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GC MS Analysis of One Ayurvedic Preparation 'Aswagandharishtam'

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Aswagandharishtam is classical medicine for diseases pertaining to nervous system and digestive system prepared by a number of plants and plant parts. The present work is to know the types of biomolecules present in it by GC MS analysis. Aswagandharishtam was procured from standard Ayurvedic outlet and was subjected to Gas Chromatography Mass Spectrometry after due processing.The GC MS analysis of Aswagandharishtam has shown some promising molecules like Prostaglandin A2, Cholesterol, Piperine, Gentamicin a, d-Mannose, Eugenol, Pipradrol among others, which have activities similar to that of Aswagadharistham. This is a preliminary report where some clue about the various types of biomolecules present in Aswagandharishtam was obtained. Further work is on to prove the efficacy of this medicine by other parameters.

Keywords: Aswagandharishtam, GC MS, Piperine, Eugenol, Cholesterol, d-Mannose.

Ashwagandharishta or Aswagandharishtam is a liquid Ayurveda medicine used in the treatment of feeling tired all the time, psychiatric conditions, dullness, loss of memory, sluggishness, epilepsy, stomach problems like low digestion power, emaciation, Piles and Vata imbalance diseases. This increases ojas, nourishes all dhatus. It is also used as a nervine tonic. sexual disorders, depression etc. Ashwagandharishta contains about 5 – 10 % of self generated natural alcohol in it acts as a media to deliver water and alcohol soluble the active herbal components to the body. The dosage of this medicine in usually 12-24 ml twice daily after food or as advised by the physician. Not much scientific data of validation of this medicine is available. The present work undertakes the GC

MS analysis of this medicine to throw some light on the type of molecules present in Ashwagandha and their medicinal role. This is a first step in the direction of understanding the medicinal efficacy of Aswagandharistam. This Arishtam is made of the following ingredients and the following paragraphs indicate the medicinal role of each of the ingredients briefly. The ingredients are divided into two sections: Kwatha dravyaas and Prakshepa dravyaas.

The coarse powder of Kwatha dravyaas are added with water, boiled and reduced to 12.288 liters, filtered. It is added with honey and Prakshepa Dravyaa powders are added and kept in an air tight container for one month for fermentation. After a month time, it is filtered and preserved. The manufactures of this medicine are Baidyanath, Dabur, AVN, AVP, Vaidik Herbs and Kottakkal Arya Vaidya Sala.

Ashwagandharishtam ingredients:

•Ashwagandha (*Withania somnifera*) – Root – 2.4 kg
•Mushali (*Chlorophytum tuberosum*) – Root – 960 g
•Manjishta (*Rubia cordifolia*) – Root – 480 g
•Haritaki (*Terminalia chebula*) – Fruit – 480 g
•Nisha – Turmeric – (*Curcuma longa*) rhizome – 480 g
•Daruharidra (*Berberis aristata*) – Stem – 480 g
•Yashtimadhu – Licorice – (*Glycrrhiza glabra*) Root – 480 g
•Rasna (*Pluchea lanceolata*) – Root / leaf – 480 g
•Vidari (*Pueraria tuberosa*) – Root – 480 g
•Arjuna (*Terminalia arjuna*) – stem bark – 480 g
•Mustaka (*Cyperus rotundus*) – Rhizome – 480 g
•Trivrit (*Ipomoea turpethum*) – Root – 480 g
•Sariva (Indian sarsaparilla – *Hemidesmus indicus*) – Root – 384 g
•Krishna Sariva (*Cryptolepis buchanani*) – Root – 384 g
•Shweta Candana (*Santalum album*) – heart wood – 384 g
•Rakta Candana (*Pterocarpus santalinus*) – heart wood – 384 g
•Vacha (*Acorus calamus*) – Rhizome – 384 g
•Chitraka (*Plumbago zeylanica*) – Root – 384 g
•water for decoction – 98.304 liters
•Boiled and reduced to 12.288 liters.
•Madhu – Honey – 14.4 kg
•Prakshepa – Dravyas
•Dhataki - *Woodfordia fruticosa* – Flower – 768 g
•Shunti – Ginger – (*Zingiber officinalis*) Rhizome – 96 g
•Maricha – Pepper – (*Piper nigrum*) fruit – 96 g
•Pippali – Long pepper – (*Piper longum*) - 96 g
•Twak – Cinnamon – (*Cinnamomum zeylanicum)* - 192 g
•Ela – Cardamom – (*Elettaria cardamomum*) - 192 g
•Patra (*Cinnamomum tamala*) – leaves – 192 g
•Priyangu (*Callicarpa macrophylla*) – Flower – 192 g
•Nagakeshara (*Mesua ferrea*) – Stamen – 96 g

The medicinal properties of the ingrediants are mentioned here under briefly.

Ashwagandha – Winter cherry/ Indian Ginseng (root) –*Withania somnifera* (L.) Dunal

This plant has medicinal values such as immuno-modulator, aphrodisiac, antitumor, anti-inflammatory, anti stress, antioxidant, sleep inducing, effective in memory related conditions, and cardiopulmonary systems (Uddin *et al*, 2012) (1). The phyto-constituents present in this plant like Withanoside IV or VI produced dendritic outgrowth in normal cortical neurons of isolated rat cells, whereas axonal outgrowth was observed in the treatment with withanolide A in normal cortical neurons (2). The crude extract of the plant containing the steroidal substances sitoinodosides VII–X and withaferin A augmented learning acquisition and memory in both young and old rats (3).

***Mushali (Chlorophytum tuberosum* Baker)**

The tuberous roots are medicinally important and are known commonly as *safed musali*. *Safed musali* is used as an aphrodisiac and galactogogue as well as for its nutritive, health promoting properties and immune-enhancing, hepatoprotective and antioxidants activities (4-6). The tubers are also used in fever and leucorrhoea.

Bhandi *(Rubia cordifolia)*

This plant is reported to have medicinal properties like anti-acne, anti-inflammatory, antibacterial and antioxidant (7-12).

Haritaki – Chebulic Myrobalan fruit rind – *Terminalia chebula*

One of the constituent of the common Triphala choornam, *T. chebula* bark, rind, galls etc. have been found to have activities like antioxidant, antimicrobial, antidiabetic, hepato

protective, anti-inflammatory and anti arthritic, anti mutagenic, anti proliferative, radio protective, cardio protective, hypo lipidemic, antispasmodic, Immuno-modulatory and antiviral activities (13).

Nisha – Turmeric- *Curcuma longa*

Turmeric is another important medicinal plant with its wide application as food, medicine and as preservative. Many workers have worked on this plant on various aspects. Turmeric is anti-inflammatory, antimicrobial, preservative, antifungal, anticancer, cardio protective, hypoglycemic and antidiabetic (14, 15).

Daruharidra (*Berberis aistata*)

Berberis aristata is ethno botanically important herb that is used from time immemorial by mankind for the treatment of various ailments. Sharma *et al*, 2011 has reviewed this plant's therapeutic role such as hepato-protective, hypoglycemic, anticancer, antimicrobial, anti-inflammatory, antioxidant etc. among many other medicinal values (16).

Yashti – Licorice – *Glycrrhiza glabra*

Glycrrhiza glabra is known for its medicinal properties such as anti-tussive & expectorant, antioxidant and antibacterial, anti-inflammatory, antiviral, memory enhancer, antifungal, antibacterial, anti-hyperglycemic, immune-stimulatory, hepato-protective, anticancer and anticoagulant (17).

Rasna *(Pluchea lanceolata)*

This plant is used as antirhematic, antiarthritic and as anti-inflammatory (18).

Vidari (*Pueraria tuberose)*

Various *in vitro* experimental models earlier have established its anti-oxidant and anti-inflammatory property (19, 21). Some of its other documented biological properties are anti-hyperglycemic, anti-hyperlipidemic, anti-fertility in male rats, and hepatoprotective (22-25). The tubers are rich in isoflavonoids and terpenes with daidzein, puerarin, puetubersoanol, and tuberosin as bioactive phytochemicals (26).

Arjuna- *Terminalia arjuna*

Terminalia arjuna is one of the most versatile medicinal plants having a wide spectrum of biological activity. The Hypocholesterolaemic effects of *Terminalia arjuna* tree bark was reported by Ram *et al*, 1997, in rabbits (27). Antioxidant and hypocholesterolaemic effects of *Terminalia arjuna* tree bark powder was reported by Gupta *et al*, 2001 (28). The bark of *T. arjuna* is anti-dysenteric, antipyretic, astringent, cardiotonic, litho-triptic, anticoagulant, hypolipidemic, antimicrobial and antiuremic agent (29-31). Many useful phytoconstituents have been isolated from *T. arjuna* which included triterpenoids for cardiovascular properties, tannins and flavonoids for its anticancer, antimicrobial properties and so on (32). In studies on mice, its leaves have been shown to have analgesic and anti-inflammatory properties (33).

Mushtaka - *Cyperus rotundus*

According to the Ayurveda, *C. rotundus* rhizomes are considered astringent, diaphoretic, diuretic, analgesic, antispasmodic, aromatic, carminative, antitussive, emmenagogue, litholytic, sedative, stimulant, stomachic, vermifuge, tonic and antibacterial. It is also useful for dietary management of psychotic diseases and metabolic disorders (Sivapalan, 2013) (34) They are used in treatment of nausea and vomiting, dyspepsia, colic, flatulence, diarrhoea, dysentery, intestinal parasites, fever, malaria, cough, bronchitis, renal and vesical calculi, urinary tenesmus, skin diseases, wounds, amenorrhoea, dysmenorrhoea, deficient lactation, loss of memory, insect bites, food poisoning, indigestion, nausea, dysuria, bronchitis, infertility, cervical cancer and menstrual disorders, and the aromatic oils are made of perfumes and splash (35, 36).

Trivrit – *Operculina turpethum*

Kohli *et al*, 2010 have given an exhaustive review on the medicinal importance of *Operculina turpethu*m (37).This plant has activities such as antisecretory, ulcer protective and anti-inflammatory, hepatoprotective, antibacterial activity, antioxidant and cytotoxic (38-41).

Shweta and Krishnasariva – Indian Sarsaparila – *Hemidesmus indicus*

This plant is a very rich medicinal resource having activities like antiarthritic, anticancerous, antimicrobial, antidiarrhial, anti-inflammatory, antioxidant, hepatoprotective, nootropic and antileprotic (41).

Krishna Sariva - *Cryptolepis buchanani*

Hanprasertpong *et al*, 2014, have reported that *Cryptolepis buchanani* Roem. & Schult. (Asclepiadaceae) has been used for treating inflammatory conditions such as muscle and joint pain, stiffness of tendon, and arthritis (43).

Chandana - *Santalum album*

Sandal is an age old medicinal plant and it is used for many diseases. It has curative roles such as anti hyperglycemic and anti hyper lipidemic, cardio protective, as a brain tonic and anti ulcerogenic (44, 45).

Rakta Chandana *(Pterocarpus santalinus)*

This plant is one of the oldest medicinals having properties like hepato protective, gastro protective, anticancer, antioxidant, anti diabetic and apoptotic (46).

Vacha - *Acorus calamus*

The medicinal properties of *A. calamus* were reported by Kumar and Vandana, 2012 (47). This plant has activities like antiulcer and cyto - protective, analgesic, antispasmodic, anti-inflammatory, anticonvulsant and antibacterial.

Chitraka - *Plumbago zeylanica)*

This plant has medicinal roles such as antimicrobial, anti ulcer, anti obesity, anti-inflammatory, hypo cholestrolemic, hepato protective, wound healing, cytotoxic, anticancer and antiproliferative (48).

Dhataki - *Woodfordia fruticosa*

It was reported by Dubey *et al*, 2014 that the presence of therapeutically potent antimicrobial compounds against MDR bacteria in *Woodfordia fruticosa* and the crude leaf extract had no host toxicity on human lymphocytes (49). n-butanol fraction of the extract was the most suitable bio-active fraction. The terpenes isolated were, phenol, 5-methyl-2-(1-methylethyl)-, phenol, 2-methoxy-4-(2-propenyl)-, 2, 6-octadien-1-ol, 3, 7-dimethyl-(E)-, 2, 6-octadienal, 3, 7-dimethyl-, cyclohexanol, and 2-methylene-5-(1-methylethenyl). The leaves have sedative properties and the juice of its fresh flowers, when applied on the head, supposed to reduce headache. The curative properties of *Woodfordia* are due to the presence of secondary metabolites like alkaloids, flavonoids, glycosides, phenols, saponins, sterols etc. Grover and Patni, 2013 have identified 21 compounds in the GC MS analysis of *Woodfordia* leaf extracts with important medicinal properties (50).

Sunthi - *Zingiber officinalis)*

Ginger is also one of the household medicines used against common cold, cough and indigestion. Its medicinal values are well documented. Adel and Prakash, 2014, have reported its antioxidant properties. Ginger controls vomiting and nausea during pregnancy. It controls blood pressure by blocking calcium channels (51).

Magadhi - *Piper longum*

Kumar *et al*, 2011 have reviewed the various health benefits of *Piper longum*. with many important medicinal values such as anticancer, antioxidant, hepato protective, anti-inflammatory, immunomodulatory, antimicrobial, antihyperlipidemic, analgesic, antidepressant, anti amoebic, vasodialtory, bioavailability enhancer due the presence of piperine in it, anti obesity activity, radio protective, cardioprotective and antifungal activities (52).

Pepper - *Piper nigrum*

Pepper plays a great role in digestions, useful for low appetite, sluggish digestion, abdominal pain, toxins and borborygmus (53). Its anthelmentic qualities help remove worms. The drug stimulates the thermal receptors and increases secretion of salvia and gastric mucous. It has antimicrobial effect. It influences liver and metabolic function, and has insecticidal effect. It has other pharmacological activities like antioxidant, anticonvulsant, sedative, muscle relaxant, antipyretic, anti-inflammatory, antifungal, hepatoprotective, antimicrobial, antiulcer and lipolytic (54, 55). Meghwal and Goswami, 2012 have reviewed the chemical and physiological aspects of pepper (56). The dried or fried seeds are used for various culinary and medicinal use. In Ayurveda it is known as Kapha virodhini (works against Phlegm). The decoction of Pepper is used for treating cough.

Twak – Cinnamon – *Cinnamomum zeylanicum*

Almost every part of the cinnamon tree has some medicinal or culinary use. Ranasinghe *et al* 2013 and Jayaprakasha *et al*, 2011, have reviewed the medicinal properties of Cinnamon (57, 58).

Ela - Cardamom - *Elettaria cardamomum*

Cardamom is another important culinary ingredient used for its characteristic aroma. Apart from the aroma it has medicinal value. Verma *et al,* 2009, have reported blood pressure lowering, fibrinolysis enhancing and antioxidant activities of Cardamom (59). Khan *et a*l, 2011 have shown the pharmacological basis of cardamom as medicine for asthma (60).

Patra - *Cinnamomum tamala* (Buch.-Ham.)

Its leaf and bark is used widely as

flavouring agent in various culinary preparations. This tree is valued for its antioxidant, antimicrobial, antibacterial and antidiabetic activities (61).

Priyangu - *Callicarpa macrophylla*

The Ayurvedic Pharmacopeia of India describes the fruits of *Callicarpa macrophylla Vahl* as an essential component of several ayurvedic formulations (62, 63). The plant has been reported to have various medicinal properties. The bark is used to heal cuts and wounds. Seeds and roots are used for digestion and leaves are used for rheumatism. The fruits are used for blisters and boils. The antimicrobial and anti-inflammatory activities of this plant have been already proved (64). As many as 20 species from *Callicarpa* have reported ethnomedical uses, and several members among these are well known in the traditional medical systems of China and South Asia. Ethnomedical reports indicate their use in the treatment disorders like hepatitis, rheumatism, fever, headache, indigestion, and other ailments (65). The plant is already reported to have antibacterial, antidiabetic, analgesic and antipyretic, antifungal, anti-inflammatory and anti-arthritic activity (66).

Nagakesara -*Mesua ferrea* L.

This medicinal role of this plant was reviewed by Chahar *et al*, 2013 (67).It has medicinal activities like antioxidant and hepato protective, analgesic, antispasmodic, anti-venom, cancer chemotherapeutic, Immuno-modulatory, anti-neoplastic, anti-convulsant, anti-inflammatory, anti-ulcer and anti-microbial (68-79).

MATERIAL AND METHODS

The medicine which is available in liquid form was subjected to GC MS analysis after necessary procedure.

The metabolites in the samples were identified using a P2010 gas chromatography with thermal desorption system TD20 coupled with mass spectroscopy (Shimadzu). The ionization voltage 70ev and GC was conducted in the temperature programming mode with a Restek column (0.25mm, 60m, XTI-5). The temperature in the initial column was 80°C for 1 min, and then increased linearly to 70°C to 220°C held for 3 min followed by linear increased temperature 100° C up to 290°C and held for 10min. The injection port temperature was 290° C and the GC/MS interface was maintained at 29°C, the samples were introduced via an all glass injector working in the split mode with helium carrier gas low rate with 1.2 ml per minute. The identification of metabolites was accomplished by comparison of retention time and fragmentation pattern with mass spectra in the NIST spectral library stored in the computer software (version 1.10 beta, Shimadzu) of the GC-MS. The relative percentage of each extract constituent was expressed with peak area normalization.

RESULTS AND DISCUSSION

The GC MS analysis graph is presented in Figure 1. Table 1 represents the retention time, percentage peak values, molecular formulae, molecular weights of possible types of compounds present in the GC MS analysis.

The possible medicinal roles of each of the compounds represented in the GC MS are mentioned below referring Dr.Duke's Phytochemical and Ethnobotanical Data base and others.

1. 1,1'-(1-Methyl-1,2-ethanediylidene) bis(cyanoacetohydrazide): Catechol-O-methyl-Transferae – Inhibitor and Methyl donar.
2. Propanenitrile, 3-chloro: Not Known.
3. Dichloroacetic acid, allyl ester: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production
4. Pyridine, 2,3,4,5-tetrahydro- Not Known
5. E-2-Octadecadecen-1-ol: Oligosaccharide provider, anticancer, antidote, Cytochrome-P450 2E1-Inhibitor, Decerease Epinephrine Production.
6. Pyrrolidine, 1-(3-chloro-4,4,4-trifluoro-2-phenyl-2-butenyl)- antiulcer, anti-tuberculosis and herbicidal activity.
7 Tramadol: It is opioid pain medicine used for moderate to severe pain.
8. Acetamide, N-(2-cyano-4,5-dimethoxyphenyl)-2-(pyrrolidin-1-yl)- Not known
9. Cyclopropanecarboxylic acid, isobornyl ester: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibits uric acid production
10. R-lavandulyl acetate: anti inflammatory
11. Geranyl vinyl ether: anti-microbial, anticancer

and antimalarial

12. 4-Amino-1, 5-pentandioic acid: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production

13. Ethyl hydrogen succinate: Hydrogen Peroxide Inhibitor, Succinate dehydrogenase inhibitor

14. Dichloroacetic acid, allyl ester: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production,

15. 1-(3-Acetamidophenyl)-3-(2,2,2-trichloro-1-isovaleramidoethyl)-2-thiourea : Not known

16. 3-Methyl-2-butenoic acid, propyl ester: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production

17. 3-Phenylpropanol: Antibacterial

18. Furan-2-one, 3,4-dihydroxy-5-[1-hydroxy-2-fluoroethyl]- 17-Beta-hydroxysteroid – dehydrgenase inhibitor, Testosterone Hydroxylase inhibitor.

19. Pipradrol: Psychotic activity, anticonvulsant

20. Formyl glutamine: Amino acid derivative

21. Eugenol or Phenol, 2-methoxy-3-(2-propenyl): Synthetic Eugenol has been reported to have many important medicinal properties as is described by many reporters. It has medicinal roles such as antifungal, antioxidan, anticonvulsant and local anaesthetic, antistress and bacteriostatic, bactericidal, Anticarcinogenic, depresses activity of central nervous depressant, anti radiation, antiviral, induces apoptosis in melanoma cells and HL-60 leukemia cells (80-86).

22. d-Mannose: 17-beta- hydroxysteroid dehydrogenase inhibitor, Anticancer (Duodenum), Circulatory depressant, CNS- Depressant, Coronary dilator, Cyclin-D1-Inhibitor, Decongestant, Decrease endothelial platelet adhesion

23. Desulphosinigrin: Not known

24. L-Glucose: Glucode-6-Phosphate Inhibitor, Anti LDL, Decrease lactate, 12-Lipoxygenase-Inhibitor

24. Asarone: is a known antifungal (87).

26. Folic Acid: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production

27. Pyrrolizin-1, 7-dione-6-carboxylic acid, methyl(ester): Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production

28. Gentamicin a: 5-Alpha Reductase inhibitor, Acetyle cholin anatagonist, AChE Inhibitor, Adaptogen

29. Tricyclo[4.4.0.0(2,7)]dec-8-ene-3-methanol, à,à,6,8-tetramethyl-, stereoisomer

30. (-)-Spathulenol Antioxidant and anti-inflammatory activities

31. 1H-Cycloprop[e]azulen-7-ol, decahydro-1,1,7-trimethyl-4-methylene-, [1ar-(1aà,4aà,7á,7aá,7bà)]- Antiobesity

32. Cyclopropanebutanoic acid, 2-[[2-[[2-[(2-pentylcyclopropyl)methyl]cyclopropyl]methyl] cyclopropyl]m: Antioxidant and anti diabetic.

32. ethyl- methyl ester; Catechol-O-Methyl Transferase Inhibitor, Methyl Donor, Methyl Guanidine inhibitor

34. Methyl 9-methyltetradecanoate: Catechol-O-Methyl-Transferase Inhibitor, Methyl-Donor.

35. Hexadecanoic acid, 14-methyl-, methyl ester: Catechol-O-Methyl-Transferase Inhibitor, Methyl-Donor.

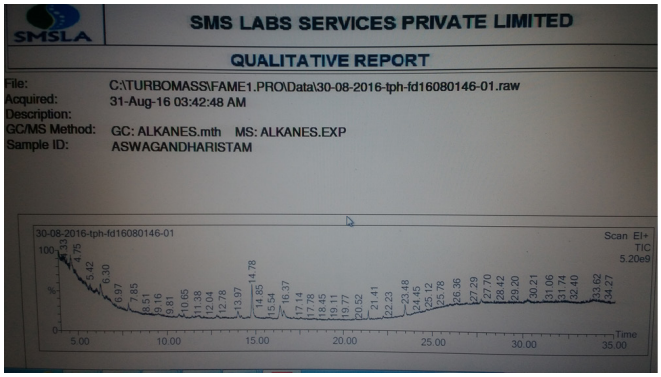

Fig. 1. The GC MS profile of Aswagandharishtam.

Table 1. Represents the retention time, percentage peak values, molecular formula, molecular weights of possible types of compounds present in the GC MS analysis

S.No.	Retention Time	% Peak Value	Name	Formula	Mol. Weight
1	4.327	0.564	Chloromethanesulfonyl chloride	CH2Cl2O2S	148
			1,1'-(1-Methyl-1,2-ethanediylidene)bis(cyanoacetohydrazide)	C9H10N6	234
			Propanenitrile, 3-chloro-	C3H4ClN	89
2.	4.695	4.181	Phenylethyl Alcohol	C8H10O	122
3.	4.975	0.506	Dichloroacetic acid, allyl ester	C5H6Cl2O2	168
			Pyridine, 2,3,4,5-tetrahydro-	C5H9N	83
			E-2-Octadecadecen-1-ol	C18H36O	268
4.	5.249	0.416	Pyrrolidine, 1-(3-chloro-4,4,4-trifluoro-2-phenyl-2-butenyl)-	C14H15ClF3N	289
			Tramadol	C16H25NO2	263
			Acetamide, N-[2-cyano-4,5-dimethoxyphenyl]-2-(pyrrolidin-1-yl)-	C15H19N3O3	
5.	5.745	0.615	Cyclopropanecarboxylic acid, isobornyl ester	C14H22O2	222
			R)-lavandulyl acetate	C12H20O2	196
			Geranyl vinyl ether	C12H20O	180
6.	6.084	0.571	4-Amino-1,5-pentandioic acid	C7H13NO4	175
			Ethyl hydrogen succinate	C6H10O4	146
7.	6.130	0.597	Dichloroacetic acid, allyl ester	C5H6Cl2O2	168
			1-(3-Acetamidophenyl)-3-(2,2,2-trichloro-1-isovaleramidoethyl)-2-thiourea	C16H21Cl3N4O2S	438
			3-Methyl-2-butenoic acid, propyl ester	C8H14O2	142
8.	6.311	2.757	3-Phenylpropanol	C9H12O	136
9.	6.877	0.423	Furan-2-one, 3,4-dihydroxy-5-[1-hydroxy-2-fluoroethyl]-	C6H7FO5	178
			Pipradrol	C18H21NO	267
			Formyl glutamine	C9H14N2O5	230
10.	7.846	1.118	Phenol, 2-methoxy-3-(2-propenyl)-	C10H12O2	164
			Eugenol	C10H12O2	164
11.	10.653	0.545	d-Mannose	C6H12O6	180
			Desulphosinigrin	C10H17NO6S	279
			L-Glucose	C6H12O6	180
12.	10.939	0.483	Asarone	C12H16O3	208
13.	11.779	0.494	Folic Acid	C19H19N7O6	441
			Pyrrolizin-1,7-dione-6-carboxylic acid, methyl(ester)	C9H11NO4	197
			Gentamicin a	C18H36N4O10	468
14.	13.979	1.679	Tricyclo[4.4.0.0(2,7)]dec-8-ene-3-methanol, à,à,6,8-tetramethyl-, stereoisomer	C15H24O	220
			(-)-Spathulenol	C15H24O	220
			1H-Cycloprop[e]azulen-7-ol, decahydro-1,1,7-trimethyl-4-methylene-, [1ar-(1aà,4aà,7á,7aá,7bà)]-	C15H24O	220
15.	14.160	0.524	Cyclopropanebutanoic acid, 2-[[2-[[2-[(2-pentylcyclopropyl)methyl]cyclopropyl]methyl]cyclopropyl]methyl]-, methyl ester	C25H42O2	374
			Methyl 9-methyltetradecanoate	C16H32O2	256
			Hexadecanoic acid, 14-methyl-, methyl ester	C18H36O2	284
16.	14.778	7.380	-Hexadecanoic acid	C16H32O2	256
17.	16.366	4.219	cis-Vaccenic acid	C18H34O2	282
			Oleic Acid	C18H34O2	282
			trans-13-Octadecenoic acid	C18H34O2	282
18.	16.593	2.629	Octadecanoic acid	C18H36O2	284
19.	21.413	1.012	Squalene	C30H50	410
20.	22.248	0.534	Piperine	C17H19NO3	285
21.	23.479	2.175	Cholesterol	C27H46O	386
			17-(1,5-Dimethylhexyl)-10,13-dimethyl-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1Hcyclopenta[a]phenanthren-3-ol	C27H46O	386
22.	26.356	0.426	Prostaglandin A2	C20H30O4	334
			7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione	C17H24O3	276
			Pregn-4-en-3-one, 20-hydroxy-, (20R)-	C21H32O2	316

36. -Hexadecanoic acid: Hexadecanoic acid is reported to have activities like antioxidant, hypocholesterolemic, nematicide, antiandrogenic, as flavoring agents, hemolytic, antibacterial and cytotoxic and as 5-alpha reductase inhibitor (88, 89).
37. cis-Vaccenic acid: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production
38. Oleic Acid: Antiinflamatory, Antiandrogenic, cancer preventive, hypercholesterolemic, 5-alpha reductase inhibitor (90).
39. trans-13-Octadecenoic acid: Acidifier, Arachidonic acid inhibitor, Increase aromatic amino acid decarboxylase activity, inhibit uric acid production
40. Octadecanoic acid: Octadecanoic acid esters are reported to be antiviral, antibacterial and antioxidant activities (91).
41. Squalene: Antibacterial, Antioxidant, Pesticide, Antitumor, Cancer preventive, Immunostimulant, Chemo preventive, Lipoxygenase-inhibitor (92).
42. Piperine: Piperine has diverse biological and supportive therapeutic activities like radioprotective, immunomodulatory and anti tumor activities, antidepressant, anticonvulsant, antinocicetive, and anti-arthritic. It helps in the absorption of selenium, vitamin B and Beta carotene as well as other nutrients. Among the various properties of piperine, the most important is that it facilitates the bioavailability of medicines by depressing the activity of drug metabolizing enzymes(93). Dendrite elongation inhibition activity was reported by Rao *et al*, 2012 (94).
43. Cholesterol: Cholesterol is precursor for steroid synthesis and is a very important biomolecule.
44. 17-(1,5-Dimethylhexyl)-10,13-dimethyl-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1Hcyclopenta[a]phenanthren-3-ol : Not known
45. Prostaglandin A2: Prostaglandin-Synthetase-Inhibitor, Prostaglandin Secretor, Inhibit AA-series- Prostaglandin synthesis
46. 7,9-Di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione: Decalcifier, Decaboxylase inhibitor, DOPA decarboxylylase inhibitor, Histidine decarboxylase inhibitor, Coronary dialator.
47. Pregn-4-en-3-one, 20-hydroxy-, (20R) - Antibiotic.

CONCLUSIONS

The GC MS analysis of Aswagandharishtam has shown some promising molecules like prostaglandin A2, Cholesterol, Piperine, Gentamicin a, d-Mannose, Eugenol, Pipradrol etc. which have a activities similar to that of Aswagadharistham. This is a preliminary report and further work is on to prove the efficacy of this medicine by other parameters.

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