RESEARCH PAPER

GC-MS Phytochemical Profiling of Guduchyadi Taila with respect to Vataja Yonivyapada (Dyspareunia and Vaginal Dryness)

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ABSTRACT

Guduchyadi Taila, a classical Ayurvedic oil formulation described in *Charaka Samhita* for *Vataja Yonivyapada* (dyspareunia and vaginal dryness), lacks phytochemical characterisation and scientific validation. Standardisation of such formulations is essential for regulatory acceptance and evidence-based integration into contemporary healthcare. *Guduchyadi Taila* was prepared at a GMP-certified facility following Ayurvedic Pharmacopoeia standards. Organoleptic and physicochemical parameters were documented. GC–MS analysis was performed on a Shimadzu GC-MS-QP2020 system at KFRI, Kerala, using hexane extraction, with compound identification via the NIST 2020 library (similarity index ≥90%). Twenty-one phytoconstituents were identified. The major compounds were benzoic acid (32.65%), stigmasta-3,5-diene (10.96%), a tocopherol/chroman derivative (10.27%), squalene (5.67%), cyclohexanecarboxylic acid (5.86%), and a phenylpropanoid dimer (5.85%). Physicochemical analysis yielded a refractive index of 1.58, specific gravity of 0.87, pH of 5.7, and viscosity of 0.05. The identified compounds exhibited anti-inflammatory, antioxidant, antibacterial, analgesic, and mucoprotective activities, collectively relevant to the symptom profile of *Vataja Yonivyapada*. GC–MS profiling of *Guduchyadi Taila* reveals a diverse array of bioactive phytoconstituents with pharmacological properties consistent with its classical therapeutic indications. These findings provide a scientific basis for its use in managing dyspareunia and vaginal dryness, supporting standardisation and evidence-based validation of this classical formulation.

Keywords: *Guduchyadi Taila*; GC–MS; *Vataja Yonivyapada*; Phytochemical standardisation; Dyspareunia.
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INTRODUCTION

In Ayurvedic texts, the method of preparing *Sneha Kalpana* is described. By using *kalka dravyas* (paste), *drava dravyas* (decoction), *Sneha dravyas* (oils), and *avapa dravyas* in a given specific proportion, oleaginous substance (*Sneha*)is prepared for pharmaceutical and therapeutic use.[1] Using this, *Guduchyadi taila* is prepared, and to determine the probable mode of action in *Vataja Yonivyapada*, physicochemical analysis with standardisation of preliminary analysis is carried out. For phytochemical profiling and quality control, Gas chromatography-mass Spectrometry (GCMS) is essential because identification of bioactive components is provided by this method. It also offers quantitative analysis. *Guduchyadi taila* mentioned in this study is described in *Charaka Samhita chikitsasthana* in the context of *vataja yonivyapada chikitsa*.[2] For confirmation of some bioactive compounds in composite formulation, GC-MS is done, and safety and quality ensuring with probable mode of action in the management of *Vataja yonivyapada* (Dyspareunia). Ayurveda provides various *tailas* used for *yonivyapada chikitsa*, including *Dhatakyadi taila*, *Saindhavadi taila*, *Balaguduchyadi taila*, *Guduchyadi taila* and *Rasanadi taila*. *Mithyachara* (improper diet and lifestyle), *Pradusta-Artava* (abnormalities of *Artava*), *Bijadosha* (abnormalities of *Bija*- sperm and ovum), *Daivakopa* (curses or anger of God) are the *hetu* (causes) of *yonivypadas*.[3] As per the classics, *Paripluta*, *Aticharana*, *Acharana*, *Shushka*, *Mahayoni* and *Antarmukhi* fall under the *Vataja Yonivyapada*. *Vataja yonivypada* has classical features like *yonishoola* (vaginal pain), *yoni shosha* (vaginal dryness), *Kathinya* (rigidity) and *gramyadharme ruja* (pain during sexual intercourse).[3,4] This condition can be correlated with Dyspareunia, vaginal dryness, and arousal disorders as per contemporary science. In classical texts of Ayurveda, the comprehensive term *Yoni* includes reproductive organs of females, such as the uterus, cervix, vagina and associated structures. The root of the word yoni is derived from Sanskrit – *yu*, which means "to unite" or "to reproduce", specifying its role in reproduction. Yoni, having *shankhanabhi akriti* (shape like a conch shell) and three *avartas* (folds), *Garbhashaya* (uterus) plays as the site for implantation and development of the fetus. *Rajopravritti* (Menstruation) is also carried through the yoni, which reflects the health of the reproductive system of females. Yoni plays a major role in *garbhadharana* (conception) by promoting *shukra* (sperm) and *shonit* (ovum) *samyoga* (union). It provides a favourable environment for *Garbhavriddhi* and *Garbhaposhana* development and nourishment of the fetus. During *prasavakala* (childbirth), it enables the delivery of the baby by acting as a birth canal. The functional unit *yoni* is responsible for menstruation, reproductive health, fertility, and sexual function. By considering genital organs' health is important in female well-being, Ayurveda texts explain different *yonivyapadas* (gynaecological disorders). [5-10]

Lactobacillus species dominate the vaginal microbiome, it maintenance mucosal integrity and acidic pH, acts as a barrier against vaginal infections, supporting *yoni swasthya* (vaginal health). Bacterial vaginosis, STIs, and yeast infections are prevented by a balanced microbiome, and the protective function of the vaginal mucosa is preserved, while microbial dysregulation increases the risk of infections by compromising mucosal integrity. The vaginal microbiome and gut are interconnected through the immune system. Gut dysbiosis leads to systemic inflammation, which further causes a reduction in lactobacillus, weakens the mucosal health of the vagina and disrupts *yoni swasthya* (vaginal health). Ayurvedic principle of *yoni swasthya* depends on gentle hygiene, aligns with avoiding vaginal washes, microbial balance maintenance, and mucosal integrity, for which adequate hydration is necessary. Microbiome imbalance leads to chronic inflammation, which affects fertility and causes vaginal discharge, itching, foul smell, indicating *yoni swasthya* compromise.[11]

Taila formulations are ideal for transvaginal drug delivery due to their lipophilic nature, which enhances the solubilization, permeation, and sustained release of bioactive compounds while increasing mucosal residence time, improving local bioavailability, and bypassing gastrointestinal degradation and first-pass metabolism. As a lipid-based drug delivery system, *Sneha Kalpana* enhances the extraction, absorption, membrane permeability, and lymphatic transport of phytoconstituents, thereby improving bioavailability and therapeutic efficacy. Additionally, its emollient and protective properties support vaginal mucosal integrity and patient comfort, making it an effective carrier for both local and systemic therapy.[12]

Guduchi (*Tinospora cordifolia*) as a *Rasayana* (rejuvenation) has been researched for its wide range of pharmacological activities, including anti-inflammatory, antibacterial, immunomodulatory, antioxidant, anticancer, antiulcer, antiviral, antipyretic, antidiabetic, anti-stress, cardioprotective, neuroprotective, hepatoprotective, as well as adaptogenic effects. Experimental studies show that *Guduchi (Tinospora cordifolia)* delays cellular deterioration and promotes the spawning of mesenchymal stem cells, which indicates the role of *Guduchi* in tissue regeneration and reinforces its *rasayana* (rejuvenation) properties.[13]

Evidence-based validation and standardisation of classical ayurvedic formulations are necessary to ensure their safety, quality, efficacy, and batch-to-batch consistency, thereby facilitating regulatory acceptance and integration into the modern healthcare system.[14]

The World Health Organisation emphasises the standardisation of traditional medicines to ensure their quality, safety, and efficacy through appropriate regulatory frameworks, quality control measures, and scientific evaluation. WHO's traditional medicine strategies encourage member states to integrate evidence-based traditional medicine into healthcare systems while

promoting standardised manufacturing practices and consistent quality assurance.[15]

Gas Chromatography–Mass Spectrometry (GC–MS) is a powerful analytical technique used to identify, characterise, and quantify volatile and semi-volatile phytochemical constituents present in herbal formulations with high sensitivity and accuracy. GC–MS studies provide scientific evidence for quality control, standardisation, and pharmacological validation of traditional medicines by correlating their chemical composition with potential biological activities.[16]

MATERIALS AND METHODS:

Study Conduction

The *Guduchyadi Taila* was prepared at Urvil Herbals, Kojoli, Trimbakeshwar, Nashik, Maharashtra, a GMP-certified Ayurvedic pharmacy, in accordance with the Ayurvedic Pharmacopoeia standards. Table 1 shows the ingredients with proportions used for the preparation of *Guduchyadi Taila*. The authentication of drugs and physicochemical analysis of *Guduchyadi Taila* were done at the same pharmacy. The prepared sample was analysed for organoleptic parameters, including colour, odour, taste, and consistency, as well as physicochemical analysis detailed in Table 2. The GC-MS analysis was done at the Centre for Analytical Instrumentation- Kerala (CAI-K), Kerala Forest Research Institute (KFRI) at Peechi, Thrissur District, Kerala.

Instrument

GC–MS analysis of *Guduchyadi Taila* was carried out using a Shimadzu GC-MS-QP2020 system, which is extensively employed for accurate qualitative and quantitative analysis due to its high sensitivity and analytical reliability**.**

Sample Preparation

Hexane Extraction-1ul of hexane was used to extract 1g of the *taila* sample. A clear solution was obtained after the removal of solid residue by filtering the extract.

Procedure

A 1 µL aliquot of the SGT sample was dissolved appropriately in HPLC-grade hexane, and 1 µL of this solution was injected into the system in split mode (split ratio 20:1). Helium was employed as the carrier gas at a constant flow rate of 1.0 mL/min. The injector temperature was maintained at 280 °C. The oven temperature program was set as follows: initial temperature 70 °C, ramped at 8 °C/min to 260 °C with a 2-min hold, followed by a second ramp of 4 °C/min to 280 °C with a final hold of 5 min. The ion source temperature was maintained at 220 °C, and the interface temperature at 280 °C. A solvent cut time of 3.10 min was applied. Mass spectra were recorded in scan mode over an m/z range of 50–500 with a scan speed of 1666 scans/s. Identification of analytes was carried out by comparing mass spectral fragmentation patterns with those in the NIST 2020 library, and compounds were accepted based on high similarity index (SI) scores and consistency of characteristic ions.

Ethical Statement

Ethical approval was not required for this study as it involved only the phytochemical analysis of a herbal formulation and did not involve human or animal subjects.

Statistical Analysis

There is no specific subsection for statistical analysis. The study relies on quantitative analysis (area percentage) and similarity indices (SI ≥90%) rather than hypothesis testing statistics.

RESULTS:

The Total Ion Chromatograph (Figure 1) shows 21 major peaks between 6.03 and 35.24 min. The most abundant compound is Benzoic acid (32.65% area) at RT 7.038 min. Second major compound: Stigmasta-3,5-diene (4.33% area) at RT 33.704 min. The name of the compounds detected, their retention time, area, height, area/height ratio and structure have been detailed in Table 3.

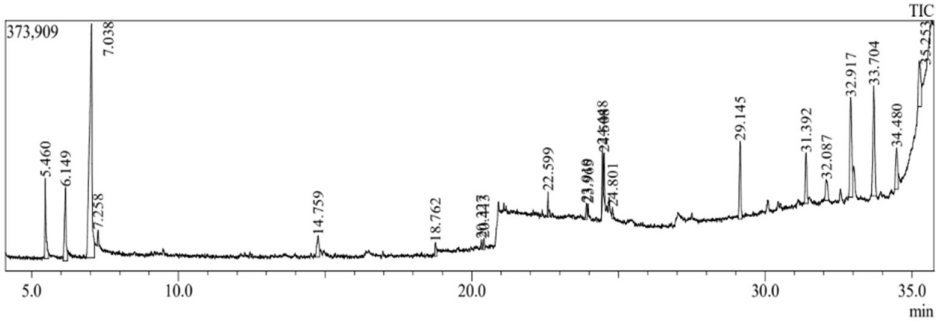


Figure 1: The Chromatograph of GC-MS Analysis of GT

Table 1: Ingredients of *Guduchyadi Taila*

S. No.	Ingredient	Drug	Latin Name	Part Used	Proportion

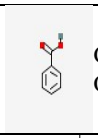
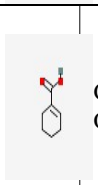
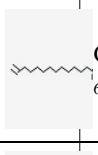
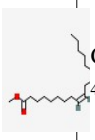
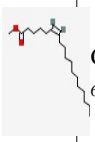
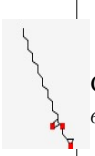
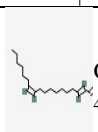
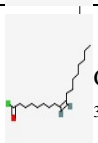
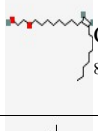
1.	*Kalka Dravya* (Paste Drug)	*Guduchi*	*Tinospora cordifolia* [Willd.] Miers	*Panchanga*	¼ Parts
		Malati	*Jasminum grandifolium*	Flower buds	
		Rasna	*Alpinia galanga*	Rhizomes	
		Bala	*Sida cordifolia*	Roots	
		Madhuka	*Glycerrhiza glabra*	Roots	
		Yuthika	*Jasminum auriculatum*	Flower buds	
		Chitrak	*Plumbago zeylanica*	Roots	
		Nidigdhika	*Solanum surattense*	*Panchanga*	
		Devadaru	*Cedrus deodara*	Bark	
2	*Kashaya Dravya (decoction drug)*	*Guduchi*	*Tinospora cordifolia* [Willd.] Miers	*Panchanga*	16 Parts
		Malati	*Jasminum grandifolium*	Flower buds	
		Rasna	*Alpinia galanga*	Rhizomes	
		Bala	*Sida cordifolia*	Roots	
		Madhuka	*Glycerrhiza glabra*	Roots	
		Yuthika	*Jasminum auriculatum*	Flower buds	
		Chitrak	*Plumbago zeylanica*	Roots	
		Nidigdhika	*Solanum surattense*	*Panchanga*	
		Devadaru	*Cedrus deodara*	Bark	
3.	*Sneha Dravya* (Oil base)	*Tila Taila*	*Sesamum indicum*	Oil	1 Part
4.	*Avapa Drava Dravya* (Added Drug)	*Goksheera*	Cow milk	Milk	1 part
		Gomutra	Cow urine	Urine	1 part

Table 2: Organoleptic and Physico-Chemical Parameters of GT Documented

Parameters	**Characters**
Description	Brown colour oil
Refractive index	1.58
Specific gravity	0.87
pH	5.7
Viscosity	0.05

Table 3: Details of Compounds detected in GCMS analysis with their Retention Time and their Activity

S. No	**Name of the compound**	**Retention time**	**Area**	**Area%**	**Height**	**Height%**	**A/H**	**Structure**	**Chemical Formula**	**Compound Class**	**Activity of Compound**
	p-Cresol	5.460	348080	5.36	119275	7.48	2.92		C_7H_8O	Phenol Derivative	Anticancer, Anticholinesterase, Antioxidant[16]
	Cyclohexanecarboxylic acid	6.149	380302	5.86	109446	6.86	3.47		$C_7H_{12}O_2$	Unsaturated Aldehyde	Antibacterial, Antiinflammatory[17]

	Benzoic acid	7.038	2119562	32.65	349083	21.88	6.07	 $C_7H_6O_2$	Aromatic Carboxylic Acid	Antibacterial, Analgesic,[18] Anti-Inflammatory, Antipyretic,[19]
	1-Cyclohexene-1-carboxylic acid	7.258	49185	0.76	23233	1.46	2.12	 $C_7H_{10}O_2$	Unsaturated Fatty Acid, Carboxylic Acid	Antiviral, Antibacterial, Anti-inflammatory, Antinociceptive[17]Antiproliferative, Anti-Inflammatory, Antimicrobial[20]
	13-Tetradecenal	14.759	160669	2.48	31619	1.98	5.08	 $C_{14}H_{26}O$	Fatty Aldehydes	Antibacterial, Antioxidant, Anti-Inflammatory, Antioxidant, Antinociceptive[21]
	n-Hexadecanoic acid	18.762	58203	0.90	20066	1.26	2.90	 $C_{16}H_{32}O_2$	Saturated Fatty Acid	Anti-inflammatory,[22]Antioxidant, Antifungal,[23] Antiplasmodial[24]
	9,12-Octadecadienoic acid (Z,Z)-methyl ester	20.327	31409	0.48	13626	0.85	2.31	 $C_{19}H_{34}O_2$	Fatty Acyls, Linoleic Acids Derivatives	Antimicrobial, Antioxidant, Anti-Inflammatory, Anticancer, Anti-Arthritic[25]
	6-Octadecenoic acid, methyl ester, (Z)-	20.413	40911	0.63	16178	1.01	2.53	 $C_{19}H_{36}O_2$	Mono-Unsaturated Fatty Acid, Fatty Acyls	Antimicrobial,[26] Anti-Inflammatory, Antinociceptive, Antipyretic, Antihyperglycemic[27]
	Glycidyl palmitate	22.599	72533	1.12	37862	2.37	1.92	 $C_{19}H_{36}O_3$	Fatty Acyls, Fatty Acid Esters, Glycidyl Esters	Anticancer, Antiinflammatory, Antimicrobial [28]
1	E,Z-1,3,12-Nonadecatriene	23.910	58243	0.90	23466	1.47	2.48	 $C_{19}H_{34}$	Unsaturated Hydrocarbon	Antimicrobial [29]
	Oleoyl chloride	23.965	28733	0.44	17651	1.11	1.63	 $C_{18}H_{33}ClO$	Acyl Halides (Acyl Chlorides)	Antibacterial[30]
	Ethanol, 2-(9,12-octadecadienyloxy)-, (Z,Z)-	24.448	164246	2.53	86575	5.43	1.90	 $C_{20}H_{38}O_2$	Alkyl Glyceryl Ethers	Anti-Inflammatory, Anti-Oxidant[31]
	9-Octadecenoic acid (Z)-,	24.508	129593	2.00	65723	4.12	1.97	 $C_{21}H_{38}O_3$	Epoxide-Containing Fatty	Anti-Inflammatory, Anti-Oxidant[32]

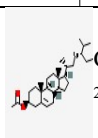
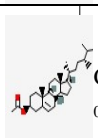
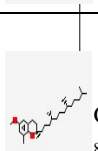
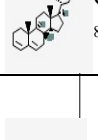
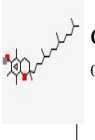
	oxiranylmethyl ester								Acid Esters	
	Myristic acid glycidyl ester	24.801	32261	0.50	16167	1.01	2.00	 $C_{17}H_{32}O_3$	Glycidyl Fatty Acid Esters	Anti-inflammatory, Antimicrobial, Antioxidant[33]
	Squalene	29.145	367951	5.67	115645	7.25	3.18	 $C_{30}H_{50}$	Polyunsaturated Triterpene Hydrocarbon	Hypocholesterolemic [33] Anti-Inflammatory, Anti-Cancer[34]
	beta-Sitosterol acetate	31.392	256131	3.95	75591	4.74	3.39	 $C_{31}H_{52}O_2$	Steroid Esters	Anti-Inflammatory, Antioxidant[35] Anti-Gastro-ulcer[36] Analgesic[37]
	Campesterol, acetate	32.087	158294	2.44	30880	1.94	5.13	 $C_{30}H_{50}O_2$	Steroid Esters	Hypocholesterolemic, anti-inflammatory, Anticancer, Antioxidant[38]
	(R)-6-Methoxy-2,8-dimethyl-2-((4R,8R)-4,8,12-trimethyltridecyl) chroman	32.917	666692	10.27	149194	9.35	4.47	 $C_{28}H_{48}O_2$	Tocopherol/ Chroman Derivative	Anti-Cancerous,[39,40] Antiepileptic,[41] Antioxidant,[42] Anti-Inflammatory[43]
	Stigmasta-3,5-diene	33.704	711590	10.96	164249	10.30	4.33	 $C_{29}H_{48}$	Steroid Derivative	Cytotoxic, Antimicrobial, Anti-Inflammatory, Antioxidant[44]
	dl-alpha-Tocopherol	34.480	276981	4.27	61434	3.85	4.51	 $C_{29}H_{50}O_2$	Prenol Lipids	Antioxidant, Anti-Inflammatory, Cardioprotective, Neuroprotective, Immunomodulatory, Anticancer, Anti-Thrombotic, Anti-Atherogenic[45]
	2,6-Bis(3,4-methylenedioxyphenyl)-3,7-dioxabicyclo(3.3.0)octane	35.253	379724	5.85	68420	4.29	5.55	 $C_{20}H_{18}O_6$	Phenylpropanoid Dimers	Antioxidant[46]

Table 4: Common Activity of the Compounds

S.No.	Activity	Number	Name of the Compound
	Anti-Oxidant	13	p-Cresol, 13-Tetradecenal, n-Hexadecanoic acid, 9,12-Octadecadienoic acid (Z,Z)- methyl ester, Ethanol, 2-(9,12-octadecadienyloxy)-, (Z,Z)-, 9-Octadecenoic acid (Z)-, oxiranylmethyl ester, Myristic acid glycidyl ester, beta-Sitosterol acetate, Campesterol, acetate,

			(R)-6-Methoxy-2,8-dimethyl-2-((4R,8R)-4,8,12-trimethyltridecyl) chroman, Stigmasta-3,5-diene, dl-alpha-Tocopherol, 2,6-Bis(3,4-methylenedioxyphenyl)-3,7-dioxabicyclo (3.3.0) octane
	Anti-Cancerous	04	p-Cresol, Squalene, Glycidyl palmitate Campesterol, acetate, (R)-6-Methoxy-2,8-dimethyl-2-((4R,8R)-4,8,12-trimethyltridecyl) chroman, dl-alpha-Tocopherol
	Anti-Inflammatory	16	Cyclohexanecarboxylic acid Benzoic acid 1-Cyclohexene-1-carboxylic acid 13-Tetradecenal n-Hexadecanoic acid 9,12-Octadecadienoic acid (Z,Z)- methyl ester 6-Octadecenoic acid, methyl ester, (Z)- Ethanol, 2-(9,12-octadecadienyloxy)-, (Z,Z)- 9-Octadecenoic acid (Z)-, oxiranylmethyl ester Myristic acid glycidyl ester Squalene beta-Sitosterol acetate Campesterol, acetate (R)-6-Methoxy-2,8-dimethyl-2-((4R,8R)-4,8,12-trimethyltridecyl) chroman Stigmasta-3,5-diene dl-alpha.-Tocopherol Glycidyl palmitate
	Anti-Bacterial	10	Cyclohexanecarboxylic acid Benzoic acid 1-Cyclohexene-1-carboxylic acid 13-Tetradecenal 9,12-Octadecadienoic acid (Z,Z)- methyl ester 6-Octadecenoic acid, methyl ester, (Z)- E,Z-1,3,12-Nonadecatriene Oleoyl chloride Myristic acid glycidyl ester Glycidyl palmitate Stigmasta-3,5-diene
	Analgesic	03	Benzoic acid 13-Tetradecenal 6-Octadecenoic acid, methyl ester, (Z)-

DISCUSSION:

Taila is classically described as the pre-eminent medium for *Vata* disorders. The lower part of the body below the umbilicus, encompassing female reproductive organs, is considered the predominant site of *Vata Dosha*. Sneha, mainly *Taila*, is best for the treatment of *Vata* disorder in Charaka Samhita. *Guduchyadi Taila* is mentioned in *Charaka Samhita* in *Yonivyapad* for *Vataja Yonivyapad Chikitsa.* It contains *Guduchi* (*Tinospora cordifolia*), *Malati (Jasminum grandifolium)*, *Rasna (Alpinia galanga), Bala (Sida cordifolia), Madhuka (Glycerrhiza glabra), Yuthika (Jasminum auriculatum), Chitraka (Plumbago zeylanica), Nidigdhika (Solanum surattense), Devadaru (Cedrus deodara),* these all drugs are taken in equal quantity of one *karsha* (12 grams) each, one *prastha* (768 mL) *Tila Taila (Sesamum Indicum L.)* and *Goksheera (Cow Milk), Gomutra (Cow Urine) two prastha each* (1536 mL).[2] These ingredients possess *Vatahara* (*vata*-pacifying), *Vedanasthapana* (pain-pacifying), *Shothahara* (anti-inflammatory) and *Rasayana* (rejuvenative) properties.

The therapeutic efficacy of *Guduchyadi Taila* may be attributed not only to its Ayurvedic properties but also to the presence of several bioactive phytochemicals present in the formulation, which are identified through GC-MS analysis. A total of 21 phytoconstituents were identified, listed in Table 3, which mainly consists Phenolic compounds, Phytosterols, Terpenoids, Fatty acid esters and Antioxidant molecules. The therapeutic efficacy of the individual drug constituents of this formulation has been established factually; the precise pharmacodynamic mechanisms moderated by their individual phytochemicals remain significantly unexplored. Elucidating these mechanisms is an important step towards bridging the gap between classical Ayurveda principles and newer contemporary

techniques. The present study endeavours to address this lacuna and thereby provides a basis for scientific validation of classical Ayurveda formulation.

Benzoic acid-Vaginal dryness is the main feature of *Vataja Yonivyapada*, which predisposes the vaginal mucosa to microtrauma and various secondary microbial infections. Benzoic acid demonstrates inhibitory activity against pathogenic microorganisms, including *Candida albicans,* which helps in the prevention of further growth of pathogens.[47] Phenolic derivatives such as Benzoic acid exhibit antioxidant property which protects vaginal tissue from oxidative stress and aid in tissue healing.[48] The anti-inflammatory properties help relieve the pain.[49]

Stigmasta-3,5-diene-Stigmasta-3,5-diene- has structural similarity to phytosterols such as stigmasterol, which is inferred to possess significant antioxidant, anti-inflammatory, and anti-microbial properties and supports epithelial tissue integrity, which is potential to alleviate vaginal discomfort and promote mucosal health, which further helps alleviate vaginal dryness and symptoms like dyspareunia.[50,51]

Tocopherol/ChromanDerivative-[(R)-6-Methoxy-2,8-dimethyl-2-((4R,8R)-4,8,12-trimethyltridecyl) chroman]-This tocopherol derivative showed the third highest abundance in GCMS analysis of *Guduchyadi taila*. These compounds are potent anti-inflammatory and antioxidant agents. Oxidative stress is mentioned as a contributing factor in mucosal dryness, impaired tissue repair and epithelial damage. Therefore, this compound may act as a protective agent for vaginal tissues against oxidative injury and facilitate the healing of damaged mucosa. The anti-inflammatory activity may contribute to reducing the local pain and discomfort. Such actions are highly relevant and important for the management of *Vataja Yonivyapada*.[42,43]

Cyclohexanecarboxylic Acid (5.86%)-Cyclohexanecarboxylic acid is anti-inflammatory and antibacterial in nature, which provides relief from symptoms such as vaginal pain and dryness caused by inflammation and microbial imbalance. The anti-inflammatory effect may alleviate local tissue irritation, and antibacterial activity supports the maintenance of healthy vaginal flora and prevents pathogenic colonisation. Thus, this compound may contribute to the restoration of vaginal health and reduce the severity of symptoms.[52,53]

2,6-Bis(3,4-methylenedioxyphenyl)-3,7-dioxabicyclo (3.3.0) octane (5.85%)-This phenylpropanoid dimer has been shown to have strong antioxidant activity. Oxidative stress is known to impair mucosal integrity and delay epithelial repair. The antioxidant activity of this compound may protect the vaginal tissues from free radical-mediated damage and promote the restoration of healthy vaginal mucosa. This action is mainly important in reducing dryness and improving tissue resilience.[54]

To add to the therapeutic potential of *Guduchyadi taila*, several minor phytoconstituents show anti-inflammatory, antioxidant, antimicrobial and analgesic activity. Fatty acid derivatives such as 9,12-octadecadienoic acid methyl ester, -Octadecenoic acid methyl ester, and n-Hexadecenoic acid help alleviate oxidative stress and inflammation; on the contrary, compounds like Glycidyl palmitate, Oleoyl chloride and Myristic acid glycidyl ester contribute to antimicrobial activity.[22,45] Phytosterols, which include β-sitosterol acetate and campesterol acetate, aid tissue protection and mucosal integrity,[35] whereas squalene provides additional antioxidant and anti-inflammatory effects.[34] Collectively, these compounds may synergistically alleviate all the symptoms of *Vataja yonivyapada*.

CONCLUSION:

GC-MS analysis of *Guduchyadi Taila* identified 21 phytoconstituents, predominantly phenolics, phytosterols, terpenoids, and fatty acid derivatives. Major compounds, including benzoic acid, stigmasta-3,5-diene, tocopherol derivatives, squalene, and β-sitosterol acetate, demonstrated significant anti-inflammatory, antioxidant, antimicrobial, and analgesic activities. These bioactive constituents collectively substantiate the classical indication of *Guduchyadi Taila* in *Vataja Yonivyapada* by addressing vaginal mucosal dryness, microbial dysregulation, oxidative stress, and pain. The lipophilic nature of the taila further enhances transvaginal bioavailability and mucosal residence. This study provides preliminary phytochemical validation of a classical Ayurvedic formulation through contemporary analytical methodology.

CONFLICT OF INTEREST: The authors declare no conflict of interest.

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