

A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL ACTIVITIES OF
JUSTICIA PICTA

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ABSTRACT

Introduction: From an ancient time, most of the population of the world are used to depends on natural herbs or plants according to world health organization (WHO) about 80% of the world's population still using natural resources for health maintenance,^[1] and we all know that natural plant is the primary sources before drug development and one of the reasons is easily assessable and affordable source of raw material for drug development. And the medicinal plant has a sun shine future because millions of plants around the world with their excellent medicinal properties some are investigated and most of them under research. and many people thinks that medicinal plant are safer to synthetic medicines fort curing the disease.^[2,3] they have been used to treat pathogenic conditions since hundreds of years. This review is on about *graptophyllum pictum* which is commonly known as justicia picta, caricature plant, Waimea caricature plant, black adulsa (dark leave variety), white adulsa (variegated variety).^[4] *graptophyllum pictum*, it is grown as an evergreen shrub and the height of the plant is up to 6-9 feet tall belonging to the family Acanthaceae (acanthus family) and its full sun to part shade and the leaves in shape are oval to elliptic, variegated with green pink, cream and some time with purple markings. And the flower is reddish-purple tubular flower in cluster and 3-4 cm long and bloom in summer.^[5] The plant is ornamental and grows profusely during the raining season in the tropic region of the world.^[9] The plant is generally found in India, Papua New Guinea, Nicaragua, Panama, Costa Rica, Mexico, United States, Ghana, Bolivia, Ecuador, and gown as an ornamental plant in gardens.^[10,11] *G. pictum* is pharmacologically used in for various health problems such as constipation, rheumatism, scabies, urinary infection, hemorrhoid, maturing boil process, swelling, smoothing skins wounds, hepatomegaly, ear diseases, and laxative.^[12,13] *graptophyllum pictum* is widely used in the treatment of many diseases wound healing it has the property to heal a wound, analgesic (for relieving pain), anti-inflammatory (used to treat inflation), antimicrobial (prevent the growth of microbes), anti-pyretic (maintain body temperature), mensural problems, anti-diabetic activity (to control diabetes), estrogenic effect, nephroprotective activity, immunomodulator activity (it modulate immunity), anti-hemorrhoid activity and many other pharmacological activity.^[6] and *Graptophyllum pictum* contain phytoconstituents are: - alkaloids, glycosides, saponins, flavonoids, tannins, and steroids^[21,22,23] and it also contain some inorganic constituents like calcium, magnesium, potassium, and iron.^[21,22] Tannin also be applied locally on wounds at the throat and oral cavity, and the later especially in stomatitis. Tannin has a physiological activity against bacteria growth.^[16] and as a detoxification agent, tannin can precipitate protein and also form a specific compound interacting with protein and saliva dissepiment^[17] to inhibit the attachment of Streptococcus mutans and reducing it.^[14] Alkaloid has a physiological activity against bacterial growth.^[12,18] Flavonoid is a phenol compound, that can be dissolve in water, and can be extracted by 70% ethanol. Flavonoid has an antiviral characteristic, antibacterial and anti-inflammation character. The general characteristic of phenolic compound is susceptible to increase cell permeability to form a complex compound with protein by hydrogen bond.^[20] *Graptophyllum pictum* extract can inhibit the growth of Streptococcus mutans bacteria.^[19]

Description:- it is a caricature plant tropical evergreen shrub. Foliage is Oval shaped, glossy, variegated and leathery. that will grow to 6–9' tall. Leaves are up to 3-4 inches long and having purple or red tubular flowers with protruding stamens. They bloom in summer.^[36]

Taxonomical Classification^[42]

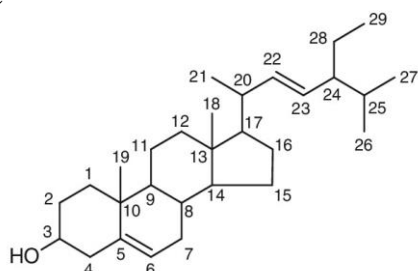
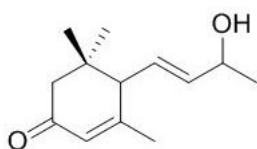
- Kingdom: Plantae
- Subkingdom: Tracheophyta
- Division: Spermatophyta
- Class: Magnoliophyta
- Sub Class: Magnoliopsida
- Order: Lamiales
- Family: Acanthaceae
- Genus: Graptophyllum
- Species: Pictum.



Distribution: - The plant *graptophyllum pictum* is generally found in India, Papua New Guinea, Nicaragua, Panama, Costa Rica, Mexico, United States, Ghana, Bolivia, Ecuador, and grown as an ornamental plant in gardens.^[36]

Synonyms: - *Graptophyllum hortense*, *Graptophyllum picturatum* and *Marama picta*.^[43]

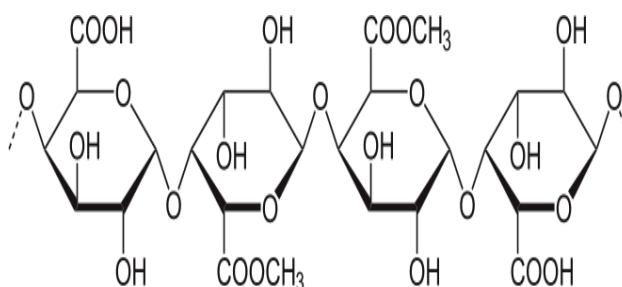
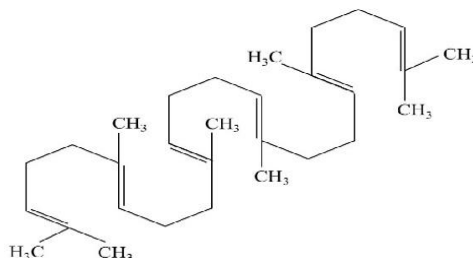
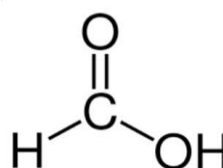
Common names:- *Graptophyllum pictum* commonly known as follows English: caricature plant, Joseph's coat, Café conleche; Konkani: Kala adulsa, Pandhara adulsa; Chinese: Man hua hua and Malay: Daun ungu.^[44]

Squalene**Stigmasterol****Vomifoliol**

Traditional uses: - Traditionally *G. pictum* is used as an emollient, resolvent, laxative, diuretic, and as well as anti-inflammatory. And also prescribed in the treatment of earache, sores, swellings, and wounds and in Indonesia it used to treat tonsillitis, abscess, and rheumatism. Herbarium Amboinense on the eastern and central Indonesian plants mentioned that it has been used to treat breast engorgement and breast abscess.^[33] Leaves and whole plant are used. Traditionally, plant is used in the treatment of reducing fertility constipation, rheumatism, hemorrhoid, urinary infections, scabies, maturing boil process, smoothing skin, hepatomegaly and ear diseases. It also has anti-fungal, anti-inflammatory, anti-plaque, laxative, anti-viral and anti-bacterial activities.^[44]

PHYTOCHEMISTRY

It contained following phytoconstituents are flavonoids (rutin, heperoside, and quercetin), steroid, glycoside, tannin, saponin, chlorophyll and nontoxic alkaloid. *G. pictum* contains alcohol, pectin, and formic acid. the essential oil content is not less than 0.4% and flavonoid (0.4%), vomifoliol, a triterpenoid compound, as a chemical marker. A report that *G. pictum* also contain compounds such as Hexadecanoic acid, ethyl ester; (2E) - 3,7,11,15-tetramethyl-2-hexadecem-1-ol; Pyridine-3-carboxamide, oxime, N- (2-trifluoromethylphenyl); 9-Tricosene; Squalene; Gamma. - Tocopherol, Stigmasterol; Beta-sitosterol; 2,5,9-cyclotetradecatrien-1-ol, 2,6,10- trimethyl-13- (1-methylethenyl).^[14,15]

**Pectin****Formic acid****Fig. Chemical constituents present in *Justicia picta*.**

PHARMACOLOGICAL ACTIVITY

1. Anti-inflammatory activity

Graptophyllum pictum have the parcels for the treatment of inflammation and it's proved by different inquiries and trials. *Graptophyllum pictum* splint ethanol excerpt wielded inhibition of edema convinced by carrageenan in hind paw's mice and this condiment also increased the vascular permeability convinced by acetic acid. This concluded that *G. pictum* wielded a seditious effect or the early exudative phase of inflammation^{[24],[20]} ethanol-uprooted cream of *G. pictum* shows an anti-inflammatory exertion to the white manly mice that had been convinced inflammation using carrageenan.^[25] and in another exploration the anti-inflammatory exertion of *graptophyllum pictum*. The anti-inflammatory and analgesic goods of ethanolic excerpt of leaves of *Justicia pecta* were estimated on carrageenan convinced edema in rats & acetic acid convinced vascular permeability as writhing symptom in mice. The excerpt was partitioned between ether and water, and also water-answerable bit was uprooted with 1- butanol. The 1- butanol-answerable bit was farther uprooted with chloroform- acetone, hot methanol and water consecutively. The water-answerable bit, 1- butanol bit and hot methanol bit were also delved for the same conditioning. The anti-inflammatory exertion was incompletely due to flavonoids present in the hot methanol bit.^[26]

2. Antibacterial activity

Many studies shows that *graptophyllum pictum* has antibacterial growth. The *graptophyllum pictum* extract exhibit antibacterial activity against some bacteria like *pseudomonas aeruginosa*, *staphylococcus aureus* and *streptococcus mutans* because *graptophyllum pictum* has various bioactive compounds Alkaloids, Flavonoids, saponins and tannins.^[33]

3. Antioxidant activity

G. pictum leaf extract it reduces nephrotoxicity induced by gentamicin via impending lipid peroxidation and ameliorating glutathione content and activity of enzymes in the liver and kidney. Healthy adult Wistar albino rats (150 to 250 g) aged 60 to 90 days received *G. pictum* ethanol extract at 300 mg/kg, 150 mg/kg, and 75 mg/kg along with gentamicin and the glutathione (GSH) and Glutathione S-transferases (GST) blood levels were significantly raised.^[27]

4. Anti-hemorrhoid activity

A recent study by Hutagalung on virile Wistar rats induced by 6 croton oil painting oil on the anus for 3 days to develop the hemorrhoid- suchlike condition. likewise, *G. pictum* extract was given orally to the rats at a cure of 100 mg/ kg on day 4 for 5 consecutive days. The result showed that the extract displayed the anti-hemorrhoid effect by abating anal edema measured by the rectoanal measure as well as the number of spare vessels leukocyte. The rats that were treated with *G. pictum* extract experience a less severe anal edema with a rectoanal measure that was significantly lower than

control group with values of 2.46 and 3.13 singly. also, the number of spare vessels leukocytes of the treatment group (900.14) was also significantly lower than the control group (1003.28).^[28]

5. Antifungal activity

-*graptophyllum pictum* have anti-fungal activity when 50% ethyl acetate fraction of the *Graptophyllum pictum* was the most active fraction with a 28 mm in diameter and with dilution test capable of showing MBC to 12.5% on *Candida albicans* ATCC 10231.^[29] A clinical trial was taken and in 10 patients with oral candidiasis demonstrated that we have seen that a decrease in hypha and spore of patients using 25% *Graptophyllum pictum* leaf mouthwash.^[31] and the 40% of ethanol extract of *Graptophyllum pictum* leaf we have seen that the number of growth of *Candida albicans* measured in 40 samples of acrylic resin denture.^[30] this is the further research topic for confirmation and according to another a research *graptophyllum pictum* have positive correlation between the antifungal effect with increasing concentration of *graptophyllum pictum* ethanol extract. And the ethanol extracts minimum concentration at 15% has anti-fungal effect to growth of *candida albicans*. And ethanol extract concentration of 35% is thought to have an equal effect with the antifungal ketoconazole.^[32]

6. Immunomodulator activity

- *Graptophyllum pictum* leaf ethanolic extract 2.5% showed phagocytosis activity to *Candida albicans* and the effect was more than Isoprinosine which is a synthesis immunomodulator drugs. *Graptophyllum pictum* leaf ethanol extract 3.125%, 6.25%, 12.5%, and 25% concentration showed a decrease of *Streptococcus mutans* adhesion to neutrophil isolate from healthy individuals in vitro. The higher concentrate of *Graptophyllum pictum* leaf ethanol extract demonstrated the smallest number of *Streptococcus mutans* adhered to neutrophil.^[33]

7. Wound healing activity

When Mice back that incised treated with 10% and 15% ethanol extract of *Graptophyllum pictum* leaf showed the healing of the wound from the dryness of wound, skin crusts, and release of skin crusts. A study on Wistar rat as reported by Prasetyo et al. revealed that ethanol extract of *G. pictum* at the dose of 100 mg/kg significantly attenuated anal ulcer by decreasing the total percentage of ulcer area, edema, leukocyte infiltration as well as malondialdehyde, and at the same time increased the superoxide dismutase as compared to the negative control.^[33]

8. Analgetic property

Pain is an unpleasant feeling. It is a signal in nervous system that something may be wrong in body. *Graptophyllum pictum* has the analgesic activity. In the vivo study of the analgesic effect of ethanol extract of *G. pictum* leaves in Swiss Webster female mice by the heat-induced method it showed that the extract at the doses of

100 mg and 200 mg/kg significantly increased the reaction time by the values of 4.62 and 5.15 seconds compared to negative control with the value of 3.59 seconds ($p < 0.05$).^[34] and β -sitosterol isolated from n-hexane fraction of *Graptophyllum pictum* leaves was given orally to male mice to investigate its analgesic activity in the writhing reflex model. The compound at the doses of 1 mg, 2 mg and 4 mg/20g was found to inhibit acetic acid-induced pain by the value of 51.2%, 64.7%, and 72.3% respectively. However, the analgesic activity of fractions was lower than aspirin as the positive control.^[35]

9. Anti-diabetic effect

-Diabetes is a condition in which blood glucose level is high and many plants are used to cure diabetes *graptophyllum pictum* have the excellent anti-diabetic effect. The anti-diabetic property of the aqueous extract of *G. pictum* leaf was evaluated on alloxan-induced diabetic Wistar rats. And after diabetic induction, the rats were divided into few groups. Groups 1 to 3 were administered 100, 150, and 200 mg/kg body weight extract orally by gastric probe for 4 weeks; and according to this article Group 4 was administered 10 mg/kg body weight metformin (which is an anti-diabetic drug), while Group 5 served as control which received distilled water. During the drug administration period, and using the Roche Accu-Chek Active Glucometer the fasting blood glucose level (FBGL) of the rats was checked before commencement of treatment and weekly. The anti-diabetic study showed a significant reduction ($P < 0.05$) in the mean FBGL in all the three groups of animals treated with aqueous extract of *G. pictum* leaf when compared to the control; and it exhibited effective anti-diabetic potency when compared with metformin.^[36]

10. Nephrotoxicity effect

Alcoholic extract of whole plant of *G. pictum* in albino male Wistar rats was determined by the serum creatinine and urea level as well as renal antioxidant status in rats after cisplatin administration at dose level of 12 mg/kg body weight. Ethanolic extract at dose level of 150 and 300 mg /kg was administered orally after cisplatin injection for 15 days. The ethanolic extract *graptophyllum pictum* significantly reduce the elevated serum creatinine and urea levels and renal antioxidant defense systems like superoxide dismutase, catalase, glutathione peroxidase, and reduced glutathione was restored to normal by treatment with the extract so ethanolic extract of *G. pictum* showed the preventive effect against the cisplatin induced nephrotoxicity in albino male Wistar rats.^[37]

11. Oxytocic and Anti-implantation Activities

-In vivo anti-implantation activities were evaluated using aqueous and ethanolic extract of leaves of *G. pictum*. The oxytocic effect was determined on the isolated strip of gravid rat uterus in mild pregnancy and it was compared with the activity of standard drug oxytocin. The *G.*

pictum ethanolic extract showed oxytocic activity while *G. pictum* aqueous extract was found to reduce the normal contraction of the uterine strip. Be potent and suppressed the normal contraction of uterine strip while the ethanolic extract exhibited agonistic effect which was rapid in onset. The anti-implantation activity was done using 8-week-old virgin female Sprague-Dawley albino rats (eight rats/ group) in three groups. Group I was administered 400 mg/kg of GPEE by oral route and the same dose of GPAE was similarly administered to another group while the vehicle of administration (distilled water) was similarly administered to the third group as control. All administrations started on day 1 of pregnancy and were given daily for 7 days. The rats were sacrificed on day 10 of pregnancy. The presence of fetus, implantation sites, and number of corporal lutea in the autopsied rats was recorded and used to calculate the percentage anti-implantation effect. The experimental results of GPEE, GPAE, and distilled water showed the percentage of anti-implantation value of 93.8 ± 9.1 , 16.8 ± 8.5 , and 3.9 ± 5.4 , respectively.^[38]

12. Effect on acrylic resin complete denture plaque growth

Ethanolic extract of *graptophyllum pictum* was assessed on the growth of denture plaque on acrylic resin complete denture this experiment carried out on different concentrations such as 5%, 10%, 20% and 40% of ethanolic extract of *graptophyllum pictum* and it results that the highest plaque growth inhibition in those soaked in 40% extract solution and the lowest inhibition were found in those soaked in 5% concentration solution.^[39]

13. Alkaline phosphatase activity against MC3T3E1 cells as a marker of osteoblast differentiation cells

Graptophyllum pictum has stimulative activity of leaves on alkaline phosphatase (ALP) of osteoblast cells. It investigated in n-hexane, ethyl acetate, n-butanol and water fractions of leaves of *Justicia picta*. The ethanolic extract of *G. pictum* at concentration 50 μ g/mL it showed 128% ALP stimulative activity whereas n-butanol and water fractions showed 112% and 122% against MC3T3E1 osteoblast cell at 10 and 50 μ g/mL respectively. The n-butanol and water fractions were found to be active fraction because they stimulated ALP activity.^[40]

14. Cytotoxic Activities of (*G. pictum*) Ethanolic Extract and its Fractions on Human Colon Cancer Cell WiDR

Graptophyllum pictum has a cytotoxic activity determined by ethanolic extract of *G. pictum* and to elucidate the compounds contained in most active extracts on human colon cancer WiDr cells. 70% ethanol and fractionated using n-hexane, chloroform, and ethyl acetate, respectively. The yield of extract obtained was 18.9%. The yield of hexane, chloroform, ethyl acetate, and ethanol water fractions were 1.07%, 2.93% 10.26%, and 84.82, respectively. Cytotoxic activity was assessed using MTT assay based on IC50 values. The IC50 value

of extract, hexane, chloroform, ethyl acetate, and ethanol water fractions were determined 1527,58; 143,97; 507,19; 3538,67; and 318660 µg/ml. The hexane fraction showed the highest cytotoxic activities due to the presence of terpenoids and phenolics.^[41]

CONCLUSION

From ancient time Plants have a glorious component for all the diseases but need to find out in correct way. Plants have an important role to achieve good health and this review on *justicia picta* shows many pharmacological activities such as anti-inflammatory, anti-bacterial, anti-oxidant, anti-hemorrhoid, anti-diabetic, analgesic, anti-fungal, wound healing properties, immunomodulators, cytotoxic activity and some traditionally use like anti-plaque, laxative, anti-viral etc. This review concludes update knowledge on *justicia picta* which chosen by current researches and article.

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