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Miraculous Ayurvedic calcium supplement - A Review on KukkutandaTwakaBhasma

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Abstract

KukkutandTwak (eggshell) is a popular Ayurvedic medicine. It is categorized under Sudha Varga (group of Calcium-containing drugs) in the *Rasashastra* literature, and it contains Calcium carbonate along with other trace elements including potassium, phosphates, magnesium, calcium, and other minerals. *KukkutandTwak* is a good source of organic calcium, which has a relatively higher bioavailability than other forms of calcium, it is a low-cost calcium source for human consumption. An attempt has been made to compile some of the previous studies of this topic and to provide a better insight about this subject explaining different facets of *kukkutand twaka bhasma* elaborately. In this study 3 research articles and one thesis and 5 textbooks were referred to collect the details of the subject. There are several procedures of *kukkutandtwakabhasmanirmanthat* are prescribed by our Acharyas and a variety of *bhavana dravyas* like *nimbuswarasa*, *changeriswarasa*, *ghritkumariswarasa* and *maranadravya* like *cinnabaris* used to prepare good quality *kukkutandtwakabhasma*. Results of SEM-EDX and XRD studies proved that the process of *bhavana* and *marana* helps in structural modification of *kukkutandtwaka* and advocates that calcite form of raw KT changes to hydroxide form after the process of *bhavana* and *marana*. Between the two naturally occurring forms of eggshells white and brown egg shells, brown egg shells were found to contain more calcium than the white eggshells.

Keywords: *kukkutandtwaka*, calcium, Sudha varga, *kukkutandtwakabhasma*

Introduction

Ayurveda is one unique system of Indian traditional medicine which is in practice for over thousands of years. *Rasa shastra* also stands by the name of ancient Indian alchemy, it is a pharmaceutical science which deals with identification, collection, purification, incineration of metals and minerals along with the knowledge of their properties, action, doses and their medicinal preparation. Medicines thus prepared is called *rasaushadhis* (herbo-mineral preparations). These minerals and metals cannot be administered in their raw form directly as they have hazardous effects on body, so these substances must undergo multiple pharmaceutical procedures *shodhana*, *marana* (purification, incineration) etc. which transform these elements into less toxic, more assimilable and bio-available form. *Bhasmas* (incinerated materials) are one of the most abundantly used preparation. It is a super fine powder of incinerated or calcinated mineral, it is obtained when metals are repeatedly combusted in fire and the ash procured is accepted as *bhasma*. *Bhasmas* are therapeutically more potent and is used in a very lesser quantity because of their small particle size (micro or nano) and target oriented action. Acharyas have classified an array of minerals into varga known as *maharasa*, *uprasa*, *sadharana Rasa*, *dhatu- updhatuvarga*, *Sudha varga*, *vishopvishavarga* etc. Under the umbrella of *Sudha varga* fall those minerals which are rich in calcium like *Sudha*, *shankha* (conch shell), *shukti* (pearl oyster), *khatika* (cowrie shell) etc. which chiefly consists of calcium compounds, *kukkutandtwaka* (egg shell) is also a component of *Sudha varga*. All the components of *Sudha varga* are of animal origin (*jantavadravya*). The word *kukkutandtwaka* consists of two words – “*kukkuta*+*Andatwaka*”. *Kukkuta* means ‘Hen’ and *Andatwaka* is outer covering of hen’s egg, it is a commonly found bird which especially used for its flesh and eggs. *Kukkutanda* or hen’s egg is frequently used food material and its ‘*twak*’ (outer shell) has so many therapeutic and non-therapeutic uses.

Our ancient rasashashtri's discovered amazing properties of the egg shells and by their greater wisdom they managed to prepare an edible form of kukkutandtwak which is not at all harmful to the body viz. Kukkutandatwakabhasma.

Although uses of kukkutandatwak is mentioned in various granthas of Samhita kala and sangraha kala but the internal use of Kukkutandatwakabhasma was first mentioned in siddhabheshajamanimalain the treatment of upadanshroga. KukkutandaTvakBhasma is not only a main source of calcium but it also possesses some other minerals in trace amount, it is cost effective, also treats symptoms due to its Rasa ViryaVipaka and cures various disorders such as Asthikshay, Shvetapradar, Vandhyatva etc.

Shodhana

The majority of dravyasin Sudha varga come from animal sources, especially marine animals. These substances do not contain any adulterants or natural blemishes in their natural form, but they do contain external impurities such as excreta and animal tissue, so shodhana is needed to extract these impurities as well as to impart additional properties.

Shodhana of kukkutandatwaka is done with the help of different media such as Lavanajala (prakshalana), Hot water or lime water (prakshalana), Saindhavajala (Nimajana/prakshalana), Sirka / namakanausadaramishritjala (Nimajana/prakshalana)

Bhavana

Bhavana is a samskara that improves a drug's qualities by intervening with its properties and introducing new characteristics. It is a very necessary procedure performed before shodhana, marana, satvapatana, amrutikarana, and lohitikarana, as well as during the preparation of various medicines. It decreases the toxic properties of substances and also contributes to the creation of organometallic compounds. The bhavana process also aids in the reduction of drug particle size, improving their absorption potential into the system. Swarasa, kwatha, jala, dugdha, madhu, mutra, and other liquids are used for bhavana. The amount of bhavana dravya to be used is described as the amount of dry powdered drug that has been fully wet.

An array of bhavana dravyas are used in the preparation of kukkutandtwakabhasmawhich are listed in various texts such as Amla dravya / Nimbuswarasa, kumariswarasa, Changeriswarasa, arkaksheera, Adrakaswarasa, shataavari kwatha. [1,2,3,4]

Marana

Marana, also known as bhasmikarana, is an indigenous mechanism of rasa shastra Marana is a word that means "to kill," and it refers to the death of biotic substances, which results in the loss of their vitality and activity. The word "marana" in rasa shastra refers to the conversion of metals and minerals into bhasma form, which is a very powerful type of medicine that easily incorporates in the body and requires only a small dose to achieve desired efficacy.

Table 1: showing Different methods of kukkutandatwakabhasmikarana [1,2,3,4,5,6,]-

Sr. no.	Name of text	Marana dravya	Bhavana dravya	No. of puta's
1.	Siddha bshajamanimala		Amla varga – 3 bhavana	3 Gajaputa
2.	Ayurveda sarasamgraha		Changeriswarasa	2/3 puta
	Ayurveda sarasamgraha	Hingula (4 tola)	Ghritkumariswarasa	5/6 puta
3.	Rasa tantra saraavum siddha prayogasamgraha– 1 st	Hingula (1.5 tola)	Changeriswarasa- 2 kumariswarasa – 4	6 puta
4.	Rasa tantra saraavum siddha prayogasamgraha– 2 nd	Hingula (1/8 part)	Nimbuswarasa - 3	5 puta
5.	Bhasmavigyaniya			
	Method -1		Kumari/nimbuswarasa	4puta
	Method -2	Hingula	Kumari/nimbuswarasa	1 puta

Table 2: Studies on kukkutanda twaka bhsama (KTB): -

Topic	Materials and methods	Observation and result
Analytical profile of KukkutandaTvakBhasma (incinerated hen egg shells) prepared by two different methods [8]	1 st method – KT processed with kumariswarasa Marana was done in E.M.F at 800°C for 15 minutes. 2 nd method – KT processed with hingula +kumariswarasa KTB-2-: first round of incineration was same as that of KTB-A. For second incineration, KT was triturated with 1/4 th part cinnabar. marana was done at 800°C for 15 min. Process of marana was repeated minimum 4 times to achieve desired kukkutanda twaka bhasma in both groups.	1. 22.75% and 41.16% of Calcium was detected in samples KTB-A and KTB-B, respectively. 2. 0.29% and 0.15% of magnesium was found in samples KTB-A and KTB-B respectively. Both the samples of Bhasma were found to contain calcium hydroxideCa(OH) ₂ . 3. Minimum four Puta (incineration cycles) with average 800°C temperature is required to prepare KTB through electric muffle furnace using Kumari Swarasa and processed Hingula as a medium. 4. An average particle size was found as 9.35 µm and 9.97 µm in samples KTB-A and KTB-B, respectively. 5. XRD study reveals that raw Kukkutanda Tvak is CaCO ₃ (calcite) and CaCO ₃ (calcium carbonate). whereas both Bhasma containCaH ₂ O ₂ (portlandite

		syn) and Ca(OH) ₂ .
Pharmaceutical and analytical study of kukkutandtwakbhasma with special reference to ayurvedsaarsangraha and vrudhavaidyaparampara ^[9]	<p>KTB was prepared using two references-</p> <ol style="list-style-type: none"> 1. Ayurvedsaarsangraha(ASS) 2. Vruddha Vaidyaparampara(VVP) <p>ASS Method – 1st puta- powder of K.T was taken in a sharava and changeriswarasawas added in it, the sharava is covered with another sharava and joints were sealed properly with fuller’s earth. After drying the sharavasamputa is given heat of 60 upala’s. after self-cooling sharavasamputa is taken out and bhasma obtained is observed. 2nd puta- KTB obtained after 1st puta is levigated with kumariswarasa and rest of the process was repeated for puta paka as 1st. After self-cooling bhasma obtained is observed for bhasmaparikshas. VVP method- KukkutandTwak was washed in water. Afterwards, it was dipped in takra for 24 hours.KT was levigated with kumariswarasaand the process of puta paka was performed and two putas were given to obtain bhasma.</p>	<p>The KTB prepared using both methods passed all of the BhasmaParikshas, indicating its fineness and ability to be quickly absorbed and assimilated in the body. Moisture content: The KTB had a lower moisture content, suggesting greater stability. Ash value- Since KT is inorganic, its Ash value ought to be high. The ash value of raw KT was 53.46 percent, while the ash value of KTB obtained by ASS method was 55.87 percent and that of VVP was 55.94 percent, both of which were relatively high. pH value: The pH of Bhasma obtained using both methods was alkaline. The increased alkalinity of the bhasma indicates its higher acid neutralising potential. SEM-EDAX:This study found that during the marana phase, a portion of the calcium in the KT changed from carbonate to oxide type. This test also discovered that the percentage of heavy metals in bhasma was reduced, which could be attributed to the bhavana and marana procedures. The percentage of calcium present in the bhasma from the VVP method was higher than that found in the ASS method, most likely due to the shodhan and bhavana procedure. For bhavana (levigation), Kumari swaras was used, Since Kumari is considerably rich in calcium, using it for bhavana would have increased the calcium percentage in bhavyadrava (KT).</p>
Pharmaceutical staderdisation of kukkutandtwakabhasma (incinerated egg shell) ^[10]	<p>In this study shodhana of KT was done by boiling it in lavanodaka for 3 hrs. for marana procedure to increase its strength asthisamharaka was used for levigation. For 1st puta KT was subjected to incineration without levigatingat 800°C for 15 mins.in EMF. After first puta bhavana of asthisamharakaand kumariswarasa was given consecutively.Similarly, 3rd and 4th puta were given and after 4th puta bhasmapareekshas were found positive.</p>	<p>The yield of bhasma was 66.53% with loss of 33.67%. comparative analysis of this KTB with standard KTB was done –Ash value of KTB was 97.37% and KTB with asthisamharaka was found to be 87.75%. pH of standard KTB was 12.44 and KTB with asthisamharkawas 11.2. The percentage of insoluble inorganic content of KTB in dilute acid was determined using an acid insoluble ash test.The acid insoluble ash test for Ayurvedic incinerated preparations is intended to be a first step in determining the bioavailability of incinerate preparations. It was 0.42 %, which reflects good bioavailability of KTB. The low percentage of average loss on drying was 1.37percentwhich infers that there was a minuscule portion of moisture.</p>
"A Pharmaceutical, Standardization and Comparative Analytical Study of KukkutandtwakBhasma of White and Brown Egg Shells Prepared by Different Methods" ^[11]	<p>Preparation of four samples of KukkutandTwakBhasma by using two types of shells i.e. "Brown egg shells" and "White egg shells" Group A- Brown egg shells Bhasma without Hingula Group B- Brown egg shells Bhasma with Hingula Group C- White egg shells Bhasma without Hingula Group D- White egg shells Bhasma with Hingula For the preparation of group-A bhasma bhavana dravya used was</p>	<p>On the basis of pharmaceutical process and analytical analysis, comparisons between these four groups of Bhasma were made. In the pharmaceutical process, there was no discernible difference in total loss between brown and white egg shells during Marana, and the difference between total loss in both forms of egg shells during Marana was negligible. Based on an observational analysis, Group B and Group D Bhasmas (KukkutandTwakBhasma with Hingula) were found to be superior to Group A and Group C Bhasmas (KukkutandTwakBhasma without Hingula). Brown egg shells Bhasma group A and group B(39.85% &32.20%) have more calcium than</p>

	changeriswarasa and 4 gaja puta were required to prepare the bhasma, for group-B hingula was added only in the first puta and bhavana of kumariswarasa and a total of 9 puta was given. For group -C KT was levigated with changeriswarasa and 4 cycles of gaja puta was given to it. For group-D in this group KT with hingula is triturated with bhavana of kumariswarasa and total of 9 gaja puta was given to obtain bhasma.	white egg shells Bhasma, according to calcium content group C & group D(31.26% & 35.35%). Overall, it can be concluded that KukkutandTwakBhasma made with brown egg shells contains more calcium than white egg shells Bhasma, making it a better choice for use in diseases where KukkutandTwakBhasma is listed.
Clinical effect of Kukkutanda Twak Bhasma in the management of Swetapradara ¹²	Purified coarse powder of kukkutanda twaka triturated with lime juice for 2 days and subjected to two Gaja putas. again, triturated with pulp of Kumari for 2 days and subjected to three gaja putas.	In this clinical study Kukkutanda twak bhasma has shown statistically significant improvement in white discharge, backache, itching, anemia, weakness, and urinary tract infection.

Discussion

Rasashastra is a sub-discipline of Ayurveda that deals primarily with materials known as "Rasadravyaas." Ayurvedic therapeutics depend heavily on the products dealt with under this discipline. Kukkutandtwaka is one such substance which is a very well-known great source of calcium. Calcium is observed in multiple salt forms and in various Sudha VargaDravyas, such as calcium phosphate in Ajasthi, calcium sulphate in Godanti, calcium silicate in Badarashma, and calcium hydroxide in Sudha. Calcium carbonate is found in the majority of Sudha VargaDravya, such as Shankha, Shukti, and Kapardika. Calcium carbonate makes up the majority of KukutandTwak, but it also contains a small amount of calcium phosphate. Calcium phosphate is essential for muscle fibres and nerves to function properly and gives them strength. KakkutandTwakBhasma is an excellent source of calcium and other minerals (e.g., strontium and fluorine). It aids in the development of strong bone, increases bone mineral density, reduces joint pain and inflammation, and is effective in the prevention and treatment of osteoporosis. KTB is one of the essential calcium rich medicines listed in various Ayurvedic classics as Sudha Varga/Shukla Varga. It is used to treat illnesses such as RaktaPradara (menorrhagia), Shweta Pradara (leucorrhoea), Shwasa (bronchial asthma), Kasa (cough), Napunsakata (impotency) and Prameha (diabetes). It has Kashaya Rasa, Stambhana and RukshaGuna.

For the preparation of KTB, different Bhavana Dravya are mentioned in texts, such as Kumari Swaras (Alove vera), ChangeriSwaras (Oxalis corniculata), and NimbukSwaras (Citrus limon), AdrakSwaras (lemon) (Zingiber officinale). For KTB preparation, Kumari swaras is widely used as Bhavana Dravya. Kumari is high in calcium, so it can be used for bhavana. It may even be beneficial to increase the calcium content of bhavyadravya, i.e. KT. As a result, it's possible that it's improving the KTB's therapeutic properties. Changeri has been shown to have antimicrobial properties against bacillus septillus and Staphylococcus aurigenosa in recent studies. It has antifungal and wound-healing properties as well. KTB is supposed to have these characteristics. Impurities and contaminants are removed from egg shell (KT) when it is processed with Changeri juice, making it more suitable for human consumption. The process of calcination increases its bioavailability in the

human body.

XRD studies have revealed that calcium inkukkutandatwaka was found to be present in calcite (CaCO_3) form which after calcification (marana) transforms into its hydroxide $\{\text{Ca}(\text{OH})_2\}$ form. Structurally kukkutandtwaka in crude form had rhombohedral structure while bhasma appeared in hexagonal form.

There are two different varieties of brown egg shells that occur naturally in our ecosystem, of these two egg shells, brown egg shells are considered more healthier and research has proven that calcium content in brown egg shells is more than that of white egg shells although, the difference between these two is not very much.

Acid insoluble ash test guides towards the bioavailability of bhasma, in this case it implies that kukkutandatwakabhasma is highly soluble in acidic media hence proving its great bioavailability. It can be inferred from the above presented data that kukkutandatwakabhasma prepared with cinnabar has more ash value than bhasma prepared without cinnabar maybe because of the inorganic matter present in cinnabar. Since KTB is primarily composed of 'incinerated Calcium compounds,' VaritaraPariksha (floating on the surface of the water) was negative in KTB due to the hygroscopic nature of the water.

Ph values of kukkutandtwakabhasma suggests that it is alkaline in nature and a good acid neutralising capacity. Moisture content test suggest that kukkutandatwakabhasma has least moisture in it.

SEM analysis proved that kukkutandtwakabhasma prepared through various methods vaguely contained calcium about 20- 40 percent suggesting KTB as a good source of calcium. This test also indicated that percentage of heavy metals reduced after bhavana (levigation) and marana (incineration) processes and it also depicted the presence of magnesium and sulphur and other trace elements in the bhasma.

Conclusion

It can be concluded that process of bhavana and marana helps in structural modification of kukkutandatwaka and advocates that calcite form of raw KT changes to hydroxide form after the process of bhavana and marana. Kukkutandatwakabhasma has good bioavailability and it is a decent source of calcium.

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