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Pharmaceutical and analytical studies on Vanga Bhasma: an updated review

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ABSTRACT

Considering the wide therapeutic properties of metals, Tin is used as therapeutic agent to treat the wide range of diseases like *Prameha, Krimi, Pandu, Mutrakricha, Shaweta Pradara, Rakta Pradara, Kalaibya* since ancient times. To get precise quality of drug and efficacious results it is important to prepare the *Ayurvedic* drugs as per classical reference. The numbers of procedures were described by our *Rasa Vaidyas* for the preparation of *Bhasma* and so many methods are adopted or adopting our research scholars to prepare the *Vanga Bhasma* in their study work. Based on reported studies, there is lack of uniformity in pharmaceutical process is an evident. The researchers have adopted different methods and have shown slight variations in pharmaceutical methods, analytical evaluations. The present report encompasses all the different pharmaceutical methods adopted and their analytical outcomes. This present report expected to provide, new needs to researchers working in the area of pharmaceutico therapeutic investigations on *Vanga Bhasma*.

Keywords: Tin, *Vanga*, Pharmaceutical Preparation, Analytical Parameter, Bhasma.

INTRODUCTION

Holistic approach of *Ayurveda* healthcare is aimed to balance the physical, mental and spiritual function of the human body [1-2]. *Ayurvedic* herbal, herbo-mineral or metal/mineral based medicines are the key tool in *Ayurvedic* armamentarium to treat wide range of diseases [3-8]. In *Ayurvedic Bhasma* preparation, various herbal materials are also being used converting the metal or mineral in suitable form compatible to human body [9-11]. These nano sized *Bhasma* are used as ingredient in several *Ayurvedic* compound formulations [12-14].

Tin is classified under metal in periodic table, having symbol (Sn) also known as *Vanga* in *Ayurveda*. It is prepared by various methods by using herbal, mineral drugs also termed as organo-metallic compound and used to treat numerous diseases like *Prameha, Medojanya Vikara, Kashaya Roga, Shukrakshya, Kalaibya, Pradara, Kasa, Sawas, Updansha, Adhmana* [15] etc. but now days it is commonly prescribed in *Prameha Roga* by many *Ayurveda* Practitioners. It is categorised under *Dhatu Varga* [16], further classified under *Puti Loha* [17] means which produce obnoxious smell on melting. There are number of methods of preparation *Bhasma* described in classical texts, which includes *Shodhana, Jarana and Marana*. After studying of different references about *Vanga Bhasma,* these steps are commonly carried out for preparation of all types with variation of drugs used for *Vishesha Shodhana, Jarana* and *Marana*. As per classical texts, acceptable quality of *Vanga* is used for *Bhasma* preparation and then subjected to various processes like *Shodhana* (purification), *Jarana*, *Marana* (incineration). *Shodhana* is process of purification can be classified as *Samanya* and *Vishesha*. *Samanaya Shodhana* is carried out in *Taila, Takra, Gomutra, Aarnala, Kulatha Kwatha* [18] whereas *Vishesha Shodhana* is done with *Nirgundi Swaras* [19] or *Churnodaka* [20] as per classical references by *Dhalana* method.

Jarana process is mainly done for the metals of low melting point and responsible for the solidification of metals and helps to facilitates the process of *Marana*. *Jarana* [21] is a process in which *Shodhita Vanga* is put in iron pan and heat is applied, 1/4rth form of dried *Apamarga Panchanga* is continuously added in *Shuddha Vanga* and stirring done till it converted into powder form. *Jarita Vanga* is now used for *Marana* process in which mineral drugs and decoction or juices of herbal drugs are used for levigation process. After levigation small circular pellets are prepared, they are dried properly and kept in *Sharava Samputa. Sandhibandhan* of *Sharava Samputa* are done with *Multani Mitti* smeared cloth and specific amount of heat applied for precise time also known as *Puta*. The choice of drug for levigation depends upon the method adopted by classical references. After self-cooling classical analytical methods are used to check

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the *uttam Bhasma* (good quality) and modern analytical methods are used to pass the value of monographs given for *Bhasma* so that it can be safely used as medicine.

MATERIALS AND METHODS

The information on *Vanga Bhas*ma was collected from classical *Rasa Shastra* text books and online databases, including Google Scholar, PubMed, Scopemed, Dhara online and other databases of bio allied sciences. The online search was conducted about the preparation of *Vanga Bhasma* by applying following keywords: Tin, *Vanga, Shodhana, Jarana, Marana, Bhasma*, physiochemical parameters. This review mainly focuses on data collected on pharmaceutical processes for the preparation of *Vanga Bhasma* and physiochemical parameters which can be beneficial information for future research perspectives. This search was undertaken from January 2020 to November 2020 and restricted to English language only.

Table 1: Pharmaceutical studies on *Vanga Bhasma* as per different reports

Research Done	Before *Shodhana*	After *Shodhana*	For *Jarana*	Quantity taken for Preparation of *Bhasma*	Prepared *Bhasma*
Shraddha Panchabbhai [22]	400gm	350gm	350gm	200gm (*Jarita Vanga* after *nirmilikarana*)	190gm
Patil et al [23]	800gm	650gm	650gm	610gm (700gm *Jarita Vanga*)	626gm
Kavya et al [24]	650gm	640gm	400gm	-	-
1st sample of *Vanga Bhasma*	-	-	-	70gm of *Shuddha Vanga*, (*Shuddha Parada* mixed , *Shuddha Gandhaka, Bhavana dravya Kumari Swaras*)	46gm
2nd sample of *Vanga Bhasma*	-	-	-	180gm *Jarita Vanga* (*Bhavana dravya Shatawari Swaras*)	245gm
3rd sample of *Vanga Bhasma*	-	-	-	180gm *Jarita Vanga* (*Shuddha Hartala , Bhavana dravya Nimbu Swaras*)	100gm
Geeti et al [25]	-	-	-	-	-
1st sample of *Vanga Bhasma*	350gm	327gm	327gm	338gm *Jarita Vanga*, (*Shuddha Hingul, Bhavana dravya – Kumari Swaras)*	258.5gm
2nd sampleof *Vanga Bhasma*	400gm	364gm	364gm	404gm *Jarita Vanga* ,(*Bhavana dravya –Kumari Swaras)*	364gm
Lagad CE et al [26]	1200gm	1032gm	1032gm	(1048gm *Jarita Vanga* obtained) *Jarita Vanga* taken for *Bhasma* preparation-200gm	198gm
Panwar et al [27]	200gm	182gm	175gm	180gm (*Jarita Vanga*)	181gm
Rajendraprsad et al [28]	400gm	350gm	-	-	-
1st sample of *Vanga Bhasma*	-	-	175gm (*Chincha Twaka Churna*)	175gm of *Jarita Vanga* (*Bhavana dravya-Kumari Swaras*	160gm
2nd sample of *Vanga Bhasma*	-	-	-	175gm –*Shuddha Vanga* (*Shuddha Hartala, Palashmula Kwatha*)	150gm
Shiva Prasad [29]	-	-	-	-	-
1st sample of *Vanga Bhasma*	500gm	445gm (*Samanya Shodhana*)	445gm	470gm (*Jarita Vanga*)- after *nirmilikaran*a was taken	365gm
2nd sample of *Vanga Bhasma*	500gm	470gm (*Vishesha Shodhana*)	470gm	510gm (*Jarita Vanga*) - after *nirmilikarana* 470gm was taken	350gm
3rdsample of *Vanga Bhasma*	500gm	410gm (*Samanya +Vishesha Shodhana*)	410gm	470gm (*Jarita Vanga*)- after *nirmilikarana* 420gm was taken	325gm

Table 2: Drugs used for the preparation of *Vanga Bhasma*

Research Done	Drugs used for *Vishesha Shodhana*	For *Jarana* process	For *Marana* process
Shraddha Panchabbhai [22]	*Nirgundi Swaras* & *Haridra Churna*	*Apamarga Panchanga*	*Bhavana dravya –Kumari Swaras*
Patil et al [23]	*Nirgundi Swaras* & *Haridra Churna*	*Apamarga Panchanga*	*Bhavana dravya –Kumari Swaras*
Kavya et al [24]	-	-	-
1st sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	*Ashvttha Twaka Churna*	*Shuddha Parada , Shuddha Gandhaka, Bhavana dravya- Kumari Swaras*
2nd sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	*Ashvttha Twaka Churna*	*Bhavana dravya- Shatawari Swaras*
3rd sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	*Ashvttha Twaka Churna*	*Shuddha Hartala , Bhavana dravya- Nimbu Swaras*
Geeti et al [25]	-	-	-
1st sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	*Ashvttha Twaka Churna*	*Shuddha Hingul, Bhavana dravya – Kumari Swaras*
2nd sampleof *Vanga Bhasma*	*Churnodaka*	*Apamarga Panchanga*	*Bhavana dravya – Kumari Swaras*
Lagad CE et al [26]	*Churnodaka*	*Apamarga Panchanga*	*Bhavana dravya – Kumari Swaras*
Panwar et al [27]	*Nirgundi Swaras* & *Haridra Churna*	*Haridaara, Yavani,Jirak, Chincha, Ashvttha Twaka Churna*	*Bhavana dravya – Kumari Swaras*
Rajendraprsad et al [28]	-	-	-
1st sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	*Chincha Twaka Churna*	*Bhavana dravya – Kumari Swaras*
2nd sample of *Vanga Bhasma*	*Nirgundi Swaras* & *Haridra Churna*	-	*Shuddha Hartala, Palashmula Kwatha*
Shiva Prasad [29]	-	-	-
1st sample of *Vanga Bhasma*	*Taila, Takra,Gomutra, Aarnala, Kulatha kwatha,*	*Samudra Lavan churna*	*Bhavana dravya –Kumari Swaras*
2nd sample of *Vanga Bhasma*	*Churnodaka*	*Samudra Lavan churna*	*Bhavana dravya –Kumari Swaras*
3rdsample of *Vanga Bhasma*	*Taila, Takra,Gomutra, Aarnala, Kulatha kwatha,+Churnodaka*	*Samudra Lavan churna*	*Bhavana dravya –Kumari Swaras*

Table 3: Number of *Puta* applied for the final product

Research Done	No. of *Puta*	Temperature variesºC/ name of *Puta*	Colour of *Vanga Bhasma* prepared
Shraddha Panchabbhai [22]	11	660- 396	White
Patil et al [23]	10	*Ardhgajputa* (cowdung cakes 10kg to 4kg)	White
Kavya et al [24]	-	-	-
1st sample of *Vanga Bhasma*	4	*Laghuputa*	Dull white
2nd sample of *Vanga Bhasma*	16	*Ardhgajputa*	Pinkish white
3rd sample of *Vanga Bhasma*	12	*Ardhgajputa*	Greyish white
Geeti et al [25]	-	-	-
1st sample of *Vanga Bhasma*	10	800-900 ºC	Brownish grey
2nd sampleof *Vanga Bhasma*	15	600-800 ºC	Yellowish white
Lagad CE et al [26]	13	*Laghuputa* (25 number of cowdung cakes)	-
Rajendraprsad et al [28]	-	-	-
1st sample of *Vanga Bhasma*	3	*Kukkutaputa* (50 number of cowdung cakes)	*Kapota*
2nd sample of *Vanga Bhasma*	3	*Kukkutaputa* (50 number of cowdung cakes)	Dark grey
Shiva Prasad [29]	-	-	-
1st sample of *Vanga Bhasma*	7	*Ardhgajputa (525* number of cowdung cakes)	Yellowish white
2nd sample of *Vanga Bhasma*	7	*Ardhgajputa (525* number of cowdung cakes)	Greyish white
3rdsample of *Vanga Bhasma*	7	*Ardhgajputa (525* number of cowdung cakes)	Dull white
Choudhary P. et al [30]	10	900ºC	Light pink

Table 4: Analysis on Physiochemical Parameters

Research Done	pH	Loss on drying%	Acid insoluble ash %	Water soluble ash%	Alcohol soluble extractives%	Total ash%	Water soluble extractives%
Shraddha Panchabbhai [22]	-	0.02	80.3	3.25	6.45	99.90	3.25
Kavya et al [24]	-	-	-	-	-	-	-
1st sample of *Vanga Bhasma*	6.8	0.69	68.9	12.09	-	98.11	-
2nd sample of *Vanga Bhasma*	7.8	0.47	75.7	3.88	-	99.59	-
3rd sample of *Vanga Bhasma*	8.4	0.25	83.6	4.89	-	99.46	-
Geeti et al [25]	-	-	-	-	-	-	-
1st sample of *Vanga Bhasma*	8	0.10	98.2	0.8	1.2	-	-
2nd sampleof *Vanga Bhasma*	7.9	0.29	92.7	21.92	0.46	-	-
Lagad CE et al [26]	-	-	83.09	4.56	-	99.09	-
Rajendraprsad et al [28]	-	-	-	-	-	-	-
1st sample of *Vanga Bhasma*	-	-	85.72	-	-	93.18	-
2nd sample of *Vanga Bhasma*	-	-	87.28	-	-	92.53	-
Shiva Prasad [29]	-	-	-	-	-	-	-
1st sample of *Vanga Bhasma*	4.59	0.1442	84.42	-	-	99.56	-
2nd sample of *Vanga Bhasma*	4.68	0.0748	77.31	-	-	99.73	-
3rd sample of *Vanga Bhasma*	4.34	0.2558	90.81	-	-	99.79	-
Piyush Choudhary et al [30]	8.75	-	93.15	-	0.86	99.75	0.37

RESULTS

The study done by *Panchabbhai Shraddha* [22] on *Vanga Bhasma* w.s.r. *Rasamritam* basically involved three steps which showed the following results, 400gm of raw *Vanga* was taken for *Samanya* and *Vishesha Shodhana*, 350gm was obtained after completion of first step. For *Jarana* process, *Apamarga Panchanga* was used and weight obtained after *nirmilikarana* (washing) was 200gm. The *nirmilikarana* was done to remove Kasharatva of *Bhasma* which was due to alkaline nature of *Apamarga Panchanga*. This *Jarita Vanga* was subjected for *Marana* process after levigation with *Kumari Swaras* pellets were formed and dried. Total number of 11 *Puta* were given, for first 8 *Puta* 15 cow dung cakes were used having average weight about 3.7kg. When the *Bhasma* became white in colour, the numbers of cow dung cakes were decreased gradually to 12 and then 10 to avoid extra charring of *Bhasma.*190gm of *Vanga Bhasma* was prepared which was tested on various physiochemical parameters. The low value of loss on drying of *Vanga Bhasma* indicates the less moisture content in the sample. The ash value indicated the organic and inorganic contents of *Vanga Bhasma*. Water and alcohol soluble extractives indicated the bio accessibility of *Bhasma* in media other than water which can explain the concept of *Anupana.*

The study was conducted by *Patil et al* [23] on pharmaceutical standardisation of *Vanga Bhasma* have shown total 800gm of raw *Vanga* was taken for *Samanya Shodhana* and *Vishesha Shodhana*, quantity obtained was 650gm. *Shodhita Vanga* was subjected for *Jarana* process in *Apamarga Panchanga* powder and total 700gm of *Jarita Vanga* was obtained. After *nirmilikarana* of *Jarita Vanga* obtained amount was 680gm. For *Bhavana* process, *Kumari Swaras* was used and pellets were prepared for *Marana* process. The total amount taken for *Bhasma* preparation was 610gm. These pellets were subjected for 10 *Ardhgajputa* using cow dung cakes. After completion of *Puta,* the colour observed for *Bhasma* was white and quantity weighed was 625gm.

Another study by *Kavya et al* [24], on *Vanga Bhasma* to analyse the superiority of *Bhasma* prepared by different methods, in which 1st sample of *Vanga* was prepared by *Shuddha Parada*, 2nd sample was prepared with herbal juices, 3rd sample was prepared with *Hartala aka Ariloha* of *Vanga*. For study on *Vanga Bhasma* 650gm of raw *Vanga* was taken.

Shodhana was done by *Dhalana* process in *Haridra Churnayukta Nirgundi Swaras* and 640 gm of *Shodhita Vanga* was obtained. *Shodhana* of 250gm of *Ashuddha Parada* was done in *Nisha Churna*, *Kumari Swaras* by *Udharva Patna Yantra* and collected *Shuddha Parada* was 215gm. Total 3 batches of 500gm of *Ashuddha Gandhaka* were taken for *Shodhana*, in Ghrita and milk. It was carried out by melting of *Gandhaka* in *Ghrita* and poured into milk through cloth covered the mouth of container. It was washed and repeated the same process for 2 more times. The obtained quantities of *Shuddha Gandhaka* were 490gm, 492gm, and 488gm respectively. For *Hartala Shodhana*, 400gm was taken in *Dolayantra* containing *Churnodaka*, 387 gm of *Shuddha Hartala* was collected after *Shodhana* process. After completion of whole processes, *Jarana* was conducted in *Chincha* and *Ashvattha Twaka Churna.* The *Marana* process for 1st sample of *Vanga Bhasma*, 70gm *Shuddha Vanga* was melted and *Shuddha Parada* was added. This mixture was triturated well to get amalgam formation then it was put in iron pan for *Jarana* process which was done in *Ashvattha Twaka Churna*. The *Jarita Vanga* was mixed with double quantity of *Shuddha Gandhaka* for each *Puta*, levigated with *Kumari Swaras* and *Laghuputa* was given. Total number of 4 *Puta* were given and 46gm of *Bhasma* was formed. For 2nd sample of *Bhasma*, *Jarita Vanga* was 180gm and levigated well in *Shatawari Swaras* and kept for *Ardhgajputa* for 16 times. The quantity obtained was 245gm. For the

3rd sample of *Bhasma*, 180gm of *Jarita Vanga* was mixed with *Shuddha Hartala*. *Bhavana* process was given with *Nimbu Swaras* and 12 number of *Ardhgajputa* were given. This sample formed 100gm of *Vanga Bhasma*. It was analysed of various physiochemical parameters in which *Bhasma* prepared by *Shuddha Parada* was slightly acidic in nature remaining samples were alkaline in nature. The ash values for three samples were more than 98% which indicated the presence inorganic material. Acid insoluble value was may be due to the presence of some silica particles and water soluble value showed it's less solubility in media.

A study by *Sood G. el at* [25] on *Vanga,* was done by preparing two samples of *Vanga Bhasma*. For 1st sample of *Vanga Bhasma*, 350gm of *Vanga* was taken for *Samanya* and *Vishesha Shodhana.* Particularly *Vishesha Shodhana* was done *Nirgundi Swaras* mixed with *Haridra Churna* obtained quantity was 327gm. *Jarana* process was done in *Ashvattha Twaka Churna* and obtained quantity was 338gm. This *Jarita Vanga* was mixed with *Shuddha Hingula* and *Bhavana* was given with *Kumari Swaras.* Total number of 10 *Puta* were given having temperature range between 800-900ºC in Electric Furnace. The weight of *Vanga Bhasma* was formed 258.5gm with brownish grey colour. For 2nd sample of *Vanga Bhasma*, 400gm of *Vanga* was taken, *Samnaya Shodhana* and *Vishesha Shodhana* was done as per classical references particularly *Vishesha Shodhana* carried out in *Churnodaka*, quantity weighed was 364gm. *Jarana* process was carried out in *Apamarga Panchang Churna* and obtained amount after process was 404gm. For *Marana* process *Kumari Swaras* was used as *Bhavana dravya*, yellowish white coloured powder was obtained as product measured amount was 364gm. The analysed reports on physiochemical parameters showed the both samples of *Bhasma* were alkaline in nature with minimum moisture content after tested on loss on drying. The major difference was observed in water soluble extractives, they may be because of media used for *Marana* process.

A study by *Lagad et al* [26] have shown the results as following in which 1200gm of *Vanga* was taken, *Samanaya Shodhana* and *Vishesh Shodhana* was carried out. For *Vishesha Shodhana Churnodaka* was used as media and obtained product was 1145gm. *Jarana* process of *Shuddha Vanga* was done in *Ashvttha Twak Churna* and weighed amount was 1032gm. For *Bhasma* preparation 200 gm of *Jarita Vanga* was taken and levigated with *Kumari Swaras* used as *Bhavana dravya*. It was subjected for *Laghuputa* , total 13 numbers of *Puta* were applied and tested on various parameters.

A study on pharmaceutical preparation of *Vanga Bhasma* by *Panwar et al* [27] explained as*,* initially 200gm of *Vanga* was taken for *Shodhana,* in which *Samanya* and *Vishesha Shodhana* was done as per references. 182gm of *Shodhita Vanga* was collected. For *Jarana* process 175gm of *Shuddha Vanga* used, in which *Haridra, Yavani, Jeerak, Chincha, Ashattha Twak Churna* were used as *Jarana dravya*. From 180gm of *Jarita Vanga* , 181gm of *Vanga Bhasma* was formed after 11 *Puta* in Electric furnace.

The study on *Vanga bhasma* by *Rajendraprasad et al [28],* was done on two samples of *Vanga Bhasma.* 400gm of *Vanga* was taken and 350gm was obtained after *Samanya, Vishesha Shodhana*. For 1st sample of *Bhasma*, 175gm of *Shuddha Vanga* was used for *Jarana* process in *Chincha Twak Churna*. After *nirmilikarana*, 175gm of *Jarita Vanga* was obtained and further taken for *Bhavana* process in which *Kumari Swaras* was used. It was subjected for 3 *Kukkuta Puta* and after completion of *Marana* process 160gm of *Kapota varna Vanga Bhasma* was collected. For 2nd sample of *Bhasma*, *Shuddha Hartala* was mixed with *Palash Mula Kwatha* and this mixture was smeared over 175gm of *Shodhita Vanga* and subjected for 3 *Kukkuta Puta*. After *Putapaka* process, 150gm of *Vanga Bhasma* was obtained with dark grey colour. They were analysed on ash value, acid insoluble, acid soluble value. The ash values for both samples were 85.7, 87.2% indicated the inorganic values whereas acid soluble values indicated the bio accessibility in acidic media.

The study was conducted by *Prasad Shiva [29]* on three samples of *Vanga Bhasma* prepared on the basis of their *Shodhana* processes. For the 1st sample of *Vanga Bhasma*, 500gm of *Vanga* was purified with *Samanya Shodhana* process. 445gm *of Samanya Shodhita Vanga* was subjected for *Jarana* process in *Samudra Lavana Churna*. 470gm of *Jarita Vanga* washed to remove *Ksharatva* and obtained weight was 395gm. This *Jarita Vanga* was used in *Marana* process in which *Kumari Swaras* was taken as *Bhavana dravya*. It was subjected for 6 *Ardhgajputa* for *Bhasma* process and weighed amount after completion was 365gm with yellowish white in colour. For 2nd sample of *Vanga Bhasma*, 500gm of *Vanga* only *Vishesha Shodhana* was done in *Churnodaka*. 470gm of *Vishesha Shodhita Vanga* was obtained and used for *Jarana* process in *Samudra Lavan Churna*. 510 gm of *Jarita Vanga* was washed for *Kshara nirmulana* and dried weight was 470gm. 390 gm of *Jarita Vanga* was used for *Bhasma* preparation, *Bhavana* was given by *Kumari Swaras* and subjected for 6 *Ardhgajputa.* After completion of *Puta* process, 350gm of *Bhasma* was formed having greyish white colour. For 3rd sample of *Vanga Bhasma,* 500gm of *Vanga* was subjected for *Samanya* and *Vishesha Shodhana*. After *Samanya Shodhana*, weight measured was 450gm and 410gm after completion of *Vishesha Shodhana*. *Samudra Lavan churna* was used as *Jarana dravya* and product formed was 470gm. To remove *Ksharatva*, it was washed with water and dried. For *Marana* process 365gm of *Jarita Vanga* was taken and levigated with *Kumari Swaras* further subjected for 6 *Ardhgajputa*. After completion of process obtained weight of *Bhasma* was 325gm having dull white in colour. These samples were tested on Ash value which are above 99%, Acid insoluble ash were more than 80% and pH of all samples were acidic on parameter scale.

A study on analytical study of *Vanga Bhasma by Choudhary P. et al* [30] evaluated following results, 99.7% of Ash value, 93.15% of Acid insoluble ash value, 0.37% Water soluble extractives, 0.86% Alcohol soluble extractives.

DISCUSSION

From Table 1, after the completion of *Shodhana* processes both *Samanaya* and *Vishesha* weight loss observe varies from 81% to 98 %. The *Jarana* process leads to increase in weight of *Shodhita Vanga* and enhances the powder formation. *Vanga* melts in the beginning of *Jarana* process and after completion powder form of *Vanga* is obtained. This powdered *Vanga* is washed with water to remove alkaline product of *Jarana*, which can be cause of loss observed after drying of *Jarita Vanga*. The reason behind loss and gain of *Vanga* powder in different research work may be due to the drugs used for *Bhasma* formation, any handling loss like washing screening sieving, pellets formation etc. From Table 2, for *Vishesha Shodhana, Nirgundi*

Swaras mixed with *Haridra Churna* and *Churnodaka* are mainly used, as per classical texts that may be because of easily availability of these drugs or the formulations of *Shodhana dravya* used in *Shodhana* can be prepared easily in pharmacy. *Apamarga Panchanga Churna* and *Ashavttha Twaka Churna* are used in maximum number of research work as per reference. Moreover the whole *Apamarga* plant can be found and dried easily. These drugs can be decided according to their properties and the diseases in which *Vanga Bhasma* is supposed to be used. For *Bhavana* process, *Kumari Swaras* is almost used in every reviewed article; may be act as good media to enhance the smoothness of *Vanga Bhasma* and pellet formation. From table 3, constant amount of heat applied for specific time is known as *Puta*, these are varying from 3 to 16 in numbers. *Laghuputa, Ardhgajputa, Kukkutaputa* namely mentioned for the *bhasma* preparation, but in Electric Furnace temperature ranges from 900 to 396ºC, initially high temperature was subjected to the *Bhasma* thereafter it was reduced. The variation in these *Puta* are may be due to the number of cow dung cakes used, size and weight of cakes, amount of heat they generated, self-cooling, the most important point is drugs used for *Bhasma* preparation, as it is observed that *Bhasma* prepared from *Parada* can be formed easily. The colour of *Bhasma* observed is white in colour with different shades as mentioned in table, this is also depends up on the drugs used for *Bhasma* preparation. From table 4, the compilation of different physiochemical parameters are mentioned. The values of pH lied 4.34 to 6.8, which comes under acidic to alkaline in nature. It is also observed that the bio accessibility of *Vanga Bhasma* prepared by Electric Furnaces is more in gastric and gastrointestinal tract as compare to *Vanga Bhasma* prepared by *Puta* method or traditional method [31].The study done on toxicity both acute and chronic; dose levels were fixed up to 2000mg/kg. In acute toxicity, *Vanga Bhasma* was given single dose to five levels with 2000mg/kg as maximum dose and observed up to 72 hrs for general behavioural change. The mortality was observed for 7 days, did not manifest any sign of toxicity up to 40 times human therapeutic dose. In chronic toxicity, dose was fixed same and administered for 90 days, no serious toxicity signs were observed and only cell infiltration with fatty changes in kidney was observed [32]. Another toxicity study was done to screen out the toxic effects of *Vanga Bhasma*, on GIT, Pancreas, Liver. It was an animal study and carried out for 10 days. *Vanga Bhasma*, gum acacia powder and 30 albino rats constituted for study. *Vanga Bhasma* dissolved in 15% of gum acacia to administer as oral suspension; this drug suspension was administered by oral route for group I and dose was calculated as 10ml/kg for 10 days. For II, III, IV, V group onwards, *Vanga Bhasma* was administered calculated as 125mg/kg, 250mg/kg, 500mg/kg, and 1000mg/kg. The final result of this study was concluded that, there were certain pathological changes observed which were mild in nature and were confined to stomach of 3 animals. There were local fatty changes in liver were observed in group IV, V where dose was 4 to 8 times higher than therapeutic dose [33].

Several works are being carried out in the drug development area for the advancements in *Ayurvedic* dosage forms [34-36], though more investigations are required. Safety concerns of metal based *Ayurvedic* medicines is being raised by recent researchers, so care should be taken in quality assured and standardized drug manufacturing [37-39].

CONCLUSION

The different methods of preparation of *Bhasma* and their analytical reports are compiled in this paper for future references and observations. A thorough study of all these investigations are indicate that, the pharmaceutical methods adopted for drug preparation have shown minor variations to each other studies. However, further studies for the standard operating procedure of *Vanga Bhasma* required for the references so that one can compare its result to evaluate its safety and efficacy. The uniform standard preparatory methods are imperative for global recognition and acceptance of *Ayurvedic* traditional methods.

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