A comprehensive review on ethnomedical applications and pharmacological activities of Acampe praemorsa (Roxb.) Blatt. & McCann (Orchidaceae)

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ABSTRACT

Orchidaceae is one of the two largest families in angiosperms. Orchids are popular owing to the most beautiful flowers they produce and due to their wide spread ethnomedical importance. In this review, ethnomedical uses and pharmacological activities of A. praemorsa is discussed by referring Rora, journals, and search engines such as Google scholar, ScienceDirect and Pubmed. Ethnomedical investigations have revealed the potential therapeutic roles of different parts of A. praemorsa. The orchid is used traditionally by for treating ailments such as stomachache, earache, backache, wounds, neuralgia, rheumatism, eye diseases, sciatica, cough and fracture. A. praemorsa is investigated for various pharmacological activities. Studies have revealed the potential of A. praemorsa to exhibit a range of bioactivities such as antitumor, antibacterial, antifungal, antioxidant and anti-inflammatory activities. In conclusion, A. praemorsa is an extensively used epiphytic orchid for medicinal purposes in several parts of the India and other countries. Major emphasis has to be given in order to conserve this medicinally important orchid species. A. praemorsa can be a promising candidate in terms of its pharmacological potential.

Keywords: Orchids, Orchidaceae, Acampe praemorsa, Ethnomedical, Pharmacological

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INTRODUCTION

The family Orchidaceae represents one of the highly evolved and most diverse group of angiosperms with about 29000 species (coming under roughly 880 genera) found distributed in different parts of the world. This is the second largest family next to Asteraceae and comprises approximately 8% of all vascular plants. The abundance as well as distribution of orchids vary from region to region and depends on climatic conditions. Orchids may be epiphytes, lithophytes, terrestrial or saprophytes depending upon the habit in which they are growing. Majority of orchids are epiphytic in nature. Many orchids are common in occurrence while some are rare and critically endangered. A high degree of endemism is also reported in certain species of orchids. Orchids exhibits significant diversity with respect to size, color and shape of the flowers. Orchids produce minute seeds whose germination is aided by fungal symbiosis. The existence and diversity of orchids is threatened by various factors such as over-exploitation, climate change and habitat loss (mainly due to anthropogenic activities, for e.g. deforestation). Orchids have found ethnomedical significance. Orchids are well known for producing extremely beautiful flowers (with distinct pollination mechanisms) and hence, orchids are grown for ornamental purposes and also for generating income out of that. Besides, many orchid species are widely used traditionally all over the world as food and for treating various human and veterinary ailments. Different parts of the orchids such as roots, leaves and pseudobulbs have found medicinal values. Studies have shown the potential of orchid extracts and purified compounds from orchids to exhibit a myriad of pharmacological activities including antimicrobial, anti-inflammatory, antioxidant, and anticancer activities. Orchids are widespread in distribution and are known to occur in tropical and temperate regions. India represents one of the biodiversity hotspots for orchids. Western Ghats, Eastern Ghats, Himalayas and North-east states of India harbor a variety of plant species including several orchid species, many of which are endemic to particular area. More than 1300 species of orchids belonging to about 180 genera are found in India. Many orchid species are used as food as well as medicinally in India for various treatment purposes. Indigenous medicinal systems such as Ayurveda, Unani and Siddha make use of several orchid species for remedy...
against certain kinds of ailments or disorders. The monopodial genus *Acampe* Lindl. consists of around 8 species, majority of which are found in Asia. *Acampe praemorsa* (Roxb.) Blatt. & McCann (Synonym A. papillosa Lindl., A. wightiana Lindl. ex Wight) is an epiphytic orchid, usually found growing on trunks of several tree species. The orchid is widespread in distribution and is known to occur in countries viz. India, Vietnam, Thailand, Bangladesh, Myanmar, Bhutan, Sri Lanka, Nepal, Burma and China. The orchid *A. praemorsa* is distributed in various states viz. Karnataka, Andhra Pradesh, Gujarat, Chhattisgarh, Odisha, Kerala, Maharashtra, Tamil Nadu, Rajasthan, Madhya Pradesh and many North-east states. *A. praemorsa* is one of the medicinally important orchids and is reported to be ethnomedically useful for treating various illnesses including rheumatism. In Western Ghats, *A. praemorsa* is used as one of the larval host plants by the butterflies. In this review, an extensive literature survey was conducted to compile data available on ethnomedicinal uses and pharmacological activities of *A. praemorsa* by referring standard flora, journals and search engines viz. PubMed, Google Scholar and Science Direct.

**PLANT DESCRIPTION**

*Acampe praemorsa* (Figure 1) is a common, large, robust epiphyte having stout stem up to 30-40cm in length and 1-1.5cm diameter. Leaves are distichous, thick, up to 10-30x2-3.5cm, coriaceous, lorate and the apex is unequally 2-lobed. Inflorescence corymbose (several, 3-4cm), much shorter when compared to leaves. Flowers are clustered (8-12), fragrant, long-lasting, are densely arranged and approximately 1.2cm across. Petals and sepals subequal, yellow, barred with red. The lip is white, caruncled, and sparsely speckled with magenta to dark brown. Capsule subsessile, fusiform.

**ETHNOBOTANICAL USES OF A. PRAEMORSA**

Higher plants have been a significant part of traditional medicine. All over the world, orchids have been used for medicinal purposes. Tribal communities extensively utilize several orchid species for treating various ailments in certain formulations. *A. praemorsa* is one among the several orchid species that find ethnomedicinal significance. Various parts, in particular roots, are used medicinally for treating rheumatism, neuralgia, snake and scorpion bite, stomach disorders, earache, cough, fever, stomach disorders, secondary syphilis, uterine diseases etc. The roots of *A. praemorsa* are used in the preparation of herbal shampoos. The ethnic people of Visakhapatnam district, Andhra Pradesh, India make use of *A. praemorsa* for managing diabetes. The leaf paste of *A. praemorsa* is used by Arakuvalley tribes of Visakhapatnam district, Andhra Pradesh, India to get relief from chest pain and hyperacidity.

In Nagaland, the root paste is consumed orally in order to get relief from rheumatism.

<table>
<thead>
<tr>
<th>Region</th>
<th>Part</th>
<th>Form</th>
<th>Use</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerala, India</td>
<td>Seed, leaf</td>
<td>Juice</td>
<td>Stomachache, ear-ache, reduction of body temperature, antibiotic for wound</td>
<td>Shanavaskhan et al.</td>
</tr>
<tr>
<td>Tamil Nadu, India</td>
<td>Root</td>
<td>Paste</td>
<td>Arthritis</td>
<td>Devi et al.</td>
</tr>
<tr>
<td>Sikkim, India</td>
<td>Root</td>
<td>Paste, decoction</td>
<td>Neuralgia, traumatic pain, arthritis, rheumatism, backache, menstruation pain, sciatica</td>
<td>Panda and Manda</td>
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<td>Nagaland, India</td>
<td>Root</td>
<td>Paste</td>
<td>Burning sensation, asthma, bronchitis, secondary syphilis, mild uterine diseases, eye diseases</td>
<td>Nongdam</td>
</tr>
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<td>Malappuram, Kerala, India</td>
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<td>Extract</td>
<td>Rheumatism</td>
<td>Chithra and Geetha</td>
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<td>Feni district, Bangladesh</td>
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<td>Juice</td>
<td>Rheumatism, cough, ear complaint</td>
<td>Uddin et al.</td>
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<td>Orissa, India</td>
<td>Root</td>
<td>Paste</td>
<td>Arthritis</td>
<td>Dash et al.</td>
</tr>
<tr>
<td>Meghalaya, India</td>
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<td>Juice</td>
<td>As tonic and for treatment of rheumatic disorders</td>
<td>Singh and Borthakur</td>
</tr>
<tr>
<td>Nepal</td>
<td>Root</td>
<td>Powder</td>
<td>Rheumatism</td>
<td>Subedi et al.</td>
</tr>
<tr>
<td>Madhya Pradesh, India</td>
<td>Root</td>
<td>Decoction</td>
<td>Cough</td>
<td>Tiwari et al.</td>
</tr>
<tr>
<td>Salem district, Tamil Nadu, India</td>
<td>Leaf</td>
<td>Paste</td>
<td>Fracture</td>
<td>Mishra et al.</td>
</tr>
<tr>
<td>Kerala, India</td>
<td>Leaf</td>
<td>-</td>
<td>Shampoo</td>
<td>Kumar et al.</td>
</tr>
<tr>
<td>Andhra Pradesh, India</td>
<td>Whole plant</td>
<td>-</td>
<td>Fracture</td>
<td>Reddy et al.</td>
</tr>
</tbody>
</table>

**Figure 1: Acampe praemorsa**

**Table 1: Ethnobotanical uses of *A. praemorsa***
Tribal communities (bagali, chakma and marma communities) in south east Bangladesh uses leaves and whole plants of *A. praemorsa* for treating fever, ear ache, injury and male and female problems. The Kokani tribe of Nasik district of Maharashtra, India, uses the plant to treat treatment of rheumatism in Bangladesh. The Khasia community of Moulvibazar district, Bangladesh uses root of *A. praemorsa* for the treatment of rheumatism and sciatica. More information on ethnomedicinal uses of *A. praemorsa* is shown in Table 1.

**PHYTOCHEMICALS IDENTIFIED IN *A. PRAEMORSA***

Orchids are known to produce a myriad of phytochemicals including alkaloids, triterpenoids and phenolic compounds. Incredibile advancement in spectral and chromatographic techniques resulted in the recovery and elucidation of structures of many phytochemicals from natural products including orchids. Studies have been carried out to detect phytochemicals/phytochemical groups in *A. praemorsa*. A new phenanthropyran named as Praemorsin, was isolated from the whole plant of *A. praemorsa*. Anuradha and Rao have also isolated and elucidated the structures of two compounds viz. flavadin and flavidinin from *A. praemorsa*. Maridass et al. have identified flavonoids and cardiac glycosides in *A. praemorsa*. Suja and Williams identified alkaloids, flavonoids, tannins, saponins, phenol, terpenoids and steroids in the plant. The study by Marjoka et al. revealed the presence of alkaloids, flavonoids, glucosides and steroid with leaf of *A. praemorsa*. Akter et al. identified the phytochemical groups viz. glycosides, flavonoids, saponins, tannins, terpenoids, steroids, coumarins, anthraquinones in the leaves of *A. praemorsa*.

**PHARMACOLOGICAL ACTIVITIES OF *A. PRAEMORSA***

Several studies have been carried out to investigate biological activities of *A. praemorsa*. The plant is reported to exhibit bioactivities viz. antibacterial, antifungal, anti-inflammatory, anticancer and antioxidant activity. A brief description on pharmacological potential of *A. praemorsa* is discussed.

**Anti-inflammatory activity**

Ethanol and aqueous extracts obtained from whole plant of *A. praemorsa* were evaluated for anti-inflammatory activity by carrageenan-induced paw oedema model in rats. Aqueous extract was shown to exhibit significant anti-inflammatory activity when compared to ethanolic extract.

**Anticancer activity**

Soumiya et al. evaluated anticancer activity of ethanol extract of *A. praemorsa* leaves by MTT assay. The extract was shown to exhibit cytotoxic effect against A549 cell line dose dependently with IC50 value of 14.63 μg/ml. Jhansi and Khasm determined cytotoxic potential of methanolic and ethyl acetate extracts of *A. praemorsa* by MTT assay against two cell lines viz. HeLa and MCF-7 cells. Extracts were toxic to both cell lines with marked activity being shown by ethyl acetate extract as indicated by IC50 values. Extracts exhibited potent cytotoxicity against MCF-7 cells when compared to HeLa cells.

**Antioxidant activity**

Suja and Williams screened antiradical activity of aqueous and ethanol extracts of *A. praemorsa* by hydroxyl and DPPH radical scavenging activity. A dose dependent scavenging of radicals was observed.

**Antibacterial activity**

Studies have shown the potential of *A. praemorsa* to inhibit many bacteria including drug resistant strains of bacteria. Hoque et al. evaluated antibacterial activity of *A. praemorsa* extracts by disk diffusion assay. Among extracts, ethanol extract revealed marked activity as it inhibited three out of five test bacteria while petroleum ether extract did not cause inhibition of any bacteria. All extracts were failed to inhibit *Staphylococcus aureus*. Paul et al. showed the potential of leaf extract of *A. praemorsa* to inhibit kanamycin and ampicillin resistant strains of *E. coli*. Jhansi and Khasm evaluated methanol and ethyl acetate extracts of leaves of *A. praemorsa* to inhibit gram positive and gram negative bacteria. Overall, ethyl acetate extract was effective in displaying marked antibacterial activity than methanol extract. Table 2 shows more information on antibacterial activity of *A. praemorsa*.

**Antifungal activity**

Aqueous extract prepared from *A. praemorsa* was effective in causing inhibition of phytopathogenic fungi viz. *Alternaria alternata*, *Curvularia lunata*, *Colletotrichum corchori*, *Fusarium equiseti*, *Macrophomina phaseolina* and *Botryodiplodia theobromae* with highest and least inhibitory activity against *C. lunata* and *M. phaseolina*, respectively. Swami et al. evaluated antifungal potential of leaf and root of *A. praemorsa*. Petroleum ether extract of leaf and root and methanol extract of leaf revealed dose dependent inhibition of *Aspergillus niger* and *Candida albicans*, however, methanol extract of root was ineffective in causing inhibition of both fungi. Akarsh et al. revealed the antifungal effect of cow urine extract of *A. praemorsa* against *Colletotrichum capsici* and *Fusarium oxysporum*. Cow urine extract was more effective against *C. capsici* (50% inhibition) than *F. oxysporum* (11.90% inhibition). Table 2 shows more information on antifungal activity of *A. praemorsa*.

<table>
<thead>
<tr>
<th>Part</th>
<th>Extract</th>
<th>Method</th>
<th>Activity against</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole plant</td>
<td>Methanol extract</td>
<td>Agar well diffusion</td>
<td><em>S. aureus</em>, Escherichia coli and Pseudomonas aeruginosa</td>
<td>Ranjitha et al.</td>
</tr>
<tr>
<td>Whole plant</td>
<td>Methanol extract</td>
<td>Poisoned food technique</td>
<td><em>C. capsici</em> and <em>F. oxysporum</em></td>
<td>Akarsh et al.</td>
</tr>
<tr>
<td>Leaf and root</td>
<td>Butanol, chloroform, diethyl ether and methanol extracts</td>
<td>Disk diffusion assay</td>
<td>Gram positive and gram negative bacteria</td>
<td>Behera et al.</td>
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<tr>
<td>Leaf and root</td>
<td>Methanol and petroleum ether extracts</td>
<td>Agar well diffusion assay</td>
<td>Gram positive and gram negative bacteria</td>
<td>Swami et al.</td>
</tr>
<tr>
<td>Whole plant</td>
<td>Methanol extract</td>
<td>Poisoned food technique</td>
<td><em>Bipolaris sorokiana</em></td>
<td>Kekuda et al.</td>
</tr>
</tbody>
</table>

Table 2: Antibacterial and antifungal activity of *A. praemorsa*
CONCLUSIONS

Orchids differ from other groups of plants with respect to distinct floral morphology, association with mycorrhizae, pollination pattern and production of tiny seeds. Since time immemorial, orchids have aesthetic and medicinal values as well as economic importance. Habitat loss and over-exploitation seems to be the important threat for existence and dwelling of orchids in natural habitats. An extensive literature survey carried out in this study revealed the potential medicinal uses of whole plant as well as various parts of *A. praemorsa*. The plant is widely used for treating several ailments including rheumatism, stomachache, fracture, wounds, bronchitis and cough. The plant is reported to exhibit some bioactivities viz. antimicrobial, anticancer, anti-inflammatory and antioxidant activity. *A. praemorsa* seems to be a suitable candidate for development of novel therapeutic agents. More emphasis has to be given for conservation of this medicinal orchid species through *in-situ* and *ex-situ* protocols.

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CONFLICTS OF INTEREST

None declared

REFERENCES


