ISSN: 0974-1291

HIPPOCRATIC JOURNAL OF UNANI MEDICINE

Volume 7 • Number 3 July–September 2012

CENTRAL COUNCIL FOR RESEARCH IN UNANI MEDICINE

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Volume 7, Number 3, July – September 2012

Hippocratic J. Unani Med. 7(3): 1-142, 2012

CENTRAL COUNCIL FOR RESEARCH IN UNANI MEDICINE
Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH)
Ministry of Health & Family Welfare, Government of India

Hippocratic Journal of Unani Medicine

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Annual Subscription: Rs. 300/- (India) US $ 100/- (Other Countries) **Single Issue:** Rs. 150/- (India) US$ 50/- (Other Countries)
Payments in respect of subscription may be sent by bank draft marked payable to Director General, CCRUM, New Delhi.

On behalf of Central Council for Research in Unani Medicine (CCRUM) published and printed by Prof. S. Shakir Jamil Director General, CCRUM at CCRUM headquarters, 61-65 Institutional Area (Opposite 'D' Block), Janakpuri, New Delhi – 110058 and printed at India Offset Press, A-1 Mayapuri Industrial Area, Phase-1, New Delhi 110 064 (INDIA)

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Editorial

Interest in traditional drugs has been spurred in recent years by methodological advances in clinical investigations, phytochemistry, ethnobotanical studies and an upsurge of interest in renewable resources and traditional medicine. Over the years, a large number of traditional drugs, mainly herbal, have been subjected to clinical, pharmacological, phytochemical and pharmaceutical studies in an effort to validate them and prove their medical efficacy and safety. All these investigations have yielded extensive and valuable findings and insights, and there is a need for wide exchange of this information among scientists engaged in the development of new drugs of natural origin.

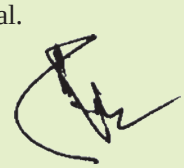
Unani System of Medicine, although originated in Greece, is one of the recognized systems of medicine of the country. Although, the Unani medicine have been in use for centuries and are known for their therapeutic efficacies, there is a need to scientifically establish their efficacy and safety in order to achieve global acceptance. Organized research work in this system was, therefore, a need of the hour. In post independent era, Central Council for Research in Unani Medicine, through its clinical, drug research, literary research, survey & cultivation of medicinal plants programme is contributing significantly for last three decades. *Vitiligo, Sinusitis, Filariasis, Eczema, Malaria, Infective Hepatitis, Asthma,* are some of the conditions where Unani therapies have earned recognition after scientific validation.

The Council has been publishing the peer reviewed *Hippocratic Journal of Unani Medicine* (HJUM), mainly to bring out fundamental and applied aspects of Unani Medicine. The journal also publishes recent advances in other related sciences and traditional medicines as well as different streams of medical sciences, which have bearing on validation and scientific interpretation of various concepts and strengths of Unani medicine.

In view of an overwhelming response, the journal earlier published twice a year, its periodicity has now been changed to quarterly w.e.f. January 2008 to accommodate more articles for quick dissemination of research data among scientific community. The journal has sufficient room for invited articles from luminaries of modern medicine and sciences as well as scholars of Unani medicine. The broad areas being covered include clinical research on single and compound Unani drugs, validation of regimental therapy, Clinical and experimental pharmacological studies, standardization of single and compound drugs, development of standard operating procedures, ethnobotanical studies, experimental studies on medicinal plants and development of agro-techniques thereof, and literary research on classics of Unani medicine. The journal is also open for studies on safety evaluation of Unani and other herbo-mineral drugs, nutraceuticals, cosmotherapeutics, aromatics, oral health, life style disorders, sports medicine etc. and such other newer areas which are the outcome of modern day living.

The current issue of this journal provides 12 original research and review papers in the areas of clinical research, drug standardization, pharmacology, ethnobotanical surveys and allied disciplines contributed by eminent scholars in their respective fields. It is hoped that data presented will contribute significantly in R&D sector of traditional drugs and prove to be an excellent exposition of current research efforts of scientists in this direction. Council acknowledges the authors for their contributions included in this issue and hope for their continued support in this endeavor. We wish to ensure the readers to bring out the future issues of the journal on time.

We at the CCRUM have been constantly striving to reach to higher standards and make HJUM the leading journal of Unani Medicine and related sciences. In this context, we thank our learned reviewers for their invaluable inputs in improving the manuscripts. We sincerely hope and trust that the mission can be accomplished with active partnership of quality-conscious individuals and institutions. Through these lines we seek your cooperation and support in materializing our dreams about the HJUM. In this regard, we request you for your as well as your colleagues' contributions for publication in and subscription to the journal. Further, we will appreciate if the journal is introduced far and wide. We would also welcome esteemed suggestions for achieving the highest standards of quality for the journal.



(Prof. S. Shakir Jamil)
Editor-in-Chief

An Account of Some Plants and Unani Drugs Cited in the Texts of Islamic Scriptures (Holy Quran and Ahadith)

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Abstract

An important period in the history of science is the Arabian period. The Arabs inherited the Greek culture and Greek scientific thought. After the advent of Islam, Unani System of Medicine got enriched also by imbibing what was mentioned in the Holy Quran and *Ahadith.* (*Ahadith:* plural of *Hadith,* the traditions relating to the life and teachings of Prophet Mohammad PBUH)

The Quran however, is not a book of science but a book of 'signs' *Ayats*. There are over six thousand verses in The Holy Quran of which more than a thousand deals with science. However some of the incredible, scientifically substantiated discoveries regarding the medical sciences derived from these scriptures. There are innumerable scientific facts present in the Holy Quran and *Hadith* and need attention for follow up investigation.

Many branches of Medical Sciences can be studied from Holy Quran and *Ahadith*, for example, *Manafeul-Aza* (Physiology), *Ilmul-Janeen* (Embryology), *Moalejat* (Therapeutics), *Hifzane-Sehat* (Preventive and Social medicine), *Ilmun-Nafs* (Psychiatry), *Ilmul-Advia* (Pharmacology).

Main emphasis is given in this article on *Ilmul-Advia* (Pharmacology). Therefore some drugs of the Unani Materia Medica described in the texts of Holy Quran and *Ahadith* have been discussed in this article. Only authentic *Ahadith* confirmed by reputed scholars are referred to make the paper more genuine, in this regard translation of main texts from Holy Quran and *Ahadith* also have been quoted.

Keywords: Ilmul Advia, Scripture, Holy Quran, Ahadith

Introduction

History bears ample testimony to the far reaching significance and influence which the early Muslims have impressed on the scientific thought. The Glorious Quran and *Hadith* liberated the human mind from the shackles of superstitions and taboos. Inspired by the commandments of Almighty God and the teachings of the Holy Prophet they became transformed mentally and spiritually, human history has yet to see such a transformation.

Prophet Mohammad (SAW) made compulsory for every Muslim male or female to seek knowledge.

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Allah (SWT) says 'who was blessed *Hikmah* 'wisdom', blessed the very righteous thing in the universe' (Al-Quran, 2:269, it indicates chapter no. 02 and verse 269. the same notation is followed throughout the paper).

Quran says 'Allah (SWT) taught the human being what he did not know' (Al-Quran, 96:5).

Allah (SWT) instructed human beings 'ask the learned men if you do not have knowledge' (Al-Quran, 16:43).

The human reason, logic and science are given primacy in present age. Any scripture claiming to be a divine revelation must also be acceptable on the strength of its own reason and logic. Noble Prize winner Albert Einstein says "Science without religion is lame, Religion without science is blind". (Naik, 2000) Analysis of the Quran and Hadith is going on and important information of modern sciences have been derived from Holy Quran like astronomy, physics, geography, geology, oceanology, botany, zoology, medical sciences, general sciences etc.

Present investigation does not mean that the plants, animals and minerals which are described in Holy Quran and *Ahadith* exactly mean for medicinal purposes but they are illustrated for other purposes too. However in this study it is emphasized that the cited plants, animals and minerals have been used for medicinal purposes in different cultures, traditions and religions. In this research medicinal uses of these plants, animals and minerals are experience of different communities of world.

Ilmul-Advia (Pharmacology)

The environment, vegetation, animals and minerals mentioned in Holy Quran and *Ahadith* are also the source for Unani Materia Medica. As Allah (SWT) says:

'We send down of the Quran that is healing '*Shifa*' and mercy for the believers'. (Al-Quran: 17:82). Some of these plants and drugs have been described here.

Adas

Masur, Lentil,

(Lens culinaris Medic, Papilionaceae)

Text:

'…call upon your lord to bring forth for us from the earth its green herbs, its *qiththa* (cucumber), its *foom* (garlic), its *adas* (lentil), and its *basl* (onion)'. (Al-Quran, 2:61)

Four plants are mentioned in above verse: Adas, Basl, Foom and Qiththa.

Adas is grown in most parts of India as food pulse.

Uses: Lentils are used as a strengthening and stimulating article of food. It is mild aperients, laxative, and diuretic useful in dysurea. Externally it is applied as poultice to foul and indolent ulcer.

Nature: Galen said it is Hot and Dry (Ibn Sina, 1593).

Chemical constituents: It contains water, legumin, nitrogen, starch, oil, fiber, ash, potassium and phosphorus.

Basl

Onion (*Allium cepa* Linn)

Text: (Al-Quran, 2:61)

Parts used: bulb and seeds.

Nature is hot and dry, may be hot and moist. (Ibn Sina, 1593)

Actions: It is stimulant, diuretic, expectorant, emmenogogue and aphrodisiac, externally rubefacient. Useful in sunstroke, piles, dyspepsia, jaundice (Ibn Sina, 1593). Applied in inflammatory swelling. Raw onion scent is unpleasant but it has anti-septic value. It contains acrid volatile oil which contains Allyl disulphide and related compound of sulphur, albumin, Vitamin C and B.

Foom

Thaum, Lehsun, Garlic (*Allium sativum* Linn)

Text: (Al-Quran, 2:61)

Parts used: Bulb and oil.

Nature: hot and dry. (Ibn Sina, 1593)

Action and uses: stimulant, carminative, emmenogogue, anti-rheumatic, anthalmintic, anti-septic, anti-spasmodic. It lowers blood pressure and reduces cholesterol which is main cause of heart attack and paralysis. It is used in colic, peptic ulcer and externally applied to a painful area. Its enema is beneficial in sciatca because it expels the causative humors. (Ibn Sina, 1593)

Chemical constituent: carbohydrate, protein, vitamin C, mucilage, albumin, oil, allyl disulphide.

Unani formulation: *Majun Seer Alvi Khan*.

Qiththa

Cucumber (*Cucumis sativus* Linn)

Text: (Al-Quran, 2:61)

It is extensively cultivated in gardens as well as in the sandy basins of rivers.

Actions: (*Qiththa)* is useful in dyspepsia, cucumber's pulp and juices are nutritious, demulcent and diuretic. It contains carbohydrate.

Nature: cold and moist.

Unani formulation: Seeds of cucumber are used in *Sharabat Bazuri*

Atraj

Citron (*Citrus medica* Linn.)

Text: Bukhari and Muslim reported that Holy prophet has said "The believer who recites Quran resembles to *Atraj* (citron) which has a delicious taste and good flavor' (Ibn Al Qayyim, 2005)

It is a garden plant chiefly cultivated for its valuable fruits.

Parts used: rind, pulp, juice, oil

Nature: rind is hot dry, Pulp is hot and moist

Actions: Fruit is an expellant of poisons. Pulp is aromatic, tonic, exhilarant and stomachic. its oil is beneficial for paralysis and palpitation. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997)

Chemical constituents: It contains vitamin C, citrine, cymene.

Athl

Tamarisk (*Tamarix aphylla* (Linn). Karst.

Text: 'We replaced their two gardens with gardens of *Khmat* and *Athal'* (Al-Quran, 34:16).

Two plants *Athl* and *Khamt* are mentioned in this verse.

Any shrub or small tree of the genus Tamarix having small scalelike or needle-shaped leaves and feathery racemes of small white or pinkish flowers; of mostly coastal areas with saline soil. Tamarix gallica is also named as *Tarafa*.

Astringent, laxative, powdered bark is aphrodisiac.[4] It contains tannic acid, used in the form of pessaries and ointment for piles.

Khamt

Arak tree (*Salvadora persica* Linn.)

Text: 'We replaced their two gardens with gardens of *Khmat* and *Athal'* (Al-Quran, 34:16)

Khamt is an Arak Tree to most of the *Mufissireen* (Ibn Al Qayyim, 2005) and every thorny tree is also reported to be a *Khamt*. Root is used as tooth brush to strengthen the teeth and gum. Bark decoction act as stimulant and tonic in amenorrhea. Leaves are applied in rheumatism. Decoction of leaves used in asthma and cough.

It contains salt and resin which act as antiseptic, anthalmintic and shining to teeth and also sugar, fat, phosphorus and vitamin K.

Asl, Honey

Text: 'Rivers of puified *Asl* (in heaven) in which they will have from all kind of fruits' (Al-Quran, 47:15). A whole chapter of Glorious Quran is named after '*Nahal'* honey bee which tells the importance of honey.

Honey is a sweet food made by bees using nectar from flowers. The variety produced by honey bees (the genus *Apis*) is the one most commonly referred to and consumed by humans. Honey bee assimilates juices of various kinds of flowers and fruits and forms the honey within its body which it stores in its cells of wax. Only a couple of centuries ago, man came to know that honey comes from the belly of the bee. This fact was mentioned in the Qur'an 1400 yeas ago in the verse.

Actions and uses: *Shahad* (Honey) has a healing and mild antiseptic property, detergent and tonic. The Russians used honey to cover their wounds in World War II. The wound might retain moisture and would leave very little scar tissue. Due the density of honey no fungus or bacteria would grow in the wound. Holy Prophet used honey repeatedly in a person suffering with diarrhea (Naik, 2000).

A person suffering from an allergy of a particular plant may be given honey from that plant so that the person develops resistance to that allergy. The knowledge contained in the Qur'an regarding honey its origin and properties were far ahead of the time it was revealed.

Nature: Hot and dry

Composition: Honey is mainly fructose (about 38.5%) and glucose (about 31.0%). Honey's remaining carbohydrates include maltose, sucrose, and

other complex carbohydrates. Honey is mostly sugars and contains only trace amounts of vitamins or minerals. Honey also contains tiny amounts of several compounds that function as antioxidants, including chrysin, pinobanksin, vitamin C, catalase, and pinocembrin. Honey is rich in fructose and vitamin K.

Unani Formulation: honey makes an important ingredient of preparing major compounds like *Majun* and *Jawarish* etc.

Bateekh
Watermelon
(*Citrullus vulgaris* Schrad.)

Text: Tirmidi and Abu-Dawood reported that the Prophet Mohammad (PBUH) used to eat watermelon with fresh date, saying, heat of the first repulses coldness of the second' (Ibn Al Qayyim, 2005).

It is large oblong or roundish melon with a hard green rind and sweet watery red or occasionally yellowish pulp.

Parts used: seeds, juice, pulp of the fruit.

Actions: Seeds are cooling, demulcent, diuretic, vermifuge, nutritive, refreshing. Flesh of the fruit is pink to red, soft, watery and sweet. Fruit juice is used to clinch thirst, in affection of urinary organs, fever and hepatic congestion.

Unani formulation: *Lauq Aab Tarbuzwala*.

Chemical constituent: fixed oil, citrullin.

Ethmed
Antimony sulphide

Text: Ibn-Maja reported that The Prophet suggested 'Resort to *Ethmed*, as it purifies the sight and makes the eye lashes grow'. (Ibn Al Qayyim, 2005)

Best *Ethmed* is from Asfahan (Iran)

Nature: Hot and Dry (Ibn Sina, 1593).

Actions: Detergent and eye tonic, drying agent without any harm, healing agent in ulcer and wounds.

Enab
Grape
(*Vitis vinifera* Linn.)

Text: We bring forth green stalks, from which We bring forth thick clustered grain and out of the date palm and its spathe come forth clusters of dates

hanging low and near, and We produce gardens of grapevine and olives and pomegranate, each similar (in kind) yet different (in variety and taste). (Al-Quran, 6: 99)

Four drugs are described in this verse: Enab, Nakhl, Rumman and Zaitun. *Enab* is described eleven places in Quran, indicating the significance.

Enab (Grapes) is mentioned at several places in Quran. It is largely cultivated in India.

Nature: Rind is cold and dry, pulp is hot and moist and seeds are cold and dry. (Ibn Sina, 1593)

Actions and uses: It is nutritive, demulcent, refrigerant, diuretic and cooling. Dried one is laxative, expectorant and blood purifier. *Enab* is used as medicament in various ailments such as in anemia, dyspepsia, dysuria, hemorrhage, chronic bronchitis, epilepsy and in scorpion sting.

It contains sugar, gum, citric acid, potassium, sodium, magnesium, iron, albumin, oil, fat and vitamin.

Nakhl

Tamar, Rotab, Balah, Basr, Date

(*Phoenix dactylifera* Linn.)

Nakhl is described in Holy Quran about 28 places. It is also mentioned in Bible.

Text: 'The Angel called Mary (PBUH), do not grieve, your Lord has provided beneath you a stream, and shake the trunk of the *Nakhl* (palm tree) toward you, it will drop upon you ripe, fresh dates, so eat, drink and be glad' (Al-Quran, 19:25).

It is main and complete diet of Arabs.

Actions: Dates are nutritious, expectorant, aphrodisiac, tonic, demulcent, laxative, and diuretic.

Uses: Heart diseases, skin diseases, antidote, swelling of kidney, intestinal pain, heart attack, wound healer, diarrhea, labour pain, sexual weakness, stomach pain, piles, physical strengthening, shrill the voice, liver disorders (Mushtaq, 2009; Qadari, 1994).

Chemical Constituents: inert sugar, sucrose, pectin, tannin, cellulose, starch, protein, fat, Vitamin A,B,C, sodium, calcium, sulphur, chlorine, phosphorus, iron.

Rumman

Pomegranate

(*Punica granatum* Linn.)

Rumman is described more than once in Glorious Quran.

Text: “In heaven there are fruit, palm trees and pomegranates” (Al-Quran, 55:68).

Rumman is used in dyspepsia, nausea, dysentery, anemia, jaundice, arthritis, bilious disease, febrile illness. It is Cardio tonic, astringent, cooling and delicious, refreshing, anthalmintic. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997). It contains tannin, sugar, pectin, iron, vitamin C and B.

Unani Formulation: *Jawarish Anarain.*

Rumman is described more than once in Glorious Quran.

Zaitun

Olive

Olea europaea Linn., Oleaceae

Zaitun is mentioned at six places in Quran.

Text: (Allah) He causes to grow for you the crops, the olives, the date-palms, the grapes, and every kind of fruit. Verily! In this indeed an evident proof and a manifest sign for people who give thought (Al-Quran, 16:11).

Nature: hot and wet.

Uses: It is useful in peptic ulcer, epistaxis, cold and cough. Oil massage gives strength to the muscles and relieves pain in arthritis, gout, sciatica and paralysis. Unani formulation is *Roghan Shifa*. Olive is a small growing ever green tree. Ripe fruit contains largest amount of oil. It contains arachidic acid, olein and fatty acid (Rahman, 1996).

Fizzah

Silver, Argentum

Fizza is mentioned more than once in Holy Quran.

Text: ‘Beautified for the people the lust of which they desire from women and sons, heaped up sums of gold and silver, fine branded horses and cattle, and tilted land’ (Al-Quran, 3:14).

Two drugs are mentioned in this verse: *Fizza* and *Zahab*.

Fizza is a soft white precious univalent metallic element having the highest electrical and thermal conductivity of any metal; occurs in argentite and in free form.

It is used after purification in the ointment to cure scabies, ulcer and wounds. Silver leaves used for decoration of *Khameerajat*.

Silver leaves are Cardio tonic, stomachic, cerebral tonic.

Nature: cold and dry (Ibn Sina, 1593).

Unani formulation: *Maul-Fizzah.*

Zahab

Gold, Aurum

Zahab is mentioned more than once in Holy Quran

Text: 'Trays of gold and cups will be passed round them, (there will be) therein all that the inner-selves could desire, and all that the eyes could delight in' (Al-Quran, 43:71).

It is a soft yellow malleable ductile (trivalent and univalent) metallic element; occurs mainly as nuggets in rocks and alluvial deposits; does not react with most chemicals but is attacked by chlorine and aqua regia. Gold is the ornament of life.

Action: *Muqawwi Aaza- Raisa and Moharrik Hararat Ghareezia*.

Ibn Sina mentioned that it is included in the drugs used for Daul Hayya and Daul Thalab (Alopecia), eye diseases, heart and palpitaion. (Ibn Sina, 1593) Research has shown that gold has an adaptogenic and nootropic activity. (Ahmad, A. 1998)

Nature: Lateef Motadil (Ibn Sina, 1593).

Unani formulation: *Mauz-Zahab* (Ahmad, 1998).

Habbat-us-Sauda

Shoneez, Kalonii, Black Cumin,

(*Nigella sativa* Linn.)

Text: Bukhari and Muslim reported that the Prophet had said 'Use this *Habbatus-Sauda*, as it is the panacea that cures all diseases except death' (Ibn Al Qayyim, 2005).

Habitat: An annual erect herb of the Mediterranean region having pungent seeds used like those of caraway.

Nature: hot and dry (Ibn Sina, 1593).

Actions: It is anti-inflammatory, carminative, stomachic, expectorant, emmenogogue, anthalmintic, nervine tonic, analgesic.

Medicinal uses: Hysteria, common cold, asthma, constipation, urine blockage, anorexia, aerophagy, flatulence, dyspepsia, gastric acute, gastro enteritis, dog bites, diabetes, kidney stone, milk production, baldness, gas trouble, brain disorders, pneumonia, cough, maleness, appendicitis, labor pain, facial clearness, pimples, fatness, typhoid, piles, swelling, weakness, eczema, diarrhea, malaria, digestive disorders, allergy, wound healer, hearing problems, ear pain and swelling, paralysis, heart diseases, antiperistalsis, intestinal worms, liver pain, waist pain, sexual weakness, common fever, ascites, ulcerative colitis, crohan`s diseases, It is also used in colic pain, arthritis, paralysis, and amenorrhea. It is useful in asthma if taken with natrium (Ibn Sina, 1593). *Kalonii* oil is used in vitiligo, eczema, pimples and other skin diseases. It is also useful in diabetes mellitus. It contains tannin, resin, protein, volatile oil, gum (Mushtaq, 2009; Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997).

Unani formulation: Roghan Kalan

Hareer

Abresham, Silk cocoon

(*Bombyx mori* Linn.)

Hareer is mentioned more than once in Holy Quran.

Text: In paradise they will be adorned with bracelets of gold and pearls and their garments therein will be of *Hareer* (fine silk) (Al-Quran, 22:23).

Three drugs are mentioned in this verse: *Hareer*, *Luloo* and *Zahab*.

Raw silk cocoon are coverings spun by a group of silk moths during their metamorphosis.

Nature: hot and dry (Ibn Sina, 1593).

Actions and uses: It has the action of attenuant and exhilarant and beneficial for eyesight as *Kuhl* (Ibn Sina, 1593) Useful in cardiac disease, athero sclerosis, palpitation, hypotension cough and cold asthma.

Unani formulation: *Khameera Abresham Hakim Arshadwala*.

Constituents: It contains amino acid, nucleic acid, Vitamin A, D and B complex. The cocoon preparation is used in medicine as styptic, cardio tonic, aphrodisiac, expectorant.

Luloo

Marwareed, Pearl)

Text: 'And round about them will (serve) boys of everlasting youth. If you see them, you would think them scattered pearls' (Al-Quran, 76:19).

Luloo is mentioned more than once in Al-Quran. It is an animal origin drug. Pearl mussel has nearly a semi circular shell, greenish, ornamented with the most beautiful nacre within.

Nature: Cold and dry

Actions: Ash of the pearl *(Kushta Marwareed)* is used in heart burn, nervous disease and bilious affection. Pearl is used as prophylaxis of epidemics. After purification pearl is used as stimulant, tonic, and aphrodisiac. It contains calcium and phosphorus.

Unani formulation: *Khameera Marwareed*

Hadeed

Iron, *ferrous*

Hadeed is mentioned more than once in Al-Quran.

Text: "Give me pieces (blocks) of iron" (Al-Quran, 18: 96).

A heavy ductile magnetic metallic element; is silver-white in pure form but readily rusts.

Actions: It is essential part of hemoglobin, plays a role in the transport of oxygen by the blood. Anemia, a well known disease, is caused by deficiency of Iron.

Various Unani formulations of iron are used such as *Sharbat Faulad, Kushta Faulad*.

Henna

Indian myrtle

(*Lawsonia inermis* Linn.)

Text: Bukhari has reported that *Hazrat Uthman* (RA) narrated we came to *Umm Salma* (May Allah please with her), she presented us some of the Prophet's hair that was colored with *henna* and *katam*. (Ibn Al Qayyim, 2005).

Here two drugs are mention in Hadith: *Hinna* and *Katam*.

It is written in Al-Qanun that the name '*Falizahraj'* is translated by some scholar as '*Henna'* (Ibn Sina, 1593).

Henna is cultivated chiefly as a hedge and garden plant.

Action: It is anti-septic, deodorant, blood purifier, detergent, astringent, tonic to the hair, highly beneficial against ulcer and other skin diseases. Leaves are used to stain hair and skin for fragrance and cosmetic. It contains tannin, resin, oil, and glycoside.

Parts used: leaves, bark, flower, seeds.

Katam

Indigofera aspalathoides Vahl.

Text: Bukhari has reported that *Hazrat Uthman* (RA) narrated we came to *Umm Salma* (May Allah please with her), she presented us some of the Prophet's hair that was colored with *henna* and *katam* (Ibn Al Qayyim, 2005).

Root is chewed as remedy for toothache. A preparation is made from the ashes of the burnt plant which is used to clean dandruff of the hair.

Action: Bitter, anti-septic, disinfectant.

Idhkhir Makki, Lemon Grass

(*Cymbopogon jwarancusa,* Schult)

Text: Bukhari has reported that 'the Prophet prohibited uprooting any plant of Makkah due to sanctity of this place except *Idkhir*, because it is used for decoration and aroma' (Ibn Al Qayyim, 2005).

This is a fragrant grass which is indigenous to India. Dioscorides mentioned it is of two kinds one without fruit and other with a black fruit (Ibn Sina, 1593).

Actions: digestive, diuretic, aromatic, anti-emetic, diaphoretic, anti-spasmodic, stimulant. It is used in the form of infusion in fever, irregular menstruation, colic, flatulence, swelling of liver and stomach.

Nature: Hot and dry.

It contains essential oil which is carminative and tonic, oil is also used in perfumery which is known as Rusa oil.

Unani formulation: *Majun-Dabeedul-warad*, *Roghan Mujarrab*

Kafoor

(*Cinnamomum camphora* Nees & Eberm.)

Text:

'Indeed the righteous will drink from a cup whose mixture is of *Kafoor'.* (Al-Quran, 76:5)

It is obtained by distillation of the wood with water.

Nature: cold and dry (Ibn Sina, 1593).

Action: Diaphoretic, stimulant, anti-septic, anti-spasmodic, carminative, analgesic, anti-poison, brain tonic. It is used to relieve the pain in pneumonia, pleurisy and headache. Useful in stomatitis, conjunctivitis and heart diseases (Ibn Sina, 1593).

Chemical constituent: volatile oil, cymene, campherol.

Unani formulation: *Qurs Tabasheer Kafuri*.

Khardal

Mustard

(*Brassica nigra* Linn.)

Khardal is described twice in Holy Quran as an example for a tiny thing.

Text: “O my son! If it be (anything) equal to the weight of a grain of mustard seed, and though it is in a rock, or in the heavens or in the earth, Allâh will bring it forth (Al-Quran, 31:16).

It is largely cultivated n India for fixed oil which it yields.

Actions: Externally oil is stimulant and mild counter irritant. Internally seeds are emetic, useful in febrile cases and inflammatory swelling, locally applied in sore throat, internal congestion and rheumatism. It is popular edible oil.

Parts used: seeds, leaves, oil.

Nature: Hot and dry.

Chemical constituent: Myrosin, glycoside, sinigrin.

Kabath

Peelu, Arak Tree

(*Salvadora persica* Linn.)

Text: Bukhari and Muslim have reported that *Jabir* (RA) said ‘We picked the *Kabath* (arak fruit) with prophet when he told us ‘pick the black fruit; it is the most delicious’ (Ibn Al Qayyim, 2005).

Nature: hot and dry.

Action: *Kabath* is digestive, stomachic, and expectorant, diuretic. It is useful for back pain. It is found in *Hijaz* region.

Marjan

Coral, *Corallium rubrum* (Linn.)

Marjan is mentioned more than once in Al-Quran.

Text: 'From both of the ocean, emerge *luloo* (pearl) and *marjan* (coral)' (Al-Quran, 55:22).

Two drugs are mentioned in this verse: Marjan and Yaqut.

Marjan is also an animal origin drug. It acts as cardio tonic, styptic, general tonic, nerve tonic and expectorant. It is used in palpitation, restlessness, cardiac weakness, general debility, cough, hemorrhage, diarrhea and leucorrhea (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997)

Nature: Cold and dry. *Marjan* contains carbonate, magnesium and iron.

Unani formulation: *Kushta Marjan*

Yaqoot

Ruby

Text: 'As if they were *Yaqoot* (Rubies) and *Marjan* (coral)' (Al-Quran, 55:58).

Yaqut is a mineral origin drug. It is used as general tonic, cardio tonic, aphrodisiac and anti-dote to the poisons.

Nature: Hot and dry

Unani formulation is *Yaqooti*.

Musk

Moschus moschiferus Linn.)

Text: 'They are provided with a drink of pure beverage which was sealed with Musk'. (Al-Quran, 83:26).

Muslim has reported that The Prophet had said 'The best perfume is Musk' (Ibn Al Qayyim, 2005).

Musk producing animal (Musk deer) is found generally in china, Russia, Assam. Musk proper is an inspissated and dried secretion from the perpetual follicle of the male musk deer.

Musk has a powerful odor, acts as stimulant, anodyne, anti-spasmodic, cardio-tonic, expectorant, diaphoretic, laxative, anti-septic, aphrodisiac, *Muqawwi Aaza- Raisa*, and anti-dote to epidemic, nervine tonic. It is used in paralysis,

general debility, impotence, palpitation and cardiac disease. Musk contains ammonia, cholesterol, fat, wax, gelatinous matter, albumin, potassium, sodium, calcium, volatile oil. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997).

Nature: Hot and dry

Unani formulation: *Dawaul-Misk Motadil*.

Mann

Tamarix mannifera Medic*; Alhagi maurorum* Bunge

Text: 'And we shaded you with clouds and sent down to you *Mann* and *Salwa* (Quails); eat from the good thing which we provided you (Al-Quran, 02:57).

Many scholars say that *Mann* was a natural delicious diet obtained from the plant, called *Turanjabeen*. It was gifted to Israelites.

Action: It acts as laxative, diuretic, expectorant, aphrodisiac and nutritious. Mann contains monosaccharide, fructose and carbohydrate.

Qitr, Nuhas

Copper, Cuprum, Brass

Qitr and *Nuhas* bothe are mentioned in Holy Quran in following verses.

Text: '*Wa-asalna lahu ainal-qitr'* (Al-Quran, 34:12).

We made flow for him a fountain of *Qitr* (molten brass or liquid copper).

There will be sent against you both, smokeless flames of fire and *Nuhas* (molten brass), and you will not be able to defend yourselves (Al-Quran, 55:35).

It is a composition of several medicine used for heart disease, skin disease, gout, rheumatism. Owing to its anti-septic qualities ancient Indians preserved water in bright copper vessels. Copper is an element found in human body naturally.

Action: astringent, sedative, anti-spasmodic, ant-septic. Modern researchers have shown colloidal copper to be useful in cancer. It diminishes pain and produces marked improvement in vision (Ibn Sina, 1593).

Nature: Hot and dry (Ibn Sina, 1593).

Unani Formulation: *Kushta Tanba.*

Qust Bahri

Costus Root, Maritime Costus

(*Saussurea lappa* C.B., Asteraceae Clarke)

Text: Bukhari and Muslim have reported that the Prophet said 'Your best remedies are the *Hajama* (cupping) and *Qust Bahri* (Ibn Al Qayyim, 2005).

Qust Bahri is the root of a plant. It is of three kinds described by Dioscorides one is white from Arab second is black from India and third is from Syria (Ibn Sina, 1593).

Nature: Hot and dry (Ibn Sina, 1593).

Action*: Muqawwi aaza- raisa* (tonic to vital organs), expectorant, anti-spasmodic, analgesic, carminative, anthalmintic, diuretic, anti-pyretic, resolvent, aphrodisiac, blood purifier and anti-septic. It is useful in arthritis, paralysis, cough, asthma, ascitis and splenomegaly. It is applied locally on ulcer, wounds and in pain, inflammation and skin diseases. It contains volatile oil, sausserine, glycoside, potassium nitrate, manganese (Usmani, 2008).

Unani formulation: *Roghan Qust, Jawarish Jalinus.*

Raihan

Sweet Basil

(*Ocimum sanctum* Linn)

Raihan is mentioned at two places in Quran.

Text: 'For him (in heaven) is a garden of pleasure and *Raihan* (scented plant)' (Al-Quran, 56:189).

Bukhari and Muslim have reported that Prophet Mohammad (PBUH) said 'The one, who is offered *Raihan*, should not return it as it is light and perfumed' (Ibn Al Qayyim, 2005).

It is small annual shrub or herb is cultivated in gardens of India.

Parts used: Herb, leave, seeds.

Action: anti-septic, diaphoretic, stimulant, demulcent, carminative, aphrodisiac and diuretic. It is useful in cough, diarrhea, gastric ulcer, piles, inflammation, spematorrhea and dysentery. It is used in aroma therapy. Leaves are fragrant and aromatic. Root is febrifuge and antidote to snake poison. It is planted near temple for sanctity and disinfection. Herb basil (sweet basil), classified as Ocimum basilicum, are popular as an alternative to standard Western

allopathic medicine for a variety of problems, including cleansing the blood, tension as well as lowering blood pressure (Rahman, 1996).

Ocimum basilicum benefits: It acts as lowering blood pressure, anti spasmodic, easing tension, general detoxifier, cleansing the blood, lowering blood sugar levels, lowering stress levels, anti inflammatory, lowering cholesterol, can be used as an “adaptogen”.

Nature: Seeds: cold and dry, leaves: hot and dry

Chemical constituents: It contains mucilage, terpen, thymol, Eugene, essential oil.

Unani formulation: *Arq-Chobcheeni, Arq-Amber*.

Senna

(*Cassia angustifolia* Vahl)

Text: Ibn-Maja has reported that the Prophet has said ‘Resort to *Senna* and *Sanut* because here is a healing from every disease except death’ (Ibn Al Qayyim, 2005).

Actions: laxative, deobstructive (*mufatteh sudad*), blood purifier, anthalmintic. It is used in constipation, fever, arthritis, asthma. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997)

It contains cathartic acid, emodine, Ca oxalate.

Unani formulation: *Itrifal Usto Khuddos*

Sidr

Cedar (*Cedrus libani* Loud.)

Sidr is mentioned in Quran at four places.

Text: ‘The companions of Right will be among *Sidra* trees with thorns removed’ (Al-Quran, 56:189).

Sidr mountain tree from the Mediterranean Sea belongs to the species Taxus, one of the large trees and the wood is solid and strong and is said to be resistant to insect pests and termites.

It is used in fever, flatulence, dropsy, rheumatism, piles, and diarrhea and in snake bite. It contains gum, essential oil.

Teen

(*Ficus hispida* Linn.)

Text: Allah swears by *Teen* and *Zaitun* (Al-Quran, 95:1). A chapter is named after *Teen* because of its advantage and benefits.

Habit and Habitat: An erect branched cultivated tree, found in Central Asian countries. (Mushtaq, 2009) The best fruit is white then red and then black (Ibn Sina, 1593).

Actions: Avicenna described *Teen* in detail (Ibn Sina, 1593). It is used in sore throat, ulcer, gout, piles. Fig is easy for digestion and drug of choice for habitual constipation. It acts as emollient, cooling, laxative, demulcent, aphrodisiac and nutritive.

It contains protease, amino acid, tyrosine, sugar, gum, fat, and enzyme. Figs have been found to be brimming with minerals like magnesium, manganese and zinc and also Vitamin E. All of them can do wonders to spice up sex life. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997)

Nature: Hot and moist (Ibn Sina, 1593).

Unani Formulation.: *Majun Injeer, Sharbat Injeer*

Ood Hindi

Eagle Wood

(*Aquilaria agallocha* Roxb.)

Text: Imam Ahmad reported from Umm Qais that prophet had said 'Resort to the Indian Wood as it encloses seven remedies, among which the cure of pleurisy' and *Muslim* reported that *Abdullah bin Umar* used to perfume himself by burning the Agar in a brazier mixed with camphor and he said 'in this way The Prophet used to perfume himself (Ibn Al Qayyim, 2005).

Actions: Nerve and brain tonic, anti-septic, expectorant, cardio tonic, stomachic, appetizer, digestive, mouth freshener, aphrodisiac. *Agar* is used in dyspepsia, loss of appetite, nausea, vomiting, diarrhea, ascitis, spermatorrhea, premature ejaculation. It contains volatile and fixed oil, resin. It is burnt to repel the worms and for disinfection. (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997).

Nature: hot and dry.

Unani formulation: *Jawarish Ood sheeri.*

Warss

(Flemingia grahamiana Wight and Arn)

English Name: Memcylon (Tintura)

Local Name: Kamaila

Arabic Name: Warss

Family: Fabaceae

Habit and Habitat: Tree

Distribution: Sudan, Yemen and Sri Lanka

Part used: Leaves extract

Text: Imam Tirmidhi reported 'The prophet prescribed the oil and the *Warss* (Ceylon cornel) against pleurisy' and Umm Salma (R A) narrated that we applied Warss on our face during forty days of puerpurium to rid off the freckle' (Ibn Al Qayyim, 2005).

A plant resembling sesame, peculiar to Arabia, of which a wash for the face is prepared. Avicenna describes it is a red substance resembling to Saffron and procured from Yemen. (Ibn Sina, 1593).

Action: Astringent, used for cosmetics, beneficial in scabies, alopecia itching, swelling, papules, *Quba, Kalf o Namash* and Freckle, (A small brownish spot of the pigment melanin on the skin)

Medicinal uses: Tuberculosis, throat infection, constipation, eczema, piles, leukoria, swelling, germicides, kidney and urinary bladder stone and hysteria (Mushtaq, 2009).

Nature: Hot and dry in 2nd grade (Ibn Sina, 1593).

Yaqteen

White Pumpkin, Gourd

Lagenaria vulgaris Seringe

Text: 'And we caused to grow over him a tree of *Yaqteen'* (Al-Quran, 37:146).

Prophet Younus (PBUH) was blessed with tree of *Yaqteen*, which is known to give cooling shade and to be a repellent of flies.

It is good vegetable, seeds are diuretic, nutritive. Oil is cooling, emollient and used in headache.

Parts used: seed, seed oil, pulp of the fruit. Chemical constituents: albumin, carbohydrate, fiber, saponin, pectin, calcium, potasium, iron, iodine, phosphorus, vitamin B and C.

Zanjabeel

(*Zingiber officianale* Rosc.)

Text: 'They will be given to drink a cup which flavor is of *Zanjabeel*' (Al-Quran, 76:17).

Zanjabeel is cultivated in many parts of India and is described by Dioscorides.[7]

Nature: Hot and Dry (Ibn Sina, 1593).

Actions: It is aromatic, carminative, digestive, rubefacient, aphrodisiac, expectorant and stimulant to gastro intestinal tract. It has a lot of benefit, used in neuralgic pain and productive cough. We Indians are fortunate that purely Indian origin plant has found a place in Holy Quran.

It is the classic medicine for dealing with many digestive disorders. Ginger promotes *Hararat Gharazi* (digestive and metabolic heat), thus promoting digestive heat burning toxins and removing and lowering cholesterol deposits. Ginger is a pungent herb par excellence; we may call ginger as being stimulating carminative for digestion (Al-Damashqi, 1987; Antaki, 1923; Razi, 1967; Saeed, 1997).

It contains volatile oil, resin, starch and gingerin.

Unani formulation: *Jawarish Zanjabeel*.

Zareera

Chiraita Chirata

(*Swertia chirata* Buch., Gentianaceae)

Texts: Bukhari and Muslim reported that *Ummul momineen Ayesha* (RA) narrated 'I applied *Zareera* as a perfume to the Prophet during his last pilgrimage at the time of putting on *Ehram* and out of it' (Ibn Al Qayyim, 2005).

Nature: hot and dry.

Action and uses: It is bitter, blood purifier, anti-pyretic, diaphoretic, tonic to stomach and liver, appetizer, carminative, anthalmintic. Its decoction is useful in skin disease, scabies, and flatulence, loss of appetite, dyspepsia, diarrhea, and fever. *Zareera* is useful for swelling of stomach, intestine and liver and ascitis (Ibn Sina, 1593, Usmani, 2008).

It contains chiratine, rofalic acid, bitter substances, and carbonates.

Zareera is also reported to be *Acorus calamus* which is used for cosmetic purpose on skin also (Mushtaq, 2009).

Zaqqum

(Euphorbia resinifera Berg., Euphorbiaceae)

Text: It is described at three places in Quran as the food of sinful persons in hell.

It acts as strong purgative, of bile and phlegm, causes abortion in women. It is poisonous plant.

Zaqqum contains resin, euphorbol, mucilage, starch.

Samak

Fish

Ibn Maja and Imam Ahmad reported from Abdullah ibn Umer that prophet has said

'Two dead animals and two bloods are permitted to eat for us: the Fish and *Jarad* (Locust), the liver and the spleen' (Ibn Al Qayyim, 2005; Asqalani, 2008).

Nature: Cold and moist but some fish are hot in nature (Ibn Sina, 1593).

Actions: creates phlegm, useful in *Wajaul-warak* (hip joint pain), clears voice and cleanses trachea, prevents haemptysis (Ibn Sina, 1593).

Heart: Fish is thought to protect the heart because eating less saturated fat and more Omega-3 can help to lower the amount of cholesterol and triglycerides in the blood – two fats that, in excess, increase the risk of heart disease. Omega-3 fats also have natural built-in anti-oxidants, which are thought to stop the thickening and damaging of artery walls. Regularly eating fish oils is also thought to reduce the risk of arrhythmia – irregular electrical activity in the heart which increases the risk of sudden heart attacks.

Brain functionality: 10-12% of the human brain is composed of lipids including the Omega-3 fat DHA. Recent studies suggest that older people can boost their brain power by eating more oily fish, with regular consumers being able to remember better and think faster than those who don't consume at all. Other research has also suggested that adding more DHA to the diet of children with attention-deficit hyperactivity disorder can reduce their behavioral problems and improve their reading skills, while there have also been links suggested

between DHA and better concentration. Separate studies have suggested that older people who eat fish at least once a week could also have a lower chance of developing dementia and Alzheimer's disease.

Joint benefits: Including fish as a regular part of a balanced diet has been shown to help the symptoms of rheumatoid arthritis – a painful condition that causes joints to swell up, reducing strength and mobility. Studies also show that sufferers feel less stiff and sore in the morning if they keep their fish oil intake topped up.

Recent research has also found a link between Omega-3 fats and a slowing down in the wearing of cartilage that leads to osteoarthritis, opening the door for more research into whether eating more fish could help prevent the disease. (Faruqi, 1997; Ghaznavi, 1997).

Minerals: Fish is high in minerals such as iodine and selenium, which keep the body running smoothly. Iodine is essential for the thyroid gland, which controls growth and metabolism, while selenium is used to make enzymes that protect cell walls from cancer-causing free radicals, and helps prevent DNA damage caused by radiation and some chemicals. Fish is also an excellent source of vitamin A, which is needed for healthy skin and eyes, and vitamin D, which is needed to help the body absorb calcium to strengthen teeth and bones.

Conclusion

Al-Quran, the main source of the Islamic faith, is a book believed by Muslims, to be of completely Divine origin. It contains Divine guidance for all humankind.

The Quran invites all humans to reflect on the creation of this universe in the verse:

"Indeed in the creation of the heavens and the earth, and the alternation of night and day there are signs for the people of understanding, who remember Allah while standing, sitting and lying on their sides and contemplate about the creation of the heavens and the earth, saying, our Lord you did not create these aimlessly, Exalted are you, then protect us from the fire of Hell" (Al-Quran 3:190).

A close look at checklist of medicinal flora tells us that some of these plants are not of Arabic origin but The Holy Prophet (PBUH) gave the references of such plants that are not only grown in Arab countries but exist through out the world. This shows that the Holy Prophet was sent for the entire world. From this study it is found that *Phoenix dactylifera* (Date palm) has highest number

of references in The Holy Quran. This plant is a complete diet having nutritional and medicinal values as it is used for digestive problems, piles, sexual diseases and heart attacks.

The scientific evidences of the Quran clearly prove its Divine origin. No human could have produced a book, fourteen hundred years ago, that would contain profound scientific facts, to be discovered by humankind centuries later.

Scientists of various disciplines and research scholars may utilize the knowledge of different branches of medical sciences cited in the texts.

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Clinical Study of '*Wajul-Fiqaria Unqi*' (Cervical Spondylosis) and Efficacy of '*Safoof-e-Suranjan*' and '*Habb-e-Gul-e-Aakh*' along with Exercise and Massage with '*Roghan-e-Baboona*'

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Abstract

Degenerative disorder of some types at a certain point of life is a universal ageing phenomenon but with changing lifestyles, the number of population suffering with such an ailment is on rise. Cervical Spondylosis is one of them. Apart from the fact that almost each and every ancient Unani Literature has occupied a vast space describing degenerative form of arthropathies, none of them have documented the specified degeneration of cervical spine. Unani Medicine is one of the best complementary healing systems which comprises of *Ilaj-bid-dawa, Ilaj-bil-ghiza* and *Ilaj-bil-Tadbeer*. The management of various arthropathies with the help of above said modalities is well documented in literature of unani medicine. The present study was carried out on cases of cervical spndylosis, selected from OPD/ IPD section of AKTC Hospital. *Habb-e-Gul-e-Aakh* and *Safoof-e-Surenjan* were advised to the patients with massage with *Roghan-e-Baboona* and neck exercises. The results were quite encouraging and found highly significant in case of pain, stiffness, neck & shoulder movement and headache ($p<0.001$) while in associated features like giddiness/vertigo and nausea/vomiting, it was significant ($p<0.05$), the inflammatory feature like local swelling and tenderness were also reduced to significant level. The safety studies regarding test drugs were also carried out to access any side effects of the drugs on various systems of the body at different parameters i.e. LFT, RFT, Blood Sugar and it was found that used drugs did not produced any adverse effect on body. ($p> 0.05$)

Keywords: Wajul-Fiqaria Unqi, Cervical Spondylosis, Habb-e-Gul-e-Aakh, *Safoof-e-Suranjan, Roghan-e-Baboona*.

Introduction

'Wajul-Fiqaria Unqi' (Cervical spondylotic myelopathy) is the most common cause of non-traumatic spastic para-paresesis and quadriparessis. On the basis of radiological findings 90% of men and women older than 50 years and 60 years respectively have evidence of degenerative changes in their cervical spine (Wilson, 2012). The term Spondylosis is derived from two Greek words; Spondylo means vertebra and Osis means condition (Thomas, 1993; Dorland, 1995). Though there is no specified term for cervical Spondylosis in ancient Unani literatures but technically it can be termed as "*Wajul-Fiqaria Unqi*".

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According to Unani concept "*Waja-ul-Unqi* usually takes place after cold exposure and prolonged abnormal posture of the neck during sleep. It causes contraction of the *Qasiyah Hilmiyah* (neck muscles). The neck pain is usually unilateral and aggravated by coughing, laughing, and head movements (Alkirmani, 1969). In Unani Medicine the pathogenesis of *Wajul-Fiqaria Unqi* resolves around one of the basic pathological factors *Soo'e Mijaz Sazij/ Soo'e Mijaz Maddi.*. In case of *Soo'e Mijaz Sazij*, there is derangement of temperament of the affected part that is why it becomes painful without any swelling or inflammation (Ahmad, 1980; Ibnesena, 1303 H; Jamaluddin 1906). In case of *Soo'e Mijaz Maddi*, *Balgham* predominates, *Dam* and *Safra* are next to it and quite rarely *Sauda* is involved (Ahmad, 1980; Ibnesena, 1303 H; Jamaluddin, 1906; Jurjani, 1878). Samerqandi pointed out that the ailment is the result of weakening of the joints and pouring of a specific material within the joints (Alkirmani, 1969).

According to modern medicine, in spondylosis of the cervical spine, the initial degenerative alterations are suspected to occur within the inter-vertebral discs leading to secondary changes in the surrounding facet joints and soft tissue structures (Chapman, 2000). The degenerative process is generally considered to occur first in the articular cartilage of inter-vertebral discs and then the other structures of the joints get involved. This wear and tear phenomenon is attributed to repetitive micro traumas to cartilage from sustained loading on the bone (Donatelli *et al*., 1994).

The principle of management in Unani Medicine is based on acuity & chronicity of the disease and nature of humors involved. Drug therapy consists of appropriate systemic administration of single drugs or compound formulations as well as local applicants to relieve the pain and reduce the inflammation. For this purpose, *So'o-e-Mizaj Sazij* is corrected by appropriate measures while *So'o-e-Mizaj Maddi* is corrected by *Nuzj wa Tanqiya*. *Tahleel-e-Warm wa Taskeen-e-Alam* is achieved by *Muhallilat-e-Warm* and *Mussakinat-e-Alam* drugs ((Alkirmani, 1969; Ibnesena, 1303 H; Jamaluddin, 1906; Jurjani, 1878; Razi, 2004; Gazrooni, 1233H). Apart from drug therapy, *Ilaj-bit-tadbeer* is also an important part of disease management that consists of *Riyazat* (Exercise) and *Dalak* (Massage) (Bagdadi, 2005; Jamaluddin, 1954; Ibnerushd, 1987).

Material and Methods

The present study was carried out on 34 patients selected from Moalejat section of Ajmal Khan Tibbiya College Hospital, Aligarh Muslim University, Aligarh. The individual assessment was done on the basis of history,

examinations, and investigations. This study was done on patients provisionally diagnosed as cervical spondylosis and fulfilling all the inclusive and exclusive criteria. All the patients were advised to take two tablets of *Habb-e-Gul-e-Aakh* (Table-1) and six gram of *Safoof-e-Suranjan* (Table-1) twice a day after meals with water.

With these medications all the patients were also advised and taught for the massage of neck and shoulders with *Roghn-e-Baboona* (5 ml) for 5-10 minutes twice daily in the morning and evening. Patients were also advised for the neck and shoulder exercises i.e. neck flexion, neck extension, lateral flexion, rotation of the neck, shoulder shrugs and retractions. These exercises were advised to be done 5-10 times regularly in the morning and evening. The duration of the study was 45 days and the follow up of each case was carried out at the interval of 15 days. The individual assessment was done on the basis of history, examinations and investigations. The observations were noted down in a case report form. The result were accessed on the following criteria

1. Reduction in pain of neck, shoulder and head
2. Reduction in neck stiffness and improvements of movements of neck
3. Reduction in inflammation
4. Reduction in myelopathic and radiculopathic symptoms (if any)
5. Reduction in nausea, vomiting, blurred vision and giddiness

The safety studies regarding test drugs were also carried out to access any side effects of the drugs on various systems of the body at different parameters i.e. Liver Function Test (LFT), Renal Function Test (RFT). The data were tabulated and analyzed by applying 'z' test.

Observations and Results

The patients selected for the study on cervical spondylosis were divided in to three age groups. It was observed that maximum number of cases i.e. 15 patients belonged to age group of 30-45 years. The other age group i.e. 45-60 years was next to it with 11 patients, while 08 cases were found in age group of 15-30 years (Table-2). An association with a particular age is the hallmark of many diseases and degenerative cervical spine disease is one of them. Cervical spondylosis is an ageing disorder which usually affects people over the age of 40 years (Wilson, 2012; Skinner, 2003; Turek *et al*., 1994). As shown in the table, $¾^{th}$ of the cases included in our study were beyond 40 years of age.

During the course of the study all patients were divided into four groups according to their temperament. The temperament of the patients was

accessed on the basis of *Ajnas-e-Ashra* and it was recorded that maximum number of patients i.e. 22 (64.7%) cases were of phlegmatic temperament, 08 (23.53%) and 04 (11.77%) cases of sanguineous and Bilous temperaments respectively while there was no case of Melancholic temperament (Table-3). The pathogenesis of most of the diseases in Unani medicine is described in terms of alterations of humor's quality and quantity and most of the Unani physicians have clearly associated pathogenesis of *Waja-ul-mafasil* with phlegm (Alkirmani, 1969; Ibnesena, 1303 H; Jamaluddin, 1906). According to the Unani literature, next to the phlegmatic temperament, patients with sanguineous and bilious temperaments respectively are more prone to suffer with *Waja-ul-mafasil*. In present study most of the cases were from phlegmatic temperament and thus the data observed in this study is in the favors of this description.

According to literature upper cervical segments are the site of inflammation while the lower segments are usually diseased by degenerative afflictions. In our study the maximum numbers of X-rays of cervical spine had showed degenerative changes in the inter-vertebral discs between C5 and C6 followed by C6-C7 and least in C4-C5 (Table-4).

Depending upon radiographic changes in the X–ray of cervical spine, patients were categorized in to two groups' viz., cases with Early Cervical Spodylosis and cases with Marked Cervical Spodylosis (Table-5). In the present study feature of Early Cervical Spodylosis were found in 30 (88.23%) while 04 (11.77%) cases have shown features of Marked Cervical Spodylosis. It is also quite in accordance of medical texts (Skinner 2003, Turek et al 1994).

According to literature available in Unani as well as Modern Medicine, arthropathies show seasonal aggravation and their prime features like pain, stiffness and hampered movements get worsened in winter. *Galen, Avicena, Rhazes* and *Ibn-e-Nafees* have mentioned the cold exposure is suppose to be predisposing/aggravating factor regarding its pathogenesis and advised its avoidance as a prime preventive measure (Alkirmani, 1969; Jamaluddin, 1906; Razi, 2004). In our study it was observed that 18 (52.94%) cases experienced aggravation in clinical features in winter which is a strong support of above saying. Furthermore it was also observed that this seasonal aggravation of clinical presentation was more in elder age group patients i.e. above the age of 40 years (Table-6).

The efficacy of drugs and improvement by *Ilaj-bit-Tadbeer* was accessed on the basis of improvements in typical clinical symptoms and signs of cervical spondylosis. Neck and shoulder pain, stiffness and restricted or painful

movements were principal presenting features of the disease (Table-7). On the commencement of this study neck/shoulder pain, and neck/shoulder stiffness were present in 34 cases and at the end of the study there was a highly significant improvements in these symptoms. Neck/shoulder pain, and neck/shoulder stiffness were reduced in 24 cases i.e. 70.58% improvement ($z=6.1$, $P<0.001$) and 23 cases i.e. 67.64% improvements ($z=5.9$, $p<0.001$) respectively at the end of the study. Restricted and painful neck movements were positive in 28 cases at the beginning which was reduced to 09 with 67.85% improvements and $z=5.7$, $p<0.001$. This showed highly significant improvement in restricted and painful neck movements.

Other complaints of the disease were headache, pain and numbness in arms. At the beginning there were 24 patients with complaints of headache, which got down to 03 cases only at the end of the study. Statistical analysis showed this improvement as highly significant ($z=5.1$, $p<0.001$). Pain in arms was significantly minimized from 18 to 06 cases with 66.66% improvement i.e. $z = 3.0$, $p<0.01$ while complaint of numbness in arms was reduced to 04 cases from 07 cases (42.85% improvements). Due to smaller number of cases of numbness in arms statistical analysis could not be done.

Local examinations of the neck for the cardinal signs of inflammations were done on commencement of the study and at every follow up. At 0 day of the study 12 patients showed swelling which was reduced at 45th day as 04 patients. There was a 66.66% improvement in this sign after completion of the study. Statistical analysis ($z=2.3$, $p<0.05$) showed result significant. Likewise there was 50% improvement at the end of 30^{th} day and 65.62% improvement in the local tenderness at the end of the study. Statistically this result was also very significant ($z=5.2$, $p<0.001$). On examinations, 04 cases showed redness and 06 cases showed raised local temperature which got improved to 100% at the end of the study in both but due to the smaller number of cases statistical analysis could not be done.

Most of the anti-inflammatory and analgesics of synthetic origin are said to be hepato/nephrotoxics but clinically there is no evidence with most of the herbal drugs. Hence to evaluate this undesired property of the test drugs on liver, Liver Function Test (LFT) which include Serum Bilirubin, AST, ALT and Serum Alkaline phosphitase and Renal Function Test (RFT) which include Blood Urea and Serum creatinine were done at the commencement of the study and at the end of the study (Table-8).

At 0 day of the study the mean Serum Bilirubin was 0.76 ± 6.2 which got reduced to 0.75 ± 0.12. On applying paired t test it was found that effect

of drugs on this parameter was insignificant (t=0.6, p>0.05). The mean AST before treatment and after treatment was 23.9 ± 6.2 and 24.0 ± 6.1 respectively. The statistical analysis showed that t = 0.5 and p>0.05 i.e. insignificant effect. The mean ALT was 19.0 ± 4.6 at 0 day of the study which got reduced to 18.6 ± 4.3 at the end of the study. Statistically this effect was also insignificant (t=0.5, p>0.05). Likewise the value of Serum Alkaline phosphates before and after the study was 10.3 ± 3.1 and 9.8 ± 2.4 respectively. Statistical analysis of this parameter also showed t = 0.7 and p>0.05. It means the test drugs have no effect on Serum Alkaline phosphates. Similarly the out come of the RFT at the end of the study also did not showed any kind of undesired effect on the kidney (p<0.05).

Table 1: Showing ingredients of *Habb-e-Gul-e-Aakh* and *Safoof-e-Suranjan*

Habb-e-Gul-e-Aakh		
Gul-e-Aakh	*Calotropis procera R. Br (Flowers)*	All the four ingredients are taken in equal amount and pills of one gm are made.
Barg-e-Bans	*Bambosa arundinacea Retz (Leaves)*	
Zanjabeel	*Zingiber officinale Rosc (Rhizome)*	
Filfil Siyah	*Piper nigrum Linn. (Fruits)*	
Safoof-e-Suranjan		
Suranjaan Shireen	*Colchium autumnale Linn (Root)*	All the constituents are taken in equal amount and fine powder is formed.
Asgand	*Withania somnifera Dunal (Root)*	
Buzidan	*Pyrithrum indicum Linn. (Stem)*	
Khulanjan	*Alpinia galangal Willd (Root)*	
Chobchini	*Smilax china Linn (Stem)*	
Malkangni	*Celastrus paniculata Willd (Seeds)*	
Zanjabeel	*Zingiber officinale Rosc (Rhizome)*	

Table 2: Distribution of patients according to Age & Sex

Age Groups (in years)	Number of patients & percentage		Total percentage
	Male	**Female**	
15-30	02 (05.88)	06 (17.64)	22.53
30-45	04 (11.76)	11 (32.35)	44.12
45-60	06 (17.64)	05 (14.70)	32.35
Total	**12 (35.29)**	**22 (64.71**	**100.0**

Table 3: Distribution of patients according to the Temperament

Temperament	No. of patients	Percentage
Sanguineous (Damvi)	08	23.53
Bilious (Safravi)	04	11.77
Phlegmatic (Balghami)	22	64.70
Melanchilic (Saudavi)	00	00.00

Table 4: Distribution of patients according to the discs involved

Disc Involved	No. of Patients	Percentage
C4 – C5	04	11.77
C5 – C6	22	64.70
C6 – C7	08	23.53

Table 5: Distribution of patients according to the radiographic changes

Radiographic Changes	No. of Patients	Percentage
Early C. Spondylosis	30	88.23
Marked C. Spondylosis	04	11.27

Table 6: Distribution of patients according to the H/o seasonal variations in symptoms & Sign

Seasonal Variations	No. of Patients	Percentage
Worse in winter	18	52.94
No aggravation	16	47.06

Table 7: Showing effect of the drugs and Ilaj-bit-Tadbeer on the clinical features

Clinical Feature	0 Day	15th Day		30th Day		45th Day		Total improvement %
		No. of patients	Improvement %	No. of patients	Improvement %	No. of patients	Improvement %	
Neck & Shoulder Pain	34	26	23.52	18	47.05	10	70.58	70.58
z = 6.1 (p<0.001)								
Neck & Shoulder Stiffness	34	28	17.64	22	35.29	11	67.64	67.64
z = 5.9 (p<0.001)								
Restricted neck movements	28	22	21.42	16	42.85	09	67.85	67.85
z = 4.7 (p<0.001)								

Headache	24	17	29.16	11	54.16	03	87.50	87.50
z = 5.1 (p<0.001)								
Pain in arms	18	16	11.11	09	50.00	06	66.66	66.66
z = 3.0 (p<0.01)								
Giddiness & Vertigo	14	08	42.85	08	57.14	03	78.57	78.57
z = 2.9 (p<0.05)								
Nausea & Vomiting	13	12	07.69	09	30.76	04	69.23	69.23
z = 2.4 (p<0.05)								
Swelling	12	10	16.66	06	50.00	04	66.66	66.66
z = 2.3 (p<0.05)								
Tenderness	32	29	09.37	18	43.75	11	65.62	65.62
z = 5.2 (p<0.001)								
Numbness in Arms	07	07	00.00	05	28.57	04	42.85	42.85
Redness	02	02	50.00	00	100	00	100	100.00
Raised local Temp.	06	04	33.33	04	33.33	00	100	100.00

Table 8: Showing effect of treatment on Liver and Renal Functions

LFT	Before Treatment (0 day)	After Treatment (45th Day)
S. Bilirubin ± S.D.(mg/100ml)	0.76 ± 6.2	0.75 ± 0.12
t = 0.6 (p>0.05)		
SGOT ± S.D. (IU)	23.9 ± 6.2	24.0 ± 6.1
t = 0.5 (p>0.05)		
SGPT± S.D. (IU)	19.0 ± 4.6	18.6 ± 4.3
t = 0.5 (p>0.05)		
SAP ± S.D. (KU)	10.3 ± 3.1	9.8 ± 2.4
t = 0.7 (p>0.05)		
RFT	Before Treatment (0 day)	After Treatment (45th Day)
Mean Blood Urea ± S.D. (mg/100ml)	28.35 ± 3.67	28.77 ± 3.41
t = 0.2 (p>0.05)		
Mean Serum Creatinine ± S.D. (mg/100ml)	0.80 ± 6.19	0.80 ± 7.86
t = 0.8 (p>0.05)		

Discussion

The significant improvement in the clinical features of cervical spondylitis may be most likely due to the *Habb-e-Gul-e-Aakh* and *Saffof-e-Suranjan*. In Unani Medicine *Habb-e-Gul-e-Aakh* is one of the drugs of choice for almost all the types of *Wajaul Mafasil* and associated neurological disorders. All the four constituents of both compounds are reported to have anti-inflammatory, analgesic and emmenogogue of phlegm. These drugs are well documented in literature of Unani Medicine and also authenticated by several experimental studies of modern researchers (Kabeeruddin, 1967; Rehman, 1980; Nafees, 2004; Ibnebaitar, 2003; Qasmi, 2001).

Riyazat-e-Unqi (neck exercise) is said to be highly effective as it minimizes the friction and loosen the hardened discs and vertebrae and soften overlaying musculature. Apart from strengthening, it softens the para-vertebral tissue to move freely and relieves the pain and stiffness by releasing the pressure exerted by narrow discs over nerve roots. Although there is no evidence of improvement in disc spaces, neck and shoulder exercises are reported to be very helpful in releasing the nerve pressure and facilitate the active as well as passive neck/shoulder movements thus minimizing the presenting clinical features (Ibnerushd, 1987; Hollis, 2006; Meena, 2006). Similarly, *Dalak* (Massage) of Neck and Shoulder with *Roghan-e-Baboona* proved to be helpful to remove muscle stiffness, local inflammatory features and to allow free movements of cervical spine and shoulders (Ibnerushd, 1987; Hollis, 2006; Meena, 2006). *Roghan-e-Baboona* is well known massage oil for all kind of arthropathies and has been in use since ancient period (Kabeeruddin, 1967; Rehman, 1980).

Conclusion

'Wajul-Fiqaria Unqi' is a degenerative disorder of ageing, and it can be easily managed by judicious use of drugs and *Ilaj-bit-Tadbeer*. The efficacy of the given management in minimizing the suffering of the patients of cervical spondylosis is highly significant. Furthermore our treatment modalities did not show any undesired effect on liver and kidney functions, so it can be said that these drugs are very much safe and can be used without any side effects for a long duration. As in this study the sample size was small, further study should be conducted on a large sample size to elaborate the effects of drugs and *Ilaj-bit-Tadbeer* individually.

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Evaluation of Therapeutic Efficacy of *Dalak* (Massage) in *Aa'iya* (Fatigue)

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Abstract

Fatigue is one of the commonest presenting symptoms in clinical setting which affects daily physical activity and functioning. It is a complex phenomenon in terms of definition, dimension, behavior, measurement and mechanism etc. In Unani medicine it has been described as *Aa'iya* which, primarily occurs as physiological phenomenon due to excessive exertion. *Dalak* (Massage) is said to be an effective regimen in the relief of *Aa'iya*. Although the regimen is used widely in various clinical problems but there are very few documentary evidences to support the claim. This study investigates the efficacy of *Dalak* (Massage) application in *Aa'iya* (Fatigue). It was an open interventional study in which 50 patients were included. After obtaining informed consent the set protocol of *Dalak-e-Isterdad* (Restorative Light Massage) was given for 10 days. *Aa'iya* (Fatigue) was diagnosed through questionnaire based Visual Analogue Scale (VAS) and Fatigue Severity Scale (FSS). The assessments were recorded on 1st, 5th and 10th days. The difference was compared and analyzed statistically for significance.

Keywords: *Aa'iya*, *Dalak –e-Isterdad,* FSS, VAS.

Introduction

Aa'iya (Fatigue) is a common musculoskeletal disorder producing disability in the work performance of an individual. It is defined as a nonspecific subjective feeling of tiredness physically and or mentally (Berrios, 1990). Muscular Fatigue can be defined as inability of the muscles to do further work (Chatterjee, 1987). Physiologically much is known about the impairments that can cause muscle fatigue. It is known that fatigue can be caused by many different mechanisms, ranging from the accumulation of metabolites within muscle fibers to the generation of an inadequate motor command in the motor cortex (Enoka, 2008).

In Unani Medicine *Aa'iya* (Fatigue) is tiredness that causes pain in the *Azlat* (Muscles); the pain is actually caused by *Harkat-e-Kaseera* (Excessive movement or exercise) (Raazi, 1991; Majoosi, 1916; Ibn Sina 2006; Ibn Rushd, 1987). According to the nature of pain four types of *Aa'iya* has been described. *Aa'iya Quroohi* (Ulcerative Fatigue), *Aa'iya Tamaddudi* (Tensive Fatigue), *Aa'iya Warmi* (Congestive Fatigue), *Aa'iya Qashfi* (Dry Fatigue). Since the nature and quantum of pain in all four types of fatigue varies, therefore different types of regimens are used for their management.

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Fatigue is a universal symptom not only associated with most acute and chronic illnesses, but also with normal healthy functioning and everyday life. It is one of the most common complaints of people seen in primary health care (Aaronson *et al*., 1993). Fatigue is prevalent and and an important cause of distress in patients with Rheumatoid Arthritis, Systemic Lupus Erythematosus, Diabetes, Multiple Sclerosis, AIDS and those with undergoing Radiation or Chemotherapy. It is also the primary disturbance in those with Chronic Fatigue Syndrome, a poorly understood condition characterized by unremitting and debilitating Fatigue (Aaronson *et al*., 1993; Tench *et al*., 2000; Pollard *et al*., 2006). Many Chronic illnesses including Cancer are associated with Fatigue (Cella *et al*., 2002). It is a disabling symptom that has been shown to have a substantial impact on patient's self care activities (Rhodes *et al*., 1988) and overall quality of life (Ward, 1999; Rupp *et al*., 2004).

Dalak (Massage) in Unani Medicine is among different regimens of *Ilaj-bit-Tadbeer* which is practiced since ancient times. Ancient Unani physicians have described *Dalak* (Massage) as the treatment of choice to relieve the *Aa'iya* (Fatigue) and also for the restoration of the functions of the organs of the body. Among different types of *Dalak* (Massage) described in Unani Medicine *Dalak-e-Isterdad* (Restorative Light Massage) is said to be highly effective in the management of *Aa'iya* (Fatigue).

In view of the above the present study was designed to evaluate the clinical efficacy of *Dalak* (Massage) in the management of *Aa'iya* (Fatigue).

Methodology

The study was conducted at Z.V.M. General Hospital, Pune from January to July 2009. Ethical Committee of Maharashtra Medical Education and Research Center Pune approved the study protocol. Each subject was fully informed of the experimental procedures and had signed an informed consent statement before taking part in the study.

Inclusion Criteria:

- Patient of either sex.
- Age of the patient ranged from 18 to 50 yrs.
- Cases of *Aa'iya* (Fatigue) confirmed on questionnaire based evaluation (QBE).
- Cases of *Aaiya* (Fatigue) who scored 36 or more on Fatigue Severity Scale (FSS).
- Patients agreed to follow the protocol.

Exclusion Criteria:

Physiological Status:

- Patients below 18 yrs and above 50 years.
- Pregnancy and Lactation.

Pathological Status:

- Hypertension.
- Diabetes Mellitus.
- Cancer.
- Skin ailments, Allergy, Dermatitis.
- Acute Ailments like fever or acute infection.
- Epileptic, History of Tetanic Seizures.
- Cancer induced Fatigue.

Others:

- Cases of recent accidental Injuries.

Target Sample Size: 50 subjects; drop out of 25% was expected and accordingly more patients were registered for the study to get the complete record of at least patients.

Total 63 subjects were registered for the study out of which 50 completed the protocol, while 13 patients dropped out during the study. The subject in the age group of 18-50 yrs who complained pain in the muscles, body ache, laziness, lassitude, weakness, loss of desire to work and unexplained nature of *Aa'iya* (Fatigue) were selected for the study. These cases were further assessed by two widely used scales of Fatigue.

1) Fatigue Severity Scale (FSS) (Portenoy et al., 2009).
2) Visual Analogue Scale (VAS) (Portenoy et al., 2009).

The Fatigue Severity Scale (FSS) is a short questionnaire that helps assess the level of Fatigue. The FSS questionnaire includes nine statements that rate the severity of Fatigue symptoms. Patient reads each statement and circles a number from 1 to 7, based on his agreement or disagreement of the statement. After completing the questionnaire, if the total number scored by an individual on FSS is found to be 36 or more the individual is considered suffering from Fatigue. The questionnaire is as follows:

FSS Questionnaire							
During the past week, I have found that:	Disagree <——> Agree						
My motivation is lower when I am fatigued.	1	2	3	4	5	6	7
Exercise brings on my fatigue.	1	2	3	4	5	6	7
I am easily fatigued.	1	2	3	4	5	6	7
Fatigue interferes with my physical functioning.	1	2	3	4	5	6	7
Fatigue causes frequent problems for me.	1	2	3	4	5	6	7
My fatigue prevents sustained physical functioning.	1	2	3	4	5	6	7
Fatigue interferes with carrying out certain duties and responsibilities.	1	2	3	4	5	6	7
Fatigue is among my three most disabling symptoms.	1	2	3	4	5	6	7
Fatigue interferes with my work, family, or social life.	1	2	3	4	5	6	7
	Total Score:						

Visual Analogue Scale (VAS) is a measurement instrument, usually a horizontal line of 100 mm in length that assesses the impact of Fatigue on daily life from “no influence at all” to “a lot of influence” (Kos *et al*., 2006).

Subjects scored 36 or more on FSS were screened on VAS to measure the impact of Fatigue on the body function. After completing both the parameters the subjects were recruited for the intervention. The subjects fulfilling the inclusion criteria were allocated directly without randomization, after obtaining the informed consent (as there were no groups/subgroups). The assessment of the complaint was made on both the scales on 1st day before starting the therapy so as to have a Base Line Value and further on 5th day and on 10th day of the therapy to determine the change if any. The basal findings of both the scales were compared with the findings observed on 5th and 10th day.

The patients were asked to lie in prone position over the treatment table. The treatment table was reasonably comfortable and easily accessible from both the sides. The entire body of the patient was covered with a sheet and only the part intended to be massaged was kept open. One pillow was placed under the abdomen while, another under the ankle so that the knees are slightly flexed.

The body parts were massaged from distal to proximal direction i.e. peripheral to central as this direction help to improve the lymphatic and venous return and in turn help remove the *Akhalt-e Faseda* (morbid waste and toxins). For the purpose of lubrication and to avoid the friction coconut oil was used.

The procedure was started with effleurage strokes, which were performed with light to moderate pressure coming from the palm of the hand with fingers

slightly bent and thumb spread. Gradually from legs the strokes were put over the thighs in upward direction, while massaging thighs the therapist operates from the either sides of the table. The leg and thighs were massaged for ten minutes. Then the arms from distal to proximal direction and the neck were massaged. The same effleurage were applied over the arms. After arms and neck the back was also massaged for ten minutes with the same effleurage.

The data was depicted as mean, median and percentage form. The absolute reduction was represented as median reduction when the base line findings were compared with the the 5th and 10th day's findings on both the scales i.e. FSS and VAS. Similarly, the percentage reduction was represented as median reduction in comparison between baseline, 5th and 10th day findings on both the scales. Paired 't' test was used to analyze the data. The confidence level was set to be <0.05 for the level of significance of the regimen. The entire statistical analysis was done using statistical package for social science (SPSS version 11.5) for MS Windows.

Results and Discussion

The mean age of the subjects participated in the study was 41.8 ± S.D.6.85 years. The female subjects were 56% while their counterparts were 44% only. The distribution of subjects according to the nature was also determined and it was observed that 72% of the patients were having sedentary life style, 18% were doing moderate physical work and 10% were strenuous workers. On socioeconomic status account, 34 (68%) cases were found to belong to middle income group, followed by high income group who amounted to 12(24%), while the remaining 4(8%) belonged to low income group.

Baseline median observation in FSS and VAS was found to be 52.5 and 23 respectively which reduced to be 28 and 12 on the 5th and 07 and 03 on the 10th day (Table 1 and Figure 1). These observations suggest a significant reduction in *Aa'iya* (Fatigue) as a result of *Dalak* (Massage) among the studied population. The statistical calculations suggest that the said protocol of *Dalak* (Massage) is highly significant ($p < 0.001$).

The percentage median reduction in Fatigue Severity Scale (FSS) and Visual analogue Scale (VAS) on 5th day was found to be -45.6% and -43.3% respectively. The reduction in between 5th and 10th day was -76.7% and -75.0% whereas 10th day median reduction was calculated to be -84.6% and -84.6% respectively (Table 2 Figure 2). Negative value indicates higher FSS and VAS at baseline as compared to follow-up values and vice-versa ($p < 0.001$).

Dalak (Massage) has been described to boost the *Hararat-e-Gharizia* (Innate Heat or Muscular Caloricity) which liquefies the accumulated *Akhlat-e-Faseda* (Morbid waste) and then mobilize them for elimination (Majoosi, 1916; Ibn Sina, 2006; Nafisi1956; Bakhtiar, 1996).The removal of these waste causes in reduction of pain, as these substances are noxious to the tissue and cause continuous irritation and discomfort (Ibn Sina, 2006; Nafisi, 1956). Since the application of *Dalak* (Massage) cause removal of the accumulated wastes which allow muscles to function smoothly.

Dalak prevents accumulation of *Fasid Akhlat* by dispersing it thus assisting the propulsion of waste matters in the channel of excretion and diverting it towards outlets. The manual pressure of *Dalak* (Massage) also increases the blood flow which reduces the anoxic condition present in the tissue, thus Massage not only removes the accumulated metabolic waste but it also nourishes the tissue by increasing the blood flow. Beside this the mechanical movement of massage stretches the individual fibers of soft tissue and their tension, thus strengthens the muscles and tendons and relieves the pressure symptoms (Sinha, 2001; Prentice *et al*., 2002). Therefore it may be inferred that *Dalak* (Massage) has a significant role in the relief of *Aa'iya* (Fatigue).

Table No.4 and Figure No. 3 show the comparative reduction in the first five and second five days of intervention. The first five day's (basal to fifth day -D_1) reduction on FSS and VAS was 31.1% and 31.7%, whereas second five days (fifth to tenth day- D_2) reduction on the same scales was 7.9% and 9.6% respectively ($D_1 > D_2$) demonstrating that the maximum reduction occurred in between base line and 5th day of the treatment (Table 3 Figure 3). The possible reason behind this reduction may possibly be associated with the maximum removal of *Akhlat-e-Faseda* (Morbid waste) in first five days as compared to the second five days. Elimination of the *Akhlat-e-Faseda* (Morbid waste) to the maximum extent in first 5 days helps improve the function of the organs. It is obvious therefore the regimen will induce greater response in first 5 days. It can be suggested therefore that the essential therapy should be given for 05 days and further sitting should be decided on the basis of the degree of symptomatic improvement.

In the light of above mentioned results and discussion it can be concluded that *Dalak* (Massage) is an effective regimen in the management of *Aa'iya* (Fatigue). A minimum 5 days application can improve the condition of *Aa'iya* (Fatigue) significantly.

Table 1: Distribution of FSS and VAS (Absolute)

Scale	Baseline	5th Day	10th Day
Fatigue Severity Scale FSS	52.5 (38.0 – 63.0)	28.0 (13.0 – 43.0)	7.0 (3.0 -22.0)
Visual Analogue Scale VAS	23.0 (14.0 -30.0)	12.0 (4.0 -17.0)	3.0 (0.0 – 9.0)

Median (Min-Max)

Table 2: Distribution of % Change in FSS and VAS

	% Change at		
Parameters	5th Day	5 to 10th Day	10th Day
Fatigue Severity Scale(FSS)	-45.6 (-76.8 to –17.3)	-76.7 (-89.3 to –30.0)	-84.6 (-94.7 to –44.7)
Visual Analogues Scale(VAS)	-43.3 (-71.4 to –20.0)	-75.0 (-100.0 to –33.3)	-84.6 (-100.0 to –46.7)

Values are Median (Min-Max)

Table 3: Comparative Reduction in First five and 2nd Five Days of Intervention

Scale	Total Reduction Between Basal to 10th Day	Reduction Between Basal to 5th Day (D1)	Reduction Between 5th to 10th Day (D2)
FSS	84.6	31.1	7.9
VAS	84.6	31.7	9.6

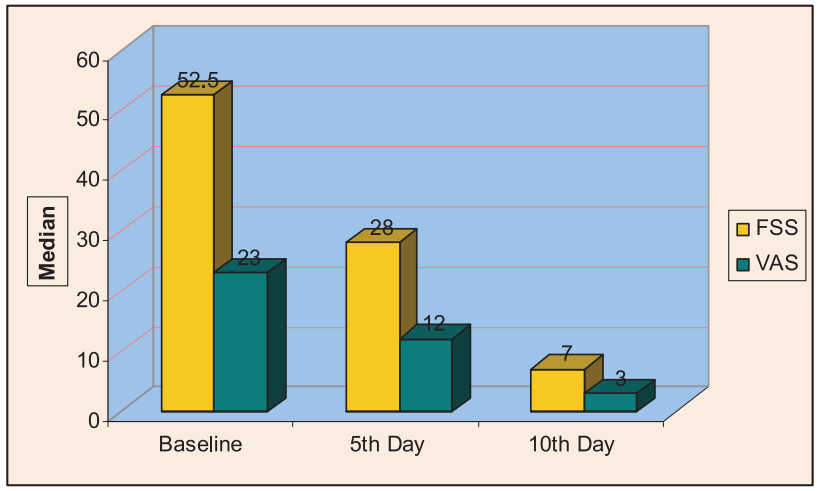

Fig.-1. Distribution of FSS and VAS (Absolute)

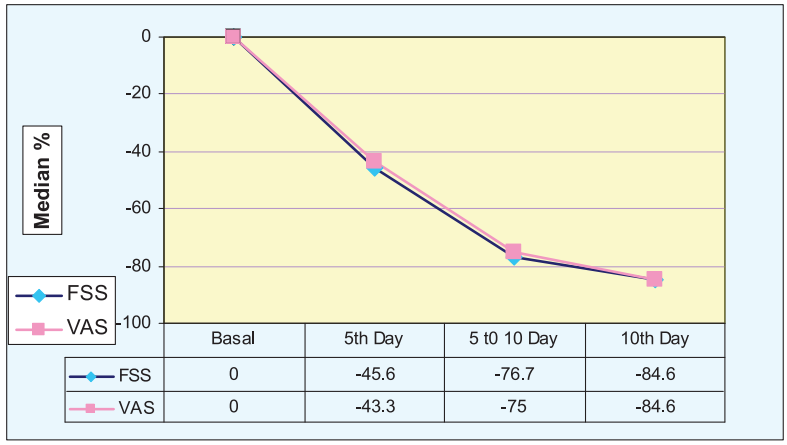

Fig.-2. Distribution of % Change in FSS and VAS

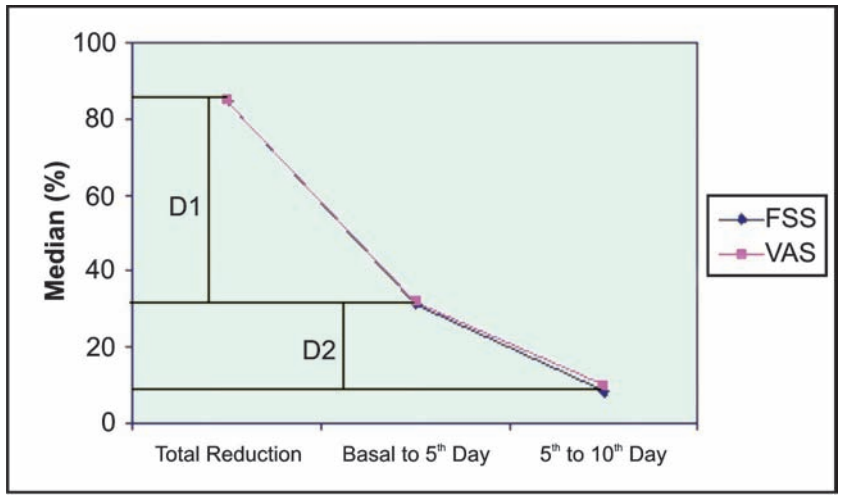

Fig.-3. Comparative Reduction in First five and 2nd Five Days of Intervention

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Inhalation Therapy and Unani Medicine

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Abstract

It is tempting to think of inhalation therapy as a modern approach to drug delivery, but this would negate some thousands of years of history and literally hundred of ingenious devices and hopeful medications. The first recorded use of inhalation therapy is from ancient Egyptian Ebrus Papyrus (1554 BC). In Unani Medicine the Greek physician Hippocrates (460-370BC) advocated the inhalation of vapors of herbs. Over a thousand year later Zakariya Razi, an Arab physician commonly known as Rhazes in western world advocated the inhalation of vapor of arsenic. More recently at the end of the 12th century, Maimonides, the physician of Sultan Saladin recommended the inhalation of vapor generated from herbs thrown in to the fire for the treatment of asthma. In Unani Medicine inhalation therapy is in use from a very long time and in future it can be used more effectively by adapting the recent advancement in basic sciences and inhalation therapy. The present study attempts to summarize the basic principles of inhalation therapy and its use in Unani Medicine.

Keywords: Inhalation therapy, Unani Medicine, Bakhoor, Inkebab

Introduction

In Unani Medicine, there are three components of the treatment as according to Ibn-e-Sena “Indeed the treatment is completed by one of the three methods first of which is Tadbeer and Taghzia, second is the use of advia and the third one is the use of Aml-e-Yad.”(Ibnesena, 1930; Ibnesena, 1995) The purpose of Ilaj-bit-Tadbeer is to evacuate the morbid material from the body or to transfer from a part to another and inhalation is one of them but now in today’s scenario inhalation has been developed as an another route of drug administration in addition to a Tadbeer to evacuate the morbid material (Ibnesena 1995) and now inhalation is a term used for a variety of treatment techniques, including drugs administered via inhalation. It aims at targeting lung tissue, airway secretion and microorganisms in upper, central and/or peripheral airways. However, drugs targeting systemic effects are used aiming at deposition in the alveoli where it can be rapidly absorbed and distributed (Neville, 1977).

It is tempting to think of inhalation therapy as a modern approach to drug delivery, but this would negate some thousands of years of history and literally hundreds of ingenious devices and hopeful medications (Sanders, 2007). Inhalation of drugs was an easy and low cost method; hence it got a

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wide use in medical therapy during that time (Shehata, 2009). Credit goes to ancient Egyptians for the first preparation of therapeutic materials for inhalation therapy. The inhaled material was in the form of smoke, vapour or volatile oils, obtained from the powdered dry plants or minerals, for the relief of nasal, throat and chest troubles (Shehata, 2009; Doghaim, 1972). Ancient people recognized the good therapeutic effect of many substances that were used for inhalation therapy in the form of snuffs, vapours or smoke. These substances were preserved in pottery pots and placed on pottery jars when used for inhalation (Doghaim, 1972).

Inhalation Therapy in Ancient Medicines

In ancient time local therapy was the prevailing means of treatment in ancient time, so nearly all respiratory troubles were treated by one form or other of inhalation. Inhalation of powder, smoke or vapour of the dry, burnt or boiled medications was well known at that time (Shehata, 2009). Ancient Egyptians were the first to use of inhalation therapy for the treatment of the oral, pharyngeal and chest troubles. Many prescriptions in the Ebers and Berlin medical papyri, written four thousands years ago report the first use of inhaled dried medicinal plants boiled medications or the smoke of some burnt, material, in the form of nasal snuff, oral insufflations or vapour inhalation (Shehata, 2009; 2012).

The Babylonian civilization was contemporary to the old Egyptian era. Physicians were known to many drug prescriptions and use them by different means of inhalations (Shehata, 2012). In ancient India, physicians used some forms of drug inhalation. The well known one was *Cannabis indica*. The Indians were the pioneer users of burnt Indian hemp (*Cannabis, indica*) for medicinal purposes (Shehata, 2012; Baraka 1982).

Inhalation Therapy and Unani Medicine

In Greek medicine, the use of burnt incense was very extensive, besides the inhalation of many dried plants. In ancient Greece, the physician Hippocrates advocated the inhalation of vapours of herbs and resins boiled with vinegar and oil which were then drawn into the lungs through a tube (Shehata, 2009; Sanders, 2012). The great Greek physician Galen (130-201 A.D.) described some powdered drugs their volatile vapour and smoke through inhalation for the relief of nasal and head troubles (Shehata, 2009).

The Romans established general public baths, in their large cities in which warm water was available. The evolved warm steam in such places was in use

for many medicinal purposes and was very helpful for the relief of many body troubles (Shehata, 2009; Reginald, 1982).

The Arab civilization that began at the eighth century added a lot of progress to inhalation therapy. They introduced new medicinal plants in this form of therapy as the Eucalyptus, Peppermint, Cinnamon, Fenugreek, Black reed and the prepared liquid of Benzoin, Thymol and Violet. The medicinal plants were in use in the form of powder for sniffing, volatile vapour for inhalation or burnt smoke for breathing. The dried leaves, roots or barks of these plants were the material for inhalation for the treatment of nasal, throat, larynx, and respiratory troubles besides the relief of several head and body troubles (Ibnesena, 1930, 1995; Reginald, 1982).

The eminent Arab physician Rhazes (850-932 AD.) used the powdered narcotic plants, Opium, Hyocyamus, Mandrake and Henbane, imbibed in a sponge to be inhaled for general anaesthesia before any surgical operation. He also advocated the inhalation of vapour of arsenic for many medicinal purposes (Sanders, 2007; Razi, 1998).

The Arab Physicians revolutionized the inhalation therapy in technique and indications. They were first to develop the inhalation anesthesia in the 9th century under the name of Al-Marquad. In this method the drugs were dissolved in water and imbibed by sponge, to be used by inhalation at surgery. This inhalation anaesthetic method was first described by the Arab physician Isa Bin Ali (Shehata, 2009; 2012).

The first early trial for resustication of camatosed patients by drug inhalation through forced respiration by a manual bellow was practiced by the Arab physician Saleh Bin Behla. That was reported for the first time at the ninth century (Shehata, 2009; Shehata, 2012).

Arabs also modified the use of Hammam by adding volatile medicinal plants to the warm water and the patients were submerged to the level of the neck in warm water, covered by a blanket to retain the vapour for inhalation (Reginald, 1982).

The Persian physicians were also well known to inhalation therapy. Their well known king and physician Jamshid described the inhalation of the volatile vapours of boiled roses, musk, eucalyptus and ambergris for the relief of respiratory troubles (Anonymous, 2012).

In 1190 AD, a famous Spanish physician and philosopher Maimonides (Physician to the Sultan Salahuddin Ayuoobi) wrote *Treatise on Asthma* and

recommended inhalation of fumes generated from herbs thrown on a fire (Sanders, 2007; Maimonides, 1963).

There are many methods employed in Unani Medicine for the inhalation therapy. Their short description is as follows:

1. Bakhoor Dhooni (Fumigation): Some drugs are burnt and their smoke is introduced to a particular place. This is also called Tadkheen
2. Inkabab, Baphara (Vopourbath): Some drugs or simply water is boiled and their vapour is introduced to a particular site.
3. Shamoom (Olfaction or smell): The drug, which is smelled and its volatile constituents reaches through the nose.
4. Lakhlakha (Inhalation): These are either watery or solid drugs, which are kept in a wide mouth container or bottle and smell reaches not only to nose but air passages also (Kabir, 2002).

The tools for inhalation therapy are large clay pots for volatile oils, metal containers for boiling liquids and wood snuff box for powdered drugs. For vapor inhalation the liquids are boiled or hot stones are used for producing the Bakhoor and the evolved vapor received by the patients under a blanket (Ibnesena, 1995; Ibnesena, 1930).

Advantage of Inhalation Therapy

Conventional therapy for respiratory diseases consists of administering therapeutic agents by the oral or parenteral route. However, the amount of drug reaching the site of pathology may be small due to poor pulmonary distribution of most systemically administered drugs. Delivering drugs by inhalation directly to the lungs results in local drug concentration far higher than that achievable by either oral or parenteral administration. Relatively small doses are required for effective therapy, reducing systemic exposure to drug and thus minimizing adverse effects. Lower dosage regimens may provide considerable cost savings, especially with expensive therapeutic agents. Delivering small doses of active ingredients directly to the lung effectively targets the drug, thereby maximizing therapeutic effect while minimizing adverse effects. A drug having narrow therapeutic window or requiring prolonged treatment regimen by conventional routes of administration, when administered by the inhalation route would have reduced systemic exposure and toxicity. Consequently, this approach may be advantageous where the patient's system is overburdened with the traditional range of chemotherapeutic agents (Anonymous, 2011; Moritz, 2011; Khilnani, 2008; Raiser, 1986).

On the other hand, the large surface area for absorption and the relatively low metabolic activity of the lungs make this organ system a potential route for the systemic delivery of drugs that cannot be delivered by other means. Many studies have shown that the lungs provide substantially greater bioavailability for macromolecules than any other port of entry to the systemic circulation.

Thus the advantages of inhalation therapy are:

- The inhaled route is the most effective method to get the medicine where it is supposed to go– directly to the airways
- The therapeutic relief is rapidly achieved – especially symptom relief with inhaled bronchodilators
- The intake is low and a fraction of the oral dose is enough for the desired result.
- Side effects are minimal since rest of the body is not exposed to the drugs.
- Some drug when taken through oral route become inactive while passing trough digestive process.
- Since chronic respiratory diseases require long term treatment, the exceptional safety of inhaled therapy is especially valuable (Anonymus, 2011; Moritz, 2011, Khilnani, 2008; Raiser *et al.*, 1986; McDonald, 2005).

The Lung as a Route of Application for Systemic and Local Therapy

Although the lung represents effective barrier systems and clearance mechanisms, much attention has been raised in the last decades to this organ for drug delivery applications.

The first reason is its large absorption area. The lung build up a total surface of ~100m2 that is enveloped by an equally large capillary network, from which many agents can be readily absorbed to the bloodstream avoiding a first-pass effect of the liver (Raiser *et al*., 1986; Patil et al., 2012; Agu *et al*., 2001).

Another reason is the known instability and low permeability of proteins and peptides when these biopharmaceuticals are administered through the widely preferred oral route. Consequently, most proteins and peptides on the market are administered intravenously. But the parenteral route of application does generally not meet with patients' convenience and compliance, in particular because the indication for the use of these agents is usually treatment of a chronic disease requiring frequent injections. Thus, the pulmonary route of application offers a noninvasive alternative for systemic therapy (Raiser *et al.*, 1986; Patil *et al*., 2012; Agu *et al*., 2001).

Drug Properties affecting Inhalation Therapy

Drugs for inhalation therapy are administered in aerosol form. An aerosol is defined as a suspension of liquid or solid in the form of fine particles dispersed in a gas. The ability of the aerosolized drug to reach the peripheral airways is a prerequisite for efficacy. The factors which influence the particles deposition in the respiratory tract include impaction (inertial deposition), sedimentation (gravitational deposition), brownian diffusion, interception, and electrostatic precipitation (Khilnani, 2008; Raiser *et al*., 1986; Hiller *et al*., 1981; Edward *et al*., 1998; Behera, 2005).

Therapeutic effect of inhaled drug can be attributed to a variety of factors;

- Inhaled aerosol particles must possess a very narrow range of ‘‘aerodynamic diameters’’ to pass through the filter of the mouth and throat.
- Even if properly designed and produced, aerosol particles may be propelled with too high a velocity and consequently deposited in the mouth and throat by inertia.
- Once in the lungs, particles must release the therapeutic substance at a desired rate and,
- Escape the lungs’ natural clearance mechanisms until their therapeutic payload has been delivered.

Effect of Particle Size : For locally-acting drugs, the particles need to be deposited in the area of the respiratory tract requiring treatment. For systemically- acting drugs, particles need to reach the alveoli for absorption. Large particles (5-10 µm) do not follow changes in the direction of airflow and are deposited by inertial impact in the upper airways. Particles deposited in the mouth and throat can be swallowed and lead to local or systemic side effects. Intermediate-sized particles (3-5 µm) can be carried further, into smaller airways of the bronchi and bronchioles. Small particles (<3 µm) behave more like gas molecules and follow the airflow all the way to the alveoli. The very smallest particles (<0.5 µm) can fail to be deposited in the alveoli, and portions of the medicine can resultantly be exhaled. Controlling the air velocity by slow inhalation will maximize the number of particles that reach the alveoli (Khilnani, 2008; Raiser *et al*., 1986; Hiller *et al*., 1981; Edward *et al*., 1998; Behera, 2005).

Fate of Drug Given Through Inhalation Therapy

The efficacy of drugs used through inhalation method depends on their local effects in the airways. Thus, achieving a high local concentration of these

agents in the lung should maximize their intended effects and minimize their systemic absorption and potential adverse actions. About 15-40% of drug released from an inhaler device is deposited in the lungs. This is more than sufficient to achieve a clinical effect. The portion of the drug that is deposited in the lungs has its pharmacological effect and is then absorbed from the lungs into the systemic circulation (Anonymous, 2011).

Drug deposited in the throat is swallowed and subsequently absorbed from the gastrointestinal tract into the systemic circulation via the liver where it undergoes metabolism and subsequent elimination (Anonymous, 2011).

Modern Drug Delivery System for the Inhalation Therapy

Inhaled drug delivery systems can be categorized into three main groups on the basis of how the aerosols are generated and each group with a unique strength and weakness. For the purpose of inhalation therapy an aerosol of the drug can be generated in three ways:

- Pressurised Aerosol System
- Dry powder system
- Nebulisers (Reiser *et al*., 1986; McDonald *et al*., 2005 ; Behera, 2005 ; Tripathi, 2003)

Pressurized Aerosol System

They are also called metered dose inhaler because it delivered a specific quantity of drug to the lung. The MDI is a device that delivers a specific and pre-metered amount of medication to the lungs, in the form of an aerosol spray that is inhaled by the patient. It consists of a canister of pressurized medication that fits into a plastic actuator sleeve and connects to a mouthpiece. The formulation in an MDI is made up of the drug and a liquefied gas propellant.

Proper use of the MDI requires some practice. Unless the MDI is used correctly, the patient will not get the full dose of the drug and, hence, will not derive the full benefits. Many patients, including children, find it difficult to co-ordinate the actuation and inhalation of the drug released from the MDI. Such patients can benefit immensely by using a spacer attached to the mouthpiece. MDI + spacer are generally as effective as a nebulizer (Reiser *et al*., 1986; McDonald *et al*., 2005; Behera, 2005; Tripathi, 2003).

Dry Powder System

Dry powder inhalers (DPIs) are devices through which a dry powder formulation of an active drug is delivered for local or systemic effect via the

pulmonary route. The drug in a DPI is provided as micronized powder (particle size 2.5-5 µm) with an inert carrier such as lactose. DPIs are breath-activated devices and, unlike the MDIs, do not require coordination between actuation and inhalation. The patient exhales out a full breath, places his/her lips around the mouthpiece, and then quickly breathes in the powder. DPIs are easy to use and as effective as MDIs (Reiser *et al*., 1986; McDonald *et al*., 2005; Behera, 2005; Tripathi, 2003; Alagusundaram, 2010; Peart *et al*., 2001).

Nebulisers

The nebulizer converts the drug solution into a continuous fine aerosol mist, which can be inhaled directly into the lungs via a face mask or mouthpiece. Nebulizing chambers are small plastic devices into which the drug solution is placed. These devices are driven by a compressor (electric/battery operated) or oxygen. A gas flow of about 6-8 liters/minute is normally required to drive the nebulizer. In this Drug inhalation is accomplished by normal tidal breathing over a 5-10 minute period (Reiser *et al*., 1986; McDonald *et al*., 2005; Behera 2005; Tripathi 2003).

Future of Inhalation Therapy in Unani Medicine

The value of inhalation as a route of drug administration has been recognized for thousands of years in Unani Medicine and it is in use as route of drug administration from the time of Hippocrates. One of the earliest inhaler devices is a design attributed to Hippocrates (Greece, 460–377 BC) that consisted of a simple pot with a reed in the lid, through which vapors could be inhaled.

Commonly used materials for the inhaled remedies include plants with anticholinergic properties, such as datura, henbane, lobelia, and belladonna, in addition to arsenicals, balsams, and gum resins. As in the Unani system of medicine, there are many drugs, which are used in the management of asthma; they can be used more effectively by adapting inhalation as a main route of drug administration especially for respiratory diseases.

On identifying the particular constituent responsible for the bronchodilator and anti-inflammatory properties and in which particular solvent that constituent or most of the constituent of that particular plant is dissolved, drug can be obtained in the liquid form or get dried in the form of fine powder depending on the type of device is to be used. The volatile oil component of the drug may be use through inhalation therapy with a suitable vehicle.

Drugs used in Unani Medicine through Inhalation Therapy			
Name of Drug	Botanical Name	Parts Used	Method Used
Ward	Rosa damascena Mill	Oil	Inhalation
Dhatura	Datura innoxia Mill.	Leaves	Tadkheen
Zaitun	Olea europea Linn.	Olive with nuts	Fumigation
Kibrit	Sulfurem		Fumigation
Tanbul	Piper betle Linn	Leaves	Fumigation
Ma'a	Water	Water vapour	Inkabab
Yasmin	Jasminum grandiflorum Linn	Oil, flower	Inhalation
Qaisus	Cistus creticus Linn	Extract	Sniffing
Qinnah	Ferulah galbaniflua Boiss et Bushe	Gum	Bakhoor
Cumin	Cuminum cyminum Linn	Seed	Inhalation

Conclusion

Information regarding the therapeutic use of inhalation therapy can be traced back to the period of Hippocrates and other Unani physician of early ages. Although the modern scientific technique and knowledge of exact pathological changes were not known at that time but on the basis of the clinical understanding of different diseases, there were various forms of inhalation therapy that may be correspond to the latest techniques of currently available inhalation therapy.

Use of a number of drugs in various inhalation techniques like *Bakhoor (Dhooni), Inkabab (Bhapara), Shamoom Lakhlakha* etc were in vague during Arabic and pre- Arabic era of Unani Medicine. The rationale behind the application of such therapies was of course the early onset of action, selectivity and specificity of the drug. Such therapies if brought into the practice using the latest technical know how about the physico- chemical properties of the drug constituents and its effective application so as to reach the desired site may proved to be revolutionary in the management of respiratory medicine and beyond.

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Ethno-Pharmacological Diversity in Family Asteraceae in the State of Orissa*

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Abstract

The family Asteraceae occupies fifth position among top ten dominant families of flowering plants in the state of Orissa. It is represented by 103 plant species belonging to 62 genera in the state. Ethno-pharmacological uses of 29 plants species of Asteraceae recorded from diverse ethnic groups in different geographical regions of Orissa are presented in this communication. The data included in the paper was collected during ethno-botanical survey trips conducted by Survey of Medicinal Plants Unit, Regional Research Institute of Unani Medicine, Bhadrak from 1981 – 2006. Information obtained from the study area on ethno-pharmacological uses reveal that some species of asteraceae have multiple medicinal uses and some of the uses are unique in nature that have not been reported earlier. First hand data recorded from the field and information collected from published literature have been presented in this communication. It has been suggested that scientific evaluation may be done of plants species claimed therapeutically useful by the inhabitants of the study area, so as to find out some useful indicators. It has also been emphasized that studies may also be taken among under-explored ethnic groups like Munda, Mankadia, Paroja and primitive tribes like Bondo, Paudi bhuinya and other bio-diversity rich areas like mangrove forests in the state.

Keywords: Asteraceae, Ethno-pharmacological diversity, Orissa.

Introduction

The tribal communities living close to nature, acquired good knowledge about the medicinal use of wild flora most of which are not known to the outside world. This rich knowledge, if subjected to scientific screening could benefit the humanity in finding treatment for many diseases and conditions. In recent times, therefore, there has been a keen interest in the ethno-pharmacological studies, since they provide lead material for the discovery of new drugs of plant origin. It is in this context the present study was undertaken and presents the data on ethno-pharmacological uses of plants recorded from the tribal and other rural inhabitants in different geographical areas in the state of Orissa. While analyzing the data it was observed that plants species of family Astreaceae have multiple medicinal uses among different tribal societies and rural folks.

The family Asteraceae is considered to be one of the most advance families of angiosperms. Almost all the diverse geographical regions are represented

*The Paper was presented in the 12th International Congress of Ethnopharmacology at Kolkata

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by the members of the family. It occupies 5th position among top ten dominant families of flowering plants in the state of Orissa. The family is represented by 103 species belonging to 62 genera (Saxena and Brahman, 1996). Different species of this important family have attracted vide attention for their value as medicinal, edible and ornamental purposes.

The state of Orissa is situated on the east cost of India. The land area is characterized by large expenses of tropical deciduous forest with *Shorea robusta* Gaertn. dominating through out. The state is inhabited by 63 different tribal communities. The major tribal groups are Kondh, Santal, Gond, Oraon, Munda, Bhumij, Bondo, Bathuri, Bhuiyan, Paudi Bhuiyan, Kharias, Saora etc. The tribal people largely depend on native plant remedies to cure common ailments.

The work on ethno-medicinal aspects of Orissa has been undertaken earlier (Saxena & Dutta, 1975; Mudgal & Pal, 1980; Das & Misra, 1987; Saxena, et al., 1988; Brahmam & Saxena, 1990; Girach, 1992; Girach et al., 1994, 1996, 2006; Aminuddin & Girach, 1993; Aminuddin et al., 2009; Mukharjee and Namhata, 1990; Satpathy and Panda, 1992; Anonymous, 2001, 2006; Panda, 2007; Sahoo and Satapathy, 2009). However, there is more scope for exploration of tribal dominated areas to record more and more information on medicinal and other uses of plants prevalent among these communities.

The present study deals with the results of field work undertaken among different tribal inhabitants on ethno-pharmacological uses of diverse nature of plants of family Asteraceae. Ethno-botanical field trips were conducted in different geographical regions of the state and data was recorded. To ensure good coverage of the data, different regions, rich in forests and tribal people were visited and often plants collected in one locality were discussed among other ethnic groups. Published literature on ethno-medicinal studies in Orissa was scrutinized and recorded wherever available.

Materials and Methods

Plants specimens belonging to 29 species of family Asteraceae included in the paper were collected during a series of ethno-botanical field trips conducted during 1981 – 2006 by survey team of Regional Research Institute of Unani Medicine (RRIUM), Bhadrak. Information on medicinal uses of plants was recorded from the local inhabitants viz., tribal and other rural folks. Information was obtained through personal interactions with knowledgeable persons of the inhabiting communities. Plants specimens were collected from the field with company of key informant along with their local name and provided voucher

number separately to each specimen. They were identified and processed for drying, pressing etc. The specimens mounted on herbarium sheets were deposited in the unit herbarium of RRIUM, Bhadrak provided with relevant information for future reference.

Enumeration

The plants specimens of Asteraceae collected from the study area have been enumerated alphabetically with their botanical names as given in Flora of Orissa (Saxena & Brahmam, 1996), followed by folk medicinal uses. Local name(s) recorded from the area surveyed, locality (district), Tribe/non-tribe informant and voucher specimen numbers are given in the brackets at the end of the folk medicinal claim. A few examples of ethnomedicinal diversity in medicinal uses of *Blumea species, Eclipta prostrata, Elephantopus scaber, Enydra flactuans, Sphaerathus indicus, Tridax procumbens, Vicoa indica and Xanthium indicum* are discussed.

Adenostemma lavenia (L.) Kuntze

1. A handful of leaves with burnt coconut fiber is made into paste and applied locally on burns. The remedy is believed to be useful in healing, if burns are up to 30 percent. (Butame, Malkangiri, Bondo, 1661.
2. Extracted Plant juice (one teaspoon, two times daily) is taken with sufficient water to get relief from abdominal pain (Pokosunga, Balasore, Murmu, 2933).
3. Leaf decoction (one teaspoon, two times daily) is taken for 3-4 days to get relief from bronchitis (Pokosunga, Keonjhar, Bhumij, 5422).

Ageratum conyzoides L.

1. Gargling of warm leaf decoction is prescribed to get relief from toothache (Pokosunga, Bhadrak, Das, 5526).
2. 5 cm piece of stem is tied as an amulet on the wrist of a person suffering from dental caries to get relief from toothache (Pokosunga, Kendrapara, Tripathi, 6345).

Bidens biternata (Lour.) M. & S.

Crushed leaves are directly applied on cuts to check bleeding (Pokosunga, Bargarh, Saora, 6889).

Blainvillea acmella (L.) Phiilipson.

Extracted leaf juice is applied directly on fresh cuts to check bleeding (Bodopokosunga, Puri, Saora, 4419).

Blumea aurita (L.f.) DC.

Crushed leaves are directly applied on cuts to check bleeding (Pokosunga, Bhadrak, Sethi, 5525).

Blumea fistulosa (Roxb.) Kurz.

Varghese (1996) reported that plant juice is applied on forehead to treat headache (Bansarso, Sundargarh, Kharias).

Blumea lacera (Burm. f.) DC.

1. Extracted root juice (20 ml, once at bed time) is given in desired quantity to a child suffering from bed-wetting habit (Pokosunga, Balasore, Kols, 2708).
2. Plant decoction with powdered *Foeniculum vulgare* (Panmohri) and sugar candy in desired quantity is drunk as cooling agent in gastric disorder (Pokosunga, Balasore, Patra, 2973).
3. Plant paste is applied locally to get relief from body ache. (Hemraj, Bhadrak, Maharana, 6116).
4. Crushed leaves are directly applied on sprain as analgesic and anti-inflammatory agent (Hemraj, Bhadrak, Maharana, 6116).
5. Plant paste is applied locally on affected parts to reduce swelling (Hemraj, Kendrapara, Jena, 6381).

Blumea membranacea Wall. ex DC.

Whole plant is reported as medicinal to get relief from body pain (Saxena & Dutta, 1975).

Chromolaena odorata (L.) R. King & Robins.

The plant is reported for bone fracture, sprain (Saxena & Dutta, 1975) and to stop bleeding (Malik, 1996).

Eclipta prostrata (L.) L.

1. Leaf decoction with honey is given in desired quantity to weak and malnourished child to treat malnutrition and gain weight (Kesari, Mayurbhanj, Kol, 0928).
2. Plant decoction is drunk and used for washing scars in smallpox (Kesudra, Balasore, Bhumij, 0986).
3. A handful of root s made into paste is applied on mumps. Leaves and shoots of the plant made into paste and applied on neck of farm animals to treat and heal infested wounds (Kesudra, Dhenkanal, Kondhs, 2679).
4. The same information was further confirmed from Jajpur district (Rout, 6557).

5. Crushed leaves are directly applied on cuts to check bleeding (Kesudra, Balasore, Murmu, 2805, 2870).
6. The same information was further confirmed from Bhadrak (Kol, 3958), Bargarh (Chohan, 6893) and Jagatsinghpur (Das, 7042) districts of Orissa.
7. Extracted leaf juice with pinch of edible salt is given to treat stomatitis.
8. Extracted juice of plant with Haldi (*Curcuma longa*) is taken (one teaspoon, two times daily) for one week to treat sluggishness of liver (Bargarh, Chohan, 6893).
9. Leaf juice is applied on skin eruption caused due to working in water logged rice fields (Kesudra, Athgarh, Barik, 3161).
10. Leaf juice with desired quantity of honey is given (one teaspoon, two times daily) to treat dysentery in children (Koda Kesudra, Bhadrak, Kols, 4365).
11. Leaf paste is applied fresh on scalp to kill parasitic lice in hair (Kesudra, Bhadrak, Jena, 6107).
12. Whole plant with Banso (*Bambusa* sp.) and Pijudi (*Psidium guajava*) leaves in 1:1:1 ratio is boiled in 500ml water, till remains 100 ml. It is cooled and strained. The filtrate is taken (50 ml, two times daily) to alleviate chronic fever. (Kesudra, Kendrapara, Misra, 6757).
13. Extracted leaf juice is used as nasal drop, which induces sneezing and help to get relief from cold and headache. (Kesudra, Kendrapara, Misra, 6757).
14. Leaf decoction (one teaspoon, two times daily) is taken for one week to treat jaundice (Kesudra, Kendrapara, Misra, 6757).
15. A handful of leaves made into paste with pulp of Gheekunwari (*Aloe barbadensis*) are applied on scalp to treat mental disorders such as madness. (Kesudra, Bargarh, Chohan, 6893).
16. Leaf paste is applied locally on scabies (Kesudra, Bargarh, Chohan, 6893).

Elephantopus scaber L.

1. Root powdered with ½ black pepper is taken (3-5 gm, two times daily) with honey to treat diarrhoea. (Chandesar, Phulbani, Kondhs, 0235). The information was further confirmed from Puri district (Saoras, 4409).
2. Plant decoction (one teaspoon, two times daily) is taken for 3 days to alleviate intermittent fevers such as malaria and typhoid (Mayurchulia, Phulbani, Kondhs, 0367).
3. A handful of roots powdered with equal quantity Patalgarudu (*Rauvolfia serpentina*) leaves are taken (5 gm, two times daily) with desired quantity of curd for 21 days to treat chronic bronchitis (Mayurchulia, Phulbani, Kondhs, 0434).

4. A handful of roots made into paste with Rasna (*Vicoa* sp.) and applied externally on oedematous swelling in Filariasis. (Mayurchulia, Phulbani, Kondhs, 0434).
5. Root made into paste in cow Ghee is applied locally on neck and chest to relieve cough and cold. (Mayurchulia, Phulbani, Kondhs, 0434).
6. 4-6 secondary roots powdered and mixed with jeggary are eaten to remove placenta of parturient mother (Mayurchulia, Kalahandi, Bhumij, 1037).
7. Powdered root (5 gm, once daily) to arrest vomiting. (Mahorchori, Mayurbhanj, Bathuris, 1436).
8. Powdered root with sugarcane juice is taken (5-10 ml, two times daily) to treat loose motion (Mahorchori, Mayurbhanj, Bathuris, 1436).
9. Seven pieces of secondary roots (each 2-3 cm long) are chewed raw as an antidote to poisonous bite of snake. (Mahorchori, Mayurbhanj, Bathuris, 1436).
10. A pinch of powdered root along with edible salt is placed in the opposite side of nostrils to get relief from migraine. (Mahorchori, Mayurbhanj, Bathuris, 1436).
11. Roots (5 gm.) powdered with black pepper is placed in dental cavity once at bed time to treat pyorrhea (Mayurchulia, Malkangiri, Bondos, 1651).
12. Crushed root is applied on minor cuts to check bleeding. Root decoction is given in required quantity to check diarrhoea (Mayurchulia/ Gomuti, Dhenkanal, Kondhs, 2479).
13. A handful of roots pounded with black pepper are taken (5 gm, two times daily) to regularize menstruation (Mayurchulia, Balasore, Das, 2924).
14. Powdered root with honey in desired quantity is given to check diarrhoea in infant (Mayurchulia, Dhenkanal, Barik, 3137).
15. A handful of roots powdered with black pepper are taken (5-10 gm, two times daily) for 3 days to treat dysentery with bloody stools (Totamulo, Athgarh, Das, 3222).
16. A handful of roots and Putri (*Croton roxburghii*) roots powdered in equal quantity taken (5 gm, every 2-3 hours) as antidote to poison of snake bite (Mayurchulia, Sundargarh, Kharias, 3607).
17. Root paste is applied on forehead to get relief from headache. (Mayurchulia, Sundargarh, Kharias, 3607).
18. A handful of roots powdered with 2 black peppers are taken (5 gm, two times daily) with sufficient water to treat blood dysentery. (Mayurchulia, Sundargarh, Kharias, 3607).
19. Extracted root juice is given (one teaspoon, every morning) for 21 days to expectant mother for delivering healthy baby. (Mayurchulia, Sundargarh, Kharias, 3607).

20. Three secondary roots powdered with Chunhur (*Marsdenia* sp.) are taken (5 gm, two times daily) for one week to break and remove stones from the kidney (Mayurchulia, Bolangir, Sahu, 4130).
21. 5 cm piece of root is tied on the waist as fever amulet to alleviate fever caused by evil effect of spirit (Mayurchulia, Bonai, Paudi Bhuinyas, 4599).
22. Powdered root is placed in dental cavity to get relief from toothache. (Mayurchulia, Bonai, Paudi Bhuinyas, 4599).
23. Root decoction (one teaspoon, two times daily) is taken with goat's milk to treat diarrhoea in children. Root decoction (two teaspoons, two times daily) is taken for one week to treat jaundice (Mayurchulia, Keonjhar, Bhumij, 5235).
24. Powdered root (5-10 gm, two times daily) is taken with sufficient water to treat gastric disorder (Mayurchulia, Bargarh, Saoras, 6911).
25. Root is also reported as medicinal in other published work from Orissa for debility of children, pimples **(**Saxena *et al.*, 1981), madness, to cure aversion of food (Brahmam *et al.*, 1996**)** and to hang in ears to cure headache (Jain, 1991).

Emilia sonchifolia (L.) DC.

Leaf decoction (3 ml, two times daily) is given to treat diarrhoea in infants (Bachramara, Athgarh, Mrs. Anjana, 3192.

Enydra fluctuans Lour.

1. A handful of leaves made into paste in Ghee, is applied warm on affected parts to reduce swelling (Hidmicha, Bhadrak, Mrs. Das, 4711).
2. Plant paste is applied warm on wounds for healing (Hidmicha, Bhadrak, Nayak, 5000).
3. Plant paste is applied locally on scabies. (Hidmicha, Kendrapara, Mahapatra, 6391).
4. Powdered plant (5-10 gm, two times daily) is taken with water to treat abdominal pain. (Hidmicha, Kendrapara, Mahapatra, 6391).
5. Extracted leaf juice filtered and used as eye drop to treat eye complaints (Hidmicha, Kendrapara, Mahapatra, 6391).
6. Plant juice (one teaspoon, every morning) is taken empty stomach regularly to keep essential high blood pressure under check. (Hidmicha, Jajpur, Naik, 6617).
7. Plant paste is applied on forehead to treat giddiness. (Hidmicha, Jajpur, Naik, 6617).
8. Extracted plant juice (3-5 ml, two times daily) is taken for 5 days to treat jaundice. (Hidmicha, Jajpur, Naik, 6617).
9. Leaf juice is drunk and whole plant is consumed as vegetable after cooking to improve eye-vision (Hidmicha, Jajpur, Naik, 6617).

10. Plant is eaten raw or cooked to treat night blindness. (Hidmicha, Kendrapara, Mallik, 6783).
11. Crushed plant is applied on scalp to treat madness. (Hidmicha, Kendrapara, Mallik, 6783).
12. Plant decoction in desired quantity is taken 2-3 times daily for one week to treat jaundice (Hidmicha, Kendrapara, Mallik, 6783).
13. Plant juice (one teaspoon, two times daily) is taken to check diarrhoea (Hidmicha, Jagatsinghpur, Ojha, 7107).

Glossogyne bidens (Retz.) Alston.

1. Root is one of the ingredients of a composite drug prescribed for oral administration in rheumatoid arthritis (Buthitejraj, Kalahandi, Bhunjia, 2035).
2. Powdered root in desired quantity is taken with milk to treat burning sensation (Buthitejraj, Dhenkanal, Nayak, 3089).

Gnaphalium luteo-album L.

Plant is reported for lactation problems and healing of wounds from different parts of Orissa (Tribedi *et al.*, 1982**).**

Grangea maderaspatana (L.) Poit.

Powdered leaves are used for sneezing purpose to get relief from cold and headache (Painjari, Kendrapara, Mallik, 6397).

Launaea acaulis (Roxb.) Babc. ex Kerr

Powdered root (5 gm, once every morning) is taken with honey to check sugar level in diabetes (Balrajkonda, Kalahandi, Bhunjia, 2071).

Mikania micrantha Kunth.

1. Crushed leaves are directly applied on minor cuts to check bleeding (Barbaria, Balasore, Mahapatra, 2826).
2. The same information was further confirmed from Kendrapara (Mallik, 6404) district.

Senecio corymbosus Wall ex DC.

Stem bark decoction (one teaspoon, two times daily) is taken with honey to check diarrhoea (Panasokonda, Gajapati, Saoras, 6501).

Sonchus wightianus DC.

1. Root decoction (one teaspoon, two times daily) is taken to check diarrhoea (Dudhbajra, Mayurbhanj, Kols, 1331).

2. Crushed leaves are directly applied on minor cuts to check bleeding (Bansiriso, Gajapati, Saoras, 6515).

Sphaeranthus indicus L.

1. Leaf decoction (one teaspoon, two times daily) is taken to alleviate fever caused due to evil effect of spirit (Batliful, Phulbani, Kondhs, 0346).
2. A handful of roots made into powder with 5-7 black peppers are taken (5-10 gm, two times daily) to treat blood dysentery (Guddari, Phulbani, Kondhs, 0442).
3. Crushed leaves are applied on minor cuts to check bleeding (Matighaso, Kalahandi, Bhumij, 1041).
4. Plant decoction (one teaspoon, two times daily) is taken to alleviate fever (Koirab, Malkangiri, Bondos, 1662).
5. Extracted leaf juice is filtered and used as eye drop to treat conjunctivitis (Bhuikadamb, Bargarh, Saoras, 2003).
6. Plant decoction is taken in required quantity to check diarrhoea (Gudurkucha, Dhenkanal, Kondhs, 2477).
7. Plant paste is applied locally to get relief from muscular pain (Batuamundi, Athgarh, Kondhs, 3297).
8. Powdered plant (5 gm, two times daily) is taken with sufficient water as blood purifier in skin diseases (Ghodonadi, Bolangir, Gonds, 4113).
9. Fruit paste is applied locally on forehead to treat migraine (Panikadamb, Gajapati, Saoras, 6432).
10. Powdered plant is taken (5 gm, two times daily) to treat indigestion. Plant decoction (one teaspoon, two times daily) is given to treat cough and cold (Bokasing, Bargarh, Saoras, 6992).

Spilanthes paniculata Wall. ex DC.

Plant juice mixed with Gujriganda (Snail) of pond water is given in required quantity to regularize mensteruation (Kodakesudra, Balasore, Sahoo, 2875).

Tagetes patula L.

Crushed leaf juice is applied on cuts to check bleeding (Gendu, Balasore, Rath, 2942).

The same information was further confirmed from Bhadrak (Ojha, 4995), Kendrapara (Tripathy, 6830).

Tridax procumbens L.

1. Extracted leaf juice is poured in ear as eardrop to get relief from earache (Vishalyakarani, Bhadrak, Sahu, 0126).

2. A handful of roots boiled in Jada (*Ricinus communis*) oil, cooled and strained. The filtrate is applied locally on affected joints to get relief from joints pain. (Vishalyakarani, Phulbani, Kondhs, 0244).

3. Crushed leaves are applied on minor cuts to check bleeding (Vishalyakarani, Phulbani, Kondhs, 0244).

4. Medicinal use of this species as an anti-inflammatory and analgesic agent for cuts is quite popular through out the state both among tribal and rural population. The use has been recorded from wide range of ethnic communities from different geographical regions of the state such as Phulbani (Kondhs, 0445), Mayurbhanj (Santals, 0751), Kalahandi (Bhumij, 1043), Malkangiri (Bondos, 1665), Dhenkanal (Kondhs, 2656), Athgarh (Barik, 3162), Sundargarh (Kharias, 3645), Bolangir (Gonds, 4114), Puri (Saoras, 4480), Bhadrak (non tribals, 5094, 5158), Keonjhar (Bhumij, 5307), Gajapati (Saoras, 6450), Jajpur (Sethi, 6604), Kendrapara (Jani, 6742), Bargarh (Bhoi, 6874), Jagatsinghpur (Das, 7044).

5. Leaf decoction is taken (one teaspoon, two times daily) to treat intestinal ulcer caused due to high fever (Vishalyakarani, Mayurbhanj, Kols, 1406).

6. A handful of leaves are made into paste and applied on forehead to get relief from headache caused due to fever (Vishalyakarani, Balasore, Sahu, 2122).

7. Extracted leaf juice is applied on whitlow – a kind of nail infection (Aphuli, Balasore, Santals, 2463).

8. A handful of leaves are made into paste, heated and applied on infested wounds of farm animals for healing (Vishalyakarani, Dhenkanal, Kondhs, 2656).

9. The above information was further confirmed from Bonai (Bhuinyas, 4684).

10. Crushed flowers are advised to smell which cause sneezing to get relief from cold and headache (Vishalyakarani, Bhadrak, Kols, 3560).

11. Crushed leaves are applied warm on boils for suppuration (Vishalyakarani, Balasore, Bhumij, 4006).

12. Extracted leaf juice (warm) is used as ear drops to get relief from earache. (Phulguma, Bolangir, Gonds, 4114).

13. Leaf juice in desired quantity is taken to get relief from abdominal pain. (Phulguma, Bolangir, Gonds, 4114).

14. Extracted leaf juice with pinch of edible salt is used warm as eardrops to get relief from earache. (Vishalyakarani, Bargarh, Bhoi, 6874).

15. Crushed leaves are applied as antidote to bite of scorpion. (Vishalyakarani, Bargarh, Bhoi, 6874).

16. Extracted leaf juice is used as eye drop to treat redness, inflammation of eye (Vishalyakarani, Bargarh, Bhoi, 6874).

Vernonia anthelmintica (L.) Willd.

1. Seed decoction with desired quantity of honey is taken (one teaspoon, two times daily) to treat diarrhoea (Somraj, Dhenkanal, Kondh, 2554).
2. Extracted leaf juice is applied on skin eruption (Balijanda, Athgarh, Kondh, 3298).

Vernonia cinerea (L.) Less.

Powdered plant (10-20 gm) is advised to drink with 125 ml milk (mixed with 5-7 Cardamom and (10 gm sugar candy) once every morning, empty stomach for about three months to treat filariasis (Pokosunga, Bhadrak, Mrs. Das, 5613).

Vicoa indica (L.) DC.

1. Crushed plant is boiled in sufficient mustard oil, cooled and strained. Filtrate is applied on affected joints to get relief from rheumatic joints pain (Rasanajadi, Phulbani, Kondhs, 0237).
2. The same information was further confirmed from Nuapada district (Saoras, 1992).
3. Powdered root (3-5 gm, two times daily) is given with sufficient water to alleviate fever in children (Sabli, Phulbani, Kondhs, 0341).
4. Fresh root is chewed raw to treat abdominal pain. (Thamsiblen, Malkangiri, Bondos, 1687).
5. Dried leaves and stems are burnt and made into ash. It is mixed with edible oil and applied warm on glandular swellings (Thamsiblen, Malkangiri, Bondos, 1687).
6. Extracted flower juice is given (5 ml, two times daily) with honey to get relief from severe cold and cough in children (Indramarish, Dhenkanal, Ojha, 3080).
7. Crushed plant is kept over night in sufficient water, strained and drunk in desired quantity every morning to get relief from constipation (Mugdhaparni, Bolangir, Gonds, 4244).
8. 3 cm piece of root is worn as an amulet in ear to get relief from earache (Rasna, Bonai, Paudi Bhuinyas, 4626).

Xanthium indicum Koenig.

1. A handful of fruits made into paste and applied locally on the scars of smallpox (Gokhru, Phulbani, Kondhs, 0577).
2. Extracted seed oil is applied on skin infections (Gokhru, Bolangir, Gonds, 4194).
3. Extracted leaf juice is applied on cuts to check bleeding (Gokhru, Bhadrak, Das, 4968).
4. Root is one of the ingredients of a composite drug prescribed for the treatment of filariasis. (Gokhru, Kendrapara, Mahapatra, 6390).
5. Leaf juice is applied on scabies (Gokhru, Kendrapara, Mahapatra, 6390).

Discussion

Diversity in usage

Noteworthy instances of diversity in ethnomedicinal uses are seen, particularly in the genera *Blumea, Eclipta* and *Elephantopus.*

Genus: Blumea

Whole plant of *Blumea lacera* is used for gastric disorders in Balasore, for body ache and sprain in Bhadrak and for swelling in Kendrapara among non-tribal population of these coastal regions of Orissa. Root of this species is prescribed in bed-wetting of children among Kol tribe of Balasore district.

Leaf of *Blumea aurita* is used on cuts to check bleeding by non-tribal in Bhadrak district, *B. fistulosa* is used to treat headache among Kharia of Sundargarh and *B. membranacea* whole plant to get relief from body pain in Orissa.

Genus: Eclipta

Leaf of *Eclipta prostrata* is widely used for over a dozen disease/conditions among tribal and non-tribal population throughout the state. It is used for malnutrition among Kol of Mayurbhanj; as veterinary medicine among Kondhs of Dhenkanal and Rout of Jajpur; for cuts among tribal and non-tribal groups of Balasore, Bargarh, Bhadrak and Jagatsinghpur districts. For stomatitis, sluggishness of lever, madness and scabies among non tribal group of Bargarh district; for cold, headache and jaundice by Misra of Kendrapara; for dysentery and to kill lice among rural population of Bhadrak and for skin eruption among Barik of Athgarh district are note worthy.

Genus: Elephantopus

Elephantopus scaber is one of the most popular and widely used plant species for over twenty disease /conditions in the state. Root is largely employed either singly or in combination with other drugs in most of the disease/conditions recorded.

Root of the plant is used for diarrhoea among Kondhs of Kandhamal and Dhenkanal districts, Saora of Puri district, Bhumij of Keonjhar district and Bathuris of Mayurbhanj district. It is prescribed for fevers like Malaria among Kondhs of Kandhamal, Filarial fever among Bhumij of Kalahandi and fever caused by evil effect of spirit among Paudi Bhuiyans of Bonai; for dysentery

with bloody stools among non-tribals of Athgarh and Bolangir regions. For dental complaints like Pyorrhoea among Bondos of Malkangiri and toothache among Bhumij of Keonjhar district; for snake bite among Bondos of Malkangiri and Kharias of Sundargarh; for respiratory tract disorders like Bronchitis among Kondhs of Kandhamal and cough/cold among Bhumij of Kalahandi. Besides the root is also prescribed to remove placenta during delivery by Bhumij of Kalahandi; for vomiting by Bathuris of Mayurbhanj; for migraine by Bondos of Malkangiri; for jaundice by Bhumij of Keonjhar, to break and remove stones from kidney by Sahu of Balangir and to treat menstrual disorders by Das of Balasore district are note worthy.

Hitherto unknown or less known uses:

Out of the uses presented in the paper, following were found to be new or less known when compared with published literature on ethno-medicine of the state (Das and Misra, 1987; Jain, 1991; Aminuddin and Girach 1991; Aminuddin et al., 2009; Satapathy and Panda, 1992; Girach 1992; Girach *et al.*, 1994, 1998, 2006; Sahoo and Satapathy, 2009; Panda, 2007).

a. Use of root of *Elephantopus scaber* for filariasis and to remove kidney stones.
b. Use of *Enydra fluctuans* in blood pressure and night blindness.
c. Use of *Launaea acaulis* in diabetes.
d. Use of *Tridax procumbens* in whitlow.

Conclusion

Ethno-pharmacological diversity in the family Asteraceae recorded so far from the state of Orissa is quite rich. It emphasizes on one hand the urgent need for scientific evaluation of some of these claims and on the other hand, it provides clue for intensive ethno-botanical work among under-explored ethnic groups like Munda, Mankadia, Paroja and primitive tribes like Bondo, Paudi Bhuinya and other bio-diversity rich areas like mangrove forests in the state.

Acknowledgements

The authors are grateful to the Director General, Central Council for Research in Unani Medicine, New Delhi and Deputy Director, Regional Research Institute of Unani Medicine, Bhadrak, for encouragement and taking keen interest in this work. Necessary help and cooperation extended by state forest officials is duly acknowledged. Authors are indebted to large number of tribal/rural informants, who agreed to share valuable first hand information on local uses of medicinal plants growing in their vicinity.

Fig. 1. *Ageratum conyzoides* L.

Fig. 2. *Blumea lacera* (Burm. f.) DC.

Fig. 3. *Eclipta prostrata* (L.) L.

Fig. 4. *Elephantopus scaber* L.

Fig. 5. *Emjudra fluctuans* Lour.

Fig. 6. *Sphaeranthus indicus* L.

Fig. 7. *Tridax procumbens* L.

Fig. 8. *Vernonia cineria* (L.) Less.

Fig. 9. *Vicoa indica* (L.) DC.

Fig. 10. *Xanthium indicum* Koenig.

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Chromatographic Finger Print Analysis of Herbal Drug (*Andrographis paniculata* Nees) by HPTLC Technique

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Abstract

The present study was designed to determine the HPTLC profile of the medicinally important plant *Andrographis paniculata* Nees. The Chloroform: Methanol (85:15) was employed as mobile phase for phyto-constituents. Linear ascending development was carried out in 20 cm x 10 cm twin trough glass chamber (Camag, Mutenz, Switzerland) saturated with the mobile phase and the chromatoplate development for two times with the same mobile phase to get good resolution of phytochemical contents. The developed plate was seen under UV light 254 nm and 366 nm. The methanolic extract of whole parts of *Andrographis paniculata* Nees showed the presence of 12 different types of phyto-constituents with different Rf. values. The developed HPTLC fingerprints will help the herbal drug industry to distinguish the adulterant and standardization of herbal formulations. Such chemo finger printing will act as biochemical markers for this medicinally important plant in the pharma industry and plant systematic studies.

Keywords: Terpenoids, HPTLC profile, Fingerprint, Phytochemistry

Introduction

Natural products derived from food and medicinal plants are the potential sources of antioxidant molecules. Herbal drugs have been in exercise by different civilizations in various parts of the world for centuries to treat a large number of diseases. Today, the plant based medicines are being used worldwide as medication and suggest a broad spectrum of activity since ancient times. But Indian herbal drugs have still low acceptability in the world market due to insufficient scientific validation. International agencies especially WHO emphasized on quality standards of complex herbal formulations through scientific validation of single raw drugs. The drug efficiency depends upon the several active principles and components present in it. Many natural (age, origin) & scientific (methodology of drug formulation) factors influence the proportion of various components in plant material.

The well developed quality standards can be achieved only through systematic evaluation of the plant material using modern analytical techniques including chromatographic ones. TLC and HPTLC are methods commonly applied for the identification, assay and the testing of purity, stability, dissolution or content uniformity of raw materials (herbal and animal extracts, fermentation mixtures, drugs and excipients) and formulated products (pharmaceuticals, cosmetics, nutrients).

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Andrographis paniculata Nees (family: Acanthaceae) popularly known as 'Kalmegh' in trade and widely cultivated in India. It is used in a number of formulations of Ayurvedic, Unani and Sidha system of medicines as ingredients with the name of 'Bhunimba', 'Kalmegh' and 'Nilavempu' respectively. It has been used for centuries in Asia to treat gastro-intestinal track and upper respiratory infection, fever herpes, sore throat, and a variety of other chronic and infectious diseases. Mostly the leaves and roots were used for medicinal purpose.

The key photochemical constituents of the herb are andrographolide other such phytochemical are 14-deoxy-11-oxonedrographplide, 14-deoxy-11,12-didehydroandrographolide, neoandrographolide and deoxyandrographolide (Rajani *et al*., 2000; Cheung *et al*., 2001; Kumaran *et al*., 2003; Raina *et al*., 2007; Kulyal *et al*. 2010; Mishra *et al*., 2010)**.** The plant is reported to posse's antihepatotoxic, antibacterial, antiviral, antimalarial, antihepatitic, antithrombogenic, antiinflammatory, anti snake venom, antipyretic, laxatives, and immunostimulant agent (Chadha, 1985; Madav *et al*., 1995; Handa & Sharma, 1990; Mishra *et al*., 2009; Puri *et al*., 1993; Sharma *et al*., 1992; Srivastava *et al*., 2004; Saxena *et al*., 1998; Patel *et al*., 2008; and Mishra *et al*., 2007). The plant has been reported to possess antipyretic, analgesic, antihepatotoxic, antidiabitic antimalarial, antibacterial, antifertility anti-inflammatory and immunosuppressive properties due to bitter content (Mishra *et al*., 1992; Kapil *et al*., 1993; Saraswat *et al*., 1995; Singhal *et al*., 2003). Most of biological actions of *Andrographis paniculata* has been due to the presence of andrographolide, which is a bicyclic a diterpene lactone. About 26 different poly herbal formulations of this plant are mentioned in Ayurveda as a popular remedy for the treatment of various liver disorders. In traditional Chinese medicine (TCM) *Andrographis* is considered as the herb possessing an important cold property useful to treat the heat of body in fever and to dispel toxins from the body. In Scandinavians countries, it is commonly used to prevent and treat common colds.

The present study communicates the reliable HPTLC finger prints profilethat represent pharmacologically active and chemically characteristics component of the medicinally important plant *Andrographis paniculata* Nees. It will be helpful to authenticate and evaluate the drug in respect of quality evaluation phyto-chemical (active constitutes) identification.

Material and Methods

Plant material and chemicals

Fresh plant material was collected from Ghaziabad (UP), India in the month of January 2011; and the specimens were authenticated with the help of standard floras and pharmacopoeial reference (Anonymous, 2010). The whole plant was shade dried and powdered using the electric homogenizer. 500 gm of the powdered samples were extracted with 500 ml methanol for 8 to 12 hours by using Soxhlet apparatus. There after methanolic extracts of plant material was filtered through Whatman paper no. 42 and the resultant filtrates were concentrated under reduced pressure and finally vacuum dried. The yield of the methanolic extract was 13.2 % w/w. The protocol for preparing sample solutions was optimized for high quality fingerprinting and also to extract the marker compounds efficiently. Since the marker compounds were soluble in methanol, therefore methanol was used for extraction. Preliminary phytochemical screening was done by following the standard method described by Lala (1993) and Kokate et al. (2005). For the experimental work pre-coated silica gel 60 F254 HPTLC plates, standard Andrographolide (Purity: 99% w/w) and analytical reagent (AR) grade chemicals were used.

Chromatographic conditions

HPTLC studies were carried out by CAMAG HPTLC system equipped with Linomat V applicator, TLC scanner 3, Repostart 3 with 12 bit CCD camera for photo documentation, co-controlled by Win CATA-4 software were used. The samples and standard were spotted in the form of bands of width 5 mm with a microlitre syringe on pre-coated silica gel glass plate 60F_{254} (20 × 10 cm with 250 µm thickness using a Camag Linomat IV (Switzerland). The plates were pre-washed by methanol and activated at 60°C for 5 min prior to chromatography. The sample loaded plate was kept in TLC twin trough developing chamber (after saturated with solvent vapor) with respective mobile phase and the plate was developed in the respective mobile phase up to 90 mm. The Chloroform : Methanol (85:15) was employed as mobile phase. Linear ascending development was carried out in 20cm x 10cm twin trough glass chamber saturated with the mobile phase and the chromatoplate development for two times with the same mobile phase to get good resolution of phytochemical contents. The optimized chamber saturation time for mobile phase was 30 min at room temperature (25 ± 2°C). The developed plate was dried by hot air to evaporate solvents from the plate. The plate was photo-documented at UV 254 nm and 366 nm using Photo-documentation

device. Finally, the plate was fixed in scanner stage and scanning was done at 254nm and 366 nm. The plate was kept in Photo-documentation chamber and captured the images under UV light at 254 and 366 nm. Densitometric scanning was performed on Camag TLC scanner III and operated by CATS software (V 3.15, Camag).

Observation

Diverse compositions of the mobile phase for HPTLC analysis were tested in order to obtain high resolution and reproducible peaks. The separation was achieved using Chloroform : Methanol (85:15) as the mobile phase. The methanol extract of whole aerial parts of *Andrographis paniculatata* showed the presence of 12 different types of phyto-constituents with different Rf. values (Figure 1&2 and Table 1&2). The peak area of Rf. value 0.87 (at 254 nm) and 0.53 (at 366 nm) showed highest area. Andrographolide showed single peak at Rf. value at 0.87 (254mm) and 0.91 (366 nm).

Results and Discussion

The chemical analysis of methanol extracts of *Andrographis paniculata* Nees showed the presence of various phytoconstitutents. The isolation and identification of these bioactive compounds can be used to formulate new drugs to treat various diseases and disorders. In recent times during this molecule era in addition to morphological characters in plant taxonomy anatomical, cytological, biochemical and molecular markers are also being used to classify the plants. HPTLC finger printing profile is useful as phytochemical marker and also a good estimation of genetic variability in plant populations. The data generated from the present study would help in the authentication and quality control for *Andrographis paniculata* Nees. Such chemo finger printing will also act as biochemical markers for this medicinally important plant in the pharma industry and plant systematic studies.

Table 1: Peak display of Andrographolide **at 254 nm**

Peak	Start Rf.	Start height	Max Rf.	Max height	Height %	End Rf.	End height	Area	Area %
1.	0.87	2.0	0.89	77.7	100.0	0.91	0.00	1279.0	100.0

Table 2: Peak display at different Rf values of Andrographis paniculata methanol extract at 254 nm

Peak	Start Rf.	Start height	Max Rf.	Max height	Height %	End Rf.	End height	Area	Area %
1.	0.12	0.1	0.13	32.9	2.39	0.16	2.1	424.3	1.26
2.	0.16	2.2	0.18	27.2	1.97	0.2	0.5	516.5	1.53
3.	0.22	1.3	0.25	36.2	2.63	0.29	0.0	33.3	2.46
4.	0.38	0.6	0.42	13.1	0.95	0.44	7.1	326.5	0.97
5.	0.46	5.5	0.48	26.2	1.90	0.5	16.6	617.1	1.83
6.	0.5	17.1	0.53	152.0	11.04	0.58	32.8	3809.3	11.27
7.	0.56	33.5	0.58	104.1	7.56	0.62	1.2	2492.7	7.38
8.	0.63	0.0	0.66	252.4	18.34	0.71	6.1	6095.9	18.04
9.	0.71	6.2	0.72	25.3	1.84	0.74	5.3	321.3	0.95
10.	0.74	5.9	0.77	194.6	14.14	0.8	57.4	4650.2	13.76
11.	0.81	57.8	0.83	98.1	7.12	0.84	87.8	2291.0	6.78
12.	0.84	89.8	0.87	414.8	30.13	0.91	9.5	11412.5	33.78

Table 3: Peak display of *Andrographolide* at 366 nm

Peak	Start Rf.	Start height	Max rf	Max height	Height %	End Rf.	End height	Area	Area %
1.	0.91	3.6	0.93	15.4	100.0	0.95	0.7	305.8	100.0

Table 4: Peak display at different Rf values of *Andrographis paniculata* at 366 nm

Peak	Start Rf.	Start height	Max Rf.	Max height	Height %	End Rf.	End height	Area	Area %
1.	0.12	0.1	0.13	27.5	3.88	0.16	0.3	321.0	1.7
2.	0.2	4.2	0.25	83.4	11.77	0.29	0.3	2247.4	11.88
3.	0.43	4.3	0.47	30.5	4.3	0.49	23.7	964.0	5.09
4.	0.49	24.0	0.53	205.2	28.98	0.56	42.6	5633.3	29.77
5.	0.56	43.1	0.58	66.7	9.43	0.63	13.1	2377.6	12.56
6.	0.63	13.4	0.66	189.6	26.77	0.71	0.3	5183.0	27.39
7.	0.71	0.4	0.72	33.3	4.70	0.74	4.9	450.1	2.38
8.	0.75	3.3	0.79	33.9	4.79	0.81	12.8	1010.6	5.34
9.	0.82	12.0	0.86	15.6	2.20	0.87	2.7	375.5	1.98
10.	089	0.3	0.92	22.5	3.08	0.93	0.6	360.6	1.91

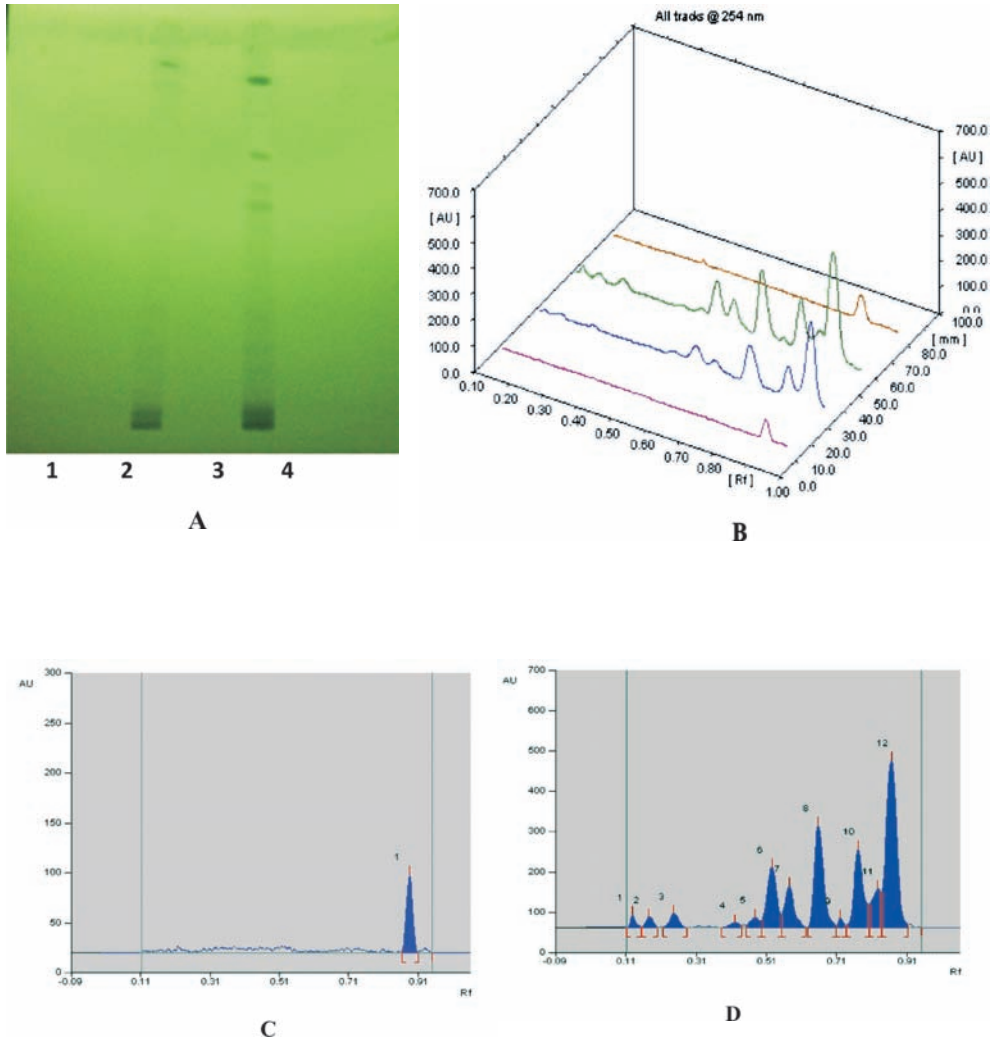

Fig.-1. HPTLC fingerprinting profile under UV 254 nm

A. HPTLC fingerprints profile of methanol extract and reference standard (Andrographolide)
B. Overlay Chromatogram
C. Chromatogram of Andrographolide
D. Chromatogram of methanol extract

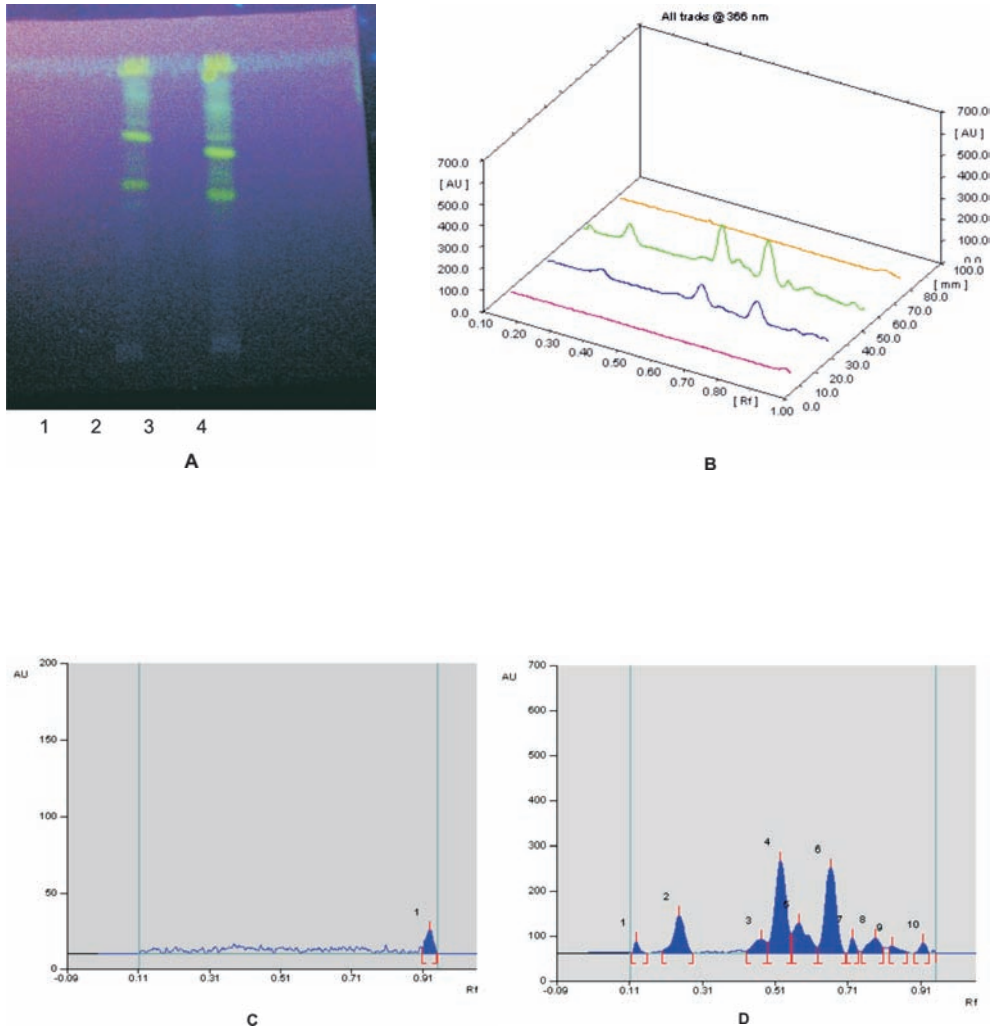

Fig. 2. HPTLC fingerprinting profile under UV 366 nm

A. HPTLC fingerprints profile of methanol extract and reference standard (Andrographolide)
B. Overlay Chromatogram
C. Chromatogram of Andrographolide
D. Chromatogram of methanol extract

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Diagnostic Characteristics of Medicinally Acclaimed *Ranunculus* Species

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Abstract

Ranunculus acris L., *R. bulbosus* L., *R. repens* L. and *R. sceleratus* L. (Family Ranunculaceae) are attributed for medicinal potential and look very alike in morphological appearance. They can be distinguished on the basis of the morphological details of leaf in respect of segmentation and trichomes. These characters are helpful for checking adulteration and mix-up between *Ranunculus* species obtained from natural habitat and market supplies.

Keywords: *Ranunculus* species, Diagnostic characters, Medicinal potential.

Introduction

Ranunculus species (family: Rannuculaceae) are medicinally acclaimed for different therapeutic actions as per medicinal claims in herbal therapies and ethno-medicinal claims. Some of the medicinally important genera are *Ranunculus acris* L., *R. arvensis* L., *R. bulbosus* L., *R. repens* L., *R. sceleratus* L., *R. trichophyllus* Chaix. *Ranunculus sceleratus* L., *R. trichophyllus* Chaix. and *R. arvensis* L. are distributed in Indian subcontinent (Khare, 2007) whereas *R. acris* L., *R. bulbosus* L. and *R. repens* L are of European origin (Gleason, 1968; Bailey, 1961). *Ranunculus acris* L., *R. bulbosus* L., *R. sceleratus* L., *R. repens* L. are of high therapeutic importance and have been recognized for their medicinal values in different systems of medicines including homoeopathy (Khare, 2007; Allen, 1874; Clarke, 1990 & Grieve, 1994).

In general Ranunculus species are tonic, extremely acrid, causes blisters followed by deep sloughing ulcer. Ranunculine ($C_{11}H_{16}O_8$), a glycoside, is present in all parts of these plants except seeds, which on breaking down produces a substance called Protoanemonin ($C_5H_4O_2$) or Ranuncular and this is the vesicant and blister causing property of these plants. Therefore this herb should not be mixed with any other drug even in a small quantity or adulterated or substituted and especially in homoeopathy, substitutions is completely prohibited.

R. acris L. (Tall butter cup) is used for treatment of bronchitis and asthma, as a lotion for dermatitis. *R. bulbosus* L.(Butter cup) acts upon muscular and fibrinous tissue, used in herpes zoster, pains in chest with apprised breathing, intercostals rheumatism and in chronic sciatica, also effective in alcohol-hiccough, epileptic form attacks, delirium, and also in day blindness. *R. repens* L. (Creeping butter cup) is used in for pulsation in back, smarting of eyes, sensation in forehead and scalp, inflammation and weakness of feet. *R. sceleratus* L. (Celery-leaved Butter Cup) is anti-fungal in nature, cures blisters on skin and has caustic property (Khare, 2007; Allen, 1874; Clarke, 1990 & Grieve, 1994).

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All these four herbs are very similar in morphological characters, having similar habit, habitat and bear similar-looking bright yellow flowers, but they differ in their efficacy and therefore should not be intermingled or substituted. These plants can be differentiated and identified on the basis of very striking but simple characteristic features and thus intermixing and adulteration can be checked which is the object of this presentation.

Material and methods

Identified plant materials and seeds were obtained from Grugapark Essen, (Germany) and Royal Horticultural Society, RHS Garden, Wisley, UK. Seeds were sown in the Experimental herb Garden of Homoeopathic Pharmacopoeia Laboratory and plants were grown. Identified plant materials obtained from Germany, France and garden grown plants were used as experimental material. Conventional method of hand sectioning and double staining methods was done following (Youngken, 1951). Sections were studied under compound microscope.

Results and Discussion

A close morphological study of these four plants shows, *R. acris* is an erect pubescent herb (Fig. 1), *R. bulbosus* is an erect and hirsute herb and has bulbous root (Fig. 2), *R. repens* is a creeping, more or less pubescent herb having roots at the nodes and very rarely ascending (Fig. 3) while *R. sceleratus* is an erect, much branched, almost glabrous herb (Fig. 4). Leaves of all these plants are fragmented giving very similar look but study shows differences which are presented in Table1 on the basis of which species can be differentiated (Figs. 5, 6, 7and 8).

Vertical section of lamina shows presence of different types of trichomes, on the basis of this simple character the species can also be identified instantly. *R. acris* bears simple unicellular, large trichomes abundantly present on lower surface (Fig. 9); *R. bulbosus* shows unicellular simple trichomes of varying length which emerge from multicellular bulbous base (Fig. 10), but in case of *R. repens* twin trichomes present frequently in grooves of upper surface of lamina (Fig. 11) and sharp leaf-teeth shows mucilage secretion; *R. sceleratus* shows small, unicellular, thin-walled, glandular trichomes (Fig. 12).

On the basis of these above said characters these four important herb drugs can be distinguished and identified which is very important because through they belong to the same genus they greatly differ in their medicinal uses and efficacy. So, these findings will help a lot to check adulteration since they are of exotic origin and not supplies often take the advantage of admixturing or adulterating.

Table 1: Differentiating characters of leaves and trichomes of four *Ranunculus* species

R. acris	R. bulbosus	R. repens	R. sceleratus
1. Leaves reniform, deeply cleft into 3 broadly lobed cuneate-ovate segments which again incised or cleft into oblong to linear lobes (Fig. 5).	Leaves 3to 5 parted, terminal division petiolated, lateral sessile or nearly so, all divisions again variously lobed or cleft (Fig. 6).	Leaves 3 parted, segments broadly ovate to sub-rounded in general outline, lobes again cleft or lobed, sharply toothed (Fig. 7).	Leaves 3 parted, segments cuneate and again variously lobed and notched (Fig. 8).
2.Trichomes simple, unicellular, long, abundant on lower surface (Fig. 8).	Trichomes unicellular of varying length, arise from multicellular bulbous base; present on both upper and lower surface (Fig. 10).	Twin trichomes present frequently in grooves of the upper surface of leaf (Fig. 11).	Trichomes small, unicellular, thin-walled and glandular; present on both surfaces (Fig. 12).

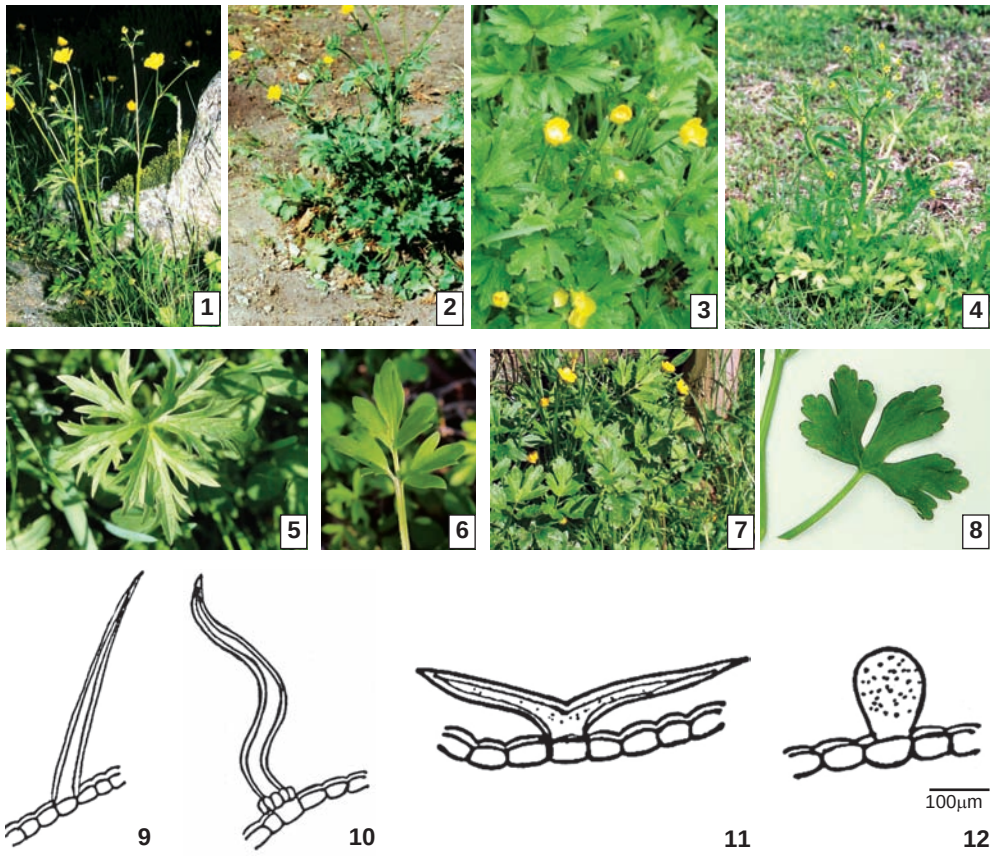

Fig 1. A view of R. acris; **Fig 2.** A view of R. bulbosus; **Fig 3.** A view of R. repens; **Fig 4.** A view of R. sceleratus; **Fig 5.** A leaf of R. acris; **Fig 6.** A leaf of R. bulbosus; **Fig 7.** A leaf of R. repens; **Fig 8.** A leaf of R. sceleratus; **Fig 9.** Simple, unicellular trichome in R. acris; **Fig 10.** Unicellular trichome with bulbous base in R. bulbosus; **Fig 11.** Twin trichomes in R. repens; **Fig 12.** Glandular trichome in R. sceleratus

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Standardization of Unani Ointments : 'Marham Quba'

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Abstract

In India the Greco-Arab medicine that is derived from Greece about 2000 year ago is known as Unani medicine; and a number of herbal drugs (Unani drugs) and formulations are in place by various herbal pharmaceutical industries. During the past decade there is tremendous demand, especially from developed countries, for drugs of herbal origin and this revival of interest is mainly due to the current widespread belief that Traditional Herbal Medicines are safe and more dependable than synthetic drugs. The SOPs (Standard Operational Procedure) and standardization, which are essential for efficacy of every batch of a drug, have not yet been thoroughly investigated and Ointments that are one of the important groups have not been screened; therefore, the work on different ointments was started and in the present paper the standardization and quality assurance of 'Marhaam Quba' is reported. The present formulation is an important ointment of Unani System of Treatment, used as topical applicant for cuts, pains and abrasions etc. The parameters that are selected are those that are recommended by National Unani Pharmacopoeia Committee. 'Marham Quba' is a red, semisolid compound with strong smell of mustered oil. Its action is mentioned as 'Mubarrid' and 'Daf-e-Taffun', in Unani literature and the mode of administration is topical (Anonymous, 1971; Anonymous, 2008). The parameters that are studied are Total ash (32.77%), Acid insoluble ash (2.17%), Water soluble ash (0.9%), Alcohol soluble matter (13.73%), Water soluble matter (14.17%), Pet. ether soluble matter (36.34 %), Water content (7.64%), Loss on drying (10.56%), pH of 1% & 10% solution (9.84 & 10.15 respectively) and Congealing point (64-700C). Thin Layer Chromatography (TLC) profile are also used for finalizing the marker compounds. The heavy metals, Aflotoxins and Pesticidal residue are not detected. No microbs noted in the final product. In addition HPLC profile of 'Marham Quba' are also recorded for future reference.

Keywords: Marham Quba, Standardization, Quality control, Ointment

Introduction

The use of herbs and their formulations to treat diseases has stood the test of time. The chemical constituents present in them are playing vital role in the physiological functions of living flora and hence they are believed to have better compatibility with the human body (Kamboj, 2000). That is why herbs and their products is now the centre of gravity for researches and application

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for treatment of various ailments. It is a point to note that the plants and their products are composed of many constituents and are therefore, capable of variation. The variability of the plant material is due to different conditions of growth, harvesting, drying, and storage. Regarding extracts we can say that the polarity of the solvent, the mode of extraction, and the instability of constituents may also influence the composition hence affecting the quality. In olden times, Hakims used to treat patients on individual basis and prepare drug according to the requirements of the consumer. Today herbal medicines however, are manufactured on a large scale in mechanical units, where manufacturers come across many problems such as non availability of good quality raw materials in bulk, and proper methodology for standardization, etc., (Harish Padh, 2001). The availability of SOP (Standard Operational Procedure) for manufacturing units on large scale production is also lacking. Marahim (Ointments) are the important preparation of Unani Medicine, used as topical applicant for cuts, pains and abrasions *etc*. Most of the ointments contain mineral and/or plant products that vary from formulation to formulation. No work on SOP and standardization of such type of drugs has been done till date, therefore, a series of work has been initiated to standardize the ointments for maintaining the quality and efficacy. For the present study 'Marham Quba' is selected and standardization is made. The part I of this series contains the SOP and standardization of 'Marham Kafoor' and communicated for the publication (Afaq *et al*. Hippocratic Journal of Unani Medicine). The work on others ointments will be reported else where. The parameters that are selected are those which are recommended by National Unani Pharmacopoea Committee.

Materials and Methods

Raw Materails

The formulation contains the ingridients (Table 1) that are mentioned in part Vth of National Formulary of Unani Medicine (Anonymous, 2008). The raw materials were purchased from the market and their identity, purity and strength were checked as per reference (Anonymous, 1978 (a)), given in table 1. The commercial sample of Sendur and Seemab banafsi was standardized and their standards are quoted here. **Sendur (Pb_3O_4)**: Decomposition point 500^{o}C, insoluble in alcohol and water, soluble in strong acid, Total Ash 99.0%. Water soluble and acid insolubles are negligible. Seemab banafsi, HgI_2O_6, colour change to yellow at 130^{o}C, melting point 258^{o}C, solubility in water 0.006 g/100 ml, solubility in alcohol 1 g/115 ml.

Preparation of Ointment

Flaks of Soap were put in a pan and kept on burner till melts. In the content wax and mustered oil were added. When all the ingredients mixed properly then the pan was removed from the burner. Further “Sendur” and “Safeda kashgari” were mixed and stirred till it become semi solid. Lastly “Semab-e-banfshi” was added and mixed to make a homogenous mixture.

Physicochemical Parameters

Physicochemical studies like total ash; acid insoluble ash; water soluble ash; alcohol, petrolium Ether and water soluble matter; water content; loss on drying and congealing point were determined quantitatively according to methods recorded in Indian Pharmacopoeia (Anonymous, 1978(a)), WHO guidelines (Anonymous, 1978(b), 2005) and methods mentioned by Afaq *et al* (1994). Thin Layer Chromatography was conducted taking the help of method mentioned by Harborne (1973). The HPLC methods determination of pesticidal residue and Atomic absorption method for Heavy metals determination was used. The presence of Aflotoxins and Microbial load were studied as per revised recomendation of WHO mentioned in its bulletin (Anonymous, 2005).

HPLC analysis

Common pesticide (Chloropyriphos, DDT, Parathion, Malathion and Endosulphan) were obtained from Sigma-Aldrich and dissolved in acitonitrile (HPLC Grade). These standards were injected in the C18 column (30 cm) fitted in the HPLC instrument (Cyber lab, USA) and software driven peaks were obtained. The pressure was 6.5 Pa and temperature was 25^0C.The Flow rate was 1.0 ml/min. The detector was UV and the wavelength was 254 nm. The mobile phased was acitonitrite: water (75:25). The drug dissolved in acitonitrite were also injected and the peaks appears were compared with the peaks of pesticides (Fig. 1; Table 5), considering the retention time in the same conditions. The general HPLC profile of drug were also recorded and given in figure (Fig.2), and the details of the 28 peaks are given in table 6.

Results and Discussion

The present study is an attempt to ascertain the pharmacopoeial standards for the standardization of ‘Marham Quba’. Total ash (32.77%), Acid insoluble ash (2.17%), Water soluble ash (0.9%), Alcohol soluble matter (13.73%), Water soluble matter (14.17%), Pet. ether soluble matter (36.34 %), Water content (7.64%), Loss on drying (10.56%), pH of 1% & 10% (9.84 & 10.15 respectively)

and Congealing point (64-70^{0}C) are depicted in table 2. These parameters are considered as tools of checking the quality, identity, purity and strength of the ointment. The HPLC profile of the drug was recorded as the obtained graph can be compared with the batches in future. The HPLC pattern shows 28 peaks and peak number 11 is the major peak. The concentration of that compound is 86.801%. This peak is followed by peak number 6 (6.217%), peak number 15 (1.411%) and peak No. 12 (1.236%). The total concentration of two compounds (Peak No. 11 and 6) is 93.011%. The total concentration of compounds depicted in peak number 15 and 12 (2.647%). Other peaks show non significant concentration, so for checking the quality one should check peak number 11 and 6. The change in the profile of any batch will be a check point for low quality or adulteration. Thin Layer Chromatography (TLC) profile (Table 4) and Rf value obtained alongwith photographs of the TLC plate (Fig. 3) was also recorded for future refernce. The heavy metals, aflotoxins, pesticidal residue and microbial load were also studied and reported (Table 3a, 3b, 3c, 3d). No growth of any Fingi or Bacteria were observed in the cultural media and no aflotoxines (B1,B2,G1,G2) were detected. The limit of heavy metals were not considered in this formulation as lead and mercury are ingredients; whereas As and Cd may be impurities but in the limit. The HPLC analysis show no any common pesticide as in HPLC profile of drug non of the peak correspond to peak number 2,4,5,7, and 8 of soft ware driven HPLC graph of the mixture of different pesticides on the same instrument and same conditions (Fig.1; Table 5). The ointment is for topical use and contains heavy metals therefore used cautionary and kept out of reach of childrens to avoid any accident.

Table 1: Ingredients of 'Marham Quba'

S. No	Unani Name	Botanical/ English Name	Part Used	Reference	Quantity
1	Safeda Kashgari	Zinc Oxide	Salt	IP; 1978, pp 550*	50 g
2	Sendur	Lead oxide Red (Pb3O4)	Lead oxide Red (Mineral)	-	50 g
3	Sabun	Soap	Soap	IP 1978, p.447*	200 ml
4	Roghane Sarsoon	Brassica juncea Hook f.	Mustard Seed oil	IP 1978, pp.320-321*	1.2 lit
5	Mom Asli (Pure Wax)	Beeswax	Wax from honey comb	IP, 1978, p. 62*	350 g
6	Seemab Banafshi	Mercuric Iodide (HgI2O6)	Mercuric Iodide (Mineral)		20 g

*IP=Indian Pharmacopoeia

Table 2: Physicochemical Properties of Marham Quba

Parameter*	Marham Quba
Total ash Acid insoluble ash Water soluble ash	Not more than 32.77% Not more than 2.17% Not more than 0.9%
Alcohol soluble matter Water soluble matter Pet. ether soluble matter	Not less than 13.73% Not less than 14.17% Not less than 36.34 %
Water Content	Not more than 7.64%
Loss on dry	Not more than 10.56%
Congealing point	64 - 70 ^{0}C
pH 1%	9.84
pH 10%	10.15

*Each parameter is mean of three experiments

Table 3: Heavy Metals (a), Microbial Load (b), Aflatoxin (c) and Pesticide residue (d) of 'Marham Quba'

(a) Qualitative Analysis for Heavy Metals

S. No.	Test Parameters	Results*	Limits
1	Lead as Pb	172.093ppm	*Not more than 10 ppm
2	Mercury as Hg	51.221ppm	* Not more than 10 ppm
3	Arsenic as As	0.117ppm	Not more than 3.0 ppm
4	Cadmium as Cd	0.229ppm	Not more than 0.3 ppm

*Note: Limit of Lead and Mercury is not applicable with this product as lead oxide Red and Mercuric Iodide is ingredient of the formulation; Arsenic and Cadmium are within limit.

(b) Microbial Load (for three samples)

S. No.	Microbs	Result*	Limit
1	Total Bacterial Count	Nil	Not more than 105 /g
2	Total Fungal Count	Nil	Not more than 103/g
3	Enterobacteriaceae	Nil	Nil
4	Salmonella	Nil	Nil
5	Staphylococcus aureus	Nil	Nil

(c) Aflatoxin (for three samples)

S. No.	Aflatoxin	Result*	Limit
1	B1	Not detected	Not more than 0.50 ppm
2	B2	Not Detected	Not more than 0.10 ppm
3	G1	Not Detected	Not more than 0.15 ppm
4	G2	Not Detected	Not more than 0.10 ppm

(d) Pesticide residue (for three samples)

S. No.	Pesticide	Result*	Limit
1	Chloropyriphos	Not detected	Not more than 0.2 mg/kg
2	DDT	Not detected	Not more than 1.0 mg/kg
3	Endosulphan	Not detected	Not more than 3.0 mg/kg
4	Malathion:	Not detected	Not more than 1.0 mg/kg
5	Parathion	Not detected	Not more than 0.5 mg/kg

Note. *All result based on three experiments

Table 4: Thin Layer Chromatography Profile of Marham Quba

Drugs	Extract	Mobile Phase	Spraying Reagent	Observation
Marham Quba	Methanolic Extract	Toluene: Ethyl acetate: Diethylene (7:2:1)	Vanillin H_2SO_4	After spray of Vanalne Sulphuric acid two spots appears; Rf. 0.10, 0.90 (Bluish Gray)

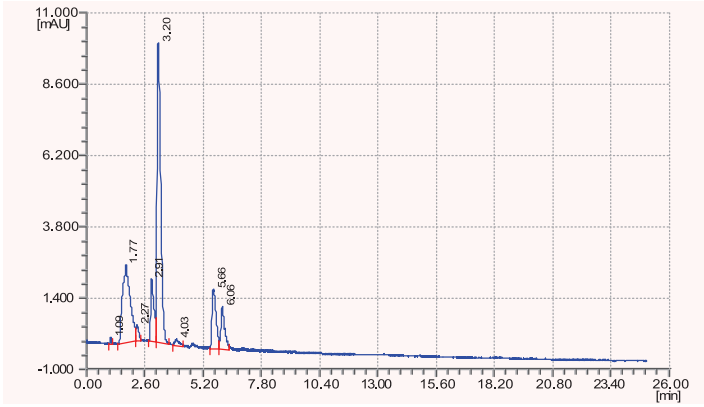


Fig. 1. HPLC of the Mixture of different pesticides

Table 5: HPLC Obtained Peaks of Pesticides

Peak	Retain. Time	Height	Area	Concentration
1	1.092	23	82.9	1.1967
2	1.768	261	6405.7	13.5796
3	2.268	54	378.2	2.8096
4	2.912	210	2042.2	10.9261
5	3.203	1009	11936.6	52.4974
6	4.030	21	294.6	1.0926
7	5.665	199	2523.1	10.3538
8	6.058	145	1701.5	7.5442

Note: Peak 2, 4, 5, 7 and 8 are the major pesticides

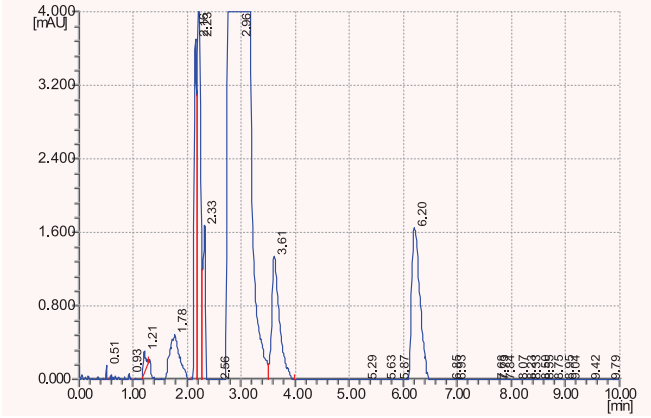
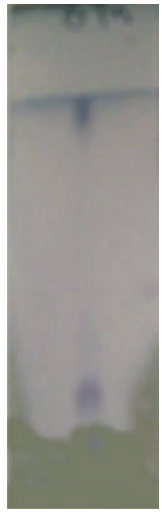


Fig. 2. HPLC profile of Marham Quba

Table 6: HPLC Obtained Peaks of Marham Quba

Peak	Retain. Time	Height	Area	Concentration
1	0.717	41	65.4	0.247
2	0.859	13	64.2	0.078
3	1.119	12	12.6	0.072
4	1.469	10	39.1	0.060
5	1.519	13	18.6	0.078
6	1.794	1031	12484.1	6.217
7	2.154	59	168.1	0.356
8	2.295	73	532.6	0.440
9	2.470	60	419.5	0.362
10	2.562	59	401.3	0.356
11	2.854	14395	133343.0	86.801
12	3.530	205	2732.6	1.236
13	4.005	136	1695.5	0.820
14	4.649	15	44.7	0.090
15	5.057	234	4720.1	1.411
16	5.800	18	60.2	0.109
17	6.527	15	41.6	0.090
18	6.627	20	43.0	0.121
19	6.877	15	100.9	0.090
20	7.177	30	394.7	0.181
21	8.267	11	97.2	0.066
22	8.400	16	56.2	0.096
23	8.442	16	36.5	0.096
24	8.525	23	34.6	0.139
25	8.667	20	42.6	0.121
26	9.142	23	43.6	0.139
27	9.312	10	22.2	0.060
28	9.445	11	42.1	0.066



Vanillin sulphuric acid

Fig. 3. Thin Layer Chromatography of 'Marham Quba'

Acknowledgement

Authors are thankful to the Unani Pharmacopoeia Committee and Department of AYUSH, New Delhi for the financial support.

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Pharmacognostical Evaluation of Authentic vis-à-vis Commercial Samples of *Syzygium cumini* (L.) Skeels (Seeds)

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Abstract

yzygium cumini (L.) Skeels (Family- Myrtaceae) is commonly known as 'Jamun', it is widely used as a fruit and also drug. The seeds are popular choice as ingredient in anti-diabetic herbal formulations. This plant species is prescribed in material medica of Ayurveda, Unani and Shidda System of medicines as drug with the name of 'Jambu', 'Jamun' and 'Naval Pattai' respectively. The seeds of *Syzygium cumini* (L.) Skeels were evaluated to assess their quality in respect of identity, purity and strength. The commercial samples were resourced from Delhi, Hardwar and Ghaziabad markets. Evaluation is based on specific parameters and limits developed by standardising authentic samples of drug.

Keywords: Pharmacognostic evaluations, Commercial herbal drugs, Quality assessment

Introduction

Syzygium cumini (L.) Skeels (Family- Myrtaceae) is commonly known as 'Jamun', it is widely used as a fruit. The fruit is laden with a large number of minerals, and provides fewer calories, as compared to other fruits. The seed of the fruit is also rich in protein and carbohydrates and traces of calcium have also been found. *Syzygium* plant is a woody, perennial, indigenous to Cochin, China, India and also widely cultivated. Jamun fruits are a good source of iron and are said to be useful in the troubles of heart and liver (Figure 1A). The seeds of jamun are an effective medicine against diabetes and their powder is widely used in India to control diabetes. Seeds have been reported to posses, alkaloid, tannins, glycoside, flavonoid and sterols. The phytochemical constituents have been structurally elucidated as jambosine, gallic acid, ellagic acid, corilagin and related tannin, 3,6-hexahydroxydiphenoylglucose and its isomer 4,6-hexahydroxy-diphenoylglucose, 1-alloylglucose, 3-galloylglucose, quercetin, kaempferol, myricetine and β-sitosterol respectively (Chopra *et al*., 1956; Bhatia and Bajaj, 1975; Gupta and Agrawal, 1970 & Rastogi & Mehrotra, 1990). *Syzygium cumini* seeds have extensively used for various ailments such as anti-inflammatory (Chaudhuri *et al*., 1990), hypolipidaemic (Stanely and Menon, 1997), anti-diabetic and antioxidant14, neuro-protective (Stanely *et al*., 2003) and recently it has been reported for the DNA protection against radiation (Jagetia *et al*., 2005). Owing to popular anti-diabetic activity of the drug, a number of commercial herbal formulations containing single ingredient (seeds of *Syzygium cumini* (L.) Skeels) in the form of powder and capsules are available in the market which attracted the attention of authors to carry out the present study to evaluate the quality of commercial samples.

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Methodology

The dried seeds of *Syzygium cumini* (L.) Skeels were collected from Haridwar forest area and commercial samples were procured from the herbal drug vendors of Haridwar, Delhi and Ghaziabad, India (Figure 1B). The plant was identified and authenticated with the help of standard floras and herbarium/ museum samples maintained in Pharmacopoeial Laboratory for Indian Medicine, Ghaziabad. The seeds were separated from the fruits and dried in shade, powdered and stored at 25^0C (Figure 1C). For studying powder microscopy Jackson & Snodon (1992) was followed. To determine physico-chemical constants, Indian Pharmacopoeia (1955) was consulted and for fluorescence study schedules mentioned by Trease & Evans (1972) was followed; colors were named by consulting Rayner (1970). Standard prescribed procedures for histochemical studies (Johanson, 1940; Youngken, 1951; Cromwell *et al*., 1955 & Trease & Evans, 1972) organic group detection (Robinson, 1963); UV Spectrophotometry (Willard, 1965) and Chromatography (Shellared, 1969; Stahl, 1969 & Smith and Feinberg, 1972) were adopted from relevant literature resource. The information is complied by reviewing the available literature.

Result and Observations

Organoleptic characteristics:

The authentic and commercial samples of powdered drugs were examined for colour, taste and odour and tabulated in Table 1 & Figure 1 B, C & D.

Table 1: Organoleptic characteristics of samples

Parameters	Authentic Sample	Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Origin	Seed	Conform	Conform	Conform
Shape	Brownish-black oval or round	Conform	Conform	Conform
Dimensions	Length1cm, wide 1 cm	Conform	Conform	Conform
Colour	Beige brown	Conform	Conform	Conform
Surface	Coriaceous covering and smooth surface	Conform	Conform	Conform
Texture	Corky, hard	Conform	Conform	Conform
Fracture	Short, complete	Conform	Conform	Conform
Odour	Odourless	Conform	Conform	Conform
Taste	Astringent	Conform	Conform	Conform

Micro-morphological characteristics:

Epidermis is single layered, mesophyll composed of isodimeteric of thin-walled parenchymatous cells which contain starch grains. Endocarp cells, endosperm cells, schizogenous cavities and stone cells are also present in powder, Table 2 & 3, Figure 2.

Table 2: Micro-morphological characteristics of seed

Parameter	Authentic Sample	Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Epidermis	Three to four layered epidermis	Present	Present	Present
Mesophyll	isodimeteric of thin-walled parenchymatous cells which contain starch grains	Present	Present	Present
Testa	Composed of polygonal cells, present schizogenous cavities which contain oil drops	Present	Present	Present

Table 3: Micro-morphological characteristics of seed powder

Parameter	Authentic Sample	Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Cellular contents	Fragments of parenchymatous cells	Present	Present	Present
	Endocarp cells	Present	Present	Present
	Fragments of polygonal endosperm cells	Present	Present	Present
	Stone cells and	Present	Present	Present
	Starch grains simple, oval or rounded measuring 7-28 µm in diameter	Present	Present	Present

Histo-Chemical Tests and Behaviour of Specific Reagents Plant Tissues:

For the micro-chemical tests and to observe the behaviour of specific reagents towards plant tissue of drugs, the dried plant material was soaked in water for two or three days. Slightly thick sections were cut for the observations as very thin sections cause danger of not arriving at proper conclusion. Due care was taken in washing the cutting implements before each operation so as to avoid contamination. The sections were placed in slides and were irrigated with specific reagents placing drops of reagent at one slide of cover-slip of prepared specimen and the subsequent sucking of the fluid under the cover-slip by placing a strip of filter paper at opposite side of it. The progress of reaction was followed by suitable magnification under microscope. Only the positive results

in reference to specific colouration in drugs tissues obtained by tests have been recorded in Table 4.

Table 4: Histo-chemical tests and behaviour of specific reagents towards plant tissues and cells contents

Regent	Test for	Authentic Sample		Commercial Samples		
		Histological cell contents responded	Inference	Haridwar	Delhi	Ghaziabad
Dragendorff's reagent	Alkaloid	Not Responded	–	–	–	–
Marme's reagent	Alkaloid	Not Responded	–	–	–	–
Wagner's reagent	Alkaloid	Not Responded	–	–	–	–
Potassium hydroxide solution (5% w/v)	Anthocynin	Not Responded	–	–	–	–
Sulphuric acid (66% v/v)	Anthocynin	Not Responded	–	–	–	–
Acetic acid	Calcium oxalate	Not Responded	–	–	–	–
Potassium hydroxide solution (5% v/v) + Hydrochloric acid	Calcium oxalate	Not Responded	–	–	–	–
Sulphuric acid	Calcium oxalate	Not Responded	–	–	–	–
Kedde reagent	Cardiac glycoside	Not Responded	–	–	–	–
Iodine Solution followed by Sulphuric acid	Cellulose	Not Responded	–	–	–	–
Sudan III	Fixed oil and fats	Endosperm cells	+	+	+	+
Chlor-zinc-Iodine Solution	Latex	Not Responded	–	–	–	–
Aniline sulphate Solution followed by Sulphuric acid	Lignin	Stone cells and endocarp cells	+	+	+	+
Phloroglucinol HCl	Lignin	Same as above	+	+	+	+

Lugol's solution	Protein	Not Responded	–	–	–	–
Millon's reagent	Protein	Not Responded	–	–	–	–
Picric acid	Protein	Not Responded	–	–	–	–
Heating with KOH (5% w/v) + H_2SO_4	Suberin	Not Responded	–	–	–	–
Sudan III	Suberin	Not Responded	–	–	–	–
Weak Iodine solution	Starch	Starch grains in endosperm cells	+	+	+	+
Potassium hydroxide solution (5% w/v)	Starch	Same as above	+	+	+	+
Sulphuric acid	Starch	Same as above	+	+	+	+

Fluorescence characteristics under UV light:

About 1 g coarsely powdered drugs (collected and market sample) were macerated with 20 ml each of the different solvents (carbon tetrachloride, ethyl acetate, hydrochloric acid, nitric acid and water, sodium hydroxide and water, sodium hydroxide and methanol, sulphuric acid and water, buffer solutions of pH 5, pH 7 and pH 9) filtered and after 24 hours examined under daylight and ultra-violet light, Table 5.

Table 5: Fluorescence characteristics of powdered drug under Ultra-Violet light

S. No.	Treatments	Authentic Sample		Commercial Samples		
		Colour in day light	Nature of colour in fluorescene	Haridwar	Delhi	Ghaziabad
A.	Powder as such	Beige brown	Dark brown	Same	Same	Same
B.	Powder with					
1.	Carbon tetra chloride	Brown	Dark brown	Same	Same	Same
2.	Ethyl acetate	Brown	Dark brown	Same	Same	Same
3.	Hydrochloric acid	Dark brown	Brown	Same	Same	Same
4.	Nitric acid + water	Brown	Dark brown	Same	Same	Same
5.	Sodium hydroxide + methanol	Dark brown	Dark brown	Same	Same	Same
6.	Sodium hydroxide + water	Dark brown	Dark brown	Same	Same	Same

7.	Sulphuric acid + water	Brown	Reddish brown	Same	Same	Same
8.	Buffer- pH 5	Brown	Dark brown	Same	Same	Same
9.	Buffer- pH 7	Brown	Dark brown	Same	Same	Same
10.	Buffer- pH 9	Brown	Dark brown	Same	Same	Same

Qualitative Analysis for Major Organic Groups of Chemical Constituents:

About 25 gm both collected and market samples were extracted with 200 ml ethanol (70% v/v) by refluxing in a continuous soxhlet extractor for 16 hrs and followed the tests of presence of chemical constitutes, Table 6.

Table 6: Qualitative analysis for major organic groups of chemical constituents

Quality Specifications	Authentic Sample	Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Alkaloid	–	–	–	–
Anthraquinone	+	+	+	+
Coumarin	+	+	+	+
Flavonoid	+	+	+	+
Glycoside	+	+	+	+
Protein	–	+	+	+
Resin	+	+	+	+
Saponin	+	+	+	+
Steroid	–	–	–	–
Tannin	–	–	–	–

Quantitative Analysis for the Physico-chemical constants:

Result related to quantitative analysis for the physico-chemical constants represented in Table 7.

Table 7: Quantitative analysis for physico-chemical constants

Physico-Chemical Contents	Authentic Sample	Analytical values		
		Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Foreign Matter, %, w/w	–	0.5	1.0	0.9
Moisture content, % w/w, Not more than	15.0	13.6	12.2	10.0

pH	7.1	7.0	7.1	7.1
Total Ash, % w/w	5.0	4.8	4.6	5.2*
Acid insoluble ash, % w/w, Not less than	1.0	0.9	0.6	1.1*
Alcohol soluble extractive % w/w, Not less than	5.0	6.2	6.6	6.1
Water soluble extractive % w/w, Not less than	12.0	13.3	14.4	15.7
Essential Oil , % v/w, Not less than	–	–	–	–

*not conforming to the values obtained in respect of authentic samples.

Ultra –Violet Spectrophotometric Studies:

10 g of coarsely powdered drug samples (collected and market) were extracted with 100 ml methanol for 24 hours by cold extraction method. The extracts were filtered by Whatmann filter paper and diluted further in appropriate ratios as per requirement of instrumentation to keep the absorbance within the calibrated range, results are presented in Table 8 & Figure3.

Table 8: Ultra-Violet Spectrophotometer characteristics of drugs.

Specifications	Data Authentic Sample	Commercial Samples		
		Haridwar	Delhi	Ghaziabad
Tincture dilution ml/ml	1	1	1	1
Maximum absorption peak	0.076	0.074	0.074	0.075
	0.476	0.477	0.476	0.477
	0.743	0.746	0.745	0.744
λ Maxima at, nm	357.25	356.75	355.95	357.55
	256.80	257.30	255.85	256.15
	214.85	215.65	214.45	216.15

HPTLC Profiling:

HPTLC study were done on the pre coated silica gel60 G 'F_{254} (20x10 cm^2; 0.2 mm thick) aluminium plates using Toluene: Ethyl acetate: Formic acid (5:4.5:0.5) v/v as mobile phases. Methanol extract of samples were applied on plates by using Linomat applicator. Camag Twin Trough Glass Chamber (20x10 cm^2) with SS lid was used for development of HPTLC plate. The Twin Trough Glass Chamber was saturated with mobile phase for 30 minutes. TLC

plates were developed to 8 cm distance above the position of the sample application after this plates were removed from the chamber and air dried at room temperature. These plates were sprayed (derivatized) with anisaldehyde-sulphuric acid reagent followed by heating at 110 °C for 10 minutes. HPTLC plate were scanned by Camag Reprostar III, before derivatization, under UV 254 nm, UV 366 nm and after derivatization, all observations are tabulated in Table 9 & Figure 4.

Table 9: HPTLC Finger finger-printing characteristic of drugs

Mobile phase	Visualizations	R_f Values of bands	No. of Spots	Commercial Samples		
		Authentic Sample	Authentic Sample	Haridwar	Delhi	Ghaziabad
Toluene: Ethyl acetate: Formic acid (5:4.5:0.5) v/v	254 nm	0.19, 0.67, 0.79 and 0.86 (all grey)	4	4	4	4
	366 nm	0.56, 0.60 (both sky blue), 0.79 (bright sky blue), 0.86 and 0.88 (both red)	5	5	5	5
	After derivatization (anisaldehyde-sulphuric acid)	0.21 (grey), 0.47 (light violet), 0.69 and 0.80 (both violet)	4	4	4	4

Conclusion

Pharmaco-botanical evaluation of commercial samples of herbal drugs with comparison to genuine and authenticated crude drug samples reveal the extent of authenticity and quality of commercial samples. Each commercial samples of drug is compared in the tables 1 -4.24 with the authentic drug samples. The commercial samples from Ghaziabad does not conform the limit led down for total ash and acid insoluble ash. The total ash of the drug is residual substance which is not volatilized when the drug is ignited at certain temperature. This residual substance is physiological ash derived from the plant tissues itself. The extraneous to material viz. sand and soil adhering to the drug also contribute to ash as non-physiological ash. The cumulative residual substances of both kinds of ash are determined together and are termed as total ash. The genuineness of the drug sample is restricted within the physiological ash and lower amount of the ash up to certain extent is an indication of presence of

material other than prescribed ones. The higher values are indication of either the material being other than prescribed drug or addition of extraneous material in the drug. Acid insoluble ash is the residual amount obtained by boiling the total ash with dilute hydrochloric acid, collecting the insoluble matter in filter, washing and finally igniting the matter. This procedure is intended to measure the amount of silica, especially sand and siliceous earth, present in drug due to adhering soil and foreign matter as result of ignorance. The present study reveals that commercial samples are always subject to quality control for their authenticity to ensure identity, purity and strength as per pharmacopoeial and other quality standards before their use to formulate the medicine. This quality evaluation practice may also ensure the safety and efficacy of medicine

A

B

C

D

Figure 1

A. Fruiting twig of *Syzygium cumini* (L.) Skeels
B. Dried seeds in bulk
C. Dried seeds
D. Seed powder

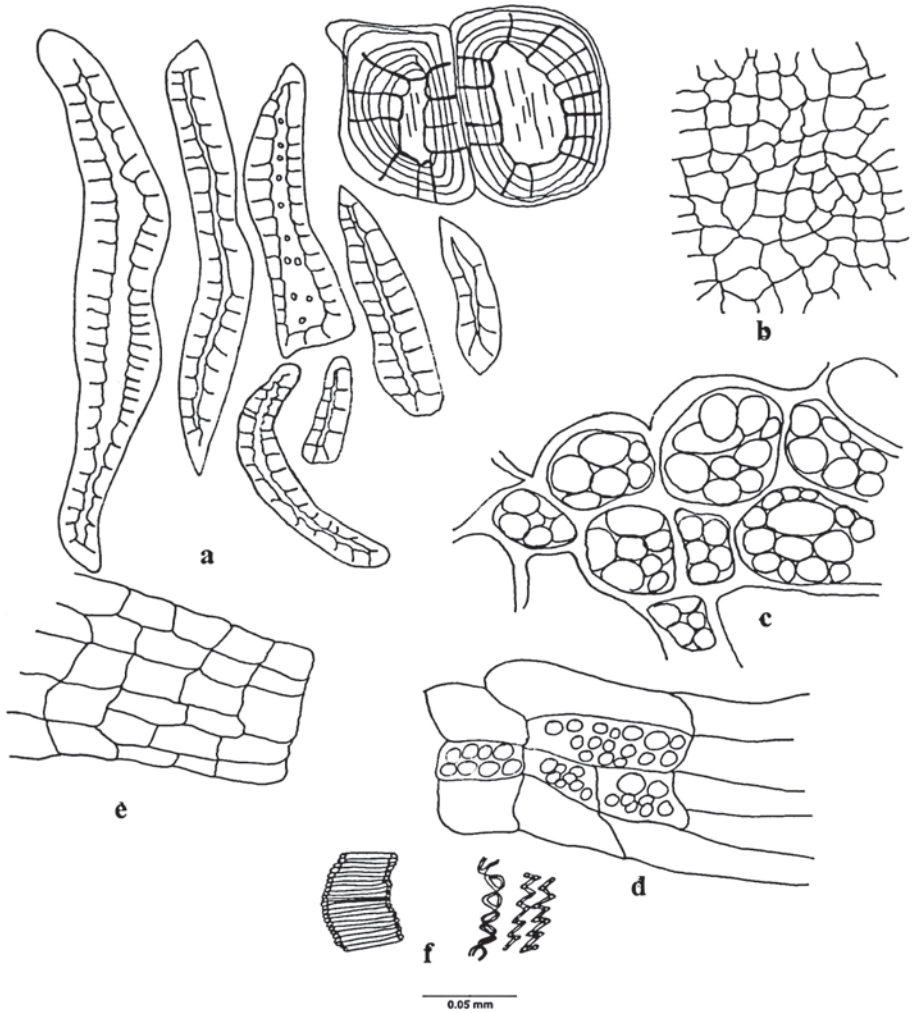
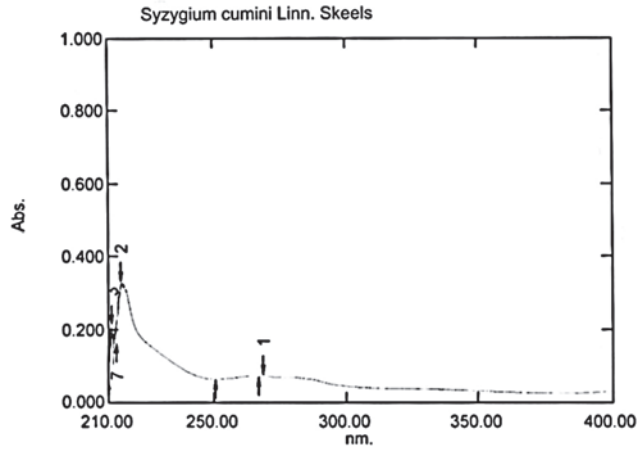


Figure 2

Micro-morphological characteristics of powder (a. stone cells; b, parenchymatous cells; c, endospermic cells containing starch grains; e, endocarp cells, f, xylem vessels)



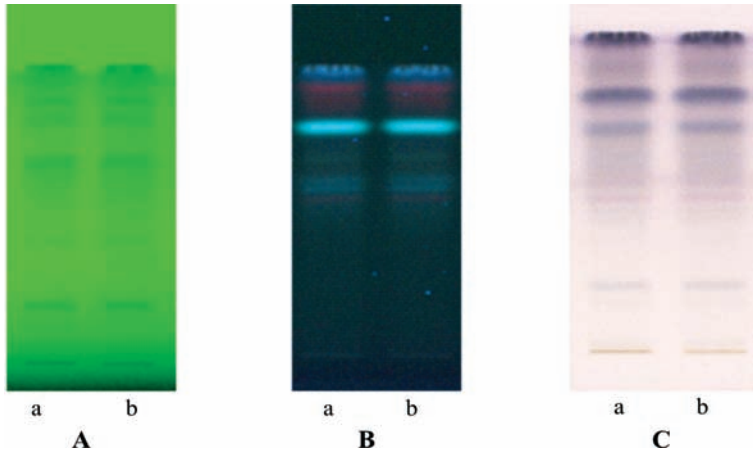


Figure 4

HPTLC finger-print profiling of seed of Syzygium cumini (L.) Skeels (a, collected sample & b. market sample)

A. Under 245nm

B. Under 366 nm

C. After derivatization

up to larger extent. Although all the herbal drugs are common in use but the analytical values in respect of quality parameters varies. The cause of non-conformance to identity is not to use genuine and prescribed plant species whereas difference in physico-chemical and phyto-chemical parameters leads to conclusion poor harvesting and storage practices adopted in commercial stock of drugs by collectors and traders. The code of 'Good Collection and Storage Practices' must be followed to ensure the availability of quality drug material in commerce.

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Physico-phytochemical Standardization of a Unani Herbo-Mineral Drug, '*Sunoon-e-Zard*': A remedy for Odontalgia and Gingivitis

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Abstract

unoon-e-zard, a herbo-mineral drug, valued in the Unani System of Medicine for its anti-inflammatory actions and therefore, utilized widely to relieve odontalgia (Waj-ul-Asnan) and gingivitis (waram-e-Lissa). It contains six ingredients, out of which only one is of mineral origin. Present communication deals with the physico-phytochemcial and thin layer chromatographic evaluations of this multiaction drug with an aim to bring out its pharmacopoeial standards and also to develop its standard operating procedure.

Keywords: Physico-phytochemical standardization, SOP, Odontalgia, Gingivitis

Introduction

Since last few decades the Traditional Systems of Medicine (TSM) has attained much recognition globally and often proved tremendously effective to relieve a variety of common human ailments. It is because of our vast and deep knowledge embodied in the classical literature of this systems and age old practices, there lies a potential source of a new brand of herbal drugs which could provide safe and effective alternatives and adjuncts to the available armamentarium of herbal drugs. The herbal drugs have already gained universal acceptance but there is still need for developing the methods to ascertain their standards to provide quality products with standardized dosage forms and proof of their safety and efficacy (Premilla, 1989; Akerele 1984 and; Hsu 1958).

Dental complaints are common both among rural and urban population. Some of the problems commonly recorded by the dentists are, toothache, pyorrhoea, tooth cavity, loose teeth, due to weakness of gums and also bleeding gums etc. The validity of numerous drugs are assured in such complaints, free from adverse drug reaction and are available at an affordable cost and can be promoted for the management of oral and dental problems. Razi (1977) and Joshi and Halde (1984) have recommended specific tooth sticks and suggested various measurements for the prevention of dental and oral complaints (Girach et al., 2011; and Punjabi, 1988).

Sunnon-e-zard is a poly herbo-mineral unani drug used to relieve a variety of dental complaints like Waj-ul-Asnan (Odontalgia) and waram-e-Lissa (Gingivitis), due to its two chief actions i.e. Mohallil-e-warm (Anti-inflammatory) and Musakkin-e-Alam (Analgesic). It contains five drugs of herbal origin and

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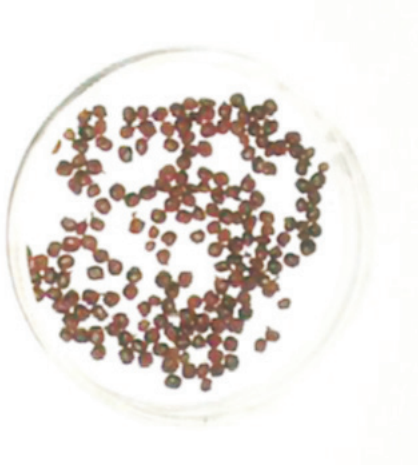
a mineral ingredient (Plate-1). The present communication thus highlights detailed physico-phytochemical assessment and thin layer chormatogrpahic validations of the laboratory sample prepared as per NFUM-I (Anonymous, 2006), to lay down the quality standards for the identification and authentication of the drug. So that it could provide maximum therapeutic potential and efficacy. The standards of few other unani formulations viz. Sunoon-e-Tambaku and Darhald have already been reported by Zuberi and Tajuddin (2008) and Siddiqui et al. (2009).

Methodology

All the ingredients used in the prepred of laboratory samples of the drug were of standard pharmacopoeial quality and identified botanically by the experts. Post-e-Anar was collected from the local juice vendors and fresh gulnar farsi was procured from our medicinal plants nursery, dried in shade and kept in

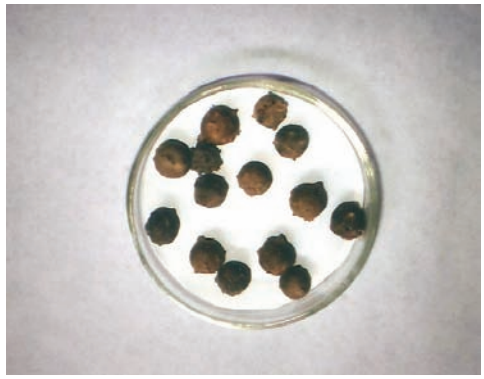
Post-e-Anar

Gulnar



Sumaq

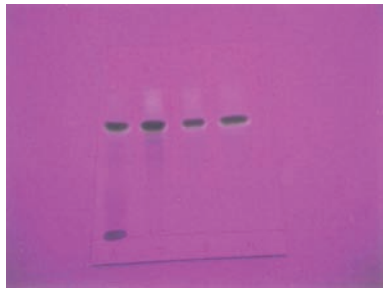
Zard chob



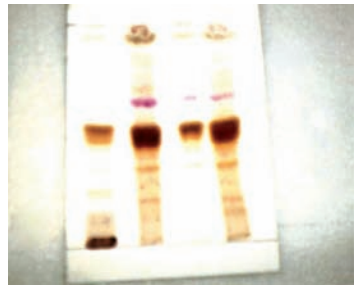
Mazu

Shibb-e-Yamani

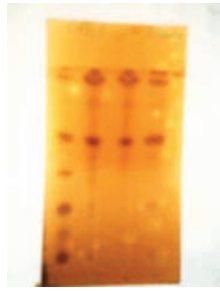
Plate 1. Ingredients of Sunoon-e-zard



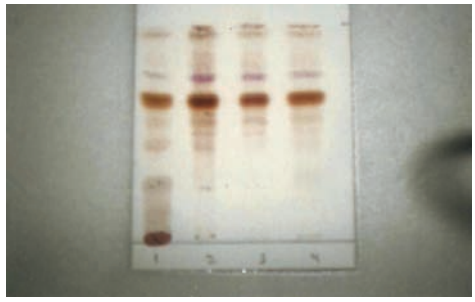
Under UV (365 nm)



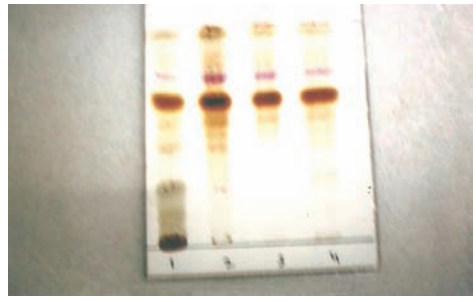
Under UV (365 nm) after derivatization with 10% Eth.H2SO4



On exposure to Iodine vapour



In visible light



Under UV (365 nm) after spraying with 10% Eth. H2SO4 and heating at 110o

Plate-2. TLC profile of Sunoon-e-zard

containers. Rest of the ingredients were collected from Dawakhana Tibbiya College AMU, Aligarh. The raw drugs were separately powdered using an electric grinder and finally passed through 60 mesh size sieve. The powders of five ingredients thus obtained were mixed as per formulation composition shown in Table-1 and then subjected to physico-chemical, phytochemical estimations, thin layer chromatography, microscopic investigation and behavior of powder drug with different chemical reagents and their observations in day light and UV (365 nm) have been recorded as already reported earlier in similar studies (Hashmi and Zuberi, 2010; Zuberi and Hashmi, 2010, 2011, 2012). Crude protein estimation (Lowry et al., 1951), the crude fibre, total nitrogen and tannins were also estimated accordingly (Anonymous, 2009).

Description

Sunoon-e-zard is a powdered drug in appearance, reddish brown in colour having an aromatic odour and a light saltish taste tending astringent.

Observations

Microscopy : The powdered drug showed epidermal cells in surface view with anomocytic stomata, druses of calcium oxalate crystals; epidermal cells in surface view with occasional anomocytic stomata; parenchymatous zones of thin walled cells, containing angular fragments of tannins, abundant starch grains with crystals of calcium oxalate; characteristic horn shaped multicellular trichomes, small and large palisade cells from testa, fragments of fruit walls with cicatries; testa of the seeds; embryo and oil globules, brick shaped cork cells showing striations in surface view, starch grains in form of big rounded pasty masses, oleoresin cells with brownish content and the xylem vessels having reticulate and spiral thickenings.

The observations related to physico-chemical and phytochemical estimations, thin layer chromatography of different extracts and the behavior of powdered drug are thus recorded in Tables 2-9.

Discussion and Results

Quality is important in the preparation of every product and its vitality depends upon the genuinity and quality of the raw materials used in the preparation of the polyherbal drugs, so the physico-chemical studies and other investigative parameters are important tools in highlighting for a drug to be genuine, potent and hence efficacious.

Quality control is a concept which strives to prevent and eliminate errors at various stages of production along with standard operation procedures. With the growth of herbal pharmaceutical industries and research organizations involved in the physicochemical, phytochemical validations has been in rapid progress in the field of standardization and physic-botanical analyses, involving complex instrumentations alongwith simple procedures and guide lines for formulations, is a matter of foremost importance. The tests of quality control and quality assurance are primarily designed to evaluate the aspects of reliability, reproducibility and accuracy of results depending upon the environmental, infrastructural, technical and also the instrumentational facilities.

The primary phytochemical screening of the extract of the test drug revealed the presence of alkaloid only with dragendorff's reagent, but a very weak positivity of the test was observed, while the test with mayer's reagent was negative. The tannins were screened with ferric chloride reagent. Steroids did not respond to salkowski's test. The behavior of the powdered drug with different chemical reagents are noteworthy due to the sharp fluorescent golden yellow colour on treating the drug with picric acid solution. The test of aluminium for shibb-e-yamani was found quite compatible (Anonymous 1970, Anonymous 1987). The physic-chemical data pertaining to the quality assessment was recorded as mean values of triplicate readings for alcoholic soluble matter (31.39%), water soluble matter (54.33%), total ash (6.84%), water soluble ash (2.37%), pH of 1% aq. solution (2.87) and 10% aq. solution (2.32). Moisture contents as taken by the loss on drying at 105ºC was found not more than 9.80 as a mean value.

Conclusion

On the basis of wide therapeutic importance and actions of the ingredients, the test drug "sunoon-e-zard" has become a vital unani remedy for dental complaints. Its systematic standardization has been therefore carried out to lay down the quality standards of the laboratory sample and a concept to provide adequate informations to the consumers about the credibility and safety of the herbal drugs.

Table 1: Formulation composition of Sunoon-e-Zard

Name of Unani Drug	Botanical name/ mineral composition	Family	Part used	Quantity
Post-e-Anar	Punica granatum Linn.	Punicaceae	Fruit rind	100 g
Gulnar farsi (abortive flowers)	Punica granatum Linn. (male variety)	Punicaceae	Flower	100 g
Haldi (zard chob)	Curcuma longa Linn.	Zingerberaceae	Rhizome	100 g
Sumaq	Rhus coriaria Linn.	Anacardiaceae	Seed	100 g
Mazu Sabz	Quercus infectoria Oliv.	Fagaceae	Gall	100 g
Shib-e-yamani	Potassium Aluminium Sulphate KAl(SO4)2.12H2O	-	-	100 g

Table 2: Physico-chemical quality standards of Sunoon-e-zard

Quality standards/ parameters	Values	Mean	Range
Alcohol soluble matter (95%) %, w/w)	41.34, 31.45, 31.38	31.39	31.34 – 31.45
Water soluble matter (%, w/w)	54.28, 54.34, 54.38	54.33	54.28 – 54.38
Successive Extractive (%, w/v)			
(i) Peter Ehter (60-80o)	1.96, 2.04, 1.94	1.97	1.94-2.04
(ii) Benzene	0.44, 0.48, 0.52	0.48	0.44-0.52
(iii) Ethyl acetate	2.38, 2.44, 2.35	2.39	2.35-2.44
(iv) Chloroform	0.82, 0.78, 0.80	0.80	0.78 – 0.80
(v) Ethanol	31.91, 32.02, 31.97	31.96	31.91 – 32.02
(vi) Water	44.88, 44.92, 44.83	44.87	44.83 – 44.92
pH (1% aq. Solution)	2.87, 2.88, 2.87	2.87	2.87 – 2.88
pH (10% aq. Solution)	2.31, 2.33, 2.32	2.32	2.31 – 2.33
Moisture contents (loss on drying at 105oC) %, w/w	9.78, 9.73, 9.89	9.80	9.73 – 9.89
Total ash (%, w/w)	6.84, 6.82, 6.88	6.84	6.82 – 6.88
Water soluble Ash (%, w/w)	2.34, 2.37, 2.40	2.37	2.34 – 2.40
Tannins	1.242, 1.248, 1.244	1.240	1.242-1.248
Resin	4.92, 4.84, 4.88	4.88	4.84 – 4.92
Crude fibre	3.24, 3.27, 3.21	3.24	3.21 – 3.27
Total nitrogen	0.044, 0.046, 0.041	0.043	0.041 – 0.046
Crude protein	0.275, 0.2875, 0.256	0.272	0.256 – 0.2875

Table 3: Preliminary phytochemical screening of sunoon-e-zard

S. No.	Organic phytochemicals	Test reagents	Inferences
1.	Alkaloids	Mayer's reagent Dragendorff's reagent	-ve
2.	Glycosides	Sodium hydroxide test	-ve
3.	Resin	Acetic anhydride	+ve
4.	Tannins/Phenols	Ferric chloride test	+ve
5.	Flavonoids	Shinoda test	-ve
6.	Steroids	Salkowski's test	-ve
7.	Protein	Xanthproteic test	+ve
8.	Carbohydrates	Anthrone test	-ve

Table 4: Behaviour of powdered drug with different chemical reagents.

S. No.	Chemical Reagents	Observations	
		Day Light	**UV (366 nm)**
1.	Conc. Sulphuric acid	Dark brown	Dark violet
2.	Conc. Hydrochloric acid	Reddish brown	Dark brown
3.	Conc. Nitric acid	Creamish yellow	Violet
4.	Iodine solution (5% aq. Solution)	Bluish black	Dark brown
5.	Acetic acid (glacial)	Pale red	Fluorescent golden yellow
6.	Formic acid	Reddish pale yellow	Bright golden brown
7.	Vanilline-H2SO4 reagent	Pale brown	Golden yellow
8.	Ferric chloride solution (5% aqueous)	Violet value	Dark bluish black
9.	Picric acid solution (commercial)	Reddish yellow	Violet green
10.	Orthophosphoric acid (commercial)	Cherry red	Dark reddish brown
11.	Ethanolic-H2SO4 reagent (10%)	Reddish	Fluorescent golden yellow
12.	Drug as such	Reddish yellow	Bright golden yellow

Table 5: TLC profile of Different Extracts of Sunoon-e-Zard in visible light

S. No.	Extracts	Solvent system	Detection/ Spray treatment	No. of spots	Rf values
1,	Methanol	Toluene-Ethyl acetate-Methanol-Formica cid (6:3:0.5:0.5)	Visible light	6	0.18, 0.31 (dull gray), 0.43 (faint yellow), 0.50 (brownish yellow), 0.56 (light yellow), 0.68 (brownish yellow)
2.	Chloroform	Toluene-Ethyl acetate-Methanol-Formica cid (6:3:0.5:0.5)	Visible light	5	0.43, 0.56 (light yellow), 0.68 (golden yellow), 0.71 (light yellow), 0.81 (yellow)
3.	Benzene	Toluene-Ethyl acetate-Methanol-Formica cid (6:3:0.5:0.5)	Visible light	3	0.56 (yellow), 0.68 (dark brownish yellow), 0.75 (light yellow)
4.	Ethyl acetate	Toluene-Ethyl acetate-Methanol-Formica cid (6:3:0.5:0.5)	Visible light	4	0.47 (light yellow), 0.58 (yellow), 0.67 (golden yellow),

Table 6: TLC Evaluations of Different Extracts of Sunoon-e-Zard under UV (365 nm) radiation

S. No.	Extracts	Solvent system	Detection/ Spray treatment	No. of spots	Rf values
1.	Methanol	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	UV (365 nm)	7	0.21 (dark brown), 0.25 (light red), 0.32 (dark brown), 0.42 (light yellow), 0.50 (light pinkish yellow), 0.54 (fluorescent pale yellow), 0.61 (golden yellow)
2.	Chloroform	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	UV (365 nm)	11	0.18 (light brown), 0.21 (light golden yellow), 0.25 (golden yellow), 0.28 (red), 0.34 (light golden yellow), 0.42 (pale yellow), 0.47 (reddish yellow), 0.57 (dark golden brown), 0.71 (light yellow), 0.75, 0.82 (fade yellow)

3.	Benzene	Toluene - Ethyl acetate- Methanol- Formica cid (6:3:0.5:0.5)	UV (365 nm)	4	0.40 (yellow), 0.47 (light yellow), 0.54 (pale yellow), 0.61 (golden yellow)
4.	Ethyl acetate	Toluene - Ethyl acetate- Methanol- Formica cid (6:3:0.5:0.5)	UV (365 nm)	7	0.17 (fade brown), 0.22 (golden yellow), 0.25 (light golden yellow), 0.36 (golden yellow), 0.48 (pale red), 0.57 (golden brown), 0.77 (light yellow)

Table 7: TLC profile of various Extracts of Sunoon-e-Zard on Exposure to Iodine vapours

S. No.	Extracts	Solvent system	Detection/ Spray treatment	No. of spots	Rf values
1.	Methanol	Toluene-Ethyl acetate-Methanol- Formica cid (6:3:0.5:0.5)	I2 vapours	5	0.11 (light brown), 0.17, 0.24 (light yellowish brown), 0.50 (light brown), 0.57 (brown)
2.	Chloroform	Toluene-Ethyl acetate-Methanol- Formica cid (6:3:0.5:0.5)	I2 vapours	6	0.18 (light brown), 0.38 (dull brown), 0.50 (light brown), 0.54 (dark brown), 0.82, 0.94 (light brown)
3.	Benzene	Toluene-Ethyl acetate-Methanol- Formica cid (6:3:0.5:0.5)	I2 vapours	4	0.37 (fade brown), 0.52 (dark brown), 0.81 (light brown), 0.94 (light brown)
4.	Ethyl acetate	Toluene-Ethyl acetate-Methanol- Formica cid (6:3:0.5:0.5)	I2 vapours	7	0.20, 0.25, 0.38 (light brown), 0.48, 0.51 (dark brown), 0.80, 0.94 (brown)

Table 8: TLC profile of Different Extracts of Sunoon-e-Zard after spraying with 10% Ethanolic H_2SO_4 reagent and viewed under UV (365 nm)

S. No.	Extracts	Solvent system	Detection/ Spray treatment	No. of spots	Rf values
1.	Methanol	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	10% Ethanolic-H2SO4 reagent & heating at 110oC	6	0.22, 0.31 (gray), 0.53 (yellow), 0.56 (brown), 0.68 (light pink), 0.95 (dull gray)
2.	Chloroform	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	10% Ethanolic-H2SO4 reagent & heating at 110oC	6	0.28, 0.41 (light golden brown), 0.56 (dark brown), 0.68 (pink), 0.72 (light gray), 0.92 (dark gray)
3.	Benzene	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	10% Ethanolic-H2SO4 reagent & heating at 110oC	4	0.41 (light brownish yellow), 0.56 (dark yellowish brown), 0.68 (light pink), 0.97 (light gray)
4.	Ethyl acetate	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	10% Ethanolic-H2SO4 reagent & heating at 110oC	7	0.22 (light gray), 0.28 (light brown), 0.41 (yellowish brown), 0.60, 0.62 (golden brown), 0.68 (light pink), 0.97 (gray)

Table 9: TLC profile of Different Extracts of Sunoon-e-Zard under uv (365 nm) radiation after heating the chromatogram at 110^{o}C

S. No.	Extracts	Solvent system	Detection/ Spray treatment	No. of spots	Rf values
1.	Methanol	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	Under UV (365 nm) after heating at 110oC	10	0.22 (dark brown), 0.25 (light red), 0.27 (dark brown), 0.33 (fade yellow), 0.46 (pale yellow), 0.52 (golden yellow), 0.65 (pinkish red), 0.68 (light grayish red), 0.91 (light reddish yellow), 0.93 (light sky blue)

2.	Chloroform	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	Under UV (365 nm) after heating at 110oC	9	0.18 (light golden brown), 0.22 (sharp golden brown), 0.31, 0.40 (pale yellow), 0.47 (dark brown), 0.62 (pinkish brown), 0.69 (grayish yellow), 0.81 (light pinkish red), 0.87 (brownish yellow)
3.	Benzene	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	Under UV (365 nm) after heating at 110oC	8	0.29 (yellow), 0.35, 0.40 (light yellow), 0.37 (brownish pale yellow), 0.65 (light pink), 0.68 (light grayish yellow), 0.78 (pinkish red), 0.87 (grayish yellow)
4.	Ethyl acetate	Toluene-Ethyl acetate- Methanol-Formica cid (6:3:0.5:0.5)	Under UV (365 nm) after heating at 110oC	9	0.17 (light grayish brown), 0.21 (brownish gray), 0.33, 0.42 (pale yellow), 0.46 (dark brown), 0.60 (pinkish brown), 0.71 (grayish yellow), 0.82 (pinkish red), 0.88 (light yellowish brown)

Acknowledgement

The authors are deeply indebted to Prof. S. Shakir Jamil, Director General, CCRUM, New Delhi for providing necessary research facilities and encouragement.

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Quality Evaluation of Commercial Samples of Some Herbal Drugs of Leaf Origin

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Abstract

Commercial samples of three herbal drugs of leaf origin viz. *Adhatoda zeylanica* Medicus., *Azadirachta indica* A. Juss. and *Ocimum tenuiflorum* L. were evaluated to assess their quality in respect of identity, purity and strength. The samples were resourced from Delhi, Hardwar and Cochin/Trichur markets. Evaluation is based on specific parameters and limits prescribed in Ayurvedic, Unani and Siddha Pharmacopoeia and as well in other literature.

Keywords: Pharmacognostic evaluations, Commercial herbal drugs, Quality assessment.

Introduction

Use of plants as a source of medicine has been an ancient practice and is an important component of the health care system in global scenario. In the various traditional systems of medicine practised in globally, most practitioners formulate and dispense their own recipes from the locally available medicinal plants. The use of herbal medicines is growing with approximately 40 per cent of population reporting use of herb to treat medical diseases within the past year. India has 16 Agro climatic zones, 45000 different plant species out of which 15000 are medicinal plants. The Indian Systems of Medicine have identified 1500 medicinal plants, of which more than 500 species are mostly used in the preparation of drugs direct or indirect ways and highly potential spices in the trade related practices in Indian and Global markets. A part from requirement of medicinal plants for internal consumption, India exports crude drugs mainly to developed countries, viz. USA, Germany, France, Switzerland, UK and Japan. The supply base of 90% herbal raw drugs used in the manufacture of Ayurveda, Siddha, Unani & Homoeopathy systems of medicine is largely from the wild. According to the report of the World Health Organisation (WHO), a large population of the world relies on the traditional systems of medicines, largely plant based to meet their primary health care needs. According to WHO, the international market of herbal products is estimated to be US $ 62 billion which is poised to grow to US $ 5 trillion by the year 2050, but India's share in the global export market of medicinal plants related trade is just 0.5 per cent (Singh, 2006). The demand for medicinal plants to fetch the need of different stakeholders is growing at a very fast pace. In India, about 90% of medicinal plants used by the industries are collected from the wild resources. It is estimated that about 800 species are used in

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production by the pharmaceutical industry, whereas less than 40 species of plants are under commercial cultivation. Over 70% of the plant collection involves destructive harvesting. This poses a definite threat to the genetic stocks and to the diversity of medicinal plants.

The major sources of medicinal plants are wild sources viz. forest areas, open land, non-cultivated sources etc. The medicinal plants collected from wild sources remain questionable for their quality especially when they have been procured from trade channels owing to fair chances of adulteration, substitution and inappropriate storage condition which lead to deterioration in quality. All the medicinal plants which is available in dried form in the trade are termed as crude drugs and is always subject to quality check in a laboratory on the basis of pharmacognostical, physico-chemical, phyto-chemical, microbiological and other analytical specifications. At times mere look alike species are used as a substitute, which may not even contain the active ingredients available through the main plants nor the effects of the end product is the same as that obtained from that of original plant (Sharma, 1987, Rai *et al.*, 2011, 2012a&b and Padmakumar *et al*., 2012). In some cases, pharmacopoeia and formularies permits the use of substitutes in place of original plants thus, giving legitimacy to the substitutes.

Materials and Methods

The leaf herbal drugs under study were collected from natural habitats and authenticated with references to pharmacopoeial standards and other literature. The commercial samples sold under the trade names purported to be prescribed species were drawn from the different market sources (Hardwar, Delhi and Cochin/Trichur). Standard protocols/methods prescribed in pharmacopoeia were followed for pharmacognostical, physico-chemical and phytochemical values prescribed in Ayurvedic, Unani and Siddha Pharmacopoeia of India were taken as standards values (Anonymous, 1986, 1998, 1999, 2007a,b and 2008).

Table 1: Commercial Herbal Drugs under study

Botanical Name	Official Name	Trade Name	Official Standards
Adhatoda zeylanica Medicus	Vasa	Bansa	Leaves
Azadirachta indica A. Juss.	Neem	Neem	Leaves
Ocimum tenui florum L.	Tulasi	Tulasi	Leaves

Abbreviation- API-Ayurvedic Pharmacopoeia of India, Part -I, UPI-Unani Pharmacopoeia of India, Part- I, and SPI-Siddha Pharmacopoeia of India, Part-I.

Observations and Results

All the commercial samples of the drugs were evaluated as per the specifications laid in Pharmacopoeia and other literature. Observation made are given in Table 2 to 4 -

Table 2: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Adhatoda zeylanica* Medicus

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug			
1. Macromorphological characteristics	Conforms	Conforms	Conforms
2. Micromorphological characteristics	Varies slightly	Conforms	Conforms
Powdered drug	Conform	Conforms	Conforms
Major organic groups			
(i) Alkaloids	√	√	√
(ii) Tannins	-	-	-
(iii) Glycosides	-	-	-
(iv) Sterols	-	-	-
(v) Volatile Oil	√	-	√
(vi) Flavonoids	-	-	-
(vii) Anthraquinone	-	-	-
(viii) Resins	-	-	-
(ix) Fixed oil	-	-	-
(x) Poly phenolic compounds	-	-	-
Physico-Chemical Characteristics			
(i) Moisture content %	2.20	4.20	4.50
(ii) Total ash %	17.00	16.20	19.00
(iii) Acid insoluble ash %	0.70	0.90	1.20
(iv) Water soluble extractives	28.20	30.40	26.50
(v) Alcohol soluble extractives %	6.40	4.60	3.50
Foreign Matter %	2.20	1.60	1.90

Table 3: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Azadirachta indica* A. Juss.

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug	Conforms	Conforms	Conforms
1. Macromorphological characteristics			
2. Micromorphological characteristics	Varies	Conforms	Conforms
Powdered Drug	Conforms	Varies	Conforms
Major Organic Groups			
(i) Alkaloids	-	-	-
(ii) Tannins	-	√	-
(iii) Glycosides	-	-	-
(iv) Sterols	√	√	√
(v) Volatile Oil	-	-	-
(vi) Flavonoids	-	-	-
(vii) Anthraquinone	-	-	-
(viii) Resins	-	-	-
(ix) Fixed oil	-	-	-
(x) Poly phenolic compounds	-	-	-
Physico-Chemical Characteristics			
(i) Moisture Content %	1.80	2.40	4.50
(ii) Total ash %	9.70	12.50	8.20
(iii) Acid insoluble ash %	1.70	1.55	0.90
(iv) Water soluble extractives	13.52	21.30	23.50
(v) Alcohol soluble extractives %	11.50	18.70	14.80
Foreign Matter %	0.20	3.20	1.80

Table 4: Pharmacognostical Evaluation of Commercial Crude Drug Samples of *Ocimum tenui florum* L.

Specifications	Market Sample		
	Delhi	Haridwar	Cochin
Entire Drug	Conforms	Conforms	Conforms
1. Macromorphological characteristics			
2. Micromorphological characteristics	Conforms	Conforms	Slightly varies
Powdered Drug	Conforms	Conforms	Conforms
Major Organic Groups			
(i) Alkaloids	-	-	-
(ii) Tannins	-	-	-
(iii) Glycosides	-	-	-
(iv) Sterols	-	-	-
(v) Volatile Oil	√	√	√
(vi) Flavonoids	-	-	-
(vii) Anthraquinone	-	-	-
(viii) Resins	-	-	-
(ix) Fixed oil	-	-	-
(x) Poly phenolic compounds	-	-	-
Physico-Chemical Characteristics			
(i) Moisture Content %	3.50	3.90	4.50
(ii) Total ash %	12.00	15.80	18.20
(iii) Acid insoluble ash %	2.50	2.70	1.80
(iv) Water soluble extractives	13.50	12.80	14.10
(v) Alcohol soluble extractives %	6.80	8.00	6.30
Foreign Matter %	1.80	2.30	0.90

Discussion and Conclusion

Pharmaco-botanicall evaluation of commercial samples of leaves of different herbal drugs with comparison to genuine and authenticated crude drug sample as well with pharmacopoeial standards reveal the extent of authenticity of commercial samples. Each drug is discussed in detail below-

Dried leaves of *Adhatoda zeylanica* Medicus is sold in the market with the trade name of Bansa or Adusa patti or Vasaka leaves. Epidermal cells with

anomocytic stomata on both surfaces with few trichomes. Cystolith is present in mesophyll cells. Acicular and prismatic forms of calcium oxalate crystals present in mesophyll. It contains alkaloids and essential oils. Total ash value for the commercial sample varies from 16.2% to 19%. Alcohol soluble extractive varies from 3.5% to 6.4%. Moisture content varies from 2.2% to 4.5%. All the commercial samples conform to the values of authentic sample. However, Delhi and Cochin sample contains foreign matter of 2.2% and 1.9% respectively. Dried leaves *of Azadirachta indica* A. Juss. is available in trade as Neem patti. Stele of the midrib composed of one crescent shaped vascular bundle and parenchymatous cells with rosette crystals of calcium oxalate Phloem surrounded by non-lignified fibre strand. Parenchymatous cells of lamina also contain rosette crystals of calcium oxalate. It contains triterpenoids and sterols. Foreign matter varies from 0.2% to 3.2% in the studied commercial samples. Cochin sample conforms to the values of authentic samples. Micromorphological characteristics of Delhi sample varies. *Ocimum tenuiflorum* L. is available as dried leaves in commerce. Epidermal cells of the leaves consist of a number of glandular trichomes. Petiole consists of three vascular bundles; middle one is larger than the other two. Lamina also contains trichomes similar to that of petiole with anamocytic and diacytic stomata present on both surfaces. Powder is light green in colour. Active chemical constituents are essential oils. All the commercial samples collected conform to the values of authenticated samples. However, Delhi and Haridwar samples shows higher percentage of foreign matter compared to Cochin sample. Foreign matter content varies from 0.90% to 2.30%.

The present study reveals that commercial samples are always subject to quality control for their authenticity to ensure identity, purity and strength as per pharmacopoeial and other quality standards before their use to formulate the medicine. This quality evaluation practice may also ensure the safety and efficacy of medicine up to larger extent.

Adhatoda zeylanica Medicus

Azadirachta indica A. Juss.

Ocimum tenui florum L.

Fig. Herbal Drugs of Leaf Origin Under Study

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Standardization of *Kushta Sammul far* (Calx of Arsenic Trioxide) Prepared by Two Different Methods

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Abstract

This study was carried out on two samples of *Kushta Sammul far* (Calx of Arsenic trioxide), one prepared by classical method of calcination and the other one by muffle furnace in order to set the parameters for its standardization and to observe similarity or dissimilarity between the two samples if any, to offer a more refined alternate method of calcination. The parameters of standardization included tests for luster, fineness, floating, and curd and lemon tests substantiated with analytical methods which included determination of moisture content, pH value, particle size distribution; and Fourier Transform Infrared Spectroscopy (FTIR). The study revealed almost similar results in the two samples with slight difference in the physicochemical properties. The methods and the findings may be used as reference to prepare and standardize *Kushta Sammul far*.

Keywords: Unani Medicine, *Kushta*, Standardization, Particle size, F.T.I.R.

Introduction

Metals and minerals such as gold, silver, copper, iron, zinc, lead; salts, earthy matters and gems etc. are commonly used in traditional systems of medicine (Dubey *et al.*, 2008; Devanathan et al., 2010.) especially in Unani medicine and Ayurveda. Since, most of the above mentioned metals and minerals cannot be used systematically as it is, because of pharmacokinetic inconvenience and potential toxicity; therefore, strategies have been set for conversion of these metals and minerals into carbonate or oxide forms which can be used effectively and safely in small doses. The oxide is technically known as *Kushta* (calx), a term derived from a Persian word '*Kushtan*' meaning 'To kill" (Anonymous, 1997; Husain, 1940) indicating a process by which metals and minerals are killed i.e. burnt at high temperature.

Preparation of *kushta* (*s*) by classical methods is though time tested but the process is a bit unsophisticated, complex and time consuming, therefore it was found suitable to switch over to some alternate methods (Shamim, 2009). The possible and simple alternate is muffle furnace method provided the same pattern of temperature, as used in classical method, is extrapolated and adjusted in muffle furnace. Shamim *et al* (2009) also developed a thermogram by digitally recording the temperature pattern encountered during the preparation of *Kushta Sammul far* by classical method and extrapolated it on muffle furnace, and compared the *kushta (s)* prepared by these two

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methods with reference to acute and sub acute toxicity. They found almost similar results in the two samples. Since they have performed only animal study therefore it would not be appropriate to conclude that the two samples are similar in all respect. Despite being a well-established dosage form, and having wide scope of incorporation of modern techniques for validation of *kushta*, very few scientific reports on physicochemical properties and toxicity profile of *kushta* (*s*) are available. Therefore, in our study the two samples of *Kushta Sammul far* were subjected to the physicochemical standardization to see difference in physicochemical properties, if any. The parameters used for the purpose of standardization included test for luster, fineness, floating characteristics, change of colour, moisture content, pH value, particle size, polydispersity index and finally the Fourier Transform Infrared Spectroscopy.

Materials and Methods

Materials

*Arsenic***:** Arsenic trioxide (As_2O_3) was procured from Nice Pvt. Ltd., Kerala, India.

*Alum***:** Alum was procured from local market of Bangalore.

Preparation of Test Drugs

Two samples of *kushta Sammul far* were prepared**.** The sample prepared by the method described in National Formulary of Unani Medicine (Anonymous, 2006) named as KSCM, whereas the sample prepared by muffle furnace as per the method described by Shamim *et al*. (2009) was named as KSMF.

Standardization of Kushta Sammul far

For standardization the following methods were adopted.

(i) Classical Methods

(a) *Test for Luster*

KSCM and KSMF were taken in a Petri dish and observed for any luster in day light through magnifying glass (Anonymous, 2001; Mohapatra and Jha, 2010).

(b) *Test for Fineness*

KSCM and KSMF were taken in between the thumb and index finger, rubbed to see that the *Kushta* (*s*) have deposited into the lines of the finger and easily

washed out from the cleavage of the lines. (Anonymous, 2001; Mohapatra and Jha, 2010).

(c) *Test for Floating*

A small amount of KSCM and KSMF were sprinkled over the still water in a beaker to observe that the particles of *Kushta* (*s*) floated over the surface of water or not (Anonymous, 2001; Mohapatra and Jha, 2010).

(d) *Curd Test*

A pinch of KSCM and KSMF were mixed with a little amount of curd in a clean and dry Petri dish to observe any colour changes (Mohapatra and Jha, 2010).

(e) *Lemon Test*

A pinch of KSCM and KSMF were mixed with lemon juice in a test tube, to observe any colour changes (Mohapatra and Jha, 2010).

(ii) Conventional Methods

(a) *Determination of Moisture Content*

Moisture content was determined by loss on drying method. For estimation of moisture content, 200 mg of KSCM and KSMF were placed in known weight of porcelain dish separately in hot air oven at the temperature ranging 100 – 105 ^{0} C. The weight of the drug was continuously monitored after every two hour followed by cooling of drug in a desiccator, until the weight of the drug remained constant. The constant weight was then subtracted from the weight of the drug taken and the percentage of moisture was determined (Jenkins, 1940).

(b) *Determination of pH*

For pH determination, a Systronic digital pH meter (model 152- R) equipped with a combined electrode was used. The instrument was calibrated using buffer solution of 4.00, 7.00 and 9.20 to ascertain the accuracy of the instrument prior to the experiment. The test drug (100 mg) was taken to determine the pH in 1% solutions (Anonymous**,** 1968).

(c) *Particle Size Determination*

For particle size determination of the KSCM and KSMF, Dynamic Light Scattering (DLS) was used for the measurement of average hydrodynamic meters and Polydispersity Index (PDI). Each sample was analyzed in triplicate at 20°C at a scattering angle of 173. Pure water was used as a reference for dispersing medium. Zeta potential data were collected through electrophoretic light scattering at 25°C, 150 V, in triplicate for each sample (Malvern Zetasizer

Nano-1690, Malvern Instruments, UK) in pure water. The instrument was calibrated with Malvern-50 V standard before each analysis cycle (Paul et al., 2011).

(d) *Fourier Transform Infrared Spectroscopy (FTIR)*

Fourier Transform Infrared Spectroscopy of KSCM and KSMF was carried out by FTIR Spectrophotometer 8700 (Shimadzu). Potassium bromide (KBr) was used as a binder agent. Before making pellet, the KBr put in an oven for removing moisture content. Afterwards, *Kushta* and KBr were taken in the ratio of 2:100 (mg), triturated with the help of mortar and pestle and made pellet of 0.5 mm of thickness by pressing of KBr press. The prepared pellet was analyzed by FTIR Spectroscopy (Vikas *et al.*, 2009).

Results

Physico-chemical Standardization

(i) Classical Methods

Results of test for lustreness, fineness, floating, curd test, and lemon test are given in table 1.

(ii) Conventional Methods

Moisture content of KSCM and KSMF was as 0.77% and 0.55%, respectively (Table 01). The pH value of KSCM and KSMF was found to be 7.20 and 4.48, respectively (Table 01). The particles of KSCM were found to be 655.8 nm and that of KSMF 573.3 nm (Table 02; Figure 01 A & B). FITR analysis showed that functional group region of both samples presented with same peaks indicating the probable similarity in chemical properties of both the *Kushta* forms, but different peaks were seen in finger print region indicating variation in stereomeric configuration of the two *Kushta* forms (Figure 2 A & B).

Discussion

Though, most of the drugs used in Unani medicine are supposed to be safe, but some may be toxic even at therapeutic dose level and very few of them mainly metals / minerals may be highly toxic if not subjected to the process of detoxification, as described in Unani literature. The methods of detoxification may either be physical or chemical or a combination of both. Calcination, which is one of the physical processes of detoxification, aims at downgrading

the toxicity of the drug so as to make it safe for therapeutic application. But if the drug happens to be a metal it may still contain the element of toxicity. Earlier the physicians of traditional medicines were processing and preparing the medicines under their direct supervision therefore, the authenticity and the quality of drug was ensured, but now the situation has changed and drugs are mostly prepared by pharmaceutical companies and industrial houses. In such circumstance, it is necessary to setforth standard parameters for checking the purity and quality of mineral drugs.

When the KSCM and KSMF were subjected to classical methods of standardization, it was found that both samples were equitable and of desired quality. However, quantitative studies showed slight differences in the two samples.

Moisture content determination is a reliable parameter for assessing the quality of crude drugs, but estimation of moisture content in a drug which has been burnt at temperature exceeding 500^0C seems to be inconsequential, still in our study it was taken as a parameter because kushta being a fine powdery preparation and having larger surface area may absorb moisture during packaging and storage. The moisture content *of Kushta Sammul far* prepared by classical method should ideally not exceed 2% (Anonymous, 1986), which in our study was found to be 0.77% and 0.55%, in KSCM and KSMF, respectively indicating its good quality and also the reliability of the procedures adopted to prepare the two samples.

The pH of a drug may also be considered as an important parameter. Change in the pH of the solution can change the physical chemistry of a drug by adding or removing protons at certain sites of the molecule and thus increasing or decreasing the solubility of the drug (Anonymous, 2012). In our study the pH value of KSCM and KSMF was found to be 7.20 and 4.48, respectively showing difference in the pH of the two samples. The pH of KSCM inclined to alkalinity, whereas that of KSMF showed acidic nature. This difference might be because of some possible chemical changes occurred during the processing which rendered two different physical attribute to the two samples but it needs intensive investigation to ascertain the cause.

Particle size of drugs used for systemic effect influence their dissolution rate. It is therefore expedient to have small particle size of drugs as they will have larger surface area (Walter, 1994). Earlier, particle size of *kushta* (*s*) was judged on the basis of simple tests which were unable to give accurate results, but with the help of analytical methods it became possible to get the

size even in nm. Dynamic Light Scattering method is a good technique used to determine the size distribution profile of small particles. We found particle size of KSCM and KSMF estimated by Dynamic light scattering as 655.8 nm and 573.3 nm, respectively. Similarly, FTIR Spectroscopy is an important method for assessment of quality of crude drugs. Although, this technique is more useful for identification of functional groups present in organic compounds, but it was applied to our study material to observe difference, if any, in the spectra of the two samples. On comparing the FTIR spectra of KSCM and KSMF, we found same peaks in functional group region indicating similarity in chemical structure, but different peaks in fingerprint region were observed which may be due to some inequitable physical properties of the two samples. These findings indicated that KSCM and KSMF may have minor but insignificant difference in their physical and even in chemical properties. Since no reference literature on Dynamic Light Scattering and FTIR for any *Kushta* (*s*) including *Sammul far* is available for comparison therefore our study may be considered as one of the earliest reports in this area of research and may also be considered as standard for future references.

Table 1: Physical properties of *Kushta Sammul far* tested by classical methods

S. No.	Tests	Samples	
		KSCM	KSMF
1.	Test for Luster	–	–
2.	Test for Fineness	+	+
3.	Test for Floating	+	+
4.	Curd Test (color change)	–	–
5.	Lemon Test (color change)	–	–
	+ = Yes - = No		

Table 2: Moisture content, pH value and Particle size of KSCM and KSMF

S. No.	Samples	Moisture content (%)	pH	Particle size (nm)	Pdi
1.	KSCM	0.77	7.20	655.8	0.46
2.	KSMF	0.55	4.48	573.3	0.45

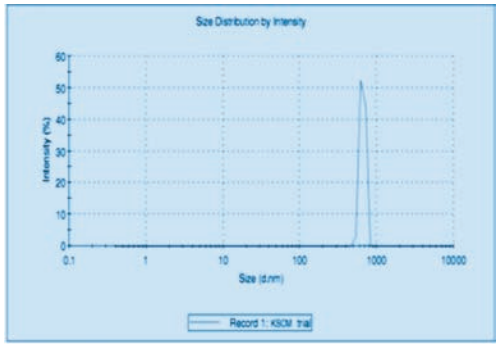

Fig.1: Particle size of KSCM

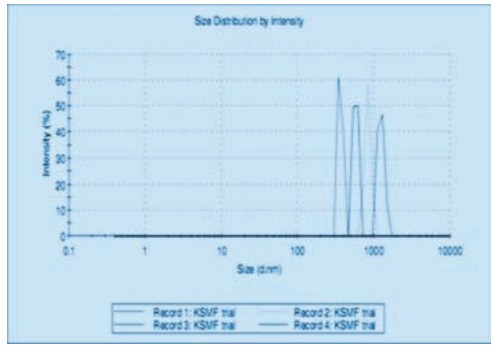

Fig. 2: Particle size of KSMF

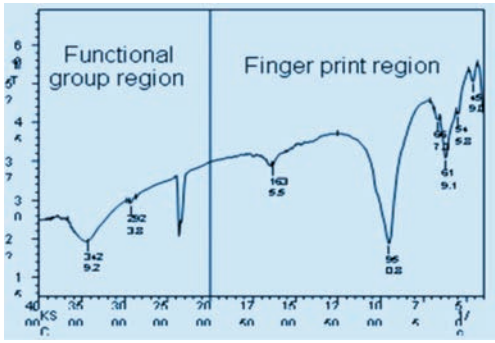

Fig. 3: FTIR spectrum of KSCM

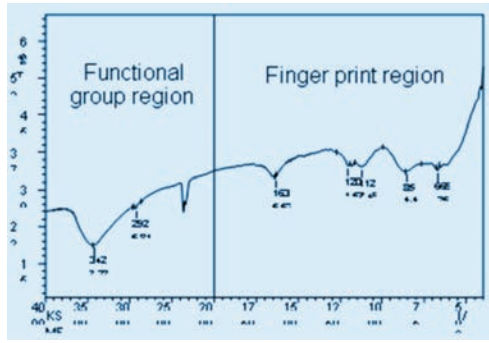

Fig.4: FTIR spectrum of KSMF

Conclusion

Our study sets the standard for the preparation and standardization of *Kushta* Sammul far. The methodology and the findings may be used to standardize the *Kushta* prepared from the drugs of mineral origin. The study also validated the use of alternate method of *kushta* preparation thus giving choice of using muffle furnace in place of relatively inconvenient conventional methods.

Acknowledgment

The authors are thankful to the authorities of National Institute of Unani Medicine, Bangalore, for providing facilities for this study.

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