

A CRITICAL REVIEW OF VACHA (ACORUS CALAMUS L.) IN AYURVEDIC & MODERN CONTEXT**Dr. Sohit Singh^{*1}, Dr. Manoj Yadav² and Dr. Manoj³**¹Assistant Professor, Department of Dravyaguna, G.S. Ayurveda Medical College and Hospital Hapur. UP.²Associate Professor, Department of Rachana Sharir, G.S. Ayurveda Medical College and Hospital Hapur. UP.³Assistant Professor, Department of Rasashastra & Bhaisajyakalpana, G.S. Ayurveda Medical College and Hospital Hapur. UP.***Corresponding Author: Dr. Sohit Singh**

Assistant Professor, Department of Dravyaguna, G.S. Ayurveda Medical College and Hospital Hapur. UP.

Article Received on 04/01/2022

Article Revised on 25/01/2022

Article Accepted on 15/02/2022

ABSTRACT

Last few eras have again shown a important resurgence of interest in medicinal plants. The reason behind is the increasing awareness about the limitations of the synthetic chemotherapeutic agents. Now herbal medicines and natural products are in big demand all over the world. One of the important medicinal plants used in Ayurveda traditional medicine to treat different ailments and maintain health condition is Vacha (*Acorus calamus* Linn.). Vacha (*Acorus calamus* L.) is a herb extensively used in the Indian system of medicine belongs to the family Araceae. As traditional medicine, the plant is useful in Slurred speech, Headache, Edema, Skin diseases, Eye diseases, Colic, Piles, Indigestion, Acid gastritis, Heart disease and Ear diseases. Vacha is mentioned as one of the Rasayana dravya and its regular intake is said to make one endowed with sharp intellect and sweet voice. Ayurveda advocates Shodhana (Purificatory procedures) for poisonous substances to render it safe and effective for therapeutics. But mentioning of Shodhana for a non poisonous plant like Vacha is a matter of great curiosity with regards to the purpose of Shodhana. In this review an attempt has been made to scrutinise the notion and relevance of Vacha in view of both classical and modern thoughts.

KEYWORDS: Vacha, *Acorus calamus* L., Sweet flag, Agri-turki, Godavaj, Vekhand, Vayambu.**INTRODUCTION**

Herbal medicine, sometimes referred to as herbalism or Botanical medicine, is the use of herbs for their therapeutic or medicinal value. An herb is a plant or plant part valued for its medicinal, aromatic or savory qualities. Herb plants produce and contain a variety of chemical substance that act upon the body. It was the period of Nighantus the botanical description of the medicinal herbs came into description. Vacha (*Acorus calamus* L.) is exceedingly influential and renowned drug in Ayurveda well known for medhya karma (that which improve memory & intellect). The rhizome of this plant has been indicated as brain tonic in weak memory (API). In Sanskrit the word Vacha means that which improves speech or enhances the power of speech. It is commonly known as Sweet flag, a tall perennial wetland monocot plant from the Araceae family. It is exceedingly common in Manipur and Naga Hills and on the edges of lakes & streams. It is found throughout India under cultivation as well as in the wild state, in plains, lower elevations and in Himalayan upto altitude of 2200 ml. Vacha has a special place in Ayurveda as it is a main Medhya drug, which has the property of improving the

memory power and intellect. Poor memory, lower retention and slow recall are common problems in today's stressful and competitive world. Age, stress, emotions are conditions that may led to memory loss, amnesia, anxiety, high blood pressure, dementia and to more ominous threat like schizophrenia and Alzheimer's diseases.^[1] Vacha (*Acorus calamus* Linn.), an indigenous drug of India belongs to family Acoraceae. It is delineated under various therapeutical groups like 'Lekhaneeya', 'Triptighna', 'Arshoghna dashemani' etc., by Acharya Charaka^[2], 'Pippalyadi', 'Vachadi' etc., ganas by Acharya Sushruta^[3] and 'Mustadi', 'Vatsakadi' etc., gana by Vagbhata.^[4] The pharmacognostical characters of Vacha are described through various synonyms like 'Shadgrantha' (Having six nodes), 'Uragandha' (Having strong aroma), 'Lomasha' (Having small hairs), 'Golomi' (Having small hairs like cow) etc. It has important pharmacological properties like Deepana (Appetizer), Pachana (Digestive), Vamaka (Emetic), Medhya (brain tonic), Kanthya (Good for throat), Sanjnansthapana (Restores lost consciousness), Vedanasthapana (Anodyne) etc., and hence used extensively in therapeutics.^[5,6,7] Classics like Chakradatta and Bhaishajya Ratnavali have given

emphasis on Shodana (purification process) of Vacha using different media like Gomutra (Cow's urine), Mundi Kwatha (Decoction of *Sphaeranthus indicus* Linn), Gandhodaka (Decoction of six aromatic herbs) etc.^[8,9]

Vernacular names

Vacha is commonly known as "Shadgrantha, Golomi, Ugragrathi, Sataparvika, Jatila" in 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, "Ekhand" in Konkan, "Vacha, Bacch" in Unani, "Bojho" in Nepali and "Shobu" in Japanese.^[10,11] The plant *Acorus calamus* Linn. is known as Vacha and Swaralu because it is a potent drug used for improving voice. Vacha is a semiaquatic herb having reddish brown (Aruna), hairy (Golomi, Lomashi, Jatila) and intense smelling (Uragandha) rhizome which has many nodes (Sadagratha, Sataparvika). Vacha is highly beneficial in reducing body weight (Karshani), arousing consciousness (Bodhniya, Smarniya), relieving colic (Shulaghni) and destroying organisms (Bhutanashani, Rakshoghni). Vacha is regarded generally as auspicious (Mangalya).^[12,13]

Classical reference

Acharya Charaka^[14] has categorized Vacha in Lekhaniya, Arshoghna, Triptighna, Asthapnopaga, Shirovirechana, Sanjnasthapana, Sitaprashamana Mahakashaya. Charaka enumerated Haimvati (Shweta Vacha) under Mulini Varga. In Sushruta samhita, Vacha has been found in Pippalyadi, Mustadi and Vachadi gana. Acharya Vagbhatta has included the plant Vacha in Mustadi, Vachadi, Vatsakadi, Haridradi, Chardana and Niruhana varga.

Taxonomical classification

- Kingdom: Plantae
- Subkingdom: Tracheobionta
- Super division: Spermatophyta
- Division: Magnoliophyta
- Class: Liliopsida
- Subclass: Arecida
- Order: Arales
- Family: Acoraceae
- Genus: *Acorus*
- Species: *Calamus*

Varieties

According to Bhavprakash there are four varieties of Vacha is found. These are as follows

1. **Ghona Vacha** (*Acorus calamus* Linn)
2. **Bala Vacha** (*Paris polyphylla* Sm.) (also known as Majar ka Phool on basis of their flower colour i.e. White, Blue, Red)
3. **Maha Vacha** (*Zinziber zerumbet* Rosc.ex Smith)
4. **Dwipantar Vacha** (*Smilax china* Linn)

Properties

- Rasa : Katu, Tikta
- Guna : Laghu, Tikshna
- Virya : Ushna
- Vipaka : Katu

Karma: Dosha Karma: VataKaphahsama, Pittavardhak

Samanya Karma: Dipaniya, Medhya, Kanthya, Krmihara, Vamaka, Mala-Mutravisodhanl

Botanical description

Vacha (*Acorus calamus* Linn.) is a tall, perennial wetland monocot, 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.

Rhizome: The root system consists of shallow, branching rhizomes that are stout and knobby. Tufts of basal leaves occur at intervals along these rhizomes while coarse fibrous roots develop below. The plant multiplies by its rhizomes. Rhizome is long indefinite branched, smooth, pinkish or pale green. Internally the rhizome is whitish pink in color and pleasantly aromatic, smelling of citrus, although it has a bitter taste.

Leaves: The basal leaves are erect and sword shaped, resembling Iris leaves. They are flattened and smooth along the margins. The leaves are few and distichously alternate whose size is between 0.7 and 1.7 cm wide with average of 1 cm. The sympoidal leaf of *Acorus calamus* is shorter than that of the vegetative leaves. The leaf has a single prominent midvein and then on both sides slightly raised secondary veins and many, fine tertiary veins. The margin is curly edged or undulate. Botanists distinguish between the *Acorus* species by the number of prominent leaf veins as *Acorus calamus* Linn. Has only one.

Flowers: Plants are very rarely flower or set fruit, but when they do, the flowers are 3 to 8 cm long cylindrical in shape, greenish brown and covered in a multitude of rounded spikes. The inflorescence consists of a leaf-like spathe and a spike-like spadix, produced from the middle of the spathe, that is densely covered with yellow and green flowers. The spadix, at the time of expansion, can reach a length between 4.9 and 8.9 cm. Flowers blossom in early to late summer depending on the latitude.

Fruits: The fruits are found to be small and berry like with few seeds.

Distribution

It is distributed throughout the tropics and subtropics, especially in India and Sri Lanka. It is found in marshes, wild or cultivated, ascending the Himalayas up to 1800 m in Sikkim. It is plentiful in marshy tracts of Kashmir

and Sirmoor, in Manipur and Naga Hills. It is regularly cultivated in Koratagere taluk in Karnataka. The plant is grown in clayey loams and light alluvial soil of river bank. It is now found widely wild on the margin of pounds and rivers in most English countries.^[15]

Parts Used: The parts used in most of the experimental studies are the leaves, roots (rhizomes) and stem of the plant. In Traditional systems of medicine mostly the rhizomes are used.^[16]

Table 1: Table showing classification of Vacha by different Acharya.

Samhita & Nighantu	Varga
Charaka Samhita	Virechan Varga; Lekhaniya, Triptighana, Arshoghna, Asthapanopaga, Sheetaprashamana & Sangyasthapan Mahakashaya; Shirovirechana Dravya, Tikta Skanda.
Sushruta Samhita	Pippalyadi, Vachadi, Mustadi Gana; Urdhavabagahara & Shirovirechana Dravya.
Ashtanga Hridaya	Tikta Skanda, Vachadi Gana, Mustadi Gana, Vamaka Gana, Vastakada Gana, Niruha Gana
Ashtanga Sangraha	Vamaka & Virechaka Gana, Niruha Gana, Shirovirechana Gana, Lekhaniya Gana, Hridhya, Gana, Arshoghna Gana, Sheetaprashamana Gana, Sangyasthapan Gana, Vatsakadi & haridradi Gana
Dhanvantari Nighantu	Shatpushpadi Varga
Shodala Nighantu	Shatpushpadi Varga
Madanpala Nighantu	Shuntyadi Varga
Kaiyadev Nighantu	Oushadi Varga
Bhavprakasha Nighantu	Haritakyadi Varga
Raj Nighantu	Pippalyadi Varga
Shaligram Nighantu	Haritakyadi Varga
Shankara Nighantu	Haritakyadi Varga
Mahaoushadi Nighantu	Mahaoushadi Varga
Brihat Nighantu Ratnakara	Vachadi, Pippalyadi & Mustadi Gana
Nighantu Adarsha	Vachadi Varga
Priya Nighantu	Shatpushpadi Varga

Table no 2: Karma (Action) of Vacha in various Nighantu.

Karma	D.N	Sho.N	M.N	K.N	B.P	R.N	Sha.N	Maha. N	P.N
Vamaka			+	+	+	+	+	+	+
Vanhikara			+	+	+	+	+	+	+
Mala Vishodhan	+			+	+			+	
Mutra Vishodhana	+			+	+			+	
Kaphaghana	+	+		+	+	+	+		+
Vataghna	+	+	+	+	+	+	+		+
Bhootaghna			+		+	+	+	+	+
Jantughna	+			+	+			+	
Kanthya	+								
Medhya	+	+		+			+		
Krimighna	+						+		
Ayushya	+						+		
Amapachaka				+			+		
Vrishya							+		
Swaradayaka			+	+				+	
Vatanuloman									+
Jivaniya				+					
Rakshoghna				+					
Dipana	+			+				+	
Smritivardhak									
		+							

D.N-Dhanwantari Nighantu; S.N-Sodhala Nighantu; M.N-Madanapala Nighantu;

R.N-Raj Nighantu; K.N-Kaiyadeva Nighantu; B.P.N-Bhavaprakasha Nighantu;
Sa.N-Shaligram Nighantu; Ma.N-Mahaoushad Nighantu; P.N-Priya Nighantu.

Table no 3: Rogagnata (Therapeutic indication) of Vacha in various Nighantu.

Roga	D.N	Sh.N	M.N	K.N	B.P	R.N	Sha.N	Maha.N	P.N
Vibandha	+			+	+			+	+
Adhamana	+			+	+			+	+
Shoolanashak	+	+	+	+	+			+	+
Apasmara			+	+	+			+	+
Unmada			+	+	+	+	+	+	+
Hridya Roga	+			+	+			+	+
Granthi						+	+		
Shotha						+	+	+	
Vataja Jwara						+	+	+	
Atisara						+	+		

D.N-Dhanwantari Nighantu; S.N-Sodhala Nighantu; M.N-Madanapala Nighantu;
R.N-Raj Nighantu; K.N-Kaiyadeva Nighantu; B.P.N-Bhavaprakasha Nighantu;
Sa.N-Shaligram Nighantu; Ma.N-Mahaoushad Nighantu; P.N-Priya Nighantu.

Chemical constituents

The dried rhizome of *Acorus calamus* contain the yellow aromatic volatile oils having asarone as a main constituent which contains the small quantity of sesquiterpenes and its alcohols; the rhizome also contains the choline, flavone, acoradin, galangin, acolamone, isocolamone and aerial parts of plant contains luteolin-6,8 c-diglucoside.^[17] 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). This characteristic aroma is derived from the chemical compound (Z,Z)-4, 7-decadienal. 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. Methyleugenol, cis-methylisoeugenol, β -asarone, geranylacetate, β -farnesene, shyobunone, epishyobunone and isoshyobunone are the most abundant chemical compounds which are present in 20% of the essential oil. The other chemical components include α and γ -asarone, calamenene, asaronaldehyde, acorenone, calamenone, n-heptanic acid, calanendiol, numerous sesquiterpenes, and other compounds in the plant. This oil and asarone has a relaxing effect on smooth muscle tissue. Tannins, starches, mucin, soft gums and resins are also present in this plant. Lectins present in plant have mitogenic action on mononuclear cells of human cells (macrophages of murine spleen). Lectins have inhibitory effect on the growth of some neoplastic cell lines from mice. Saponins showed effects against hyperlipidemia in rats. Especially α and β -asarone are highly active in

antioxidant, antilipidemic, antimicrobial, anticancer, immunosuppressive, antidiabetes activities.^[18,19]

Pharmacological actions

Nootropic Activity

The neuropsychopharmacological effect of a polyherbal formulation Bramhi Ghrita (BG) on learning and memory processes in rats by elevated plus maze, and in mice by Morris water maze model. It contains *Acorus calamus*. Its effect has tested on learning and memory processes. Brami grita act on memory enhancer formulation and may also be helpful as a supportive adjuvant in the treatment of impair memory functions.^[20]

Anti-diabetic Activity Oral glucose tolerance test (OGTT) was performed in normal rats. Male albino rats had rendered 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 by estimating various biochemical parameters. 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 phosphatase levels and hepatic markers enzymes were decreased when compared with diabetic control. Plasma insulin, tissue glycogen, glucose-6-phosphate dehydrogenase levels were increased significantly compared to diabetic control. parallel histopathological studies of the pancreas showed analogous regeneration by extract which were earlier necrosed by STZ.^[21]

Anti-Obesity Effect: The β -asarone compound isolated from the rhizome was investigated against high-fat diet (HFD)-induced obesity in animals. β -Asarone-treated adipose rats showed weight loss, but also inhibited metabolic transformations, as well as glucose intolerance, elevated cholesterol, and adipokine variance.^[22] The in vitro investigation on the *A. calamus* aqueous extract showed lipid-lowering activity through

inhibition of the pancreatic lipase percentage (28.73%).^[23]

Antihypertensive Effect: The antihypertensive effects of *A. calamus* were studied on their own, in isolation, and in combination with *Gymnema sylvestre* 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, *A. calamus* in combination with *G. sylvestre* reduced the SBP and heart rate significantly. *A. calamus* with *G. sylvestre* exhibited synergistic effect as compared with individual herbs.^[24]

Anti-Inflammatory and Immunomodulatory Effect: The methanolic *A. calamus* rhizome extract (12.5 µg/mL) prevented the VCAP-1 and intercellular expression on the surface of mouse myeloid leukemia cells and murine endothelial cells, respectively.^[25] In an in vitro anti-inflammatory study (Red blood cell membrane stabilization method), the *A. calamus* aqueous rhizome extract at the highest concentration of 10 mg/mL showed insignificant activity against hemolysis inhibition and the RBC membrane stabilization percentage.^[26] Aqueous *A. calamus* leave extract was studied on HaCaT cells and restricted the characteristics of interleukin (IL)-8, IL-6 RNA protein levels alongside interferon regulatory factor 3 (IRF3) and nuclear factor κB (NF-κB) activation.^[27] N-hexane, butanolic, and aqueous fractions of *A. calamus* were evaluated against cyclooxygenase (COX) and lipoxygenase (LOX)-mediated eicosanoid production by arachidonic acid. The butanolic fraction inhibited the COX-mediated production of thromboxane B2 (TXB2) and lipoxygenase product 1 (LP1). Investigation of the underlying signaling pathways revealed that the butanolic fraction inhibited phospholipase C (PLC) pathway in platelets, presumably acting on protein kinase C (PKC).^[28] The essential oil isolated from *A. calamus* was evaluated by protein denaturation assay, where at the concentration level of 300 µg/mL, 69.56% of the inhibition level was observed.^[29]

Anti-seizures Activity To evaluate the efficacy of aqueous extract of *Acorus calamus* (AEAC) on electrical and chemical induced seizures in albino mice. Either normal saline or sodium valproate or AEAC was given sixty minutes prior to the experiment in acute study, whereas in chronic study, they were given twice daily for ten days and the last dose was given before lone hour to the contact of the animal either to maximal electrical shock (MES) or pentylenetetrazole (PTZ) administration. On acute administration, AEAC dose dependently decreased the duration of tonic hind limb extension in MES induced seizure that was comparable to that produced by sodium valproate. In PTZ induced seizures, the test drug decreased the latency and increased the period of seizures and mortality. On repeated management the test drug extensively reduced the

duration of tonic hind limb extension and also the clonus phase of MES induced seizures.^[30]

Antidepressant Activity In a clinical study in fifty cases of depression at OPD of S.S. Hospital BHU, Varanasi, *Acorus calamus* (500 mg in a dose of 2 tablets three times a day after meal with water) given for six weeks 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 ($P < 0.001$).^[31]

Neuromodulatory Effect

Acorus calamus methanolic extract (ACME) and acetone extract (ACAE) pre-treatment at a range of doses against apomorphine (APM) induced stereotyped behavior and haloperidol induced catalepsy in mice was studied. ACME (20, 50 mg/kg BW p.o) considerably reversed stereotypy induced by APM, when administered before 6 h to APM. It is also found that ACME (50 mg/kg body weight, per oral) and ACAE (20, 50 mg/kg body weight, per oral) administration significantly potentiated the haloperidol induced catalepsy in mice.^[32]

Vacha (*Acorus calamus* Linn.) Shodhana in Ayurveda

Shodhana for Vacha seems to be an uncommon procedure in the Ayurvedic armamentarium because of its only reference in Chakradatta. Also lack of therapeutic indications particularly for Shodhita Vacha makes us to assume that Shodhana was not particularly intended to reduce the toxicity, but alter its pharmacological activity desirably.^[33]

CONCLUSION

Vacha One of the important medicinal plants used in Ayurveda traditional medicine to treat different ailments and maintain health condition is Vacha (*Acorus calamus* Linn.). Vacha (*Acorus calamus* L.) is a herb extensively used in the Indian system of medicine belongs to the family Araceae. As traditional medicine, the plant is useful in Slurred speech, Headache, Edema, Skin diseases, Eye diseases, Colic, Piles, Indigestion, Acid gastritis, Heart disease and Ear diseases. Vacha is mentioned as one of the Rasayana dravya and its regular intake is said to make one endowed with sharp intellect and sweet voice. Ayurveda advocates Shodhana (Purificatory procedures) for poisonous substances to render it safe and effective for therapeutics.

REFERENCES

1. Debjit Bhowmik, Chiranjib, Pankaj Tiwari, K. K. Tripathi and K. P. SampathKumar. Traditional Indian memory enhancer herbs and their medicinal importance. Scholars Research Library, Annals of Biological Research, 2010; 1: 41- 46.
2. Agnivesha. Charaka Samhita. Part I. In: Kashinatha Shastry & Gorakhanatha Chaturvedi (ed.). Varanasi:

- Chaukambha Bharati Academy; 2001. p. 72, 80, 81, 83, 94 and 791.
- Sushruta. Sushruta Samhita. Part I. In: Kaviraja Ambikadatta Shastri (ed.). Varanasi: Chaukhambha Sanskrit Sansthan; 2002. p. 143, 145 and 147.
 - Vagbhata. Ashtanga Samgraha. In: Kaviraja Atrideva (ed.). Varanasi: Chaukhambha Krishnadas Academy, 2005; 140,138 and 139.
 - Bhavamishra. Bhavaprakasha nighantu, Hareetakyadi varga/103. In: G. S. Pandey (ed.). Varanasi: Chaukhambha Bharati Academy, 2006; 43-45.
 - Dhanvantari nighantu. Shatapushpadi varga/7-8. In: Sharma PV.(ed.). Varanasi: Chaukhambha Orientalia; 2005. p. 71.
 - Kaiyadeva. Kaiyadeva nighantu. Oushadhi varga/1215-1217. In: Sharma PV (ed.). Varanasi: Chaukhambha Orientalia, 2001; 224- 225.
 - Chakrapanidatta. Chakradatta. In: Ramanath Dwivedi (ed.). Varanasi: Chaukamba Sanskrit Samsthan, 2005; 155.
 - Govind Das. Bhaishajya Ratnavali. In: Brahmashankar Mishra (ed.). Varanasi: Chaukhambha Surabharati Prakashan, 2008; 570.
 - 10 . Dr. K.M. Nadkarni, Indian Materia Medica, Second edition, Revised and enlarged by A.K. Nadkarni, Publisher Bombay Popular Prakashan; Year, 2005; 1: 35.
 - en.m.wikipedia.org/wiki/Acorus_calamus (Accessed on 21/10/14)
 - Sharma Priya Vrat, Namarupajnanam, Satyapriya Prakashan Varanasi, 2000; 116.
 - 13.. Dr. J.L.N Sastry, Ayurvedokta Oushadha Niruktamala, Varnasi: Chaukhambha Orientalia, Year, 2001; 95-96.
 - Charak Samhita, Prof. K.R. Srikantha Murthy, Chaukhamba Orientalia, Varanasi. Print: Sutra sthana and Nidana sthana, 2004; 1: 77.
 - 15 . Balakumbhan R, Rajamani K, Kumanan K. Acorus calamus: An overview. J Med Plant Res., 2010; 4: 2740-45.
 - Paithankar VV, Belsare SL, Charde RM, Vyas JV. Acorus calamus: An overview. Int J Biomed Sc., 2011; 2: 518-29.
 - A.E. Raja, M. Vijayalakshmi & G. Devalarao., Research J. Pharm and Tech., 2009; 2(2).
 - [http://bsienvis.nic.in/medi.htm#Acorus calamus](http://bsienvis.nic.in/medi.htm#Acorus_calamus) (Accessed on 2/11/14)
 - http://www.sigmaaldrich.com/lifescience/nutrition_research/learningcenter/plantprofiler/acorus-calamus.html (Accessed on 2/11/14)
 - Dong W, Yang D, Runhua Lu. Chemical Constituents from the Rhizome of Acorus calamus L. Planta Med., 2010; 76: 454-7.
 - Nadkarni KM. Indian Plants and Drugs with their medicinal properties and Uses. New Delhi: Srishti Book Distributors, 2005; 16-7.
 - Thakare, M.M.; Surana, S.J. β -Asarone modulate adipokines and attenuates high fat diet-induced metabolic abnormalities in Wistar rats. Pharmacol. Res., 2016; 103: 227–235. [CrossRef] [PubMed]
 - Karthiga, T.; Venkatalakshmi, P.; Vadivel, V.; Brindha, P. In-vitro anti-obesity, antioxidant and anti-inflammatory studies on the selected medicinal plants. Int. J. Toxicol. Pharmacol. Res., 2016; 8: 332–340.
 - Singh, D.K.; Kumar, N.; Sachan, A.; Lakhani, P.; Tutu, S.; Shankar, P.; Dixit, R.K. An experimental study to see the antihypertensive effects of gymnema sylvestre and acorus calamus in wistar rats and its comparison with amlodipine. Asian J. Med. Sci., 2017; 8: 11–15. [CrossRef]
 - Tanaka, S.; Yoichi, S.; Ao, L.; Matumoto, M.; Morimoto, K.; Akimoto, N.; Zaini bin Asmawi, M. Potential immunosuppressive and anti-inflammatory activities of Malaysian medicinal plants characterized by reduced cell surface expression of cell adhesion molecules. Phytother. Res., 2001; 15: 681–686. [CrossRef]
 - Kim, H.; Han, T.H.; Lee, S.G. Anti-inflammatory activity of a water extract of Acorus calamus L. leaves on keratinocyte HaCaT cells. J. Ethnopharmacol, 2009; 122: 149–156. [CrossRef]
 - Ahmed, S.; Gul, S.; Zia-Ul-Haq, M.; Stankovi'c, M.S. Pharmacological basis of the use of Acorus calamus L. in inflammatory diseases and underlying signal transduction pathways. Bol. Latinoam. Caribe Plantas Med. Arom at., 2014; 13: 38–46.
 - Loying, R.; Gogoi, R.; Sarma, N.; Borah, A.; Munda, S.; Pandey, S.K.; Lal, M. Chemical Compositions, In-vitro Antioxidant, Anti-microbial, Anti-inflammatory and Cytotoxic Activities of Essential Oil of Acorus calamus L. Rhizome from North-East India. J. Essent. Oil Bear. Plants, 2019; 22: 1299–1312. [CrossRef]
 - Dwivedi P, Singh R, Malik MT, Jawaaid T. A traditional approach to herbal Nootropic agents: An overview. Int J Pharm Sci Res., 2012; 3: 630-6.
 - Prisilla DH, Balamurugan R, Shah HR. Antidiabetic activity of methanol extract of Acorus calamus in STZ induced diabetic rats. Asian Pac J Trop Biomed, 2012; 2(2): 941-6.
 - Gopalakrishna HN, Sudhakar P, Shilin G, Shenoy AK, Holla, GK, Nair V, et al. Effect of Acoruscalamus on electrical and chemical induced seizures in mice. Int J Appl Biolo Pharma Technol, 2010; 1: 465-72.
 - Bhat Savitha D et al / IJRAP, May–Jun, 2012; 3(): 343.