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 Pradaro, 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, Medojavaya Vikara, Kashaya Roga, Shukrakshaya, Kalaibya, Pradara, Kasa, Saws, 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 Visha Shodhana, Jarana and Marana. After studying of different references about Vanga Bhasma, these steps are commonly carried out for 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. Samanya Shodhana is carried out in Taila, Takra, Gomutra, Aarunala, 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 Pata. 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 Bhasma 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 Panchhabhaj [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 Svaras) | 245gm           |
| 3rd sample of Vanga Bhasma | -               | -              | -                                   | 180gm Jarita Vanga ( Shuddha Hartala, Bhavana dravya Nimbu Svaras) | 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 sample of Vanga Bhasma | 400gm           | 364gm          | 364gm                               | 404gm Jarita Vanga , (Bhavana dravya –Kumari Svaras) | 364gm           |
| Lagon 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           |
| Rajendra Prasad 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          | 445gm                               | 470gm (Jarita Vanga)- after nirmilikarana was taken | 365gm           |
| 2nd sample of Vanga Bhasma | 500gm           | 470gm          | 470gm                               | 510gm (Jarita Vanga) - after nirmilikarana 470gm was taken | 350gm           |
| 3rd sample of Vanga Bhasma | 500gm           | 410gm          | 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                  |
|----------------------------|----------------------------------|-------------------------------------|-------------------------------------|
| Shradhha Panchabba [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      |
| Geeti et al [25]           | -                                | -                                   | -                                   |
| 1st sample of Vanga Bhasma | Nirgundi Swaras & Haridra Churna | Ashvthta Twaka Churna               | Shuddha Parada, Shuddha Gandhaka, Bhavana dravya- Kumari Swaras |
| 2nd sample of Vanga Bhasma | Nirgundi Swaras & Haridra Churna | Ashvthta Twaka Churna               | Bhavana dravya- Shatowari Swaras    |
| 3rd sample of Vanga Bhasma | Nirgundi Swaras & Haridra Churna | Ashvthta Twaka Churna               | Shuddha Hartala, Bhavana dravya- Nimbu Swaras |
| Patil et al [23]           | -                                | -                                   | -                                   |
| Lagad CE et al [26]        | Churnodaka                       | Apamarga Panchanga                  | Bhavana dravya – Kumari Swaras      |
| Panwar et al [27]          | Nirgundi Swaras & Haridra Churna | Haridara, Yavani, Jirak, Chinha, Ashvthta Twaka Churna | Bhavana dravya – Kumari Swaras |
| Rajendraprasad 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, Aarnaia, Kulatha kwath, Samudra Lavan churna | -                                   | Bhavana dravya – Kumari Swaras      |
| 2nd sample of Vanga Bhasma | Churnodaka                       | Samudra Lavan churna               | Bhavana dravya – Kumari Swaras      |
| 3rd sample of Vanga Bhasma | Taila, Takra, Gomutra, Aarnaia, Kulatha kwath, 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 |
|------------------------------|-------------|-----------------------------------|---------------------------------|
| Shradhha Panchabba [22]      | 11          | 660-396                           | White                           |
| Patil et al [23]             | 10          | Ardhgajputa (cowdung cakes 10kg to 4kg) | White                           |
| Geeti et al [25]             | -           | Laghuputa                         | Dull white                      |
| 1st sample of Vanga Bhasma   | 4           | Ardhgajputa                       | Pinkish white                   |
| 2nd sample of Vanga Bhasma   | 16          | Ardhgajputa                       | Greyish white                   |
| 3rd sample of Vanga Bhasma   | 12          | Ardhgajputa                       | -                               |
| Patil et al [23]             | -           | Laghuputa                         | -                               |
| 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) | -                               |
| Rajendraprasad et al [28]    | -           | Laghuputa                         | -                               |
| 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                   |
| 3rd sample 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 Panchabhag [23]       | -   | 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 sample of Vanga Bhasma     | 7.9 | 0.29            | 92.7                 | 21.92               | 0.46                        | -          | -                         |
| Lagad CE et al [26]           | -   | -               | 83.09                | 4.56                | -                           | 99.09      | -                         |
| Rajendra Prasad et al [27]    | -   | -               | -                    | -                   | -                           | -          | -                         |
| 1st sample of Vanga Bhasma     | -   | -               | 85.72                | -                   | -                           | 93.18      | -                         |
| 2nd sample of Vanga Bhasma     | -   | -               | 87.28                | -                   | -                           | 92.53      | -                         |
| Shiva Prasad [28]             | -   | -               | -                    | -                   | -                           | -          | -                         |
| 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 [29]   | 8.75| -               | 93.15                | 0.86                | 0.37                        | 99.75      | 0.37                      |

RESULTS

The study done by Panchabhaghi Shraddha [23] 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 Kasharartha 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 physicochemical 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 Dolayanta containing Churnadaka, 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 amalanga 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 Bhasmas, Jarita Vanga was 180gm and levigated well in Shatwari 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 Ardhaajputa 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. et al [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 Vishesh Shodhana. Particularly Vishesh 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 Vishesh Shodhana was done as per classical references particularly Vishesh Shodhana carried out in Churnodaka, quantity weighed was 364gm. Jarana process was carried out in Aparmarga 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 Vishesh Shodhana Churnodaka was used as media and obtained product was 1145gm. Jarana process of Shuddha Vanga was done in Ashvthta 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 Vishesh Shodhana was done as per references. 182gm of Shodhita Vanga was collected. For Jarana process 175gm of Shuddha Vanga was used, in which Haridra, Yasani, 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 Rajendra Prasad et al [28] was done on two samples of Vanga Bhasma. 400gm of Vanga was taken and 350gm was obtained after Samanya, Vishesh 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 Balash Mula Kwaatha 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 Lavan Churna. 470gm of Jarita Vanga was 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 Ardhaajputa 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 Vishesh Shodhana was done in Churnodaka. 470gm of Vishesh Shodhita Vanga was obtained and used for Jarana process in Samudra Lavan Churna. 510 gm of Jarita Vanga was washed for Kshara nirrulana 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 Ardhaajputa. After completion of Puta process, 350gm of Bhasma was formed having greisy white colour. For 3rd sample of Vanga Bhasma, 500gm of Vanga was subjected for Samanya and Vishesh Shodhana. After Samanya Shodhana, weight measured was 450gm and 410gm after completion of Vishesh 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 Ardhaajputa. 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 Samanya and Vishesh 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 Vishesh 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 Ashvattha 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 Furnace is more in gastric and gastrointestinal tract as compare to Vanga Bhasma prepared by Puta method or traditional method. 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. 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. Several works are being carried out in the drug development area for the advancements in Ayurvedic dosage forms, 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.

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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