Pharmacognostical And Phyto Analytical Studies On Musali Khadiradi Choornam – An Ayurvedic Formulation For The Treatment Of Uterine Disorders

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Abstract
Musali khadiradi choornam (MKC) is prescribed by Ayurvedic physicians for the treatment of menorrhagia, leucorrhea, and polycystic ovaries syndrome (PCOS). The choornam contains six herbal drugs, they are Musali (*Curculigo orchioides*), Khadira (*Acacia catechu*), Amalaki (*Emblica officinalis*), Jambu (*Syzygium cumini*), Shatavari (*Asparagus racemosus*), and Trikanta (*Tribulus terrestris*). Various studies conducted by the National Institute of Health, Government of India, reveal that the prevalence of infertility among women with PCOS ranges from 70%-80%, and 60% of women aged 25-34 are affected by PCOS. The present study aims to evaluate the under-explored Ayurvedic formulation, "Musali khadiradi choornam" on its pharmacognostic and Phyto-analytical aspects as a step towards developing Pharmacopoeial standards. The morphological and powder microscopical observation helps authenticate the raw drugs and their formulation from adulterant in the market. The phytochemical screening including GC-MS studies brings out the drug on par with modern drug in the global markets. This study might be helpful for authentication of the formulation and making it available with global standards.

Keywords: Musali khadiradi choornam, PCOS, Ayurvedic formulation, pharmacognostic, Phyto-analytical studies.

Introduction

Ayurveda is the science of life. It is an ancient medicine of India. It is derived from Vedas more than four thousand years ago. It is based on observations of nature and man. The Aim of Ayurveda is primarily for the promotion, prolongation, and maintenance of healthy and happy human life. It also aims at the prevention of the disease. (Kulkarni P.H)

Polycystic ovary syndrome (PCOS) is a common hormonal condition that affects women of reproductive age. The condition affects an estimated 8–13% of women of reproductive age, and up to 70% of cases are undiagnosed. It usually starts during adolescence, but symptoms may fluctuate over time. PCOS can cause hormonal imbalances, irregular periods, excess androgen levels, and cysts in the ovaries. Irregular periods, usually with a lack of ovulation, can make it difficult to become pregnant. PCOS is a primary leading cause of infertility. PCOS is a chronic condition and cannot be cured. However, some symptoms can be improved through lifestyle changes, medications, and fertility treatments. The cause of PCOS is unknown but women with a family history of type 2 diabetes are at higher risk. (WHO, 2023)

Standardization of herbal medicines is the process of prescribing a set of standards or inherent characteristics, constant parameters, and definitive qualitative and quantitative values that carry an assurance of quality, efficacy, safety, and reproducibility. Several problems not applicable to synthetic drugs often influence the quality of herbal drugs which include, herbal drugs are usually mixtures of many constituents, the active principles are in most cases unknown, selective analytical methods or reference compounds may not be available commercially, plant materials are chemically and naturally variables, Chemo-varieties and chemo cultivars exist, the source and quality of the raw material are variable.

From the global perspective, there is a shift toward the use of medicine of herbal origin, as the dangers and shortcomings of modern medicine are getting more apparent. It is the cardinal responsibility of the regulatory authorities to ensure that consumers get the medication, which guarantees purity, safety, potency, and efficacy. Though herbal products have become increasingly popular throughout the world, one of the impediments to their acceptance is the lack of a standard quality control profile. The quality of herbal medicine that is, the profile of the constituents in the final product has

implications for efficacy and safety. (Kunle, Oluyemisi Folashade, Egharevba, Henry Omoregie and Ahmadu, Peter Ochogu,2012)

Musali khadiradi choornam is prescribed by Ayurveda physicians for the treatment of a wide range of gynecological conditions like leucorrhoea and menorrhagia. It is an herbal decoction, formulated by using one part of Musali (*Curculigo orchioides*), Vari (*Asparagus racemosus*), Khadira (*Acacia catechu*), Amla (*Emblica officinalis*), Trikanta (*Tribulus terrestris*), Jambu (*Syzygium cumini*) with 16 parts of water. All ingredients are mixed well and it is boiled until it is reduced to one-eighth. The current study deals with the standardization of the most important Ayurvedic formulation, Musali khadiradi choornam. (Anonymus, Sahasrayogam)

Materials and methods

Pharmacognostical studies

The plant materials are washed, shade-dried for a day, and then dried completely in an oven at 40^0C. The plants were coarsely powdered using a rotary grinder stored in airtight plastic containers and then used for phytochemical tests. Fresh leaves were used for micromorphological and anatomical studies. The morphological and organoleptic examination of *Curculigo orchioides, Asparagus racemosus, Acacia catechu, Emblica officinalis, Tribulus terrestris, Syzygium cumini* was done by observing the collected sample with the naked eye as well as under luminescent light for their color, size, and shape. The odor and taste of the material were also observed. All these observations are noted and given in the result section. (Rajesh Kumar Nema)

Physio-chemical evaluation

Determination of ash value

Total ash

Incinerate about 2 to 3 g of accurately weighed, of the ground drug in a tarred platinum or silica dish at a temperature not exceeding 450°C until free from carbon, cool, and weigh. If a carbon-free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the residue on an ashless filter paper, incinerate the residue and filter paper, add the filtrate, evaporate to dryness, and ignite at a temperature not exceeding 450°C. Calculate the percentage of ash concerning the air-dried drug. (Khadabadi S.S, Deore, Baviskar)

Acid insoluble ash

Boil the ash obtained in total ash for 5 minutes with 25 ml of dilute hydrochloric acid, collect the insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water, and ignite to constant weight. Calculate the percentage of acid-insoluble ash concerning the air-dried drug. (Khandelwal R.R, Vrunda Sethi)

Water-soluble ash

Boil the ash for 5 minutes with 25 ml of water, collect insoluble matter in a Gooch crucible, or on an ashless filter paper, wash with hot water, and ignite for 15 minutes at a temperature not exceeding 450°C. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash concerning the air-dried drug. (Gokhale S.B, Kokate C.K)

Determination of extractive value

Water-soluble extractive

Macerate 5g of air-dried drug, coarsely powdered, with 100 ml of chloroform water of the specified strength in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowing to stand for 18 hours. Thereafter, filter rapidly taking precautions against the loss of chloroform, evaporate 25 ml of the filtrate to dryness in a tared flat-bottomed shallow dish, dry at 105°C, and weigh. Calculate the percentage of water-soluble extractives concerning the air-dried drug.

Ethanol-soluble extractive

Macerate 5g of the air-dried drug, coarsely powdered, with 100 ml of ethanol of the specified strength in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowing to stand for 18 hours. After that, filter rapidly taking precautions against loss of ethanol, evaporate 25 ml of the filtrate to dryness in a tared flat-bottomed shallow dish, dry at 105°C, and weigh. Calculate the percentage of ethanol-soluble extractive concerning the air-dried drug.

Preliminary phytochemical screening

Extracts of Curculigo orchioides, Asparagus racemosus, Acacia catechu, Emblica officinalis, Tribulus terrestris, Syzygium cumini, and Musali khadiradi Choornam were taken. Preliminary phytochemical screening under the standard procedure and the presence and absence of carbohydrates, alkaloids, glycosides, anthraquinone, tannins, flavonoids, saponins, terpenoids, volatile oils, proteins, amino acids, phenols were found. It is presented in the result and discussion section.

Determination of foaming index

Reduce about 1g of the plant material to a coarse powder (sieve No.125), weigh accurately & transfer to a 500ml conical flask containing 100ml of boiling water. Maintain at moderate boiling for 30 minutes. Cool & filter into a 100ml

volumetric flask & add sufficient water through the filter to dilute to volume. Pour the decoction into 10 test tubes in successive portions in 1ml, 2ml, and 3ml, and adjust the volume of the liquid in each tube with water to 10ml. The test tubes are shaken in a lengthwise motion for 15 seconds, 2 shakes per second. Allow to stand for 15 minutes & measure the height of the foam. The results are assessed as follows:

If the height of the foam in every tube is less than 1cm, the foaming index is less than 100. If the height of foam of 1cm is measured in any tube, the volume of the plant material decoction in this tube is used to determine the index. If this tube is the first or second tube in a series, similarly prepare an intermediate dilution to obtain a more precise result. If the height of the foam is more than 1 cm in every tube, the foaming index is over 1000. In this case, repeat the determination using a new series of dilutions of the decoction to obtain results.
Calculate the foaming index using the formula: 1000/A
Where A=the volume in ml of decoction used for preparing the dilution in the tube where foaming to a height of 1cm is observed.

Phyto-analytical studies

Determination of total phenol content (TPC)

Prepare calibration curve of standard Gallic acid (10-100µg/ml in water). Prepare 1 mg/ml of extract solutions alcoholic extract. Mix 1 ml of each sample with 0.25 ml of Folin-Ciocalteu's reagent and 1.25 ml of 20% sodium carbonate solution. Allow the mixture to react for a minimum of 40 minutes at room temperature. After the reaction period, the contents are mixed, and the blue color at 725 nm in comparison with standards.

Calculate the amount of total phenol from the calibration curve as a Gallic acid equivalent by following the formula:

T=C.V/M Where, T= Total content of phenolic compounds mg/ml of plant extract,C the concentration of gallic acid established from the calibration curve, mg/ml V=volume of extract in mlM= the gram weight of plant extract.

Estimation of total flavonoid content (TFC)

Prepare calibration curve of standard Quercetin (10-100 µg/ml in methanol). Mix 0.5 ml standard solution with 1.5 ml of 95% ethanol, and 0.1 ml of 10% aqueous aluminium chloride. 0.1 ml of 1M potassium acetate and 2.8 ml of distilled water. Incubate for 30 minutes at room temperature. Measure the absorbance of the reaction mixture at 415 nm with a UV-visible spectrophotometer. To prepare a blank solution substitute 10% of aluminum chloride with the same amount of distilled water. Similarly, treat 0.5 ml of MKC samples with aluminum chloride for determination of flavonoid content from the calibration curve.

GC-MS analysis of Musali Khadiradi Choornam

Musali khadiradi Choornam is subjected to GC MS analysis as per standard procedure. The metabolites in the samples were identified using a GCMS-QP2010 Plus (Shimadzu). The ionization voltage 70ev and GC were 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 of 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 of 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

Tuber of Curculigo orchioides, roots of Asparagus racemosus, bark of Acacia catechu, fruits of Emblica officinalis, fruits of Tribulus terrestris, stem part of Syzygium cumini was collected from Rajiv Gandhi Ayurveda Medical College, Mahe, Pondicherry.

Organoleptic parameters

Organoleptic characteristics of the tuber of Curculigo orchioides, roots of Asparagus racemosus, the bark of Acacia catechu, fruits of Emblica officinalis, fruits of Tribulus terrestris, stem part of Syzygium cumini were evaluated and the result is given in table no.1

Table No.1: Organoleptic parameters of collected ingredients of Musali khadiradi choornam.

Sl. No.	Drug	Color	Odor	Taste	Size	Shape
1	*Curculigo orchioides* (Tuber) 	Red to brown	No characteristic	Bitter	3-5 cm long	Flat pieces
2	*Acacia catechu* (Heartwood) 	Dark brown to black	No characteristic	Bitter in the beginning but turns astringent afterward	10-12 cm long, 4 to 5 cm	Elongated
3	*Emblica Officinalis* (Fruit) 	Greenish when tender, changing to yellowish or pinkish when mature	Characteristic	Sour and astringent followed by delicately sweet.	2.5 to 3.5 cm	Globose
4	*Syzygium cumini* (Jambu) 	light grey to ash colored	Pleasant Aroma	Astringent	0.5-2.5 cm thick	slightly curved or flat pieces
5	*Asparagus racemosus* (Vari) 	slight yellowish	No specific	Slightly bitter	5 to 60 cm in length and 1 to 2.5 cm in thickness	tuberous, tapering towards both ends
6	*Tribulus terrestris* (Fruit) 	light or greenish-yellow	Characteristic	slightly astringent	1 cm in diameter	five ribbed or angled, more or less spherical in structure

Ash values

The results obtained from the physicochemical evaluation reveal that the total ash value of MKC was found to be 7.3±0.065%, water-soluble ash was 5±0.03% and acid-insoluble ash was 5.5±0.03%.

Extractive value

Table No.3: Extractive value of ingredients of MKC

Sl. No	Active part	Water-soluble extractive(%w/w)	Alcohol-soluble extractive (%w/w)
1	*Curculigo orchioides*	2.4±0.12	0.8±0.12
2	*Acacia catechu*	11.2±0.12	3.6±0.12
3	*Emblica Officinalis*	21.8±0.12	10.1±0.12
4	*Syzygium cumini*	16.6±0.12	1.6±0.12
5	*Asparagus racemosus*	19.6±0.12	14±0.12
6	*Tribulus terrestris*	7.7±0.12	4.0±0.12
7	MKC	20.2±0.12	21.6±0.12

Preliminary phytochemical screening

Table no.4: Preliminary Phyto chemical screening of MKC

Group of Phyto compound	Musali	Khadira	Amla	Jambu	Vari	Trikanta	MKC
Carbohydrates	+	+	+	-	+	+	+
Alkaloids	+	+	+	+	-	+	+
Glycosides	+	-	-	-	-	+	+
Anthraquinone	-	-	-	-	-	-	-
Tannins	-	+	+	+	-	+	+
Flavanoids	-	+	+	+	-	+	+
Saponins	+	+	+	+	+	+	+
Terpenoids	-	-	+	-	-	-	-
Volatile oils	-	-	-	-	-	-	-
Proteins	+	+	-	-	-	-	+
Amino acids	+	+	-	-	-	-	+
Phenols	+	+	+	-	-	-	+

Present (+); absent (-)

Foaming index

The foaming index was performed by using the water extract taken from MKC and determined by adopting the WHO protocol. The foaming index of MKC was found to be 66.66±0.6.

Total Phenol content

The total phenolic content was determined by using the Folin-Ciocalteu method. Gallic acid was used as standard calibration and total phenolic content in mg gallic acid equivalence (mg GAE/g). The total phenolic content of the crude extracts was solvent-dependent. Total Phenol content was found to be 3.75±0.05mg GAE/g.

Total flavonoid content

The total flavonoid content was determined by the aluminum chloride colorimetric method as described by Chang et al. (2002). Quercetin was used as standard calibration and total flavonoid content in mg quercetin equivalence (mg QE/g). Total flavonoid content was found to be 8.0±0.21 mg QE/g.

GC-MS

GC-MS studies were conducted and 150 peaks were observed in the sample of MKC the important compounds are, palmitic acid, piperine, methyl stearate, squalene, ginseng, nor morphine, n pentadecanol, neophytadene, difluoro phosphoric acid, etc.

Fig: GC-MS study peaks

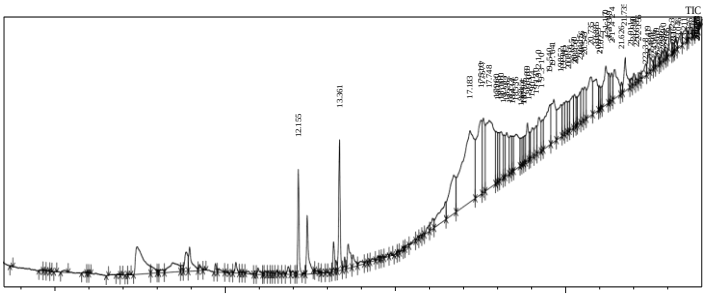

Table no: 05 GC-MS analysis of MKC

Peak#	R.Time	Area	Area%	Height	Name
1	3.723	6527	0.01	2713	1,2-DIVINYLCYCLOBUTANE
2	4.624	25375	0.04	4941	5-Methylhexane-2,4-dione, enol
3	4.715	13062	0.02	3734	(E)1-Allyl-2-methylcyclohexanol
4	4.804	20727	0.03	4818	Butanoic acid, 2,2-dimethyl-3-oxo-, methyl ester
5	4.880	3540	0.01	1989	2-Hydroxy-2,5-dimethyl-hept-6-en-3-one
6	5.014	4263	0.01	1937	2,4,6(1H,3H,5H)-PYRIMIDINETRIONE
7	5.309	66490	0.10	8852	1,2,3,4-Pentadecanetetrol, [2R-(2R*,3S*,4S*)]-
8	5.867	34431	0.05	5835	HEXANOYL CHLORIDE, 6-BROMO-
9	5.980	14591	0.02	4609	3-(2-ANILINO-2-OXOETHYL)OCTANOIC ACID
10	6.040	7022	0.01	2757	3,3,5-Trimethylcyclohexylamine
11	6.545	2855	0.00	1302	Difluorophosphoric acid
12	6.864	17917	0.03	4116	Alpha-l-rhamnopyranose
13	6.985	6751	0.01	1974	N-(1-PYRROLIDINYL)BENZAMIDE
14	7.114	5510	0.01	2513	L-Prolinamide
15	7.201	7810	0.01	2851	2(3H)-FURANONE, 5-ETHYLDIHYDRO-
16	7.429	1927984	2.80	115314	BENZOIC ACID, 2-[[[4-[(ACETYLAMINO)SULFONYL]PHENYL]AMINO
17	7.835	240422	0.35	30188	N-(4-Methylcyclohexyl)acetamide, cis-
18	8.045	35809	0.05	12124	1,3-Dimethylcyclopentanol
19	8.095	106917	0.16	12007	2-PHENOXY-N-(TETRAHYDRO-2-FURANYLMETHYL)ACETAMIDE
20	8.471	768941	1.12	39191	1,2,4-BENZENETRIOL
21	8.740	118880	0.17	25627	Isophorone diisocyanate
22	8.867	524744	0.76	80715	.BETA.-D-GLUCOPYRANOSE, 1,6-ANHYDRO-
23	8.965	625327	0.91	100847	PHENOL, 3,5-BIS(1,1-DIMETHYLETHYL)-
24	9.260	108539	0.16	25290	Benzoic acid, 2,6-dimethoxy-, methyl ester
25	9.385	12434	0.02	4443	1,2,3,4-CYCLOPENTANETETROL, (1.ALPHA.,2.BETA.,3.BETA.,4.ALPHA
26	9.726	119949	0.17	37017	Formic acid, (3-methyl-2-nitrophenyl)methyl ester
27	9.820	99589	0.14	13642	CYCLOHEXANONE, 2-(2-NITRO-2-PROPENYL)-
28	10.044	13578	0.02	4790	cis-2-Ethylcyclopentanecarboxaldehyde
29	10.179	26794	0.04	9588	1-.beta.-d-Ribofuranosyl-1H-imidazole-4-carboxamide
30	10.323	172437	0.25	44700	aR-Turmerone
31	10.456	26400	0.04	8052	Cyclohexene-3,5-diol, cis-
32	10.543	20438	0.03	6292	1-.beta.-d-Ribofuranosyl-1H-imidazole-4-carboxamide
33	10.683	71258	0.10	10821	METHYL 11-(2,3-DIDEUTEROCYCLOPENTAN-1-YL)UNDECANOATE
34	10.875	7280	0.01	1907	Piperidine
35	10.970	141508	0.21	26678	PALMITIC ACID
36	11.130	15085	0.02	5856	Benzoic acid, 2-ethylbutyl ester
37	11.210	54667	0.08	11255	2-Undecene, 3-methyl-, (Z)-
38	11.261	48049	0.07	12045	Cyclohexene, 1-methyl-5-(1-methylethenyl)-
39	11.355	25191	0.04	7773	Cyclohexanone, 4-(benzoyloxy)-
40	11.423	20717	0.03	7313	5-Butyl-1,3-oxathiolan-2-one
41	11.527	59874	0.09	18685	Neophytadiene
42	11.588	26768	0.04	9633	2-Nonadecanone
43	11.708	30641	0.04	11325	Undecanal
44	11.857	154585	0.22	33017	Chloroacetic acid, undecyl ester
45	11.988	70214	0.10	13137	6-BUTYLHEXAN-6-OLIDE
46	12.087	22855	0.03	8406	trans-2,7-Dimethyl-4,6-octadien-2-ol
47	12.155	1141185	1.66	441403	Hexadecanoic acid, methyl ester
48	12.292	12111	0.02	4074	8-AZABICYCLO[5.1.0]OCTANE
49	12.411	1111292	1.62	247461	n-Hexadecanoic acid
50	12.620	2381	0.00	1350	2-Methylnonanoic acid, methyl ester
51	12.715	7086	0.01	2436	PROPANE, 2-ETHOXY-2-METHYL-
52	12.784	9448	0.01	5138	PIPERIDINE-4-CARBOXYLIC ACID
53	12.855	5963	0.01	1855	2-Piperidinecarboxylic acid
54	12.973	6263	0.01	2639	Diethyl fluoromalonate
55	13.100	3322	0.00	1464	Decanoic acid, 3-methyl-
56	13.187	402860	0.59	125126	Butyric acid, 2-phenyl-, 3-methylphenyl ester
57	13.250	130636	0.19	46115	n-Pentadecanol
58	13.361	1669984	2.43	550123	9-OCTADECENOIC ACID (Z)-, METHYL ESTER
59	13.511	146597	0.21	52305	Methyl stearate

60	13.615	597509	0.87	102267	9,12-Octadecadienoic acid (Z,Z)-
61	13.756	292350	0.43	51635	2-AMINOETHANETHIOL HYDROGEN SULFATE (ESTER)
62	13.965	131935	0.19	14046	2-Furanmethanol, 5-ethenyltetrahydro-.alpha.,.alpha.,5-trimethyl-, cis-
63	14.100	37029	0.05	7569	Spiro[1,3-benzodioxole-2,1'-cyclohexane]
64	14.215	22490	0.03	5887	Cyclohexanol, 2-(2-ethyl-1-hydroxy-1-hexyl)-
65	14.360	64163	0.09	8919	[1,1'-Bicyclopropyl]-2-octanoic acid, 2'-hexyl-, methyl ester
66	14.499	41368	0.06	15070	1-PHENANTHRENECARBOXYLIC ACID, 7-ETHYL-1,2,3,4,4A,4B,5,6,7,9
67	14.549	31988	0.05	11466	(Z)-Dodec-5-en-4-olide
68	14.616	21775	0.03	7023	CYCLOOCTYL METHYLPHOSPHONOFLUORIDOATE
69	14.765	48396	0.07	11581	7-Hexadecenoic acid, methyl ester, (Z)-
70	14.857	34126	0.05	12796	cis-Verbenol
71	15.035	20296	0.03	8190	SIMONELLITE
72	15.077	27507	0.04	12664	METHYLABIETA-8,11,13-TRIEN-18-OATE
73	15.205	53495	0.08	14938	2,3-Dihydroxybenzoic acid, 3TMS derivative
74	15.260	30513	0.04	11351	3,4-Dimethylbenzoic acid, TMS derivative
75	15.367	61870	0.09	9628	2-ISOPROPYLIDENE-5-METHYL-HEX-4-ENAL
76	15.567	77004	0.11	9685	2H-3,9A-METHANO-1-BENZOXEPIN, OCTAHYDRO-2,2,5A,9-TETRAM
77	15.655	48429	0.07	13252	Benzamide, N-(2-cyano-1-cyclopentenyl)-3,4,5-triethoxy-
78	15.720	48804	0.07	10840	Octadecane(dithioic) acid
79	15.805	33555	0.05	8284	(S)-Ethyl 3-methyl-5-((1S,4aS,8aS)-5,5,8a-trimethyl-2-methylenedecahydrona
80	15.980	158505	0.23	26237	SILICONE OIL
81	16.090	264451	0.38	43970	9-TERT-BUTYL-TRICYCLO[4.2.1.1 2,5]DECANE-9,10-DIOL
82	16.465	1087649	1.58	75054	7-Oxodehydroabietic acid, methyl ester
83	16.709	2183736	3.18	162499	SILIKONFETT SE30 (GREVELS)
84	17.183	7579422	11.02	299927	DISTEARIN
85	17.510	3358297	4.88	311137	HEXADECANOIC ACID, 2-BROMO-
86	17.577	1610825	2.34	312788	Squalene
87	17.748	4834103	7.03	285379	HEXACONTANE
88	17.960	771731	1.12	216808	SILIKONFETT
89	18.025	678142	0.99	205994	SILANETRIAMINE, N,N,N',N',N'',N''-HEXAMETHYL-1-PHENYL-
90	18.100	1290329	1.88	201880	4,6,8(14)-Cholestatriene
91	18.183	534478	0.78	179419	Normorphine, 2TMS derivative
92	18.262	1270806	1.85	182026	1H-PURIN-6-AMINE, [(2-FLUOROPHENYL)METHYL]-
93	18.375	649427	0.94	157044	N-BUTYL-[(3E)-4,8-DIMETHYL-1-(1'-BUTYLPYRROL-3'-YL)NONA-3,7-
94	18.434	533671	0.78	149550	4,6-di-tert-Butylresorcinol
95	18.536	1515909	2.20	146726	Methyloctadecyldichlorosilane
96	18.685	416162	0.61	115920	Silicic acid, diethyl bis(trimethylsilyl) ester
97	18.744	342571	0.50	115226	Silicic acid, diethyl bis(trimethylsilyl) ester
98	18.795	375317	0.55	114673	SILIKONFETT
99	18.869	801968	1.17	159414	Ergosta-5,7,9(11),22-tetraen-3-ol, (3.beta.,22E)-
100	18.930	273246	0.40	114731	2-METHOXY-1,3-BIS(TRIMETHYLSILYL)BENZENE
101	19.014	708960	1.03	124610	Smilagenin benzoate
102	19.130	671258	0.98	121445	3A,5-CYCLO-6B-MEOXY-27-NOR-24-ME-26-DIPHENYL-5A-CHOLEST-
103	19.210	927266	1.35	148283	SILANE, TRIMETHYL[[(3.BETA.)-STIGMAST-5-EN-3-YL]OXY]-
104	19.310	528851	0.77	127346	1,2-Cinnolinedicarboxylic acid, 1,2,3,5,6,7,8,8a-octahydro-4-trimethylsilyloxy
105	19.540	1932765	2.81	168110	Pyridine, 3-(5-ethyl-1,2,4-oxadiazol-3-yl)-2-methoxy-6-phenyl-
106	19.641	1577084	2.29	179431	CHOLESTA-4,6-DIEN-3-OL, BENZOATE, (3.BETA.)-
107	19.852	1244557	1.81	136394	3-Methylphenytoin, TMS derivative
108	19.941	633544	0.92	135515	Ethyl (1-adamantylamino)carbothioylcarbamate
109	20.002	636912	0.93	135404	Ethanethioic acid, S-[8-(diethylphosphono)octyl] ester
110	20.085	492065	0.72	126139	1-Tributylsilyloxytridec-2-yne
111	20.195	869501	1.26	136627	(S)-(E)-(-)-4-ACETOXY-1-PHENYL-2-DODECEN-1-ONE
112	20.250	592444	0.86	137483	SILICONE GREASE, SILICONFETT
113	20.316	291049	0.42	122241	SILANE, TRIMETHYL[[(3.BETA.)-STIGMAST-5-EN-3-YL]OXY]-
114	20.415	748496	1.09	132053	1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-HEXADECAMETHYLOCTASILOXA
115	20.476	655008	0.95	141907	benzoic acid, 4-[[(trimethylsilyl)oxy]methyl]-, trimethylsilyl ester
116	20.549	673523	0.98	138309	3-Methylsalicylic acid, 2TMS derivative
117	20.735	1639762	2.38	161532	10,13-DIMETHYL-17-(1,4,5-TRIMETHYL-HEX-2-ENYL)-2,3,4,9,10,11,12
118	20.885	1300904	1.89	137916	1,2-Bis(trimethylsilyl)benzene
119	20.973	262315	0.38	101079	Carvacrol, TBDMS derivative
120	21.025	297149	0.43	91632	SILIKONFETT
121	21.170	1385521	2.01	162639	Ginsenol

122	21.261	380689	0.55	123127	BENZENE, 1,4-BIS(TRIMETHYLSILYL)-
123	21.339	524148	0.76	116690	HEPTASILOXANE, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-TETRADECAMETHYL
124	21.424	1096380	1.59	122912	Smilagenin
125	21.626	153387	0.22	48518	TETRASILOXANE, DECAMETHYL-
126	21.735	852971	1.24	140142	CHOLEST-5-EN-3-YL (9Z)-9-OCTADECENOATE #
127	21.911	133353	0.19	36332	2-(2,4-DICHLORO-6-NITROPHENOXY)ETHANOL
128	21.990	188387	0.27	48683	.beta.-Amyrone
129	22.068	52184	0.08	16538	12-(ACETYLOXY)-20-OXOPREGN-16-EN-3-YL ACETATE #
130	22.156	118351	0.17	35151	Arsenous acid, tris(trimethylsilyl) ester
131	22.338	334226	0.49	48757	5AH-3A,12-METHANO-1H-CYCLOPROPA[5',6']CYCLODECA[1',2':1,5]C
132	22.419	439373	0.64	99985	Lup-20(29)-en-3-one
133	22.489	236201	0.34	57774	Cyclotrisiloxane, hexamethyl-
134	22.606	129422	0.19	50970	2,3-BIS(TRIMETHYLSILOXY)-2,3-BIS(4'-METHYLPHENYL)BUTANE
135	22.669	240523	0.35	57918	SILANE, 1,4-PHENYLENEBIS[TRIMETHYL-
136	22.759	72760	0.11	27448	SILIKONFETT
137	22.827	182482	0.27	44370	benzoic acid, 4-[[(trimethylsilyl)oxy]methyl]-, trimethylsilyl ester
138	22.890	136524	0.20	43070	SILIKONFETT
139	22.966	59591	0.09	26796	Cyclotrisiloxane, hexamethyl-
140	23.046	499908	0.73	125267	Ginsenol
141	23.123	102388	0.15	45885	2,3-BIS(TRIMETHYLSILOXY)-2,3-BIS(4'-METHYLPHENYL)BUTANE
142	23.162	76382	0.11	37386	SILIKONFETT
143	23.211	200936	0.29	52940	2,3-BIS(TRIMETHYLSILOXY)-2,3-BIS(4'-METHYLPHENYL)BUTANE
144	23.376	394563	0.57	59164	HEPTASILOXANE, 1,1,3,3,5,5,7,7,9,9,11,11,13,13-TETRADECAMETHYL
145	23.510	397398	0.58	59024	Cyclotrisiloxane, hexamethyl-
146	23.556	102076	0.15	41295	1,2-Benzenediol, 3,5-bis(1,1-dimethylethyl)-
147	23.636	227663	0.33	65020	PYRANO[3,4-B]INDOL-3(9H)-ONE, 1-(4-PENTYNYL)-
148	23.753	207652	0.30	75743	SILIKONFETT
149	23.796	260191	0.38	73507	BENZOIC ACID, 3-[(2,4-DIMETHOXY-6-PROPYLBENZOYL)OXY]-2-HY
150	23.923	64131	0.09	31158	3,4-DI(4-TRIMETHYLSILOXYPHENYL)HEXANE
		68772394	100.00	10885266	

Discussion

The use of herbal medicines has become a global subject with medical and economic ramifications over the past few decades. Polyherbal formulations being a multi-component dosage form often prone to a higher chance of contaminants, adulterants, pesticide residue, and toxins infestations. Hence nowadays, it become mandatory to establish the safety, sterility, and standard of each batch before dispensing the same to consumer usage. Musali Khadiradi Choornam is used for the treatment of PCOS, Menorrhagia, and Leucorrhea in Ayurveda. The current findings in the phytochemical screening, it is showing the presence of carbohydrates, proteins, amino acids, phenols, alkaloids, glycosides, flavonoids, tannins, and saponins. The results obtained from the physicochemical evaluation reveal that the total ash value of MKC was found to be 0.7.3±0.065%, water-soluble ash was 5±0.03% and acid-insoluble ash was 5.05±0.03%. Water soluble extractive was found to be 20.2±0.12 and alcohol soluble extractive was found to be 21.6±0.12. The foam index of MKC was found to be 66.66±66. Total phenol content was found to be 3.75±0.05 mg GAE/g. Total flavonoid content were found to be 8.0±0.21 mg QE/g. Using GC-MS analysis presence of 150 compounds was found. The current research will add up the standards for the Musali Khadiradi Choornam for further research and to attain a good global market standard.

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