

PHARMACEUTICO ANALYTICAL STUDY OF SWARNA BHASMA AND EXPERIMENTAL EVALUATION OF ITS NOOTROPIC ACTIVITY

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ABSTRACT

The main objective of this review article is to discuss the Nootropic effect of *swarna bhasma* and to discuss the experimental study which was conducted on rats. The authentic subject material has been reviewed from *Ayurveda* and modern medical literature. Different research and review article were searched in different journals. The subject material has also been searched on internet. This study is mainly focused on different aspects of *Swarna Bhasma*. It is well recognized in *Ayurveda* that *Swarna Prashana* has been mentioned as it is an important recipe for child growth and memory enhancement and also to promote longevity in children on one month use. Nowadays many people are showing interest in Ayurveda and *Swarna Bindu Prashana* so here an attempt has been made to address therapeutic uses Of *Swarna Bhasma* and its Nootropic effect.

Keywords: *Swarna Bhasma*, Nootropic effect

INTRODUCTION

Ayurveda is a science with rich heritage and antiquity. Its essence is percolated from knowledge based out of Veda. Over a period of time, this got systemized to professionalism for the prevention, promotion and care of disease condition. *Rasashastra* being a tribute of Ayurveda contributes to promote, and maintain health. The use of metals and minerals in therapeutics was the specialty of this science. In *Kashyapa Samhita*, *Swarna Prashana* has been mentioned as it is an important recipe for child growth and memory enhancement and also to promote longevity in children on one month use¹. *Swarnaprashana* was modified on the literary backup from classical compendiums to *Swarnamrita Prashana*. Besides *Swarna Bhasma*, *Medhya* drugs like *Vacha*, *Mandooka parni* etc were added to enhance the Nootropic property. It contains plant extractives mixed with Ghee and honey and was given to lick

(*Prashana*). As we know Nootropics are the class of drugs used for cognitive enhancement or we call them as nutraceuticals that are purposed to improve mental functions, such as cognition, memory, intelligence, motivation, and concentration. *Swarna bhasma* is one such drug which has its action on cognitive enhancement^{2,3,4}.

MATERIALS AND METHODS

Pharmaceutical stride involved in preparation of *SWARNA BHASMA*:

The method of preparation of *Swarna bhasma* encompasses following steps:

- *Shodhana* of *Hingula* – *Bhavana* with *Nimbu swarasa*
- *Hingulottha Parada Nirmana* by *Urdhwa patana*⁵
- *Shodhana* of *Parada* by *Haridra churna*.
- *Shodhana* of *Gandhaka* by *Bhudhara yantra*.

- *Samanya Shodhana* of Swarna by *Nirvapa* of Swarna *Patras* in *Taila*, *Takra*, *Gomutra*, *Aranala (kanji)* and *Kulattha kwatha* successively for 7 times.
- *Vishesha shodhana* of Swarna: Thin *Patras* of Swarna are taken and mixture of *Gairika* and *Saindhava lava* is applied over them. These are kept in *Sharava samputa*, heated in midst of fire for one and half hour.
- *Gairika shodhana* will be done by giving *bhavana* with *Godugdha*.
- Preparation of *Samaguna Kajjali* –
 - *Shuddha Parada* and *Shuddha Gandhaka* (eq.quantity) were taken & triturated till the mixture becomes *Nischandra*. 3 *bhavanas* were given to this *Kajjali* with *Vatankura swarasa*.
- Preparation of *Rasa Sindoor*.

The *Vatankura Swarasa Bhavitha Kajjali* was filled in to 2/3rd part of *Kachakupi*, placed in VMF, *Kramaagni* given and temperature was recorded. After *swangasheeta kupi* was broken and the sublimed product was collected. The procedure was done in two successive batches.

- Preparation of *Swarna Bhasma* - *Rasa Sindoor* (1/4th part to that of *Swarna*) was taken and triturated with *amla dravya*, after making a fine paste, this was applied on the both sides of the *shodhita Swarna patras*. They were placed in a *sharava* and subjected to *kukkuta puta*. The procedure was repeated till it attains *bhasma lakshanas*.

ANALYTICAL STUDY

- ▶ The raw drug *Swarna* that satisfied all the classical *Grahya lakshanas* and containing 999.9 % purity i.e.24 carat was chosen for the study.

All the analytical parameters of *Swarna Bhasma* were in the range of API standards.

- ▶ Physico-chemical analysis- Total Ash value 97.60%, Acid insoluble ash 21.80%, Water soluble ash 0.12%, Loss on drying at 110°C 0.27% and pH 6.48.
- ▶ XRD report of *Swarna bhasma* showed 3-1 peaks of both Au and HgS respectively with different D-space from 5.60642 to 1.2331. No additional peaks were seen in XRD of *Swarna Bhasma*. This confirms that *Swarna bhasma* contained mainly gold nano particles, which are in crystalline nature. HgS may be due to its use during marana procedure.
- ▶ The SEM analysis showed the particle size ranging between 21.85 nm to 28.40nm. EDX analysis revealed 93.96% Au and other trace elements however Hg was not detected. The absence of Hg in *bhasma* indicates proper incineration yielding a high quality product.

EXPERIMENTAL STUDY

In the present experimental study the Nootropic effect of *Swarna bhasma* in Swiss albino mice and Wistar albino rats are studied by doing plus **Elevated Plus Maze and Morris Water Maze Tests** respectively. So the present work was undertaken to establish its pharmacological action in experimental animals.

Ethical clearance:

The experiment was carried out in conformity with the Institutional Animal Ethics Committee (IAEC) after obtaining its permission with reference number – **SDMCAU/JAEC/2014-2015 dated 22.08.2014**. All the procedures performed were in accordance with Control and Supervision of Experiments on Animals (CPCSEA) guidelines, under ministry of Animal Welfare Division, Government of India, New Delhi.

DRUG AND CHEMICALS:

- Test drug *Swarna bhasma* was prepared in the PG DEPT OF *Rasashastra* GAMC, Bangalore.
- Standard drug *Piracetam* was obtained from .(Normabrain®Torent Pharmaceuticals Ltd., Vill, India),
- *Scopolamine* was obtained from *Sigma Aldrich*, Bangalore.
- *Di-ethyl ether*
- *Formaldehyde*
- *Vacha choorna* –SDM pharmacy
- *Grutha* –*Nandini* Milk dairy.
- *Madhu*–*Ashoka* honey & food products from local market *Udupi*.
- *Picric acid*(to stain animals for identification)
- *Distilled water* Used for the preparation of suspension of standard drug and test compound and it was supplied by - pharmacology laboratory of S.D.M. Centre for Research in Ayurveda & Allied Sciences.

Grouping of animals

48 mice and 48 rats were randomly grouped into 8 groups. In each group the animals were marked with yellow Colour to different body parts to permit individual identification. Each group of 6 animals were kept in separate polypropylene cages denoting the number from 1 to 8 respectively.

Group 1: Normal control

Group 2: *Scopolamine* control

Group 3: *Piracetam*

Group 4: *Swarna Bhasma* TED

Group 5: *Swarna Bhasma* 2xTED

Group 6: *Swarna Bhasma*+ *Vacha, Grutha, Madhu*.

Group 7: Scopolamine +*Swarna Bhasma* TED

Group 8: Scopolamine +*Swarna Bhasma* 2xTED

Dose fixation⁶:

The dose of *Swarna Bhasma* is 1/8 to 1/4 ratti (15.62 to 31.25mg) according to classics of *Rasashastra*.

The dose for experimental study was calculated by extrapolating the human dose to animal dose based on the body surface area ratio by referring Puget's and Barnes (1964) chart.

For Swiss albino mice

Mice Dose: Therapeutic human dose x surface area ratio 0.0026x50

1. Single dose TED

= Therapeutic human dose x 0.0026x50(per kg body weight)

= 31.25 mg x 0.0026 x 50

= 4.06mg/kg = 4.06/1000 = 0.004mg/g

2. Double dose 2xTED

= Therapeutic human dose x 0.0026x50 per kg body weight)

= 62.50 mg x 0.0026 x 50

= 8.125mg/kg = 8.125/1000 = 0.00812mg/g

3. *Swarna bhasma* with *Vacha* *Grutha* *Madhu*

Swarna bhasma +*Vacha choorna* (0.49mg /kg body wt) +equal parts of *Madhu* and *Grutha* were taken and suspension was prepared and administered orally as per body weight.

4. Piracetam –

200mg/kg =0.2mg/g

1ml=200mg, 0.1ml=20mg

1ml Piracetam was taken and mixed with 4ml distilled water stock solution was prepared and administered through IP as per body weight.

5. Scopolamine-

= 2mg/kg

= 0.002mg/g

1mg scopolamine was mixed with 10ml distilled water stock solution was prepared and administered through IP as per body weight.

RESULT

In the first phase of study

- The test drug groups of *Swarna bhasma* TED and 2xTED showed very good significant positive Nootropic effect over normal control and scopolamine control groups. But in comparison to the above two groups the magnitude was less in *Swarna bhasma* 2x TED group.

- In *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* group also good Nootropic effect was observed which was intermediated between that observed In *Swarna Bhasma* TED group and *Swarna Bhasma* TED x 2 groups.
 - This clearly establishes that both the forms of *bhasmas* produce significant learning and memory enhancement effect in mice
- In the second phase of study
 - Acquisition memory:
 - Swarna bhasma* TED, *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* showed significant enhancement effect and in *Swarna Bhasma* 2xTED group near significant effect was observed on learning based memory acquisition over normal control and scopolamine control groups.
 - This clearly indicate that *Swarna bhasma* has learning promoting property probably through faster establishment of working and spatial memory
 - Retention Memory:
 - The escape latency to find the target quadrant was prolonged in scopolamine treated control group, moderately shortened in reference standard, *Swarna Bhasma* in TED groups but due to variation in the data the shortening did not reach statistically significant level. Surprisingly the performance of the *Swarna Bhasma* in TED and TED x 2 dose group's rats in scopolamine pre-treated rats was significant.
 - This shows that *Swarna Bhasma* has moderate memory retention effect but significant anti-amnesic effect against scopolamine amnesia to retain the acquired memory.
 - Spatial Acquisition memory (working memory):
 - The escape latency in the test paradigm was not significantly affected by scopolamine in comparison to the control group rats. It was significantly shortened in reference standard, *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* and *Swarna Bhasma* in TED dose groups in comparison to the normal control. Further, *Swarna Bhasma* in TED and TED x 2 dose groups shortened the escape latency in scopolamine pre-treated rats. Near significantly in the lower dose and in statistically significant manner in higher dose level.
 - This clearly shows that both the test drugs like reference standard have strong facilitatory effect on spatial memory which is considered as working memory. In

addition *Swarna Bhasma* also has anti-amnesic effect in this test paradigm also.

➤ **Thigmotaxic Behaviour:**

- The duration of Thigmotaxic behaviour was significantly reduced by reference standard, *Swarna Bhasma* TED dose and *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* treated groups. *Swarna Bhasma* TED x 2 dose produced moderate and statistically non-significant shortening.
- This clearly shows that the test drugs ensure proper functioning of sensorimotor function resulting in acquisition of spatial memory in quicker time.

Histological examination:

- Cerebellum and mid brain - No remarkable difference between control group sections and sections from group 2-8 test groups could be identified.
- Hippocampus (Hippocampal system): on an average good cellularity in Group 4, 6 and 7, moderate cellularity in Group 5 and 8.
- Fore brain - high cellularity in group 3 and 8, lesser cellularity in group 5 and normal profile in remaining groups.

Thus the test formulation *Swarna Bhasma* TED, 2xTED and *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* matched the performance of the reference standard sometimes even bettering it in the entire test paradigm studied. It also exhibited a strong anti-amnesic effect.

The only fact of note is that it did not produce dose dependent effect in all the test parameters. *Swarna bhasma* 2xTED showed moderated and statistically non-significant results in entire test paradigm studied. *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* was good in promoting memory acquisition and spatial learning- but produced weak effect in memory retrieval related tests.

Hence *Swarna bhasma* TED is enough to enhance and promote memory in all normal and pathological aspects and no need to double the therapeutic dose.

In animals of test drug group observed the beneficial *Brumhana*, *Deepana*, *Pachana* & *Rasayana* effects but to substantiate this long term studies are required

Thus the test formulations *Swarna Bhasma* and *Swarna bhasma* with *Vacha choorna*, *Madhu*, *Grutha* exhibited good learning and memory enhancing effect. This is an important finding to aid an age related amnesia patients which is a current major health problem. Based on the result obtained in this study the test formulation has good potential in neurodegenerative disorders characterized by cognitive and memory deterioration. Their administration

for Nootropic effect in growing children seems to strongly justify.

DISCUSSION

Probable Mode of Action of *Swarna Bhasma* as a Nootropic Ayurvedic Perspective

Swarna Bhasma is basically a *Tejo Tatwa Pradana Dhathu* With Properties as *Madhura Pradhana Kashaya, Tikta Rasa, Guru, Snigdha Guna Sheeta Veerya, Madhura Vipaka, agni, bala and ojo vardaka, vrushya, brumhana, rasyana, sarva dosha and sarva roga hara, medhya and smriti vardaka* mainly indicated in all type of *manovikaras*.

Swarna ranks top in the list of *Shuddha sthira dhatu* which means it is unaffected by moisture, oxygen, ordinary acids and environmental temperature. These properties of *Swarna* facilitates it to not get altered by body fluids and other factors while undergoing systemic metabolic procedures but virtue of its biocompatibility, the nano particles of *swarna bhasma* can easily reach the targets, even at intra cellular level in the same form.

As *Swarna* naturally inherent the properties of *Medhya, Smritikara* by default have the affinity to the locus of action –*Adhikara* (i.e. nerves/ hippocampal region) and with the help of receptors (*sharira paramanu Grahya*) reaches the targeted structures & transform themselves for required physiology. In this process *tikta* and *kashaya rasas* facilitates *madhura rasa* and its properties to cross all barriers through their qualities of *srotho shodhana, visha hara* (clears toxins/pathologies obstructing the receptors & act as an absorbent into intra cellular space.

Guru, Snigdha the *Samanya gunas* having *Vishishta Samarthyas*, along with *Madhura rasa* may repairs, regenerates and nurtures the target with all required nutrients. Thus, preparing the platform for *Tejo tatva* to get into action. It could be inferred that, the *tejo tatva* an excellent electrical conductor (i.e. metallic gold) definitely increases (stabilize) the stimulations and conduction through nerves by virtue of its *medhya* and *smritikara* effects. As gold is also proved to be an exemplary drug of nervine, this interaction becomes more evidence based. Such healthy stimulation from a healthy platform is known to form Nootropic effect much satisfactorily.

This path could be proposed from the perspectives of Ayurveda for *Swarna Bhasma* to be a magnificent drug to swing up memory and IQ. Hence this could be considered as a safe and potential substitute for synthetic nootropics.

Role of *Vacha*, *Madhu*, *Grutha* –

Vacha – It is most repeatedly found *Dravya* among the *Swarnaprashana yoga* mentioned by the all the *Acharyas*. According to the Ayurvedic texts, *Vacha* posses the *Katu*, *Tikta rasa*, *Laghu*, *Tikshna*, *Sara gunas*, *Usna virya* and *Katu vipaka*. It is *Kaphavata shamak*, *Pittavardhak*. It performs the *Medhaya karma* by its *Prabhava*.

The plant has been reported to possess tranquilizing-anti stress, antimicrobial, neuroprotective, antioxidant, and anticholinesterase activities. . Its tranquilizer activity is seen in the child as it sleeps calmly and less irritant than the other child. Antimicrobial activity helps to reduce the chances of infection.

Due to *Medhya prabhava* it is used as the stimulant to the CNS which may aid & act as nootropic when given with *Swarna Bhasma* .

Madhu (Honey): It is a naturally occurring sweet fluid produced by the honeybees by enzymatic transformation of floral nectar ingested by them.

Its therapeutic properties are *Madhura rasa*, *Kashaya anurasa*, *Seeta veerya* and *Katu vipaka*, *Guru*, *Laghu*, *Picchila*, *Ruksha*, *Teekshna* and acts as *Tridosahara*, *Bhedhana*, *Chedana*, *Hrudya*, *Lekhaniya*, *Svara vardhaka*, *Vrushyam*, *Vishghna*.

A special property of *Madhu* explained is *Param Yoga-vahi* (capability to carry therapeutic properties of added drugs) and *Sukshma Shrotagami* (medicines reaches to each and every channels of body). These all properties are helpful to target its efficacy in formulation *Swarna Bhasma* as Nootropic.

Ghrita: *Ghrita* will easily permeable through body tissue. May *Bhasma* nano particles transferred through *ghrita* media. The therapeutic properties of *Ghrita* are *Madhura rasa*, *Guru*, *Snigdha*, *Mrudu Guna*, *Sheeta Veerya*, *Madhura Vipaka* and act as *Vata-Pitta- Kapha hara*, *Agnideepana*, *Ayushya*, *Balya*, *Dipana*, *Hrdya*, *Kantiprada*, *Medhya*, *Ojavardhaka*, *Rasayana*

The lipophilic nature of ghee facilitates entry of combined active ingredients of the drug into the cell as well as its delivery to the mitochondrium, microsomes and nuclear membrane. In the process of evaluating the activities of natural compounds, it has been found that mixing of ghee with herbs potentiates their activity and utility many times. *Grutha* itself possess and proven for its *Medhya* property, when given with *Swarna bhasma* it may facilitates drug non obstructed, quick entry into the targeted cell and enhances the memory.

CONCLUSION

No side effects of *Swarna bhasma* were observed during the study. An honest and sincere effort is put in this study, to have all the details. But for the time constraint, there could be more scope to have detailed study in this subject. Based upon the findings of the study it could be concluded that *Swarna bhasma* has a better Nootropic effect in different types of memory and it is safe, potential substitute for synthetic Nootropics.

REFERENCES

1. Tiwari PV. Editor, Kashyapa Samhita. 1st edition, New Delhi; Chaukhambha Vishwa Bharathi : 2002, p.7.
2. Maharshi Sushruta, Sushruta Samhitha, Nibandha sangraha, commentary of shree Dalhana, Varanasi, chaukhambha orientalia. 2005, Sutra sthana, 26th chapter, 20th shloka, 124pp.
3. Kaviraj Prabhakar chatterji, Rasa Chikitsa, 2nd Edition, Varanasi, Chaukhambha Bharati Academy, 1996, Prathama khanda, 52pp.
4. Vagbhata, Astanga hrudaya, Edited by Pandit Bhisagacharya Harishastri Paradkar Vaidya, Varanasi, Krishnadas Academy, 2000, Uttara sthana, 40th chapter, 48th shloka, 944pp.
5. Sri Sharma Sadananda. Rasa Tarangini. Edited by Pandit Kashinath Shastri. 11th Edition .Varanasi: Published by Motilal Banarasidas Publication; 1979, 5th Taranga, Verses 38– 42, 82 pp.
6. Ghosh M.N, Fundamentals of experimental pharmacology, Chapter 30, 3rd edition, Kolkota, Hilton and Company, 2005, page no-192.

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