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Review Article

URARIA PICTA (JACQ.): A REVIEW ON ETHNOMEDICAL USES, PHYTOCHEMISTRY, AND BIOLOGICAL ACTIVITIES

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ABSTRACT

The aim of this systematic review is to provide an in-depth study of ethnological uses, phyto-chemistry, pharmacological activities, and toxicological research in *Uraria picta* (Jacq.), to identify remaining gaps, and to provide a basis for future research. By searching for the words "*U. picta*" and "Prishnaparni" in electronic databases such as SciFinder, Web of Science, PubMed, and Google Scholar, information on common uses, phytochemistry, and pharmacological activities was systematically collected. Phytochemical analysis of *U. picta* shows various components such as alkaloids, flavonoids, steroids, terpenoids, phenols, and saponins. The extracts and their isolated components showed numerous *in vitro* and *in vivo* pharmacological effects, including urinary tract diseases, tumors, edema, smoking, and dyspnea. On the other hand, searches of patent databases found almost seven applications, highlighting the differences between a large number of published scientific articles and non-existent patent applications. This event demonstrates the technological potential of undiscovered species. Ethnographic research shows that *U. picta*, an important Asian medicinal plant, is used to treat many diseases. In this review, the ethnobotanical, phytochemical, pharmacological, and ethnological properties of various morphological parts of the *U. picta* plant are highlighted. Future research has provided information for commercial research and has shown that this herb has tremendous potential for pharmaceutical and nutritional applications.

Keywords: *Uraria picta,* Prishnaparni, Ethnobotanical, Phytochemistry, Pharmacological properties.

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INTRODUCTION

Uraria picta (Syn. *Doodia picta* Roxb, *Hedysarum pictum* Jacq., Family-Leguminosae: *Papilionoidae*.) is commonly called "Wizardry" or "Slight-of-hand" and the Prishnaparni or Pithvan plant. It is also found throughout India and almost all places in Bangladesh, Sri Lanka, tropical Africa, the Malaysian Islands, the Philippines, Australia, Africa, and Asia [1-6]. Especially in some diseases of traditional medicine, it is a very important plant, compared to many other plants, in terms of its usefulness and effectiveness. The suffruticose plant is vertical or fertile, 1.5 m high and is often found in dry grasslands, bare lands and forests. It is one of the key ingredients of "Dashmoolarista," the main Ayurvedic medicine in the Indian medical system, made from the roots of 10 medicinal plants and used for treating general fatigue, mouth ulcers and various gynecological diseases. The formulation Dashmula contains ten roots of medicinal plants: Gambhari (*Gmelina arborea*), Bilva (*Aegle marmelos*), Agnimantha (*Premna integrifolia*), Shoynaka (*Oroxylum indicum*), Patla (*Sterospermum suaveolens*), Shalaparni (*Desmodium gangeticum*), Kantkari (*Solanum xanthocarpum*), Gokshura (*Tribulus terrestris*), and Brahati (*Solanum indicum*) [3,4,7,8]. Dashmool is also used as an essential ingredient in the manufacture of more than 109 drug formulations [9,10]. It is also used in other Ayurvedic formulations such as Abana, Amritarishta, Angamardana prashamana kashaya churna, Dashamoola carving, Vyaghri carving, Madhyama Narayana carving, Dashmularishta, and Shira Shuladi vajra Ras [11,12].

Almost all parts of *U. picta* have therapeutic value and are used in the medical system of India to treat fatigue, oral ulcers, and various gynecological diseases [8,13-15]. *Echis carinatus* is also known as an antiseptic to cure snake [3] and fractures [16]. It contains antiseptic [17], antimicrobial [18], acaricide [19], antiulcerogenic [20], antihypodynamic [21], and antipulmonary hypertension [22] and partial vasodilation [8,9]. In addition to its use in the traditional pharmacological system, it is widely used in the pharmaceutical and pharmaceutical industries to make various formulations. The quality and efficacy of a plant depends on rhoifolin (apigenin-7-o-neoesperidoside), a biologically active compound used as a chemical marker, and rhoifolin, which has a high environmental impact [15].

This study represents a critical evaluation of the latest technology in conventional practices in *U. picta*, phytochemistry, pharmacology, and toxicology. The article aims to propose new research strategies to use the therapeutic potential of herbal products to treat human diseases.

MATERIALS AND METHODS

The available information about the traditional uses, phytochemicals, and pharmacological properties of *U. picta* was searched through Web of Science, Google Scholar, PubMed, Science Direct, and Springer search using English as the retrieval languages. The keywords used include *U. picta*, Prishnaparni, traditional uses, phytochemistry, bioactive components, pharmacological activities, toxicology, and other related words. All references were from experimental studies and published before September 2020 was reviewed.

Available information on traditional uses, phytochemicals, and pharmacological properties of *U. picta* was analyzed by Web of Science, Google Scholar, PubMed, Science Direct, and Springer using English as the search language. The keywords used are *U. picta*, Prishnaparni, traditional use, phytochemistry, bioactive substances, pharmacological activities, toxicology, and other related words. All references to experimental research were published and published in September 2020.

BOTANICAL ASPECTS

Morphology

U. picta is a straight tree between 1 and 2.5 m tall. At the bottom are wooden stems. The leaves are composed of 2–5 leaflets and pinnate pairs. In the vegetation phase, the pairs of leaves appear without the final

leaves. The lower leaves are oval, 2–8 cm long and 2–3 cm wide; the upper leaves are 7–25 cm, 5–25 mm wide, and oval-lanceolate. The number of inflorescence flowers is between 35 and 75 (it is 10–70 cm long on a stem 0–5 cm long), usually in dense clusters like thorns that are pink or purple 1.5 m long. There are long clusters and terminals. The bracts are the highest at the base and top. The fruits are between 2 and 6 seeds and the parts are almost separated. The fruits are hairless, distinctive, and gray. The seeds are light brown, tall, and about 2.5 × 1.5 mm (Fig. 1).

- Plant growth habit: Annual woody erect
- Soil: Loam to clay loam
- Plant size: 1–2.5 m height
- Leaf: 1.4–7.2 × 0.6–3 cm, elliptic-oblong
- Flowering season: July to September
- Flower: Bright reddish purple
- Fruit shape and size: 0.4–1.2 cm long
- Fruit color: Gray
- Seed: Light brown, oblong, 2.5 × 1.5 mm
- Fruit season: December to January [23,24].

Taxonomical classification:

- Kingdom: *Plantae*
- Subkingdom: *Viridiplantae*
- Superorder: *Rosanae*
- Order: *Fabales*
- Class: *Magnoliopsida*
- Subclass: *Rosidae*
- Family: *Leguminosae*
- Sub-family: *Fabaceae*
- Genus: *Uraria*
- Species: *Picta* – (Jacq) DC [25,26].

Vernacular names:

- Sanskrit: Citraparni, Kalasi, Dhavani, Prishniparni, Galvanina
- Hindi: Pithava, Dabra
- Marathi: Pithava, Prishniparni
- Tamil: Oppai
- Telugu: Murele Honne, Andale home, Prushniparni
- Gujarati: Pithava
- Bengali: Salpani, Chhalani, Chakule
- Kannada: Kolakuponna
- Malayalam: Oril
- Panjabi: Detedarnee
- Oriya: Prushnipamee, Shankar Jata [27].

TRADITIONAL USES

U. picta is prescribed for boiling cough, chills, and fever. The antiseptic leaves are well thought out and used to get gonorrhea. The roots and pods are used to treat infantile rectal prolapse. The capsules are used to treat oral pain in children. It is used to treat urinary tract diseases, tumors, and inflammation, smoking and breathing problems. Its paste mixed with water is used as a remedy for snake bites. It is the Ayurvedic medicine of the Indian system of medicine for the treatment of general fatigue. It is an antioxidant, analgesic, and anti-inflammatory drug in medicine [28,29]. The herb is traditionally used as an antipyretic, diuretic, astringent (used for irritable bowel syndrome, diarrhea, and dysentery) against colds, diuretics, anthelmintics, laxatives, and tonic nerves. As in China, where *U. picta* is used as a popular remedy, it is mainly used to treat fever, neutralize toxins, relieve pain, stimulate blood circulation, relieve cough, and improve breathing [30].

Charaka and Sushruta prescribed the entire plant, internally in prescriptions, in misperistalsis, diarrhea, dysentery, cough, consumption, respiratory diseases, abdominal glands, and fever from the inside of the whole herb; relieve asthma attacks as an ingredient in a drink to increase breast milk. Charaka gave him liquid porridge cooked with Prishnparni for the bloody bottom; it is cooked with Prishnparni, processed with dry rice and bullet (*Sida cordifolia*) for bleeding piles and hemorrhage. Sushruta places boiled milk on the ground with Prishnparni, added with sugar and honey, for gout; powdered root of Prishnparni with meat soup for promoting adhesion of fractured bone [17].

PHYTOCHEMISTRY

The plant is said to contain alkaloids, flavonoids, steroids, terpenoids, phenols, and saponins, all of which are components of plants. The tannins were not in the stem and roots, and the glycosides in the internal organs were in the roots [26]. Various significant compounds secluded from the root bark of *U. picta* are 5,7-dihydroxy-2'-methoxy-3',4'-methylenedioxyisoflavanone and 4',5-dihydroxy-2',3'-dimethoxy-7-(5-hydroxyoxychromen-7yl)-isoflavanone [18], stigmasta-4, 22-diene-3-one, ß-Sitosterol, and lupeol. Recently, a flavonoid rhoifolin (Apigenin-7-o-neohesperidoside) has been isolated from this plant [10].

PHARMACOLOGY

Anti-inflammatory

Singh, 2017, showed significant activity against both inflammatory models. Extraction of methanol from the *U. picta* roots reduced the inflammation of the treated egg albumin and formalin in a dose-dependent manner [23]. Naik and Krishnamurthy, in 2018, performed anti-inflammatory activities against the whole plant against leg edema caused by carrageenan of *U. picta* methanol extract in albino rats. Methanol extracted from *U. picta* was extracted at weight doses of 200–400 mg/kg. The measure of inhibition of the extracts was compared with a standard reference drug indomethacin. This study provides information on pharmacological evidence showing that *U. picta* can be used as an anti-inflammatory agent [31]. Regarding anti-inflammatory activity, Olufemi *et al*., in 2016, the *U. picta* leaf ethanol initiative significantly inhibited edema depending on the inflammation caused by carrageenan and the formation of granuloma caused by Cotton pinch in mice. It has anti-inflammatory activities due to stabilization of the lysosomal membrane of COX-2 [32,33].

Hepatoprotective effects

Singh, in 2017, tested liver damage caused by PCM 2000 mg/kg in mice to increase blood levels of the enzyme alanine transaminase (ALT), alkaline phosphatase (ALP), and aspartate aminotransferase (AST) in mice. Administration of methanol extract from *U. picta* roots reduced ALT, ALP, and AST enzyme levels, equivalent to the standard drug silymarin [23,34,35].

Anti-acaricidal activity

Igboechi *et al*. examined the acaricidal activity of extracts of *U. picta* in 1989. In total methanol extraction has been found to be 21 times more effective than acaricide than water extract. This aspect of efficacy clearly shows that the acaricidal principles of *U. picta* are better removed from water with alcoholic solvents [19,36].

Antimicrobial efficacy

Osazuwa and Igboechi, in 1988, carried out antimicrobial activity of two chemicals isolated from *U. picta* leaves. Isolation had significant static or bactericidal and fungistatic or fungicidal activity. These effects have been demonstrated in numerous microorganisms. The results of the study provide scientific support for the timely application of *U. picta* leaves to treat skin diseases and to accelerate the healing of fractures [18,37,38].

Antinociceptive effect

In terms of antinociceptive effect, Amole *et al*., 2016, show a marked inhibition of acetic acid-induced bending, resulting in a shortened UP duck period in the duck test formally induced in mice. The ethanol leaf extract has an contraceptive effect, induced by opioid mechanisms, ATP-sensitive K + channels, and nitric oxide [39,40].

Antioxidant activity

Patel *et al*., 2011, approaches the free radical elimination potential of *U. picta* ethanol extract. Several *in vitro* models have been studied for their radical elimination properties, namely, DPPH radical scavenger

test, ABTS radical scavenger test, O-phenanthroline test, lipid peroxidation test, superoxide capture test, non-enzymatic hemoglobin glycosylation test, and total antioxidant. The total antioxidant capacity of the ethanol extract from *U. picta* (10 mg/ml) corresponds to 63.31 mg/ml ascorbic acid. It showed 84.89% inhibition in the nonenzymatic hemoglobin glycosylation test. In summary, significant antioxidant activity has been associated with the presence of phenol derivatives, flavonoids, sterols, and terpenes [41]. Mohan *et al*., 2019, determined the free radical elimination activity from the leaves, stems, and roots of *U. picta*. Antioxidant activity was determined using the DPPH method to eliminate free radicals. It was found that ethanolic extracts and aqueous root extract from leaves and stems contain the lowest IC_{50} and hence the highest antioxidant activity. Based on the results, it can be concluded that the most promising antioxidant activity was demonstrated due to the presence of various extracts from the leaves, stems, and roots of *U. picta*, ethanolic extracts from leaves and stems, and aqueous extracts from the roots of phenols and flavonoid compounds [26,42,43].

In the treatment of Alzheimer's disease

Odubanjo *et al*., 2013, investigated the *in vitro* connection of an aqueous extract of *U. picta* with acetylcholinesterase and butyrylcholinesterase enzymes with Alzheimer's disease. *In vitro* inhibition, total phenol content and radical scavenging ability of acetylcholinesterase and butyrylcholinesterase were evaluated. The enzyme acetylcholinesterase and butyrylcholinesterase inhibited by the extract in a dose-dependent manner. The extract contains phenols and flavonoids. The extract also removed the 2,2-azino-bis (3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) residue and hydroxyl (OH) residue in a dose-dependent manner. The inhibition of acetylcholinesterase, butyrylcholinesterase, and the antioxidant properties demonstrated could make *U. picta* extract a good agent for the treatment/control of Alzheimer's disease [44-47].

Fracture healing activity

Prasad *et al*., 1965, studied the healing of fractures with radioactive P-32 and Ca-45 under the influence of *U. picta*. Albino rats, in 130 groups, received 45Ca or 32P injections 24 h before death; half of these groups were injected twice a week with *U. picta* alcohol extract and half with distilled water. Seven rats per group were killed at 5 weeks/week. They all had a broken arm bone. Bone radioactivity was measured and a bone was used for autoradiography. Bone activity is described in terms of the relationship between the humerus with the rupture of radioactivity and the whole humerus. When used as a 32P indicator, bone radioactivity was higher in the 2nd and 3rd weeks compared to untreated rats in urea-extracted rats; Animals treated with 46Ca showed the highest radioactivity at week 4, significantly better than the untreated group [48-50].

Cancer activity

In 2013, Eldahshan studied rhoifolin as an antitumor activity that is almost comparable to vinblastine, tested against human cell laryngeal occult carcinoma (Hep 2) and human cervical carcinoma (HeLa) cell lines. Promising activities have also been achieved against hepatocellular carcinoma (Hep G2), large intestine (HCT-116), and human fetal lung fibroblasts (MRC-5). A special effect of rhoifolin was the absence of cytotoxic activity against normal healthy cells (Vero cells), indicating the high selectivity of this compound [40,51]

Protective effect

Kale *et al*., in 2012, overuse of NSAIDs (anti-inflammatory steroids) resulted in nephrotoxicity, such as paracetamol, liver necrosis, and renal failure, occurring in approximately 1–2% of patients with acetaminophen overdose. Treatment with *U. picta* gold extract containing polyphenolic compounds and carbohydrates can significantly reduce urine urea and BUN levels, increase serum creatinine levels and urine creatinine with the paracetamol group. The stimulating activity of the summary may be due to its ability to activate antioxidant enzymes. The results suggest that it may be used as a new therapeutic agent that is not suitable for adapting the water extract of *U. picta* [14,52-55].

Fig. 1: Whole plant, leaves, flower, and fruits of *Uraria picta*

Antidiabetic activity

Fatokun *et al*., 2012, studied the activity of oral glucose tolerance of *U. picta* (leaves) in a model animal fed on a high-calorie diet to induce Type II diabetes. Sprague-Dawley 120 male rats were divided into two main groups. One group received a normal rat diet and the other group a high-calorie diet for 4 months. Raw herbal extracts were made by boiling, pressing, drying, and heating using traditional methods of sweetening. The untreated group and the rat group treated with metformin were used as controls and comparators, respectively. Each animal received different doses of oral herbal extracts at 3 weeks. Blood was taken from all rats before the analysis of glucose concentration. During this period, the animals were weighed weekly and fed every 3 days. After the dosing period, an oral glucose tolerance test was performed and blood samples were taken empty on the stomach for 0, 30, 60, and 120 min, and glucose concentrations were analyzed. *U. picta* showed a marked difference in the effect of reducing plasma glucose in rats fed a normal diet. The effects of plant extracts on weight and food intake were very small and were not significant in most groups. Doses of *U. picta* usually given to animals in the diet have greatly improved glucose clearance [56-60].

Anxiolytic activity

Garg, 2015, provided several types of summaries of *U. picta* leaves to rats at a dose of 200 mg/kg, 400 mg/kg, and 600 mg/kg with a thin pharmacological CNS. Anxiety-like activities have plant antioxidant effects and may be due to their ability to cleanse free radicals. The study compared diazepam, the standard anti-anxiety medication [61-65].

TOXICOLOGY

Acute oral toxicity studies did not show mortality in mice up to 5 g/kg, but the i.p. administered UP produced LD of 812.83 mg/kg; in addition, oral dose administration of 50 and 500 mg/kg resulted in a significant dose reduction ($p<0.05$) in the number of line crossings and dose-dependent culture behavior ($p<0.05$). The results of this study show that ethanol leaf extract from *U. picta* is oral [32].

CONCLUSION AND FUTURE OF THE AUDIT

U. picta is an excellent medicinal plant with traditional bioactive ingredients, such as antidiabetic, antitumor, anxiolytic, antioxidant, antinociceptive, antimicrobial, anti arizid agents and Arthritis. Pharmacological studies on crude compounds and extracts have demonstrated extensive biological effects of *U. picta* and provided basic evidence for its common use. While the overview is that *U. picta* provides a comprehensive summary of information on botanical, conventional,

and ethnographic functions, phytochemistry, pharmacology, and toxicity, there are still some gaps that require scientific evaluation and research.

Initially, many studies were focused on controlling conventional pharmacological activities, phyto-chemical analysis of the extract was poorly evaluated, and functional components were unknown. Some studies did not mention methods of identification and detailed information about the *U. Picta* (such as location, date of harvest, development phase, plant or plant parts, and harvesters). Second, some new results were evaluated, which had some problems with pharmacological methods and experimental designs. Some of the methods used in the pharmacological activities of *U. picta* have not been developed because there is no positive control group, which makes the results less reliable. Third, data on many aspects of *U. picta*, such as acute and chronic toxicity, pharmacokinetics, quality control standards, and the clinical value of medications are limited, so more needs to be done. Study to determine safety and toxicological limits and provides instructions for clinical applications.

In summary, knowledge of *U. picta* in traditional uses, its origins, chemical components, pharmacological activities, and toxicology has shown that *U. picta* is more popular and supports further research into the development of new herbal and health products.

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AUTHORS' CONTRIBUTIONS

Mr. Jaykumar Mane contribution included designing and preparing the review paper. Dr. Dheeraj Nagore and Dr. Sohan Chitlange contribution included data checking. All the authors have read the final manuscript and approved the submission.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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