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Original Article

A Systemic Review on Calanthe Trulliformis

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ABSTRACT

Calanthe species is a Tujia ethnic herb, which has traditionally been used to treat gastric ulcers, chronic hepatitis, etc. We explored the chemical constitutes, gastroprotective effects, and the active fraction of C. species , as well as elucidating the underlying mechanisms. Firstly, four in vitro antioxidant tests were applied to determine the oxidation resistance of C. species methanol extract and its fractions. The gastroprotective effects were evaluated in ethanol-induced gastric ulcer rats, gastric histopathology was visualized by H&E staining, and the acidity of gastric juice was measured by titrating with NaOH solution. The contents of malondialdehyde, catalase, superoxide dismutase, gastroinstetinal, and the activity of H+K+-ATPase were estimated using commercial kits. For the first time, all of these compounds were extracted from C. Species . The findings showed that CsEF is a promising source of gastroprotective agents; the underlying mechanism of action was found to be the antioxidant activity of this herb, along with the prevention of gastrin secretion and inhibition of H+K+-ATPase.

Keywords: Medicinal plant, Therapeutic drug ,Secondary metabolites ,Calanthe species

INTRODUCTION

Calanthe species exist in the family Orchidaceous, the genus Calanthe contains over 220 species of orchids, which are usually referred to as Christmas orchids [1] These terrestrial evergreen or deciduous plants have big corrugated leaves, short oval pseudo bulbs, robust roots, and upright, occasionally arching flowering stems. Typically, the labellum has spreading lobes, and the sepals and petals are slender and comparable in size. Orchids in the genus Calanthe are terrestrial with small, crowded pseudobulbs with thick roots and a few corrugated or wrinkled leaves with the base tapering to a petiole -like stalk. Some species are evergreen while others are deciduous. The flowers are delicate but showy, white, pink, yellow or orange and crowded near the end of an erect, sometimes arching flowering stem. The sepals and petals are relatively narrow, similar in size and spread widely. The labellum has three or four spreading lobes and, in most species, there is a spur at the base. Unlike similar orchids, the labellum of Calanthe orchids is fused to the column. [2,3,4,5,6]

Figure 1. Calanthe trulliformis (orchid)

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Geographical Distribution of Calanthe trulliformis

All tropical regions, with a primary concentration in Southeast Asia. Certain species also inhabit subtropical regions like Himachal Pradesh, Sikkim, China, India, Madagascar, Australia, Mexico, Central America, the West Indies, and numerous islands in the Pacific and Indian Oceans. [7]

Classification of Calanthe trulliformis

Kingdom: - Plantae
Phylum: - Streptophyta
Class: - Equisetopsida
Subclass: - Magnoliidae
Order: - Asparagales
Family: - Orchidacae
Genus: - Calanthe
Species: - Calanthe trulliformis
Common Name: - The Trulliform Calanthe [denotes the Scoop-Shaped lip]
Blossom Diameter 1" [2.5 cm]
Flowering: - June and July. [8]

Morphology: - Located in eastern Nepal, Bhutan, India, Sikkim (District of Darjeeling) and Myanmar on shady forest floors at altitudes of 1830 to 2400 meters, this small to medium- sized, cool to cold-growing terrestrial features cylindrical pseudo bulbs that support 3 to 4 linear-lanceolate, acute, sessile-bases leaves. It flowers from spring to summer on an erect, puberulous peduncle measuring up to 9.2" [23 cm] long, with an overall height reaching 16" [40 cm], producing a loosely arranged inflorescence of 14 to 18 flowers, adorned with linear- lanceolate floral bracts that are either longer than or equal to the ovary. [8]

The Plant

Earth based very tiny pseudo bulbs that are oblong to cylindrical and less than 1.5 cm long with several robust, lengthy roots. Short pseudo- stem, around 2cm in length. There are for to five narrow, linear lanceolate, sharp , erect, and diagonally arching leaves that are sessile , clearly veined, and measure 7-12 cm in length and 1.5- 2cm in breadth . An erect, broad lanceolate bract surrounds the middle of the peduncle, which has flowers grouped laxly at the top quarter. The blooms are longer than the leaves and emerge from the inside of the outer leaf. [9]

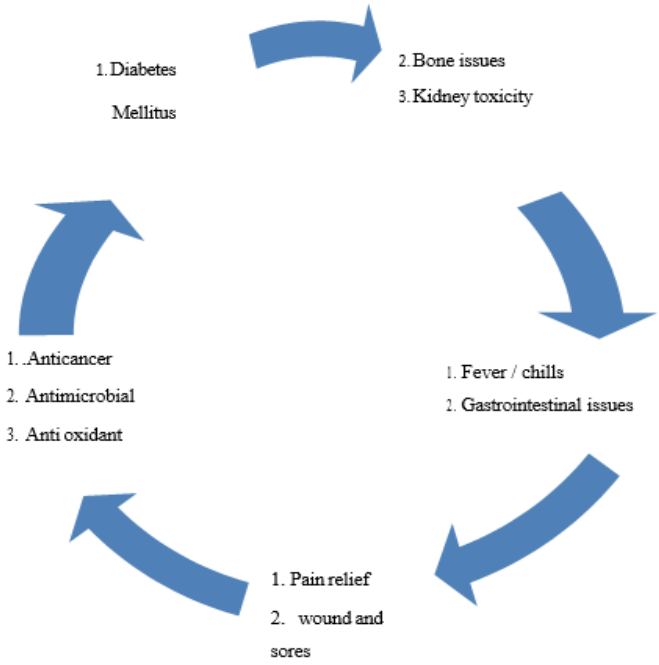
The flowers and Leaves

Flowers are upright and 1.5 to 3 cm wide. Lateral spreading, dorsal erect, surface and margins irregularly curved, three veined, sub-equal, lanceolate, and greatly narrower towards the apex. One veined, lanceolate, spreading, with irregularly curved surfaces and borders, the petals are narrower than the sepals. [9] The lip's trowel shape has a few irregular rounded lobes at its edges, is significantly narrower at its apex, and is adnate with the column at the base. The disc is puberulous at the apex, with two lamellae running parallel to two-thirds of its length and convergent from its base. The mouth has a triangular opening, and small hairs cover the inside of it. Short, cylindrical spur that is minutely puberulosus and has a rounded apex. [9] Parallel to its veins are sepals with long, variable-sized purple brown edges that are wider at the base and becoming smaller and vanish at the apex. While the purplish brown borders are broken or uneven in length, the petals are identical to the sepals. [9] Lip creamy white, with pink edges at the base; the internal base of the convergent lamellae is pink as well. The spur's entrance is covered with tiny, white hairs. Spur: transparent, milky white. dark green floral bracts. There are a few darker veins on the green exterior of the petals and sepals. [9]

The Pursuit

Although it is rarely discovered or recorded in its natural settings, this Calanthe is another stunning one in the area. "Mahaldaram Peak" was listed by the writers as the species' habitat in their epic book. To far, no researchers have been able to find it in the area in its natural environment, even with that reference. With my alpine area flower quest in 2012, I had the opportunity to travel to several of the region's heavily forested hills and slopes during the monsoon season. In general, most calanthes bloom during the monsoon season. I therefore made it my mission to find this species as well. [10]

Traditional Medicinal uses of Calanthe trulliformis



Diabetes Mellitus

High Blood glucose, endocrinology, and lipid metabolic disorders are the hall marks of diabetes mellitus, a complex metabolic disease. [15] The primary pathophysiology of diabetes is insulin insensitivity hypoperipheral tissue and insufficient insulin secretion. [16] According to the world health organization, between 221 million and 300 million people worldwide will have diabetes between 2015 to 2025. [17] Diabetes is now the rise. Long term hyperglycemia may cause numerous issues that harm the kidneys, eyes, nerves and arteries, according to the clinical and experimental research, although the exact process is yet known. [18] Insulin injection and oral hypoglycemic medications are currently the primary methods used to manage hyperglycemia and lower the risk of complications from diabetes.[19] Despite the fact that there are numerous oral anti-diabetic medications available in clinics, including gliclazide , biguanides and sulfonyl ureas, concerns are being raised about the medications negative effects and potential for subsequent failure.[20] As a result , researchers focus on finding novel therapeutic possibilities from natural chemicals that have minimal adverse effects . Traditional Chinese medicine has a long history of being used to treat diabetes, particularly its complications. Diabetes has historically been treated using an estimated 1000 different types of medicinal herbs. [21] The orchidaceae family includes Calanthe trulliformis.C. trulliformis is utilized as a Tujia ethnic medicine for a variety of conditions, including detoxification, sore throats, gastric ulcers, chronic hepatitis, dispersing stasis, and increases blood circulation. Studies on the cultivation, breeding and ornamental value of plants in the Calanthe genus have been published thus far. [22] [23] [24] However the pharmacological characterstics and chemical components of C. trulliformis have not been thoroughly studied by many researchers. This study examined the antidiabetic effect C. trulliformis and its fractions in OGTT mice and STZ diabetes mice. Additionally, the activity of C. trulliformis on intestinal alpha-glucoside, hepatic glucogen, and normal blood glucose in normo glycocemic mice was assessed in an effort to investigate the first mechanism of Anti-biotic action. Additionally, GC-MS method were used to illustrate the fingerprints of the primary chemical components of C. trulliformis. The orchidaceae family includes the 20-50 cm tall terrestrial plant Calanthe trulliformis. As a Tujia ethnic medicine, C. trulliformis is used to treat pharyngitis, chronic hepatitis, stomach ulcer, and scattering stasis. [23] However, there is currently little research on the pharmacological characteristics and chemical components of this ethnic herb. It has recently been discovered that C. Trulliformis extracts have antibacterial activity against Staphylococcus aureus, beta-hemolytic streptococcus, and Shigella dysenteriae. [24] In the past, we discovered that C. Trulliformis methanol extract could prevent blood

glucose increase and showed hepatoprotective effects in diabetic mice. [25] However, it is still unknown what chemical components make up C. Trulliformis. Furthermore, it is yet unknown what molecular pathways underlie the traditional use of the ethnic plant, particularly in the treatment of stomach ulcers. In this investigation, ethanol-induced experimental rats were used to test the gastro protective properties of the chemical components of C. trulliformis and its fractions. According to the study, C. trulliformis and its fractions—of which the EtOAc fraction was the active component could considerably reduce the harm that absolute ethanol caused to stomach tissues. 22 compounds were identified and purified from the EtOAc fraction using various spectroscopic and chromatographic techniques. The primary chemical components of C. Trulliformis, its protective effects on stomach ulcers in vivo, and potential molecular processes are discussed in this research. [25]

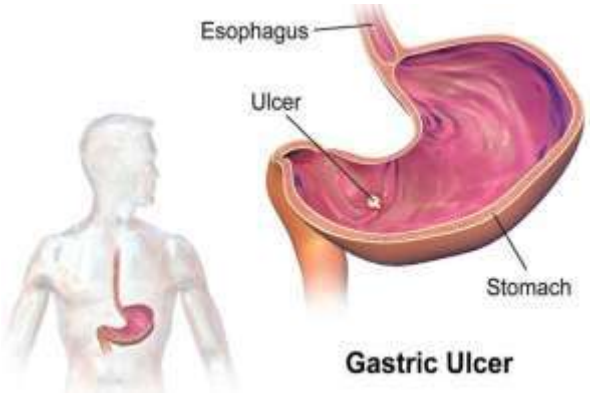


Figure 3: - Gastric ulcer

Antimicrobial Activity

In various regions of the world, orchids are used to cure a variety of illnesses, including skin conditions, infectious disorders, issues with the digestive, respiratory, and reproductive systems, blood circulation issues, tumours, pain relief, an decreasing fever, for example [26,27,28]. Understanding various ethno pharmacological studies and connecting traditional knowledge of medicinal orchids to contemporary research endeavours offers a novel, trustworthy method that significantly increases the likelihood of medication discovery compared to random collection. [28] The genera Calanthe, Coelogyne, Cymbidium, Cypipedium, Dendrobium, Ephemerantha, Eria, Galeola, Gastrodia, and Gymnadenia comprise the majority of the medicinal orchids. Nevilia, Thunia, Luisia, Ludisia, and Habenaria. [29] Papilionanthe teres, Dendrobium fimbriatum Eulophia compestris, Eria musicucola Nepalese Satyrium, Orchis latifolia, Laparis odorata, Vanda cristata, V. tessalata, V. coerula, V. Among the significant therapeutic plants utilised by traditional healers in the Indian subcontinent are spathulata, Cymbidium gigantieum, C. aloifolium, C. williomsoni, Dendrobium nobile, D. moschatum, and Phaius tancarvilleae. [30] The diverse range of phytochemical components found in the leaves, pseudobulbs/tubers, and flowers of orchids is responsible for their biological activity. [31]

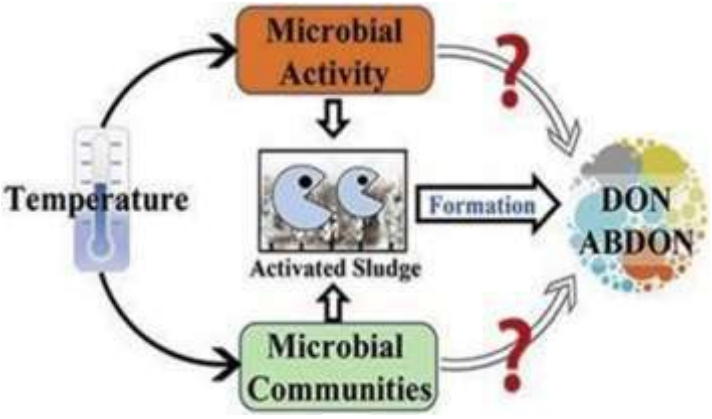


Figure 4: –Microbial Activity

Antibacterial Activity

The agar well diffusion method was used to test for bacterial growth inhibition. Sterile Muller Hinton Agar (MHA) plates that had already been produced were taken and dried for half an hour at 37°C in an incubator. Additionally, five distinct species' standard working inoculums were collected. A cotton swab that was sterile dipped into an organism tube's standard working inoculums (according to the McFarland turbidity standard, cell density 1.5×108CFU/ml). To get rid of extra inoculums, the swab was then pressed on the tube wall above the liquid while rotating. The MHA plates were rotated three times while the swab was streaked across them at 60°C angle. All of the inoculation plates were covered and allowed to dry for approximately ten minutes at room temperature. [32] The wells were made in the incubated media plates with the help of sterile cork borer (6 mm) and labeled properly. Then 50 µl of the working solution of plant extract were loaded into the respective wells with the help of micropipette. The solvent itself was tested for its activity as a control at the same time in the separate well. The plates were then left for half an hour with the lid closed so that plant extract diffused to the media. The plates were incubated overnight at 37□C. The plates were then observed for the zone of inhibition (ZOI) produced by the anti- bacterial activity of different plant extracts. At the same time ZOI of different organism by different samples were measured with the help of the ruler for the estimation of potency of anti- bacterial substance and tabulated. From the result of ZOI, the plant extracts which had shown excellent antimicrobial activity against tested bacterial strains were chosen for determination of MIC up to maximum dilution by tube dilution method. [33]

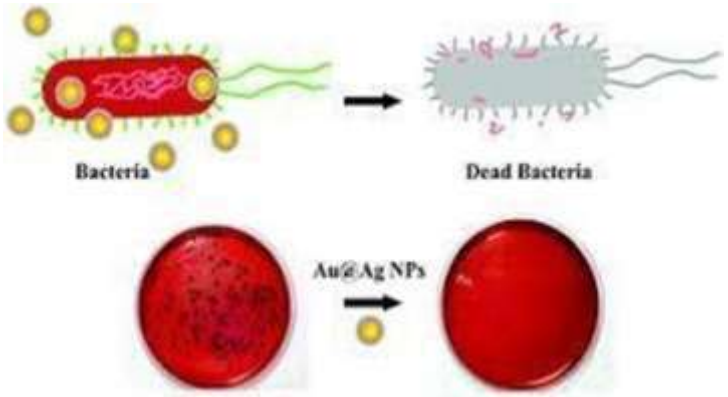


Figure 5: - Antibacterial activity

Antifungal Activity

The agar well diffusion method was also used to test for fungal growth inhibition. PDA (potato dextrose agar) plates were made sterile. Prior to being used, the plates were dried for five minutes at 40°C in a hot air oven to eliminate any extra moisture from the media's surface. A sterile cotton swab was submerged. After carefully swabbing every plate, the produced inoculums and excess inoculums were extracted by pressing and rotating against the tube's upper inner wall above liquid level. After every swabbing, the plates were rotated at a 60° angle. Ultimately, the swab was run around the agar surface's margins. The wells were created using PDA plates. In a separate well, 50 µl of the plant extract working solution was added while the solvent's activity was simultaneously assessed as a control. After that, the plates were left with the lid covered for 30 minutes to allow the plant extract to permeate the media. The trays were kept at 27°C for a duration of seven days. The zone of inhibition (ZOI) created by the antifungal activity of various plant extracts was then studied on the plates. [34]

CONCLUSION

The findings demonstrated the strong antibacterial and antifungal qualities of various epiphytic orchid extracts. Extracts from calanthe orchids were displayed. intermediate action, while none of the other extracts had any activity against any of the five different fungal species. And shown other activities like antimicrobial, antidiabetic, and other medicinal uses of calanthe plants.

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