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Review Article

A REVIEW ON THERAPEUTIC APPLICATION OF SWARNAMAKSHIKA BHASMA

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ABSTRACT

Bhasmas are multi elemental drugs derived from natural sources, which are administered after subjecting to various processes like shodhana and marana. Swarnamakshika bhasma is one such bhasma explained under maharasa varga and upadhatu of swarna (gold) having a wide range of therapeutic action. It is a best rasayana and is explained as sakalamayaghna; that which destroys all diseases. Swarnamakshika is chemically chalcopyrite (CuFeS₂) containing iron and copper as major constituents. Swarnamakshika Bhasma is an independently and extensively prescribed medicine. As it is soumya (mild) formulation containing Fe and Cu and tridosha pacifier, it can be prescribed in almost all diseases even in pregnancy & children with proper anupana and right dose. The current article is to highlight the therapeutic application of swarnamakshika with its probable mode of action.

Keywords: Swarnamakshika bhasma, Chalcopyrite, Therapeutic application

INTRODUCTION

Swarnamakshika (Chalcopyrite) is an important mineral placed in maharasa varga in Rasashastra. Owing to its high therapeutic efficacy, applicability towards parada bandha (assists in amalgamation of parada (mercury) and abhraka (mica)) it is considered as prana of Rasendra (essence of lord shiva). Rasa Ratna Samucchaya explained it further as vrushya (aphrodisiac), agrya rasayana and sakalamayaghna (useful in all diseases)¹. Swarnamakshika is grouped under upadhatu of swarna as it has similar properties of Swarna, also it possess additional properties due to addition of loha (iron) and tamra (copper) in it². Chalcopyrite is copper pyrite with copper and iron as major constituent. Common name of chalcopyrite is fool's gold due to its high resemblance with gold in colour.

Occurrence of Swarnamakshika

The reference regarding Swarnamakshika occurrence is found in Rasa Ratna Samucchaya as yavana desha (Greece), tapati teera (Madhya pradesh), kirata desha (Nepal), cheena desha (China)³. Currently natural ore of chalcopyrites is obtained from Khetri mines in Rajasthan, Malanjkhanda in Madhya pradesh and Ghatshila in Jharkhand.

Classification of swarnamakshika

It is generally classified as swarnamakshika and rajatamakshika. Swarnamakshika is superior variety which is similar to swarna in appearance. It is explained as pancha varna suvarnavat. Rajatamakshika is inferior variety having less potency and

contains much of the stone⁴. Another type of makshika; kamsya makshika is also explained.

Chalcopyrites though universally accepted as swarnamakshika, two different sources are mentioned in API. They are Chalcopyrites (Swarnamakshika) and Copper concentrate chalcopyrites (sandrita swarna makshika). The former is natural ore with Cu content not less than 5%, Fe content not less than 12%, and sulphur content not less than 20% in it. The latter is created by artificial intervention where the concentration of Cu is enhanced to not less than 12%⁵.

GRAHYA LAKSHANA VERSUS MINERAL PROPERTIES

Any mineral to be considered that of rasa dravya mentioned in classic, grahya lakshana (necessary qualities) and mineralogical properties should go hand in hand. Grahya swarnamakshika is golden coloured, guru (heavy), snigdham (unctuous), nishkona (without angles), and on rubbing on hand produces blackish tinge⁶. Chalcopyrites also possess similar properties, it is brassy yellowish in colour, with metallic lustre, hardness 6 – 6.6, uneven fracture and imperfect cleavage (nishkona) and streak is brownish black⁷. So they can be considered as the same. Similarly, Rajatamakshika can be considered as ironpyrites without angles. Ironpyrites with angle becomes vimala (as grahya lakshana explains 6 angles, 8 planes). A different opinion on grahya lakshana regarding swarnamakshika can be traced in Ayurveda prakasha; where author quotes eeshat neelacchavi (bluish tinge)⁸.

PROPERTIES

Swarnamakshika though is a widely used rasa dravya, its properties including rasa panchaka were not explained until the period of rasashastra. In Brihattrayi little reference can be found regarding individual properties. It is madhura tikta rasa yukta drug having guru (heavy) (in terms of hardness) with laghu (light for digestion) guna. It is a best rasayana dravya. Amayika prayoga (clinical application) is explained in detail in Rasatarangini⁹.

Therapeutic application of swarna makshika in Samhita

References of therapeutic applications of swarnamakshika can be found in all Brihattrayi as single drug administration or as in combinations. But there is no mentioning of mode of use, anupana, and dose and purification protocol to be followed. It may be inferred that purification method prevailed in samhita kala but it has not been documented.

PURIFICATION OF SWARNAMAKSHIKA

Ashuddha apakva lakshana & Chikitsa

There is no rasa dravya mentioned in classics that can be consumed without proper purificatory procedure. Processing of rasa dravya include procedures such as shodhana (purification) and marana (incineration). Improper shodhana and marana leads to various disorders. In Bhrihat Rasa Raja Sunadara, ashuddha (improper shodhana) and apakva (improper marana) lakshana and their management is elaborately mentioned. Ashuddha lakshana include mandagni (indigestion), balahani (loss of strength), vishtambha (abdominal distention), netraroga (eye disorders), kushta (skin disease), and gandamala (lymphedinitis)³⁷. Apakva lakshana is pain³⁸. The treatment protocol explained is kulattha kwatha and dadima tvak kwatha with sita (sugar candy) for a period of 3 days³⁹.

Kulattha (*Dolichos biflorus*) is proved anti-oxidant and have free radical scavenging action on superoxide, hydroxyl, nitric oxide, etc⁴⁰. Dadima (*Punica granatum*) especially dry peel of fruit showed highest anti-oxidant activity compared to counter parts of plants. It is anti – inflammatory, anti-biotic, and anti-cancerous in nature⁴¹.

Shodhana of swarna makshika

Different methods have been adopted for shodhana including swedana, pachana, nirvapa and putapaka method.

Shodhana by swedana method:

- Swarna makshika is kept in soorana kanda (*Amorphophallus campanulatus*) and is subjected to swedana in kulattha kwatha, kodrava (*Paspalum scrobiculatum*), nara mootra (human urine), amlavetasa (*Garcinia pedunculata*), katutraya (*Zingiber officinale*, *Piper nigrum*, *Piper longum*) and Rambha swarasa (*Musa sapientum*)⁴².]
- Dolayantra swedana in kadali kanda swarasa (*Musa sapientum*) for 2 hours⁴³.

Shodhana by pachana method:

- Swarna makshika churna 3 parts, saindhava lavana 1 part and nimbu swarasa (*Citrus limon*) in iron vessel is subjected to high flame with occasional stirring with ladle till reddish colour is attained⁴⁴.
- Swarna makshika is taken with eranda (*Ricinus communis*) taila and matulunga (*Citrus medica*) swarasa till liquid portion completely dries up⁴⁵.

Shodhana by nirvapa method:

- Swarna makshika is heated and immersed in nimbu (*Citrus limon*) swarasa for 21 times⁴⁶.
- Swarna makshika is heated and immersed in triphala kwatha (decoction of *Embolia officinalis*, *Terminalia chebula*, *Terminalia bellerica*) for 7 times⁴⁷.
- Swarna makshika is heated and immersed in tila (*Sesamum indicum* Linn) taila, takra (curd), kulattha (*Dolichos biflorus*) kwatha and triphala kwatha⁴⁸.

Shodhana by putapaka method:

The shigru (*Moringa oleifera*) root is rubbed with Agasti pushpa (*Linum usitatissimum*) and pashanabheda (*Aerva lanata*), to it swarnamakshika is rubbed dried and made to balls. It is subjected to fire with 20 cowdung cakes for 7 times⁴⁹.

Swarna makshika marana

Different methods of incineration with parada, mulika dravya (plant origin) and gandhaka, etc. are explained in classics.

Marana with Parada (Mercury)

Shudha Hingula 1/8th part is added to 1 part Shudha Swarnamakshika and levigation is done with Nimbu swarasa (*Citrus limon*) – 8 puta⁵⁰.

Marana with mulika dravyas (Plant drugs)

Shuddha Swarnamakshika is levigated with Nimbu swarasa (*Citrus limon*) – 10 Gaja puta⁵¹.

Shuddha Swarnamakshika is levigated with Kumari (*Aloe vera*) swarasa – 27 Kukkuta puta⁵².

Marana with gandhaka (Sulphur)

Shuddha Swarnamakshika with equal quantity of Shuddha Gandhaka is levigated with matulunga (*Citrus medica*) swarasa – 5 Varaha puta⁵³.

Matra (Dose)

According to Rasatarangini, the dose of swarnamakshika bhasma is ½ to 2 ratti (60mg – 250mg) considering the strength and disease condition⁵⁴ of patient.

MODE OF ACTION OF SWARNAMAKSHIKA

Swarnamakshika is chalcopyrite with iron and copper as major constituents. Copper is a major micro nutrient that helps in bone development, maintaining connective tissue and organs, helps absorption and utilization of Fe and an Enzyme co factor. It is anti-fungal, anti-microbial, anti-oxidant etc. Iron is a micronutrient that assists in production of heme, enzyme co factor, oxygen transport, in energy development, organ function, muscle function, etc.

Rasayana action: Rasayana action of swarnamakshika can be understood by virtue of anti-oxidant properties of constituent elements. Copper is required in relatively low quantity for optimal health. Cu as a co-factor of metalloenzyme, copper zinc superoxide dismutase (SOD) helps in converting toxic superoxide free radicals to non-toxic hydrogen or oxygen peroxides⁵⁶. Copper deficiency causes improper functioning of macrophages and neutrophils leading to inflammatory reactions, bacterial infection and reduced innate immunity⁵⁷. Copper as a free ion, rather than the component of enzyme also plays stimulatory role in immune cells.

Hrudya action: Lysyl oxidase, a copper dependent metalloenzyme helps in crosslinking arterial collagen and elastin there by rebuild and maintains cardiac tissue⁵⁸. SOD is also present in cardiac tissues which is an anti-oxidant promote cardiovascular health. Iron plays an integral part in heame

production by binding with porphyrin which does oxygenation to entire body. Copper is proved to reduce plasminogen activator inhibitor type 1 which is one of the risk factor of atherosclerosis⁵⁹.

Neurological action: In anxiety and stress, studies have proved both Fe and Cu intake inhibit GABA (gamma amino butyric acid) receptors. Fe intake reduces the chance of depression if consumed internally in optimum levels⁶⁰.

Vrushya activity: Ferritin is a Fe storage protein that supports male reproductive system. Sertoli and leydig cells have abundant amount of ferritin. Fe helps in the development of spermatozoa. Copper bind with metallothionins (MT); storage protein for Cu and Zn, detoxify a variety of heavy metals in male reproductive system and protect spermatogenic cells. Ceruloplasmin; Copper dependent ferroxidase in sperm is considered as marker compound of proper functioning of seminiferous tubule⁶¹.

Other major actions: Vishaghna and chakshushya properties of swarnamakshika can be attributed to the anti-oxidant properties of SOD, which is present in almost all tissues in body including in major proportions in eye.

Research updates on swarnamakshika bhasma suggest the particle size is 931.4nm (DLS method). The elements identified include Fe, Cu, P, S, Si, Ca, Zn, and Mg in major proportions and trace levels of Mn, Al, Na, etc. were also identified⁶². Evaluation of subchronic genotoxic potential done by Dr Pavan B Savalgi states that, the Swarnamakshika bhasma samples were found to be safe after the administration for 14 days at the therapeutic doses. No abnormality was noticed in Chromosomal aberrations and sperm abnormal aberrations in all trial groups⁶³. Swarnamakshika bhasma has shown significant results in biological parameters including increase in Hb%, decrease in serum cholesterol, triglycerides, VLDL level, and significant increase in bone marrow parameters like myeloid to erythroid ratio, Pronormoblast, and Reticulocytes⁶⁴.

Table 1 Properties of Swarnamakshika bhasma

Book	Rasa Ratna Samucchaya ⁹	Rasa Tarangini ¹⁰	Ayurveda Prakasha ¹¹	Ananda Kanda ¹²
Rasa	Madhura	Madhura, Tikta	Madhura, Tikta	Kashaya, Tikta, Madhura, Katu
Guna	Laghu	Snigdha, Guru	Snigdha, Guru	Laghu
Veerya	Sheeta			Ushna
Vipaka	Katu			
Doshaghna		Tridoshaghna	Tridoshaghna	
Karma		Rasayana	Vrushya, Rasayan, Chakshushya	Rasayana, Vrushya
Rogaghna		Pandu, Kushta, anidra Vishdosha, Jirna jwara, Arsha Prameha, MutraKruccha, chakshushya	Pandu, visha, shotha, kandu, vishoddaroga	Kushta, Shotha, Sakalamay, Vanti

Table 2 Reference of swarnamakshika in samhita

Author	Formulations	Indication
Sushruta	Avalgujadi Lepa with gopitta	Shwitra (leucoderma) ¹³
	Makshika rasayana	Prameha (diabetes) ¹⁴
	Swarna (Gold), Swarna makshika with honey	Rasayana (rejuvenative) ¹⁵
	Anjana	Praklinna vartma (blepharitis) ¹⁶
	Mandura(iron oxide), Loha (iron), SwarnaMakshikaChurma with honey	Pandu (anaemia) ¹⁷
Charaka	Swarna Makshika, Shilajati, with cow's urine	Kumbha Kamala (jaundice) ¹⁸
	Makshika with cow's urine	Kushta (skin disease) ¹⁹
	swarnamakshika with Gandhaka (sulphur)	Kushta (skin disease) ²⁰
	Swarna makshika yoga	Pandu (anaemia) ²¹
	Yogaraja choorna	Pandu (anaemia) ²²
	Mandura vataka	Pandu (anaemia) ²³
	Mustadi lepa	Visarpa(cellulitis) ²⁴
Vagbhata	Timira roga nasaka anjana	Timira (cataract) ²⁵
	Sapta sama gutika	Kushta (skin disease) ²⁶
	Bhaskara anjana	Timira (cataract) ²⁷
	Apratishara anjana	Timira (cataract) ²⁸
	Shadmakshika anjana	Timira (cataract) ²⁹
	Swarna, swarnamakshika with ghruta, honey	Yogaja visha ³⁰
	Swarnamakshika Leha	Rasayana (rejuvenative) ³¹
	Vasa (<i>Adhatoda vasica</i>), Swarnamakshika, phalini (<i>Callicarpa macrophylla</i>), lodhra(<i>Symplocos racemosa</i>)	Rakta pitta (bleeding disorder) ³²
	Kutaja tvak (<i>Dolichos biflorus</i>), Swarnamakshika, Ativisha (<i>Aconitum heterophyllum</i>) Leha	Raktarsas (piles) ³³
	Mandura vataka	Pandu (anaemia) ³⁴
	Tapyadi churna	Pandu (anaemia) ³⁵
Swarnamakshika, Shilajati with cow's urine	Kumbha kamala (jaundice) ³⁶	

DISCUSSION

Swarnamakshika is upadhathu of swarna and is rasayangrya. Procedures like shodhana and marana make the mineral biologically available to the body. Shodhana loosen bond, oxidize and solubilize impurities in liquid media (drava dravya). Marana reduce the particle size to nano level, impart veerya to aushadha and makes it compatible. Swarnamakshika bhasma contains Cu_2S , Cu_2O , Fe_2S , SiO_2 and trace amount of Mg, Zn, Mn, etc. Smaller particle size of bhasma enables rapid dissolution in the body fluids and quick digestion of the bhasma. Nano-particle size of the bhasma facilitates self-targeted activity. This proves vyavayi, vikasi guna of bhasma. Nanoparticle improve drug delivery, the drug will be taken by cells more efficiently than larger one. It also gets cleared from the body easily. Swarnamakshika bhasma is a soumya kalpa of loha and tamra. It is swadu, tikta, vrushya, rasayana, yogavahi, sakti vardhaka, rakta stambhaka and rakta prasadana. It has a wide spectrum of action and is utilised in many diseases like prameha, pandu, amlapita, vatavikara, etc. Madhura, tikta rasa, sheeta veerya, katu vipaka, laghu, snigdha, agni deepaka, pittahara action of swarnamakshika makes the drug a best choice in pandu. It promotes absorption of iron, increases RBC and Hb%, and stimulates erythropoiesis. Madhura-tikta rasa, katu vipaka- deepana, kledo-medo upashoshana action of swarnamakshika make it pramehahara. Copper acts on impaired glucose and lipid metabolism. Iron reduces the degree of oxidative stress signalling pathways, preventing insulin resistance and β -cells dysfunction there by control blood sugar level. Madhura-Tikta rasa, Katu vipaka, pitta shamaka, drava shoshana, deepana qualities of drug facilitates amlapittahara action. Raktasthambhaka property arrests bleeding associated with amlapitta. Moreover Copper prevents gastrointestinal damage and proved to have antiulcer activity.

Contra indications during intake of swarnamakshika bhasma include dietary fibres, spicy food items (it contain high phytic acid which hinders Fe absorption), wide variety of beverages (beverages with anti-oxidant property inhibit iron absorption) etc.

CONCLUSION

Swarnamakshika is maharasa dravya considered to be rasayangrya and sarvarogahara. It is a good rasa formulation which can be independently prescribed. Properly shodhita and marita swarnamakshika bhasma does broad spectrum action due to its nanoparticle form and in bound properties. As soumya form of Fe and Cu and tridosahara, it can be prescribed, in almost all vyadhi even in durbala, komala, garbhini & children with proper anupana and dose. As less clinical data is available regarding Swarnamakshika bhasma, to authenticate the karma, clinical trial in different amayika pragoya is needed.

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