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Phytochemical Screening and Potential Uses Of *Acmella ulignosa* Flowers for Treatment of Mouth Ulcers

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Abstract: -

Mouth ulcers are a common, painful condition that can have a detrimental effect on one's quality of life. The creation of novel treatments derived from natural sources, such as plant extracts and phytochemicals, is gaining popularity. One such plant that has shown promise for therapeutic effects but has not received enough attention is *Acmella ulignosa*. The current status of research on *Acmella ulignosa* is outlined in this review, along with an assessment of the plant's potential for use as an integrative medicine to treat mouth ulcers. The goal of future studies should be to clarify the pharmacological processes by which products derived from *Acmella ulignosa* provide anti-mouth ulcer therapeutic benefits. In summary, *Acmella ulignosa* exhibits early promise as a novel therapeutic agent for a prevalent chronic illness that requires enhanced integrative medical solutions with negligible side effects.

Key words: Mouth ulcer, *Acmella ulignosa*, Extraction, TLC, Photoluminance study.

Introduction:

A mouth ulcer, also referred to as an oral ulcer or a mucosal ulcer, is a sore on the mucous membrane of the oral cavity. Painful, circular or oval-shaped sores or ulcers can appear in the mouth, usually on the inside of the lips or cheeks. Numerous conditions, each with a distinct mode of action, can cause mouth ulcers. Nevertheless, these ulcers typically have no significant underlying cause. Mouth ulcers can be caused by a wide range of things, such as poor dental hygiene, infections, stress, constipation, mechanical injuries, food allergies, hormone imbalances, skin issues, and dietary deficiencies like iron and vitamins B12 and C.

Because it can make it uncomfortable to eat, drink, and brush your teeth while they are present, mouth ulcers are also frequently referred to as aphthous ulcers.(1)

Mouth ulcers can be categorized as minor, major, or herpetiform based on their size and quantity.

• Minor ulcers These typically go away in 10 to 2 weeks and have a diameter of 2-8 millimeters.
• Major ulcers: These have a raised or uneven border and are typically deeper and larger. This kind of ulcer may leave a scar in the mouth and take many weeks to heal.

• Herpetiform ulcers: A cluster of several tiny lesions, roughly the size of pinheads, make up this form of ulcer. (2)

Causes:

• Stress: Because emotional stress weakens the immune system, mouth ulcers are more likely to develop.

• Minor Trauma: Dental work, excessive brushing, or inadvertent biting can all result in ulcers.

• Diet: For certain people, eating acidic or spicy meals might result in mouth ulcers.

• Viral Infections: Ulcerations can result from viral infections such as the herpes simplex virus.

• Hormonal Changes: Fluctuations in hormones, such those that occur during menstruation, may be a factor in ulcer development. (3)

• Underlying Health Conditions: Crohn's disease and other inflammatory bowel disorders are occasionally linked to ulcers.

Plant profile:

Acmella ulignosa:

Common Name: Toothache plant, paracress, jambu, electric daisy and locally it is known as karkara.

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Asterales

Family: Compositae

Genus: Acmella

Species: uliginosa

Characteristics:

➢ Growth Habit: Acmella uliginosa is a small, herbaceous annual plant.

➢ Height: It typically reaches a height of 15-30 cm (6-12 inches).

➢ Leaves: The leaves of Acmella uliginosa are green, lance-shaped, and covered with fine hairs. They can have a slightly succulent texture.

➢ Flowers: The plant produces distinctive, small, yellow flowers with a dark center. The flower heads are held on slender stems.

➢ Flowering Season: Acmella uliginosa blooms in the summer and early autumn.(18)

Cultivation:

• Acmella uliginosa can be grown in well-draining soil with good sunlight exposure. It prefers a warm and tropical climate.

• The plant can be propagated from seeds, and it is relatively easy to grow in gardens or as a potted plant.

• It requires regular watering and should be protected from frost.(19)

Phytogeography:

A small hairy herbaceous perennial in the Asteraceae family, known by its trade name "Akarkara" in India. The Arabian native plant is primarily found in North Africa, the Mediterranean region, the Himalayas, Spain, and India, where it can be found in the northern regions, along the Himalaya, in Bengal, and in Jammu and Kashmir.

According to Akarkara, an aphrodisiac medication has several applications in Unani and Ayurvedic medicine. Kenya, Tanzania, and Australia are the top producers of pyrethrum extract.(20)

Chemical composition:

The presence of alkaloids, reducing compounds, and cathechic tannins will be discovered through phytochemical screening of the roots, leaves, and flowers. In addition, the plant has trace amounts of Zn, Fe, Cu, Cd, Cr, Ni, and Pb as well as other chemicals like gallic tannins, triterpenes, sterols, mucilage, coumarins, saccharides', and holosids. Compared to leaves and roots, flowers have the highest concentrations of flavonoids, total phenol, and polyphenols. While the aerial parts are rich in flavonoids and tannins, the roots are rich in alkaloids. The root contains gum, inulin, lignin, several salts, a brown, acrid resin, and a trace amount of tannic acid. The plant's roots have aphrodisiac properties because they contain bioactive N-alkylamide compounds.(21)

Culinary and Medicinal Uses:

The most remarkable feature of Acmella uliginosa is its numbing or tingling effect on the mouth. When consumed, it can cause a temporary tingling or electric sensation on the tongue and gums.

This unique sensation makes it a popular ingredient in culinary dishes and cocktails. It is often used as a flavoring agent in various dishes, such as salads, seafood, and cocktails. Acmella uliginosa is also used in traditional medicine in some regions.

It is believed to have potential medicinal properties, including anti-inflammatory and analgesic effects. It has been used to relieve toothaches and other oral discomforts. Additionally, Acmella uliginosa has gained attention in the field of modern medicine for its potential applications in topical pain relief and as an ingredient in oral care products.(21)

Cautions:

While Acmella uliginosa is generally considered safe for culinary use, the tingling sensation it produces can be intense for some individuals. It is recommended to use it in small quantities to avoid overwhelming the taste buds.

Acmella uliginosa is a unique and fascinating plant, known for both its culinary and potential medicinal applications, as well as its distinctive mouth-numbing properties. It has gained popularity as a novel ingredient in various dishes and beverages, particularly in fusion cuisine and mixology

Materials and Methods:

ETHNOMEDICINAL STUDIES:

To gather information about *Acmella ulignosa*medicinal applications, a questionnaire was created. Respondents over 450 were selected at random, with no consideration given to their sex, occupation, or educational background. To help the respondents communicate more effectively, the interviews were ideally conducted at a time and in a language they could understand.(11)

PLANT MATERIAL

Collection, Authentication and Preservation of Sample

The plant specimen was gathered at Kot, Bilaspur, Himachal Pradesh in its natural setting.

The plant specimen was authenticated by Dr. Pankaj Sharma, Sr. Scientific Professional Himachal Pradesh State Biodiversity Board, Shimla, Himachal Pradesh Letter no.- HPSBB/272.

MACROSCOPIC STUDY

Morphological characteristics:

Morphological characteristics of bark of *Acmella ulignosa*such as shape, texture, colour and peeling sections were studied as per visual observations and verified with standard taxonomical books.

Organoleptic study:

Organoleptic properties such as odour, taste and touch were visually and sensory observed. The collected data was precisely recorded and documented. (12)

PREPARATION OF PLANT EXTRACT

In order to compare effectiveness of extraction methods, the Phyto-constituents of the plant's leaves and roots were extracted using Soxhlet extraction techniques.(13,14)

Extraction:

Soxhlet Extraction

The powdered plant material was extracted with methanol using the Soxhlet extraction method. Ten grams of plant powder were extracted at 60 degrees using 250 milliliters of ethanol in a round-bottom flask. The mixture was extracted until all of its color was gone, which could have taken up to one full day. (15)

The extract was allowed to evaporate at room temperature until it had reduced to one-third of its original volume. The extracts were kept in vials and chilled to 40 degrees Celsius.(16)

PHOTOLUMINESCENCE STUDIES

Under visible and ultraviolet light, the fluorescence of a powdered plant material with different chemical reagents and extracts was observed.

PHYTOCHEMICAL SCREENING

Using coloration and precipitation reaction techniques, phytochemical screening for aqueous and methanolic extract was investigated for a variety of phytochemicals, including alkaloids, flavonoids, carbohydrates, tannins, terpenoids, steroids, reducing sugars, saponins, and glycosides. (17,18)

THIN LAYER CHROMATOGRAPHY

Preparation of Stationary Phase

The sample was applied to TLC-Precoated Plates that had silica gel G F254 (a fluorescent indicator) on them, one centimeter above the baseline.

Development of Chromatographic Chamber

A glass container with a water and methanol (1:1) solvent system was used to create the chromatographic chamber. To eliminate the edge effect, this chromatographic chamber was pre-saturated.

Development of Chromatogram

The stationary plate containing the sample was put into the pre-saturated chromatographic chamber so that the solvent or mobile phase was below the sample application spot. The sample was eluted through the TLC plate by the capillary action mechanism.(19)

Scanning and detection of the spots

The TLC plates were left to air dry. Using a UV chamber exposed to UV-visible radiation, including both near- and far-UV radiation, the spots were scanned and found. We computed the Rf value of spots using the following formula:

$$R_f = \frac{Distance\ \ travelled\ by\ spot\ from\ origin}{Distance\ travelled\ by\ solvent\ front}$$

All values were recorded precisely and documented. (20,21)

RESULTS AND DISCUSSION

MACROSCOPY STUDY

Morphological characteristics:

The leaves of *Acmella uliginosa* are green, lance-shaped, and covered with fine hairs. They can have a slightly succulent texture. The plant produces distinctive, small, yellow flowers with a dark center. The flower heads are held on slender stems.

Organoleptic study:

Table1: Organoleptic properties of *Acmella ulignosa* flowers are:

Parameter	Observations
Touch/Texture	Slightly Granulated
Colour	Yellow
Taste	Bitter
Odour	Sweet Flowery

PHOTOLUMINESCENCE STUDY

Under visible and ultraviolet light, the fluorescence of a powdered plant material with different chemical reagents and extracts was observed. The following is a list of the results obtained:

Table 2: Fluorescence characteristics of *Acmella ulignosa* Flowers:

Sr. No.	Treatment	Visible light	UV Light 254nm (Shorter Wavelength)	UV Light 365nm (Long Wavelength)
1.	Leaves Powder	Yellow	Reddish-Brown	Dark purple
2.	Leaves Powder + 1N NaOH	Yellowish-Green	Blood Red	Greenish-Black
3.	Leaves Powder + 1N HCl	Pale Yellow	Green	Greenish-brown
4.	Leaves Powder + 1N H2SO4	Pale Yellow	Green	Dark brown
5.	Methanolic extract	Greenish yellow	Light Brown	Black

PHYTOCHEMICAL SCREENING

Various phytochemical tests were performed by using coloration and precipitation reactions.

The obtained results are as follow:

Table3: Qualitative analysis of *Acmella ulignos*a leaves in methanol.

Sr No.	Phytochemicals	Phytochemical Test	Methanolic Extract
1.	Alkaloids		
		Mayer's test	+
		Dragendorff's test	+
		Wagner's test	+
2.	Flavonoids		
		Lead acetate test	+
		Alkaline reagent test	+
3.	Terpenoids		
		Salkowski's test	-
4.	Saponins		
		Froth test	+
5.	Tannins		
		Ferric chloride test	+
		Gelatin test	+
		Borntrager's test	-

6.	Reducing Sugars	Fehling's test Benedict's test	+ +
7.	Steroids	Salkowski's test	+
8.	Glycosides	Legal's test	+
9.	Carbohydrates	Molisch's test	+

+ = Present, - = Absent

Thin Layer Chromatography

Using methanol:distilled water (1:1) (MeOH: DW) as the mobile phase, qualitative chromatography of methanol and distilled water extract was performed. Under 254 nm Ultra-Violet radiation, a total of 5 spots were found in the chromatogram of the methanolic extract and 3 spots in the extract made from distilled water.

Table4: Rf value calculation in thin layer chromatography of *Acmella ulignosa* flowers under 254nm.

Extract	Mobile Phase	Total run(cm)	Number of spots	Distance of Solvent front from origin	Distance of spot from origin (Sample application site)	Rf value
Methanolic extract	MeOH + DW (1:1)	3	3	7	2.2 3.1 5.2	0.314 0.442 0.74
Distilled water extract	MeOH + DW (1:1)	3	4	7	1.4 2.5 4.2 6.2	0.2 0.35 0.6 0.88

CONCLUSION:

The initial research indicates that *Acmella ulignosa* flowers contain a wide range of bioactive substances that may have pharmacological implications. In conclusion, the preliminary phytochemical screening, Photoluminance study, and TLC analysis of leaf extracts from *Acmella ulignosa* reveal a rich diversity of bioactive compounds with potential medicinal and industrial applications. *Acmella ulignosa* flowers have the potential to be medicinal due to the presence of numerous phytochemicals, which calls for more research into their pharmacological characteristics. The Photoluminance study also *Acmella ulignosa* possible use in

optoelectronic applications. *Acmella ulignosa* continues to reveal its significance in both traditional and modern scientific contexts through careful examination and exploration of its contents, opening up new possibilities for future research and development in the fields of nutraceuticals, pharmaceuticals, and beyond.

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