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Review Article

Zaj-e-Abyaz (Alum) an Important Styptic drug of Unani Medicine: Review

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ABSTRACT

Zaj-e-Abyaz (Alum) is a mineral origin drug found immersed in stones and earth. Its description with the name of Stupteria is available in De Materia Medica by Dioscorides. Medicinal use of potash alum (potassium aluminium sulphate) has been reported since ancient times. Due to its antiseptic, astringent, and styptic actions, it is used to treat a variety of disorders such as dental disease, and to control different kinds of hemorrhages. One percent alum solution for bladder irrigation is still prevalent as a therapy to control obstinate hematuria of vesical origin. In an observational retrospective cohort study including COVID-19 patients, the alum in the dose of 2 g/day as a food supplement in addition to actual treatments have shown beneficial effects clinically as well as on laboratory parameters. In the present review all information available in Unani literature in terms of its vernacular names, occurrence, toxicity, actions, therapeutic uses, purification, and its important formulation have been summarized. Apart from this, the mechanism of action, experimental studies, clinical trials related to alum have also been summarized. This review will be helpful for researchers for further studies..

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INTRODUCTION

Zaj-e-Abyaz (Alum) is a naturally occurring mineral origin drug found immersed in stones and earth. The great Greek scholar Dioscorides in his book *Kitab al Hashaish* (De Materia Medica) has described the alum with the name of Stupteria. He has also mentioned that various kinds of alum are found in nature, out of them only three varieties are used medicinally viz; (i) *Mushaqqaq* | *Sahti* (cracked or scissile); It is capable of being cut or divided. It is yellowish-white, transparent, without stones, with a strong smell, very astringent. This variety is found in Egypt and the mountains of Yemen, that's why it is called *Shibb-e-Yemani*; (ii) *Istriqooli* / *Mustadir* / *Madharaj* (round); It is round in

shape somewhat white with paleness, anesthetize the tongue and strongly binding, and additionally it is both with or without stones and brittle and found in Melia or Egypt; (iii) *Awagira* / *Ratab* (moist). It is soft, transparent, and moist to the touch. It is also known as *Shibb-e-Zafar* or *Zaj-e-Zafar*. The moist alum which is most transparent, milky, even, juicy throughout, without stones giving out a smell of fire is chosen for medicinal use (Dioscorides, 2120; Khan, 2013; Ibn Sina, 1998; Ghani, 1926; Ibn Baitar, 1999).

Types of *Zaj* according to color

Four types of the alums (*Zaj*) have been described in Unani literature based on their color:

- White Alum / *Zaj-e-Abyaz*: It is free from sands and stones, also known as *Qalqadees*.
- Yellow Alum / *Zaj-e-Asfar*: It is also known as *Qalqatar*
- Green Alum / *Zaj-e-Akhzar*: It is also known as *Qalqand*.
- Red Alum / *Zaj-e-Ahmar*: It is also known as *Soori* and *Soghmar*.

All types of alum are water-soluble and melt easily on heating except red alum because of its toughness and hardness. The easily breakable white and green variety of alum is considered of the best quality (Baghdadi, 2005).

Chemical Description and Types of Alum

Alum is usually double salts of ammonium, potassium, or sodium sulphate with aluminium. It is a colorless, odorless chemical material. It exists as a white crystalline powder and is generally soluble in hot water. It occurs naturally and can be prepared artificially. Chemically it is the generic name of a group of hydrated double salts having the general formula $A_2(SO_4) \cdot M_2(SO_4) \cdot 3 \cdot 24H_2O$, where A stands for monovalent radicals of potassium, sodium, ammonium, cesium, and other elements, and M stands for trivalent radicals of iron, aluminium, chromium, manganese, cobalt, and other metals. Broadly two types of alum (ferric and non-ferric) are marketed in various grades. Ferric ammonium sulphate (FAS) is known as iron alum/ferric alum. It appears as weakly violet, octahedral crystals. It is used for industrial purposes. Potassium aluminium sulphate is non-ferric alum also called potash alum. It is used medicinally.

The three most important non-ferric alums are:

- Potassium alum: also known as 'potash alum' or simply 'alum' with chemical formula $K_2(SO_4) \cdot Al_2(SO_4)_3 \cdot 24H_2O$ or $KAl(SO_4)_2 \cdot 12H_2O$.
- Sodium alum: also known as 'soda alum' or 'SAS' with chemical formula $NaAl(SO_4)_2 \cdot 12H_2O$.
- Ammonium alum: $NH_4Al(SO_4)_2 \cdot 12H_2O$.

Synthetic Alum

Alums can easily be produced in the laboratory by precipitation from an aqueous solution of aluminium sulfate and potassium sulphate (Anonymous, 1989).

REVIEW METHODS

The present review includes the information available in Unani classical literature for its complete description viz. temperament, actions, therapeutic, dosage uses, etc. For History, quality standards, pharmacological actions, toxicity, and other aspects to prove the importance of *Zaj* the information available in computerized databases such as Medline, PubMed, Ovid SP, Google Scholar, and Science-direct has been included.

History of Medicinal Use of *Zaj* (alum)

The earliest use of alum as a mordant for madder dye has been reported dating back to before 2000 BC in Egypt. The medicinal use of alum was first reported in ancient Mesopotamia. According to Herodotus (500 BC), the Egyptians used alum as an agent for mummification to deodorize the corpse. The use of alum for tumors and as an eye salve (ointment) is found in Ebers Papyrus and Berlin Papyrus. The Roman historian, Pliny the Elder (D.79 CE), had described various uses of different types alum e.g. wool dyeing, leather tawing, leather tanning, for creating special metal and glass finishes, for medicinal and cosmetic uses in his book 'Natural History'. According to Pliny, alum has the effect of checking and dispersing perspiration, and of neutralizing offensive odors of the arm-pits. Trotula, the renowned gynecologist of the 12th century (school of Salerno Italy) who authored a book on women's health has mentioned the use of alum for dental care, lighting blemishes of the skin, hair dyeing, and revirgination (Rapp, 2009; Bostock, 1855).

Occurrence

Most of the varieties of alum are found in Egyptian mines. Also found in other areas e.g. Milas, Maqedonia, Linara, Soroon, Linaroos, Fruia, Arminia. It is procured from Lahore and Khushab. It occurs naturally and is prepared in Egypt, Italy, England, Germany, Yemen, Afghanistan, India, Pakistan, and Nepal. In India, it is found in Punjab, Bihar, Gujarat, and Assam (Ghani, 1926; Ibn Baitar, 1999; Nadkarni, 1976; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ali, 1993).

Vernacular names: Arabic: *Zaj-e-Abyaz*, Bangla: PhatKiri, English: Alum, Alumen, Hindi: Phitkari, Persian: Shubb, Shubb-e-Yemani, Zaaj sufaid, Zaak, Latin: Aluminium sulphate, Sanskrit: Sphatika, Surashtraja; Kamakshi; Tuvri, Urdu: Phitkari (Khan, 2013; Ghani, 1926; Ibn baitar, 1999; Nadkarni, 1976; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ali, 1993; Ashtarf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Temperament: According to unani scholars it is Haar (Hot) and Yabis (Dry) in class third of temperament

(Khan, 2013; Ibn Sina, 1998; Ghani, 1926; Ibn Baitar, 1999; Baghdadi, 2005; Nadkarni, 1976; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ali, 1993; Ashtar, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Actions: As per Unani literature its action are; *Qabiz* (Astringent), *Habis-ud-dam* (Styptic), *Mujaffif* (Desiccant, Siccative), *Akkal* (corrosive), *Jali* (detergent), *Daf-e-tashannuj* (Antispasmodic/anticonvulsant), *Daf-e-taffun* (Antiseptic), *Muqi* (Emetic), *Mukhrij-e Janeen wa mashima* (Abortifacient), *Musakkin* (soothing), *Daf-e-taplarza* (antipyretic), *Daf-e-naubate tap* (anti intermittent fever), *Mane sailan* (leucorrhoea), *Mughalliz-i-mani* (semen inspissant), *Mane-aashob-e-chashm* (anti-conjunctivitis), *Muharrrik* (stimulant), *Muqawwi dandan* (strengthens teeth), *Naf-e-lissa damia* (useful in bleeding gums), *Mudir* (diuretic), *Mufattit hisath gurdah wa masanah* (lithotryptic), *Mulattif* (demulcent), *Munbit shaar* (hair grower), *Muhallil waram* (resolvent), *Mundamil qurooh* (cicatrizant), *Musakkhin* (caloric), *Muhazzil* (anti obesity), *Muhallil riyah* (antiflatulent) (Khan, 2013; Ghani, 1926; Ibn Baitar, 1999; Nadkarni, 1976; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ali, 1993; Ashtar, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Therapeutic Uses

Zaj-e-Abyaz is used locally as well as orally.

External/local Uses

- As *Sunoon* (tooth powder), *Zarur* (oral sprinkling powder), and as gargle in following disease conditions: *Qurooh lissa* (Ulcers in the gum), *Sailan khoon lissa* (Bleeding gums), *Istarkha lissa* (loosening of gums), *Qula* (Stomatitis), *Warm-e-luztain* (Tonsillitis), *Warm-e-halaq* (Pharyngitis).
- As a vaginal pessary/suppository in case of uterine bleeding.
- As a Douching agent in the case of *Sailan-ur-rahem* (Leucorrhoea), vaginal pruritus and postpartum loosening of vagina.
- As a water solution in cases of nasal bleeding (epistaxis), nasal wounds, and other wounds.
- As an eye drop along with *Arq-e-Gulab* (distillate of rose) in case of conjunctivitis (Tariq, 2004; Kabiruddin, 1955).

Internal/oral Uses

- As sufoof (powder); it is used only after purification in cases of chronic diarrhea, intestinal bleeding, and periodic fever.
- In cases of childhood respiratory disease such as diphtheria, cough, and whooping cough the alum powder is given in emetic dosage (Tariq 2004; Kabiruddin 1955).

SYSTEM WISE THERAPEUTIC USES

As a styptic agent

- In a febrile condition, alum powder in doses of 650 mg to 780 mg thrice daily with or without opium is beneficial in cases of hemorrhages from kidneys, uterus, and other internal organs. Boil 7 gm powdered alum in 570 ml of milk and strain it. The strained liquid (Alum whey/lime whey) in the dose of 15 to 60 ml thrice daily is beneficial in menorrhagia and bleeding piles. Application of 5% saturated solution of alum is beneficial in bleeding from the nose, gums, vagina, or the rectum and as a styptic, in leech bites, cuts, rectal prolapse, and uterine prolapse. To stop nasal bleeding (epistaxis) alum is used as snuff as well as the nose is plugged with gauze wet with 5% alum solution. To stop partum hemorrhage or menorrhagia, sterilized cotton plug saturated with alum powder or sterilized alum 5% lotion is used. To stop bleeding from piles, constant application of cloth to the part saturated with a solution of alum in the decoction of galls or *Babul* bark (in the proportion of 7 gm of alum to the 240 ml of decoction) is beneficial. This is also useful in anal prolapse in children. To stop uterine bleeding, sterilized cloth wet with alum solution prepared with aab-e-Gandana (*Allium ascalonicum* L.) is kept in uterine ostium (Khan, 2013; Ghani, 1926; Nadkarni, 1976).

Contraceptive

- Pessary of alum kept in the uterine ostium before coitus, prevents conception. This pessary also works as an Abortifacient. According to *Ibn Zuhr*, the alum and suddab (*Ruta graveolens* L.) desiccate seminal fluid (Khan, 2013; Ghani, 1926).

Eye Ailments

- A solution of alum prepared in the ratio 3 to 6 grains to an ounce of distilled water or rose water is beneficial to use in case of chronic and purulent ophthalmia, chronic conjunctivitis, sore eyes.

- A *surma* (collyrium) of alum can relieve pain, swelling, and hardness of eyelids, can clean conjunctiva, and improve vision.
- A collyrium prepared with alum, pearls, sugar, ash of egg shell, and snake excreta in equal amounts can relieve eye opacity.
- Collyrium prepared with *Mazu* (*Quercus infectoria*) *Sumaq* (*Rhus coriaria*) and alum can relieve *Dama* (Epiphora) and redness of eyes (Khan, 2013; Nadkarni, 1976).

Skin Ailments

- Local application of an ointment having ingredients in the ratio of alum 14 gm (fine powder), catechu 3.5 gm (fine powder), opium 1.75 gm, and butter or ghee 30 or 60 gm, on chronic, spreading, and gangrenous ulcers show excellent results.
- Application of a mixture prepared with 2 gm of burnt alum mixed with egg white is beneficial for bed sores.
- Application of alum moistened with water at the site of scorpion and insect bite gives instantaneous relief. Local application of alum solution prepared with *Aab-e-zift* (*Pinus longifolia* Roxb.) on the scalp can kill lice and relieve dandruff.
- Application of alum solution prepared with *Myrrh* (*Commiphora myrrha*) checks foul-smelling sweats in the armpits, groins, and soles of the feet. Alum powder mixed with talc and zinc oxide is a good remedy for sweating feet. 1 to 2% solution of alum is used as a lotion to treat ulcers, phlegmatic wound inflammation, acne vulgaris, and chilblains.
- Washing of nails with a water solution of alum can remove white spots of nails.
- Application of alum solution prepared with juice of *Lalsaag* (*Amaranthus gangeticus* Linn.) is beneficial in cases of Pityriasis and vitiligo.
- Local application of powdered alum mixed with beeswax is beneficial in Dakhis (paronychia).
- Liniment prepared with alum powder and vinegar decant can dry the wounds and stop bleeding. Local application of cloth wet with the lotion of alum 14 gm, vinegar, and Arrack (beer) 1 pint (473 ml) each on the affected part helps relieve traumatic swellings and enlargement of the joints especially that of the

knee and for other swellings from blows, bruises or sprains.

- Application dried alum mixed with honey is beneficial for burn and scald. A lotion made of alum and borax 2.6 gm each and 240 ml of water is useful in eczema (Khan, 2013; Ghani, 1926; Nadkarni, 1976; Ali, 1993).

Urogenital Ailments

- Oral intake of 1-2 mg of alum powder mixed with three times cane sugar along with milk is beneficial in cases of kidney, bladder wounds, and gonorrhoea. This mixture is also helpful in breaking kidney and urinary bladder stones.
- A gauze wet with 5% alum lotion combined with glycerine or alum douches may be used in leucorrhoea. Application of 4 % alum solution twice or thrice daily is very beneficial in case of urethral discharge caused by a sore or excoriated surface between the prepuce and the head of the penis associated with gonorrhoea.
- Injection of a lotion made of alum having 12 gm alum, *Nilatutiya* (blue vitriol) 4.5 gm and water 900 ml, dissolved by aid of heat, strained, and cooled is beneficial for urethral stricture and gleet. In chronic gonorrhoea 1 or 2 %. Solution of alum with potassium permanganate is also used (Khan, 2013; Ghani, 1926; Nadkarni, 1976).

Oroidental Ailments

- Rinsing of alum water heated with *Filfil siyah* (*Piper nigrum*) relieve toothache and strengthen the gums and restore the loosening of teeth.
- Application of alum paste prepared with vinegar and honey or rinsing alum mixed with honey water is beneficial for bad breath and stomatitis. Rinsing with the decoction of jasmine and alum powder is beneficial for stomatitis. Rinsing with decoction prepared with 12 gm alum, 6 gm *Mochras* (*Bombax ceiba* L.) and 500 ml water is beneficial for toothache and loosening of teeth. Local application of a powder composed of alum 1 part and *Gil-e-armani* (armenia bole) and *Kaat safiad* (*Acacia catechu* (Linn. f.) Willd.) half part each, is beneficial to swollen gums and toothache (Khan, 2013; Ghani, 1926; Nadkarni, 1976).

Gastrointestinal Ailments

- Oral intake of a mixture containing 650 mg alum, 5 drops of opium, and 75 ml infusion of acorus root, thrice daily is useful in case of chronic diarrhea.
- Repeated dose of a sufoof (powder) having alum, catechu (*Acacia catechu* (Linn. f.) and cinnamon (*Cinnamomum aromaticum*) in equal amounts (650 mg) mixed with honey is beneficial for diarrhea preceding cholera and in the diarrhea of phthisis.
- In obstinate hiccup alum in the dose of 3.5gm is given two or three times a day to induce vomiting and stop hiccup.
- Enema of the solution prepared with alum and decoction of Babool bark (*Acacia arabica*) can stop diarrhea (Khan, 2013; Ghani, 1926; Nadkarni, 1976).

Ear, Nose, and Throat Ailments

- Gargle with a solution prepared by 7 gm alum solution and 470 ml decoction of Babul bark or plain water is beneficial in cases of ulcerated sore-throat, aphonia, atony of the larynx.
- A paste made of alum and gypsum equal parts and *Gil-armani* (Armenian bole), is applied around the ear to relieve inflammation and in otorrhoea, it may be dropped into the ear.
- 5% solution of alum may be used also as a nasal spray to stop nasal bleeding if the lesion is higher up in the nose.
- Putting a suppository in the ear made by dried alum and *Murmakki* (*Commiphora myrrha*) in equal amounts along with honey can relieve earache (Khan, 2013; Ghani, 1926; Nadkarni, 1976).

Respiratory Ailments

- The alum in doses of 125 mg to 250 mg powder or solution in the distillate of ajwain (*Trachyspermum ammi*) in the ratio of 1 to 60 according to the age of the child is given twice or thrice a day in cases of whooping cough. In cases of asthma and cough, 500 mg alum along with 15 ml *Arq-e-gulab* (distillate of rose) is given twice a day (Khan, 2013; Ghani, 1926; Nadkarni, 1976; Ali, 1993).

Miscellaneous Uses

- Desiccated alum in the dose of 500 mg with a teaspoonful of water is given in the cases of malaria or periodic fever 2 hours before the

expected rigor. If alum with *Zanjabeel* (*Zingiber officinale*) 62.5 mg each is given with batasha (spongy sugar cake) before the onset of fever, the fever will not occur.

- In cases of concussion of the brain or spinal cord or in severe sprains or fractures the first thing given is alum 500 mg with jaggery (gud) or sugar (Ghani, 1926; Nadkarni, 1976).

Potent Action: *Habis-ud-dam* (Styptic) (Rafiquddin, 1985; Mustehasan, 2004), For the diseases of the kidney, urinary bladder, and eyes (Singh, 1949; Tariq, 2004; Ashtarf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Dosage: 250-500 mg. (Khan, 2013; Ghani, 1926; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ashraf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007), Emetic dose; 3 gm (Singh, 1949; Kabiruddin, 1949; Nabi, 2007).

Adverse Action: *Zaj-e-abyaz* can produce adverse effects on the lungs, stomach, and intestine (Khan, 2013; Ghani, 1926; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ashraf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007). Oral intake of 7 gm of *zaj-e-abyaz* can cause severe cough and dryness in the lungs and even lead to death (Khan, 2013; Ghani, 1926).

Correctives: To counter the adverse effects, *milk and oils* have been recommended (Khan, 2013; Ghani, 1926; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ashraf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Substitute: *Naushadar* may be used as a substitute (Khan, 2013; Ghani, 1926; Rafiquddin, 1985; Singh, 1949; Mustehasan, 2004; Tariq, 2004; Ashraf, 2011; Hakeem, 2011; Lubhaya, 2001; Kabiruddin, 1955; Nabi, 2007).

Purification: For oral/internal use purification of alum is recommended by Unani Scholars. *Zaj-e-abyaz* is parched or roasted without any medium by putting directly over the fire in any vessel or frying pan. *Zaj-e-Abyaz* thus obtained is now called *Zaj-e-Abyaz* birya (Anonymous, 2006).

Important Formulations:

Habb-e-Siyah Chashm, Kohl-e-Yasmeen, Kushta-e-Samm-ul-Faar Aatishaki, Qutur-e-Ramad Qawi, Marham Basaliqoon, Marham Ejaz, Marham Gulabi, Safoof Indrijulab, Safoof Surkh, Sanoon -e-Chobchini, Sanoon Mukhrij-e-Rutubat, Sanoon Mustahkam-e-Dandan, Sanoon Zard (Anonymous 2006); *Habb-e-Suzak Haad, Kohl Chashkham, Habb-e-Ramad, Kohl-e-Gul-e-Kunjad, Kohl-e-Mameeran, Kohl-*

e-Ramad, Shiyaf Ahmar Haad, Shiyaf-e-Gharb, Shiyaf-e-Nasoor, Dawa-e-Bawaseer-e-Anaf, Dawa-e-Suzak, Dawa-e-Tehal (Anonymous 2007); *Habb-e-Mamool, Habb-e-Mamool Qawi, Habb-e-Siyah, Qurs-e-Zirneekh, Shiyaf-e-Ahleel* (Anonymous 2001), *Habb-e-Sabz* (Anonymous 2006); *Qurs Bandish Khoon, Kushta Qalai, Kushta Tamesar* (Anonymous 2008); *Sunoon Muqawwi Dandan, Aksir Surfa, Safoof Istihaza Jadid, Sunoon Surkh, Qutur-e-Chashm* (Anonymous, 2011).

Absorption, Distribution, Metabolism, and Excretion (ADME) of *Zaj-e-Abyaz* (Alum):

Owing to its large molecules, potassium alum is not absorbed through the skin. If taken orally, it is rapidly solubilized in the stomach and can generate aluminum hydroxide or poorly absorbed basic aluminum salts. After absorption, alum in the form of aluminum salts can accumulate in kidneys, muscle, bone, and gray matter. Potassium alum does not metabolize. After being absorbed, it is rapidly dissolved and forms ions that later generate other salt derivatives. The major portion of the absorbed alum is excreted through the kidneys. Renal clearance of aluminum salts is approximately 5-10% in comparison to urea or creatinine due to their high protein binding (Anonymous, 2021).

Mechanism of action of *Zaj-e-abyaz* (Alum): As per Unani literature, it has many functions. The mechanism of actions of some important functions i.e. astringent, styptic, antiseptic, or adjuvant agents has been established.

It induces coagulation in the superficial tissue layers until the formation of a crust to show its astringent action. The alum ions neutralize the charges on plasma proteins, leading to blood coagulation to show its styptic action. Alum ions react with the free organic acid and thiol groups of proteins on microbes and free proteins, resulting in protein precipitation to show its antiseptic action. As an adjuvant, it is mainly used in the production of vaccines where it enhances the immune response (Anonymous, 2021).

Zaj-e-Abyaz (alum) toxicity in Human Body: FDA (Food and Drug Administration) consider *Zaj-e-Abyaz* (Potassium alum) as a generally recognized as safe (GRAS) substance (Anonymous, 2021). However, several studies have been reported by scientists regarding the harmful effects of alum use on the human body. These toxicities were observed particularly in patients with renal impairment. *Phelps et al* reported that a 70-year-old male with advanced obstructive nephropathy having bladder hemorrhage was continuously irrigated with 1% alum for 2 days to stop hemorrhage. Due to renal impairment aluminium was not excreted completely and the manifestations of

encephalopathy appeared owing to accumulation of aluminium in the brain. The author advised that alum irrigation should be cautiously given in patients with renal impairment (Phelps et al., 1999). In another case report, Phelps et al. (1999) observed that irrigation of intravesical alum to a patient with renal failure following a bone marrow transplantation resulted in acute encephalopathy. The author concluded that the encephalopathy may be due to apparent aluminum intoxication (Phelps et al., 1999). In the case reported by Saeer et al. (1990) that a 17-year-old girl with chemotherapy-induced renal failure developed encephalopathy and cardiomyopathy while receiving an intravesical aluminum infusion for hemorrhagic cystitis. This encephalopathy, cardiomyopathy was due to the accumulation of aluminium in tissues owing to renal impairment (Saeer et al., 1990). *Richhariya et al* reported that a 16-year-old male has a history of chronic fever consumed 2-3 teaspoons (approx. 20 gm) of Phitkari (Alum) on verbal advice of a roadside quack physician and developed fulminant hepatic failure (*Richhariya et al.*, 2018).

Pharmacological activities

1. Anti-haemorrhagic / styptic activity: Westerman et al. (2016) conducted a clinical trial on 40 patients with Hemorrhagic cystitis (HC) between 1997-2014. It was concluded that the Intravesical alum therapy resolved hemorrhagic cystitis in approximately 60% of patients and the durable response was seen in approximately one-third of patients. This therapy was well-tolerated and may be considered as a first-line treatment option for patients with hemorrhagic cystitis (Westerman et al., 2016). In a clinical trial of 45 patients of tonsillectomy more than 99% pure Alum (aluminium potassium sulfate) was used as a hemostatic agent on one side and gauze pack on the other side. It was concluded that local application of alum on the tonsillar bed in tonsillectomy significantly decreased volume of blood loss, procedure time, and a number of ties used (Al-Abbas et al., 2009). To evaluate the efficacy and safety of intravesical instillation of 1% alum solution in 12 cases of uncontrolled hematuria of vesical origin a study was conducted. Complete response was noted in 6 patients and a partial response in 4 patients. It was concluded that despite some local side effects bladder irrigation with 1% alum solution is a safe method to control vesical hematuria (Goswami et al., 1993). A clinical trial was conducted involving 34 patients of hematuria due to radiation cystitis

following external beam radiotherapy for carcinoma cervix to evaluate the efficacy and safety of 1% alum bladder irrigation to stop hematuria. The patients with an average age of 59.79 years and normal renal functions were enrolled in the study. The result showed that 64.51% of patients showed complete response, 12.9% patients showed partial response, and 22.58% patients had no response to alum irrigation. It was concluded that 1% alum irrigation is safe and efficacious to control hematuria due to radiation cystitis although the normal renal function is a prerequisite (Barua et al., 2019).

In an experimental study, the efficacy of alum to control epistaxis in comparison to silver nitrate was assessed in rabbits. Rabbits were divided into three groups (5 each). A similar incision was made in the nose of all groups of rabbits. The first control group was cauterized with silver nitrate sticks to stop bleeding. The Second test group was treated with alum sticks. The third group was left for spontaneous cessation of bleeding. The mean time needed for cessation of bleeding was measured and compared. The bleeding stopped faster in the test group, in comparison to the other two groups. It was concluded that Alum is a better alternative to silver nitrate to control epistaxis with less risk for developing healing-related complications (Al-Jabr et al., 2020).

1. Antimicrobial activity, antibacterial activity: White alum has shown significant activity against *Escherichia coli* (Shahriari et al., 2017). Alum showed excellent inhibitory effects against four malodor-producing axillary bacterial flora i.e. *Micrococcus luteus*, *Staphylococcus epidermidis*, *Corynebacterium xerosis*, and *Bacillus subtilis* as an active ingredient in deodorants and antiperspirants (Al-Talib et al., 2016). The antibacterial activity of Lemnian Earth, Samian Earth, and alum was assessed. Out of the all tested material, the alum showed remarkable antibacterial activity against Gram-negative (*Pseudomonas aeruginosa*) and one Gram-positive (*Staphylococcus aureus*) bacterium (Jones et al., 2018). In a randomized clinical trial molar solution of Alum and 0.2% of Chlorhexidine as a supplement to regular oral hygiene measures on the debris and calculus among school children. The result showed that there was an equal reduction in debris score and calculus score in both the alum group as well as Chlorhexidine group (Chethan et al., 2016).

2. Antifungal activity; In an experimental study, the efficacy of potash alum against *Candida albicans* was compared with Sodium Hypochlorite. Potash Alum and Sodium Hypochlorite both showed statistically significant activity against *C. Albicans* (Irshad et al., 2020a). Another study was conducted to investigate the in vitro susceptibility of clinical isolates of *C. albicans* to Potash Alum. The result showed that the potash alum has a fungistatic action against *C. albicans* in vitro (Irshad et al., 2020b).
3. Antiviral activity; A study was conducted to see the antiviral effect of alum against HSV-2 (Herpes simplex virus type 2). It was concluded that alum (alumen) had an in vitro anti-HSV-2 effect through multiple approaches. Alumen can suppress in vivo vaginal HSV-2 infection of guinea pigs to some extent (Hong et al., 2011).

Owing to the antiviral and antibacterial properties of aluminum salts (alum), an observational retrospective cohort study including COVID-19 patients was conducted in Turkey. A total of 109 patients, 54 in the test group and 55 in the control group, were included in the study. The test group received a daily salt need (2 g/day aluminum salts) as a food supplement in addition to actual treatments during hospitalization. It was concluded that aluminum salts (alum) have beneficial effects both clinically and in the laboratory on COVID-19 patients (Ali et al., 2020).

1. Anticancer activity: A study was conducted to observe alum as an adjuvant to boost anti-tumor response against a Balb/c hepatoma line H22 in mice. It was observed that the injection of alum into mice carrying H22 hepatocarcinoma resulted in a significant reduction of tumor growth with extended animal survival. It was concluded that alum is a well-tolerated adjuvant, therefore its potential use in tumor treatment may be explored (Wang et al., 2015).
2. Anti-obesity activity: A study was conducted to assess the anti-obesity effect of potash alum on Wistar rats. The test group of animals was fed a high-fat diet along with alum for 24 weeks. The results exhibited a significant reduction in body weight, food intake, serum triglycerides, total cholesterol, and high-density lipoproteins. This effect of potash alum may be due to delaying fat absorption from the intestine by inhibiting pancreatic lipase activity (Ahmad et al., 2012).

3. Larvicidal activity: The efficacy of potash alum was tested against the larvae of the dengue vector, *A. aegypti*. LC 50 and LC 90 values were recorded. The LC50 and LC90 values of alum among various larvae on 24 hour exposure ranged between 2.1 to 48.74 ppm and 15.78 to 93.11 ppm, respectively. Potash alum was found effective against all instar larvae (Preet & Sneha, 2011).
4. Spermicidal activity: A study to assess the spermicidal effect of potash alum was conducted on human sperm. Mortality of sperms was observed in different concentrations of potash alum solution. At 15% concentration death time was 51.9% sec, at 10% it was 87.2 sec and at 5% it was 122.1 sec. Higher concentration has higher effects (Singh et al., 1998).
5. Healing activity: To assess the healing effect of alum suspension a randomized double-blind placebo-controlled study was done on 52 patients with recurrent aphthous ulceration. The patients were divided into 5 groups (1, 3, 5, 7 %) of alum suspension and placebo. The test drug and placebo were applied topically four times daily for five days. On statistical analysis, the result showed that the effect on the healing time of the three concentrations of the drug (3, 5, 7) had a significant reduction in the time required for complete healing of the ulcer compared with the placebo group.

Role of alum in virus transmission: Although the alum possesses antiviral properties, the one study confirming transmission of Hepatitis -C Virus through potash alum used at barber's shop was conducted in Pakistan. Most of the Hepatitis C Virus positive patients have a history of facial/armpit shaving from barbers. Barbers generally rub potash alum stone on facial shaving cuts to stop bleedings. To check the viability of hepatitis C virus on potash alum stone, the blood samples from HCV-positive patients were taken and treated with 0.1, 0.2, 0.3, 0.4, and 0.5 molar concentrations of Potash Alum for different periods. It was observed in all the samples, treated with different concentrations of Potash Alum, the virus remains alive on Potash Alum stone for a long period. It was concluded that Potash Alum being used by barbers on facial shaving cuts has a definite role in HCV transmission in the Pakistani population (Waheed et al., 2011).

Unani system of medicine offers four kinds of treatment modalities through its non-medicinal, medicinal, dietary intervention/modulation, and surgical methods

(Azhar et al., 2020a). These are very effective in many disease conditions e.g. hyperlipidemia & Obesity (Azhar et al., 2020b), nephrotic syndrome (Azhar, 2018) etc. A variety of metals and minerals are effectively used as medicine to cure various ailments for a long time. *Zaj-e-abyaz* (alum), one of the mineral origin drugs, has been used as an antimicrobial and styptic agent for centuries. Recently published studies showing antibacterial (Shahriari et al., 2017; Al-Talib et al., 2016; Jines, 2018; Chethan et al., 2016), antiviral (Hong et al., 2011; Ali et al., 2020), anti-hemorrhagic (Westerman et al., 2016, Al Abbasi, 2009, Goswami et al., 1993, Barua et al., 2019; Ali Jabr, 2020), spermicidal (Singh et al., 1998), wound healing (Altaei et al., 2005) and anti-obesity activity (Ahmad et al., 2012) have justified the claim of Unani Scholars regarding its therapeutic uses.

CONCLUSION

In the current scenario, the alum is being used to treat obstinate hematuria and as an adjuvant in vaccine production. One study suggested that the alum used by barbers may be the source of transmission of Hepatitis-C virus and warned the mass not to share barber's alum to stop bleeding from cuts. In another study, the alum in the dose of 2g/day as a food supplement in addition to actual treatments has shown good results in the recovery of Covid-19 patients. This review will be helpful to the researcher for planning further studies to explore antiviral activity against the Covid-19 virus.

REFERENCES

- Ahmed Z, Afzal M, Kazmi I, Gupta G, Ahmad I, et al. Anti-obesity potential of Potash Alum: Pharmacological and Biochemical Approach. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2012;4:90-93.
- Al-Abbasi AM. The Benefit of Alum in Tonsillectomy. *Gomal Journal of Medical Sciences*. 2009;7:124-127.
- Ali D, Ibrahim E, Oğuz D and Murat K: Influence of aluminum salts on COVID-19 infected patients. *The Turkish Journal of Medical Sciences*. 2020;50:1771-1780.
- Ali SS. *Unani Advia Mufrada*. Taraqqi Urdu Bureau, New Delhi, India 6th edition, 1993: 298-300.
- Al-Jabr IK: *Alum Usage for Control of Epistaxis as an Alternative to Silver Nitrate*. *Majmaah Journal of Health Sciences*. 2020; 8: 25-36.
- Al-Talib H, Nasir NISM, Yaziz HU, Zulkafli NF, Adani NA et al. Potassium Aluminium Sulphate (Alum) Inhibits Growth of Human Axillary Malodor-

Producing Skin Flora In Vitro. *Journal of Clinical and Health Science*. 2016;1: 59-63.

Anonymous, National Formulary of Unani Medicine Part-I (Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India), 2006 reprint: 321,62,63,76,161-163,219,243,248,249,250.

Anonymous, National Formulary of Unani Medicine part-VI (Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India, 201: 14,25,37,49,50,62,99,104,109,110,120,126.

Anonymous. National Center for Biotechnology Information. PubChem Compound Summary for CID 24856, Aluminum potassium sulfate. Retrieved September 18, 2021 from <https://pubchem.ncbi.nlm.nih.gov/compound/Aluminum-potassium-sulfate>.

Anonymous. National Formulary of Unani Medicine part-V (Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India 2008: 20,57,58.

Anonymous. National Formulary of Unani Medicine, Part-II (Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India, 2007 reprint: 21,25,50-53,57,59,61.

Anonymous. National Formulary of Unani Medicine, Part-III, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India, 2001: 28,29,40,50,74.

Anonymous. National Formulary of Unani Medicine, part-IV, Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry of Health & Family Welfare, Government of India, 2006: 20.

Anonymous. The New Encyclopaedia Britannica. Vol. I., Vol. XI, Vol. XXI., The University of Chicago, 1989: 303, 367, 388.

Ashraf M, *Makhzan-ul-Mufradat* (Khawas-ul-Advia) Ma Murakkabat, Aijaz Publishing House, Delhi, India, 2011: 80.

Azhar MU, Ayub S, Mustehasan. Effect of Non Medicinal Therapy of Unani Medicine in Weight and Dyslipidemia Management. *World Journal of Pharmaceutical Research*. 2020a;10:1285-1294.

Azhar MU. Effect of herbal unani formulation on nephrotic syndrome: a case study. *Indian Journal of Traditional Knowledge*. 2018;17: 807-810.

Azhar MU; Ayub S, Anjum N, Ahmad S. Effect of Jawarish Bisbasa on dyslipidemia - a case study. *International Journal of Scientific Research in Biological Sciences*. 2020b, 7: 20-23.

Baghdadi IH, *Kitab Al-Mukhtarat Fit -Tibb* (Urdu translation) 1st edition. Vol. II. CCRUM publication New Delhi, India, 2005: 127-128, 266, 267.

Barua SK, Das N, Barua SJ, Rajeev TP, Bagchi PK, et al. Management of late hemorrhagic radiation cystitis in patients of carcinoma cervix with special reference to 1% alum irrigation and its safety: a clinical study in a tertiary care centre. *International Journal of Advances in Medicine*. 2019;6:599-604.

Bostock, J, *The Natural History*, Pliny the Elder, Henry G. Bohn, York Street, Covent Garden London Vol VI Book 35, Chapter 52, 1855: 294-298.

Chethan J, Priyanka BB, Hassan S and Sujith. *Effectiveness of Alum and Chlorhexidine Mouth rinses on Oral hygiene of School Children aged 13-15 yrs: A Comparative In Vivo study*, *Indian Journal of Orthodontics and Dentofacial Research*. 2016;2: 119-122.

Dioscorides: *Dioscorides De Materia Medica* IBIDIS PRESS cc PO Box 81169 Parkhurst Johannesburg South Africa 2120, 2000: 806-807.

Ghani N. *Khazain-ul-Advia*, Vol- III, Abdul Hamid Publishers and Printers Lahore, 1926;149:482-485.

Goswami AK, Mahajan RK, Nath R and Sharma SK. How safe is 1% alum irrigation in controlling intractable vesical hemorrhage. *Journal of Urology*. 1993;149:264-7.

Hakeem MA. *Bustan-ul-Mufradat*, Aijaz Publishing House Delhi, India. 2011.

Hong L, Xu X, Chen L, Li B, Wu D, et al. The anti-HSV-2 effect of alumen: *In vitro and in vivo* experimental studies. *Current Medical Science* (original name: *Journal of Huazhong University of Science and Technology Medical Sciences*). 2011;31:828-833.

Husain GM, Urooj M, Mustehasan, Javed G, Kumar P, Kazmi MH. Beneficial Effect of Qurs-E-Damavi. A Traditional Unani Formulation in Cyclophosphamide induced Haematological Perturbations in Rats. *Advances in Complementary & Alternative Medicine*. 2020;6:576-592.

- Ibn Baitar ZU, *Kitab-al-Jami-ul-Mufradat-al-AdviawalAghzia*, Vol-III, (urdu translation), CCRUM Publication, New Delhi, India. 1999: 118-119.
- Ibn-Sina. *Canon of Medicine* (English translation). Deptt. of Islamic Studies JamiaHamdard, New Delhi, India. 1998.
- Irshad M, Younas M, Qureshi AU, Hameed A. Determination of minimum inhibitory and fungicidal concentrations of potash alum against clinical isolates of *candida albicans*. Journal of the Pakistan Dental Association. 2020b;29:235-238.
- Irshad M, Younas M, Shabir H, Alam MS, Rehman ZU, et al. In vitro antifungal activity of potash alum against *Candida albicans* on acrylic resin. Pakistan Armed Forces Medical Journal. 2020a;70:1460-1464.
- Jones EP: From mine to apothecary: an archaeo-biomedical approach to the study of the Greco-Roman lithotherapeutics industry. World Archaeology. 2018;50:418-433.
- Kabiruddin M. *Makhzan-ul-Mufradat*, vol-I, National fine Printing Press, Hyderabad, India. 1955:173-174.
- Khan MA, *Muheet-e-Azam*, Vol-III, CCRUM Publication New Delhi, India, 2013: 277-280.
- Lubhaya R. *Bayan ul Advia*, Vol-I, Idara Matbul Sulemani Lahore, 2001: 322-323.
- Mark P and Brown E: Acute aluminum toxicity and alum bladder irrigation in patients with renal failure. American Journal of Kidney Diseases. 1993; 21: 44-46.
- Mustehasan, Ali A. *AdviaMadania*, Aijaz Publishing House Delhi, India, 2004: 12-14.
- Nabi G. *Makhzan-ul-Mufradat wa Murakkabat Al-Marooof Khawas-ul Advia*, CCRUM Publication New Delhi, India, 2007: 89.
- Nadkarni KM. *Indian Materia Medica*, 3rd edition. Vol-II, Popular Prakashan Private Limited, Mumbai, India, 1976:2-6.
- Phelps KR, Naylor K, Brien TP, Wilbur H, Haqqie SS: Encephalopathy after bladder irrigation with alum: case report and literature review. American Journal of Medical Science. 1999;318:181-185.
- Preet S, Sneha A. Biochemical evidence of efficacy of potash alum for the control of dengue vector *Aedes aegypti* (Linnaeus). Parasitology Research. 2011;108:1533-1539.
- Rafiquddin M. *Kunzul Advia Mufrada*, (University publication unit, Sarfaraz House, AMU Aligarh, India. 1985: 553-554.
- Rapp GR; Wagner GA; Herrmann B. Archaeomineralogy: Natural Science in Archaeology series. Berlin, Heidelberg: Springer Berlin Heidelberg. 2009: 152-154.
- Richhariya D, Mohan N, Verma V and Walia S: An Unusual Case of Iatrogenic ALUM Toxicity Resulting in Fulminant Hepatic Failure of Young. Emergency Medicine. 2018;8:367.
- Seear MD, Dimmick JE and Rogers PC: Acute aluminum toxicity after continuous intravesical alum irrigation for hemorrhagic cystitis. Urology. 1990;36:353-4.
- Shahriari R, Salari S and Shahriar S: In vitro Study of Concentration-effect and Time-course pattern of white Alum on *Escherichia coli* O157:H7 Growth. African Journal of Traditional, Complementary and Alternative Medicines. 2017;14:311-318.
- Singh D. *Unani Dravya guna Vigyan*. Nirnay Sagar Press Mumbai, India. 1949: 337-339.
- Singh HP, Singh CK, Singh RR. Effect of Potash Alum (Aluminium Potassium Sulphate) on Human Semen and Sperm. Indian Journal of Pharmacology. 1998; 42:311-314.
- Tariq NA. *Taj-ul-Mufradat (Khawas-ul-Advia)*, Idara Kitaab-ul-Shifa, New Delhi, India. 2004:211-212.
- Waheed Y, Safi SZ and Qadri I. Role of Potash Alum in Hepatitis C virus Transmission at Barber's Shop. Virology Journal. 2011;8:211.
- Wang B, Wang X, Wen Y, Fu J, Wang H, et al. Suppression of established hepatocarcinoma in adjuvant only immunotherapy: alum triggers anti-tumor CD8+ T cell response. Scientific Reports 2015; 5:17695.
- Westerman ME, Stephen A and Boorjian, Brian JL: Safety and efficacy of intravesical alum for intractable hemorrhagic cystitis-a contemporary evaluation. International Brazilian Journal of Urology. 2016;42:1144-1149.