



A REVIEW ON NATURAL PAINKILLERS

Ashwini Sukhdev Pundkar*, Deshmukh Gayatri, Deshmukh Pooja, Kalpana Pralhad Ubale and Sayama Muktar Sayyad

Department of Quality Assurance, Rajesh Bhaiyya Tope College of B.Pharmacy, Nipani-Bhalgaon, Aurangabad-431007, Maharashtra, India.

*Corresponding Author: Ashwini Sukhdev Pundkar

Department of Quality Assurance, Rajesh Bhaiyya Tope College of B.Pharmacy, Nipani-Bhalgaon, Aurangabad-431007, Maharashtra, India.

Article Received on 02/05/2023

Article Revised on 22/05/2023

Article Accepted on 12/06/2023

ABSTRACT

Complementary and alternative medicines such as herbal medicines are not currently part of the conventional medical system. As the popularity of and global market for herbal medicine grows among all age groups, with supporting scientific data and clinical trials, specific alternative treatments such as herbal medicine can be reclassified as a practice of conventional medicine. One of the most common conditions for which adults use herbal medicine is pain. However, herbal medicines carry safety concerns and may impact the efficacy of conventional therapies. Natural products still hold great potential for the discovery of novel agents for treatment of pain disorders and potentially drug addictions with exciting pharmacological profiles. Aim behind is to compile common and available herbal medicines which can be used as an alternative to or in combination with conventional pain management approaches. While self-management has been recognized as part of the overall treatment strategy for patients suffering from chronic pain, it is important for practitioners to be able to also optimize herbal medicine.

KEYWORDS: Painkiller, Herbal plant, Reliving agent, Rosemary oil, Peppermint oil.

INTRODUCTION

Many people rely on medications, but they can come with a risk of side effects, drug interactions, and sometimes misuse. While certain circumstances may require a prescription or over-the-counter (OTC) pain medication, it may also be possible to find some of the relief you need from a variety of natural pain relievers. Many herbs and spices have a long history of being used to relieve inflammation and pain. These natural pain relievers fall under a category of treatment known as alternative medicine, which also include acupuncture, yoga, reiki and other practices. There can be a lot of benefits to easing pain and inflammation more naturally, but keep in mind that these natural remedies can occasionally interfere with other medications you are taking.

Furthermore, some natural pain relievers have not been well studied in humans (especially when it comes to dosage), and many are not tested by an independent lab to ensure quality or safety. Supplements are also not regulated for quality by the Food and Drug Administration (FDA) like drugs are. If you're dealing with pain or chronic issues, it's best to talk with a doctor before buying any natural remedies. Integrative medicine professionals, which are physicians who have training in

more natural remedies, may be a great option if you're seeking alternative forms of pain therapy. It's also important to consult a qualified health professional before adding any supplements to your routine, especially if you have any underlying health conditions or are taking other medications.

Pain & Pain Management^[1]

Pain can be defined as a somatic sensation of acute discomfort, a symptom of some physical hurt or disorder, or even emotional distress. Pain is a crucial aspect of the body's defense mechanisms & it is a part of a rapid warning relay instruction the motor neurons of the central nervous system to minimize physical harm.

Pain can be classified into two types

a) Acute pain b) Chronic pain

a) Acute pain: Acute pain is the body's warning of present damage to tissue or disease. It is often fast and sharp followed by aching pain. It is short-term pain or pain with easily identifiable causes.

b) Chronic Pain: Chronic pain is pain that last much longer than pain normally would with a particular injury. Chronic pain can be constant or intermittent and is generally harder to treat than acute pain. Pain can also be

grouped by its source and related pain detecting neurons such as cutaneous pain, somatic pain, visceral pain, and neuropathic pain.

Causes of pain

- Pain caused by is the stimulation of pain receptors which are free nerve endings.
- Nociceptors are pain receptors that are located outside the spinal column in the dorsal root ganglion and are named based upon their appearance at their sensory ends. These sensory endings look like the branches of small bushes.
- The perception of pain is when these receptors are stimulated and they transmit signal to the central nervous system via sensory neurons in the spinal cord.

Analgesics: Medication used to relieved pain.

Analgesia: Analgesia simply means the absence of pain without losing consciousness.

Mechanism of action of pain

The analgesia system is mediated by 3 major components

- The periaqueductal grey matter (in the midbrain)
- The nucleus raphe magnus (in the medulla)
- The pain inhibitory neurons within the dorsal horns of the spinal cord, which act to inhibit pain-transmitting neurons also located in the spinal dorsal horn.

Sources of Painkillers^[1]

There are various sources of painkillers; they are classified into following two types:

- a) Synthetic Drugs
- b) Natural sources

Examples of Natural Painkillers

1. Peppermint oil^[2]

Synonyms: Oleum *Mentha piperita*, colpermin, *Mentha* oil.

Biological source: The oil is obtained by steam distillation of the fresh flowering plants known as *Mentha piperita* Linn.

Family: Labiatae.

Geographical Source

Mentha species are cultivated in various part of the world. It grows wild in Europe, while it is cultivated in Japan, England, France, Italy, USA, Bulgaria and in India, it is cultivated near Jammu and in Tarai region of Uttar Pradesh.

Chemical Constituents

Peppermint oil contains chiefly L-menthol to the extent of 70 percent in free, as well as, in the form of esters, depending upon variety (like American, Japanese,

Indian). American peppermint oil contains 80 percent of menthol while Japanese contains 70-90 percent. Other important constituents of peppermint oil are menthone, menthofuran, jasmone, methyl isovalerate, methyl acetate and several other terpene derivatives. The other terpenes include l-limonene, is pulegone, cineole, pinene, camphene, etc. Jasmone and esters are responsible for pleasant flavors, while menthofuran causes develop dirty smell.

Chemical Test

A few drops of peppermint oil mixed with 5ml of nitric acid solution (Prepared by adding 1ml of nitric acid to 300ml of acetic acid, heat on water bath). Within five minutes liquid develops- blue color, which on further heating deepens and shows copper colures fluorescence after some time it becomes golden yellow.

Uses

Peppermint or *Mentha* oil is used as carminative, stimulant, and flavoring agent. It has mild antiseptic properties too. It used in toothpaste, tooth powders, shaving creams, and different pharmaceutical dosage forms. It is also consumed in the preparations of chewing gums, candies, jellies, perfumes and essences Menthol is manufactured in India by S. H. Kelkar and Co. Bhavna Chemicals, Procter and Gamble Ltd. and several others. India produces about 500 tons of menthol annually.

Substitutes and Adulterants

Several species of *Mentha* are known to contain oil. Many a time, these oils are De- Mentholized and used as adulterants to the drug.

2. Rosemary Oil^[3]

Synonyms: Rosmarin oil, Rosemary oleoresin.

Biological Source: Volatile oil obtained from fresh flowering tops of the plants *Rosmarinus officinalis* Linn.

Family: Labiatae.

Geographical source: Rosemary is indigenous to South Europe and South Asia. It is cultivated in Mediterranean basin and India.

Chemical Constituents: The flowers contain about 1.0 percent of volatile oil, resin, ursolic acid and bitter principle. While leaves, in addition to oil, also contains tannins. Volatile oil contains mainly 10-15 Percent of borneol, 2.5 – 3 percent of bornyl acetate, camphor, eucalyptol, pinene, d-camphene, cineol and 45 percent of terpenes.

Uses

It is used as carminative, rubefacient, stimulant and as flavoring agent for liniments, hair lotions, inhaler, soaps and cosmetics.

3. Clove^[1]

Synonym: Caryophyllum, Clove buds, Clove flowers.

Biological Source: Clove consists of dried flower buds of *Eugenia caryophyllus*. It should contain not less than 7.0 percent (w/w) of eugenol calculated on dried basis.

Family: Myrtaceae.

Geographical source

It is indigenous to Amboyna and Molucca islands. It is now cultivated in chiefly in Zanzibar, Pemba, Penang, Madagascar, Sri Lanka and India. In India, cloves are grown in Nigiri, Tenkasi-hills and in Kanyakumari district of Tamil Nadu state. It is also cultivated in Kottayam and Quilon districts of Kerala.

Chemical Constituents

Clove contains about 15 – 20 percent of volatile oil; 10 – 13 percent of tannins (gallotannic acid), resin, chromone and eugenin. The volatile oil of drug contain eugenol (about 70 – 90 percent), eugenol acetate, caryophyllenes and small quantities esters, ketones and alcohol. Oil of clove is colorless to pale yellow in color. It becomes thick and darker in color on storage. It has specific gravity of 1.038 – 1.06, refractive index is 1.527 to 1.535 and it boils at 250°C.

Chemical Test

If the transverse section of clove is treated with strong potassium hydroxide solution, the needle shaped crystals of potassium eugenate are observed.

Uses

Clove is used as dental analgesic, carminative, stimulant, flavoring agent, an aromatic and antiseptic. It is also used in preparation of cigarettes. The oil is used in perfumery and also in the manufacture of vanillin.

Adulterants

Mother cloves: These are dark brown, ovate ripened fruits of clove tree. They are slightly aromatic and contain starch. They are very inferior in volatile oil content.

Blown cloves: These are expanded flowers of clove tree. The stamens generally get detached. They also contain volatile oil and similar in color to the cloves. The volatile oil content is less as compared to authentic drug.

Clove stalks: These are generally used to adulterate the powdered cloves and are detected by isodiametric scleroids and prisms of calcium oxalate. Their ash value and crude fibre contents are so high. The authentic clove should not contain more than 5 percent of stalks to pass the pharmacopoeial limit. Due to similar in color, odour, and taste, clove stalks are mixed with the cloves. Clove stalks contain only 5 percent of oil.

Exhausted cloves: These are the cloves from which oil has been extracted by distillation. They are dark in color, more shrunken and when passed with finger nails, do not show the presence of oil. Exhausted cloves float on water.

4. Feverfew^[4]

Synonyms: Featherfew, Feather foil, midsummer daisy, Altamisia, Chrysanthemum parthenium, Pyrethrum parthnium.

Biological source: Feverfew consists of fresh or dried leaves and aerial parts of the plant *Tanacetum parthenium* (L) Bernh.

Family: Asteraceae.

Geographical Source

Found in Britain, Balkan peninsula and also cultivated in Britain.

Chemical Constituents

Feverfew leaves are prepared to contain sesquiterpenes lactones, chrysanthemins A and B, parthenolide, chrysanthemolide and partholide. The volatile oil found in traces (0.02 to 0.07 per cent) contains borneol, camphor, farnesene and their esters, while pyrethrin flavonoids are the other constituents of the herb.

Chemical Test

TLC method of identification as described below is to be applied. Use solvent system A

Prepare Test solution as under

1. Extract 1g of powdered feverfew with 10ml methanol on water bath for 15 min. Cool and filter. Apply 20 microliter of this solution to plate and
2. 0.025 per cent rutin in methanol and apply 20 microliters of this solution to plate.
3. Spray the plate with spray reagent A and examine in ultra-violet light at 366 nm.

Major bands relative to rutin are whitish-blue 2.25; greenish blue 2.0; yellowish green 1.65, yellowish orange 1.5. There should be neither green band at 2.3, nor blue band at 1.1, (distinguishing from *Matricaria* and from Roman chamomile respectively).

Traditionally, feverfew is being used in treatment of migraine, vertigo, arthritis, fever and menstrual disorders.

5. Boswellia^[5]

Synonyms

Kundururu, Sallaki guggul, Indian Olibanum tree, Sallaki.

Biological Source

The oleo-gum-resin obtained from plant known as *Boswellia serrata*. It contains not less than 1.0 per cent

of total 11-keto- β -boswellic acid and acetyl-11-keto- β -boswellic acid.

Family: Burseraceae.

Geographical Source

About 10 species of genus *Boswellia* occur in tropical parts of Asia and Africa. *B. serrata*, the species found in dry hilly areas of Bihar, Madhya Pradesh, Gujarat. It is medium sized but highly branching tree. It grows upto 12– 15 feet in height. The type of leaves distinguishes India olibanum into two varieties called *var serrata*, having pubescent and serrate leaves and *var. glabra* having glabrous and entire leaves.

Chemical Constituents

Oleo - gum resin approximately consists of

Volatile oil: 8-9 %

Gum: 20-30 %

Resin: 55 %

- 1. Volatile oil:** This is composed of sesquiterpene alcohols, anisaldehyde, d- α -thujone, α -pinene, d- α -phellandrene and phenolic compounds. Similar to turpentine oil, this oil is soluble in colophony and dammer, but more volatile in nature. Acidic components of volatile oil are known as compholenic acid and compholytic acid.
- 2. Gum:** It is mainly composed of arabinose with small amounts of xylose and galactose. Gum also contains oxidizing and diastatic enzymes. The highly brittle resin is soluble in various organic solvents.
- 3. Boswellia resin:** *Boswellia* mainly contains boswellic acid. Boswellic acid belong to pentacyclic triterpenoids which are the active therapeutic contents. Important of them are β -boswellic acid, acetyl- β -boswellic acid, acetyl-11-keto- β -boswellic acid and 11-keto- β -boswellic acid of which acetyl-11-keto- β -boswellic acid is the main anti-inflammatory compound on which drug is standardized. Additionally, it also contains diterpenic alcohol serratol and α and β amyryn.

Tetracyclic triterpenic acids present in resin known as elemolic acid and elemonic acid.

Uses

It is anti-inflammatory and antiarthritic. Indian olibanum is mainly used in treatment of rheumatoid arthritis. It is known to regain integrity of vessels in joints from damage or spasm. It is also used in preparation of incense sticks and as a fixative perfume.

6. Capsicum^[6]

Synonyms: Chillies, Cayenne pepper.

Biological Source: Capsicum consists of dried ripe fruits of *Capsicum annum* Linn. var: *minimum*. It contains not less than 0.25% of capsaicin on dried basis.

Family: Solanaceae.

Geographical Source

Capsicum is cultivated and collected in almost all the tropical countries. East Africa, West Africa and India are the regions producing the drug on commercial scale. In India, it is grown in Andhra Pradesh, Uttar Pradesh, Gujarat, Maharashtra, Assam and Tamil Nadu.

Chemical Constituents

Capsicum contains about 0.5 – 0.9 per cent colorless, crystalline and pungent principle, known as capsaicin which is volatile above 65°C. Capsicum also contains fixed oil (4 – 16 percent), proteins and pigments, viz. capsanthin and carotene. Pigments are responsible for the red colour. Thiamine and ascorbic acid are the other contents of drug. Unlike ginger, the pungency of capsicum is not destroyed by boiling it with 2 per cent solution of sodium hydroxide. But it is destroyed by oxidizing agents like potassium permanganate.

Uses

It is used as a carminative, an appetizer and a stomachic. Externally, it is used as a counter irritant in the treatment of rheumatism, lumbago and neuralgia. It is also used in spices.

7. Ginger^[7]

Synonyms: Zingiber, zingiberis, Sunthi.

Biological Source: Ginger consists of whole or cut, dried scrapped or unscrapped rhizomes of *Zingiber officinale* Roscoe. It contains not less than 0.8 per cent of total gingerols on dried basis.

Family: Zingiberaceae.

Geographical Source

It is said to be native of South East Asia, but is cultivated in Caribbean islands, Africa, Australia, Mauritius, Jamaica, Taiwan, India. More than 35 per cent of the world's production is from India.

Chemical Constituents

Ginger consists of volatile oil (1-4 percent), starch (40-50 percent), fat 10 per cent), fibre (5 per cent), inorganic material (6 per cent), residual moisture (10 per cent) and acid resinous matter (5 – 8 percent). Ginger oil is constituted of monoterpene hydrocarbons, sesquiterpene hydrocarbons, oxygenated mono and sesquiterpenes, and phenyl propanoids. Sesquiterpene hydrocarbon content all types of ginger oil from different countries are found to be same and includes α -zingiberene, β -bisabolene, α -farnesene, β -sesquiphellendrene and α -curcumene. Aroma and flavors are the main characters of ginger. Aroma is due to fragrant principles of volatile oil while the flavor, pungency and pharmacological action is exerted by phenolic ketones of oleo-resin. Various components of volatile oil like isometric terpenic aldehydes like geranial and citral, which cause the delicate and lemony aroma. Few sesquiterpene oil hydrocarbons are believed to exert spicy notes. Phenolic

ketones of oleo resin include gingerols like shogaols, zingerone, paradols, gingediols, hexahydrocurcumin and also 0-methyl ethers of these compounds.

Uses

Ginger is used as a stomachic, an aromatic, a carminative, stimulant and flavouring agent. Ginger oil is used in mouth washes, ginger beverages and liquors. Ginger powder has been reported to be effective in motion sickness. It has been suggested that adsorbent, aromatic and carminative properties of ginger on G.I. tract causes adsorption of toxins and acid enhanced gastric motility. These may have probably blocking effects of G.I. reactions and nausea. *Z. officinale* (methanolic extract) has molluscicidal effects, possessing efficacy to control the parasitic infection viz. schistosomiasis. U.S. Food and Drug administration has included ginger as product that is generally regarded as safe (GRAS).

Adulterants

Ginger is adulterated with exhausted ginger, but it can be detected by determination of water-soluble ash, volatile oil content and alcohol and water-soluble extractives.

8. Garlic^[8]

Synonyms: Garlic, Allium.

Biological source: This consists of bulbs of the plant known as *Allium sativum* Linn.

Family: Liliaceae.

Geographical Source

Lahsun is cultivated in Central Asia, Southern Europe, USA, and India. In India, it is found in almost all the states and cultivated as a spice or a condiment crop.

Chemical Constituents

Garlic bulbs contain 29 per cent of carbohydrates, about 56 per cent of proteins (albumin), 0.1 per cent of fat, mucilage and 0.06 to 0.1 per cent of volatile oil. It also contains phosphorus, iron and copper. Volatile of the drug is the chief active constituent and contains allyl propyl disulphide, diallyl disulphide, alliin and allin. Garlic oil is yellow in colour and has specific gravity of 1.046. It is optically inactive.

Uses

Garlic is used as carminative, aphrodisiac, expectorant, stimulant and disinfectant in the treatment of pulmonary conditions. It is largely used as condiment. Oil of garlic is used as anti-helminthic and rubefacient. Allicin is antibacterial. Garlic oil is used in high blood pressure and atherosclerosis. Fresh garlic is prophylactic against amoebic dysentery. It has strong antioxidant effect.

9. Turmeric^[9]

Synonyms: Turmeric, Haldi, Haldar.

Biological Source: Turmeric consists of the dried rhizome of *Curcuma domestica* (*Curcuma longa*).

Family: Zingiberaceae.

Geographical Source

The drug is cultivated in tropical Asia and Africa especially in India, west Pakistan, China and Malaya. A native of South and Southeast Asia, turmeric probably originated in the slopes of hills in the tropical forest of the Western Ghats of South India. *Curcuma*, a genus in the family Zingiberaceae (of the suborder Zingiberoside), consists of than a hundred species and several varieties of rhizomatous herbs, grown extensively in East and Southeast Asia.

Chemical Constituents

Turmeric contains volatile oil, colouring matter curcumin and resin. Volatile oil contains phellandrene, d-sabinene, borneol and cineole. However, it contains mainly sesquiterpene hydrocarbon zingiberene and 65 per cent two ketones turmerone and ar-turmerone. All the three substances are related to each other. Curcumin is responsible for the colour of the drug and consists of curcumin I, II and III. Curcumin I is 60 per cent and is diferuloylmethane. Curcumin II is 24 per cent and is hydroxycinnamoyl feruloylmethane and Curcumin III is 14 per cent and is dihydroxy dicinnamoylmethane. Curcuminoids are present to the extent of 3% to 4%. It is important active ingredient responsible for the biological activity of turmeric. Curcumin $C_{21}H_{20}O_6$, m p 184°C to 185°C was isolated as early as 1815. It is insoluble in water but soluble in ethanol and acetone. Daube in 1910 obtained it in crystalline form. The structure of curcumin as a diferuloylmethane was confirmed by the degradative work and synthesis by Lampe in 1913.

Test

Turmeric because of curcumin shows the following reactions. For the tests curcuma powder or evaporated residue of tincture is used.

1. With concentrated sulphuric acid red colour is produced.
2. With solution of sodium or potassium hydroxide red violet colour is produced.
3. With acetic anhydride and concentrated sulphuric acid, it shows violet colour. When this test is seen in ultra violet light, intense red colored fluorescence is seen. This fluorescence test is due to Curcumin II and Java turmeric only greyish yellow fluorescence is seen and thus turmeric and Java turmeric can be distinguished.

Uses

Volatile oil is responsible for the aromatic and pungent properties of the drug. Curcumin I and II have choleric and cholagogue action while curcumin II has anticholeric action and so in some pharmacopoeias *C. domestica* is not official but only Java curcuma is official. It is however used as choleric and cholagogue and is used in liver disease. Turmeric has anti-inflammatory action and compares favorably with phenylbutazone. It is useful in cough and bronchitis. It has great reputation in Ayurveda and is used in diabetes and liver diseases. Turmeric is one of the ingredients of a

spice known as 'Curry powder' used in India and abroad and consists of equal parts of coriander, cinnamon, pimento, clove, nutmeg, ginger and turmeric. Turmeric is used for identification of boric acid and ammonia. Turmeric paper gives red colour with boric acid and with fumes of ammonia becomes blue. Further turmeric is used as dye for food materials such as cheese and sweets and for fabrics of wool and silk.

10. Wild Cheery^[10]

Synonyms: Virginian bark, Cortex Pruni Virginian, Prune Bark.

Biological Source: Wild cherry bark is the dried bark of *Prunus serotina* Ehrhart, collected in autumn.

Family: Rosaceae.

Geographical Source: Northern and Central U.S.A.

Chemical Constituents

It contains prunasin, a cynogenetic glycoside. Thin green bark, collected in autumn yields 0.12 to 0.16% HCN. In commercial thick bark the percentage may be as low as 0.016%. Prunasin is hydrolyzed by prunase enzyme present in the drug into benzaldehyde, glucose and hydrocyanic acid. It further contains scopoletin or β -methyl aesculetin a coumarin derivative. Scopoletin gives blue fluorescence when dissolved in alcohol and ammonia added to it. It also contains benzoic acid, p-coumaric acid volatile oil.

Uses

Hydrocyanic acid has local anesthetic action. Its syrup is used as sedative in cough and bronchitis. It imparts a pleasant flavor.

SUMMARY AND CONCLUSION

When a person takes traditional pain relief medication as prescribed, with guidance from a doctor, it is a safe and effective way to manage pain. Natural pain relievers, however, offer an alternative for people who want to avoid the long-term side effects of pain relief medication. People can use essential oils by adding a few drops to a tissue or a steam bath and inhaling the vapor. People can also add the herbs and spices listed above to food. However, if a person is unable to do that, they can instead take them as supplements. Mindfulness is easy to try at home. Many people may also be able to try yoga at home, for which there are many introductory videos available online. To try acupuncture, it is best to visit a professional, certified practitioner. Not every natural pain reliever will work for everyone. Some people may find that a natural option that works well for them in the long-term. Others may not be able to manage pain naturally and may prefer traditional medication.

REFERENCES

1. Kumar M, Shete A, Akbar Z. A Review on Analgesic: From Natural Sources. *Int J Pharm Biol Arch*, 2010; 1(2): 95–100.
2. Baker B, Grant J, Malakar-Kuenen R. Peppermint & Peppermint Oil Profile. *Integr Pest Manag*, 2018; 8(4): 1–18.
3. Brian P. Baker, Jennifer A. Grant RM-K. Soybean Oil Profile Active Ingredient Eligible for Minimum Risk Pesticide Use., 1813; 11.
4. Pourianezhad F, Tahmasebi S, Abdusi V, Nikfar S, Mirhoseini M. Review on feverfew, a valuable medicinal plant. *J HerbMed Pharmacol*, 2016; 5(2): 45–9.
5. Serrata B, Bioactive RA, With H, Pharmacological V, Mishra S, Bishnoi RAMS, et al. *ACTIVITIES*, 2020; 13(11).
6. Palma JM, Terán F, Contreras-Ruiz A, Rodríguez-Ruiz M, Corpas FJ. Antioxidant profile of pepper (*Capsicum annuum* L.) fruits containing diverse levels of capsaicinoids. *Antioxidants*, 2020; 9(9): 1–19.
7. Zadeh JB, Kor NM. Physiological and pharmaceutical effects of Ginger (*Zingiber officinale* Roscoe) as a valuable medicinal plant Faculty of Animal Science, Shahid Bahonar University, Kerman, Iran Jalal Bayati Zadeh and Nasroallah Moradi Kor. *Pelagia Res Libr Eur*, 2014; 4(1): 87–90.
8. Sethi N, Kaura S, Dilbaghi N, Parle M, Pal M. Garlic: a Pungent Wonder From Nature. *Int Res J Pharm*, 2014; 5(7): 523–9.
9. Brier J, lia dwi jayanti. No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title, 2020; 21(1): 1–9.
10. I. A, S. S, R. Z. A review on sour cherry (*Prunus cerasus*): A high value Unani medicinal fruit. *Int J Green Pharm*, 2017; 11(1): 1–6.