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STANDARDIZATION OF YAVAKSHARA CHURNA AND MADHU ON SCALING WOUND- A DRUG REVIEW

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ABSTRACT

Periodontal tissue is destroyed by the irritants of dental tartar deposits.[1] Therefore, all the dental tartar must be removed by ultrasonic scaler first. After that, Yavakshara churna (an alkali preparation from the plant Hordeolum barley) and Madhu (honey) paste are applied on the scaling wound described by Acharya Vagbhat.[2] Prior to oro-dental application, Yavakshara churna and Madhu should be standardized by using modern parameters such as pharmacognostic evaluation, chemical analysis, powder microscopy, and sophisticated instrumental analysis. Scanning electron microscopy (SEM) analysis was done to see the morphology of Yavakshara churna. The heavy metals are toxic to our bodies and pesticide residues in plants are retained for a long-time causing side-effect in the body. The microbiological test was done to see the contaminations/affections if any, and the mycotoxin test to see the presence of aflatoxin if any. After analysis with modern parameters, it was found that all the parameters of both drugs are within the permissible limit as per API. The heavy metals were seen within the permissible limits as per API; pesticide residues were seen within the permissible limits as per API; microbiological parameters were seen within the permissible limit as per API, and mycotoxins were seen within the permissible limits as per API in both drugs Yavakshara churna and Madhu. Additionally, the negligible toxicity profile of both drugs indicates that they may be used in herbal paste on the scaling wound in the future.

KEYWORDS: Standardization, Yavakshara churna, Madhu, Scaling wound, Drug review.

INTRODUCTION

The paste consists of a mild caustic powder (Yavakshara churna) suspended in a liquid phase of honey (Madhu). It acts as a cleansing and humectant agent on the scaling wound. Churna (fine powder) is often given with some anupana or vehicle such as milk, buttermilk, ghee, Madhu etc., depending on the formulation and indication. A chapter of Lavana- Kshara has been included in AFI part-I, 10th chapter. This book describes different formulations of Kshara with references, doses, anupana, therapeutic uses, etc.[3] Drug and Cosmetic act, 1940 also states the list of machinery, equipment, and minimum manufacturing premises required for the manufacturer of Kshara.[4]

Yavakshara churna is an alkali preparation from the plant Hordeolum barley. It generally has sharp, hot potency, light, dry in nature, carminative, caustic, digestive stimulant, and depletive properties.[5] Yavakshara churna is light, unctuous, minute/piercing, and improves digestive strength. It relieves pain and balances Kapha, Ama (a product of altered digestion and metabolism), and Vata dosha. It cures Shwasa (asthma, respiratory disorders involving difficulty in breathing), Galamaya (throat disorders), Pandu (anaemia, initial stages of liver disorders), Arsha (haemorrhoids), Grahani (malabsorption syndrome, irritable bowel syndrome), Gulma (abdominal tumour, distention), Anaha (bloating, constipation), Pleeha (spleen related disorders, splenomegaly), Hrudamaya (heart diseases).[6]

Madhu has Sandhanaka (tissue reattachment), Chedana (tissue scrapping) properties, and has Kashaya (astringent) and Madhura rasa (sweet in taste).[7] Madhu has Vrana shodhaka (tissue purification), Sandhanaka (tissue reattachment), and Ropaka (wound healing) properties, and has an astringent and sweet taste.[8] Madhu is described in SANDHANIYA (tissue reattachment) and RAKTA–STHAPANA (homeostasis) Mahakasaya (group).[9]

MATERIALS AND METHODS

1. Yavakshara: The raw material was collected and properly dried to ensure complete burning. Kshara was prepared in Sharad ritu as one prepared in the rainy season absorbs moisture easily and thus reduces potential. The clean utensil of inert material such as Iron was used, as contamination may alter the real chemical nature of Kshara.

Method of Preparation

- Entire barley plant (Hordeum vulgare) was collected, cleaned well, and dried completely in sunlight.

- It was taken in a big iron pan and completely burnt to ash in the open air.
- After it cooled down on its own, collected the ash, added 4 times water, and then mixed it well.
- Strained it through a folded cotton cloth in an iron container and kept them overnight.
- Filtered the liquid floating on the surface over a precipitate into a clean container and repeated this process thrice.
- Heated this filtrate (clear water) over a low flame till the entire water content was evaporated.
- After this process, white-colored Yavakshara churna was obtained which was then stored in an air-tight glass container.
- Its expiry date is 5 years if stored in an air-tight container. Once the bottle containing this drug is opened, it should be emptied within a month or two.

Pharmacognostical evaluation of Yavakshara churna

Morphology of Yavakshara churna- It is a fine powder with few lumps or masses.

Figure 1: Morphology of yavakshara churna.

Table 1: Organoleptic study of Yavakashara churna.

Description	Findings
Color	White
Odor	Odorless
Taste	Salty
Texture	Slightly hygroscopic

Chemical analysis of Yavakshara churna

Table 2: Physico-chemical parameters of Yavakshara churna.

Parameters	Result	Permissible Limit as per API P-II, Vol-I, pg.111
Loss on drying at 110℃	0.47 %	Not more than 4 %
Acid insoluble ash	0.05 %	Not more than 1 %
pH (10 % aq. Solution)	8.30	9 to 10

Table 3: Elemental analysis of Yavakshara churna using flame photometer.

Element	Result	Permissible Limit as per API P-II, Vol-I, pg.111
Sodium (Na)	14.9%	Not less than 17%
Potassium (K)	0.59%	Not less than 16%

Chemical parameter	Result	Permissible Limit as per API P-I, Vol-VI, 2014
Calcium (Ca)	32.27g/100gm	Not less than 17%

Powder microscopy of Yavakshara churna

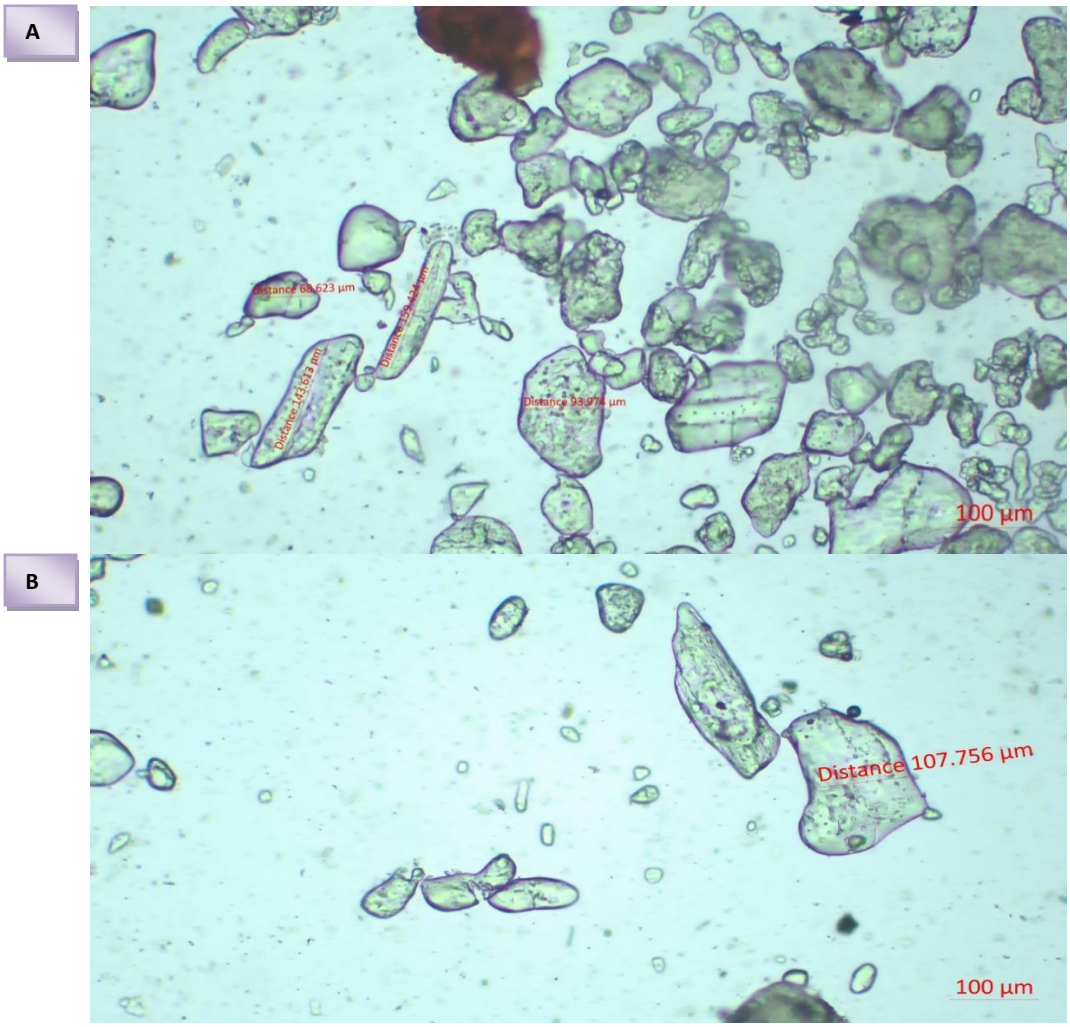

Figure 2: Powder microscopy of Yavakshara churna.

SEM analysis of Yavakshara churna

A

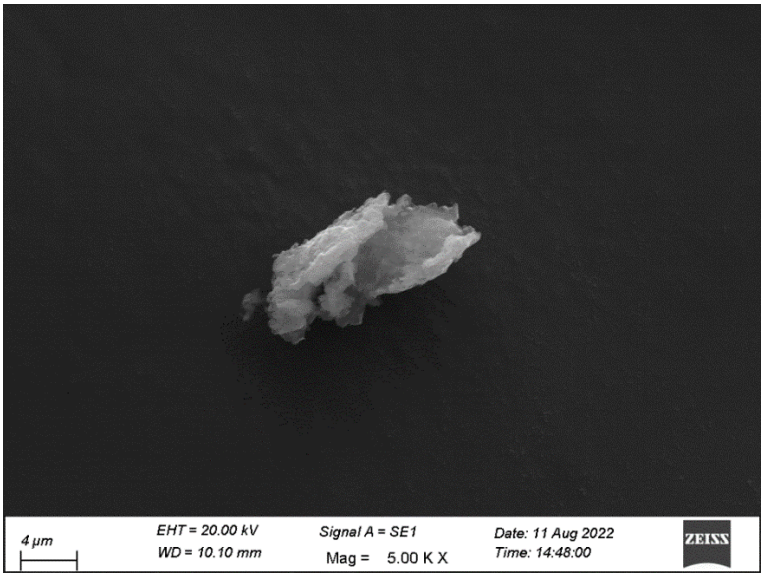

Figure 3: SEM analysis of Yavakshara churna at 5.00 KX.

B

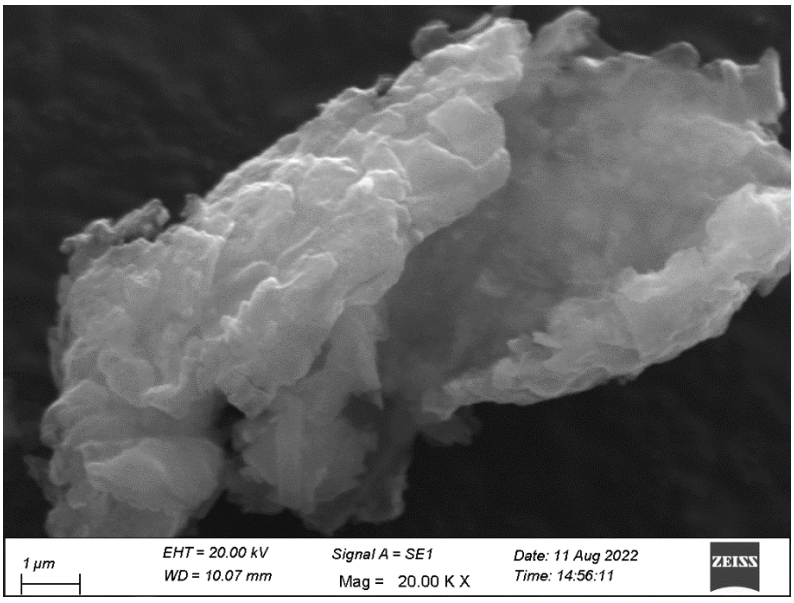

Figure 4: SEM analysis of Yavakshara churna at 20.00KX.

Sophisticated instrumental analysis of Yavakshara churna

Table 4: Heavy metals in Yavakshara churna.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Lead (as Pb)	mg/kg	0.34	10.0 Max	AGSS/CHEM/SOP/ICP-MS/13)
2	Arsenic (as As)	mg/kg	0.19	3.0 Max	AGSS/CHEM/SOP/ICP-MS/13)
3	Cadmium (as Cd)	mg/kg	BLQ(0.05)	0.3 Max	AGSS/CHEM/SOP/ICP-MS/13)
4	Mercury (as Hg)	mg/kg	1.44	1.0 Max	AGSS/CHEM/SOP/ICP-MS/13)
5	Iron (as Fe)	mg/kg	130.02	-	AGSS/CHEM/SOP/ICP-MS/13)

Table 5: Pesticide residues in Yavakshara Churna.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Aldrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
2	Dieldrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
3	Lindane (Gamma-HCH)	mg/kg	BLQ(0.01)	0.6 Max	AGSS/CHEM/SOP/PEST/15)
4	Deltamethrin	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
5	2,4-DDT	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
6	4,4-DDT	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
7	Dichlorvos	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
8	Malathion	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
9	Fenitrothion	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
10	Parathion	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
11	Parathion methyl	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)
12	Phosalone	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
13	Dithiocarbamates (as CS2)	mg/kg	BLQ(0.01)	2.0 Max	AGSS/CHEM/SOP/PEST/15)
14	2,4-DDE	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
15	4,4-DDE	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
16	2,4-DDD	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
17	4,4-DDD	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
18	Endrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
19	Hexachlorobenzene	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
20	Hexachlorobenzene isomers (other than gamma)	mg/kg	BLQ(0.01)	0.3 Max	AGSS/CHEM/SOP/PEST/15)
21	Alachlor	mg/kg	BLQ(0.01)	0.02 Max	AGSS/CHEM/SOP/PEST/15)
22	Cis-chlordane	mg/kg	BLQ(0.01)	0.05Max	AGSS/CHEM/SOP/PEST/15)
23	Trans-chlordane	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
24	Alpha-endosulfan	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
25	Beta-endosulfan	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
26	Endosulfan sulphate	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
27	Hepatochlor (sum of hepatochlor and hepatochlor epoxide)	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
28	Chloropyrifos	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)

29	Chlorfenvinphos	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
30	Cypermethrin (sum of isomers)	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
31	Permethrin	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
32	Fenvalerate	mg/kg	BLQ(0.01)	1.5 Max	AGSS/CHEM/SOP/PEST/15)
33	Ethion	mg/kg	BLQ(0.01)	2.0 Max	AGSS/CHEM/SOP/PEST/15)
34	Methidathion	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)
35	Piperonyl butoxide	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
36	Pirimiphos methyl	mg/kg	BLQ(0.01)	4.0 Max	AGSS/CHEM/SOP/PEST/15)
37	Chlorpyrifos methyl	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
38	Azinphos methyl	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
39	Fonofos	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
40	Diazinon	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
41	Quintozena (sum of quintozene, pentachloro aniline and methyl pentachloro phenyl sulphide)	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
42	Pyrethrins	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
43	Bromopropylate	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)

Table 6: Microbiological parameter of Yavakshara churna.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Total bacterial count	cfu/ml	<10	100000 Max	API(P-I) (Vol-VI) 2014
2	Total fungal count	cfu/ml	<10	1000 Max	API(P-I) (Vol-VI) 2014
3	E.coli	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
4	S. aureus	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
5	P. aeruginosa	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
6	S. aureus	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014

Table 7: Mycotoxin test of Yavakshara churna.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Aflatoxin B1	ppb	BLQ(1.0)	2.0 ppb	AGSS/CHEM/SOP-AFL/12)
2	Aflatoxin (B1+B2+G1+G2)	ppb	BLQ(1.0)	5.0 ppb	AGSS/CHEM/SOP-AFL/30)

2. Honey (Madhu): Agmark honey (Ashram Madhu) was purchased from Kshetriya Shri Gandhi Ashram, Bareilly, UP with GSTIN 09AABTK0037G1ZX and Lic. No. 12718066000077.

Pharmacognostical evaluation of Madhu

Morphology of Madhu- It is thick, homogenous and translucent fluid.

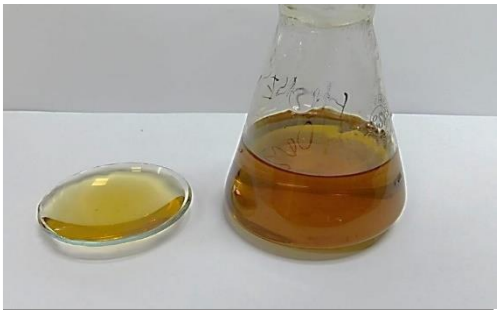

Figure 5- Morphology of Madhu.

Table 8: Organoleptic study of Madhu.

Description	Findings
Color	Yellowish brown
Texture	High consistency thick homogenous fluid
Odor	Pleasant, flavored, characteristic
Taste	Sweet, aromatic, characteristic

Chemical analysis of Madhu

Table 9: Physico-chemical parameters of Madhu.

Parameters	Result	Permissible Limit as per API P-I, VOL-VI, pg. 215
Wt. per mL at 25℃	1.41 g/mL	Not less than 1.35 g/mL
Moisture content (LOD)	17.30 %	Not more than 25 %
Ash content	0.05 %	Not more than 0.50 %

Table 10: Chemical parameters of Madhu.

Chemical parameter	Result	Permissible Limit as per API P-I, Vol-VI, 2014
Acidity	0.001	API volume-6
Reducing sugar	63.04%	API volume-6
Total reducing sugar	83.11%	API volume-6
Fructose-glucose ratio	3.80	API volume-6
Sucrose content	19.06%	API volume-6

Powder Microscopy of Madhu: As per the method of API, approximately 15 ml of the sample was stirred with a glass rod thoroughly, diluted with about 20 mlof distilled water and stirred with the glass rod to a homogenous mixture. It was centrifuged at 3000 rpm for about 5 minutes. 30 ml from the top was transferred to the second tube and again centrifuged similarly, reserving the sediment. About 25 ml from the top was removed. The sediments were collected in a pre-washed tube (5 ml distilled water). The mixture was centrifuged at 2000 rpm for two minutes. Much of the supernatant without the sediment was removed. The small portions of the sediments were taken in a capillary, after that a small drop of chloral hydrate solution was added to this test tube and finally put this mixture on a micro slide.

Several such slides were prepared and examined under a low and high-power digital microscope.

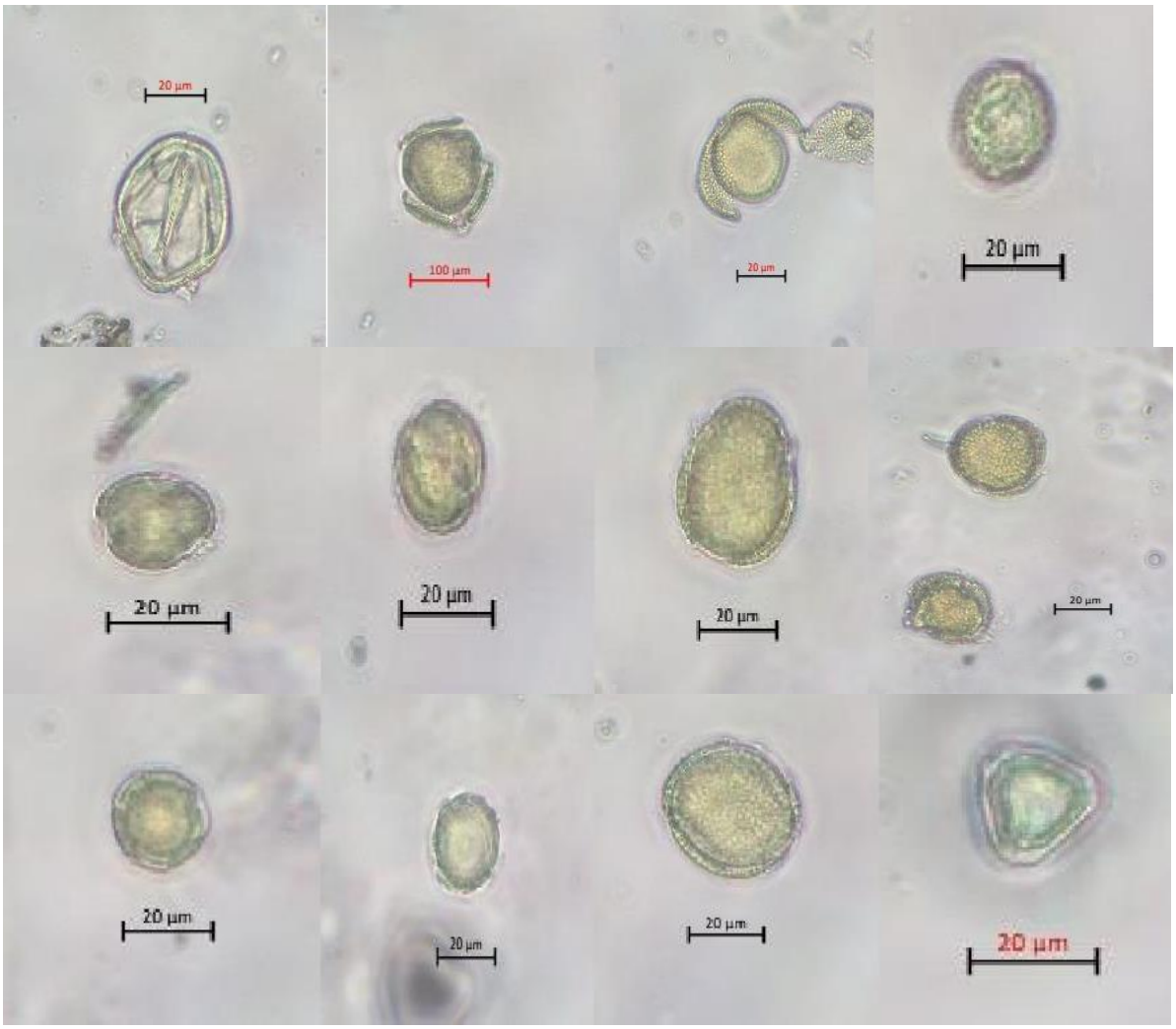

Figure 5: Photo microscopy of Madhu with different pollen grains.

Sophisticated instrumental analysis of Madhu

Table 11- Heavy metals in Madhu.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API-VI 2014	Method of testing
1	Lead (as Pb)	mg/kg	0.06	10.0 Max	AGSS/CHEM/SOP/ICP-MS/13)
2	Arsenic (as As)	mg/kg	BLQ(0.05)	3.0 Max	AGSS/CHEM/SOP/ICP-MS/13)
3	Cadmium (as Cd)	mg/kg	BLQ(0.05)	0.3 Max	AGSS/CHEM/SOP/ICP-MS/13)
4	Mercury (as Hg)	mg/kg	BLQ(0.05)	1.0 Max	AGSS/CHEM/SOP/ICP-MS/13)

Table 12: Pesticide residues in Madhu.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Aldrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
2	Dieldrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
3	Lindane (Gamma-HCH)	mg/kg	BLQ(0.01)	0.6 Max	AGSS/CHEM/SOP/PEST/15)
4	Deltamethrin	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
5	2,4-DDT	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
6	4,4-DDT	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
7	Dichlorvos	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
8	Malathion	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
9	Fenitrothion	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
10	Parathion	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
11	Parathion methyl	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)
12	Phosalone	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
13	Dithiocarbamates (as CS2)	mg/kg	BLQ(0.01)	2.0 Max	AGSS/CHEM/SOP/PEST/15)
14	2,4-DDE	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
15	4,4-DDE	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
16	2,4-DDD	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
17	4,4-DDD	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
18	Endrin	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
19	Hexachlorobenzene	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
20	Hexachlorobenzene isomers (other than gamma)	mg/kg	BLQ(0.01)	0.3 Max	AGSS/CHEM/SOP/PEST/15)
21	Alachlor	mg/kg	BLQ(0.01)	0.02 Max	AGSS/CHEM/SOP/PEST/15)
22	Cis-chlordane	mg/kg	BLQ(0.01)	0.05Max	AGSS/CHEM/SOP/PEST/15)
23	Trans-chlordane	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
24	Alpha-endosulfan	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
25	Beta-endosulfan	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
26	Endosulfan sulphate	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
27	Hepatochlor (sum of hepatochlor and hepatochlor epoxide)	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
28	Chloropyrifos	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)
29	Chlorfenvinphos	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)
30	Cypermethrin (sum of isomers)	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
31	Permethrin	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
32	Fenvalerate	mg/kg	BLQ(0.01)	1.5 Max	AGSS/CHEM/SOP/PEST/15)
33	Ethion	mg/kg	BLQ(0.01)	2.0 Max	AGSS/CHEM/SOP/PEST/15)
34	Methidathion	mg/kg	BLQ(0.01)	0.2 Max	AGSS/CHEM/SOP/PEST/15)
35	Piperonyl butoxide	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
36	Pirimiphos methyl	mg/kg	BLQ(0.01)	4.0 Max	AGSS/CHEM/SOP/PEST/15)
37	Chlorpyrifos methyl	mg/kg	BLQ(0.01)	0.1 Max	AGSS/CHEM/SOP/PEST/15)
38	Azinphos methyl	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
39	Fonofos	mg/kg	BLQ(0.01)	0.05 Max	AGSS/CHEM/SOP/PEST/15)
40	Diazinon	mg/kg	BLQ(0.01)	0.5 Max	AGSS/CHEM/SOP/PEST/15)

41	Quintozena (sum of quintozene, pentachloro aniline and methyl pentachloro phenyl sulphide)	mg/kg	BLQ(0.01)	1.0 Max	AGSS/CHEM/SOP/PEST/15)
42	Pyrethrins	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)
43	Bromopropylate	mg/kg	BLQ(0.01)	3.0 Max	AGSS/CHEM/SOP/PEST/15)

Table 13: Microbiological parameter of Madhu.

Sr No	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Total bacterial count	cfu/ml	<10	100000 Max	API(P-I) (Vol-VI) 2014
2	Total fungal count	cfu/ml	<10	1000 Max	API(P-I) (Vol-VI) 2014
3	E.coli	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
4	S. aureus	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
5	P. aeruginosa	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014
6	S. aureus	/ml	Absent	Absent	API(P-I) (Vol-VI) 2014

Table 14: Mycotoxin test of Madhu.

Sr no	Test parameter	Unit of measurement	Result	Limit as per API (P-1) Vol-VI 2014	Method of testing
1	Aflatoxin B1	ppb	BLQ(1.0)	2.0 ppb	AGSS/CHEM/SOP-AFL/12)
2	Aflatoxin (B1+B2+G1+G2)	ppb	BLQ(1.0)	5.0 ppb	AGSS/CHEM/SOP-AFL/30)

DISCUSSION

Yavakshara represents a herbo-mineral Ayurvedic formulation, i.e., corrosive, pungent, saline, and acrid in nature. Thus, Yavakshara churna has a Ksharana property which removes the defective tissues or metabolic wastes from the gum tissues,[10] whereas Madhu has a wound healing property on the scaling wound.[11]

Yavakshara churna was a fine powder with few lumps or masses (Figure 1). It was white in color, odorless, salty, and slightly hygroscopic in nature (Table 1). In physico-chemical parameters, its pH in 10% aq. solution was 8.30, loss on drying at 110℃ was 0.47%, and its acid insoluble ash was 0.05% (Table 2). All parameters were seen within the permissible limit as per API. Element analysis was done using a flame photometer and on qualitative estimation, the presence of Sodium, Potassium, and Calcium was found in different proportions (Table 3). Yavakshara churna was a crystal mass of different shapes and lengths,a few rounded to spherical-shaped and the particle size was within the permissible limits (<160µm) shown in powder microscopy (Figure 2). SEM analysis was done to see the

morphology of Yavakshara churna, and on the nanoscale, the Yavakshara particle size is below 160µm and it looks a sheet-like structure with wrinkles at 5.00 KX and 20.00 KX (Figure 3 & 4). The sophisticated instrumental analysis was done to see the negligible presence of heavy metals (Table 4), pesticide residues (Table 5), microbiological (Table 6), and mycotoxin parameters in Yavakshara churna (Table 7).

Madhu was a thick, homogenous, and translucent fluid (Figure 5). It was yellowish brown in color, high consistency, pleasant, flavored, characteristic, sweet, and aromatic in nature (Table 8). Its weight per ml at 25℃ was 1.41g/ml. Moisture content (LOD) was 17.30%, and ash content was 0.05% (Table 9). Its acidity was 0.001, reducing sugar 63.04%, total reducing sugar 83.11%, sucrose content 19.06%, and the fructose-glucose ratio was 3.80. All parameters were seen within the permissible limit as per API (Table 10). Under the powder microscopy, different types of pollen grains with differ micromorphology were presented which indicated the various source plants (Figure 6). The sophisticated instrumental analysis was done to see the negligible presence of heavy metals (Table 11), pesticide residues (Table 12), microbiological (Table 13), and mycotoxin parameters in Madhu (Table 14).

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CONCLUSION

The genuineness and authenticity of Yavakshara churna and Madhu are established to introduce the novel drug into the global scenario of the standard health care system. Both drugs have been standardized by the CCRAS guidelines on the set parameters of pharmacognostic evaluation, chemical analysis, powder microscopy, sophisticated instrumental analysis for heavy metals, and so on. All parameters are within the permissible limit as per API in both drugs. As per the macro-microscopic observations compared with

that of Ayurvedic Pharmacopoeia of India, the Yavakshara churna and Madhu are authenticated as pure ones and thus standardized.

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