

## THERAPEUTIC APPLICATION OF TANKAR (BORAX) ACCORDING TO UNANI SYSTEM OF MEDICINE: A REVIEW

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### ABSTRACT

Borax is a mineral origin drug belongs to traditional system of medicine. It is a color less, translucent monoclinic crystalline with irregular shape. Chemically it is composition of boric acid and sodium. Its important component is Boron. It is also called as Sodium baborate. Borax contains 11.3% boron. Turkey is the largest source of borax about 73% of world. Vegetables, Fruits and salts are the main source of boron. Borax is used as a medicine because of its various therapeutic purposes such as Antimicrobial, Anticancer, Osteogenesis, Genotoxic, Vermicidal, Hemostatic, Analgesic and Healing properties. The information about this drug was extracted from traditional, modern drugs and electronic resources. Borax naturally present in crude form known as "sohagroo or tinkala". After purification sohagroo called as Tankar (borax) and used for multiple therapeutic purposes. Borax is pentahydrate with specific gravity 1.73 having wide range of actions in Unani System of Medicine (USM) such as *Jali* (Cleanser/Detergent), *Daf-e-taaffun* (Antiseptic), *Hazim* (Digestive), *qatil-e-Jaraseem* (Insecticides), Akkal (Corrosive), *Munaffis-e-balgham* (Expectorant), *Mudir-e-hydz* (Emmenagogue), *Mudir-e-bowl* (Diuretic), *Kasir-i-Riyah* (Carminative) and *Daf-e-samoom* (Antidot). Traditionally used orally in the treatment of acidity, amenorrhea, dysmenorrhea, menorrhagia, puerperal convulsions (PIH). Locally beneficial for ulcers, piles, cystitis, leucorrhea, gonorrhoea, cervical erosion also treat skin disease such as ringworm, acne, Pityriasis and melasma. Borax has temperament hot<sup>3</sup> and dry<sup>3</sup> temperament.

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### INTRODUCTION

Borax (Sodium borate, Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub>) is one of the valuable naturally occurring mineral, which is used traditionally in Unani system of medicine because of its medicinal values or properties. Widespread in nature, in earth crust its concentration about 10 ppm and in seawater. 4.6 pmm.<sup>1</sup> It can be obtained from seasonal lakes after repeated large quantities of evaporation.<sup>2,3</sup> Chemically it is composition of boric acid and sodium. It is a salt of Boric acid that is an important component of Boron. It is also called as Sodium baborate. It is essential element for our body so, necessary to consumed daily in food. Borax contains 11.3% boron. Vegetables, Fruits and salts are the main source of boron, in vegetable boron is found at highest level. Plants (0.1 to 0.6 mg borax/100 g) have higher level of borax than animal food (0.01 to 0.06 mg/100g).<sup>1</sup> Turkey is the largest source of borax about

73% of world.<sup>4,5</sup> Borax is pentahydrate having wide range of actions in Unani System of Medicine (USM) such as *Jali* (Cleanser/Detergent), *Daf-e-taaffun* (Antiseptic), *Hazim* (Digestive), *qatil-e-Jaraseem* (Insecticides), Akkal (Corrosive), *Munaffis-e-balgham* (Expectorant), *Mudir-e-hydz* (Emmenagogue), *Mudir-e-bowl* (Diuretic), *Kasir-i-Riyah* (Carminative) and *Daf-e-samoom* (Antidot). Hence it can be used internally as well as externally in different form dependents on diseases.<sup>6,7,8,9</sup> In Unani system of medicine Borax is of two type 1) Mineral (Natural) and 2) Non Mineral (Artificial).<sup>9</sup> In India mineral type is founded in Nepal and Tibet. Artificially it made of Bora-i-Armani and Namak-e-sahji (Sodium Cabonate).<sup>9</sup> Originally found in the form of crystalline translucent irregular tough masses. Present on shores and mud of lakes surrounded by hills of this state is known as crude. This crude form of

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Tankar known as “sohagroo or tinkala”. After purification sohagroo is called as borax (*Tankar*). It is composition of boric acid and soda and became opaque after exposure to air. Another one is greenish-white known as Telio or tankana. They are small pieces, smooth, translucent six-sided prisms also became opaque and dirty white in color after air exposure.<sup>3</sup> Tankar used after purification by different methods according to their uses such as internal and external. For external use: sohagroo dissolved in 24 parts of water and filter it then after get heated till it dried completely. For internal use: make fine powder of sohagroo heated at low flame in iron vessels till then it became *kheel* then after cool it and done fine powder and used internally single or in formulations.<sup>10</sup>

#### Common Vernacular Name

**Arab:** Buraekes-saghah, **English:** Sodium Biborate; Sodium Borate; Biborate of soda; Borax; Biborate of Sodium; Tetraborate Sodium, **Gujrathi:** Tankan-khar; Kuddiar-khar, **Hindi:** Tinkal; Tincal; Sohaga, Khariloon, **Punjabi:** Sohaga, **Persian:** Tinkar; Tankar, **Sansanskrit:** Tankana; Tunkana; Rasashodhan.<sup>3</sup>

#### Purification of Borax

There various methods which is used to purify borax and then it is able to use for medicinal purposes. It can be purified by Raw Borax first powdered, then it take in hot iron pot & stirred till it intumesced this borax than make powder very fine and used for analysis. Also it can be purified by dissolving it in water, straining through cloth and then evaporating to dryness. Another method for purification is Raw Borax is taking in a clean and dry kharal and pounce well to prepare powder. This powder is take in to an earthen pot then it is heated on low flame followed by high flame, until all the water content in the Borax is completely evaporated. Finally Tankan is obtained as a white colored puffy light substance. After three time purification almost 50% of weight is reduced due to evaporation of water in the raw Tanaka.<sup>1</sup>

#### Morphological Characteristics

Borax (decahydrate) is one of best mineral origin drug. It is used for various medicinal purposes due to some special characteristics. It has a specific gravity of 1.73. It is soluble in cold water (47.1 g/L at 20 °C) and in hot water and insoluble in acids and ethanol. It is a color less, translucent monoclinic crystalline with irregular shape. It readily effloresces. On heated at 320 °C or above it loses all water and become *Kheel*. This is slightly soluble in methanol.<sup>11</sup>

#### Properties of Borax:<sup>12</sup>

IUPAC name	Sodium Tetraborate Decahydrate
Molecular formula	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> ·10H <sub>2</sub> O
Molar mass	381.38 g/mol
Appearance	White solid
Density	1.73g/cm <sup>3</sup>
Melting point	743 °C
Boiling point	1575 °C

**Source:** it occurs as a natural deposit. Crud borax is found in masses by evaporation of water, on shores of dried up lakes in India and Tibet, it is also obtain from the mud of lakes surrounded by hills in Nepal. In this crud state it is known as suhagoo or tinkala. When purified by dissolving it in water, straining through cloth, evaporating to dryness and crystallizing, it is called borax or *tankan khar*.<sup>3</sup>

**Characteristics:** it is composed of boric acid and soda. In the native state it exists as an impure saline in incrustation of a dirty white color. It exists as crystalline tough masses or in the form of translucent irregular masses. Exposed to the air it becomes opaque. Another variety known as telio tankana is an impure salt met with in small pieces or smooth, translucent six sided prism. The color is greyish white, on exposure it become opaque and dirty white. It has a faintly balsamic odour and testes like *papada khar*.<sup>3</sup> Properties (Actions): *Jali* (Cleanser/Detergent), *Daf-e-taaffun* ( Antiseptic), *Hazim* ( Digestive), *qatil-e-Jaraseem* (Insecticides), *Akkal* (Corrosive), *Munaffis-e-balgham* (Expectorant), *Mudir-e-hydz* (Emmenagogue), *Mudir-e-bowl* (Diuretic), *Kasir-i-Riyah* (Carminative) and *Daf-e-samoom* (Antidot).<sup>6,7,8,9</sup>

#### Traditional Medicinal uses

Borax can use internally and externally in different doses according to diseases. Internally in doses varies from 10-30 grains, in acidity, amenorrhoea, dysmenorrhoea, menorrhagia, puerperal convulsions (PIH) and increase uterine contraction during labour pains. As a solvent it is given in uric acid diathesis at dose of 20-40 grains for an adult. In fever used in the form of pills called as *Kaphaketu Rasa* (aconite). Borax and half of these take conch-shell make powder and soaked over three times in the juice of fresh ginger and made pills of two grains each is given with honey and ginger juice for all sorts of phlegmatic diseases such as common bronchitis and pneumonia. Borax is used at dose of 30 grains in the situation of prolonged and obstructed labor pains to expel out baby. It can also give in pre-eclampsia and eclampsia.

In case of abortion 10 grains with Konjee may give every one and two hours for 3 to 4 times. In irregular menstrual bleeding and chronic uterine infection 10 grain of borax with 10 grain of cinnamon are used. It acts betel juice 4 to 8 grains doses as preventive of ague. In small doses it is act as laxative, appetizer and used in painful dyspepsia, cough, asthma and obstinate cough. Also act as sedative in irritable conditions of the fauces and pharynx, chronic bronchitis, cystitis. It also used in foetid stools of diarrhea of children in summer. If diarrhea with spasmodic griping pains it is used with glycerin. Traditionally it is

used in convulsions of children at doses of 1 to 5 grains given with mother's milk according to the age of child. In adult it is used for bronchitis and asthma at dose of 5 grains of borax and 3 grains of pepper mixed with 1 tsp honey given thrice a day. Also used in children but dose depends on age of child for epilepsy continued for years in doses of 15 to 30 grains after meal. Borax (5 grain) eaten with betel leaves has been very effective in impotence also in de-obstruent in internal tumors of abdomen. Gastro-intestinal disturbance usually occurs at beginning then after resolve gradually.<sup>3</sup>

#### Indications of Borax:

S.No.	Pharmacological Action	Indications	Mode of Administration	Reference
1.	Mudirr-i-hayd (emmenagogue)	Amenorrhea, Dysmenorrhea, Oligomenorrhea,	Orally	1, 6,7,8,10
2.	Amraz-e-niswa	Amenorrhea, Dysmenorrhea, Menorrhagia, Puerperal convulsions (PIH), Pre-eclampsia, Eclampsia, Cystitis, Leucorrhea, Cervical erosion	Orally	1,3, 6,7,8,10
3.	Amraz-e-tanaffus (Respiratory diseases)	Chronic cough, Asthma	Orally	6,7,8,10
4.	Amraz-e-jild (Skin diseases)	Acne, Pityriasis, Ringworm, Melasma	Locally	6,7,8,9,10
5.	Amraz-e-meda wo ama	Splenomegaly, Acidity, Abdominal pain, Dyspepsia,	Orally	6,7,8,9,10
6.	Kasir-e-Riyah (Carminative)	Dyspepsia, Acidity	Orally	6,7,8,9,10
7.	Jaali (detergent)	Hyperpigmentation, Boil, Acne, kalaf, freckles, Mouth ulcers, Candidiasis, Vaginitis, Otorrhoea, Ringworm, Stomatitis	Locally	6,7,8,10
8.	Däfi'-i-Su'äl (antitussive)	Obstinate cough, acute and chronic Bronchitis, Asthma	Orally	6,7,8,10
9.	Mushtahé (appetizer), Däfi'-i-Warm-i-Jigar (hepatoprotective)	Acidity, appetizer, dyspepsia,	Orally	6,7,8,10
10.	Munaffis-e-balgham (expectorant)	Cough, acute and chronic Bronchitis Pneumonia, Asthma	Orally	6,7,8,10
11.	Akkal (corrosive)	Hemorrhoids	Locally	6,7,8,10
12.	Daf-e-taaffun (Anti Septic)	Chronic ulcers, Tongue fissure, Gingivitis, Otorrhoea, Gonorrhoea	Locally	6,7,8,10
13.	Daf-e-samoom (Antidot)	Snake bite,	Orally	6,7,8,10

#### Temperament:

Temperament is one of the unique features of USM. It is used for treatment, diagnosis and prevention of diseases. Borax having *Dry*<sup>3</sup> and *Hot*<sup>3</sup> temperament.<sup>7,8,10</sup>

**Dosage:** 500 mg.<sup>13</sup>

**Adverse effect:** As per Unani literature this drug may adversely effect on Stomach (vomiting and diarrhea).<sup>6,9</sup>

**Corrective:** Kateera (*Cocchlospermum religiosum* Linn), Gond-e-babul (*Vachellia nilotica*).<sup>6,9</sup>

**Substitute:** Bora-i-Armani.<sup>13</sup>

**Active constituents:** Boric acid, Sodium Carbonate.<sup>13</sup>

Mashoor murrakkab: Habb-e-Tinkar, Habb-e-Kabid Naushadri, Sufoof-e-Chutki, Habb-e-Tihal.<sup>13</sup>

### Therapeutic Applications:

#### Osteogenesis:

Borax is one of the best drugs used traditionally for growth and development of bone. It plays an important role in regeneration of bone and osteogenesis.<sup>14</sup>

#### Hormonal changes:

There are various studies revealed that oral use of Borax produces similar effect like estrogen in postmenopausal women having osteoporosis. In males taking 10 mg/day for 7days significantly decreases in sex hormone and increase testosterone level in blood plasma.<sup>15</sup>

#### Antimicrobial Action:

Various research studies revealed antibacterial and antifungal action of borax specifically against bacterial strains such as *E. coli*, *P. aeruginosa*, *S. aureus*, *S. pyogenes* and fungal strains *C. albicans*, *A. clavatus* and *A. niger*.<sup>16</sup>

#### Anticancer Action:

Certain studies have showed that boron has anti-carcinogenic properties. In regions where people take Boron rich diets, soil and water having lower risk of several types of cancer such as breast, cervical and lung cancers. Borax intervenes in the life cycle of HPV and HPV-16 and HPV-18 cause approximately 95% of all cervical cancers. Boron exists in the human body mostly in the form of boric acid, act as serine protease inhibitors reduce the immortalizing and transforming capacity of the HPV E7 oncogene.<sup>17</sup>

#### Genotoxic Action:

In Preclinical study by Gulsoy N et al on Zebrafish showed that DNA strand breakage induced by boric acid and borax, regardless of dose and time depend, could be detected by the Comet assay in fish in the aquatic environment, especially near the boron rich areas. Therefore genotoxic effect of these compounds should be investigated by the field and the laboratory controlled experiments. Most of the studies reported that boron compounds were found to be non-genotoxic and even boron had antioxidant effects on various human cell lines

in vitro and rat tissues by Türkez et al., 2007, 2010, 2012a,b, 2013; Türkez, 2008; Geyikoğlu and Türkez, 2008; Ince et al., 2014; Üstündağ et al., 2014. Some studies showed that borax has protector agent for metals or drugs induced genotoxicity in vitro.<sup>18</sup>

#### Anti-inflammatory Action:

There are various study showed anti-inflammatory property by suppression of level of inflammatory biomarkers (interleukin-8).<sup>19</sup>

#### Wound healing:

Application of 3% boric acid solution to deep wounds improve wound healing capacity.<sup>20</sup>

#### Toxic Action:

There is various studies revealed that 17.5 mg boron/kg per day affected fertility rate in rats. In human may cause nausea, vomiting, diarrhea and lethargy.<sup>21</sup>

#### Field study:

A field study conducted by Saleem M is proved that Borax application improved all the agronomic growth parameters such as height, number of grains, Weight, growth of plant. It is significantly increased the yield of rice crop under flooded condition.<sup>22</sup> Moreover study conducted by Ali I et al investigated that borax-modified starch (BMS) provide significantly improved strength properties, reduction in softwood pulp costs, and better papermaking machine performance. Results clearly suggest that the overall tensile properties show a significant increase while other properties are not negatively affected.<sup>23</sup>

#### Commercial uses:

Borax used in many process such as metallurgical processing of steel, non-ferrous and amorphous metals, welding fluxes, and plating compounds as well as in ceramics, laundry detergent boosters, food additive, cleaners, preservatives, dispersal agents, filler in composite materials, shielding material in nuclear applications due to its high ability for adsorption of nuclear emissions, cross linking additive in the processing of biomaterials and corrosion resistance coatings. Anhydrous borax is used for the preparation of sodium borohydride. It is an important hydrogen storage material, and also for the boron recovery. The production of borax from new raw materials is important, due large commercial uses and very less resources, particularly from waste materials by facile process. Nowadays it is used for removal of various organic and inorganic contaminants such as Cr and 2,4-dichlorophenol from waters also used for the synthesis of Fe nanoparticles.<sup>24-34</sup>

Dilute solution of borax used for cameraless photochemical photography. Steam injection of borax is one of the well-known thermal recovery processes that have been extensively applied to heavy oil reservoirs.<sup>12,35</sup>

Borax can be used for formation of ceramic, glass, cement, metallurgy and imitations of precious stones etc hence boron-based products is continuously increased.<sup>35</sup>

Borax is economically friendly therefore its waste can be assessing in the roof tile and brick in which 10 % concentrator wastes (TCM5 and BCM5) at 960 C gave the most satisfactory result in terms of firing strength. The addition of Borax is good factor for flame protection of the composite also enhances fire retardant.<sup>5,37</sup> Borax is used for the assaying of ores. It is the fusible to metals, and is particularly useful when small particles of metal mixed with dirt and ashes. They also facilitate the soldering of metals. Small amounts are used in sealing and optical glasses, Vycor, and vitrifying nuclear waste. Borax is used to produce a heat-resistant borosilicate glass for the home and laboratory. Borax can contribute to the softening of hard water by tying up calcium ions, as well as acting as a buffer agent. Borates are used extensively as fire retardants. Borax is necessary in small amounts for plant growth. It is one of the 16 essential nutrients and can be applied either to the soil or to the foliage. An adequate supply of boron is essential for proper seed set and normal fruit development. Its absence in a soil can cause vulnerability to disease and low yield in a crop also has Insecticide effect. Borax extensively used as a polishing agent.<sup>36</sup>

**Conflict of interest:** Nil

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