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# Magnitude of *Bhasmas* in handling *Madhumeha* (Diabetes Mellitus) - A Critical Review

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## ABSTRACT

India is being estimated with fastest growing population of Diabetes. Diabetes is a metabolic disorder which is either due to Pancreas not producing enough insulin or the cells of the body not responding to the insulin produced. Diabetes refers "To run through siphon" and Mellitus means "Honey", Similar condition *Madhumeha* "*Prayo Madviva Mehanti*" (Honey like urine) has been explained in the *Ayurvedic* classics long centuries ago in an apparent way. *Rasashastra* emphasize the usage of various *Rasoushadhis* in the management of *Madhumeha*. Various researches conducted in last few decades on the *Rasa Bhasmas* and *Rasayogas* mentioned in literature for *Madhumeha* have shown phenomenal Antidiabetic property. In this article, review of therapeutic efficacy of 5 *Rasa Bhasmas* Viz *Naga*, *Vanga*, *Yashada*, *Swarna Makshika*, and *Abhraka Bhasmas* with the scientific evidence and rationality have been compiled. Target conditions choosing of these *Rasa Bhasmas* in *Madhumeha* have been discussed.

**Key words:** *Diabetes Mellitus, Madhumeha, Bhasmas, Rasoushadhis.*

## INTRODUCTION

Diabetes is the most common metabolic disorder. India is already considered as Diabetic capital of the world with over 69.2 million people living with diabetes (8.75%) as per 2015 data of WHO.<sup>[1]</sup> It is estimated that there will be more than 100 million diabetes patients by 2030.<sup>[2]</sup>

The disease *Madhumeha* with cardinal symptoms "*Prayo Madhuriva Mehanti*"<sup>[3]</sup> (honey like urine) and "*Samanya Lakshanam Tesham Prabhuta Avila Mutrata*"<sup>[4]</sup> is included in *Asthamahagada* (eight

major disease) by *Charak Acharya* shows the significance given to it.<sup>[5]</sup> The *Nidana* (etiology) of *Prameha (Madhumeha)*<sup>[6]</sup> includes intake of *Navaanna* (newly harvested paddy - Rich in Carbohydrates), *Gudavikruti* (items made up of jaggery and sugar), *Payasa*, *Dadhini* (Diary products - which has more lactose and less number of complicated carbohydrate chains), *Gramya Oudaka Anupa Mamsa Rasa* (meat and flesh of marshy land animals- rich in proteins and fats). Even conventional science consider Diabetes as an endocrinal disorder with impaired Carbohydrates, fat and protein metabolism characterized by the constant Hyperglycemia due to absolute or relative deficiency of Insulin with varying degree of Insulin resistance.

This *Aahara* (food) said in *Nidana* which is ingested gets digested and assimilated by *Jatharagni*. Thus free glucose increases in the blood which collects the seven water molecules for one glucose molecule and ultimately accumulates in *Vasti* (Bladder) where reabsorption mechanism fails (in henley's loop) and sweet urine (*Madhu Tulya Mutra / Glycosuria*) is witnessed ultimately in all *Mehas*.<sup>[7]</sup>

*Rasashastra* recognizes the importance of *Bhasmas* (Metallic preparations in Calx form) in treating

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different ailments. These metallic preparations *Bhasmas* occupy a significant place in *Rasashastra* pharmacopeia. Due to the small dose, quick effectiveness, tasteless ness, effectiveness on dreadful diseases and long shelf life *Rasoushadhis* occupy a superior status among Ayurvedic medicines,<sup>[8]</sup> and these qualities of *Rasoushadhis* (*Bhasmas*) make them to fit for the criteria's for *Prashasta Bhesaja* (ideal drug) laid down by *Acharya Charaka*.<sup>[9]</sup> Browsing *Rasashastra* texts we find many *Yogas* indicated for *Madhumeha*. On keen analysis of these *Rasa Yogas*, many and most of them contains *Naga, Vanga, Yashada, Swarna Makshika* and *Abhraka Bhasma* as common ingredients. Various scientific studies have established the facts that these *Bhasmas* when used alone or as in *Yoga* containing them as an ingredient gives tremendous results as antidiabetic agents, the picture of it is depicted in this article.

Therapeutic efficacy as per *Rasashastra* classical texts, Probable mode of actions and scientific works on 5 *Bhasmas* - *Naga, Vanga, Yashada, Abraka* and *Swarna Makshika* will be talked over here on.

### **Naga Bhasma**

**Table 1: Showing the details of Naga Bhasma<sup>[10]</sup>**

Dose	½ - 1 Ratti (62.5 to 125mg)
Anupana	Shilajatu, Haridrachurna and Amalaki
Rasa	Tikta
Veerya	Ushna
Doshagnata	Vatakaphahara
Rogagnata	Madhumeha, Medoroga, Dhatukshaya

### **Indications of Naga Bhasma<sup>[11]</sup>**

- In Polydypsia, as *Naga Bhasma* decreases the osmolarity of blood.
- When Diabetes is associated with complications like carbuncle, along with *Shilajatu* if *Naga bhasma* is administered gives good results.
- Diabetic patient complaining feeling of incomplete urination even after passing urine.

- Obese diabetic patient.
- Chronic diabetes patient.
- Diabetes associated with giddiness and psychological symptoms like depression etc or when the etiopathology is of psychological origin.

**Table 2: Showing the probable mode of action of Naga Bhasma<sup>[12]</sup>**

Site of action	Probable mode of action
Pancreas	Stimulates insulin secretion by increasing and activating beta cells.
Obese	Due to <i>Medohara</i> and <i>Lekhana</i> property, facilitates free circulation and normal binding of insulin, rectifies the receptors.
Brain	Decreasing the stress hormones like cortisol- a hormone responsible for increased blood sugar through Gluconeogenesis.
Kidney	Improve renal glucose threshold.

### **Research works on Naga Bhasma**

#### **Experimental studies**

- Naga Bhasma* alone in high dose 11.25mg/kg body weight (Total dose administered-125 mg) and in medium dose of 6.3mg (Total dose administered- 70mg) along with *Nishamalaki* showed significant level of improvement in decreasing blood glucose level of alloxan induced mice. The histopathological study confirmed increase of beta cells of pancreas from 60%-75%.<sup>[13]</sup>
- Naga Bhasma* (Lead calx) at a dose of 60mg twice daily for 28days provided significant relief in all signs and symptoms of DM. FBS and PPBS were reduced significantly ( $p < 0.05$ ). This study also says that *Naga Bhasma* prepared by *Parada* and *Manashila* media significantly reduces blood sugar level.<sup>[14]</sup>

- c) A sense of well being was reported by 90% of patients and 65% of patients showed a reduction in blood sugar, who were consuming modern antidiabetic drug along with *Naga Bhasma*; while, 50% of patients who were on only *Sastiputa Naga Bhasma* also showed a reduction in blood sugar levels. This study can prove to be a lead toward addition of *Bhasma* as an adjuvant to the synthetic drugs for the management of Diabetes mellitus.<sup>[15]</sup>
- d) In the testicular regenerative potential study of *Naga Bhasma*, it was observed that the test drug when given simultaneously with CdCl<sub>2</sub> (cadmium chloride) showed marked prevention of testicular degenerative effects of CdCl<sub>2</sub> and when given alone after 36 hours of CdCl<sub>2</sub> administration, showed a noticeable regenerative potential on partially degenerated testis. *Naga Bhasma* showed specific regenerative effect on germinal epithelium of testis. Thus these findings are well collaborated with Ayurvedic concept of *Vrishaya* property of *Naga Bhasma*.<sup>[16]</sup>

### Vanga Bhasma

**Table 3: Showing the details of Vanga Bhasma<sup>[17]</sup>**

Dose	1 – 2 Ratti (125 to 250mg)
Anupana	<i>Mocha Rasa</i> and <i>Haridra</i> <i>Abhraka Bhasma</i> and <i>Shilajatu</i> <i>Guduchi Satva</i> and <i>Madhu</i> <i>Tulasi Patra Swrasa</i>
Rasa	<i>Tikta</i>
Veerya	<i>Sheeta</i>
Doshagnata	<i>Kaphahara</i> , <i>Kinchit</i> <i>Vatapittakaaraka</i>
Rogagnata	<i>Rasayana</i> , <i>Prameha Nashaka</i> , <i>Vrishya</i>

### Indications of Vanga Bhasma<sup>[18]</sup>

- Diabetes Mellitus associated with Oligospermia.

- Old age diabetic patients with decreased bladder continence

**Table 4: Showing Probable mode of action of Vanga Bhasma**

Site of action	Probable mode of action
Pancreas <sup>[19]</sup>	Improves insulin action at cellular level and increases beta cells.
Testicles	Stimulates Epidermal growth factor there by maintenance of spermatogenesis
Organs of urinary system	Gives strength to the organ as it avoids Neurogenic and Stress incontinence
Liver <sup>[20]</sup>	Improves glucose metabolism or glucose homeostasis.

### Research works on Vanga Bhasma

#### Experimental studies

- In glucose loaded normal rats hypoglycemia was observed 120min after the hypoglycemic effects seen on the glucose loaded rats treated with *Vanga Bhasma*. This indicates the efficacy of *Vanga Bhasma* to suppress the elevated blood glucose levels.<sup>[21]</sup>
- Therapeutic dose of *Vanga Bhasma* average 188mg along with *Guduchi Satwa* showed significant reduction in blood glucose level on Wister rats. Histopathological study showed improvement in number of beta cells within islet of langerhans as evidenced by increased number of clearly stained cells in the centre of the islets.<sup>[22]</sup>

#### Clinical study<sup>[23]</sup>

30 Patients of NIDDM (Non insulin dependent diabetes mellitus) were selected of age group less than 20 years and were administered *Vanga Bhasma* in a dose-125mg / day along with hot water. Results were assessed after 21 days.

**Table 5: Showing the results of effects of Vanga Bhasma on NIDDM patients.**

Symptoms reduced	Reduction percentage of symptoms
Polyuria, joint pain	86.6%
Blood glucose level	80%
<i>Hasta Pada Daha</i>	85%
Polydypsia and polyphagia	83.33%
<i>Bhrama</i>	62.5%
<i>Bahu Sweda</i>	72.22%

**Yashada Bhasma****Table 6: Showing the details of Yashada Bhasma<sup>[24]</sup>**

Dose	1 – 2 Ratti (125 to 250mg)
<i>Anupana</i>	<i>Navaneeta, Mishri, Dugdha, Grita</i>
<i>Rasa</i>	<i>Kashaya</i>
<i>Veerya</i>	<i>Sheeta</i>
<i>Doshagnata</i>	<i>Kapha Pitta Nashaka</i>
<i>Rogagnata</i>	<i>Prameha, Netra roga, Vrana, Vrana Srava.</i>

**Indications of Yashada Bhasma<sup>[25]</sup>**

- *Pitta Pradhana Lakshanas* in *Madhumeha*
- Diabetes associated with peripheral neuropathy
- Diabetic patients complaining excess lethargy
- Diabetes associated with Psychological precursors or psychological originated diabetes.
- Lean diabetic person

**Table 7: Showing probable mode of action of Yashada Bhasma<sup>[26]</sup>**

Site of action	Probable mode of action
Pancreas	Accumulates in pancreatic beta cells due to beta cell specific zinc transporter-increases glucose stimulated insulin. Regulates glucagon secretion from pancreatic alpha cells.
Insulin	Synthesis, storage, secretion of Insulin Enhances half life of insulin

	Improves insulin sensitivity Maintenance of integrity of crystalline structure of insulin
Muscles	Increases the glucose uptake and reduces lethargy.
Nerve fibres	Corrects neurotransmitter dysfunction and thus in <i>Yashada Bhasma</i> helps in neuropathy.

**Research works on Yashada Bhasma**

- Jasada Bhasma*, a Zinc - Based Ayurvedic preparation: contemporary evidence of Antidiabetic activity inspires development of a nanomedicine.<sup>[27]</sup>
- Hypoglycemic property of *Shilajeet* and *Yashada Bhasma*<sup>[28]</sup>

In normoglycemic rats, the administration of *Yashada Bhasma* for 15 days significantly decreased the fasting blood sugar levels ( $p < 0.01$ ). Similarly the fasting blood sugar levels were also observed to be lower in *Yashada Bhasma* pretreated alloxinized rats as compared to control alloxanized rats ( $p < 0.05$ ). The observations recorded in this study shows that *Yashada Bhasma* possess hypoglycemic activity.

**Swarnamakshika Bhasma****Table 8: Showing the details of Swarnamakshika Bhasma<sup>[29]</sup>**

Dose	1/2– 2 Ratti (62.5 to 250mg)
<i>Anupana</i>	<i>Jambu Rasa, Triphala Kashaya, Guduchi Swarasa</i>
<i>Rasa</i>	<i>Katu- Tikta</i>
<i>Veerya</i>	<i>Sheeta</i>
<i>Doshagnata</i>	<i>Pitta Shamaka</i>
<i>Rogagnata</i>	<i>Rasayana, Mehagna, Atyanta Vrishya, Balya, Chakushya.</i>

**Indications of Swarnamakshika Bhasma<sup>[30]</sup>**

- Diabetic patients with *Pitta Pradhana Lakshana*



- Diabetes associated with vascular disorders
- Diabetes associated with Anemia.

#### Probable mode of action of *Swarna Makshika Bhasma*

Major components of *Swarna Makshika* are Cu, Fe, Ca, Al, K, Mg etc. one of the major component of *Swarna Makshika*, copper has essential role in Glucose and Cholesterol metabolism. Oral administration of copper alone in dose of 0.1mg daily in milk to anemic rats produced a different type of glucose tolerance curve than that of curve obtained from same animal before copper ingestion. Copper might stimulates liver to convert glucose in to glycogen.<sup>[31]</sup>

#### Research work on *Swarna Makshika Bhasma*

- a) An experimental study of *Swarna Makshika Bhasma* as antidiabetic medicine.<sup>[32]</sup>

The effect of *Swarna Makshika Bhasma* and standard drug Glibenclamide was observed on various biochemical parameters like blood glucose, total cholesterol, triglycerides on streptozotocin induced diabetic rats of either sex (Blood glucose level > 200mg/dl). Duration of experiment was of 27days, where in biochemical parameters were assessed on day 10, 17, and 27. The *Swarna Makshika Bhasma* solution was administered in a graded dose of (5.85mg/kg, 11.25mg/kg, 22.5mg/kg) once daily. Glibenclamide was given 600µg/kg orally. Glibenclamide showed decreased in blood glucose level in diabetic rats. The experimental drug *Swarna Makshika Bhasma* showed marked decrease in Blood glucose level from 7<sup>th</sup> day onwards. All the 3 graded dose of *Swarna Makshika Bhasma* showed significant lowering of elevated Blood glucose level. Lower dose of *Swarna Makshika Bhasma* (5.85mg/dl) has more Blood glucose lowering effect compared to its medium and high doses. Also *Swarna Makshika Bhasma* had effect on lowering elevated total cholesterol and triglycerides.

- b) Role of copper in carbohydrate metabolism<sup>[33]</sup>

The role of copper and Iron on blood sugar was assessed on the anemic and non anemic rats. Oral

administration of copper alone to anemic rats produced a different type of glucose tolerance curve than that obtained from the same animal before ingestion. The study concludes that copper seems to involve in liver function to bring about an acceleration of glycogen formation and thus rapid removal of glucose from blood. Pure iron alone does not alter in glucose tolerance but along with copper may help in glucose metabolism.

#### *Abhraka Bhasma*

Table 9: Showing the details of *Abhraka Bhasma*<sup>[34]</sup>

Dose	1– 2 Ratti (125 to 250mg)
Anupana	<i>Guduchi Satva, Pippali, Madhu, Shilajatu</i>
Rasa	<i>Kashaya Madhura</i>
Veerya	<i>Sheeta</i>
Doshagnata	<i>Vatakaphahara</i>
Rogagnata	<i>Pramehagna, Netradourbalya, Mutrakriccha, Shukra Stamba</i>

#### Indications of *Abhraka Bhasma*<sup>[35]</sup>

- *Madhumeha* with *Pleeha Vridhi*
- In Gestational diabetes, *Abhraka Bhasma* can be given along with *Pravala Pisti*
- *Madhumeha* associated with Reproductive and Cardiac problems.

#### Probable mode of action

Regeneration of islets of langherhans and induces the secretion of insulin from pancreas.

#### Research works on *Abhraka Bhasma*

- a) Evaluation of Antidiabetic and Antioxidant properties of *Abhraka bhasma*, *Nisa amalaki* and Zinc chelate on Streptozotocin induced Type 2 Diabetic rats. Study says that *Abhraka bhasma* dose not exhibit significant hypoglycemic effect on normal animals, where as it showed significant improvement in glucose tolerance test on glucose

loaded hyperglycemic rats. Also experiment proves Abhraka as a potent antioxidant by adding higher degree of lipid peroxidation.<sup>[36]</sup>

- b) Raghava Rao Gundimeda studied on invivo hypoglycemic activity of *Abhrak Bhasma* by alloxan induced method.<sup>[37]</sup>

## DISCUSSION

The potentiality of *Bhasma* is that it can handle even *Asadhya Vyadhis*. While treating Diabetes it is important to resolve the signs and symptoms, equally it is also important to allow the patient to achieve as normal life as possible and healthy feeling as well. To achieve above said goals appropriateness in treatment is must. Right patient, Right condition, Right drug, Right dose, Right time, Right duration is the right tools. To implicate the same rightness with above dealt *Rasa Bhasmas* few points are discussed based on the probable mode of action of these *Bhasmas* on Diabetes mellitus.

*Naga Bhasma* - There are 44 formulations of *Naga Bhasma* mainly indicated for *Prameha*. According to the properties of *Naga Bhasma*, it is mainly useful in *Vataja -Kaphaja Madhumeha*. *Haridra, Amalaki, Guduchi* and *Madhu* as *Anupana* enhances the antidiabetic action of *Naga Bhasma* and are also helpful in preventing diabetic complications.<sup>[38]</sup>

*Vanga Bhasma* - Different texts of *Rasashastra* reveals that *Vanga Bhasma* is a potent drug in handling *Madhumeha*. *Indra Vati, Harishankara Rasa, Vangeshwara Rasa, Bhrit Vangeshwara Rasa, Loha Garbha Pottali, Ashwaganda Paka* are the few *Madhumehahara Yogas* containing *Vanga* as an ingredient. *Vanga* is indicated in *Sarva Prameha*, thus it has wide range of therapeutic efficacy. The *Mehagna, Medogna, Chakshushya, Rasayana and Vrisha* properties of *Vanga* makes it a good choice of drug in *Madhumeha*.<sup>[39]</sup>

*Yashada Bhasma* (Zinc calx) - One of the most common ingredient of *Rasa Yogas* used for *Madhumeha Chikitsa*, and appreciated for its therapeutic results by many practitioners as well.

Zinc is involved in insulin synthesis, storage and secretion from pancreas<sup>[40]</sup> and Zinc extend the duration of action of Insulin.<sup>[41]</sup> Zinc effects glucose metabolism by inhibiting the intestinal glucose absorption.<sup>[42]</sup> Zinc also protects the beta cells from death, thereby ensuring higher plasma insulin levels. Interestingly, it is also known that Zinc deficiency coexists with diabetes. Patients with diabetes are more likely to have suboptimal Zinc status and negative correlation has been observed between Zinc intake and prevalence of diabetes. Zinc also improves the binding of insulin to its receptors. All these mechanisms of zinc might works synergistically and improves insulin action.<sup>[43]</sup> (Figure 1)

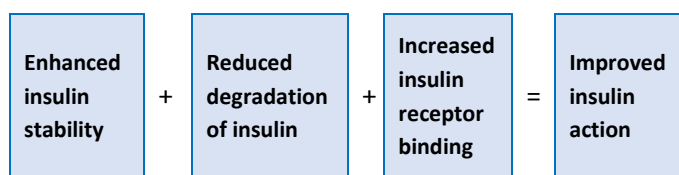


Figure 1: Showing the effect of Zinc on Insulin

*Swarna Makshika Bhasma* contains copper and iron in oxide forms. Copper accelerates the liver to convert glucose into glycogen their by helps in glucose metabolism. Iron along with copper is proved as a hypoglycemic agent.<sup>[44]</sup>

*Abhraka Bhasma* contains Iron, Calcium, Magnesium, Aluminum, Silica elements. All these elements help for the smooth muscle utilization of glucose to minute extent. *Abhraka* being appreciated by virtue of its *Rasayana* action decrease the *Vyadhi Bala (Madhumeha)*.<sup>[45]</sup>

## CONCLUSION

*Rasa Bhasmas* help in the treatment of diabetes by eliminating the symptoms of hyperglycaemia and achieving optimum control. Reduce or eliminate microvascular and macrovascular complications of diabetes mellitus. Acts as a synergist along with other anti-hyperglycemic herbal and synthetic drugs. Targets the main symptoms and other associated complications. Thus *Rasoushadhis (Rasa Bhasmas)* are highly potent in the treatment of diabetes provided they are used in the right dose, right duration and in the right condition.

## REFERENCES

1. WHO, world health day 2016: Diabetes [www.searo.who.int](http://www.searo.who.int) > media centre > events.
2. India's diabetes burden to cross 100 million by 2030- Times of India, [m.timesofindia.com](http://m.timesofindia.com) > India > 11101062.
3. Acharya Vagbhata, Asthanga Hridaya with Aruna dattha and Hemadri commentary, Nidana sthana 10/20, ed by Vaidya Harisaastri Paradaakara, Varnasi: Chaukhambha orientalia, reprint 2005;p.504
4. Acharya Madhava, Madhava Nidana with Madhukosha Vyakhyana, ed by Upadhyaya Yadhunandana, Varnasi: Chaukhambha Prakashana, reprint 2009;p.10
5. Agnivesha charaka samhita chakrapani commentary, Indriya sthana 9/8-9, ed by P.V Sharma, 8<sup>th</sup> edition, Varnasi: Chaukhambha Sanskrit orientalia, reprint 2007;p.569-70
6. Agnivesha charaka samhita chakrapani commentary, Chikitsa sthana 6/4, ed by Yadavaji Trikamji Acharya, Varnasi: Chaukhambha Sanskrit sansthan, reprint 2009;p.445
7. Prasad K S R, Aetiopathology of Mahumeha, slide share: Ayurmitra Dr. KSR Prasad.
8. Acharya Vagbhata, Rasa ratna sammuchaya 28/1, Hindi vyakhyana by Siddhinanadan Mishra, Varnasi: Chaukhambha Orientalia, 2011;p.633
9. Agnivesha charaka samhita chakrapani commentary, Siddhi sthana 6/15-16, ed by Yadavaji Trikamji Acharya, Varnasi: Chaukhambha Sanskrit sansthan, reprint 2009;p.445
10. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.65-66
11. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.66-69
12. Kumar Naveen, An experimental evaluation of Hypoglycemic effect of Naga bhasma in albino rats W.S.R to Histopathological studies, PG dissertation, Department of RSBK, GAMC Bengaluru, RGUHS, 2010-2011.
13. Kumar Naveen, An experimental evaluation of Hypoglycemic effect of Naga bhasma in albino rats W.S.R to Histopathological studies, PG dissertation, Department of RSBK, GAMC Bengaluru, RGUHS, 2010-2011.
14. Tate P.A, Pharmaceutical standardization and toxicity study of Naga bhasma prepared by two different methods W.S.R to Madhumeha(DM), PG dissertation , Department of RSBK, IPGTand RA, Gujarat Ayurveda university, Janmagar, 2008.
15. Chaube A, et.al, Novel Ayurvedic antidiabetic medicine. Ancient science of life. 1995;15:153-5[ PMC free article] [ PubMed]
16. Maksoodan S, et.al, Studies on testicular regeneration Potential of Naga Bhasma, Ancient science of life. 1989;9:95-8 [ PMC free article] [ PubMed]
17. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.57-58
18. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.59-62
19. Soni chandan et al, Research article, Screening of Antidiabetic effect of Vanga bhasma(Tin ash) in alloxan- induced Hyperglycemic rats, Wanjari Manish et al/IJRAP 2011, 2(4)1225-1230.
20. Soni chandan et al, Research article, Screening of Antidiabetic effect of Vanga bhasma (Tin ash) in alloxan-induced Hyperglycemic rats, Wanjari Manish et al/IJRAP 2011, 2(4)1225-1230.
21. Soni chandan et al, Research article, Screening of Antidiabetic effect of Vanga bhasma(Tin ash) in alloxan- induced Hyperglycemic rats, Wanjari Manish et al/IJRAP 2011, 2(4)1225-1230.
22. Hukeri Sripal, Pharmaceutico- Analytical and experimental evaluation of Antidiabetic activity of Vanga bhasma and Guduchi satwa W.S.R. to effect on Pancreas, PG dissertation, Department of RSBK, GAMC Bengaluru, RGUHS, 2012-2013.
23. Hukeri Sripal, Pharmaceutico- Analytical and experimental evaluation of Antidiabetic activity of Vanga bhasma and Guduchi satwa W.S.R. to effect on Pancreas, PG dissertation, Department of RSBK, GAMC Bengaluru, RGUHS, 2012-2013.
24. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.63
25. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.64-65
26. Chausmer AB, Zinc, insulin and diabetes, [www.ncbi.nlm.nih.gov/pubmed/9550453](http://www.ncbi.nlm.nih.gov/pubmed/9550453)(Abstract), 1998 Apr;17:109-15.



27. Rinku D. Umrani and Kishore M. Panikar, Jasada bhasma, a Zinc- Based Ayurvedic preparation: contemporary evidence of Antidiabetic activity inspires development of a nanomedicine, Evidence based Complementary and Alternative medicine, vol 2015 (2015), Article ID 193156, 9 pages. <http://dx.doi.org/10.1155/2015/193156>.
28. Bharati et al. Hypoglycemic property of Shilajeet and Yashada Bhasma, Ancient Science of Life, vol.No.16 Oct 1996;p.118-121.
29. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.69
30. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.70-72
31. Keil H.L and Nelson V.E, The role of Copper in Carbohydrate metabolism, from the laboratories of Physiological chemistry, Iowa state college, Ames.
32. Sing Neetu et al, An experimental study of Swarna makshika bhasma as anti diabetic medicine.Singh et.al. Unique journal of Ayurveda and Herbal medicine, UJAHM 2014,02(06):p.1-6
33. Keil H.L and Nelson V.E, The role of Copper in Carbohydrate metabolism, from the laboratories of Physiological chemistry, Iowa state college, Ames.
34. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.75-76
35. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.77
36. Phanindra B et al, Evaluation of Antidiabetic and Antioxidant properties of Abhraka bhasma, Nisa amalaki and Zinc chelate on Streptozotocin induced Type 2 Diabetic rats, International journal of Pharmacy and Pharmaceutical analysis. Panindra et.al IJPPA,2017;vol01(03):21-43.
37. Gundimeda Ragava Rao, Hypoglycemic activity of Abhraka bhasma prepared with Katuki Kwatha- An Experimental study. PG dissertation, 2011.
38. Dhirajsingh Rajput et al, Anti diabetic formulations of Naga Bhasma(Lead calx): A brief review. Ancient science of Life .[https://www.ncbi.nlm.nih.gov > articles](https://www.ncbi.nlm.nih.gov/articles).
39. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.59-62
40. Taylor C.G, Zinc, the pancreas, and diabetes: insights from rodent studies and future directions, Biometals, Vol-18, no.4, 2005;p.305-312,
41. Meyer J.A and Spence D.M, A perspective on the role of Metals in diabetes: past findings and possible future directions, Metallomics, Vol 1, no.1, 2009;p.32-41
42. Ueda. E et.al, In vitro alphasglucosidase inhibitory effect of Zn(II) complex with 6-methyl-2-picolinmethylamide, Chemical and Pharmaceutical Bulletin, Vol.53, no 4, 2005;p.451-452,
43. Rinku D. Umrani and Kishore M. Panikar, Jasada bhasma, a Zinc- Based Ayurvedic preparation: contemporary evidence of Antidiabetic activity inspires development of a nanomedicine, Evidence based Complementary and Alternative medicine, vol 2015 (2015), Article ID 193156, 9 pages.<http://dx.doi.org/10.1155/2015/193156>.
44. Keil H.L and Nelson V.E, The role of Copper in Carbohydrate metabolism, from the laboratories of Physiological chemistry, Iowa state college, Ames.
45. Rasatantra sara evam siddhaprayoga sangraha, Part1, Ajmir: Krishna gopal Ayurveda bhavan, p.77

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