



INTERNATIONAL JOURNAL OF ADVANCES IN PHARMACY MEDICINE AND BIOALLIED SCIENCES

An International, Multi-Disciplinary, Peer-Reviewed, Indexed, Open Access Journal

www.biomedjournal.com

ISSN 2348-2109

INTERNATIONAL
JOURNAL OF ADVANCES
IN PHARMACY MEDICINE
AND BIOALLIED SCIENCES



Unnab: A boon to herbal nutraceuticals

Mohd Talib¹, M. Aslam¹, M Aftab Ahmed¹, M. Wajeehul Qamar¹, Shahid S. Chaudhary^{1*}, Anwar Jamal².

¹Department of Ilmul Advia, School of Unani Medicine, Jamia Hamdard, New Delhi, INDIA.

²Central Council for Research in Unani Medicine, Ministry of AYUSH, New Delhi, INDIA.

REVIEW ARTICLE

ABSTRACT

Unnab (*Ziziphus sativa* Gaertn) is one of those traditional plants which have a long history of usage as a fruit and remedy. According to Unani literatures, it possesses nutritional as well as therapeutic values, thus it is one of the herbal nutraceuticals. Modern literatures and research studies also prove it. Its fruit, seed, leaves and bark are used traditionally for treatment of various diseases such as fasad-e-khoon (blood putrefaction), hiddat-e-khoon, chest pain, burning micturition, chronic ulcer etc. The fresh and dried, both ripe fruits of Unnab contain carbohydrates, proteins, many vitamins and minerals. Its phytochemical constituents are Vitamin C, alkaloids, glycosides, flavonoids, terpenoids, phenolics and polysaccharides. Research studies showed its pharmacological activities like antioxidant, immunomodulatory, anti-inflammatory, antiulcer, antiallergic, antifungal, antidiarrhoeal, antidiabetic and wound healing activities etc.

Keywords: Unnab, Fasad-e-khoon, Nutritional value.

*Author for correspondence

E-mail: drshahidnium@gmail.com

Article ID 131

Biomedjournal © Copyright 2013, All rights reserved. Biomedjournal Privacy Policy.

INTRODUCTION

It is a global realization about allopathic or synthetic drugs that their usage is not safe for the long duration with some exceptions. For this reality, the medical fraternity as well as ailing mankind at a large is looking for alternatives from natural sources to fight diseases, particularly those wherein conventional allopathic system of medicine has little to offer (Anonymous, 2009). Traditional and complementary systems of medicine especially Unani medicine has been found very effective in fulfilling the health care and in treatment of chronic diseases such as hepatic diseases, arthritis, respiratory diseases and skin diseases etc (Anonymous, 2009). It is also gaining trust of people worldwide. Moreover, indigenous household cures for common ailments should find a proper place in our national health endeavor, especially in those fields or those ailments where allopathic medicine has not yet provided sufficient relief. Greater use of indigenous therapeutics will also help us to combat the increasing cost of modern health services.

Ziziphus sativa known as Unnab in Unani medicine belongs to the family Rhamnaceae is widely used in traditional systems of medicine as fresh or dried ripe fruit. It is a shrub or small deciduous tree, upto 12m in height, sometimes a large bush, found both cultivated and naturalized (Anonymous, 1976). Unnab or Ber is used as edible fruit and also used medicinally in traditional system of medicine including Unani system. Medicinally, it is used as an expectorant, stomachic, digestive, laxative, blood purifier and anti pruritus. Scientific studies showed that it contains various chemical constituents such as sativanine-C, sativanine-G, sativanine-E, sativanine-H, sativanine-F, sativanine-D, sativanine-K, sanjoinine, franguloine and amphibine-D. Several pharmacological studies also revealed its various pharmacological actions such as antioxidant, anticancerous, antianxiety, immunostimulant, anti-inflammatory, antiulcer, antiallergic and antiobesity activities, and many others are yet to be explored.

Scientific classification (Plants, USDA, 2017)

Kingdom	Plantae – Plants
Subkingdom	Tracheobiont-Vascular plants
Superdivision	Spermatophyta – Seed plants
Division	Magnoliophyta–Flowering plants
Class	Magnoliopsida – Dicotyledons
Subclass	Rosidae
Order	Rhamnales
Family	Rhamnaceae – Buckthorn family
Genus	<i>Ziziphus</i> Mill. – Jujube
Species	<i>Ziziphus sativa</i> Lam. –Indian jujube

Vernacular Names/ Synonyms

Ziziphus jujuba, *Z. mauritiana* (Anonymous, 2013)

Arabic: غناب (Unnab); Persian: Sailana, Sinpo-i-Jilani; Urdu: غناب(Unab), Jangali ber; Hindi: Ber, Kandiari, Simli; Greek: Zizuphy, Zizypha; English: Common Jujube, Jujube, Chinese date; Chinese: K'u Tsao, Suan Tsao; Punjabi: Amlai, Amra, Barari, Ber, Beri; Sindhi: Anab, Ber; Turkish: Unap; Kashmiri: Bary, Konkamber; Bombay: Ranbor, Unab; Sanskrit: Koli, Badari, Rajabadari; Bengali: Kul; Assamese: Bogori; Uriya: Bodori; Gujrati: Bordi; ; Marathi: Bor; Malayalam: Badaram; Kannada: Bogari; Tamil: Vadari; Telgu: Renu (Anonymous, 2006; Al Bairuni, 1973; Chopra, 1956)

Parts of Unnab used as a medicine

- (1)Fruits (Nabi, 2007; Anonymous, YNM)
- (2) Leaves(Ibn Baitar, 1999; Basu, 1987)
- (3) Seeds(Ibn Baitar, 1999)
- (4) Bark (Khan, 2014)
- (5) Root (Anonymous, 1992)
- (6) Gum (Nadkarni, YNM)

Modern description of Unnab

a) Macroscopic

Pulp pieces irregular in shape, shrunk, with external surface smooth and glossy, 2 mm in thickness, brittle; colour, orange red; odour, not distinct; taste, sour (Anonymous, 2001).

b) Microscopic

Fruit pulp shows single layered epicarp consisting of thin-walled, parenchymatous cells, covered with thin layer of cuticle; mesocarp differentiated into two zones, outer zone consisting of 5-10 layers of rectangular, thin-walled, parenchymatous cells, inner mesocarp consisting of oval to polygonal, thin-walled, crushed parenchymatous cells,

most of the mesocarp cells filled with reddish-brown substance, which is tannin when tested; a few fibro-vascular bundles found scattered in this region. (Anonymous, 2001)

Botanical description

A spiny deciduous shrub or a small tree upto 10-12 m high; Leaves alternate, ovate to ovoid-lanceolate, 3-7 cm long by 2-3.5 cm wide; apex slightly obtuse; base oblique; margin closely serrulate, 3-veined; Inflorescence an axillary cyme; Flowers perfect, 7-8 flowers in each cluster, greenish-yellow; Fruits drupe, 1.5-5 cm long, ovate to oblong, dark reddish-brown when ripe, containing a single stone surrounded by fleshy pulp. (Prajapati, 2003)

Habitat and Distribution

Rangpur, Nepal, Jurjan, Khata, Baghdad , Punjab, Himalayas, Kashmir, Baluchistan, dry hot regions of Western India chiefly Rajasthan, Bengal, commonly cultivated in India, Japan, China, Africa, Malaysia, Afghanistan and Australia. It is believed that this species is a native of North China, from where it was introduced in to West Asia 2,500 – 3,000 year ago. (Chopra, 1956; Agarwal, 1990; Basu, 1987; Prajapati, 2003)

Cultivation

It requires hot summers and sufficient water for acceptable fruiting. It tolerates fairly cold winters, surviving temperatures down to about -15 °C, grows in the mountain desert habitats, provided there is access to underground water through the summer. (Kassem et al, 2011)

Unani description of Unnab

According to Najmul Ghani, Unnab is the fruit of a tree resembling Ber. It is red colored and sweet to taste (Ghani, YNM). Ibn Baitar says that Unnab is the fruit of a tree, which possesses nutritional and medicinal values (Kabeeruddin, YNM; Baghdadi, 2005). According to Hakim Mohd Azam Khan, Unnab are the fruit of a tree resembles Zaitoon and Ber tree in height. Leaves are slightly thick and longer than Ber. The lower side of leaves is hairy. Jurjani, Khatai and Nepali Unnab are better which are red in color and sweet to taste. Unnab of Baghdad area is big and fine, which is known as Waquqi. A kind of Unnab is slightly long like dates and its seeds are thin and longer. These types of Unnab are imported from Hill area of Nepal and Rangpur. They are more sweet to taste and slightly astringent. (Khan, 2014)

Mizaj (Temperament)

Motadil (Antaki, 1317 AH; Takmili, 1987), Motadil between dry and wet (Majusi, 2010; Jurjani, 1903), Hot 2° Dry 1° (Kabeeruddin, YNM)

Afaal wa Khawas (Medicinal actions) (Ghani, YNM, Khan, 2014; Al Masihi, 2014; Halim, 2009; Anonymous, 2001; Agarwal, 1990, Hussain, 1990)

Musakkin-e-hiddat-e-khoon wa safra (Blood and bile refrigerant)

Musaffi-e-khoon (blood purifier)

Munziji-e-akhlat-e-ghalizah (Concoctive of viscous humour)

Mulayyin-e-sadr (Emollient of chest)

Munaffis balgham (expectorant)

Dafe sual wa rabu (Antitussive and anti asthma)

Dafe khashunat-e-halaq wa sadar

Mulayyin (laxative)

Muza'if-e-bah (Anaphrodisiac)

Muqallil-e-mani (Reducer of semen)

Mundamil-e-quruh (cicatrizant)

Dafe alam-e-kuliya wa masana (Analgesic)

Nafe sozish-e-baul

Mukhaddir (Anaesthetic)

Musaffi -e-saut

Musakkin-e-atash

Mushil-e-akhlat-e-raqiqa

Dafe hikka (anti pruritus)

Habisuddam (styptic)

Muqauwi-e-meda (stomachic)

Mawaq-e-Istemaal (Therapeutic uses):

Fruits: According to Ibn Baitar dried ripe fruits are used in constipation but unripe Unnab causes constipation. Infusion or decoction of dry fruits is very useful in dry cough, sore throat and busoor (skin eruptions) (Kabeeruddin, YNM; Anonymous, 1976). Hkm Azam Khan mentioned in his book *Muhit-e-Azam* that Sharbat -e-Unnab is very beneficial in Mashara (Urticaria), Amraz-e-sadr (Thoracic diseases), Amraz-e-Riatain (Lungs diseases), Surfa (Cough), Laza-e-Meda (Stomach irritation) Nazfuddam (Hemorrhage), Hiddat-e-Khoon, Ghalayan-e-Khoon, Judri (Chechak, Small pox) and Hasba (Measles). Hkm Azam Khan also said that Nuqu-e-Unnab (Infusion of Unnab) is very effective in several diseases

such as Khashunat-e-Halaq (Sore Throat), Sozish-e-baul (burning micturition), Surfa yabis (dry cough), pain in chest, lungs and kidney (Khan, 2014). It is also used in Damma (asthma), bahhatus saut (hoarseness of voice) (Ghani, YNM), hiddat-e-khoon wa safra, wajaul kuliya wa masana (Nabi, 2007; Hakim, YNM; Khan, 2014), Hikka (pruritus), Kasrat-e-mani (excess of semen), Kasrat-e-shahwat (Excess of sexual desire) (Ibn Baitar, 1999; Khan, 2014; Ghani, YNM). Unnab fruit is also used in poor appetite and colitis (Agarwal, 1990). Syrup of dried fruit is used for bronchitis (Chopra, 1956). Large Unnab is better and very useful in general fatigue, night sweat, hysteria when it is taken before meal (Ibn Sina, 2010; Ibn Baitar, 1999; Prajapati, 2003). Unripe and acrid Unnab is beneficial in loose motion and diseases of rectum. it is used prophylactically for liver diseases (Al Bairuni, YNM).

Seeds: The seeds are effective in dry cough and skin eruptions (Basu, 1987). They are edible and frequent eating of the kernels is said to increase flesh and strength (Anonymous, 1976). Ibn Baitar and Daood Antaki mentioned in their books that powder of the seeds is useful in diarrhea (Antaki, 1317 AH; Ibn Baitar, 1999). According to Azam Khan, powder of whole Unnab along with seed is beneficial in intestinal ulcer (Ibn Baitar, 1999; Khan, 2014; Ghani, YNM).

Leaves: Decoction of fresh leaves with sugar or khand is very useful in pruritis. Powder of dry leaves with honey is very effective in aakila (stomatitis) and quruh-e-khabeesa (chronic ulcers). Fresh leaves, when chewed, destroy the power of the taste of disagreeable medicines. (Ibn Baitar, 1999; Khan, 2014; Ghani, YNM, Basu, 1987; Chopra, 1956)

Bark: Powder of bark of Unnab with equal quantity of Safeda is used to clean wound, sores and chronic ulcers (Ibn Baitar, 1999; Khan, 2014; Ghani, YNM, Basu, 1987). Bark is also considered to be a good remedy in diarrhea (Anonymous, 1992).

Root: It is used in decoction form for fever and as a powder it is applied to old wound and ulcer (Anonymous, 1992).

Gum: The gum is used in certain infections of the eyes (Baghdadi, 2005; Khan, 2014; Ghani, YNM, Basu, 1987). Its usage with sirka (vinegar) is beneficial in quba (ring worm) (Ibn Rushd, 1987; Razi, 1991; Al Masihi, YNM).

Dose of fruit: 20 pieces for general use, 15 for using as decoction (Khan, 2014; Ghani, YNM)

Adverse Effect

It is not easily digested (Baghdadi, 2005; Khan, 2014; Ghani, YNM, Basu, 1987; Halim, 2009). It leads to

flatulence (Masihi, 2014, Khan, 2014). Dry Unnab causes Zof-e- baah (anaphrodisiac action) (Razi, 2007; Hakim, YNM).

Correctives

For indigestion and flatulence khaand, maveez (*Vitis vinifera*) and gulab (*Rosa damascena*) and for zof-e-baah honey (Ghani, YNM).

Substitutes

Sapistan (*Cordia latifolia*) (Ghani, YNM; Kabeeruddin, YNM, Nabi, 2007)

Unani Compound Formulations

Sharbat-e-Unnab, Sharbat-e-Ejaz, Laooq Sapistan, Laooq Sapistan Khyar Shambari (Kabeeruddin, YNM; Anonymous, 2006).

Phytochemical constituents

Alkaloids (Tschesche et al, 1997; Mahajan et al, 2009; Han et al, 1986; Han et al, 1990; Jossang et al, 1996;)

Cyclic peptide alkaloids

sativanine-C, sativanine-G, sativanine-E, sativanine-H, sativanine-F, sativanine-D, sativanine-K, sanjoinine, franguloine and amphibine-D, sanjoinine-B-D-F and -G2

Cyclopeptide alkaloids

Mauritine-A, amphibine-H, jubanine-A, jubanine-B, mucronine-D, nummularine-B, sativanine-E

Antibacterial peptide alkaloid: Frangufoline

Glycosides (Woo et al, 1979; Zeng et al, 1987; Yoshikawa et al, 1997; Matsuda et al, 1999)

Flavonoid glycosides/ spinosins₂₄, 2"-O- beta - glucosylswertisin

Acylated flavone-C glycosides

6'''-sinapoylspinosin, 6'''-feruloylspinosin and 6'''p-coumaroylspinosin

Saponins

jujubosides A, B, A1, B1 and C, acetyljujuboside B, protojujubosides A, B and B1

Terpenoids (Lee et al, 1996; Lee et al, 2003; Lee et al, 2004)

colubrinic acid, aliphatic acid, 3- O-cis-p-coumaroylaliphatic acid, 3-O-transp-coumaroylaliphatic acid, 3-O-cis-p-coumaroylmaslinic acid, 3-O-transp-coumaroylmaslinic acid, oleanolic acid, betulonic acid, oleanonic acid, zizyberenic acid, betulonic acid, betulin, betulonic acid, ursolic acid, 2 α -hydroxyursolic acid, ceanothic acid

Triterpene esters

2-Oprotocatechuoyl aliphatic acid, Caffeoyl aliphatic acid and Ceanothic acid dimethyl ester.

Phenolic Compounds (Pawlowska, 2000)
Betulinic acid

Flavonoid compounds (Cheng et al, 2000; Pawlowska, 2000)

Swertish, puerarin, 6 000-feruloylspinosin, apigenin-6-C-b-d-glucopyranoside, spinosin, 6 000-feruloylspinosin, isospinosin, and isovitexin-2 00-O-b-d-glucopyranoside.

Table I. Nutritive values of Unnab.

Raw Unnab: Nutritive Value per 100 g.

Nutrient	Unit	Value per 100 g
Proximates		
Water	G	77.86
Energy	Kcal	79
Protein	G	1.2
Total lipid (fat)	G	0.2
Carbohydrate, difference	by G	20.23
Minerals		
Calcium, Ca	Mg	21
Iron, Fe	Mg	0.48
Magnesium, Mg	Mg	10
Phosphorus, P	Mg	23
Potassium, K	Mg	250
Sodium, Na	Mg	3
Zinc, Zn	Mg	0.05
Vitamins		
Vitamin C, total ascorbic acid	Mg	69
Thiamin	Mg	0.02
Riboflavin	Mg	0.04
Niacin	Mg	0.9
Vitamin B-6	Mg	0.081
Vitamin B-12	μ g	0
Vitamin A, RAE	μ g	2
Vitamin A, IU	IU	40
Lipids		
Fatty acids, total trans	G	0
Cholesterol	Mg	0

(USDA Food Composition Databases, 2017)

Pharmacological activities of the parts used as medicine

Fruits

Antioxidant activity

The antioxidant components and antioxidant activity of the raw and cooked peel of *Ziziphus Jujuba* Mill were compared. The peel was analyzed for polyphenols, glutathione and tannin contents. In addition methanol and aqueous extracts were analyzed for flavonoid, saponin contents and antioxidant activity. The antioxidant activity of extracts was determined by DPPH and reducing power assay. It was found that antioxidant activities of all the extracts increased with increasing concentration except in hydro alcoholic (HA) extract of raw peel. In the raw peel, methanolic extract with highest antioxidant capacity revealed the same antioxidant activity as compared to standard of butylated hydroxytoluene (BHT). HA extract was the most potent antioxidant in the raw and cooked extracts. Data confirmed the raw and cooked peel of *Ziziphus jujuba* Mill. both have a great potential for utilization as a source of natural antioxidant. (Esteki & Urooj, 2012).

Table 2. Fresh, dried Unnab: Nutritive Value per 100 g.

Nutrient	Unit	Value per 100 g
Proximates		
Water	g	20.19
Energy	kcal	281
Protein	g	4.72
Total lipid (fat)	g	0.5
Carbohydrate, difference	by g	72.52
Fiber, total dietary	g	6
Minerals		
Calcium, Ca	mg	63
Iron, Fe	mg	5.09
Phosphorus, P	mg	68
Potassium, K	mg	217
Sodium, Na	mg	5
Zinc, Zn	mg	0.39
Vitamins		
Vitamin C, ascorbic acid	total mg	217.6
Thiamin	mg	0.047
Riboflavin	mg	0.053
Vitamin B-12	µg	0
Lipids		
Cholesterol	mg	0

(USDA Food Composition Databases, 2017)

Anticancerous activity:

In a study Cytotoxicities of the triterpenoic acids (extracted from *Z. jujuba*) was tested against tumour cell lines. The lupane-type triterpenes showed high cytotoxic activities. The cytotoxic activities of 3-O-p-coumaroylaliphitic acids were found to be better than those of non-coumaroic triterpenoids. The results indicated that the coumaroyl moiety at the C-3 position of the lupane-type triterpene may play an important role in enhancing cytotoxic activity. (Lee et al, 2003)

Seeds:

Antianxiety activity:

The extract from seeds of *Ziziphus jujuba* showed the significant antianxiety effects. It depressed the activity of the central nervous system which ultimately reduced anxiety and induced sleep. It was found that it produced sleep, without producing anticonvulsant or muscle relaxant like activities. (Peng et al, 2000)

Sweetness inhibitors:

Triterpenoid sweetness inhibitors were isolated from *Z. jujuba*. Extracts from the seeds and leaves of *Z. jujuba* have been found to suppress sweet taste sensation. Antisweet substances isolated from *Z.jujuba* included jujubasponins II, III, IV, V and VI and from the leaves, jujuboside B from the leaves and seeds and ziziphus saponins I-III from dried fruit. They were found active in suppressing the sweet taste. (Suttisri, 1995)

Leaves:

Immunostimulant activity

The hydroalcoholic extract of leaves of Unnab stimulated cell-mediated immune system by increasing neutrophil phagocytic function. The extract was found to stimulate chemo tactic, phagocytic and intracellular killing potency of human neutrophils. (Ganachari et al, 2004)

Anti-inflammatory activity

The leaf extract of *Ziziphus jujuba* possesses significant anti-inflammatory effect against carrageenan-induced rat paw edema. The percentage of inhibition of paw edema at 3 h after carrageenan administration produced by *Ziziphus jujuba* leaves extract was found significant when compared to control. (Kumar et al, 2004)

Antipyretic effect

Methanolic extract of *Zizyphus jujuba* leaves was tested for its antipyretic activity. The leaf extract cause a highly significant reduction in temperature. The antipyretic effect was comparable with that of a standard paracetamol. (Balakrishnan et al, 2012)

Antiallergic activity

The antiallergic effect of the aqueous extract of leaves of *Z. jujuba* was evaluated by measuring inhibitory action on hyaluronidase (bovine testes) activation *in vitro*. *Z. jujuba* was found to have strong anti-allergic activity. (Su et al, 2002)

Antiulcer and gastroprotective activity

The anti-ulcer activity of Jujube leaves extract was evaluated by employing pylorus ligation, ethanol and aspirin induced gastric ulcers in rats. The study demonstrated that Jujube leaves extract has gastroprotective activity against experimentally induced ulcers in rats. The mechanism of gastroprotective action can be attributed to its antisecretory and cytoprotective property. (Ganachari et al, 2004)

Antiobesity activity

The hydroalcoholic extract of *Z. jujuba* leaves showed anti-obese property by causing reduction in body weight, food intake, serum glucose and lipid levels, and fat pad weights in dietary obese rats. The results suggested that the extract possesses significant weight reducing, hypophagic and hypolipidemic properties in sucrose-induced obese rats. (Ganachari et al, 2004)

Bark:**Wound healing activity**

The wound healing activity of topically applied methanolic extract of jujuba bark was evaluated by excision wound model. The extract showed effective wound healing effect. While comparing the jujuba bark extract 5% w/w, the 10% w/w showed significant result. (Kumar et al, 2012)

Root:

The wound healing activity of the root of *Z. jujuba* in experimental animal, rat model, was confirmed through topical application of an ointment, made with jujuba root, at a dose 0.5% and 1%. (Chopda et al, 2014)

CONCLUSION

From this exhaustive literature review it is concluded that Unnab is an important indigenous shrub used in Unani system of medicine since time immemorial. Along with its therapeutic potential, it also possesses nutritional value as well. Its medicinal actions, phytochemical constituents and pharmacological studies show the importance of this plant. The plant and its parts are yet to be explored for its rich nutraceuticals as well as therapeutic values for the betterment of humanity.

CONFLICT OF INTEREST

None declared.

REFERENCES

- Agarwal VS. Economic Plants of India: Kailash Prakashan, Calcutta; 1990. P. 413.
- Al Bairuni A R. Kitabus Saidana (Persian): Manuchahar Satuda Irej Uftad; YNM. P. 932.
- Al Masihi AS. Kitabul Miah Fil Tibb, Vol. I: CCRUM, New Delhi; 2014. P. 219.
- Al Masihi IQ. Kitabul Umda Fil Jarahat. Vol I: CCRUM, New Delhi; YNM. P. 278.
- Anonymous. The Wealth of India, Vol. XI: CSIR, New Delhi; 1976. P. 111-112.
- Anonymous. Contemporary Researches in Traditional Drugs & Medicinal Plants: Unani Medicine (Abstracts 1980-2009), Central Council for Research in Unani Medicine. Dept. of AYUSH, MoH & FW, Govt. of India, New Delhi; 2009. P-1.
- Anonymous. NFUM, Part III: Department of ISM & H, New Delhi; 2001. P. 127-128, 133.
- Anonymous. PDR for Herbal Medicines: Medical Economics Company Montvale, New Jersey; YNM. P. 439.
- Anonymous. Qarabadeen-e-Sarkari: CCRUM, New Delhi; 2006. P. 101.
- Anonymous. Survey of Medicinal Plants. RRIUM, Madras Unit: CCRUM, New Delhi; 1992. P. 125.
- Anonymous. The Ayurvedic Pharmacopoeia of India, Part- I, Vol. III: Department of ISM & H, New Delhi; 2001. P. 94.
- Anonymous. The Plant list, A working list of all plant species; 2013. http://www.theplantlist.org/tpl1.1/record/kew-2470699 (Accessed 10 January 2017).
- Anonymous. Unani Medicine in India. Central Council for Research in Unani Medicine. Dept. of AYUSH, MoH & FW, Govt. of India, New Delhi; 2009. P-1.
- Anonymous. United states Department of Agriculture, Agricultural Research Service, USDA, Branded Food Product Database; 2017. [https://ndb.nal.usda.gov/ndb/foods] (Accessed 15 January 2017).
- Anonymous. United states Department of Agriculture, Food Composition Databases; 2017. [https://ndb.nal.usda.gov/ndb/foods] (Accessed 15 January 2017).

- Anonymous. United states Department of Agriculture, Natural resources Conservation Service, Plant Databases; 2017. [https://plants.usda.gov/core/profile?symbol=ZIMA](A accessed 10 January 2017).
- Antaki DZ. Tazkirato Ulil Albab, Vol I: Maktaba wa Matba Mohd Ali Sabeeh Al Azhar, Qairo, Egypt; 1314 AH. P. 221.
- Arutla R, Swaroopa D & Rao K S. Wound healing potential of Ziziphus jujuba bark extract on albino rats. *International Journal of Research in Ayurveda & Pharmacy*, 2012; 3(5).
- Baghdadi AIH. Kitabul Mukhtarat Fit Tibb, Vol. II (Urdu Translation): CCRUM, New Delhi; 2005. P. 226.
- Balakrishnan A, Balasubramaniyam PD & Natesan SK. Antipyretic Activity of Ziziphus jujuba lam. Leaves. *Journal of Advanced Scientific Research*, 2012; 3(3):
- Basu MBD. *Indian Medicinal Plants*, Vol. I: International Book Distributers, Dehradun; 1987. P. 593-594.
- Cheng G, Bai Y, Zhao Y, Tao J, Liu Y, Tu G, et al. Flavonoids from Ziziphus jujuba Mill var. spinosa. *Tetrahedron*. 2000; 56(45): 8915-8920.
- Chopda MZ, Nemade NV, Mahajan RT. Wound healing activity of root of Ziziphus jujuba Mill in rat model. *World Journal of Pharmacy and Pharmaceutical Sciences*. 2014; 3(9).
- Chopra RN, Nayar SL, Chopra IC. *Glossary of Indian Medicinal Plants*: CSIR, New Delhi; 1956. P. 262.
- Esteki T, Urooj A. Antioxidant components and activity in the peel of Ziziphus Jujuba Mill. *Journal of Pharmacy Research*. 2012; 5(5, Cop): 2705-2709.
- Ganachari MS, Kumar S. Anti-ulcer properties of Ziziphus jujuba Lam leaves extract in rats. *Journal of natural remedies*. 2004; 4(2): 103-108.
- Ganachari MS, Kumar S, Bhat KG. Effect of Ziziphus jujuba leaves extract on phagocytosis by human neutrophils. *Journal of Natural Remedies*. 2004; 4(1), 47-51.
- Ghani N. *Khazainul Advia*, Vol. III: Shaikh Md Basheer & Sons, Urdu Bazar, Lahore; YNM. P. 142-144.
- Ha BH, Park MH. Studies on the sedative alkaloids from Ziziphus spinosamen (seed). *Saengyak Hakhoechi*, 1986; 16(4): 233-238.
- Hakim AM. *Bustanul Mufradat*: Siddique Book Depot, Lucknow; YNM. P. 228.
- Halim AM. *Mufradat-e-Azizi*: CCRUM, New Delhi; 2009. P. 30.
- Han BH, Park MH, Han YN. Cyclic peptide and peptide alkaloids from seeds of Ziziphus vulgaris. *Phytochemistry*, 1990; 29(10): 3315-3319.
- Hussain SF. *Advia Main kaam aane wale paude*: Urdu Science Board, Lahore; 1990. P. 25.
- Ibn Baitar. *Al Jame le Mufradatil Advia wal Aghzia*, Vol. III (Urdu translation): CCRUM, New Delhi; 1999. P. 314-316.
- Ibn Rushd. *Kitabul Kulliyat* (Urdu Translation): CCRUM, New Delhi; 1987. P. 325-326.
- Ibn Sina. *Al-Qanoon*, Part II (Urdu translation): Ejaz Publishing House, New Delhi; 2010. P. 420.
- Jossang A, Zahir A, Diakite D. Mauratine J, a cyclopeptide alkaloid from Ziziphus mauritiana. *Phytochemistry*, 1996; 42(2): 565-567.
- Jurjani AA. H. *Zakheera Khawarzaam Shahi*, Vol. III (Urdu Translation): Matba Nami Munshi Nawal Kishor, Lucknow; 1903. P. 76-77.
- Kabeeruddin M. *Makhzanul mufradat* (Khwassul advia): Ejaz Publishing House, New Delhi; YNM. P. 403-404.
- Kassem HA, Al-Obeed RS, Ahmed MA, Omar AKH. Productivity, fruit quality and profitability of jujube trees improvement by preharvest application of agrochemicals. *Middle-East J. Sci. Res*, 2011; 9(5): 628-637.
- Khan MA. *Muhit-e-Azam*, Vol. III. (Urdu translation): CCRUM, New Delhi; 2014. P. 604-606.
- Kumar S, Ganachari MS, Nagoor VS. Anti-inflammatory activity of Ziziphus jujuba Lam leaves extract in rats. *Journal of Natural remedies*, 2004; 4(2): 183-185.
- Lee SM, Min BS, Lee CG, Kim KS, Kho YH. Cytotoxic triterpenoids from the fruits of Ziziphus jujuba. *Planta medica*. 2003; 69(11): 1051-1054.
- Lee SM, Min BS, Lee CG, Kim KS, Kho YH. Cytotoxic triterpenoids from the fruits of Ziziphus jujuba. *Planta medica*. 2003; 69(11): 1051-1054.
- Lee SM, Park JG, Lee YH, Lee CG, Min BS, Kim JH, et al. Anti-complementary activity of triterpenoides from fruits of Ziziphus jujuba. *Biological and Pharmaceutical Bulletin*. 2004; 27(11): 1883-1886.
- Lee SS, Lin BF, Liu KC. Three triterpene esters from Ziziphus jujuba. *Phytochemistry*. 1996; 43(4): 847-851.
- Mahajan RT, Chopda MZ. *Phyto-Pharmacology of Ziziphus jujuba Mill-A plant review*. *Pharmacognosy Reviews*. 2009; 3(6): 320.
- Majusi IA. *Kamilus sina'ah: Idara kitab al shifa*, New Delhi; 2010. P. 156.

- Matsuda H, Murakami T, Ikebata A, Yamahara J, Yoshikawa M. Bioactive saponins and glycosides. XIV. Structure elucidation and immunological adjuvant activity of novel protojubilogenin type triterpene bisdesmosides, protojubilosides A, B, and B1, from the seeds of *Zizyphus jujuba* var. *spinosa* (*Zizyphi Spinosi* Semen). *Chemical and pharmaceutical bulletin*. 1999; 47(12): 1744-1748.
- Nabi MG. *Makhzan-e-Mufradat wa Murakkabat*: CCRUM, New Delhi; 2007. P. 170.
- Nadkarni KM. *Indian Materia Medica*. Vol. I: Bombay Popular Prakashan; YNM. P. 1318.
- Peng WH, Hsieh MT, Lee YS, Lin YC, Liao J. Anxiolytic effect of seed of *Zizyphus jujuba* in mouse models of anxiety. *Journal of ethnopharmacology*. 2000; 72(3): 435-441.
- Prajapati ND. *A Hand Book of Medicinal Plants*: Agrobios India; 2003. p. 553.
- Razi Z. *Kitabul Hawi* Vol. 21 (Urdu Translation): CCRUM, New Delhi; 2007. P. 116.
- Razi Z. *Kitab al mansuri*: CCRUM, New Delhi; 1991. p. 122.
- Su BN, Cuendet M, Farnsworth NR, Fong HH, Pezzuto JM, Kinghorn AD. Activity-guided fractionation of the seeds of *Zizyphus jujuba* using a cyclooxygenase-2 inhibitory assay. *Planta medica*. 2002; 68(12): 1125-1128.
- Suttisri R, Lee I S, Kinghorn AD. Plant-derived triterpenoid sweetness inhibitors. *Journal of ethnopharmacology*. 1995; 47(1): 9-26.
- Takmili IH. *Advia Unania: Fahmeeda Cottage*, Top Darwaza, Lucknow; 1987. P. 239.
- Tschesche R, Shah AH, Eckhardt G. Sativanine-a and sativanine-b, two new cyclopeptide alkaloids from the bark of *Zizyphus sativa*. *Phytochemistry*, 1979; 18(4): 702-704.
- Woo WS, Kang SS, Shim SH, Wagner H, Chari VM, Seligmann O, et al. The structure of spinosin (2''-O- β -glucosylwertisin) from *Zizyphus vulgaris* var. *Spinosa*. *Phytochemistry*. 1987; 18(2): 353-355.
- Yoshikawa M, Murakami T, Ikebata A, Wakao S, Murakami N, Matsuda H, et al. Bioactive Saponins and Glycosides. X. On the Constituents of *Zizyphi Spinosi* Semen, the Seeds of *Zizyphus jujuba* MILL. var. *spinosa* HU (1): Structures and Histamine Release-Inhibitory Effects of Jujubosides A1 and C and Acetyljujuboside B. *Chemical and Pharmaceutical Bulletin*. 1997; 45(7): 1186-1192.
- Zeng L, Zhang RY, Wang X. Studies on the constituents of *Zizyphus spinosus* Hu. *Acta Pharma Sinica*. 1987; 22: 114-120.