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REVIEW ARTICLE

Critical Review on Pharmaceutical Prospects of *Nagabhasma* (Incinerated Lead)

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ABSTRACT

Bhasma's occupied significant place in Ayurvedic system of medicine. *Rasashastra* is a branch of Ayurveda that primarily utilizes metals and minerals in the form of *Bhasma* for therapeutic purpose. Based on their experiences, the ancient *Acharya's* of *Rasashastra*have described several for preparing *Bhasma* of single metal based on the therapeutic utility and to impregnate expected properties in respective metal. Even in one text these methods differs between themselvesin terms of accompaniments and process detail. Correspondingly, the processing of certain metals lead to *Bhasmas* with different forms and colours. Hence it is important to know the various ways of processing the single metal. *NagaBhasma* is one of such preparation basically indicated for the treatment of *Prameha* (Diabetes mellitus), various skin diseases and for aphrodisiac therapy. Therefore in this paper, attempt has been made to decipher the different preparative procedure of *NagaBhasma*according to different classical text of *Rasashastra.*Present work aimed to compile different pharmaceutical procedure of *NagaBhasma* preparation along with their probable therapeutic aspect.

Critical review of pharmaceutical procedure of *NagaBhasma*is compiled from available classical text which includes basic procedure, material used for the procedure, number of incineration cycles and colour of final product. Attempt has been made to withdraw possible interpretation between rationality of different methods and therapeutic indications. There are 97 methods of *Naga Bhasma* preparation which includes *Puta* (31), *Jarana* followed by *puta* (31), *Jarana* (15), *Lepa* followed by *Puta* (7), *Dhamana* (3), *Damaru Yantra Patana* (3), *Lepa-Jarana* followed by *Puta* (2), *Pishti* followed by *Puta* (3) and *Utthapana* (2). Therapeutic indications of *Naga Bhasma* depend on the method and media utilized for *Bhavana* and incineration cycles.

Key words: Ayurveda, Lead, *Naga Bhasma*, Pharmaceutics, *Rasashastra*.

INTRODUCTION

The material medica of Ayurvedic system of medicine essentially deals with three major sources of medicine, plant origin, animal origin and metals-minerals origin. [1] Therapeutically more suitable forms of metals were developed after evolution of *Rasashastra*. Ancient *Acharya* of *Rasashastra*, have discovered several methods of processing metals such as *Shodhana* (Ayurvedic purification methods), *Jarana* (open pan frying), *Marana*(incineration) etc to convert them into therapeutically useful dosage form. It is understood that these methods were developed based on their individual experiences as well as the purpose for which the metal would be utilized. e.g. *NagaBhasma*prepared by triturating with juice of *Ahiphen* (*Papaver somnifera*) possesses more aphoristic property while the *NagaBhasma*prepared from *Manahashila, Gandhaka and Vasa (Adhatodia vasaica)* is more effective in skin diseases.[2]Therefore numerous methods of processing of single metals are found mentioned in different *Rasashastra* text. There are several methods described for same metal even in one classical text which consequence in the formation of *Bhasma* of varying physico-chemical

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properties. Thus it is crucial to know these different pharmaceutical process and rationality behind their application.

NagaBhasma is one of the potent medicine prepared through subjecting Lead metal to special procedures such as *Shodhana*, *Jarana* and *Marana*. There are 97 methods narrated by different text.Till date no published review work is found on the various pharmaceutical procedure of *NagaMarana*. This work is a first attempt and hence may prove a torch bearer for future research work on *NagaBhasma*.

MATERIALS AND METHODS

Careful review of available classical text was done by compilation of various methods of *Naga Bhasma* preparation from available classical texts. Compiled pharmaceutical procedures of *NagaBhasma* are categorized according to the involved principal process. Several claims are made regarding specific indication of specific process based on the therapeutic properties of media utilized for *NagaMarana*. These claims can be considered as hypothesis for further research.

OBSERVATION AND RESULTS

According to different classics there are twelve principle procedures utilized for *NagaMarana*. In many methods more than one procedure are combined but to facilitate the description each procedure is separately explained below.

1. ***Bhavana*(levigation)**: The procedure of steeping powders of metals and herbs with liquid substances like *swarasa* (juice), *kwatha*(decoction) etc followed by trituration in mortar and pestle up to dryness is known as *Bhavana*.[3] Here the heat produced during grinding and the atmospheric heat helps in drying the materials quickly. By applying *Bhavana* the drug are rendered fine and potentiated.*Bhavana* is utilized in nearly all procedures of *NagaBhasma* preparation except in *Lepa*(paste) and *Pishti*(amalgam) method.

2. ***Jarana* (J)**: *Jarana* literally means becoming old, decomposition, digestion or way in which an eclipse is supposed to end.[4]In *Jarana* process metal is heated in open iron pan and continuously rubbed with stems or roots of some herbs till converted into fine powder form followed by covering with earthen saucer and applying strong heat for three hours.*Arka* root (root of *calotropis procera*), *Manahashila* (orpiment), *Gandhaka* (sulfur), *Palasha* root (root of *abutilon indicum*), *Chincha*(*Emblica officinalis*), *Vasa* stem (*Adhatoda vasaica*) and *Apamanga Kshara*(ash obtained from *Achiranthus aspera*) are the mostly utilized media for *Jarana* of *Naga* (**Table 1**).

Table 1: **Various methods of *Naga Marana* by applying *Jarana* method**

S. No	Type	Media	*Puta*	No.	Colour	Ref.
1	J	*Arka root, Manashila, Gandhaka, karpur, kumkum, Nimbu swarasa.*	-	--	*Sinduraruna ,Pitabha*	RJN(part-III) (Chapter-2,pg.no-131)
2	J	*Parada, Arjuna, Aksha, Aragvadha, Dadima, Apamarga-Kshara*	--	21	*Rakta*	R.Chu (1/38), RRS 5/174-79
3	J	*Palasha root*	--	--	*Raktabha*	RPS (4/103-104)
4	J	*Chincha,Aksha,Ikshu,Bhallat,Vasa,Vajrilata,Apamarga,Ashwattha-Bhasma; Palashadanda*	--	--	--	AK (6/31-32)
5	J	*J- Vasa, Ajmoda; Vasakashtha*	--	--	--	Vasavarajiyam (25-Chapter,pg.no-403)
6	J	*J- ChinchatwakBhasma*	--	--	--	Vasavarajiyam (25-Chapter,pg.no-403)
7	J	*J-Raktashakini, Apamarga,KutajaBhasma*	--	--	--	Vasavarajiyam (25-Chapter,pg.no-403)
8	J	*J-Bhunaga, Agasti, Vasa, Apamanga Kshara*	-	-	-	R.Chi (6/49)
9	J	*Ahiphena,Nimbakashtha*	--	--	*Shweta*	BRRS (2nd Method,pg.no-50)
10	J	*Arkamula*	--	--	*Harita*	BRRS (no-81)
11	J	*Gandhaka*	--	--	--	RT (19/41-42)
12	J	*Muli, Palash*	-	-	*Raktabh*	RPS 4/103-104
13	J	*Arka Mula*	-	-	*Harita*	R.Sambh. verse 365, RJN pp 131
14	J	*Parada, Arjun, Bibhitaka, Amlaki*	-	-	*Rakta*	R.Chu. 14/141-47
15	J	*Kshara of Chincha, Bibhitaka, Ekshu, Bala, Asthisamhara, Apamarga, Arjun, Ashvattha*	-	-	-	RJN pp 126

3. ***Puta* (incineration cycles)**:

Puta(P) is knowledge of quantity of heat applied to various substances. The heat thus applied should never be less or more than optimally required as such optimally heated substances are useful to the body.[5] In present days quality, quantity and period for which is to be applied can be preciously measured and controlled however that was not the case in ancient times. The heat control was obtained and derived by limiting quantity of fuel and type of fuel used. Such devices which known quantity of fuel could be burned to produce exact amount of required heat for conversion of raw substances into drug were known as "*Puta*".There are 31 methods of

NagaMarana through *Puta*procedure which involves*Bhavana* of some specific media followed by incineration either by *LaghuPuta*, *VarahaPuta* or *GajaPuta*.Mostly utilized media for *NagaMarana*includes *Parada* (mercury), *Gandhaka*, *Manahashila*, *Arkadugdha*(milk of *calotropis procera*) and *Vasa swarasa*(juice of *Adhatoda vasaica*) (**Table 2**).

Table 2: **Various methods of *Naga Marana* by applying *Puta* method**

S. No	Type	Media	*Puta*	No.	Colour	Ref.
1	P	*Arkadugdha, Manahshila*	--	--	--	RM. (2/54)RRS (5/184).
2	P	*Ahimararasa*	--	--	--	RHT (3/25)
3	P	*Lohaparpati, Tapya, Kankushtha, Vimala, Abhraka, TamraBhasma, Shilasatva, Snuhi & Arkal-kshira, Hingula.*	--	--	--	Rasarnav. (7/46-47),(6/10-33),(7/87-88)
4	P	*Mritagolaka, Hemagolaka, Matulunga*	--	--	*Shukragopanibh*	Rasarnav (7/78)
5	P	*SutaBhasma*	-	1	*Sinduraruna*	Rasarnav (5/14-16)
6	P	*Nagaranjita Rajata*	-	--	*Sinduraruna*	Rasarnava (5/75-78)
7	P	*Kumarimoola*		100	*Sinduraruna*	RJN(part-III) (Chapter-2,pg.no-132)
8	P	*Shila, Vasarasa*	*Varaha*	3	--	RPS (4/98-102)
9	P	*Trikshara, panchalavana, Jambira*	*Gajaputa*	--	--	Rasaratnakara (2/7-9)
10	P	*Shila, Tambulirasa*	--	32	--	AP (3/192), Sha.M. 11/10, BRRS pp 81
11	P	*Manashila, Gandhaka, Nimbu*	-	-	-	AP 3/200
12	P	*Manashila, Vasa*	*Gaj*	3	-	AP 3/201
13	P	*Shila, Gandhaka, Vasa*	*Gaja*	3	--	YR (shaloka no-1,pg.no-128)
14	P	*Shila, Tanduliya, Vasa*	--	7	--	BRRS (pg.no-80-81)
15	P	*Shila, Gandhaka, Karpura, Kumkum*	--	60	*Vidyutabhasa*	BRRS (no-81)
16	P	*Parada, Gandahka*	*Laghu*	3(tika)	*Kajjalaprabha*	RT (19/29-33)
17	P	*Gandhaka, Tuttha, Kumari*	*Gaja*	1 or 2	-	R.Manjari 5/64
18	P	*Vasaswarasa, Manashila*	-	3	-	R.Sa.S. 1/294-95
19	P	*Manashila, Vasa*	*Varaha*	3	-	RPS 4/98-99, RSS 1/285
20	P	*Manashila, Vasa swarasa*	*Gaj*	3	-	R.Sambh. verse 364, BRRS pp 80
21	P	*Manashila, Gandhaka, Kapura, Keshar, Jambir Nimbu*	*Gaja*	60	*Pita*	R.Sambh. verse 366-67
22	P	*Manashila, Gandhaka, Arka dugdha*	-	12	-	AP 3/56, R.Chi. 6/20
23	P	*Shweta Jiraka, Endrajao, Palash, Latakaranj, Koshataki, Hasti mutra*	*Gaja*	21	*Shweta*	Rasopanishad 7/13-15
24	P	*Mritagolaka, Hemagolaka, Nimbu, Tambul, Vrishchikali patra*	-	-	*Vir bahuti*	Rasarnava 12/92-93
25	P	*Apamarga patra*	-	-	*Shweta*	Anu.M. 5/9
26	P	*Arka dugdha, Kumari, Palash*	-	-	*Rakta*	R.Ndi. pp 223
27	P	*Churnodaka*	-	-	*Krishna-shweta*	R.Ndi. pp 223
28	P	*Apamarga, Pipal, Chincha*	-	-	*Krishna*	R.Ndi. pp 223
29	P	*Hingula, Manashila, Gandhaka, Jambir*	*Laghu*	7	*Pink*	Bh.Ras. pp 515
30	P	*Parada, Manashila, Jambir*	-	21	*Rakta*	Bh.Ras. pp 516
31	P	*Shad-lavana, Devi swarasa*	*Laghu*	3	-	RHT 5/8-9

4. ***Dhamana* (to burn to ashes)**:

No classical text has defined *Dhamana*, although based on the procedure it can be defined as strong heating of metal in a closed crucible till it get converted into *Bhasma* form.[6]Rasachintamani (12^{th} century AD) and Rasopanishada (8^{th} century AD) are the only classics in which this method is found mentioned (**Table 3**).

Table 3: **Various methods of *Naga Marana* by using *Dhamana* and *Pachana* method**

S. No	Type	Media	Duration	No.	Colour	Ref.
1	*Dhaman*	*Musha of Bhunaga Mruttika*	-	-	*Pita*	Rasa.Chi (5/153-55)
2	*Dhaman*	*Parada, Gandhaka, Vatsanabh*	-	-	*Swarna varna*	Rasopanishad 7/20-21
3	*Pachana*	*Parada, Gandhaka*	-	-	-	R.Chi. 6/21

5. ***Pachana* (cooking)**:

This procedure is mainly indicated for the matters which can be purified by vapour of specific liquid media.[7] However regarding the context *Bhasma* preparation *Pachana* means heating of metal in *Valukayantra*(instrument which contain sand as heating medium) with *Parada* and *Gandhaka* for twelve hours.[8] Only one classic has narrated this method and the procedure is similar to *Jarana* except that intense heating and rubbing is not advised. (Table 3)

6. ***Damaru Yantra Patana* (DYP)**:

An apparatus, in which one pot is kept in inverted position over another pot with joints sealed, is termed as *Damaru Yantra*[9] and distillation process done by using *Damaru Yantra* is known as *Damaru Yantra Patana*. Rasayansara is the only classic in which three methods of DYP are mentioned. In first method only DYP is advised while in other two methods *Jarana* is advised followed by DYP (**Table 4**).

Table 4: **Various methods of *Naga Marana* by applying *Damaru Yantra Patana* method**

S. No	Type	Media	No.	Colour	Ref.
1	DYP	*Parada, Gandhaka; Gunja, Vasa, Nimbu, Kumari*	--	--	Rasayanasara (Shloka no.189-190,pg.no-256)
2	J, DYP	*J- Arka; DYP- Shila, Hingula, Gandhaka*	--	*Sindura*	Rasayanasara (Ist part, Shloka no.187-188,pg.no-256)
3	J, DYP	*J- Ashwatthakshara etc;* *P- Parada, Shila*	--	*Sindura*	Rasayanasara (2nd part, Shloka no.197,pg.no-259)

7. *Jarana* followed by *Puta*(JP):

Naga (lead), *Vanga*(tin) and *Yashada*(zink) are the metals which are mostly subjected for *Jarana* followed by *Puta* for incineration.There are 31 methods of *NagaMarana* through JP. This is an easy method as many classics have advised it and also mentioned the procedure in detail (**Table 5**).

Table 5: **Various methods of *Naga Marana* by applying *Jarana* followed by *Puta* method**

S. No	Type	Media	*Puta*	No.	Colour	Ref.
1	J,P	*Ashwath,Chincha,Manashila,Nimbu Swarasa.*	-	3	*Sinduraruna*	RJN (Chapter-2,pg.no-126)
2	J, P	*J-Ashwattha,Chincha;* *P- Shila, Jambira/ Kanji*	--	60	--	RRS (4/103-104) AK (6/25-27) Sha (11/37)
3	J, P	*J- Palashadanda; P-Shila*	*Gajaputa*	60	--	Rasaratnakara (3/109-110)
4	J, P	*J-Churna,Parthadanda; P- Chitrakadrava*	*Laghu*	6	--	AK (6/28-30)
5	J, P	*J- Agasti,Bhunaga,vasa, Chincha-Kshara, Vasakashtha; P-Shila, Tapya, Vasakshara*	--	21	*Sindura*	AK (6/33-36)
6	J, P	*J- Kumari, Asana, Arka, Bahupad, Palashamula; P- Shila, Kumarirasa*	*Karishagni*	3	*Sinduraruna*	AP (3/191)
7	J, P	*J- Chincha, Ashwattha; P- Shila, Tushodaka, Gandhaka*	*Gajaputa*	60	--	R.S.K (shloka no,31-32,pg.no-31)
8	J, P	*J- Shila; P- Gandhaka, Nimburasa*	--	--	--	R.Chi (6/48)
9	J, P	*J- Tala; P- Gandhaka, Nimburasa*	--	--	--	R.Chi (6/48)
10	J, P	*J- Bhunaga, Agasti, Vasa,Apamargakshara;* *P- Vasarasa*	--	7	*Sindura*	R.Chi (6/52-54)
11	J, P	*Kumari*	--	100	*Sindura*	BRRS (no-81)
12	J, P	*J- Ashwattha-twak-churna; P-Shila, Nimbu/ Kanji*	--	3	*Kajjalaprabha*	RT (19/11-18)
13	J, P	*J- Apamargachurna, Vasa;* *P-Shila, Vasarasa*	--	3	--	RT (19/24-28)
14	J, P	*J- Apamargadichurna;* *P- Tala*	--	--	--	RT (19/34-36)
15	J, P	*J-Shila,P-Shila,Arka-kshira*	--	--	--	RT (19/37-40)
16	J, P	*J- Arka, Kumari;* *P- Ahiphena, Arka*	*Varaha*	6/2/3	--	Rasayanasara (2nd part, Shloka no.193,pg.no-257)
17	J, P	*J- Ashwattha, Chincha;* *P- Shila, Kanji*	*Gaja*	6	--	R.Pu (16/17)
18	J, P	*J- Parada, Khakhasa;* *P- Shila, Vasarasa*	*Laghu*	7	--	Rasamritam (Shloka,104-106,pg.no-73)
19	J,P	*J-Manashila, P-Vasapatra*	*Gaja*	3	-	R.Manjari 5/39
20	J,P	*J-Bhunaga, Agasti, Vasa, Apamarga. P-Vasa swarasa*	*Gaja*	7	*Sindura*	R.Manjari 5/40-42 R.Sa.S. 1/291-93
21	J,P	*J-Kumarimula, Ashvatthamula, Vatamula, Palasha P-Manashila, Kumari swarasa*	*Kukkut*	4	-	Rasapaddhati 60
22	J,P	*J-Manashila, P-Gandhaka, Nimbu swarasa*	-	-	-	R.Sambh. verse 359
23	J, P	*Kumari Mula, Kumari Swarasa*	*Gaja*	60	*Rakta*	R.Sambh. verse 368
24	J,P	*J- Ahiphen, P-Manashila, Vasa*	*Laghu*	7	-	Rasamruta 3/104-06
25	J,P	*J-Ashvattha, Chincha P-Manashila, Nimbu Swarasa*	-	6	-	RJN pp 125
26	J,P	*J-Manashila, P-Tanduliyaka, Vasa*	-	7	-	RJN pp 130
27	J,P	*J-Manashila or Hartala, P-Gandhaka, Nombu swarasa*	-	-	-	RJN pp 130
28	J,P	*J-Chincha, Pipal twaka, P-Manashila, Kanji*	-	60	-	AP 190-91
29	J,P	*J-Vasa, Apamarga kshara, P-Vasa*	-	7	*Sindura*	RSS 1/282-84
30	J,P	*J-Kshara of Chincha, Pipal, P-Hartala,Palash kwatha*	*Gaj*	10	-	RSK 2/27-29
31	J,P	*J-Churnodaka, P-Churnodaka*	*Gaj*	7	*Shweta*	Bh.Ras. pp 514

8. *Lepa*(paste) followed by *Puta* (LP):

In this procedure metal is first converted into sheets followed by application of thick layer of specified media and then subjected for *Puta*.*Manahashila*(orpiment) is the common media utilized in LP (**Table 6**).

Table 6: **Various methods of *Naga Marana* by applying *Lepa* followed by *Puta* method**

S. No	Type	Media	Puta	No.	Colour	Ref.
1	L,P	*L-Tuttha*	-	-	-	Rasopanishad 8/10
2	L,P	*L-Swarna Makshika, Madhu, Ghrita*	-	-	*Kumkum*	Rasarnava 17/33-34
3	L,P	*L-Manashila, Arka dugdha*	-	10	-	RRS 5/184
4	L,P	*Parada, Hingula, Kankushta, Lohaparpati, Abhraka Satva, Tamra Bhasma, Makshika satva Bhasma, Manashila, Vimal, Snuhikshir, Arkakshira*	-	32	-	AK Amritikarana Vishranti 4/256-59, RHT 5/19-21
5	L,P	*L-Manashila, Makshika, Arka dugdha*	-	-	-	RJN pp 128

6	L,P	*Manashila, Arka dugdha*	-	-	-	RJN pp 129
7	L,P	*L-Manashila, Gandhaka, Karpura, Kumkuma, Jambir limbu*	-	60	*Pita*	RJN pp 131

9.***Lepa* followed by *Jarana* and *Puta* (LJP)**:
It involves similar procedure as mentioned in *Lepa* and *Puta* except that *Jarana* procedure is done after *Lepa* and then metal is subjected for *Puta*. LJP method is not found mentioned before 18th century AD and hence it can be assumed that LP method is difficult or time consuming as it require 10 to 60 *Puta* hence, the author of Ayurved Prakash (18th century AD) and Rasa-Jala-Nidhi (19th century) incorporated *Jarana* method in LP (**Table 7**).

Table 7:- **Various methods of *Naga Marana* by applying *Lepa-Jarana* followed by *Puta* method**

S. No	Type	Media	*Puta*	No.	Colour	Ref.
1	L,J,P	*L-Bhunag, Agasti, J-Vasa, Palash kshara, P-Manashila, Vasa swarasa*	-	7	*Sindura*	AP 3/193-97
2	L,J,P	*L-Kharpara, J-Chincha mula, Arjuna danda, P-Chitraka kwatha*	*Laghu*	6	-	RJN pp 126

10. ***Pishti*(amalgam) followed by*Puta***: The floor like substance which is produced after grinding *Parada* with metal is known as *Pishti*.[10]*NagaPishti* can be prepared by heating of *Naga* till complete melting, pouring melted *Naga* in mortar which contain advised media and instantly triturating up to conversion into soft mass.It is observed that *NagaPishti* can be easily prepared with *Parada* but author of Ayurved Prakash advised decoction of some herbs. (Table 8) Preparation of *NagaPishti* by reference of Ayurved Prakash appear difficult as well as controversial because *Naga* quickly regains its solid nature after pouring in herbal decoction and it is very hard to triturate solidified *Naga*.

Table 8: **Various methods of *Naga Marana* by applying *Pishti* followed by *Puta* method**

S. No	Type	Media	*Puta*	No.	Colour	Ref.
1	*Pishti,P*	*Pishti-Parada, P-Gandhaka, Nimbu swarasa*	*Laghu*	3	*Kapot*	RT 19/29-33
2	*Pishti,P*	*Pishti-Kumari, Pipal, Arka, Vata or Palash, P-Manashila, Kumari*	*Gaja*	3	*Sindura*	AP 3/198-99
3	*Pishti,J,P*	*Pishti-Parada, J-Ahiphen, P-Manahshila, Vasa swarasa*	*Laghu*	7	-	Rasamruta 3/104-06

11. ***Pishti*followedby*Jarana* and *Puta***:
There is single method in which *NagaPishti* prepared with *Parada* is firstly subjected for *Jarana* and then after triturated with *Manahashila* and *Vasa Swarasa*subjected for seven *Laghuputa* (**Table 8**).

12. ***Utthapana*(obtaining again)**: *Utthapana* literally means *Swarupapadanam* (regaining original state).[11]*NagaBhasma* which has attained the state of fine *Varitar*(float on water) ash is brought back to its original state by the help of strong heating in sublimation apparatus and then again subjected for repeated ten cycles of intense heating. It is apprized that each heating should be done for continuous twenty one days (**Table 9**).

Table 9: **Various methods of *Naga Marana* by applying *Utthapana* method**

S. No	Type	Media	Puta	No.	Colour	Ref.
1	*Utthapana*	Repeat method for 10 times	-	10	-	RRS 5/180
2	*Utthapana*	--	--	10	--	R.Chu (14/155)

DISCUSSION

*Bhasma*s are unique Ayurvedic metallic preparations used in the Indian subcontinent since the seventh century BC and widely recommended for treatment of a variety of chronic ailments.[12] The *Bhasma*s are in fact products of classical alchemy inorganic compounds of certain metals and gems in a very fine powdered form, mostly oxides, made in elaborate calcinations process known as *Marana* which is also known as *Bhasmikarana*. It is believed that *bhasmikarana* process converts the metal into its specially desired chemical compound which eliminates the toxicity of the metal and has the necessary medicinal benefits [13,14].The methods of *Bhasma* preparation vary so much for each metal such that *Bhasma* with different colours are produced. The resultants are considered to be same medicinal substances with the ascribed indications even though these may differ in the chemical composition between them. However it is a well-known fact that if two compounds have different chemical composition then their pharmacodynamic and pharmacokinetic action will be different.

NagaBhasma is utilized in many Ayurvedic formulations. There are 97 methods of *NagaMarana* described by different classics but it is not mentioned that which method should be used to prepare *NagaBhasma* which is included as an ingredient in specific formulation. The attributes of media used for *Bhasma* preparation

are impregnated in the *Bhasma* and also enhance its therapeutic properties. Therefore it is advisable that *NagaBhasma* prepared by using specific media should be utilized in specific formulation indicated for specific disease. There are twelve principle procedures of *NagaMarana* which utilizes four types of media. The *Marana* of *LohadiDhatus* is said to be of best quality (*Shreshtha*) when done along with *Parada* or *RasaBhasma*, of medium quality (*Madhyam*) when done with herbs (*Muli*), of low quality (*Kanishtha*) when done with *GandhakadiDravyas* and worse quality (*Durgunaprada*) when done with *Ariloha*.[15] The type of media and its co-relation with therapeutic properties are interpreted below.

***Parada* or *RasaBhasma*media:**

In this category *Parada* and mercurial compounds such as *Kajjali, Hingula, Rasasindura* are included. *Naga* easily make amalgam with *Parada* and while incineration *Parada* also help in disintegrating *Naga* particles into finest form. *Parada*possesses*Yogavahi* (carrier of therapeutic properties)[16] and *Rasayana* (rejuvenation)[17] property. Thus *NagaBhasma* prepared by using *Parada* media can be used for *Rasayana* purpose and to treat chronic diseases such as diabetes. Here to avoid any untoward effect it is appreciable that does and don'ts advised in the context of internal use of *Parada* should be followed while therapeutically employing *NagaBhasma* prepared by *Parada* media.

***Muli* (herbal) media:**

*Naga*is a quick melting metal. If high temperature given for first incineration then there is possibility that *Naga*will regain its metallic nature. Therefore *Jarana* procedure is advised before incineration cycles while preparing *NagaBhasma*with herbal media. During *Jarana*, strong heating up to 750 ^{0}C in open iron pan and continuous rubbing with fresh herbalstem causes strong chemical reaction between melted *Naga*and oxygen present in wet herbal stem as well as the oxygen in open air. After some hours all *Naga*get converted into yellowish powder which is lead oxide (PbO) with mixture of organic ash. It is difficult to decide actual nature of *Jarita Naga*but it can be assumed that *Jarita Naga*must be in organo-metallic form. Some weight gain after *Jarana* also suggests its compound form.

Jarana helps to reduce particle size and thereby facilitate *Bhavana* (trituration) process. Trituration impregnate chemical constitute present in herbal media on the surface of metallic particles and thus create a herbo-metallic complex. Some chemical reaction occurs on faster rate when this mixture subjected for incineration cycle. Repetitions of this process result in formation of organo-metallic compound which is known as *Bhasma*.As *Bhasma* prepared from herbal media contain more proportion of organic ash hence can be considered as safe and effective. It is understood that every herb has its specific utility in some disease conditions and thus *Bhasma* prepared from a herb can be said to better effective in respective disease condition in which the utilized herb is indicated. Therefore it can be claimed that *NagaBhasma* prepared from *Ahiphen* will be more effective for aphrodisiac purpose while *NagaBhasma* prepared from Vasa media will be more effective in disease of respiratory system.

***GandhakadiDravyas* (sulfur and other minerals)**:

Utilization of mineral media such as sulfur, *Hartala* (arsenic bisulfide), *Hingula* (cinnabar) etc leads to prepare *NagaBhasma* within less number of incineration cycles. These minerals get easily reacted with surface particles of *Naga* and while incineration, separate such particles from core particles by oxidation or reduction mechanism. This results in conversion of metallic *Naga* into micro and nano particles. It is found that *Bhasma*possesses significant percentage of nano particles along with micro particles. As such *Bhasma* contain significant proportion of other minerals hence can't be considered as complete safe. Therefore *Bhasma* prepared from mineral media can be used for short duration or in acute conditions. Sulfur, arsenic bisulfide and cinnabar are mostly utilized mineral media in *NagaBhasma* preparation. These media possesses antibacterial, antifungal and anti-infective properties. Thus *NagaBhasma* prepared from these media can be utilized in some infective conditions such as *Rajayakshama* (tuberculosis), *Jwara* (fever), *Krimi* (heliminthic condition) and various skin diseases.

***Ariloha* media**:

Literally *Ariloha* means enemy metal or killing metal. There are some metals and minerals which are mentioned to have properties to convert other metal very easily into *Bhasma* form. *Manahashila* (arsenic trisulfide or orpiment) is mentioned as *Ariloha* for *Naga*. The classical test mentioned that *Bhasma* prepared from *Ariloha* are not much useful and have untoward effects. However,nearly 60% of*NagaBhasma* preparation method utilizes

orpiment as media. It is a confusing point that whether such claim was made for *Lohavada* (conversion of lower metal into precious metal) or *Dehavada* (therapeutic application of metals and minerals to maintain healthy and long life). It is clear from the literature that utilization of *Ariloha* for *Bhasma* preparation is easy and common method. Here it can be interpreted that for safety purpose, it looks better to avoid administration of *Bhasma* prepared from *Ariloha* for longer duration or administration during functional impairment of vital organs. It can be claimed that to avoid any risk, *NagaBhasma* prepared from orpiment can be uses for local application in some skin diseases such as *Shvitra Kushtha* (leucoderma).Further research is required to test this claim.

For *NagaBhasma* preparation, maximum numbers of method involve *Puta* (31) and *Jarana* followed by *Puta* (31). As repeated incineration cycles help to impregnate chemical constitute of other drugs in *Bhasma* so these two principal methods are more suitable for therapeutic purpose. Only *Jarana* procedure is indicated in 13 methods. *Jarana* comprise strong heating in open iron pan and thus creates oxide form of metal with mixture of organic ash. There is no data available to make any comment on therapeutic utility of *Bhasma* prepared by only *Jarana* process. As this method is easy, time saving and economically chief therefore further research is necessary to establish importance and benefit of such methods. Other methods which comprise incineration cycles include *Lepa* followed by *Puta*, *Damaru Yantra Patana*, *Lepa-Jarana* followed by *Puta* and *Pishti* followed by *Puta*. *Dhamana* and *Utthapana* are the two rarely utilized methods. According to classical text, repeated incineration cycles are intended for *Doshavinash* (destroying unwanted effect) and *Gunaodaya* (initiation of new properties) but no such evident is found mentioned regarding *Dhamana* and *Utthapana*. Hence these two methods appear controversial. In present work a critical review of pharmaceutical prospect of *NagaBhasma* has been presented and discussed in detail. This study may be useful as torch bearer for future research in context of *NagaBhasma* preparation.

CONCLUSION

There are 9 principle methods occupying 97 methods of *Naga Bhasma* preparation. Various methods result in formation of *Naga Bhasma* with different colour which indicates their different chemical nature and different physico-chemical as well as therapeutic properties. Media used for *Bhavana*, adopted method of *Bhasma*preparation and number of incineration cycles are related with therapeutic indications and utility of *Naga Bhasma*, hencethese points should be considered before utilization.*Naga Bhasma*prepared from *Parada* media and herbal media can be used for longer duration while *Naga Bhasma*prepared from *Gandhakadi* media and *Ariloha* media should be used for short duration only.

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