EJPMR, 2025, 12(12), 395-401 **Review Article** **Impact Factor: 8.158**

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL ACTIVITIES OF JUSTICIA PICTA

Mohd. Shuaev*, Dr. Rajesh Yadav, Nadeem Ahmad, Mohd Asif, Ramit Yadav, Saman Moin, Semshair Ali

Mohammad Ali Jauhar University Rampur Uttar Pradesh India.

***Corresponding Author: Mohd. Shuaev**

Mohammad Ali Jauhar University Rampur Uttar Pradesh India. **Email id:** shuaibalim9997@gmail.com

DOI: https://doi.org/10.5281/zenodo.19551772

How to cite this Article: Mohd. Shuaev*, Dr. Rajesh Yadav, Nadeem Ahmad, Mohd Asif, Ramit Yadav, Saman Moin, Semshair Ali (2025). A Review on Phytochemical and Pharmacological Activities of Justicia Picta. European Journal of Biomedical and Pharmaceutical Sciences, 12(12), 395–401.
This work is licensed under Creative Commons Attribution 4.0 International license.

Article Received on 05/11/2021 **Article Revised on 25/12/2025** **Article Published on 01/12/2025**

ABSTRACT

Graptophyllum pictum(L.) Griff., a shrubby stove plant, has been used traditionally to treat various diseases. This review summarizes the up-to-date data about its phytochemistry and pharmacological properties and provides a perspective and direction for future research. The phytochemical analysis of *G. pictum* revealed the presence of flavonoids, steroids, glycoside, tannins, saponin, chlorophyll, nontoxic alkaloid, and anthocyanin. Meanwhile, the pharmacological analysis revealed that this plant possessed various activities such as antimicrobial, immunomodulatory, antioxidant, anti-inflammation, anti-analgetic, wound healing, anti-hemorrhoid, anti-diabetic, and estrogenic effects. However, most of its pharmacological activities were based on the crude extracts and the bioactive compounds responsible for the bioactivities have not been well identified. A further detailed investigation in phytochemistry to identify the bioactive compounds and to investigate the mechanism action of its bioactivities is required. Moreover, a toxicology study is also needed to develop a standardized formulation of *G. pictum* preparation and to fulfill the requirements of modern phytomedicine.

KEYWORDS: *G. pictum*, Indonesia, Pharmacological, Activities, phytochemistry.

INTRODUCTION

From an ancient time, most of the population of the world are used to depends on natural herbs or plants Approximately 80% of the global population continues to rely on natural resources for the purpose of maintaining their health, as reported by the World Health Organization (WHO).,[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. The medicinal plant has a promising 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, also known as Justicia picta, is popularly referred to as the caricature plant, Waimea caricature plant, black adulsa (for the dark leaf variant), and white adulsa (for the variegated variation)., 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 justicia picta is decorative and experiences vigorous growth throughout the rainy season in tropical regions worldwide. [9] The plant justicia picta is distributed in the following countries; India, Papua New Guinea, Nicaragua, Panama, Costa Rica, Mexico, United States, Ghana, Bolivia, and Ecuador. It is also cultivated as an attractive plant in gardens.[10,11] G. pictum is pharmacologically utilized in addressing many health problems such as constipation, rheumatism, scabies, urinary infection, hemorrhoid, maturing boil process, swelling, smoothing skins wounds, hepatomegaly, ear disorders, 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 given topically on wounds at neck and oral cavity, and the later notably in stomatitis. the tannin has a physiological activity against bacterial growth. [16] and used as a detoxifying agent, tannin can precipitate protein and generate a particular molecule interacting with protein and saliva dissepiment [17] to limit the adhesion of Streptococcus mutans and decreasing it.[14] Alkaloid has a physiological function against bacterial growth. [12,18] Flavonoid is a phenol chemical, that can be soluble in water, and can be extracted by 70% ethanol. Flavonoid has an antiviral feature, antibacterial and anti-inflammation property. The general characteristic of phenolic compound is susceptible to improve cell permeability to build a complex compound with protein by hydrogen bond.[20] Graptophyllum pictum extract can prevent the growth of Streptococcus mutans bacterium.[19]

Description: - it is a cartoon plant tropical evergreen shrub. Foliage is Oval shaped, lustrous, variegated and leathery. It will develop to 6–9' tall. Leaves grow up to 3-4 inches long and bearing purple or red tubular blooms with protruding stamens. They bloom in July.[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 commonly found in India, Papua New Guinea, Nicaragua, Panama, Costa Rica, Mexico, United States, Ghana, Bolivia, Ecuador, and valued as an ornamental plant in gardens.[36]

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

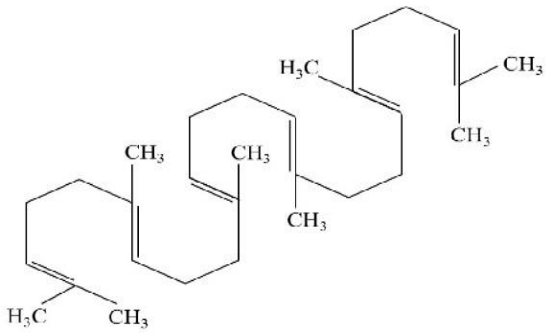
Common names: - graptophyllum pictum is commonly known as English: caricature plant, Joseph's coat, Café conleche; Konkani: Kala adulsa, Pandhara adulsa; Chinese: Man, hua hua and Malay: Daun ungu. [44]

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

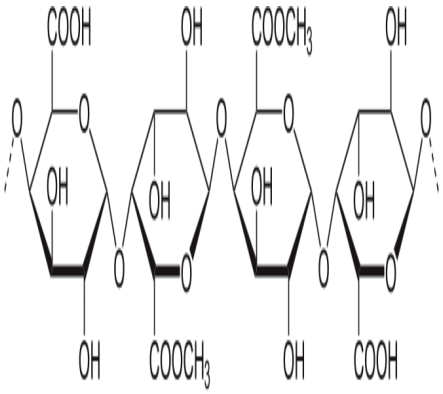
PHYTOCHEMISTRY

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

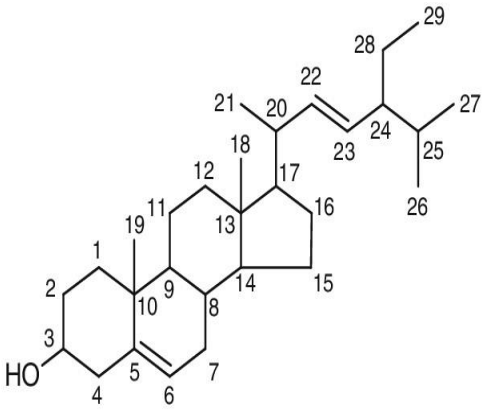




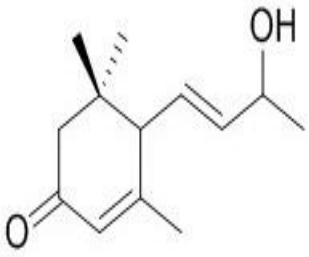
Squalene



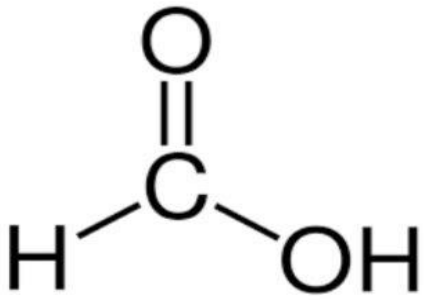
Stigmasterol



Pectin



Vomifoliol



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 picta 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 of2.46 and3.13 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. Analgesic activity

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 (p0.05). [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 substance at the doses of 1 mg, 2 mg and 4 mg/20g was reported to inhibit acetic acid-induced discomfort 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 of 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 activity

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 utilized to compute the % anti-implantation effect. The experimental findings 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 acryl resin on denture plague growth -

Ethanolic extract of graptophyllum pictum was examined 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 sign of osteoblast development cells: Graptophyllum pictum has the ability to mimic the effects of leaves on osteoblast cells' alkaline phosphatase (ALP). It was investigated in the water, n-hexane, ethyl acetate, and n-butanol fractions of Justicia picta leaves. At 50 µg/mL, the ethanolic extract of G. pictum shown 128% ALP simulative activity, whereas at 10 and 50 µg/mL, the n-butanol and water fractions demonstrated 112% and 122% against MC3T3E1 osteoblast cells, respectively. Because they increased ALP activity, the n-butanol and water fractions were demonstrated to be active fractions.[40]

14. Graptophyllum pictum ethanolic extract cytotoxic effect on human colon cancer cell WIDR- Graptophyllum pictum has a cytotoxic activity tested by ethanolic extract of G. pictum and to elucidate the components present 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 investigated using MTT test 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 demonstrated the highest cytotoxic activity due to the presence of terpenoids and phenolics.[41]

15. 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.

REFERENCES

1. Andiyani R, Yuniarni U, Mulyanti D. Uji Efektivitas Ekstrak Daun Wungu (Graptophyllum pictum (L.) Griff) Sebagai Penyembuh Luka. 2015.
2. Kalia AN. Textbook of industrial pharmacognosy. New Delhi, India: CBS Publishers and Distributors; 2009.
3. Shah B, Seth AK. Textbook of pharmacognosy and phytochemistry. New Delhi, India: Reed Elsevier India Pvt Ltd; 2010.

4. Rikomah SE, Elmitra AOM. Effectiveness Test of Anti-Inflammation of Ethanol-Extracted Cream of Graptophyllum pictum L. Griff on White Male Mice (Mus musculus).
5. Missouri Botanical Garden. Graptophyllum pictum. St. Louis, Missouri: Missouri Botanical Garden; 2014. Available from: http:// www.missouribotanicalgarden.org/plantfinder/plantfinderdetails. aspx?kempercode=a519. [Last accessed on 2014 Mar 31].
6. Quiros-Moran D. Guide to Afro-Cuban Herbalism. Authorhouse; 2009
7. Aulia Z, Khamid MN, Aninjaya MJSDK. Analisis kandungan flavonoid ekstrak etanol 70% simplisia daun ungu (graptophyllum pictum l griff.) Dengan metode kromatografi lapis tipis densitometri. 2018; 10(2): 81- 8.
8. Manoi F. Analisa fitokimia dan kandungan bahan aktif dari lima aksesi tanaman handeuleum (Graptophyllum pictum (L.) Griff). J Jurnal Penelitian Pertanian Terapan. 2011; 11(1)
9. Widyowati R. Alkaline phosphatase activity of Graptophyllum pictum and Sphilanthes acmella fractions against MC3T3-E1CELL as marker of osteoblast differentiation cells, Int. J. Pharm. Pharm. Sci., 2011; 3: 347.
10. Wikipedia. Graptophyllum pictum. USA: Wikipedia; 2014. Available from: http://www.en.wikipedia.org/wiki/justiciapicta. [Last accessed on 2014 Mar 31]
11. Hortipadia. Graptophyllum pictum; 2014. Available from: http://www. en.hortipedia.com/wiki/graptophyllum_pictum. [Last accessed on 2014 Mar 31]
12. Widyowati R. Alkaline phosphatase activity of Graptophyllum pictum and Sphilanthes acmella fractions against MC3T3-E1CELL as marker of osteoblast differentiation cells, Int. J. Pharm. Pharm. Sci., 2011; 3: 347.
13. Kasahara YS, Mangunkawatjia S. Medicinal Herb Index in Indonesia. Jakarta, Indonesia: P.T. Eisai; 1986: 318.
14. Wu Yuan CD, Chen CY, Wu RT. Gallotanins inhibit growth, water insoluble glucan synthesis, and aggregation of mutans Sreptococcoci. J. Dent. Res., 1988; 1: 51-5.
15. Dills SS, Olshan AM, Goldner S, Brogdon S. Comparison of the antimicrobial capability of an abrasive paste and chemical soak denture cleanser. J Prosthet. Dent., 1988; 60: 467-70.
16. Martin EW, Cook EF. Remingtons practice on pharmacy. 12th ed. New York: Mack Publishing Co; 1961; 67-9.
17. Pelczar MJ, Chan ECS. 1988. Dasar-dasar mikrobiology. Hadioetomo RS, dkk. Jakarta: Penerbit Universitas Indonesia; 1988: 456-8.
18. Pelczar MJ, Chan ECS. 1988. Dasar-dasar mikrobiology. Hadioetomo RS, dkk. Jakarta: Penerbit Universitas Indonesia; 1988: 456-8.
19. Wahyuningtyas E, Indrastuti M. Pengaruh ekstrak Graptophylum pictum terhadap pertumbuhan bakteri Streptococcus Mutans pada resin akrilik. Maj Ked Gigi (Dent J); Edisi Khusus Temu Ilmiah Nasional IV 2005: 298-301.
20. Harbone. Denture plaque distribution and the effectiveness of denture cleaner. Quintessence Int 1987; 27: 341-5.
21. Khandelwal KR. New Delhi: Nirali Prakashan; 2002. Practical pharmacognosy techniques and experiments.
22. Geneva: Office of the Publications, World Health Organization; Anonymous. Quality Control Methods for Medicinal Plant Materials, 1998; 8–46.
23. Raman N. New Delhi: New India Publishing Agency; Phytochemical Techniques, 2006; 19–24.
24. OZAKI Y, Sekita S, SOEDIGDO S, Harada M. Antiinflammatory effect of Graptophyllum pictum (L.) Griff. J Chemical pharmaceutical bulletin. 1989; 37(10): 2799-802.
25. Rikomah SE, Elmitra AOM. Effectiveness Test of Anti-Inflammation of Ethanol-Extracted Cream of Graptophyllum pictum L. Griff on White Male Mice (Mus musculus).
26. Ozaki YY, Sekita SS, Soedigdo SS, Harada MM. Antiinflammatory effect of Graptophylum pictum (L.) Griff. Chem Pharm Bull 1989; 37(10): 2799-802.
27. Srinivasan KK, Mathew JE, D'Silva KJA, Lobo R, Kumar N. Nephroprotective potential of Graptophyllum pictum against renal injury induced by gentamicin. J Iranian Journal of Basic Medical Sciences. 2015; 18(4): 412.
28. Hutagalung MSBJJoB, Research T. Phlebotrophic Effect of Graptophyllum Pictum (L.) Griff on Experimental Wistar Hemorrhoids. 2019; 5(1): 1-4.
29. Ayuningtyas M. UJI AKTIVITAS ANTIJAMUR FRAKSI n-HEKSAN, ETIL ASETAT DAN AIR DARI EKSTRAK ETANOLIK DAUN UNGU (Graptophyllum pictum (L.) Griff) TERHADAP Candida albicans ATCC 10231, Universitas Setia Budi Surakarta; 2017.
30. Wahyuningtyas E. Pengaruh ekstrak Graptophyllum pictum terhadap pertumbuhan candida albicans pada plat gigi tiruan resin akrilik. Journal of Dentistry Indonesia. 2008; 15(3): 187-191.
31. Wulandari B. Pengaruh Pemberian Perasan Daun Ungu (graptophyllum pictum (l) griff) terhadap Jumlah Hifa dan Spora Candida Albicans pada Penderita Oral Candidiasis dengan Faktor Predisposisi Stres. Skripsi Fakultas Kedokteran Universitas Jember. 2008.
32. Victoria Husadani Permata Sari, Sri Haryati, Sigit Setyawan Antifungal Test of Caricature Plant (Graptophyllum pictum [L.] Griff.) Ethanol Extract to The Growth of Candida albicans In Vitro. Vol 6, No 1 (2017).
33. Makkiyah F, Rahmi EP, Revina R, Susantinigsih T, Setyaningsih Y. Graptophyllum pictum (L.) Griff. (Syn: Justicia picta Linn.) and its Effectiveness: A

Well-Known Indonesian Plant. Pharmacog J. 2021; 13(3): 835-8.
34. Rakasiwi HL, Suhargo L, Sugiharto. The effect of Graptophyllum pictum (L.) Griff leaf extract on morphometry and calcium levels of ovariectomized mice femur. Paper presented at: AIP Conference Proceedings, 2019.
35. Hutagalung MSBJJoB, Research T. Phlebotrophic Effect of Graptophyllum Pictum (L.) Griff on Experimental Wistar Hemorrhoids. 2019; 5(1): 1-4.
36. Goswami M, Ojha A, Mehra M. A Narrative literature review on Phytopharmacology of a Caricature Plant: Graptophyllum pictum (L.) Griff. (Syn: Justicia picta Linn.). Asian Pac. J. Health Sci., 2021; 8(3): 44-47.
37. Srinivasan KK, Mathew JE, Joesph K, Vachala SD, Malini S. Effect of ethanol extract of Graptophyllum pictum (L.) Griff. on cisplatin induced nephrotoxicity in rats. Heba Pol 2011; 57: 52-65
38. Olagbende-Dada SO, Ukpo GE, Coker HA, Adesina SA. Oxytocic and anti-implantation activities of the leaf extract of Justicia picta (Linn) Griff. (Acanthaceae). Afr J Biotechnol 2009; 8: 5979-84.
39. Wahyuningtyas E. The Graptophylum pictum effect on acrylic resin complete denture plaque growth. Maj Ked Gigi (Dent J) 2005; 38(4): 201-4.
40. Retno W. Alkaline phosphatase activity of Graptophylum pictum and Sphilanthes cmella fractions against MC3T3 E1 cells as a marker of osteoblast differential cells. Int. J. Pharm. Sci., 2011; 3(1): 34-7.
41. Goswami M, Ojha A, Mehra M. A Narrative literature review on Phytopharmacology of a Caricature Plant: Graptophyllum pictum (L.) Griff. (Syn: Justicia picta Linn.). Asian Pac. J. Health Sci., 2021; 8(3): 44-47.
42. Discover Life. Graptophyllum pictum (L.) Griff. Justicia picta L. Caricature plant. Berkeley, USA: University of California; 2014. Available from: http://www.discoverlife.org/mp/20q?search=graptophyllum+pictum. [Last accessed on 2014 Mar 31].
43. Flora of Pakistan. Graptophyllum pictum. [Online] Available from: http://www.efloras.org/florataxon.aspx?flora_id=5&taxon_ id=250000002 [Accessed on 31st March, 2014]
44. Pradeep Singh1, Ratan Lal Khosa, Garima Mishra, Mohd Adil Tahseen. A phytopharmacological review on Justicia picta (Acanthaceae): A well-known tropical folklore medicinal plant 2015 by the Journal of Coastal Life Medicine.