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**Abstract** The demand for plant-based metabolites, pharmaceuticals, food supplements, cosmetics etc. keeps on increasing day by day. For that purpose, our quest for finding novel uses of plants is never ending. Among a large number of useful species of plants, some are generally overlooked, or underestimated. In this paper, such a species from the genus *Ageratum* of family Asteraceae is being discussed, which is claimed to have high therapeutic potential to treat various diseases, yet ignored largely as a weed. It is a multipurpose herb with many ethno-medicinal and pharmacological characteristics, with a long history of traditional medicinal use. Extract of young leaves is said to be effective against skin problems, and a study of the literature revealed many other pharmacological activities of this plant. The current review is an attempt to provide pharmacological and biological reports on *A. houstonianum*.

**Keywords:** *Ageratum houstonianum*, antimicrobial, medicinal plants, phytoconstituents

**Introduction**

Herbal drug practitioners have been engaged in using traditional or folk medicine from ancient times for treatment of various ailments like irritation, artery diseases, cancer as well as for their antimicrobial activities (Kumar *et al.* 2007). Herbal plants or their uses are less demonstrated and, therefore, scientifically inadequately assessed by the followers of modern medicine for their properties. Herbal medicine has been used extensively in many countries and has become part of primary health care as the herbal products are used to treat various skin conditions, skin irritation, burns, indigestion, infections, lesion, trims, ulcers and swellings. They are also effective as antibacterial, antifungal, antiviral, and antiprotozoal agents (Tennyson *et al.* 2011). In general terms, out of approximately 400,000 species of plants known to exist, bioactivity has been studied in only 6% and around 15% plant compounds have been examined. Phytochemicals are really very useful in protecting humans from various disorders. They generally have curative, protective, or disease preventive properties for the host (Kanase and Shaikh 2018). *Ageratum houstonianum* is herbaceous plant, often known as blue mink. It is very useful in curing fever, paste of leaves is useful in wound healing, essential oil shows cytotoxic effect (Hadidy *et al.* 2019), and it is also examined for antimicrobial and mosquitocidal effects (Tennyson *et al.* 2011). The screening of literature regarding biological assets of *A. houstonianum* revealed negligible data and seems almost silent on this aspect as very few reports are present on activity of this plant (Chandrekar *et al.* 2020). Oil of this plant is having insecticidal activity (Kurade *et al.* 2010). *A. houstonianum* is widely used as a fodder and to protect soil (Menut and Lamaty 1993). The essential oil has very strong smell and has been tested for different biological activities. Chemical constituents of *A. houstonianum* essential oil include: flavonoids, triterpenoids (Chandra *et al.* 1996), benzofuran derivatives and steroids (Menut and Lamaty 1993). This study is aimed to summarize pharmacological and biological activities of this valuable herb.
Taxonomical Information

The accepted name of the taxon is *Ageratum houstonianum* Mill (http://powo.science.kew.org/) with native range from Mexico to Central America. As per the same database, it has 19 synonyms. The genus *Ageratum* L. with around 40 species worldwide is included in family *Asteraceae* Bercht. & J. Presl.

Vernacular Names

Floss flower, Blue mink, Blueweed, Pussyfoot, Mexican paintbrush, Bluebilly goat weed. It is referred to as "Yerba de Zopilote" and "Flor de Garrapata" in Vera Cruz, its native habitat (Johnson, 1971). A few more regional names are being provided below:

<table>
<thead>
<tr>
<th>Language</th>
<th>Vernacular Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Floss flower, Mexican paintbrush</td>
</tr>
<tr>
<td>Nepali</td>
<td>Nigogandhe, Buko bon, Gundhejhaar</td>
</tr>
<tr>
<td>Malayalam</td>
<td>Michanga, Niloappa</td>
</tr>
<tr>
<td>Bengali</td>
<td>Nakful, Dochunty, Elamejhar</td>
</tr>
<tr>
<td>Kannada</td>
<td>Amanpathri</td>
</tr>
<tr>
<td>Arunachal Pradesh</td>
<td>Eehgaarh</td>
</tr>
</tbody>
</table>

Table 1: Showing Vernacular Names

Habitat and Distribution

In 1731, Vera Cruz was the first place from where *Ageratum houstonianum* was collected and placed in the tribe Eupatoriaceae, which is characterized by its tubular flowers. The family Asteraceae includes more than 1650 genera globally, which are distributed across tropical and subtropical regions. This species usually grows wild near habitation on fallow lands, along the sides of roads, in disrupting regions, and banks of the river in Mexico, Central America, the Caribbean, South and East Africa (Hadidy et al. 2019, Menut and Lamaty1993). It is present mainly up to 1300 m above sea level.

Botanical description

It is an annual, herb 30-70 cm in height. It emerges from Peru, Mexico, and Central America (Devkota and Sahu 2019). Stems glandular, densely hairy, usually purple to reddish, round. Leaves opposite, ovate to triangular, 2-7 cm long, margins serrated. Bluish-pink, homogamous flower heads or capitulate appear in umbellate clusters. Florets tubular with 5 sepals reduced to pappus. The brown to black 'seeds' (achenes) are topped with five whitish awn-tipped scales resembling short bristles or hairs, which are modified sepals (pappus). Seeds are dispersed with the help of air. According to a study by Lamsal et al. (2019) *A. houstonianum* plants are not drought tolerant and grow better in...
neutral to alkaline soil conditions.

**Cultivation and General Phenology**

**Flowering:** April-November;  
**Fruiting:** September-December

It is often grown for showy heads, as an ornamental, attracted by a number of butterflies and other insects. For cultivation (not much popular in India), the propagules are seeds, which can be sown from March to September. The preferred soil type is neutral to slightly alkaline, and the shady, moist areas are the habitats which promote its growth well. Being a tropical climate plant, it can flourish at a variety of temperatures. When in cultivation, the removal of dead flowering heads extends its flowering season.

**Cytology and Morphology**

In *A. houstonianum*, white flower plants have diploid number n=10, whereas tetraploid number (n=20) were reported in plants having blue flowers (Gill and Garg 2016). The cultivated varieties usually include tetraploids as well as hybrids.

**Differences between *A. houstonianum* and *A. conyzoides***

*A. houstonianum* is common in plains while *A. conyzoides* is naturally distributed in high altitude areas. *A. houstonianum* has a better invader strategy due to low LCC resulting in use of energy more effectively (Singh *et al.* 2011). (Table 1).

**Pyrrolizidine alkaloids**

*A. houstonianum* was found to inhibit the growth of nematodes. Some *Crotalaria* species are known to be used for inhibiting nematodes, because they produced pyrrolizidine alkaloids. But it is also to be noted that these alkaloids were commonly produced by *A. houstonianum*. Wiedenfeld and Cetto (2001) isolated four Pyrrolizidine alkaloids which were determined with the help of GC–MS and homo- as well as hetero-nuclear 2D NMR spectroscopy. They stated that only one was reported previously that belongs to retronecine-type O\(^{-}\)(-)viridiflorylretronecine while other three were characterised by them, which show retronecine-O\(^{-}\)and retronecine-O\(^{-}\)structure.

**Polymethoxy flavones and Benzofuran derivatives**

Quijano *et al.* (1982) collected aerial parts of *A. houstonianum*, its petroleum extract resulted in isolation of lucidin dimethyl ether, eupalestin, and agecoryn C that are already known but they demonstrate new flavones that are highly oxygenated, named as agehoustin A and B. According to them, it was the first report of these flavones. In Asteraceae family, the first octamethoxyflavone reported was Agehoustin A and the third compound reported from nature.Benzofuran derivatives isolated from *A. houstonianum* roots are of phytochemical and taxonomic interest due to their unusual pattern (Breuer *et al.* 1987).

### Table 2: Differences Between *A. houstonianum* and *A. conyzoides*

<table>
<thead>
<tr>
<th>S. No.</th>
<th><em>A. houstonianum</em></th>
<th><em>A. conyzoides</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Plants more vigorous and grows up to 60 cm in height</td>
<td>Plant less vigorous and grows not above 30 cm in height</td>
</tr>
<tr>
<td>2.</td>
<td>Branches more and dense, purple.</td>
<td>Branches few and sparse, green.</td>
</tr>
<tr>
<td>3.</td>
<td>Ovate to triangular leaves, simple and opposite</td>
<td>Egg-shaped leaves with the broad end at the base</td>
</tr>
<tr>
<td>4.</td>
<td>Leaf base is generally cordate to truncate</td>
<td>Leaf base is obtuse or broadly cuneate</td>
</tr>
<tr>
<td>5.</td>
<td>Numerous sticky hairs on the bracts</td>
<td>Few hairs on the bracts</td>
</tr>
<tr>
<td>6.</td>
<td>Diameter of capitulum up to 6 mm wide</td>
<td>Capitulate up to 4 mm wide</td>
</tr>
<tr>
<td>7.</td>
<td>Involucre bracts pubescent</td>
<td>Involucre bracts are less pubescent</td>
</tr>
</tbody>
</table>
Chromenes precocene I and II

Siebertz et al. (1990) separated plants into different organs (leaves, flowers, stems, and roots) to analyze the accumulation of precocene. The most prevalent amounts have been identified in leaves (12.45 µmol per plant) then in flowering heads (9.14 µmol per plant), followed by small concentration in stalks and roots (0.069-0.63 µmol per plant). Precocene I and II have been found to be present in highest concentration in involucral bracts and in receptacles (34 and 31.5 µmol g⁻¹ fresh weight respectively). Precocene aromatic ring biosynthesis was conducted by feeding stable isotopes and C-labeled compound, inhibitors of PAL, to the seedling of A. houstonianum. With this study, it was concluded that chromene is the biogenetic precursor of precocene II.

Table 3: Showing Phytoconstituents of A. houstonianum

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Class</th>
<th>Source</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agerarin</td>
<td></td>
<td>Plant extract</td>
<td>Shin et al., 2017</td>
</tr>
<tr>
<td>Precocene I, Precocene II</td>
<td>Chromenes</td>
<td>Plant extract</td>
<td>Lu et al., 2014, Kurade et al., 2010</td>
</tr>
<tr>
<td>2,2-dimethyl chromenes</td>
<td>Chromenes</td>
<td>Plant extract, Oil extract</td>
<td>Hadidy et al., 2019</td>
</tr>
<tr>
<td>β-caryophyllene</td>
<td>Sesquiterpenes</td>
<td>Plant extract, Oil extract</td>
<td>Lu et al., 2014</td>
</tr>
<tr>
<td>β-sesquiphellandrene</td>
<td>Sesquiterpenes</td>
<td>Leaves oil</td>
<td>Menut and Lamaty, 1993</td>
</tr>
<tr>
<td>3,7-Dimethyl-2,6-octadienyl acetate</td>
<td></td>
<td>Plant extract</td>
<td>Zeeshan et al., 2012</td>
</tr>
<tr>
<td>Ageratochrome (Precocene II)</td>
<td>Chromenes</td>
<td>Oil extract</td>
<td>Adebisi et al., 2019, Lu et al., 2014</td>
</tr>
<tr>
<td>Benzo furan derivatives</td>
<td></td>
<td>Roots</td>
<td>Breuer et al., 1987</td>
</tr>
<tr>
<td>α-Bisabolo</td>
<td></td>
<td>Leaves oil</td>
<td>Hadidy et al., 2019</td>
</tr>
<tr>
<td>Exoticin</td>
<td>Flavones</td>
<td>Aerial parts extract</td>
<td>Quijano et al., 1982</td>
</tr>
<tr>
<td>Geranial</td>
<td>Terpenes</td>
<td>leaves</td>
<td>Chandra et al., 1996</td>
</tr>
<tr>
<td>Camphene</td>
<td>Terpenes</td>
<td>leaves</td>
<td>Chandra et al., 1996</td>
</tr>
<tr>
<td>Myrcene</td>
<td>Terpenes</td>
<td>Leaves oil</td>
<td>Menut and Lamaty, 1993</td>
</tr>
</tbody>
</table>

Table 4: Showing Traditional Uses of A. houstonianum

<table>
<thead>
<tr>
<th>Countries</th>
<th>Used plant part</th>
<th>Plant properties</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>Whole plant</td>
<td>To clear away heat and toxic material</td>
<td>Devkota and Sahu, 2019</td>
</tr>
<tr>
<td>Central America</td>
<td>Whole plant</td>
<td>Used as an antiphlogistic to relieve swelling and throat pain</td>
<td>Devkota and Sahu, 2019</td>
</tr>
<tr>
<td>Nepal, Mexico, Southern America</td>
<td>Whole plant</td>
<td>Used as an ornamental plant</td>
<td>Sharma, 2020</td>
</tr>
<tr>
<td>India</td>
<td>Whole plant</td>
<td>Anti microbial, anti fungal, and mosquitocidal activity</td>
<td>Devkota and Sahu, 2019</td>
</tr>
<tr>
<td>Mexico, India</td>
<td>Aerial parts</td>
<td>Anti microbial, antibacterial, antioxidant, anti fungal, anti inflammatory, wound healing</td>
<td>Lu et al., 2014</td>
</tr>
<tr>
<td>Mexico</td>
<td>Aerial parts</td>
<td>Plant infusion is given in most of the stomach problems such as diarrhea, dysentery, and indigestion as well as rheumatism and fever</td>
<td>Hadidy et al., 2019</td>
</tr>
<tr>
<td>India</td>
<td>Aerial parts</td>
<td>The paste of the leaves is applied to the wound to stop bleeding and quick healing</td>
<td>Wangpan et al., 2019</td>
</tr>
<tr>
<td>India</td>
<td>Aerial parts</td>
<td>Treat skin infections and sore throat</td>
<td>Hadidy et al., 2019</td>
</tr>
<tr>
<td>India</td>
<td>Leaves extract</td>
<td>Treatment of diabetes</td>
<td>Sharma, 2020</td>
</tr>
<tr>
<td></td>
<td>Leaves extract</td>
<td>Treat conjunctivitis, ophthalmies, and skin problems</td>
<td>Adebisi et al., 2019</td>
</tr>
</tbody>
</table>
Ethnopharmacological Activities (Table 3)

a. Adulticidal activity and Antidiabetic activity
The absorption of the different levels of plant extract was recorded by the \( \alpha \)-amylase inhibition activity. The results demonstrate that extracts of plant found to be a potent \( \alpha \)-amylase enzyme inhibitor similar to standard acarbose. A dose dependent increase in \( \alpha \)-amylase inhibitory activity of plant extract is reported by Sharma (2020). Reddy et al. (2012) conducted an experiment in alloxane-induced diabetic rats and regular rats to monitor blood glucose levels at two doses 200 and 400 mg/kg. It was shown that hydro-alcoholic extract of A. houstonianum with 400 mg/kg was more impactful than 200 mg/kg in the treatment of diabetes as this dose was found to reduce blood glucose concentration between 2-4 hours.

b. Antimicrobial activity
Tennyson et al. (2011) studied the A. houstonianum leaf extracts to analyse the antimicrobial effect with different solvents (hexane, ethyl acetate and methanol) by disc diffusion method. Test organisms included Staphylococcus aureus, Pseudomonas aeruginosa, Vibrio fischeri, Klebsiella pneumoniae, Yersinia enterocolitica, and...
Erwinia amylovora, Salmonella typhi, Enterobactera aerogens, Proteus vulgaris and Candida albicans. The highest activity (19 mm) against P. aeruginosa was given by ethyl acetate extract followed by S. typhi (18 mm). P. aeruginosa was inhibited by all three extracts but E. aerogens was not inhibited by any of the solvent extracts.

c. Antioxidant and Antifungal activity

Hadidy et al. (2019) revealed potential cosmetic and medicinal uses of A. houstonianum. The herb is very useful source of naturally occurring antioxidants. The free radical scavenging action against radicals of DPPH and hydroxyl was assessed using methanolic leaf extracts, ethyl acetate and hexane. Ethyl acetate gave better results as compared to hexane and extract of methanol (Tennyson et al. 2012). If compared with the standard ascorbic acid IC₅₀ 5.38 µg/ml the plant showed mild antioxidant potential with IC₅₀ 123.67 µg/ml (Sharma, 2020). Devkota and Sahu (2019) have demonstrated high fungicidal potential of A. houstonianum against five strains Sclerotium rolfsii, Phytophthora capsici, Alternaria brassicae, Fusarium oxysporum and Botrytis cinerea. Highest antifungal activity had been shown by methanolic extracts against P. capsici, S. rolfsii, and F. oxysporum at various concentrations. At higher concentrations of about 150-250 mg/mL, the plant extracts might have better fungicidal properties as they were more efficient than the chemical fungicides.

d. Wound healing

Panicke et al. (2017) performed wound healing experiment on wistar rats with leaf extract of A. houstonianum by using methanol as a solvent. A. houstonianum treated group was recovered more quickly and the wound width was considerably reduced in comparison with control. Moreover, microscopic examination of rat's scar tissue showed reduction when medicated with 10% to 20% concentration of extract in a dose dependent manner. The reason behind this is the presence of antioxidant molecule i.e., flavonoids which scavenge free radicals and thereby contributing in wound healing property of the extract.

e. Oviposition deterrent activity

Tennyson et al. (2012) have shown the impact of A. houstonianum leaf extract against oviposition activity of Anopheles stephensi, Aedes aegypti, and Culex quinquefasciatus. They conducted site analysis, planning, ovitraps placement, field observation, and finally natural breeding monitoring at the study site. They concluded that A. houstonianum leaf extract has the potential of oviposition deterrent property that is observed in both field and laboratory results.

f. In vitro organogenesis

The combination of Auxin and IAA activates the root and shoot regeneration for A. houstonianum. Various concentrations of Kin and IAA (0.4-0.4, 1-1, 2-2, 4-4, 0.4, 1-0.4, 2-4, 4-2) (mg L⁻¹) were used in induction of callus shoot, root multiplication, and plantlet formation. At 2-4 (mg L⁻¹) concentration, the maximum results for root and shoot formation in epicotyl explants were observed. Shoot apical meristems were found to be responding best for regeneration of plantlets at 4-2 (mg L⁻¹) Kin-IAA combination (Mohammadi, 2017).

g. Heavy metal stress tolerant

Cadmium (Cd) is causing high toxicity as it is a heavy metal pollutant of the environment. Milusheva et al. (2019) performed experiments to examine the Cd stress physiological response, shown by ornamental A. houstonianum. The stress effect was assessed by examining different indicators like changes in height and width of the plant, diameter and length of roots, biomass, and the electrolyte discharge of micro plant. Visual observations, including delayed growth and necrosis, leaf chlorosis and root tip browning, withering and severe stress effect death were observed as symptoms of toxicity. The effects of Cd toxicity on the plant's development and explant height were more severe in young plants according to biometrical indices of in vitro cultivated A. houstonianum. In the presence of Cd up to 10 mg L⁻¹, the height of explants remained unaffected as compared to control (non-treated) (5x MPC). The height of 20-day-old explants was found to have decreased significantly. They claim that using in vitro models of ornamental plants is a reliable method for analysing and predicting yearly tolerance to Cd and other heavy metal.
Essential oil

In the plant essential oil, almost 35 components were identified. Precocene II (62.68%), Precocene I (13.21%), and β-caryophyllene (7.92%) were present in major amount. Oil and its constituents have better ability to develop insecticides and resist stored grain insects (Lu et al. 2014). According to Kurade et al. (2010), precocene-II (43.99%), precocene-I (23.34%), and β-caryophyllene (9.16%) were the main constituents. Flavonoids, triterpenoids, steroids and benzofuran derivatives were present (Chandra et al. 1996).

a. Antimicrobial activity

Agar well diffusion method was assessed for the antimicrobial effect of leaves and flowers essential oil of A. houstonianum (Hadidy et al. 2019). Both Gram positive and negative strains of bacteria including Staphylococcus aureus, Bacillus subtilis and Methylen resistence Staphylococcus aureus clinical isolate, Klebsiella pneumoniae, Salmonella typhimurium, and Escherichia coli were used. In comparison with Gentamycin, the flower oil sample was shown to be highly efficient against B. subtilis and S. aureus having 50% potency. The antibacterial effect of essential oils was observed and better results were shown against gram positive bacteria as compared to gram negative bacteria. They suggested that due to the presence of chromenes the essential oil of the flowers of A. houstonianum showed the antibacterial effect.

b. Acaricidal activity

Leaf essential oil of A. houstonianum containing foam soap shown the acaricidal properties against Rhipicephalus lunulatus. Four replications of different doses ranging from 0.00, 0.02, 0.025, and 0.03 ml/g were observed in vitro and 10 ticks were placed in each of the petriplate having different concentration with the foam soap on the bottom. Mortality rates observed in vitro vary from 0 to 50% when treated with control and when compared 95% with the lowest dose on 8th day and 100% on the 3rd day after treatment. The result indicates the high efficiency of this medicated oil soap as it is highly toxic to R. lunulatus (Pamo et al. 2004).

c. Repellent Activity and Contact Toxicity

Aerial part essential oil of A. houstonianum evaluated for booklice to commercial repellent dimethyl phthalate, at a concentration of 0.8 nL/cm² after 4 hours of exposure. Results showed that essential oil exhibited strong repellent activity. Furthermore, the essential oil bioactive constituents also showed contact cytotoxicity against L. bostrychophila with an LC₅₀ value of 50.8 μg/cm². Stronger acute toxicity was shown by Precocene II than precocene I (Lu et al. 2014).

d. Insecticidal activity

Fresh A. houstonianum aerial parts were extracted by steam distillation and characterized by GCMS analysis. Main compounds were precocene I and Precocene II and beta-caryophyllene. The isolated constituents were agetochrome and 1-heptadecene. Plutellaxylostella and Aphiscraccivora were used against essential oil, hexane/methanol fractions. Hexane fraction, essential oil, agetochrome and 1-heptadecene was toxic to P. xylostella larvae while against A. craccivora methanol fraction was effective. Essential oil showed repellent activity against P. xylostella (Adebisi et al. 2019).

e. Antifungal effect

Seven fungal species viz., Aspergillus flavus, A. fumigatus, A. niger, Candida albicans, Epidermophyton floccosum, Fusarium oxysporous, Trichophyton rubrum were isolated from infected human nails. There was co-dominance of Candida and Trichophyton and these were seen to be present in both sterilized as well as unsterilized infected nails. A. houstonianum essential oil was found as most potent toxicant as it inhibits the mycelial growth at 500 ppm against the test fungi. For both Candida albicans and Trichophyton rubrum the minimal inhibitory concentration was 400 ppm, and it was fungicidal at 500 ppm for both the test fungi (Kumar 2014).

f. Anticancerous activity

Hadidy et al. (2019) performed an experiment using three cancer cell lines HepG-2, HCT-116 and MCF-7 to assess cytotoxicity test on A. houstonianum essential oil. For leaves and flower oil sensitivity of human cancer cell was performed
with the help of MTT assay test. The principle behind the MTT assay depend on the fact that, a compound of yellow colour is converted into purple derivative i.e. formazan by viable cells. Flowers and leaves derived oil showed in vitro cytotoxicity against colon (HCT-116) carcinoma cell line with IC_{50} (11.1 %, 14.2 %) μg/ml sample, respectively. According to them, it may be due to the presence of β-caryophyllene as it is a major constituent in leaves derived oil and exerted significant cytotoxicity.

g. Anti-Dermatophytic activity

The oil was obtained from the leaves of *A. houstonianum* by hydro distillation method and the test was performed against two clinical dermatophytic isolates *Microsporum gypseum* and *Trichophyton mentagrophytes*. The potentization of griseofulvin's activity with essential oil has been assessed. For testing essential oil/griseofulvin were taken in the ratio 8:2 and 10:1 respectively. On guinea pigs (*Cavia porcellus*), oil dermal toxicity was assessed by using the Agar dilution method used for anti-dermatophytic tests. When compared with the control group, no diarrhoea, change in treated skin, and appearance of fur was observed by the workers. On the contrary, with the increase in the dose concentration, noise sensitivity, pinch reaction, locomotion and reactivity decreased. The LD_{50} was 5g kg-1 body weight. These results suggested that *A. houstonianum* leaves oil when used topically may not be toxic and having anti-dermatophytic compounds (Njatenge *et al.* 2010).

Conclusion

*A. houstonianum* is very useful in pathogenic infection treatment. The research has shown that *A. houstonianum* have antioxidant, analgesic, antimicrobial, mosquitocidal, insecticidal, wound healing, and antifungal activity. The chemical constituents such as phenolic acids, flavonoids, phenolic compounds, and some other active compounds are responsible for these activities. A literature review found that *A. houstonianumis* rightly recognised as a useful natural herbal plant.

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References


Kumar B, Vijayakumar M, Govindarajan R and Pushpangadan P 2007 Ethnopharmacological
approaches to wound healing-exploring medicinal plants of India. *Journal of Ethnopharmacology* **114** 103-113.


Wangpan T, Tasar J, Taka T, Giba J, Tesia P and Tangian S 2019 Traditional use of plants as medicine and poison by Tagin and Galo tribe of
