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An overview on Vacha (Acorus calamus L.) with special reference to Ayurvedic and modern aspect

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ABSTRACT
Last few eras have shown important resurgence of interest in medicinal plants due to awareness about limitations of synthetic chemotherapeutic agent so one of the important medicinal plant Acorous calamus L. member of Araceae family popularly known as Vacha.It is one of the traditionalmedicine of ayurveda having semi-evergreen perennial herb with arching tapered reed like leaves, minute yellow green flowers and scented rhizomes.It can be used in medicine as single drug or ingredient of polyherbal formulations. The rhizomes Vacha is used for the treatment of various aliments such as Epilepsy, Headache,Slurred speech, Eye disorder, insomnia, loss of memory,Edema, Skin diseases,Colic, Piles, Indigestion etc.Vacha is mentioned in one of the Rasayandravya and regular intake said to make endowed with sharp intellect and sweet voice. Its therapeutic uses described in Ayurvedic Samhita studies reveals that Vacha has rhizomes contains an aromatic essential oil which has significant anticonvulsant activity. Vacha roots also useful to treat Memory loss, Alzheimers disease, Tremors, Anxiety, depression pain disorder of neurological origin. This review article include information on habitat,cultivation and propogation,phytochemical constituents, pharmaco logicalactivites, traditional uses and therapeutic uses of Acorus calamus L. plant.

Keywords
Vacha, Acorus calamus L. phytochemistry, pharmacological actions.

I. INTRODUCTION

In ayurveda Acorus calamus L. or sweet flag or calamus is a semi aquatic, creeping rhizomes widely useful in the traditional medicines. The word Vacha means which offers good speech or which improves the power of speech.The rhizomes also useful as brain tonic as Ayurveda well known for medhya karma that improves memory and intellect.It is also useful in conditions that may lead to memory loss, amnesia, anxiety, etc. It is commonly known as sweet flag, a tall perennial wetland monocot plant from Areaceae family commonly found in Manipur and Naga Hills and on the edges of lakes and streams. Recent studies on this plant shows its tranquilizing, antimicrobial, antidiarrhoeal, antioxidant, antihelminthic, anticonvulsant, antiinfammatory effects.In India tetraploid Vachavariety is found containing about 75% of B- asaronetherefore Shodhit or detoxified is used. The small doses of this herbs used to treat anorexia and acidity problems and large doses used cause nausea and vomiting .

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Botanical Name – Acoruscalamus L.
Synonyms

Synonyms	Dhanwantari Nighantu[2]	Raj Nighantu[3]	Madanpal Nighantu[4]	Bhavprakash Nighnatu[5]	Adarsh Nighantu[6]	Shodhal Nighantu[8]	Kaiyyadev Nighantu[7]
Ugragandha	+	+		+	+		+
Golomi	+	+		+		+	
Jatila	+	+	+	+	+	+	+
Ugra	+	+			+	+	+
Lomsha	+	+			+	+	+
Vach		+				+	+
Rakshoghna		+			+	+	+
Vijaya		+	+	+	+		+
Bhadra		+	+	+	+		+
Manglya		+	+	+	+		
Hemvati				+	+		
Shwetvacha					+		

NIRUKTI

1. Swaralu–It is potent drug used for improving voice
2. Aruna – Vacha issemiaquatic herb having reddish brown colour
3. Golomi, Lomashi, Jatila – having hairy structure
4. Ugragandha – Having intense smell
5. Shadhgrantha – Having rhozomes which has many nodes and internodes
6. Sataparvika– Having rhozomes which has many nodes
7. Karshani – Because it is useful in reducing body weight
8. Bodhniya, Smarniya –Arousing consciousness
9. Bhutanashani, Rakshoghni – Destroying microorganisms
10. Mangalya – Auspicious herb
11. Shulagni – It reduces pain[9][10]

Vernacular names

Vachais commonlyknown as "Shadgrantha, Golomi, Ugragranthi, Sataparvika, Jatila" **Sanskrit**, "Bach" in**Hindi** and **Bengali**, "Sweet flag" in **English**, "Agri-turki" in **Persian**, "Godavaj" in **Gujarat**, "Vaj" in**Bombay**, "Vekhand" in **Marathi**, "Vasa" in **Telugu**, "Vashambu" in **Tamil**,"Vayambu" in**Malayalam**, "Baje" in**Kannada**, "Ekhanda" in **Konkan**, "Vacha, Bacch" in **Unani**, "Bojho" in Nepaliand "Shobu" in **Japanese**[11][12].

Classificationof Vacha in Ayurvedic Samhita –

Charaka Samhita - VirechanVarga; Lekhaniya, Triptighana, Arshoghna, Asthapanopaga, Sheetaprashamana & Sangyasthapan Mahakashaya; Shirovirechana Dravya, Tikta Skanda.

1. Sushruta Samhita - Pippalyadi, Vachadi, MustadiGana; Urdhavabhagahara & Shirovirechana Dravya.
2. Ashtanga Hridaya - Tikta Skanda, Vachadi Gana, Mustadi Gana, VamakaGana, Vastakada Gana, Niruha Gana.
3. Ashtanga Sangraha – Vamaka & Virechaka Gana, NiruhaGana, Shirovirechana Gana, Lekhaniya Gana, Hridhya, Gana, Arshoghna Gana, Sheetaprashamana Gana, Sangyasthapana Gana, Vatsakadi & haridradi Gana
4. Dhanvantari Nighantu – Shatapushpadi Varga
5. Shodala Nighantu - ShatpushpadiVarga
6. Madanpala Nighantu - ShuntyadiVarga
7. Kaiyadev Nighantu – Oushadi Varga
8. Bhavprakasha Nighantu – Haritakyadi Varga
9. Raj Nighantu – Pippalyadi Varga

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10. Priya Nighantu – Shatpushpadi Varg
11. Nighantu Adarsh – Vachadi Varg
12. Shankar Nighantu – Haritakyadi Varg
13. Shaligram Nighantu – Haritakyadi Varg
14. Brihat Nighantu Ratnakar – Vachadi, Pippalyadi, Mustadi Gana[13]

Rasapanchaka –

1. Rasa -Katu, Tikta
2. Virya- Ushna
3. Vipaka- Katu
4. Doshaghnata–vatkaphaghna,pittavardhak
5. Guna- Laghu, Tikshna
6. Prabhav – Medhya, Krimihar[14]

	Ras	**Virya**	**Vipaka**	**Guna**	**Doshghnta**
D.N.	Katu,tikta,	Ushna	Katu	Laghu	apha-vataghna
R.N.	-	Ushna	Katu	Laghu	vatakphaghna
B.N.	Katu,tikta,	Ushna	Katu	Laghu, Tikshna	vatakaphaghna
A.N.	Katu,tikta	Ushna	Katu	Laghu	vatakaphaghna
M.N.	Katu,tikta	Ushna	Katu	-	vatakaphaghna

PanchabhautikSanghatan

Ras	**Pruthvi**	**Jal**	**Tej**	**Vayu**	**Akash**
Tikta				+	+
Katu			+	+	
Kashaya					

Part used
Rhizomes, Leaves, Steam and root of the plant
Doses-Powder – 125 -500 mg

Formulation –
Saraswat churna, Medhyarasayan, Vachadichurna, Balachaturbhadrachurna, Vachadighruta, Vachavaleha, Rajonyadichurna, Manasmitravatak, Brahmi vati, Kolakulathadichuranam, Chandroday Varti.

Traditional uses

Vacha having all these properties like Vamaka (Emetic), Vanhikara (Digestive fire stimulant), Mala Vishodhan (Clears mala), Mutra Vishodhana (Clears urine), Kaphaghana (Alleviates kapha), Vataghna (Alleviates vata), Jantughna (Anti-microbial/Disinfectant), Kanthya (Beneficial for throat),Medhya (Intellect promoting), Krimighna (Anthelmintic), Ayushya (Life promoter), Amapachaka (Digestant), Vrishya (Aphrodisiac), Swaradayaka (that which improves voice), Vatanuloman (Carminative), Jivaniya (Vitalizer), Rakshoghna (Disinfectant), Dipana (Appetizer), Smritivardhak (Improves cognizance/recollection).[15]

1. In piles, the fumigation with Vachais helpful.
2. In Suryavartta pressed snuff of Vacha and Pippali or Madhuka and honey is useful.
3. According to Sushrutasamhita, Vacha cooked a hundred times with one drone (10.24 kg) of Ghee when given to a person, that person obtains a life of five hundred years and acts as a good Rasayana, it also cures cervical lymphadenitis, goitre, filariasis and disorders of voice.
4. Application of paste of Vacha and Devadaru or Gunja is highly beneficial for alopecia[16]
5. Emesis induced with the help ofVacha powder and honey or MadanphalawithMadhuka cures opthalmia neonatorum.
6. Use of Vacha with milk or ghee or oil for one month makes the person invincible for pathogenic agents and endowed the person with sharp intellect and sweet voice. Vacha, Hingu, Yashti, Tagara, Shirisha, Lashuna and Kushtha are pounded with goat's urine and used as snuff and collyrium in epilepsy and hysteria.[17]
7. The paste of Vacha and Sarshapa is applied onOld ghee processed with VachaBrahmi juice, Kushtha and Shankhapushpi alleviates insanity, inauspiciousness, epilepsy and insinful conditions.

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8. Vacha mixed with honey or Lashuna with oil or Satavari with milk or juice of Brahmi is highly beneficial to cure epilepsy.
9. Water boiled with Vacha and Prativisha or Musta and Parpata or Haridra and Shunthi should be given to the patient suffering from diarrhoea.
10. Vacha medicated Taila should be applied and Vacha fermented with warm pounched lump of Vacha and Shatapushpa should be used for curing Hemorrhoids.
11. Vacha along with Devadaru, Musta, Shunthi, Ativisha and Haritaki fermented in Varuni (a type of wine) or seeds of Jyotishmati percolated in warm water is also beneficial for hemorrhoids.
12. Vacha, Vayastha, Golomi and Jatila should be worn on the body of children seized by Naigmeshagraha.
13. Vachadichurna made with Vacha, Haritaki, Hingu, Vid lavana, Kuth, Chitrak, Ajwayana and taken with honey or lukewarm water helps to cure colic.
14. Vacha mixed with honey and jaggery should be given to the patients suffering from gastritis.

Rogaghnata (Therapeutic indications) of Vacha in various Nighantu

	D.N	Sh.N	M.N	K.N	B.P	R.N	Sha.N	Maha.N	P.N
Vibandha	+			+	+			+	+
Adhamana	+			+	+			+	+
Shoolnashak	+	+	+	+	+			+	+
Apasmara			+	+	+			+	+
Unmada			+	+	+	+	+	+	+
Hridayaroga	+			+	+	+		+	+
Granthi						+	+	+	+
VatajaJwara						+	+		
Atisara						+	+	+	

- D.N -Dhanwantari Nighantu,
- M.N -Madanpal Nighantu,
- K.N - Kaiyadeva Nighantu
- R.N - Raj Nighantu,
- B.P - Bhavprakash Nighantu,
- S.N - Shodhal Nighantu,
- Sa.N -Shaligram Nighantu,
- P.N - Priya Nighantu
- Ma.N - Mahaoushad Nighantu

Different karma of Vachaaccording to different Nighantu

Indication	D.N	Sho.N	Sha.N	K.N	B.N	R.N	P.N	M.N	D.N
Vamak				+	+		+	+	
Vanhikara				+	+	+	+	+	
Mala vishodhan	+	+		+	+	+	+		+
Mutra vishodhan	+			+	+	+	+		+
Kaphaghana	+		+	+	+				+
Vataghna	+	+	+	+	+		+	+	+
Bhootaghna	+			+			+	+	+
Jantughna	+	+		+	+				+
Kanthya	+					+			+

Taxonomy;

- Kingdom – Plantae
- Subkingdom – Tracheobionta
- Superdivision – Spermatophyta
- Division – Magnoliophyta
- Class – Liliopsida
- Order – Arales
- Family – Acoraceae
- Genus - Acorus
- Species – Calamus[18]

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Varieties

Accourding Bhavprakashthere are four varieties of Vacha is found. These are as follow

1. **Ghona Vacha** – Acorus calamus Linn
2. **Bala Vacha** – Paris polyphylla Sm. Also known as Major ka phool on basis of their flower colour that is white, blue, red.
3. **Mahabhari Vacha**–Zinziber zerumbet Rosc.ex Smith
4. **Dwipantar Vacha** – Smilax chinaLinn[23]
5. **Habitat**

Vacha is indigenous to Eastern Europe and Central Asia. It is Cultivated and distributed throughout the tropics and subtropics found in moist marshy regions of India and Burma.It is generally found in wet places in India, Assam, Manipur, Uttarakhand, Karnataka, Sikkim and Naga hills etc.[19]

Morphology;

1.Macroscopic –Vacha (Acorus calamus L.) is a tall, perennial wetland monocot,which is 1-4 feet tall of the Araceae or Acoraceae family. It is an aromatic marsh herb with creeping root stock. The seemingly numerous plants seen above ground in a population probably arise from a single plant connected by an extensive underground rhizome.[20]

1.Rhizome – The root system of Vacha consist of shallow, branching rhizomes that are stout and knobby.The leaves which are basal occurs along these rhizomes while fibrous roots develops below.These plants multiplies by its rhizomes, which are long indefinite branched, smooth, pinkish or pale green. Internally it is whitish pink, pleasantly aromatic, bitter in taste.

2.Leaves - The basal leaves are erect and sword shaped which resembles iris leaves.They are smooth and flattened also along the margins.The sympodial leaf of acorus calamus is shorter than that of vegetative leaves.It has single prominent midvein, margins are curly edged or undulate.[21]

3.Flower- Plants are having very rearly flower or set fruit,but when they have it, it is 3 to 8 cm long, cylindrical in shape,greenish brown having spikes.

4.Fruit – The fruits are found to be small and berry like with few seeds[22].

2.Microscopic

Root–Transverse sections of root taken by free hand and photomicrography had been done after proper mounting and staining shows[24]

- Epidermis - these are single layered, radially elongated cells, heavily thickened outer walls
- Cortical region - Thin walledparenchyamatous cells, sheathed vascular bundles and bundles of fibre, single layer of barrel shaped endodermal cells with abundant starch grains
- Vessel and Fibres - Simple and scalariform pits,thic walled and pitted. Areticulate, annular vessels.
- Starch grains - Mostly round, rarely oval and irregular.[25]

Ethano-botanical study ofVacha;

Vacha is considered as boon for all mankind by nature use ofVacha has recommended by ayurveda for a wide range of diseases.It is

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suggested to be an antimicrobial, antidiarrhoeal, antioxidant, anti-inflammatory properties, analgesic effects .

Phytochemistry (chemical composition)

1. The dried rhizome of Vacha Acorus calamus contain the yellow aromatic volatile oils having asarone as a main constituent which contains the small quantity of sesquiterpenes and its alcohols; this rhizome also contains the choline, flavone, acoradin, galangin, acolamone, isocolamone and aerial parts of plant contains lutcolin-6,8 c-diglucoside[26]
2. The major chemical constituents of the essential oils of sweet flag are phenylpropanes, monoterpenes, and thermolabile sesquiterpenoids. The pale yellow to pale brown volatile calamus oil has an odor described as "woody-spicy with increasingly sweet after notes and great tenacity" that resembles "dried milk or sweet leather, slightly creamy-nutty," and has been compared to the fragrance of a milk-truck or shoe-repair shop (Arctander 1960)[27]
3. This characteristic aroma is derived from the chemical compound (Z,Z)-4, 7-decadienal.[2] The chemical constituents are of 67 hydrocarbons, 35 carbonyl compounds, 56 alcohols, eight phenols, two furans and four oxido compounds also detected, in an alcohol extract of A. calamus var. calamus, 243 volatile components, 45 of which were new records from sweet flag.[28]
4. Methyleugenol, cis-methylisoeugenol, β-asarone, geranylacetate, β-farnesene, shyobunone, epishyobunone and isoshyobunone are the most abundant chemical compounds which are present % of the essential oil. The other chemical components include α and γasarone.[29]

Pharmacological activities;

1. **Nootropic activity** – The neuropsycho-pharmacological effect of polyherbal formulation BramhiGhrita on learning and memory processes in rats by elevated plus maze and mice.It contains Acorus calamus .The effect of this tested on learning and memory processes.ThisBrahmi grita act on memory enhancer formulation and also helpful as a supportive adjuvant.[30]
2. **Antihypertensive activity** – The antihypertensive effects of A. calamus were studied in combination with Gymnemasylvestre in the HFD-induced hypertension in rats. The HFD was given for 4 weeks, which significantly increased the average systolic blood pressure (SBP). At a 200 mg/kg dose, this A. calamus in combination with G. sylvestre reduced the SBP and heart rate significantly. This shows that A.calamus with G. sylvestre exhibited synergistic effect as compared with individual herbs.[31]
3. **Anticonvulsant activity –** Methanolic extract of this Vachaplant showed analgesic effect on the rat, in the study which is done through the Writhing response.[32]
4. **Antidepressant activity** –In a clinical study in fifty cases of depression Acorus calamus (500 mg in a dose of 2 tablets three times a day after meal with water) given for six weeks. It showed reduction in the degree of severity of depression and better rehabilitation.There was also a significant improvement in assessment based on rating of symptoms on Hamilton depression rating scale. The rate of improvement before and after treatment was significant[33]
5. **Anti-Obesity activity** - The β-asarone compound which is isolated from the rhizome was investigated against high-fat diet (HFD)-induced obesity in animals.This β-Asarone-treated adipose rats showed weight loss, but also inhibited metabolic transformations, as well as glucose intolerance, elevated cholesterol, and adipokine variance.[34] The in vitro investigation on the A. calamus aqueous extract showed lipid-lowering activity through inhibition of the pancreatic lipase percentage (28.73%).[35]
6. **Anti-diabetic Activity** - Oral glucose tolerance test (OGTT) was performed in normal rats. Male albino rats had render diabetic by STZ (40 mg/kg, intra-peritoneally). 200 mg/kg of AC extract was administered orally to diabetic rats for 21 days to determine the anti-hyperglycaemic activity. Results showed significant restoration of the levels of blood glucose level. After 21 days of treatment, blood glucose, lipid profile, glucose 6-phosphatase, fructose 1, 6 bis phosphatise levels and hepatic markers enzymes were decreased when compared with diabetic control.[36][37]
7. **Anticancer activity** - Acorus calamus rhizomes was evaluated for anticancer study. In this study, hydro alcoholic extract of

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Terminalia chebula, rhizome of Acorus calamus and root of Glycyrrhiza glabra was prepared and further their antiproliferative activity on anticancer cell was studied. Results predict the fact that all of these plant materials have significant antiproliferative activity.[38][39]

8. **Antimicrobial and Antifungal activity** - The antimicrobial and antifungal activity of Acorus calamus rhizome and leaf was evaluated. In this study, petroleum ether, chloroform, hexane and ethyl acetate extract of rhizomes was highly effective in amtifungal and antimicrobial activity beta asarone is highly effective for this antifungal activity.[40]

II. CONCLUSION

VachaAcorus calamus.L belongs to Araceae family is important medicinal plant used in Ayurveda traditional medicine to treat different health conditions. As Vacha is traditional medicine it is useful in diseases like Slurred speech, Headache, Edema, Skin diseases, Eye disorder,Gastritis, Heart diseases, Colic pain, Indigestion. Due to its Rasayan karma regular intake of Vacha helpful in endowed with sharp intellect and sweet voice. Essential oil of Vacha has antispasmodic and carminative effect and also used for treatment of Epilepsy, mental aliment, chronic diarrhea, dysentery, bronchial asthma. Vacha is also used in remittent fevers and is held in high esteem as an insectifuge, especially for fleas. So this AcorusCalamus plant helps in treating different aliments involving various systems and enhances the immunity and improves hoarseness of voice. So further studies must be carried out to explore some other benefits of Vacha .

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