Journal of Biomedical and Pharmaceutical Research
Available Online at www.jbpr.in
CODEN: - JBPRAU (Source: - American Chemical Society)
NLM (National Library of Medicine): ID: (101671502)
Index Copernicus Value 2022: 83.05
Volume 13, Issue 6: 2024, 111-117
Review Article
ISSN (Online): 2279-0594
ISSN (Print): 2589-8752

A Smart Review on Rubus Paniculatus in Preclinical Models

Vishal Shukla*, Dr. Waseem Khan [1], Dr. Sanjay Singh [2]

Siddhartha Institute of Pharmacy, Dehradun, Uttarakhand

Article Info: Received: 14-10-2024 / Revised: 16-11-2024 / Accepted: 18-12-2024
Corresponding author: Vishal Shukla
DOI: https://doi.org/10.32553/jbpr.v13i6.1222
Conflict of interest statement: No conflict of interest

Abstract

Rubus Paniculatus Smith. (Family Rosaceae), often known as the yellow Himalayan raspberry (Yellow Hissar), is one of the most widely used edible fruits in Indian folk medicinal systems. The current review aims to identify the gap between research and existing applications of this fruit to help scientists explore the current trends and opportunities for future development. Fruits of *R. Paniculatus* are the source of several classes of compounds. Fruits of *R. Paniculatus* are also rich in nutrients such as carbohydrates, vitamins, and minerals. Fruits of *R. Paniculatus* have been the subject of several in vitro and in vivo investigations, all of which have corroborated their wide range of biological activities and demonstrated their potential for the identification of new therapeutic candidates and the development of innovative herbal food supplements. Additional mechanism-based pharmacological evaluation and clinical research should provide an adequate scientific basis for the traditional usage of *R. Paniculatus* fruits, which is currently not sufficiently supported by the available research on its active components and molecular mechanisms. The vast majority of people continue to view medicinal plants as a low-cost source of medications and treatments. Numerous trees, herbs, plants, and shrubs have been used as remedies for various ailments since the dawn of time. *Rubus Paniculatus* Smith, a weedy wild raspberry that flourishes in damp woods at high elevations, particularly those in the Himalayas and the Nilgiris area, is one of the important ethnomedicinal plants in the genus *Rubus*. Traditional Tibetan medicine places a great deal of importance on the plant *R. Paniculatus*. Because of the abundance and diversity of phenolics and flavonoids in fruits or berries, which have a high concentration of both, they are generally regarded as inherently healthful foods. The roots and leaves, as well as the fruit, have traditionally been used as therapeutic agents for several illnesses including colic pain, gastrointestinal discomfort, wound healing, diarrhea, antifertility, antibacterial, analgesic, epilepsy, and others. The objective of the current review is to concentrate on the pharmacological characteristics, nutrition profile, phytoconstituents, and folkloric therapeutic applications of *R. Paniculatus*, therefore achieving the review's overall subject.

KEYWORDS: *Paniculatus,* Himalayan raspberry, Numerous trees, Raspberry, carbohydrates, Cheeseberry.

Introduction

It is truly said that nature is the best physician as the natural healing force within each of us is the greatest force to recover from any disease in getting well. Nature itself is the cure of various illnesses but the need is to identify the healing source and to utilize the same for human welfare. Even today the medicinal plants are considered as a cheap source of medicine and drugs by the majority of population. Various trees, plants, shrubs and herbs have been used since ancient

times for curing of different ailments. *Rubus. Paniculatus* is one of them, which belongs to the genus *Rubus* and *Rosaceae* family having more than 750 species. The plant is well known for its pharmacological properties, and has been categorized under top ten wild edible medicinal plants (Pandey and Bhatt, 2016).

Rubus. Paniculatus, commonly called yellow Himalayan raspberry is also known by various other names viz. Indian raspberry tree (AlQahtani et al., 2017), Cheeseberry (Wu et al., 2013) etc. It is a thicket which attains height upto 3m and forms a thorny shrub having pink or white petals. The plant is invasive in Australia, Hawaii, U.S.A. and was first naturalized in Queensland in 1912 and then in many other countries namely, tropical Africa, England, West Indies, tropical regions of Southern America (Wu et al., 2013, Wu et al., 2014). Being invasive, it is capable of replacing the native vegetation of a particular area in which it is growing. It has been categorized as one of the major threats in Ola'a Forest Tract of Hawaii's Volcanos National Park where it has displaced the native vegetation and plant species including *Rubus hawaiiensis*, which is native Hawaiian raspberry whereas in Queensland it is declared as noxious plant (Wu et al., 2013). Beside this, the plant exhibit various biological properties such as anti-inflammatory, analgesic, antipyretic, antiproliferative, antitumor, antioxidant, anticonvulsant, etc. and has immense ethnomedicinal value because of its numerous compounds (George et al., 2013; Saini et al., 2013; Badhani et al., 2015; George et al., 2015). It is thus being used traditionally but it is losing its identity in the modern era due to the negligence of researchers and processors. This review majorly focus on the area and distribution of *Rubus. Paniculatus*, its composition and nutritive value, medicinal properties, utilization and future prospective with the aim of dispersing the facts related to it.

Medicinal plants as natural alternatives in modern civilization are expanding daily and gaining popularity worldwide. Modernized traditional health care is currently hampered by significantscientific advancements, chronic disease, resistant infections, degenerative disorders of aging, autoimmune disorders, and huge problems from risky medicine. Additionally, these non- allopathic medical approaches are still used by 70 % of India's 1.1 billion people. It is inevitably necessary to continue looking for newer traditional medicine sources and to check existing ones for new therapeutic uses.

Nobel Prize winner Ernst Boris Chain, who developed the powerful natural antibiotic penicillin, published a motivational piece titled "The quest for new biodynamic substances". In 1967, he wrote, "In China and India, there has been an extensive drive aimed at the systemic study of medicinal plants traditionally used in these countries in folklore medicine; this has failed, so far, to bring to light new classes of compounds with interesting pharmacologic activities. As far as drug research is concerned, therefore, we cannot expect many major surprises to come from the study of plant constituents".

India is home to the Himalayas, the Western Ghats, the Nicobar Islands, and the North-Eastern rain forests, which together make up four of the world's total 34 biodiversity hotspots. With about 1,350 species, Rubus is a vast and diversified genus of flowering plants in the rose family, Rosaceae, subfamily Rosoideae, and it is extensively dispersed in forests at high elevations, including those in the Himalayas and the Nilgiris area. A huge evergreen shrub that flourishes in the wild, *R. Paniculatus* Smith (also known as *R. Paniculatus*), a member of the Rosacea is a significant ethnomedicinal plant. The berries are also consumed globally for their flavour or as a reservoir of phenolics, tannins, and flavonoids, which are natural remedies. It has traditionally been used to treat gastralgia, ulcer, diarrhea wound healing, antifertility, antimicrobials, analgesics, and epilepsy. Numerous bioactive components from the species have been shown to have a wide range of pharmacological properties that are health-promoting. This review will serve as a springboard for subsequent research and focuses

on the species' potential to produce pharmaceutical, health-improving, and nutraceutical products.

Geographical Distribution

R. Paniculatus is a weedy wild raspberry that thrives in moist forests and spreads quickly in both bright open spaces and dense rainforests. As a result, it is common in forests at high elevations, including those in the Himalayas and the Nilgiris region. In addition to this, plants are extremely resilient and can build a natural defense mechanism that allows them to flourish while being

exposed to both biotic and abiotic environmental stimuli. It is one of the top 100 most invasive species in the world. It grows between 300 and 2600 meters above sea level along highways, hillsides, thickets, slopes, mountain valleys, and sparsely populated woodlands. The plant is found in an area with a 2000–6500 mm per annum rainfall range. The plant was initially allowed to grow naturally in Queensland and is indigenous to Southern Asia, South East Asia, South Western China, Sikkim, Myanmar, Bhutan, Laos, Pakistan, Sri Lanka, Nepal, Philippines, Vietnam, Thailand, and India (distributed in the Himalayan foothills, Nilgiri, and Peninsular Hills region). The plant is just found in a limited region of the Central coastal region of New South Wales and Southern Queensland in Australia. In China, it grows in frost-tolerant habitats such as wet lowland regions next to pond banks and heavily forested to drier montane habitats at elevations of 1000–2500 m up to 3000 m. In India, it is found in Assam, Sikkim, Tamil Nadu, Kerala, and Maharashtra state. The plant's blooming season lasts from March to April, while the fruiting season, which produces golden yellow fruits, lasts from April to May.

Morphological Studies:

R. Paniculatus is a thorny, 1-3-meter-tall shrub. Stems are pubescence consisting of sparse, curved prickles, dense, purplish-brown glandular hairs, and pubescence that is brown or purplish-brown in colour. Stipules are linear, 7–11 mm long, pubescent, and covered in intermixed glandular hairs. The leaves are imparipinnate and trifoliate. The petiole is 2-6 cm long, 2-3 cm long make up the petiolule of the terminal leaflet, and the lateral leaflets are subsessile. Leaflets' blades are obovate or elliptic. In compared to the lateral leaflets, the terminal leaflet is larger, has a base that is rounded, a margin that is unevenly minutely sharply serrated, and an apex that is acute, abruptly pointed, shallowly cordate, or sub-truncate. Along the midvein, the veins are pubescent and impressed adaxially. Purplish red pubescent bristles cover the rachis and petiolule. Terminal inflorescences with thick glomerate racemes. Sepals that are erect, oblong, and abaxially densely covered in yellowish grey tomentose; flowers with a calyx that is abaxially pubescent, intermixed with yellowish tomentose, and sparsely bristly. Petals those are pink or white, spatulate, longer than the sepals, with a densely hairy base and a premorse edge. The ovary is hairy, and the styles are glabrous and a little bit longer than the stamens. Golden-yellow, sub-globose aggregate fruit with triangular-ovoid pyrenes and pubescent drupelets at the apex. The thalamus of the *R. Paniculatus* fruit is nipple-shaped and measures 6 mm long and 7 mm diameter at the base. The fruit weighs 444 mg, has a volume of 567 microliters, is yellow, and is very easily detachable from the thalamus and falls when it reaches maturity.

Folklore Medicinal Uses

R. Paniculatus plant possesses great importance in Tibetan traditional medicine. The fruit has a laxative effect, and the inner bark is used for a variety of purposes including as a renal tonic and an anti-diuretic. Typhoid fever is traditionally treated using the entire plant since it has astringent properties. Extracting root juice has been used to treat a variety of ailments, including fever, gastrointestinal problems (including infant colic when the young shoots are also used), diarrhoea, and dysentery, and applying root paste to wounds speeds up healing. Additionally, the fruit juice is used to cure colds, sore throats, colic, and fevers. When the senses are impaired and a person has vaginal or seminal discharge,

the inner bark is said to be beneficial. As the fruit is fibrous, it also aids in digestion. It is used as a diuretic and a diaphoretic in the summer to stimulate sweating. *R. Paniculatus* roots and young shoots are used to relieve colic discomfort. It has traditionally been used to treat ulcers, gastralgia, wound healing, diarrhoea, antifertility, antibacterial, and analgesic. There have been claims that various portions of the plant are helpful for illnesses like diabetes, diarrhoea, gastritis, dysentery, epilepsy, wound healing, anti-fertility, antibacterial, analgesic, and renal tonic.

As one of Manipur's significant ethnomedicinal plants, *R. Paniculatus* root bark has long been used by the Naga tribe in Manipur to treat fever. For fever treatment, the Nagas advise drinking a root bark decoction twice daily. In addition, the root bark is utilized for severe headaches, shattered bones, emmenagogues, abortifacients, and dysentery. The Lepcha tribe in North Sikkim, India, uses *R. Paniculatus* to treat a variety of illnesses. Unexpected stomach ache is relieved by chewing raw fresh shoots. Children were given a root decoction to relieve their heated stomachs. Young fruit paste is eaten in cases of gastritis, diarrhea, and dysentery, whereas ripe fruits are used in cases of constipation as they posses laxative action. In the Tanahun District of Western Nepal, the root juice used to treat urinary tract infections and its fruits, which are tasty, were listed among the top ten wild edible medicinal plants. In different parts of Nepal, it is used to treat colds, typhoid fever, and several other alignments. It is normally advised to use it for the full nine months of pregnancy and can be used in the last stages of pregnancy to aid with delivering. Themuscles in the pelvis and uterus seem to be toned by raspberry leaf tea.

Pharmacological studies

R. Paniculatus has been used is used to treat various ailments since ancient times. Various part of the plant extracts has been reported for the presence of flavonoids, phenolic compounds, steroids, saponin, and tannins. These various compounds are used as an analgesic, antipyretic, anti- inflammatory, antimicrobial, antitumor, wound healing, antidiabetic, nephroprotective, antioxidant, antiproliferative.

Antioxidants

Antioxidants are chemicals that have the potential to donate electrons to reactive species, so helping to rid the body of oxidative species that cause chronic diseases in humans. And it was observed that decreased plasma antioxidant count contributed to the rising prevalence of cancer death.

Meda et al. studied the ability of *R. Paniculatus* to scavenge reactive oxygen species, prevent ß-carotene bleaching, and decrease ferric activity, which was examined concerning the plant's antioxidant characteristics. The acetone extract had the highest levels of ABTS cationic radical scavenging and DPPH free radical scavenging activity with value of 1072.6 mg BHAE/100 g FW and 619.3 mg CE/100 g FW respectively, while the methanol had 502.2 mg CE/100 g and that of acidic methanol had 521 mg CE/100 g of antioxidant activity. The presence of phenolics is required for the ferric reduction action (Fe3+ to Fe2+) of plant extracts, which was highest with acid acetone extracts (1389.82 mg AAE/100 g FW) and lowest with methanolic.

Medicinal properties of plant *Rubus* Paniculatus

Rubus Paniculatus is rich in phytochemicals and is traditionally being used as a source of medicine. Every part of the plant is rich in one or more essential component which can be used either in manufacturing of drugs or the part itself can be used in various forms such as laxative, decoction and many more. The complete plant is astringent in nature and is used to lower down the body temperature during fever, especially during typhoid (Pandey and Bhatt, 2016). The fruit possess laxative properties and is thus used in traditional medicinal system of Tibet and in folk medicinal system (George et al., 2013). The fruit of *Rubus Paniculatus* (edible part) is a rich source of natural antioxidants, which helps in reducing the oxidative stress and thereby protects

the body against degenerative diseases including cancer upon the direct consumption. The young roots and shoots of the plant are effective during stomach ache, abdominal pain, colic pain, etc. In Unani and Ayurveda, antifertility property of plant *Rubus Paniculatus* has been reported (Pandey and Bhatt, 2016). The plant is also used for wound healing, gastralgia, dysentery, ulcer, diabetes mellitus, antifertility, analgesic, antimicrobial and epilepsy.

Modern uses:

The fruit of *Rubus Paniculatus* are not only edible but are also delicious and have the ability to be utilized in food industry as a very good substrate. The antioxidant potential of this fruit i.e., *Rubus Paniculatus* makes it useful for the development of various supplemented probiotic products (Kumar and Kumar, 2016). Beside all these, nowadays it is also used for manufacturing of purplish blue coloured dyes (Pandey and Bhatt, 2016). But, the scientific intervention in the processing of this crop is a lacking issue and this crop is still unexplored, and needs to be exploited with the passage of time for the development of wide range of food products. Owing to its composition, berries can be utilized for development of the numerous food products (juice, squash, jam, jelly, preserve and candy) and pharmaceutical products with the intervention of researchers and processors for their wide popularization.

HYPOTHESIS

Null Hypothesis (H_0): The extract of *Rubus paniculatus* has no significant wound-healing potential in preclinical models compared to the standard treatment or control.

Alternative Hypothesis (H_1): The extract of *Rubus paniculatus* exhibits significant wound-healing potential in preclinical models, evidenced by enhanced wound contraction, increased tensile strength, accelerated epithelialization, and improved biochemical and histopathological parameters compared to the standard treatment or control.

CHEMICALS: The following chemicals will be procured from Loba Chemie and utilized during the experimental protocol.:

Table 1:

S.No	Chemical	Quantity	Supplier
1	Stearic Acid	12 g	Loba Chemie
2	Cetyl Alcohol	0.5 g	Loba Chemie
3	Sorbitol	5 g	Loba Chemie
4	Distilled Water	78.2 ml	Loba Chemie
5	Propylene Glycol	3 g	Loba Chemie
6	Triethanolamine	1 g	Loba Chemie
7	Methyl Paraben	0.1 g	Loba Chemie
8	Sodium Metabisulfite	0.1 g	Loba Chemie
9	Silver Sulfadiazine (2.5%)	25 mg	Loba Chemie
10	Cedrus deodar oil (1%)	-	Loba Chemie

Table 2: Instruments: The following instruments were utilized during the experimental protocol:

Sr. No	Instrument	Purpose
1	Digital Weighing Balance	Accurate weighing of chemicals
2	Water Bath	Heating substances
3	Magnetic Stirrer	Homogenization of samples
4	pH Meter	pH adjustment of formulations
5	Homogenizer	Preparing emulsions
6	Digital Melting Point Apparatus	Determining melting points

Conclusion:

Rubus fruits or berries are high in nutrients and contain a diverse spectrum of phytochemicals. One of the significant ethnomedicinal plants among them, *R. paniculatus*, serves a variety of functions, including being utilized to produce processed products, edible fruits, and traditional remedies. Its intake may be crucial in the fight against several illnesses due to its anti-inflammatory, nephroprotective, anti-proliferative, antipyretic, cytotoxic, analgesic, anti-cancer, anti-fertility, wound-healing, anti-microbial, antioxidant, and anti-plasmodial characteristics. In light of the aforementioned, one of the probable mechanisms of action of the extract might be its free radical scavenging and antioxidant properties. This hypothesis, however, needs to be validated. We may infer from the facts above that *R. paniculatus* can be employed as a raw material in the formulation of nutraceuticals.

Rubus paniculatus berries are not available throughout the year and have the limited availability at few places only as per its habitat. So, in order to preserve the fruit and make it available throughout time, it's processing and preservation can be used as a weapon which may help in enhancement of the employment of rural people. More research is still required for attracting the food processors and industrialists for its value addition and creating awareness about its high nutritive and medicinal value among consumers.

Reference

1. Guo, S., & DiPietro, L. A. (2010). Factors affecting wound healing. *Journal of Dental Research, 89*(3), 219-229.DOI:10.1177/0022034509359125
2. Lobo, V., Patil, A., Phatak, A., & Chandra, N. (2010). Free radicals, antioxidants, and functional foods: Impact on human health. Pharmacognosy Reviews, 4(8), 118-126.DOI:10.4103/0973-7847.70902
3. Kaur, R., & Arora, S. (2009). Role of medicinal plants in wound healing. Journal of American Medical Science, 10(5), 37-44.
4. Patel, A. V., Rojas-Vera, J., & Dacke, C. G. (2004). Therapeutic constituents and actions of Rubus species. Phytotherapy Research, 18(7), 538-544. DOI:10.1002/ptr.1468
5. Negi, P. S. (2012). Plant extracts for the control of bacterial growth: Efficacy, stability, and safety issues for food application. International Journal of Food Microbiology, 156(1), 7-17. DOI:10.1016/j.ijfoodmicro.2012.03.006
6. Dong R, Guo B. Smart wound dressings for wound healing. Nano Today. 2021 Dec 1; 41:101290.
7. Wilkinson HN, Hardman MJ. Wound healing: Cellular mechanisms and pathological outcomes. Open biology. 2020 Sep 30; 10(9):200223.
8. Guo B, Dong R, Liang Y, Li M. Haemostatic materials for wound healing applications. Nature Reviews Chemistry. 2021 Nov;5(11):773-91.
9. Hai Z, Ren Y, Hu J, Wang H, Qin Q, Chen T. Evaluation of the treatment effect of Aloe vera fermentation in burn injury healing using a rat model. Mediators of inflammation. 2019 Jan 27; 2019.
10. Belkhodja H, Meddah B, MEDDAH TIR TOUIL A, BOUHADI D, BELMIMOUN A. Wound healing activity of the essential oils of Rosmarinus officinalis and Populus Alba in a burn wound model in rats. SAR J. Pathol. Microbiol. 2020; 1:1-9.
11. Seyhan N. Evaluation of the healing effects of Hypericum perforatum and Curcumin on burn wounds in rats. Evidence-Based Complementary and Alternative Medicine. 2020 Feb 14; 2020.
12. Rodrigues M, Kosaric N, Bonham CA, Gurtner GC. Wound healing: a cellular perspective. Physiological reviews. 2019 Jan 1;99(1):665-706.
13. Abazari M, Ghaffari A, Rashidzadeh H, Badeleh SM, Maleki Y. A systematic review on classification, identification, and healing process of burn wound healing. The

International Journal of Lower Extremity Wounds. 2022 Mar;21(1):18-30.

14. Guo HF, Ali RM, Abd Hamid R, Chang SK, Zainal Z, Khaza'ai H. A new histological score grade for deep partial-thickness burn healing process. International journal of burns and trauma. 2020; 10(5):218.

15. Shupp JW, Nasabzadeh TJ, Rosenthal DS, Jordan MH, Fidler P, Jeng JC. A review of the local pathophysiologic bases of burn wound progression. Journal of burn care & research. 2010 Nov 1;31(6):849-73.

16. Lei J, Sun L, Li P, Zhu C, Lin Z, Mackey V, Coy DH, He Q. The wound dressings and their applications in wound healing and management. Health Science Journal. 2019;13(4):1-8.

17. Ridhanya K. Skin wound healing: an update on the current knowledge and concepts. Research Journal of Pharmacy and Technology. 2019;12(3):1448-52.

18. Summer GJ, Puntillo KA, Miaskowski C, Green PG, Levine JD. Burn injury pain: the continuing challenge. The journal of pain. 2007 Jul 1;8(7):533-48.

19. Honnegowda TM, Kumar P, Udupa P, Rao P. Epidemiological study of burn patients hospitalised at a burns centre, Manipal. International wound journal. 2019 Feb;16(1):79-83.

20. Sanchez R. Initial shock from burns. Physiopathology: therapeutic principles. Pathologie- biologie. 2002 Mar 1;50(2):82-92.

21. Lami FH, Al Naser RK. Epidemiological characteristics of burn injuries in Iraq: A burn hospital- based study. Burns. 2019 Mar 1;45(2):479-83.

22. Suruse P. Evaluation of wound healing activity of Arisaema leschenaltii blume. Der Pharmacia Lettre 2011; 3(4): 200-206.

23. George BP, Parimelazhagan T, Saravanan S. 2013. Anti-inflammatory, analgesic and antipyretic activities of Rubus ellipticus smith. leaf methanol extract. International Journal of Pharmacy and Pharmaceutical Sciences. 5(SUPPL. 2):220–4.

24. Ahmad M, Masood S, Sultana S, Hadda T Ben, Bader A, Zafar M. 2015. Antioxidant and nutraceutical value of wild medicinal Rubus berries. Pakistan Journal of Pharmaceutical Sciences. 28(1):241–7.

25. Vadivelan R, Bhadra S, Ravi AV, Shanish KS, Elango K SB. 2009. Evaluation of anti-inflammatory and membrane stabilizing property of ethanol root extract of Rubus ellipticus Smith in Albino rats. Journal of Natural Remedies. 9(1):74–8.

26. Maity D, Pradhan N, Chauhan AS. 2004. Folk uses of some medicinal plants from North Sikkim. Indian Journal of Traditional Knowledge. 3(1):66–71.

27. Badhani A, Rawat S, Bhatt ID, Rawal RS. 2015 Dec 1. Variation in Chemical Constituents and Antioxidant Activity in Yellow Himalayan (Rubus ellipticus Smith) and Hill Raspberry (Rubus niveus Thunb.). Journal of Food Biochemistry.;39(6):663–72. Available from: https://doi.org/10.1111/jfbc.12172

28. Lowe S., Browne M., Boudjelas S. DPM (2000). 2000. 100 of the World's Worst Invasive Alien Species A selection from the Global Invasive Species Database. 2000. 7 p.

29. Wu K, Zhang J, Zhang G, Ding J. 2014. Epiblema tetragonana and Epinotia ustulana (Lepidoptera: Tortricidae), two potential biological control agents for the invasive plant, Rubus ellipticus. Biological Control. 77(2014):51–8.

30. Wu K, Center TD, Yang C, Zhang J, Zhang J, Ding J. 2013. Potential classical biological control of invasive Himalayan yellow raspberry, Rubus ellipticus (Rosaceae). Pacific Science. 67(1):59– 80

31. Pandey Y, Bhatt SS. 2016. Overview of Himalayan yellow raspberry (Rubus ellipticus Smith.): A nutraceutical plant. Journal of Applied and Natural Science. 8(1):494–9.