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Research Article

PHARMACEUTICAL ANALYTICAL STUDY OF *KAMPAVATARI RASA* - AN AYURVEDIC HERBO MINERAL FORMULATION

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ABSTRACT

Kampavatari Rasa (KVR) is a unique Ayurvedic herbo- mineral formulation mentioned in the classics *Rasa Raj Sundar* in *Vata vyadhi* and indicated mainly in *Kampavata* which resembles Parkinson's disease. The line of treatment in *Ayurveda* is to combat *Vata dosha* and to sustain neuronutrition by Rasayana remedies, which can be achieved by *Kamapavatari Rasa* with its properties like *Tridosh shamaka* and Rasayana. The present study was executed to establish a finger print for this unique formulation which can be used further for drug standardization. *Kampavatari rasa* is prepared by triturating *Tamra bhasma* and *Rasa Sindura* in equal quantity with *Katuki* swaras (*Picrohiza kurroa*) for 21 times. Each ingredient was prepared according to the norms of *Ayurvedic* classical texts. Raw drugs were selected on bases of *Grahya lakshana* and its percentage. To ensure the proper preparation of *Tamra bhasma*, standard tests (*Bhasma Pariksha*), XRD, NPST and SEM were carried and for *Rasa sindura* NPST test and XRD were employed. After been complied these tests KVR was prepared and subjected for physico chemical analysis and quantitative analysis of Mercury, Sulphur and Copper by ICPAES. The study of *Kampavatari Rasa* revealed that its Loss on Drying - 3.4%, Total Ash - 48 %, Acid insoluble ash -13%, water soluble ash - 9.5%, Hardness test was 7kg/cm^2 and Tablet disintegration test 14/min which are within the normal limits and ICP – AES shows the percentage of Copper 20.51, Sulphur 8.9, and Mercury 20.43. This is the first study to establish the characterization of *Kampavatari rasa.*

KEYWORDS: *Kampavatari Rasa, Tamra Bhasma, Rasa Sindura*, *Katuki,* ICPAES.

INTRODUCTION

Ayurveda (knowledge of life), the science of longevity, is one of the most ancient forms of medicine that is said to have originated from *Lord Dhanvantri*, the physician of Gods. In this science, preparations involving heavy metals called *Bhasmas* (ash) are very common. These metals in combination with the constituents of herbs are said to form an effective combination in disease management and treatment[1], they are called as *Rasaushadhis* which are well known for their rapid action, small drug dose and having great efficacy.[2] This *Rasa kalpas* are prepared into different dosage forms like *Khalvi Rasayana, Parpati, Pottali* & *Kupipakwa Rasayana, among this Khalvi Rasayana* are used more above 80%.[3] *Kampavatari Rasa* is a such formulation which include this type of dosage form mentioned in classics *Rasa Raj Sundar* mainly indicated in the *Kampavata*[4]. *Kampavata* is one of the *Nanatmaja vata vyadhi* termed as *Vepathu* mentioned by *Acharya Charaka*[5], having main symptom like *Kampa*. *Kampavata* resembles PD and because of its crippling nature and non availability of curative treatment this disease has remained a great problem in the society[6]. The line of treatment mentioned in *Ayurveda* is to combat *Vata dosha* and sustain neuronutrition by *Rasayana* remedies, which can be achieved by this formulation having the main ingredient *Tamra bhasma* which is *Tridosha shamaka*, and *Rasa sindura* as a best *Rasayana*. Since these preparations are sustaining themselves since centuries in clinical use, therefore one cannot exclude its use as it contains heavy metals which are considered toxic by contemporary science. Proper documentation is the demand of time to validate the claims about this metallic preparations[7]. The technological development and apprehensions of modern science obligated the patients and physicians to be watchful about the quality assurance, safety and efficacy of the medicine. Hence it is the need of the hour to produce fingerprints for quality medicines[8]. Many researchers have analyzed the metal and mineral-based individual *Bhasmas* and required to develop fingerprints for the compound formulations also. But till date no scientific work has been carried out on selected formulation *Kampavatari Rasa* with respect to physicochemical characterization, which is essential for drug standardization so study has been selected.

MATERIALS AND METHODS

Material

Raw material *Tamra patra, Parada, Gandhaka*, and *Navasadar* and other associated drugs are collected on

bases of their *Grahya lakshnas* form market and authenticated from the CRF KLE University BMK *Ayurvedic Mahavidyalaya*. And send for elemental essay in % at BTH Bangalore.

Pharmaceutical study carried out at Department of *Rasa shastra* KLE B.M.K. *Ayurveda Mahavidhyalaya* Research centre, analytical study were carried out at CRF K.L.E. University B.M.K. *Ayurvedic Mahavidyalaya* Research centre, IIT POWAI Mumbai, and Shivaji University Kolhapur.

Methods

Kampavatari rasa contain mainly *Tamra Bhasma, Rasa Sindura* and *Katuki* (*Picrohiza kurroa*). The pharmaceutical study is carried out under following steps.

Rasa sindura

A. *Shodhan* of *Parada*[9]
B. *Shodhana* of *Gandhaka*[10]
C. *Samaguna Kajjali* preparation[11]
D. *Shodhana* of *Navasadar*[12]
E. Preparation of *Rasa Sindura*[13] in Electric Muffle Furnance

For the preparation of *Rasa Sindura*, *Nimbu swaras Bhavita Kajjali* (black sulfide of mercury, wet-triturated with fresh juice of *Citrus Limon*) added *Navasadar* triturated well and was filled in a beer bottle wrapped by seven layers of clay and cloth. It was subjected to mild (250°C) moderate (250-450°C) and severe (650°C) heat through vertical electric muffle furnace. Total duration of heating was 24 hours. *Rasa Sindura* thus obtained was collected in the form of sublimate at the neck of the bottle and analyses were done.

1. *Tamra Bhasma*
   A. *Samanya shodhana* of *Tamra*[14]
   B. *Vishesh shodhana* of *Samnya shodhita Tamra*[15]
   C. *Marana* of *Tamra*[16]
   D. *Amritikarana* of *tamra Bhasma*[17]

For Samanya shodhan Kantaka vedhi Tamra patra was taken and heating and quenching done in media *Tail, Takra, Gomutra, Kanji* and *Kulatha kwath* each for 7 times. Then its *Dola yantra swedan* for 6 hrs had done in the *Gomutra* with *Saindhava* for its *Vishesh shodhana*. For *Marana* process it is subjected for *Gajaputa* by adding *Kajjali* and *Bhavana* of *Nimbu swaras*. Total 8 *Puta* have been given till the *Bhasma siddhi lakshana* are achieved. After the tests complies it processed for *Amritikarana* by giving *Panchamruta bhavana* to the *Tamra bhasma* and *Shudha Gandhaka* and subjecting *Gaja puta*, same procedure repeated for 3 times as per reference.

2. Preparation of *Katuki swaras* according to *Sharangadhara Samhita*[18]

Dry *Katuki* made into course powder and 8part water added and reduced to 1/4th quantity by heating. Then it is filtered and used for *Bhavana.*

3. Preparation of *Kampavatari rasa* according to the *Rasa Raj Sundhara*[19]

Equal quantity of *Tamra bhasma* and *Rasa sindura* taken in the *Khalva yantra* and triturated by adding *Katuki swaras* and dried so procedure of triturating by adding *Katuki swaras* done for 21 times and finally rolled into *Vati* form dried under shed and packed in the air tight container.

Analysis of *Tamra bhasma, Rasa Sindura* and *Katuki* were carried out at CRF KLE University B.M.K. Ayurvedic Mahavidhyalaya, Belguem. XRD of *Tamra Bhasma* and *Rasa Sindura* at Shivaji University. Particle size estimation of *Tamra Bhasma* by SEM at IIT Powai Mumbai.

The physico chemical analysis of *Kampavatari Rasa* is carried out at CRF KLE University BMK Ayurvedic Mahavidhyalaya and quantitative analysis of Hg, S and Cu by ICPAES is carried out at IIT Powai Mumbai.

RESULTS

Pharmaceutical results

Table 1: Showing the results of *Rasasindura*

Batch	*Kajjali*	*Shodhita Navasadar*	*Nimbu Swaras*	Weight of *Rasa Sindura* obtained
1	100g	12.5 g	25 ml	38.4 g
2	100g	12.5 g	20 ml	36.8 g

Graph No1. Graph showing temperature pattern for *Rasa Sindura*

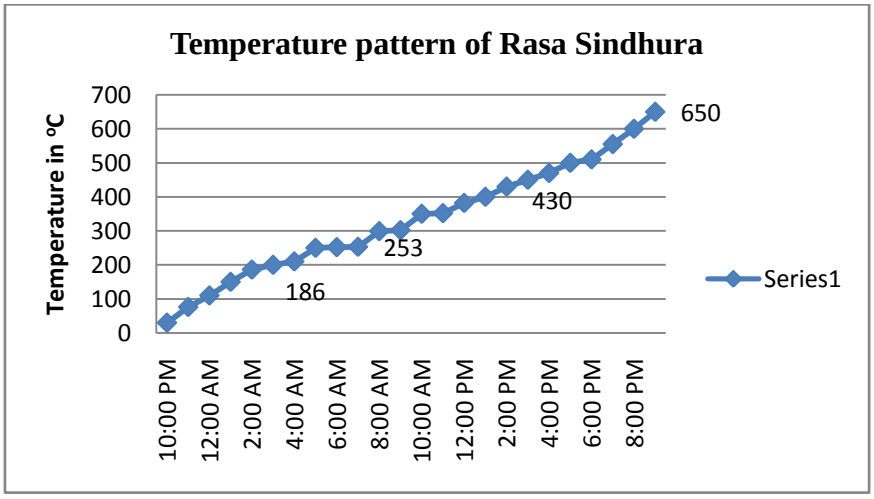

Table 2: Showing the weight variations during the procedures *Shodhana, Marana* and *Amritikarana* of *Tamra*

Sr. No.	Observations	*Tamra Patra* (in gm)
1	Wt before *Samanya shodhan*	200
2	Wt after *Samanya shodhan*	129
3	Loss	71
4	Wt. after *Vishesh shodhan*	115
5	Loss	14
6	Wt of sh. *Tamra* before *Marana*	110
7	Wt of *Tamra bhasma* after 8th *puta*	101
8	Loss after *Marana*	9
9	Wt of *Tamra bhasma* taken for *Amritikarana*	60
10	Wt of *Tamra bhasma* after *Amritikarana*	58
11	Loss after *Amritikarana*	2

Table 3: Relation of *Puta*, weight and consistency during *Tamra Marana*

No.of *puta*	Wt. of *Tamra* in gms	Wt. of *Kajjali* in gms	Total wt. in gms	Wt after *Puta* in gms	Color	Consistency
1st *puta*	110	220	330	129	Black with tinge of Red	Foils were brittle to powder
2nd *puta*	120	30	154	123.2	Black	Hard
3rd *puta*	118	29.5	153.4	110.2	Black	Hard
4th *puta*	110.2	27.5	156.2	108.4	Greyish black	Soft
5th *puta*	108.4	25	142.6	108.8	Greyish black	Soft
6th *puta*	108.8	27	134.6	104.4	Greyish black	Soft
7th *puta*	104.4	26	137	107	Black	Soft
8th *puta*	107	26.2	135	101	Black	Soft

Graph No. 2 Graph showing temperature pattern for *Gajaputa*

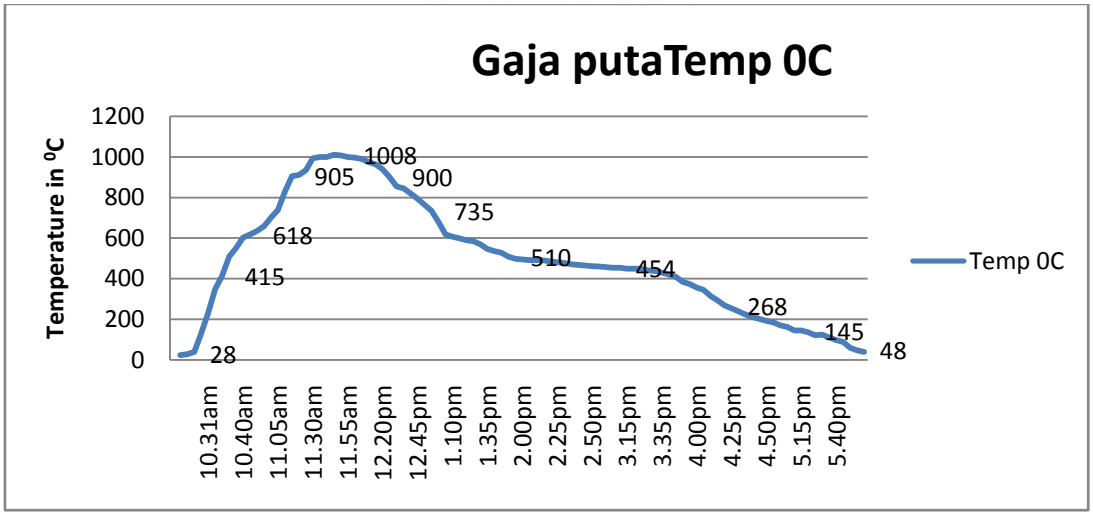

Table 4: Showing the results of *Amrutikarana* of *Tamra Bhasma*

No of Putas	*Tamra Bhasma*	*Shodhita Gandhaka*	*Panchamruta*	Total Wt.	Wt after *Puta*
1st	60 g	30 g	QS	101g	60g
2nd	60 g	30 g	QS	115g	60g
3rd	60 g	30 g	QS	105g	58g

Graph No. 3 Graph showing temperature pattern for *Amritikarana*

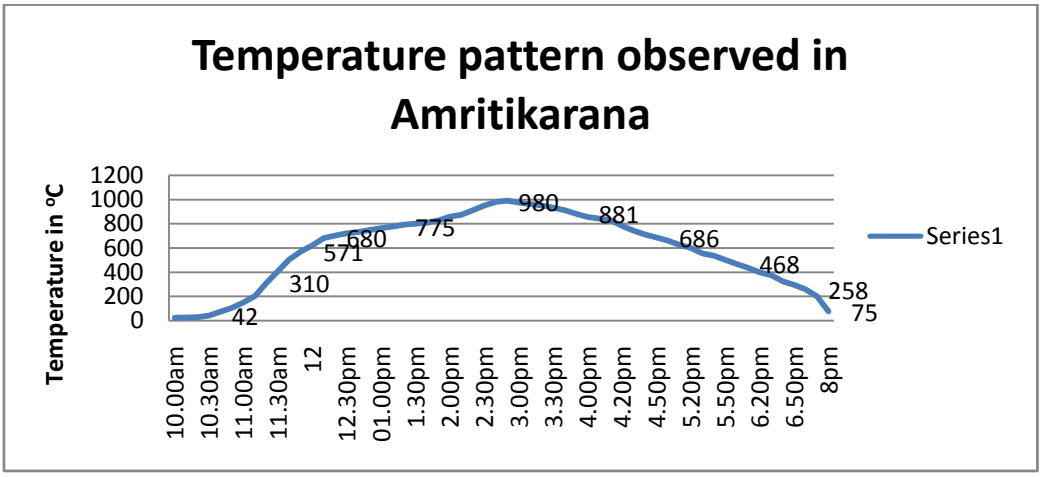

Table 5: Showing the results of Preparation *Kampavatari Rasa*

Tamra Bhasma	*Rasasindura*	*Katuki Swaras*	Weight Before	Weight After 21 *Bhavana*
43 g	43 g	25ml (appr. each Time)	86 g	110 g

Table 6: Showing the Relation of weight and *Bhavana Dravya* in Preparation of *Kampavatari Rasa*

No.of *bhavana*	Quantity of drug in gm		Quantity of *Kwath* in ml	Duration in hrs
	Before	After		
1st	86	89.2	25	4
2nd	89.2	90.5	24	4
3rd	90.5	91.3	24	3
4th	91.3	92.8	22	3
5th	92.8	93	25	4
6th	93	93.4	20	3
7th	93.4	93.9	18	3
8th	93.9	94.2	20	4
9th	94.2	94.6	21	3
10th	94.6	95.4	21	4
11th	95.4	96.5	20	3
12th	96.5	98	20	4
13th	105.7	106.2	18	4
14th	106.2	106.5	18	3
15th	106.5	107	16	4
16th	107	107.4	18	4
17th	107.4	107.6	16	3
18th	107.6	108	15	4
19th	108	108.6	15	3
20th	109	109.4	15	3
21st	109.4	110	15	4

Analytical result

Table 7: Quantitative analysis of *Parada, Gandhaka* and *Tamra* by AAS (Instrumental) method[20]

S.No	Raw material	Parameters	Percentage
1	*Parada*	% of Hg	87.08%
2	*Gandhaka*	% of S	97.23%
3	*Tamra*	% of Cu	88.64%

Table 8: Physicochemical features of Prepared *Rasasindura*[21]

Name of test	Results
Ash Value	Nil
Loss on drying	0.295%

Table 9: X-Ray Diffraction (XRD) results of *Rasasindura*[22]

Sample	Major Phase-form
Rasasindura	Mercury Sulfide

Table 10: Showing Results of NPST of *Rasasindura*[23]

Sample	Solution	Paper	Observation
Rasasindura	Aqua Regia	10% KI	Brick red solid spot with dark brown periphery observed

Table 11: Showing the results of *Bhasma Pariksha* of *Tamra Bhasma*[24]

Name of test	Results
Rekhapurnatwa	Passes
Varitara	Passes
Unnama	Passes
Nirdhumatwa	Passes
Jiwva Pariksha	Passes
Apunrbhavatwa	Passes
Dadhi Pariksha	Passes

Table 12: X-Ray Diffraction (XRD) results of *Tamra Bhasma*[25]

Sample	Major Phase-form
Tamra Bhasma	Copper sulfide

Table 13: Showing Results of NPST of *Tamra Bhasma*[26]

Sample	Solution	Paper	Observation
Tamra Bhasma	5 N HNO_3	10% KI	Solid chocolate color spot.

Scanning Electron Microscopic (SEM) result: [27]

Tamra bhasma (after 8th *puta*)**:** Particle size 40 nm - 140 nm.

Analysis of *Katuki*[28]

Table 14: Showing Physicochemical Analysis of *Katuki*

Name of test	Results
Loss on drying	8.4%
Total ash	2.463%
Acid insoluble ash	0.492
Water insoluble ash	2.487

Table 15: Organic test of *Katuki* shown positive for following test

Sr. No.	Name of Test	Water extract	Alcohol extract
1	Carbohydrate	Positive	Negative
2	Non reducing sugar	Positive	Positive
3	Steroids-Salkowski reaction	Positive	Positive
4	Test for Glycosides		
a.	Cardiac Glycosides (Deoxysugar)	Positive	Positive
b.	Saponin Glycosides	Positive	Positive
c.	Coumarin Glycosides	-	Positive
d.	Flavonoids	-	Positive
5	Alkaloids	Positive	Positive

Table 16: Qualitative Test for Inorganic Elements in *Katuki* shown positive for following test

Name of test	Results
Test for Iron	Positive
Test for Carbonate	Positive
Test for Sulphate	Positive
Test for Chloride	Positive

Table 17: Showing organoleptic characters of *Kampavatari Rasa*

Size /weight	Approximately 160-250 mg
Odour	Aromatic
Colour	Brownish black
Shape	Round
Taste	Tikta, Katu
Touch	Smooth

Table 18: Showing Physicochemical Analysis of *Kampavatari Rasa*[29]

Name of test	Results
Hardness test	7kg/cm^2
Disintegration time	14 min
Loss on drying	3.4%
Total ash	48%
Acid insoluble ash	13%
Water soluble ash	9.5%
Microbiology Test	Within Normal Limit

Table 19: Qualitative Test for Inorganic Elements in *Kampavatari Rasa*[30]

Name of test	Results
Test for Calcium	Present
Test for Magnesium	Absent
Test for Sodium	Absent
Test for Potassium	Absent
Test for Iron	Absent
Test for Carbonate	Absent

Table 20: Elemental study by ICP-AES of *Kampavatari Rasa*[31]

Sr No.	Elements	Percentage
1	% of Hg	20.43%
2	% of S	8.9%
3	% of Cu	20.51%

DISCUSSION

Kampavatari rasa is a unique metal base formulation mentioned in the *Rasa raj Sundhara* containing *Rasa sindura*, *Tamra Bhasma* in equal quantity and 21 *Bhavana* of *Katuki Swaras*.

The formulation is in use clinically but still there is no data available regarding its pharmaceutical and analytical study so present study is taken into consideration to fill this gap of knowledge.

Rasasindura and *Tamra Bhasma* have been taken equal in quantity in *Khalva yantra* and 21 *Bhavana* of *Katuki* has been given. Fresh *Katuki* for *Swaras* was not available so dry whole *Katuki* rhizome were purchased and identified by expert and *Paryayi swaras* method mentioned in *Sharandhara Samhita* was adopted. Initial weight was 86 g after completion of 21 *Bhavana's* it is raised upto 110 g so 24gms i.e. 27.9% of weight gain was observed. It may be due to *Bhavana dravya*. When *Katuki swaras (Kwath*) is prepared it contains *Ghana Satva* of *Katuki kandha* and water so increase in the weight may be due to *Ghana satva*.

Bhavana process increases the therapeutic efficacy of material and with its active chemical constituents organic components of liquid media are transferred to the material to make it organo- metallic compounds with main drug, which are favourable to the

body, thus increasing bioassimilation power and therapeutic effect.

As we proceed for the *Bhavanas* it was becoming stickier and the quantity of *Katuki swaras* required for the each *Bhavana* was decreased as we proceed. The *Katuki* smell appeared to the final product and the final product became stickier which can be easily rolled into pills.

The colour of *Tamra Bhasma* was black in colour. Touch is smooth and soft, odourless and tasteless. All samples fulfilled *Rekhapurnatwa, Varitaratwa, Unama, Avami, Apunrbhavatwa* and *Dadhi pariksha* after 8 *Gaja* puta.

XRD was carried out for *Tamra Bhasma*, the 2θ value at maximum intensity of *Tamra Bhasma* showed almost similar peaks which match with Cu_2S (Copper sulfite). SEM shows most of the particles in nanoparticles ranges from 40 nm to 140 nm. Reduction in particle size facilitates absorption of the *Bhasma* in the system.

The colour of *Rasasindura* was reddish brown. Touch is smooth and fine, odorless and tasteless.

Total ash value found to be Nil and Loss on drying was 0.295 % which were similar to the standards which are mentioned in the Pharmaceutical Standards of Ayurvedic Formulation for *Rasa Sindhura*.

XRD was carried out for *Rasasindura*, the 2θ value at maximum intensity of *Rasasindura* showed similar peaks which match with HgS (Mercury sulfite).

The role pills were subjected to tablet Hardness test and Disintegration test. Hardness was 7 kg/cm^2 which are within the normal limits and Disintegration time was 14 min which is within the limits.

Acid insoluble Ash is that ash which is not soluble in 5% HCl. If the amount of Ash insoluble in HCl is 13% in case of *Kampavatari Rasa*, this otherwise means that, rest of the part of the ash is soluble in 5% HCl. This gives us hint that all most 87% of the *Kampavatari Rasa* is being absorbed in the stomach where in the pH similes the environment created in the procedure of Acid insoluble Ash.

Loss on drying suggests the presence of moisture, organic matter or volatile substances present in the Yoga. In case of *Kampavatari Rasa* it is 3.4%, which can be explained by presence of *Katuki bhavana dravya,* and its volatile substances.

Total ash of *Kampavatari Rasa* found to be 48 % which may be due to presence of *Tamra bhasma* which must have total ash more than 90 % and where as *Rasa Sindura* has total ash nil.

The result of ICP-AES shows the percentage of Copper is 20.51, Sulphur is 8.9 and Mercury is 20.43 in *Kampavatari rasa.*

CONCLUSION

Kampavatari Rasa is a black colored compound formulation in form of *Vati* used in the intervention of *Kampavata*. Physico chemical analysis of KVR revealed Loss on Drying - 3.4%, Total Ash - 48 %, Acid insoluble ash -13%, water soluble ash - 9.5%, Hardness test 7 kg/cm^2, Tablet disintegration time -14 min. Quantitative analysis of KVR by ICPAES reveals Mercury - 20.43%, Copper - 20.51%, and Sulphur - 8.9%. This study can serve the need for the characterization of KVR. This study can be a direction for establishing the fingerprint of *Kampavatari rasa* herbomineral compound formulation.

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REFERENCES

1. Surya Nagarajan et al. Safety and toxicity issues associated with lead-based traditional herbo-metallic preparations; Journal of Ethnopharmacology 151 (2014) 1–11 www.elsevier.com/locate/jep.
2. Dr Lagad C. E., Dr Jadhava Vishal Comparative study of Kupipkwa rasayana by traditional method and modified method with special reference to rasa sindoora Ayurveda mahasamelana Patrika September 2010: 35.
3. Sawant Ranjeet, Bhoyar Manish, Pharmaceutics & therapeutics of Kajjali (black Sulphide of mercury) - a review Asian Journal of Pharmaceutical Research and Development Vol.1 (3) May- June 2013: 92-97.
4. Pathak Shrikrishna Lalagaj Dattaram; Ras Raj Sundar, Uttarakhand (uttarabhag), Kamala prakash, Mathura, Edn 1888, vatavyadhi chikitsa adhyaya page no.549-550.
5. Agnivesh, Charaka Samhita, Acharya Vidyadhar Shukla and Proff. Ravidatta Tripathi, Chowkhamba Sanskrita Pratistana Varanasi reprint 2007, Ch.Su.20/11,Pp293.
6. Dr. Vijaya mahantesh. A Clinical study on kampavata (Parkinson's disease) and its management with Triguna rasa RGUHS 2011 http://hdl.handle.net/123456789/4613.
7. N. Pattanaik et al., Toxicology and free radicals scavenging property of tamrabhasma. Indian Journal of Clinical Biochemistry, 2003, 18 (2) 181-189.
8. Gupta K. L. Virupaksha and Neeraj Kumar Characterization of Tarakeshwara Rasa: An Ayurvedic herbomineral formulation AYU 2012 Jul;33(3):406-11.
9. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini chaukhamba publication 11th edition 1979 5/27-29 p. 79.
10. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini chaukhamba publication 11th edition 1979 8/7-11 pg no. 176.
11. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini Motilal Banarasidas Varanasi 11th edition 1979 reprint 2000 2/27 pg no. 16.
12. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini,

chaukhamba publication 11th edition 1979 14/3-4 pg no. 326.

13. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita, Rasatarangini, chaukhamba publication, 11th edition 1979 8/185 pg no. 138.
14. Shri Vagbhatacharya Virchit Rasa Ratna Samuchaya, Kaviraja Shri Ambica Datta Shastri, Chaukhamba Amarbharati Prakashan, Varanasi 9th edition 1995 reprint 2003 5/29 pg.no.99.
15. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini, chaukhamba publication, 12th edition 1978 17/17 pg no. 412.
16. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini chaukhamba publication, 12th edition 1978 17/25 pg no.414.
17. Pranacharya Shrisadanandasharmana virachita P. Kashinatha shastrina sampadita Rasatarangini Motilal Banarasidas Varanasi 11th edition 1979 reprint 2000 17/37- 39 pg no. 417-418.
18. Pandita Sharngadharacharya Sharangadhara - Samhita by Dr Brahmanand Tripathi Chaukhamba Surbharti Prakashan Varanasi reprinted edition 2010 Madhyam Khanda 1/4 pg no. 125.
19. Pathak Shrikrishna Lalagaj Dattaram; Ras Raj Sundar, Uttarakhand (uttarabhag), kamala prakash, Mathura, Edn 1888,vatavyadhi chikitsa adhyaya page no.549-550.
20. Government of India Ministry of Health and Family Welfare Department of Ayurveda, Yoga and Naturopathy Unani Siddha and Homoepathy The Ayurvedic Pharmacopoeia of India 2007 1st edition Part II Volume -I pg. no. 243-246.
21. K. R. Khandelwala Practical Pharmacognosy Techniques and experiments, Nirali Publication, 19th edition, 2008 pg. no. 149-157.
22. Cullity BD. Elements of X-Ray diffraction 2nd edition. London: Addison Wesley Publishing Company. Palo. Alto; 1978.
23. CCRAS, Ministry of Health And F.W. Govt. of India, New Delhi, Application of Standardised Namburi Phased Spot Test In Identification of Bhasma And Sindura Preparations of Ayurveda, Pp 53.
24. Prof. Siddhinandan Mishra Ayurcediya Rasashastra Chaukhambha Orientalia, Varanasi 4th edition 2004 pg. no 99.
25. Cullity BD. Elements of X-Ray diffraction 2nd edition. London: Addison Wesley Publishing Company. Palo. Alto; 1978.
26. CCRAS, Ministry Of Health And F.W. Govt Of India, New Delhi, Application Of Standardized Namburi Phased Spot Test In Identification of Bhasma And Sindura Preparations of Ayurveda, Pp 52.
27. Goldstein J, Newbury DE, Joy DC; SEM and X- Ray Microanalysis 3rd edition New York: Springer science; 2003.
28. K.R. Khandelwala Practical Pharmacognosy Techniques and experiments, Nirali Publication, 9th edition, 2008 pg. no. 149-159.
29. Ayurvedic Pharmacopoeia of India part-I, e-Book, Appendix Volume(s)-I, II, III, IV, Government of India, Ministry of Health and Family Welfare Department of AYUSH 2007.
30. K.R Khandelwala, Practical Pharmacognosy, Techniques and experiments, Nirali Publication, 9th edn, 2008, P 149-157.
31. Thompson M. and Walsh J.N., "Inductively Coupled Plasma Spectrometry" Blackie. (1989).

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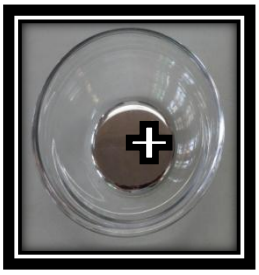
KAIIALI PREPARATION



Sh. Parada

Sh. Gandhaka

Trituration

Kajjali

RASA SINDHURA PREPARATION

Kupi bharana

Kupi heating in EMF

Kanthastha collected Rasa

Rasa sindhura

TAMRA BHASMA PREPARATION

Chakrikas for Puta

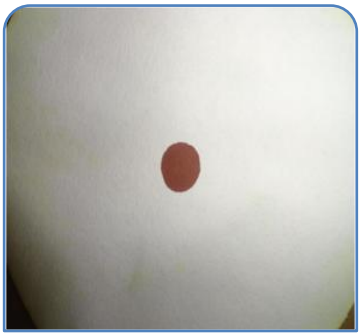
Gaja puta

Tamra bhasma

Final product Kampavatari Rasa in tablet form after 21 bhavanas of Katuki

Analytical tests

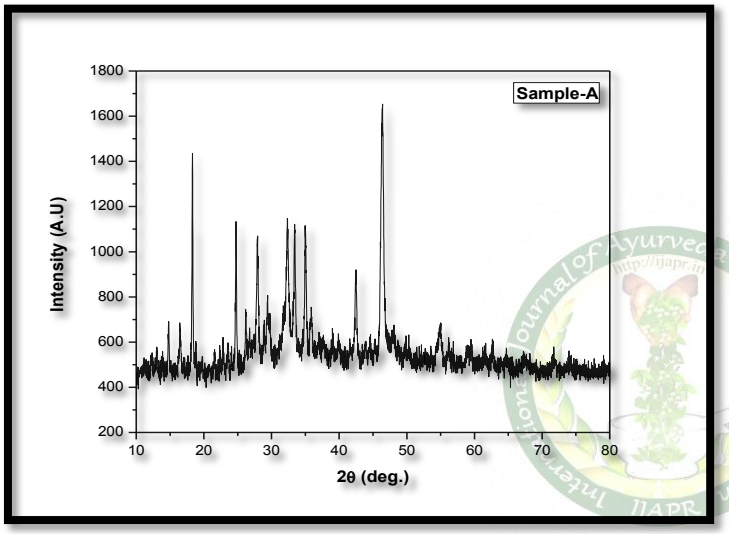
Disintigration test of KVR



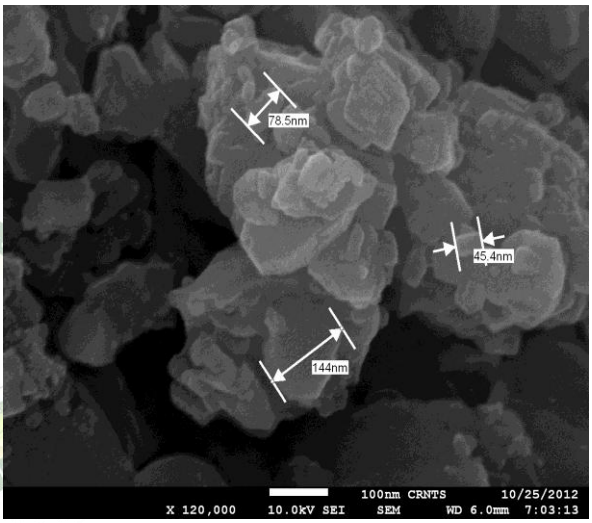
NPST of Tamra bhasma

NPST of Rasa Sindura

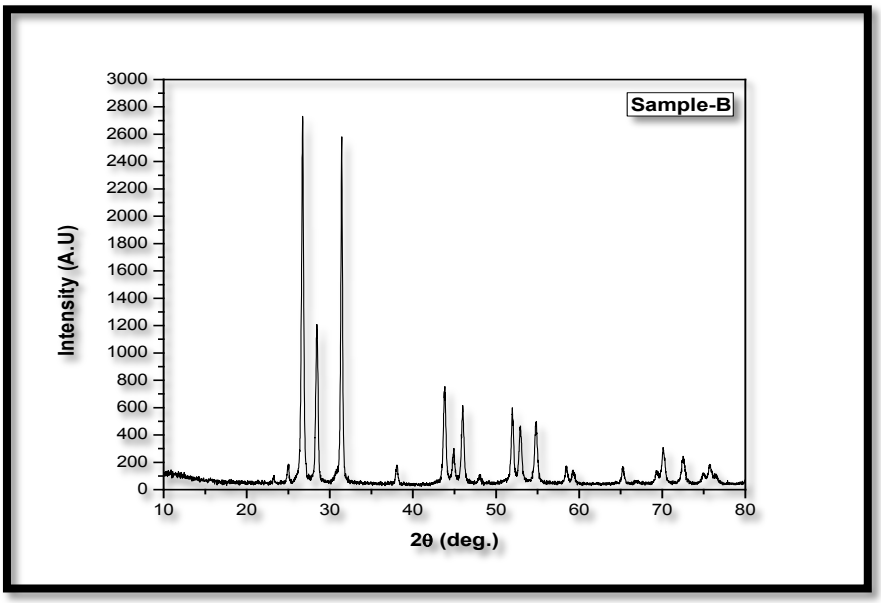
Graph No.1 Graph showing XRD result of Tamra Bhasma



Graph 1: Graph showing XRD result of Tamra Bhasma



SEM of Tamra Bhasma after 8th Puta



Graph 2: Graph showing XRD result *Rasa Sindura*