



A review on the significance of the medicinal plant *Acorus calamus*

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Abstract: The medicinal plants remained as a heritage for mankind throughout the world. Nepal is rich in medicinal plants diversity. Out of many daily used medicinal plants, the *Acorus calamus* (sweet flag) is one well-known plant among the Nepalese communities. The aim of this study is to document the medicinal significance of the *Acorus calamus*. For this, data was assembled by reviewing more than 48 articles collected from online portals. Collected data was analyzed and presented in descriptive and tabular form. The result shows that *Acorus calamus* (Bojo) of the family Acoraceae is renowned and one of the most consumed herbs used by almost all ethnic groups in Nepal. This plant is used both in Ayurvedic and allopathic medicine. In Nepal, this plant is cultivated in tropical and subtropical regions and mainly its rhizome is to cure many health disorders like throat inflammation, common cold, chest pain, bronchitis, whooping cough and to open the respiratory passages. Commercial cultivation of this species can be helpful to uplift the economic status of rural farmers. Hence, emphasis should be given to the proper documentation and transferring the traditional knowledge to the new generation.

Keywords: Ayurvedic, ethnomedicine, phytochemistry, sweet flag, traditional medicine

INTRODUCTION

Natural resources are the gift of nature. Human beings have been dependent on natural resources since their introduction on the earth for livelihood. The secret of healing substances almost invariably lies in natural substances (Datta, 2007). The history of medicinal plants has been widely acknowledged in terms of serving mankind all around the world (Gahatraj et al., 2020). To cure many diseases and disorders, both Ayurvedic and allopathic medicine is common in Indian sub-continent. Since Nepal is very rich in biodiversity, it has a lot of medicinal and aromatic plants in the northern Himalayas to southern Terai plains among which many are protected inside protected areas by the government of Nepal. 5856 different species of flowering plants were found in Nepal (HMG, 2002) and among them, 690 species had medicinal properties (Malla and Shakya, 1984). Out of 690 different species of flowering medicinal plants, 510 species were wild, 120 species were naturalized and were in cultivation and the remaining 60 species were exotic. A total of 1624 species of plants were listed as medicinal plants by a group of botanists and professionals in the medicinal and



aromatic plant database of Nepal (MAPDON) (Sharma et al. 2007). Fifty-three different types of non-timber products are traded from the Jajarkot district only (Lamichhane et al., 2021). And in nature, there is medicine for every kind of disease. WHO has found more than 80% of the world population getting their treatment by using traditional medicines (Balakumbahan et al., 2010). The United States of America was also found to extract 50% of its daily medicines from nature-based resources (Copping, 1996).

Acorus calamus (sweet flag) Bojho (in Nepal) is recognized as one of the commonly used medicinal aromatic plants whose different parts are consumed in different forms to cure different diseases. It is the most frequently used medicine in the context of Nepal. Different 126 ethnic groups in Nepal have been using more than 2300 different plant species traditionally to cure several diseases and Bojho was the major plant species they have been consuming for many years (Kandel et al., 2020). It is one of the highly used plants studied in western Nepal. Its use-value and use frequency was recorded 0.41 and 0.15 respectively in Arghakachi, western, Nepal (Poudel et al., 2021). So, it requires more exploration and research work on the *Acorus calamus* to establish this species worldwide. The objective of this study is to document the scattered findings of the *Acorus calamus*.

MATERIAL AND METHODS

Data collection and analysis: This article is fully based on secondary data. Secondary data was collected from the articles assembled from online portals and published articles (Timilsina et al., 2020). Keywords like *Acorus calamus*, ethnomedicine, traditional medicine; Ayurvedic, phytochemistry, etc. were used to search the articles. A total of 48 articles was collected and reviewed. The gathered information was presented well in descriptive and tabular form.

RESULTS AND DISCUSSION

Taxonomy of Acorus calamus:

Table 1 Taxonomic classification of *Acorus calamus*

Kingdom	Plantae
Subkingdom	Tracheobionta (vascular plant)
Super division	Spermatophyta (seed plants)
Division	Magnoliophyta (flowering plants)
Class	Liliopsida (monocotyledons)
Subclass	Arecidae
Order	Arales
Family	Acoraceae
Genus	<i>Acorus</i> L.
Species	<i>Calamus</i>
Synonyms	<i>Acorus asiaticus nakai; Acorus terrestris spreng</i>



Figure.2 The entire plant of *Acorus calamus*
(Note: Collected from Gulmi Nepal; Altitude: 2100m; Northern aspect)



Distribution of Acorus calamus: *Acorus calamus* is a medicinal plant that lies in the family Acoraceae. It is also called sweet flag in English, Shi chang Pu in Chinese, Kalamus in Germany, Bajai in Hindi (Seidemann, 2005), and Bojo in Nepali. Commonly, this plant is also recognized as sweet flag, sweet rush, sweet root, sweet cane, sweet myrtle, myrtle grass, myrtle sedge, gladdon, vacha, and cinnamon sedge (Packer and Ringius, 1984). It is recorded in 42 countries ranging from 900m to 1800m (Quraishi et al., 2017). It generally grows at the temperature ranging from 10 to 38°C and rainfall of about 650 mm to 2500 mm per year in the Hills of Nepal and the Nepalese climate is best for its growth (Balakumbahan et al., 2010).

Acorus calamus is natural to Central Asia and Eastern Europe and also the endemic to marshy lands of mountains of India (Gupta, 1964). It is native species of North America and Asia and it is basically a perennial, marshy, semi-aquatic plant (Kokate, Purohit, & Gokhale, 2003). It is more abundant to the northern slope of subtropical and temperate parts of Asia, Europe, and the North America (Mukherjee et al., 2008). This plant grows best in the temperature range of 10 to 38 degrees Celsius and the rainfall of 700 mm to 2500 mm (Balakumbahan et al. 2010). It is found cultivated at an altitude of 2200 m. In the case of India, it is distributed in the lands of Jammu Kashmir, Manipur, Himachal Pradesh, Nagaland, Uttar Pradesh, Uttarakhand, Tamil Nadu, Andhra Pradesh, Karnataka, and Maharashtra (Pawar et al. 2011; Malabadi et al. 2007; Rao and Sreeramulu 1985).

Acorus calamus is a flowering plant having psychoactive chemicals. It is one of the perennials, semiaquatic herbs having creeping rhizomes (Mukherjee et al., 2008). It is one of the common Nepalese herbs which grow up to 1-1.5 meters in height in most of the hilly region. The rhizome which is the major part used, generally grows up to 40-50 cm long. It has 1 to 3 seeded berries which are angular, green, and oblong in shape. The woody branched, light brown and occasionally orange-brown colored cylindrical to flat in shape rhizomes with nodes and internodes, possess strong, aromatic odor and bitter taste (Anonymous, 2001). Scattering rootstock directly gives rise to tufts from the basal leaf. These sword-shaped and erect basal leaves of the *Acorus calamus* are more similar to those of *Iris* spp. but in comparison, the *Acorus calamus* has more green basal leaves than *Iris* spp. (Wallis, 2003). Generally, it is hermaphrodite (having male and female both in the same flower) which is usually pollinated by insects (Prajapati et al., 2003; Nadkarni 1998; Wallis 1997).



Figure. 3 Rhizome of *Acorus calamus*

(Note: Collected from Gulmi Nepal; Altitude: 2100m; Northern aspect)

Phytochemical constituents of *Acorus calamus*: The rhizomes, leaves, and essential oil in *Acorus calamus* is rich in different varieties of chemical constituents (Namba, 1993; Wang et al., 1998). The oil extracted from the rhizome of the *Acorus calamus* is used to prepare different chemical constituents (Oprean et al., 2001; Raina et al., 2003). Fatty acids like palmitic acid with its ester, ester of butyric acid, and heptylic acid are also present in its oil (Chaudhury et al., 1957). The aerial portion of this plant has luteolin-6,8-c-diglucoside and its rhizome contains aromatic and volatile yellow-colored oils with asarone as its major constituent which possesses a little amount of sesquiterpenes along with its alcohol and also the rhizome is rich in choline, acoradin, flavones, galangin, isocolamone, acolamone (Singh et al., 2011). Similarly, glycosides, terpenoids, and sterols were observed in the ethanol extracted from its rhizome (Tewari et al., 1984). From the rhizomes of *Acorus calamus* in Nepal, fifty-three different organic volatile compounds were extracted and identified as 19 hydrocarbons, 14 aldehydes, 11 alcohol, 4 ketones, 3 esters, 1 furan, 1 nitrogen-containing miscellaneous and 46.78% of beta-asarone (major bioactive compound) (Gyawali and Kim, 2009). Basically, plants age, geographical condition, climatic condition, and the ploidy of plant determines the content and makeup of chemical components in different parts of the plant (Venakutonis and Dagilyte, 2003). The number of chemical constituents differs with the plant parts from which the oil is to be extracted (Motley, 1994).



Ethnomedicinal value: Since a long time, it has been an essential traditionally used medicinal plant by the Indian and Chinese people (Wu et al., 2009; Lee et al., 2011). Also, it is traditionally used in America and Indonesia for treating gastrointestinal diseases like diarrhea, colic pain, and diabetes therapy (Gilani et al., 2006; Si et al., 2010). In Nepal, its dry rhizomes have been consumed for hundreds of years to treat throat inflammation, open respiratory passages, chest pain, bronchitis, and whooping cough. The dry rhizome is used during cold, cough, and also to clear throat; it can be used either raw or roasted. Rhizome juice is used to treat sore throat, gout, epilepsy, cold, cough (Acharaya, 2012; Gubhaju & Ghimire, 2010; Poudel et al., 2021).

The rhizomes in Ayurveda are believed to contain redolent, bitter tonic, stimulant, nauseant, emmenagogue, expectorant, aphrodisiac, diuretic, cathartic, spasmolytic, parasitical, and flatus-relieving properties which help in the treatment of diseases like epilepsy, memory disorder, schizophrenia, chronic diarrhea, dysentery, intermittent fever, bronchial catarrh, tympanitis, otitis media, colic, asthma, cough and tumors of gland and abdomen (Kirtikar and Basu, 1987; Anonymous, 2001). Traditionally, they were used for relieving gas in the alimentary canal and chronic indigestion and also for treating kidney and liver problems (Mukherjee et al., 2007). Consumption of rhizomes with salt and water during indigestion causes emesis while consuming honey, hot water, and barely treats cardiac diseases (Bangasen, 1984). Rhizome induces nausea and vomiting (Srivastava et al., 1986). The root is very helpful in stomach pain (Mao, 1993). The bark of the root (root skin) works as an antidote for curing snakebite (Singh and Prakash, 1994). Ancient people of Tirumala hills used to treat dental disorders through the use of its rhizome (Balaji et al., 1996).

CONCLUSION

Acorus Calamus commonly known as sweet flag has been consumed by people all around the world to treat various kinds of diseases since a long time. In case of Nepal, it is the most commonly used medicinal plant by all Nepalese communities. Along with its disease curing potentials, it has a huge economic potential. Since Nepal has very favorable conditions for its production, we can even establish it commercially. Indeed to maintain good health through our traditional practices, we need to have more research, study and exploration of such medicinal plants.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflict of interest.

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