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Research Article

PREPARATION AND PHYSICO CHEMICAL ANALYSIS OF A HERBO MINERAL COMPOUND MEHAKULANTHAKA RASA

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ABSTRACT

Mehakulanthaka Rasa (MKR) is a herbo mineral compound used in the management of Diabetes mellitus. The formulation is mentioned in one of the latest classics, Bhaishajyaratnavali. It is prepared by the trituration of Abhraka Bhasma, Vanga Bhasma, Parada, Gandhaka, Shilajatu and around 15 herbal ingredients. Till date no standards are available for the above drug. Considering this fact an attempt was made to validate the pharmaceutical preparation of Mehakulanthaka Rasa and at the same time develop the analytical profile of the drug by assessing its organoleptic as well as physico-chemical parameters including hardness, disintegration time, pH, loss on drying, ash value etc. It was found that the formulation was having a pH of 3.90, hardness 3.5 to 4.0 kg/cm^2 and disintegration time 60.0 min to 65.0 min while the phytochemical analysis revealed the presence of flavonoids, coumarins etc. in the sample.

Key words: Mehakulanthaka Rasa, Herbo mineral compound, analytical profile.

INTRODUCTION

Diabetes is one of the world's major diseases, currently affecting an estimated 285 million people worldwide[1]. Oral hypoglycemic agents form a primary part of treatment of diabetes but prominent side effects of such drugs are the main reason for a number of people seeking alternative therapies that may have less severe or no side effects. Rasa Yogas, the organo metallic formulations of Ayurveda have been in use in the treatment of diabetes with their excellence for centuries. Mehakulantaka Rasa is one such excellent herbo mineral preparation described in the Pramehadhikara of one of the prominent Rasashastra texts of 19th century; Bhaishajya Ratnavali[2].

As for the classics and for their uses, the formulations stand already standardized. In fact, what we mean by standardization is validation of the existing processes. Since a lot of innovations and expertise has been inculcated in to the Ayurvedic pharmaceutics, pharmaceutical study of formulations utilizing the tools and technique available at present has become essential for producing quality drug as well as revalidating the claim of ancient acharyas. Considering the above facts an attempt has been made to standardize the pharmaceutical preparation of Mehakulanthaka Rasa.

MATERIALS AND METHODS

The raw materials for the preparation of Mehakulanthaka Rasa were procured from the pharmacy attached to National Institute of Ayurveda, Jaipur. Ingredients and their various proportions are mentioned in table 1.

Pharmaceutical study of *Mehakulanthaka Rasa*

Pharmaceutical processes carried out during the preparation of Mehakulanthaka Rasa was dealt under various sections as follows:

- Shodhana of Parada[3]
- Shodhana of Gandhaka[4]
- Preparation of Kajjali
- Preparation of Vanga bhasma[5]
- Preparation of Abhraka bhasma
- Shodhana of Shilajatu
- Preparation of powders of crude drugs
- Mixing of powders and bhasmas and give bhavana

Details of shodhana of various ingredients like Parada, Gandhaka, Vanga, Abhraka and Shilajatu are depicted in the table 2.

Kajjali was prepared by triturating equal amount of shudha parada and shudha gandhaka until a black coloured fine powder was obtained[6]. Jarana of shodhita vanga was carried out using apamarga *(Achyranthes aspera)* panchanga churna[7]. For preparation of vanga bhasma bhavana of kumari swarasa *(Aloe barbadensis)* was given to the jarita vanga and puta was given in an electric muffle furnace. The details of vanga marana is depicted in table 3. Dhanyabhraka was prepared from shodhita abhraka as per the reference of Ayurveda Prakash[8]. For the marana of abhraka; arka ksheera (latex of *Calotropis procera),* arka patra rasa (juice of *Calotropis* leaves*),* kadali kanda rasa *(*juice of *Musa paradisiaca* tuber*)* and vata jata kwatha

(decoction of *Ficus bengalensis* root were utilized[9]. The details of marana are mentioned in table 4.

All the herbal ingredients were powdered and sieved through 120 mesh. The prepared mineral drugs were taken in a porcelain mortar, powders were added to it and triturated well. Bhavana was given with gopalakarkati mula swarasa *(Melothria moderaspatana* root*)* Handmade pills of 250 mg were made and stored in air tight glass bottle.

Analysis of *Mehakulanthaka Rasa*

Physico chemical constants like LOD, Acid insoluble ash, water soluble and alcohol soluble extractives were carried out along with screening for phytochemical constituents and microbial contamination.

RESULTS

Results of the analytical studies carried out for the formulation are depicted in the following tables (tables 5-8).

Table 1: **Ingredients of *Mehakulanthaka Rasa* and their proportion**.

Sl No.	Ingredients	Proportion	Sl No.	Ingredients	Proportion
1.	*Vanga bhasma*	1 part (3 g)	11.	*Hareetaki*	1 part (3 g)
2.	*Abhraka bhasma*	1 part (3 g)	12.	*Amalaki*	1 part (3 g)
3.	*Sudha parada*	1 part (3 g)	13.	*Vibheetaki*	1 part (3 g)
4.	*Sudha gandhaka*	1 part (3 g)	14.	*Trivrit*	1 part (3g)
5.	*Shudha shilajatu*	4 part(12 g)	15.	*Rasanjana*	1 part (3g)
6.	*Bhunimba*	1 part (3 g)	16.	*Vidanga*	1 part (3g)
7.	*Pippalimula*	1 part (3 g)	17.	*Musta*	1 part (3g)
8.	*Sunti*	1 part (3 g)	18.	*Bilva*	1 part (3g)
9.	*Maricha*	1 part (3 g)	19.	*Gokshura*	1 part (3g)
10.	*Pippali*	1 part (3 g)	20.	*Dadima*	1 part (3g)

Table 2: Details of *shodhana* of various ingredients of *Mehakulanthaka Rasa*

Sl.No	Name of the drug	Method of *Sodhana*
1.	*Parada*	*Mardana* using *lashuna, sudha* and *saindhava lavana*
2.	*Gandhaka*	Melted along with ghee and poured in to *godugdha.*
3.	*Vanga*	*Samanya shodhana- Dalana* in *Kanji, Takra, Gomutra, Kulattha Kwatha, Tila Taila.* *Vishesha Sodhana - Dalana* in *nirgundi patra swarasa* mixed with *haridra churna.*
4.	*Abhraka*	Heated to red hot and quenched in *triphala kwatha*
5.	*Shilajatu*	Dissolved in *triphala kwatha* and then decanted and reduced to semi solid consistency and dried.

Table 3: **Numerical summary of various parameters obtained during the pharmaceutical process of *Marana* of *Vanga***.

Order of *puta*	Weight of *vanga*	Amount of *bhavana dravya*	Max. temp given	*Chakrika*			
				Weight before *puta*	Weight after *puta*	Colour	Consistency
1.	95 g	50 ml	500	95.6 g	95 g	Greyish white	hard
2.	95 g	50 ml	500	96 g	95.3g	Greyish white	hard
3.	95.3 g	50 ml	550	96.0 g	95.6 g	Dull white	soft
4.	95.6 g	50 ml	550	96.4g	96.0 g	Dull white	soft
5.	96.0 g	50 ml	600	97.2g	96.4 g	Dull white	hard
6.	96.4 g	50 ml	600	97.6 g	97.0 g	Dull white	soft
7.	97.0 g	50 ml	650	97.8 g	97.2 g	Dull white	Soft
8.	97.2 g	50 ml	650	98.5 g	97.6 g	Dull white	Soft
9.	97.6 g	50 ml	700	99.0 g	98.1 g	White	Soft
10.	98.1 g	50 ml	700	99.3 g	98.5 g	white	Softer

Table 4: **Summary of various parameters obtained during the pharmaceutical process of *Marana* of *Abhraka***

No. of *Puta*	Name & Quantity of *Bhavana* Drava	Weight of material			Temp. Given	Colour After *Puta*	*Chandrika*
		Before *Puta* (g)	Dried Pellets (g)	After *Puta* (g)			
1	*Arka kshira* (70 ml)	100	130	94	750 ˚c	Brownish golden	Less
2	*Arka kshara* (70 ml)	94	128	95	750 ˚c	Brownish	Lesser
3	*Arka kshara* (70 ml)	95	128	95	750 ˚c	Brownish red	Lesser
4	*Arka kshara* (70 ml)	95	126.5	95.7	750 ˚c	Brownish red	Lesser
5	Arka kshara (70 ml)	95.7	126	96.1	750 ˚c	Light brick red	Lesser
6	*Arka kshara* (70 ml)	96.1	128.5	96.6	750 ˚c	darker brick red	Lesser
7	*Arka kshara* (70 ml)	96.6	126	97	750 ˚c	Light brick red	Lesser
8	*Arka patra swarasa* (50ml)	97	117	97	750 ˚c	Brick red	Lesser
9	*Arka patra swarasa* (50ml)	97	117	97.3	750 ˚c	Brick red	Lesser
10	*Arka patra swarasa* (50ml)	97.3	116.5	97.7	750 ˚c	Brick red	Lesser
11	*Arka patra swarasa* (50ml)	97.7	118	98	750 ˚c	Brick red	Lesser

12	*Arka patra swarasa* (50ml)	98	118.5	98.2	750 ˚c	Brick red	Lesser
13	*Arka patra swarasa* (50ml)	98.2	116.1	98.5	750 ˚c	Brick red	Lesser
14	*Arka patra swarasa* (50ml)	98.5	117.4	99	750 ˚c	Brick red	Lesser
15	*Vata Jata Kwatha* (50ml)	99	113	99.2	750 ˚c	Brick red	Lesser
16	*Vata Jata Kwatha* (50ml)	99.2	113.5	99.2	750 ˚c	Brick red	Lesser
17	*Vata Jata Kwatha* (50ml)	99.2	115	99.5	750 ˚c	Brick red	Lesser
18	*Vata Jata Kwatha* (50ml)	99.5	113.5	99.7	750 ˚c	Brick red	Lesser
19	*Vata Jata Kwatha* (50ml)	99.7	115	100	750 ˚c	Brick red	Lesser
20	*Vata Jata Kwatha* (50ml)	100	115	100.4	750 ˚c	Brick red	Lesser
21	*Vata Jata Kwatha* (50ml)	100.4	114.5	100.7	750 ˚c	Brick red	Noticeable in light
22	*Kadali kanda swarasa* (50ml)	100.7	120	101	750 ˚c	Brick red	Noticeable in light
23	*Kadali kanda swarasa* (50ml)	101	120	101.5	750 ˚c	Brick red	Noticeable in light
24	*Kadali kanda swarasa* (50ml)	101.5	121	102.1	750 ˚c	Brick red	Noticeable in flash of light
25	*Kadali kanda swarasa* (50ml)	102.1	121.4	102.7	750 ˚c	Brick red	Noticeable in flash of light
26	*Kadali kanda swarasa* (50ml)	102.7	121	103	750 ˚c	Brick red	Noticeable in sunlight
27	*Kadali kanda swarasa* (50ml)	103	121.5	103.4	750 ˚c	Brick red	Noticeable in sunlight
28	*Kadali kanda swarasa* (50ml)	103.4	121.3	103.9	750 ˚c	Brick red	Occasionally seen on movement
29	*Arka kshara* (70 ml)	103.9	132	104.4	750 ˚c	Brick red	None
30	*Arka kshara* (70 ml)	104.4	132	104.7	750 ˚c	Brick red	None

Table 5: **Organoleptic characters of *Mehakulanthaka Rasa***

Sample	Colour	Taste	Odour	Texture
Mehakulanthaka rasa (vati)	Blackish brown	Bitter	Not specific	Smooth

Table 6: **Physico chemical constants of *Mehakulanthaka Rasa***

Sl. No.	Parameters	Value
1.	Moisture content (%w/w) / LOD	4.86
2.	Total Ash (%w/w)	19.4
3.	Acid insoluble Ash (%w/w)	5.24
4.	Alcohol soluble extractive (%w/w)	18.32
5.	Water soluble extractive (%w/w)	27.12
7.	pH 5% w/v sol. in water	3.90
8.	Average weight	0.260 g
9.	Hardness	3.5 to 4.0 kg/cm^2
10.	Disintegration Time	60.0 min to 65.0 min

Table7: **Qualitative phytochemical screening of *Mehakulanthaka Rasa***

Sl. No.	Test	Result
1.	Alkaloids	Negative
2.	Carbohydrates	Positive
3.	Steroids	Positive
4.	Tannins	Positive
5.	Saponins	Negative
6.	Starch	Negative
7.	Flavanoids	Positive
8.	Coumarins	Positive
9.	Carboxylic acids	Negative

Table 8: **Test report of microbial contamination of *Mehakulanthaka Rasa***

Sl.No.	Microbes	Values
1.	*Escherichia coli*	Absent/gm
2.	*Salmonella*	Absent/gm
3.	*Pseudomonas aeruginosa*	Absent/gm
4.	*Staphylococcus aureus*	Absent/gm

DISCUSSION

For samanya shodhana of Vanga the common method of the dhatu shodhana was adopted. However, the order of quenching was Kanchi, Takra, Kulatha Kwatha, Gomutra and Tila taila as per the reference of Rasatarangini[10]. The order of quenching is mentioned differently by different acharyas. The various liquids used for quenching served the basic purpose of acidic or alkaline medias which were necessary to bring about the desired changes in the metal. Tin purified by the general method was melted and poured in to Nirgundi patra swarasa *(*juice of *Vitex nigundo* leaves) mixed with Haridra *(Curcuma longa)* powder[11]. The same process was repeated for three times using fresh liquid. The ratio of Nirgundi patra swarasa and Haridra churna, was taken as 1:16 as mentioned by Prof. D.A. Kulkarni in his commentary on R.R.S[12].

For the jarana procedure vishesha shodhita vanga was taken in an iron pan, heated at the temperature 600°C - 700°C. Apamarga panchanga coarse powder was added little by little and rubbed with back of ladle with pressure. The process continued till it turned to powder form completely. The purpose of putiloha is to increase the melting point. Without jarana marana of putiloha is not possible[13].

For preparation of bhasma electric muffle furnace was used instead of classical puta method because a better control of temperature is possible by electric muffle furnace. It took 10 putas to obtain the bhasma which complied with classical bhasma parikshas.

Shodhana procedure selected for Abhraka was nirvapa which was done in triphalakwatha for 7 times[14]. Shodhana of abhraka is more a size reduction process while separating the physical impurities. The process of dhanyabhrakeekarana produces granular form of purified abhraka, destroying its lattice form and giving better chance of exposure to maximum particles of it. The small size of particles procured after this process helps in early conversion to bhasma, as more surface area is exposed for reaction. To make abhraka bhasma free from chandrika is a tedious job but the marana of abhraka with the help of arka ksheera proved very much beneficial. About 60% of Chandrika disappeared in the 1st puta itself and thereafter decrease was very gradual. It took 30 putas for complete removal of chandrika. The weight gain can be attributed to the addition of organic matter of bhavana dravya. Brick red colour of bhasma was noticed from 5th puta onwards which became darker with further puta.

The classical reference selected for parada shodhana contained sudha*(*lime*)*, lashuna *(Allium sativum)* and saindhava lavana*(*rock salt*)*. It was observed that when Parada was triturated with sudha, it was converted to powder form which may be referred as Grey powder. It is difficult to procure whole amount of parada by vastra-galana process (filtration through cloth) as mentioned in classics. So it was washed with hot water. During this procedure loss of parada with water should be checked. Lashuna contains organic sulphur, which reacts with mercury to give black colour. Studies have shown the effectiveness of garlic in reducing the trace elements present in mercury[15].

Process of Gandhaka shodhana was carried out as per AFI part-I (quoting the reference of Rasamritam) by taking one fourth ghrita and godugdha four times the weight of gandhaka. Mandagni was given to avoid burning of sulphur. Cloth was smeared with ghee to avoid sticking of gandhaka to the cloth. Godugdha was boiled and then cooled. The formation of granules was facilitated by slightly shaking the vessel of godugdha as well as pouring the molten gandhaka in to the vessel through a large area. After each dhalana, gandhaka was thoroughly washed with hot water to remove fat contents of milk and ghee. Each time, fresh godugdha was taken to facilitate detoxification of gandhaka.

Samaguna kajjali was prepared taking equal quantity of shuddha parada and shuddha gandhaka. It took average 24 hours to form proper Kajjali. As the triturating continued, the kajjali became fine and had a tendency to be spilled out of the khalva yantra. Completion tests of kajjali indicated its complete formation i.e. Nishchandrata indicated no free mercury and Rekhapurnata indicated its fineness.

Shilajatu shodhana with triphala kwatha was done as per the reference of the text Rasa Tarangini where the amount of triphala kwatha was taken double that of Shilajatu[16]. But the amount seemed insufficient for dissolving shilajatu and it was found that the solution became very thick. Hence equal amount of hot water was added. After sedimentation, the supernatant liquid was decanted and to the residual matter again hot water was added to extract remaining shilajatu. The supernatant portion was collected and was evaporated to collect the shuddha shilajatu.

Gopala karkati mula (root of *Melothria moderaspatana*) the bhavana drug is specially indicated for Prameha in Raja Nigantu[17]. During mixing of ingredients mineral drugs in the order kajjali, vanga bhasma, abhraka bhasma were added and triturated well. Then the herbal ingredients were added one by one and triturated. Shilajatu which was in the maximum quantity was added in the last.

Regarding organo leptic characters, the colour of Meha kulanthaka rasa (MKR*)* was blackish brown and it was odourless. Colour can be attributed to blackish kajjali and shilajatu apart from brown coloured herbal ingredients. The taste of MKR was tikta, kashaya due to the presence of herbal ingredients which were having tikta, kashaya rasa predominance especially Bhunimba. MKR was smooth in touch since the powders were very fine. Average weight of the vati was 260.0 mg. Both hardness and disintegration time interfere with the bioavailability of drug. MKR was found to have 3.5-4 kg/cm^2 hardness and 60-65 min disintegration time. Moisture content should be minimum to prevent degradation of product. Excess of water in drug encourage microbial growth, presence of fungi or insects and deterioration following hydrolysis.MKR contained 4.86% w/w moisture. Ash values are the criteria to judge the identity and purity of crude drug, where water soluble acid insoluble and total ash are considered.MKR contained 19.4% w/w of total ash. The water soluble and alcohol soluble extractives of the sample were 27.12 % w/w and 18.32 % w/w respectively indicating that the drug is having good solubility in water. The pH value is one of the main factors influencing the quality of medicine. It always controls many chemical and microbiological reactions. The pH of MKR 5% w/v solution in water was found to be 3.90.

By their origin, herbal drugs are subject to contamination by microorganisms from soil, air and water which can be potentially pathogenic to human. However, analysis for specific pathogens like salmonella, e coli, pseudomonas and staphylococcus were found nil in the sample. Phytochemical screening of drug revealed the presence of steroids, carbohydrates, tannins, flavanoids, and coumarins. In earlier studies steroids and terpenoids have been reported to possess antidiabetic activity[18]. Flavonoids and their related natural compounds are also known to encompass antidiabetic potential, demonstrated in various animal models[19].

CONCLUSION

The present effort to develop an SOP for the preparation of Mehakulanthaka Rasa as well as to develop its analytical profile serve as a preliminary step towards standardization of the

formulation. Further study is necessary to explore other parameters related to standardization to be carried out in different batches to set the limit for reference standards for the quality control and quality assurance of Mehakulanthaka Rasa.

REFERENCES

1. Sabitha George, Melanie Sebioglue, Kristina Yeghiazaryan. Inadequate diabetic care: Global figures cry for preventive measures and personalized treatment. EPMA Journal (2010)1:13-18.
2. Govinda Dasa, *Bhaishajya Ratnavali*, *Siddhiprada* Hindi commentary by Shri Siddhinandan Mishra, Chaukhambha Surbharati Prakashan;Varanasi, 1st edition, Reprint 2009,37/69-74,p.704.
3. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 2/27-28.pp27-29.
4. Government of India, Ministry of Health and Family Welfare, Department of ISM& H, Ayurveda Formulary of India, Controller of Publications; New Delhi Vol 2, Part B
5. Vaidya Yadavji Trikamji, Rasamrita, English translation by Dr. Damodar Joshi, Chaukhambha Sanskrit bhavan; Varanasi, Ist edition 1998,3/92-94,p.64.
6. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 2/27-28.p16.
7. Vaidya Yadavji Trikamji,Rasamrita,English translation by Dr.Damodar Joshi, Chaukhambha Sanskrit bhavan; Varanasi, Ist edition 1998,3/88-91,p.64.
8. Acharya Madhava, Ayurveda Prakasha, Artha vidhyotini hindi commentary by Gulraj Sharma Misra,Choukambha Bharti Academy; Varanasi, reprint 2007,2/113-114
9. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 10/38-42,p 229.
10. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 15/6,p362
11. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 18/11.p243.
12. Vagbhata,*Rasa Ratna Samucchaya*, vol 1 with 'Vijnanabodhini' Hindi trans.and commentary by Prof.D A Kulkarni, reprint 2010, Meharchand Lachmandas Publications; New Delhi,5/156-158.
13. Darshan K. Parmar, B. J. Patgiri, P. K. Prajapati Standardization of *Gaja Puta* and *Ardha Gaja Puta* in the preparation of *Vanga Bhasma,* Ayu. 2010 Oct-Dec; 31(4): 511–515.
14. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 10/20.p225.
15. Sane, M Chakraborty, Jaya Ramchandran. HPLC study of the Ayurvedic process of purification of Parada using Garlic juice. Indian Drugs Oct 2008 vol.28(1).
16. Sharma Sadananta, Rasatarangini, Motilal Banarsidas; New Delhi, 11th edition, reprint 2009, 22/69-84.p584.
17. Narhari Pandit, Raj Nighantu, Dravya Prakasika Hindi commentary edited by Dr. Indradev Tripathi, Krishnadas Academy; Varanasi,4th edition, 2006,p.384
18. V. Vinodhini, M. Himaja, V. Sai Saraswathi, Das Poppy. *In vitro* antidiabetic activity of *Tragia involucrata* Linn. leaf extracts. Int. J. Res. Ayurveda Pharm. 2015;6(1):1-3 http://dx.doi.org/10.7897/2277-4343.0611
19. Ramulu Jadhav, Goverdhan Puchchakayala. Hypoglycemic an antidiabetic activity of flavonoids: boswellic acid, ellagic acid, quercetin, rutin on streptozotocin-nicotinamide induced type 2 diabetic rats. Int J Pharm Pharm Sci, Vol 4(2) 251-256.

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