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HISTORICAL, PHARMACOLOGICAL AND TOXICOLOGICAL REVIEW ON A UNANI MINERAL DRUG QALAI (TIN)

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ABSTRACT

Qalai (Tin) is a silvery white, soft, malleable, ductile, water insoluble and crystalline metal. The medicinal use of *Qalai* (tin) was reported in the Middle Ages as an agent expelling intestinal worms. It is generally used in Unani Medicine in the form of *Kushta* (calx). Oral use of raw *Qalai* is not recommended due to its toxic effects. It is added in the preparation of *Kushta* after detoxification/purification. In this article entire information regarding temperament, dose, action, uses and toxicity has been incorporated from available Unani literature. Physicochemical standard of *Kushta Qalai* and its pharmacological, toxicological studies published in different journals have been summarized. This article will be helpful for researchers to conduct further studies.

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INTRODUCTION AND HISTORY

Qalai (Tin) is a silvery white, soft, malleable, ductile, water insoluble and crystalline metal. There are two varieties (pure and impure) of *Qalai* mentioned in literature, the pure variety is soft and whitish in colour is considered of good quality and used medicinally. The impure variety is hard, dirty white in colour, with bad smell and not melts easily having impurities of arsenic and sulphur. It is generally used to polish the copper or brass utensils.^[1-3] The process of polishing or coating of utensils with tin is also known as “*Qalai* or *kalai*”. When copper comes in contact with air and moisture the copper turns into copper carbonate which is poisonous in nature. The tin layer on copper or brass vessels prevents direct contact with air. Thus *Qalai* (tin coating) prevents food poisoning.^[4] *Qalai* (Tin) was often not distinguished from Seesa (lead) even upto 17th century, then *Qalai* (tin) was known as *plumbum candidum* (“bright lead”) and Seesa (lead) was known as *plumbum nigrum* (“black lead”).^[5] The initial use of *Qalai* (tin) was reported in 3500 BC in southern Mesopotamia (presently Iraq). Tin was first mined and refined in Turkey. The bronze articles have been found in the Middle East, Egypt and other civilizations dating back from 2250 to 3500 BCE. Tin coating on vessels used for cooking traced back to roman times. In 1810 AD the British Government granted the patent for the idea of using Tin. The medicinal use of *Qalai* (tin) was reported in the Middle Ages as an agent expelling intestinal worms.^[6,7,19]

Vernacular names ^[1-2,8-19]

Arabic:	<i>Rasas abyaz, Qalai</i>
English:	Tin
Hindi:	Ranga, Rang,
Persian:	Urzir
Latin:	Stannum
Sanskrit:	Vanga, Ranga
Urdu:	Qalai

Occurrence:

Tin is a scarce element and found only 2 parts per million (ppm) in the earth’s crust. It is not found as metal naturally. It is found in the form of ore. Its ore is known as Cassiterite or Stannic oxide or Tin stone or Tin dioxide (SnO₂). The tin oxide later heated with carbon to obtain tin metal and carbon dioxide. Nearly 35 countries in the world produce the tin. It is mainly found in China, Indonesia, Brazil, Australia, Malaysia and Myanmar. In India it is found in Chhattisgarh, Haryana and Odisha.^[20, 21]

Temperament:

There is a conflict among scholars regarding temperament of *Qalai*, most scholars say it is Cold and Dry with 3rd degrees.^{1-2,8-18} and other says it is Cold and Moist of 3rd degree.^[19]

Action:

- *Mujaffif* (Desiccant, Siccative)
- *Qabiz* (Constipative)
- *Mughalliz-e-Mani* (Inspissant to semen)
- *Mumsik* (Retentive)
- *Dafe kirme shikam* (Anthelmintic)
- *Daf-e-Suzak* (Anti Gonorrhoea)^[2,8-19]

Uses:

- *Qalai* mainly for eyes diseases, genitourinary diseases and ulcers.
- The powder of *Qalaican* be applied to eyelids as surma to relieve swelling of eyelids, watering of eyes (epiphora) and redness of eyes.
- The *Qalai* grounded with aab e kasni sabz (juice of *Cichorium intybus* L) or aab e kishneez sabz (juice of *Coriandrum Sativum* L) can be applied on forehead to relieve *Nazla* (Coryza).
- Local application of *Qalai* grounded with Roghan Gul (oil of *Rosa damascene* L) is beneficial in cancerous wounds, anal wounds, haemorrhoids, wounds of breast, penis and boils. When it is dissolved in a wine or in any other cold extract, it proves to be useful in swellings and neuralgia.
- Stick of *Qalai* can pull out Mercury as foreign body from ear. When *Qalai* is tied to a fruiting tree, it prevents falling of fruits.^[1,2,8-19]

Potent Action:

The potent action of *Qalai* is *Daf-e-Jiryan* (Anti spermatorrhoea) and *Daf-e-Suzak* (Anti Gonorrhoea)^[2, 10-18]

Dosage:

For oral use, it is generally used in the form of calx with the dosage of 125-250 mg^[2,10-18]

Adverse Action:

It may be harmful for hot temperament persons and for lungs^[2,10-18]

Correctives:

Unani system of medicine also has a unique speciality of adding Corrective Drugs (*Muslih Adwiya*) to counter the toxicity of the main drug. Milk and clarified butter are correctives mentioned in literature [2,10-18]

Substitute:

Seesa (lead) [2,10-18]

Important Formulations:

- Kushta Qalai
- Kushta Mirgang
- Kushta Musallas
- Zaroor Anzaroot [22]
- Kohl Tahmeezaj
- Kohl Mameeran
- MarhamSafaida kafoori Qawi [23]
- Habb Baul ud Dam
- Tiryag Reham [24]
- Qurs Abyaz
- Qurs Salajeet
- Majoon Jiryah Khas
- Majoon Mughalliz Jawahar wali [25]
- Qurs Jaryan
- Shababi [26]

Purification of Qalai:

Due to toxic effects Qalai is not recommended for oral use, however it is used for preparation of calx after purification. Various methods are mentioned in literature to purify raw Qalai:

- Melt raw Qalai and dip in Aab sambhalu (*Vitex negundo* decoction) and add a pinch of Haldi (*Curcuma longa*). Repeat the procedure three times. By this procedure *Qalai musaffa* (purified tin) is obtained.
- Melt raw Qalai and dip in Aab sambhalu (*Vitex negundo* decoction), sheera leemu (lemon juice), Aab naushadar (solution of ammonium chloride) and Aab tamar hindi (decoction of *Tamarindus indica*L) serially. Repeat the process three times to get purified *Qalai*. [27]

Physicochemical standard of Kushta Qalai:

Tariq et al (2014) prepared *Kushta Qalai* by using a Muffle furnace instead of cow dung cakes for better temperature management. 150 ml water was added in 120 ml of Aspgol husk (*Plantago ovata* L.) and left it till it was absorbed. 12 gm *Qalai musaffa* was placed between two pellets of *aspgol*. Initially above 600°C temperature was maintained for 40±5 minutes, then above 800°C temperature was maintained for 20±5 minutes. The peak temperature was maintained at 1008°C for 35±5 minutes. Then the prepared *Kushta* was taken out from the furnace and further triturated in mortar and pestle to get fine powder. The values of classical and modern parameters recorded as: The colour : light grey, Touch: smooth and very fine, Odour: odorless Taste: tasteless and lustreless.. Floating test, grain floating test, thumb finger test and fineness test: positive. All these parameters were within the limits of *kamil kushta* (ideal kushta) on classical parameters. The value of modern physicochemical parameters were recorded as: To ensure the particle size Bulk density and tapped density is conducted, higher value of these densities indicates fineness of particle size. Mean value of bulk density and tapped density: 1.32±0.00gm/ml and 2.24±0.02gm/ml respectively. Hausner's Ratio and Compressibility Index: 1.77±0.02 and 44.15±0.86% respectively suggesting poor flowability. pH in 1% and 10% solution: 10.47±0.00 and 11.17±0.02 respectively indicates the basic nature of *Kushta Qalai*. Loss of weight on drying: 0.019±0.00% indicates that the finished product is devoid of moisture and does not have organic compounds. Total ash, acid insoluble ash, water soluble ash and water insoluble ash: 96.47±0.07%, 36.87±0.06%, 5.1±0.10% and 91.64±0.20% respectively suggesting high inorganic contents. The water-soluble extractive value was 0.34±0.00%. The mean percentage of the tin oxide: 90.04±0.04% indicating oxide form of *kushta*. Qualitative tests: Iron and Aluminium present, Lead absent. [28]

Antibacterial activity of Kushta Qalai:

The nanoparticulate form of *Kushta Qalai* exhibited strong bactericidal activity against the majority of gram positive strains viz. *Staphylococcus aureus*, *Corynebacterium xerosis*, *Bacillus aureus* and against one gram negative strain viz. *Klebsiella pneumoniae*. Highest bactericidal activity was observed against *Streptococcus mutans* and *Corynebacterium xerosis*. [29]

Toxicological profile of *Qalai* in Human:

Tin metal can combine with various chemicals to form inorganic and organic compounds. The combination of tin with chlorine, sulfur, or oxygen, is called an inorganic tin compound. They are found in toothpaste, perfumes, soaps, coloring agents, food additives, and dyes. Tin when combined with carbon organotin compounds are produced. Organotins are utilized in making food packages, plastic pipes, pesticides, paints, wood preservatives, and rodent repellents. Human body is exposed to tin in three manners i.e. inhalation of fumes of tin, consumption of tin contaminated food items and through skin contact with tin. The inorganic tin compounds are readily excreted through faeces or urine and do not cause harmful effects on the body. However, swallowing a large amount of inorganic tin may cause stomach aches, nausea, anaemia, liver and kidney problems. The fumes of stannic oxide may produce pneumoconiosis/stannosis in humans. Organotin compounds exposure to humans may cause respiratory irritation, eye irritation, gastrointestinal disturbance and neurological effects.^[30]

Toxicity studies on *Kushta Qalai*:

➤ Sub-acute oral toxicity:

The oral administration of *Kushta Qalai* in the dose of 1000mg/kg and its sub fractions, 500mg and 250mg/kg body weight in albino rats daily for 28 days did not showed statistically significant changes in physiological, biochemical and haematological parameters at all the three dose levels., indicating that *Kushta Qalai* is safe for oral administration at the therapeutic dose level.^[31]

➤ Sub chronic oral toxicity of *Kushta Qalai* and crude drugs of *Kushta Qalai*:

The *Kushta Qalai* and its crude drugs were administered orally in different groups in the dose of 1000mg/kg and its sub fractions, 500mg and 250mg/kg body weight in albino rats daily for 90 days. The drug *Kushta Qalai* showed statistically significant impairment at 1000mg/kg body weight in physiological, biochemical and haematological parameters while the crude drug showed at all the three dose levels, indicating that the purification process of *Qalai* prior to preparation of *kushta* reduces its toxicity.^[32]

CONCLUSION

A variety of metals and minerals are effectively used as medicine to cure various ailments for a long time. *Qalai* (tin) is one of the metals used in Unani Medicine to treat various ailments such as spermatorrhoea, excessive nocturnal emission, premature ejaculation and Syphilis in the form of calx. Local use of *Qalal* along with other drugs is also mentioned in literature to treat different Ulcers and eye diseases. Quality control data of widely used formulation *Qalai* namely *Kushta Qalai* have been established by using modern methods of preparation. Toxicity studies of *Kushta Qalai* have proved that it is safe for oral use in humans. Antibacterial activity against gram positive and gram negative bacterias have been carried out. Further comparative studies regarding method of preparation i.e. classical method and modern method of preparation of *kushta Qalai* may be carried out. Antibacterial activity of *Kushta Qalai* justify the claim of Unani Physician for use of *Qalai* in different wounds/ulcers.

Conflict of Interest:

None

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