo* wound healing model.

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