

Historical uses of saffron: Identifying potential new avenues for modern research

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Abstract

Objective: During the ancient times, saffron (*Crocus sativus* L.) had many uses around the world; however, some of these uses were forgotten throughout the history. But a newly formed interest in natural active compounds brought back the attention toward historical uses of saffron. Understanding different uses of saffron in the past can help us finding the best uses at present. In this study, we reviewed different uses of saffron throughout the history among different nations.

Methods: ISI web of Science and Medline, along with references of traditional Iranian medicine were searched for historical uses of saffron.

Results: Saffron has been known since more than 3000 years ago by many nations. It was valued not only as a culinary condiment, but also as a dye, perfume and as a medicinal herb. Its medicinal uses ranged from treating eye problems to genitourinary and many other diseases in various cultures. It was also used as a tonic agent and antidepressant drug among many nations.

Conclusion(s): Saffron has had many different uses such as a food additive and a palliative agent for many human diseases. Thus, as an important medicinal herb, it is a good candidate with many promising potentials to be considered for new drug design.

Keywords: Saffron, Iran, Ancient medicine, Herbal medicine, Traditional medicine

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Introduction

Saffron is a spice derived from the dried stigmas of *Crocus sativus* Linné, which was known by ancient nations and has remained among the world's costliest substances throughout the history. The flower's natural fields are in the 30°- 40° North latitude. Its flowering period extends over 2 or 3 weeks in October or November (depending on geographical differences), in which the flowers are picked by hands; the dark red stigmas are separated manually and then they are dried. The stigmas from about 100,000 flowers are required to make a kilo of pure dried saffron (Claus 1962; Abrishami 1987; Abrishami 1997; Dalby 2000).

Saffron has been used by different nations for different purposes such as a spice, a dye and a perfume (Abrishami 2004). During almost four millennia, saffron has had the largest number of application among all medicinal plants and has been used in the treatment of 90 medical indications (Ferrence and Bendersky 2004). Nowadays, many researches are being done on therapeutic and other applications of this precious spice; thus, we have reviewed the modern studies in this regard (Bathaie and Mousavi). In addition, there have been some reviews about historical features and application of saffron (Ferrence and Bendersky 2004; Giaccio 2004; Schmidt, Betti *et al.* 2007). However, a need for a comprehensive review about the saffron's uses by different nations throughout the history is obvious, especially when it comes to the medicinal and historical uses of Iranian saffron, as there is little known about it in the international literature. Understanding different uses of saffron in the past may help us find new ways of using it.

Methods

ISI web of Science and Medline were searched for the historical uses of saffron. In

addition, reference books of traditional Iranian medicine and books on the history of saffron, along with internet websites were searched.

Results

According to the historical findings, it is not clear that where was the first place that saffron was grown and which nation was the first one who used it. Thus the following order is according to the historical backgrounds of the regions or countries, not the priority of using saffron. Table 1 shows relatively all medicinal usages of saffron by various nations during the history.

Saffron in the Middle East

Historical data show that saffron was used as a medicine in the Fertile Crescent between the Tigris and the Euphrates -where the first known complete civilization emerged. In Mesopotamia, saying magic words and performing symbolic gestures while prescribing and using drugs was a routine, they believed that these would give drugs the power to heal. Their materia medica was similar to other nations of the same time and consisted of substances from animal, vegetable and mineral kingdoms like fig, onion, garlic, saffron, mustard, myrrh, cypress, salt, milk, meat and fat of different animals, etc (Munby 1992; Giaccio 2004; Tolner 2005; Pirnia 2006).

Later Assyrians and Babylonians (2nd millennium BC (Blois and Spek 2005)) used saffron in treatment of dyspnea, problems of head, menstruation, delivery and painful urination. The first documentation of saffron's medical use was found in Assurbanipal library (668-627 BC); in inscriptions dated back to 12th century BC (Ferrence and Bendersky 2004; Tolner 2005).

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Table 1: Major medicinal application of saffron in ancient time.

Immune System & infections	Immunostimulant	Anti-inflammation	Arthritis & rheumatoid arthritis	anti-bacterial	anti-fungal					
	Its topical use, healing wounds	To refresh facial skin	To increase brightness of the body	To treat acne	To treat erysipelas	Diaphoretic	To treat purpura	To treat eczema		
Skin	Local using strengthen eyesight	Useful in day blindness	To cure purulent eye infection	To treat corneal disease	Lacrimating	Anti-cataract	To treat keratitis			
Vision & eye										
Reproductive System	Aphrodisiac	To treat impotency & as activator/generator of sperm	To facilitate hard delivery and delivery of placenta	To regulate menstrual cycle & dysmenhorea		To cure uterus pain	Useful for uterus ulcers	As an emmenagogue		
Urinary Tract & Kidney	Diuretic	Purifier of kidney and bladder	To cure infection of urinary tract	Plus honey, facilitates passage of renal stone						
Gastrointestinal Tract	Strengthening liver and stomach	To cure obstructions inside liver and spleen	To decrease appetite	To treat enlarged liver & enlarged spleen	To cure splenic disorders	Carminative	To treat vomiting	To treat dyspepsia	To cure rectal prolapse	To tonify stomach
Respiratory System	Strengthening respiratory system	To treat dyspnea	Anti-asthma	To treat cough	Anti-pertussis	To treat sore throat	To treat measles	Its odor and oil are good for diaphragmitis and pleuritis		
Cardiovascular System	Cardiotonic	Improving circulation	Preventing coagulation	To decrease the resistance of coronary arteries		To help nutrients & drugs reach the heart				
Cycological Disorders	Against mental disorders &	Relaxant	Anti-stress	Anti-depressant	To elevate mood	Anti-anxiety	Its topical use in Boiled water is good for severe insomnia			
Central Nervous System	To cure obstructions inside brain	To protect brain from oxygen deprivation	To treat neurasthenia	To treat apoplexy	Its topical use in Boiled water is good for severe headaches					
General Effects	Anti-spasmodic	To cure broken bones	To treat catarache	To treat tooth-ache	To cure edema					
	To invigorate the body	To strengthen senses	Sedative & febrifuge	To improve swellings & edema	Anti-poisonous	To treat alcoholism	To treat insect bites & stings	Anti-diabetic	To decrease lipids	Against cold

Saffron in Egypt

In ancient Egypt, (3100 BC – 476 AD) saffron was imported from Crete and one of its important uses was in medicine and was mentioned in 'The Ebers Papyrus'. It was used in the treatment of disorders of eye, menstruation and urinary system and also to induce labor (Sigerist; Tolner 2005; Tolner 2005). It is said that Cleopatra (69-30 BC (Wilson 2006)) used to bath in milk and saffron (Behnia 1991).

Saffron in Crete

One of the frescoes of Bronze Age (3000–1100 BC) at Akrotiri, Thera depicts *Crocus cartwrightianus* and its active principle, saffron (Ferrence and Bendersky 2004; Papaodysseus, Fragoulis *et al.* 2006) that is believed to be the wild saffron which is mostly distributed in Greece in Athica and the Cyclades region and is the ancestor of cultivated saffron (Kafi, Koocheki *et al.* 2006). The fresco shows the line of saffron production: plucking blooms, collection of stigmas and offering them to a goddess. The lower part of fresco shows a woman who is using saffron for treatment of her bleeding foot. It's hypothesized that this fresco shows the importance of saffron and its medicinal use; it is also possible to think that the goddess gave saffron the curative power, or that she has given saffron to human as a gift (Ferrence and Bendersky 2004).

In a fresco in the palace of Minos at Knossos (about 1700- 1600 BC), *Crocus sativus* is shown being picked by young girls and monkeys (Winterhalter and Straubinger 2000).

Greek saffron

In ancient Greece (about 2000 - 146 BC (Behmanesh 1338; Munby 1992; Blois and Spek 2005)), Saffron was a royal dye and was used as a perfume in saloons, courts, theatres and bathrooms; later its use spread among ordinary people (Abrishami 1987;

Dadkhah, Ehtesham *et al.* 2003). Another use of saffron was as an herbal remedy (Dadkhah, Ehtesham *et al.* 2003). Hippocrates (5-4th century BC), Erasistratus (4-3rd century BC), Diokles (3rd century BC) and Discorides (1st century AD) used saffron for medical purposes like treating eye diseases (painful eye, corneal disease and cataract, purulent eye infection), earache, tooth-ache, ulcers (skin, mouth, genitalia) and erysipelas; they believed that it has styptic and soothing properties (Ferrence and Bendersky 2004; Giaccio 2004; Tolner 2005).

Iranian saffron

The first fields of saffron were near Zagros and Alvand mountains during the Kingdom of Media (708- 550 BC (Shabani 2001; Blois and Spek 2005; Pirnia 2006)), but there is not enough information about how they used saffron (Abrishami 1997; Dadkhah, Ehtesham *et al.* 2003; Abrishami 2004). It is thought that ancient Persians were one of the first nations who cultivated saffron instead of using only the wild flower (Dadkhah, Ehtesham *et al.* 2003). Nowadays Iran is the world's largest producer of saffron (about 85% of world saffron production) with the most production in Khorasan region (Dadkhah, Ehtesham *et al.* 2003).

In ancient Persia, they used to disperse saffron, gold, flowers and sweets along the parade routes and in wedding celebrations. Another use of saffron was as an ingredient of incense, along with aloeswood (Oud) and ambergris (Abrishami 1997).

Saffron was not only precious and valuable -they used it as a gift along with gold, but also was a spiritual item; so they used it to scent the body of dead people, to write the prayers and rulers' orders and also to paint the books (Abrishami 1997).

Saffron was named as Kurkum or Karkam during the Achaemenid dynasty (550 BC- 330 BC) and was used along with cardamom and cinnamon for preparation of

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refreshing and strengthening drugs. An inscription in one of Achaemenid king palaces showed that they used about 1 kg of saffron every day, for making saffron bread, in scented body oil for kings and as a dye for shoes and clothes of king and 'The Immortal Troop' (Abrishami 1997; Abrishami 2004).

During Parthian Empire (256 BC -224 AD (Colledge 2005)) and Sassanid dynasty (226-641 AD (Munby 1992)) they used to export saffron to China, Rome, India and Greece amongst other goods (Abrishami 1997). During Parthian dynasty, they used saffron among the ingredient of a royal perfume, facial refreshing oil for kings and ritual leaders and also in cooking (Dalby 2000; Colledge 2005). During Sassanid dynasty, they used to colour papers with saffron for playing chess; in addition, King Khosru Parvez (591-628 AD) ordered that his letters should be written on pieces of papers perfumed with rosewater (Golab) and saffron. They used saffron as an ingredient of various foods, for topping and for dyeing silk, fabric and rugs (Abrishami 1987; Christensen 2004).

Saffron found its way to Ferdowsi's epic poems (one of the most famous poets of Iran) as well. For example when Freidoon triumphed over Zahhak, he ordered that fire be lighted and ambergris and saffron be ignited. They also scattered saffron and coin around the street when they celebrated the winning of Rostam over Touranian. Another use of it was in hand and finger printing; like when Siavash's son was born, his mother put the hand of the son in saffron water and pasted it on a paper and sent the paper to Siavash (Ferdowsi 2002). The finger printing with saffron was a custom during Timurids Dynasty (14th – 16th century AD) as well; the kings used this way to accredit orders and contracts (Abrishami 2004). They also used saffron and henna to make inks and colour the papers during Timurids and Safavid

(1500-1722 AD) Dynasties (Abrishami 1997; Abrishami 2004).

Saffron was still a routine gift in ceremonies during Qajar Dynasty (1794-1925 AD); but with increased import of cinnamon, saffron's uses declined and people used cinnamon in their food instead (Abrishami 2004). Still nowadays saffron is an essential ingredient of many traditional dishes with rice (like Chelow Kabab) and deserts like saffron rice pudding (Sholezard), Sohan, Zulbia and Halva. In some regions of Iran, they also make saffron tee and saffron bread as well (Behnia 1991).

One of saffron's important uses was in Traditional Iranian Medicine (TIM). Saffron is considered as hot and dry. Some of saffron's uses in TIM are described below (Hoseini 1980; Khorāsāni 1992; Avicenna 1997; Zargari 1997; Jorjani 1998; Mir Heidar 2004; Chaqmini 2006):

General: invigorate the body, strengthen senses, elevates mood; if used with wine, it can both enhance the intoxication and prevent hangovers. Its odor is hypnotic. The external use of ground saffron is good for major external bleedings. It is anti-inflammatory and can be used for swellings, otitis and wounds. It has been one of the major components of strengthening drugs.

Cosmetics and skin: It can improve complexion and can be used for the treatment of erysipelas.

Head and neck: It can be used to cure obstructions inside brain. If it is boiled, the topical use of its water is good for severe headaches and insomnia.

Eye: If used locally (collyrium), it can strengthen eyesight and can prevent it from being affected by morbid matters. It is useful in day blindness, lacrimation and keratitis. Also applying ground saffron over conjunctivitis can be useful. Another use of it can be in blue discoloration of the eyes due to some other ailments.

Heart: It is cardiogenic and can help other drugs reach the heart and other target organs easily.

Respiratory system: It can strengthen respiratory system. Its odor and its oil are good for diaphragmitis and pleurisy.

Gastrointestinal: It strengthens liver and stomach and can be used to cure obstructions inside liver and spleen. It is an emetic drug and can decrease appetite. With appropriate drugs, it is good for anal pain.

Joints: The local use of its water extract with appropriate drugs is good for gout and joints.

Genitourinary: It is a diuretic; also, it can purify kidney and bladder. If used with honey, it can facilitate passage of renal stone. Putting one stigma in urethra can cure obstructed urination. It is aphrodisiac. It can facilitate hard delivery and delivery of placenta; it can also cause abortion. It is good for uterus ulcers especially if used with wax or yolk and two times olive oil. With appropriate drugs, it is good for uterus pain. It can regulate menstrual cycle as well.

Saffron oil (mixture of saffron with six times (w/w) olive oil or sesame oil remaining for five days with daily stirring, and filtration after that) is a preparation that is sedative. It is also used locally for treatment of uterus and other organs ulcers. It is used for nose embrocation and is good for pleurisy. Saffron's leaves can be used to treat new wound and can prevent organs from being affected by morbid matters.

Saffron's side effect (headache and weakening of senses if used over a long period) can be prevented if used with *Pimpinella anisum* L. and *Sekanjebin*. Saffron's safe dose is less than 2 Dirham (about 6 g), if it is used in the amounts of 3 Dirham (about 9 g) or above, it can be lethal due to excess happiness and excitation.

Roman saffron

In ancient Rome (753 BC- 364 AD (Munby 1992; Blois and Spek 2005)), saffron was used as a gift, perfume or dye of robe hems among royalty and later among ordinary people. They also used it to scent their public halls, baths and theaters and to spread it along parade routes (Abrishami 1987; Abrishami 1997; Dalby 2000; Dadkhah, Ehtesham *et al.* 2003; Giaccio 2004).

Other uses of saffron were in religious ceremonies (they burnt saffron as an offering to their gods and goddesses (Abrishami 1997), in colored decorative (Dadkhah, Ehtesham *et al.* 2003) and as one of the ingredient of Amomum which was one of the main aromatics in a Roman wine recipe and a scent of men's hair. They also believed that adding saffron to their wine will prevent hangover (Dalby 2000; Winterhalter and Straubinger 2000). Heliogabalus (202-222 AD) also used saffron baths (Behnia 1991).

Saffron had medicinal uses as well. They used it to refresh facial skin, to relieve liver from the dominance of bile, to treat coughs and diaphragmitis, and as an eye anti-inflammatory agent (Abrishami 1997).

Indian saffron

Some believe that saffron was first introduced to India by ancient Persians (Dalby 2000); its exact date is unknown, but Wan Zhen (a Chinese medical writer), described Kashmiri saffron by 3rd century AD. A Buddhist legend dates saffron plantation there back to the 5th century BC (Dalby 2000).

In ancient India, rich people used a lot of saffron to show their royalty; they used saffron perfume on the royal person or as an air freshener, they dyed their robes and even used it just as decor. The Indian nobility may have learned these costumes from the ancient Greeks and the Romans. Saffron is also an important part of traditional Indian celebrations like wedding ceremony where

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they use it as decor, as saffron paste for the bride and guests and in food and drinks.

Saffron has had a significant role in all religions branched out from Hinduism. It is essential in performing some rituals; the Buddhist monks have adopted saffron colour as the most important one. Saffron is used to anoint deities of Hindu pantheon and to dot forehead of a worshiper.

Another use of saffron has been in herbal formulations, Ayurvedic medicine and home remedies. Saffron is considered as tonic, immunostimulator, antipoisonous, aphrodisiac, cardiac tonic, livotonic, nervine tonic, carminative, diaphoretic, diuretic, emmenagogue, lactagogue, febrifuge, stimulant, sedative, relaxant, anti-stress and anti-anxiety. Therefore it can be used in a variety of diseases and conditions like (Ríos, Recio et al. 1996):

General: general debility, alcoholism, inflammation, diabetes, children's disorders of unknown etiology, insect bites and stings, edema.

Skin: acne, skin diseases and wounds. It also can give brightness to the body.

Head and neck: headache, depression, mental disorders, weak eyesight.

Respiratory: asthma, cough, sore throat and cold.

Gastrointestinal: enlarged liver, splenic disorders, vomiting and dyspepsia, prolapse of anus.

Genitourinary: infection of urinary bladder and kidneys, menstrual irregularity, dysmennhorea, impotency. It is also an activator/generator of sperms

Others: arthritis, apoplexy, neurasthenia.

Saffron in China

Some historians believe that saffron first came to China with Mongol invaders (Abrishami 1987), but the Chinese were referring to saffron as Kashmiri origin plant in 3rd century AD (Dalby 2000). Saffron is now cultivated in China and named as hong

hua (紅花, 紅藍花), fan hong hua (番紅花) and zang hong hua (藏紅花). Saffron is used as a spice and to colour foods, it is also considered as an herbal remedy. It is warm and mostly is used with other herbal drugs. Its effects on body are as below (Chu; R.Howes, Perry et al. 2003; Mir Heidar 2004):

It is a heart stimulant; it can decrease the resistance of coronary arteries and improve circulation. It can provide blood flow and nutrition to the heart. It can prevent coagulation and in large amounts can destroy blood clots.

If used in small amounts, it can increase circulation and the rhythmic contraction of the pregnant uterus, while large amounts can cause constriction and spasm of uterus. Therefore, it must not be used in heavy menses and pregnancy.

It can lower lipids and can be used as an anti-bacterial, anti-fungal, analgesic, diuretic, immune stimulant, anti-inflammatory, anti-spasmodic, emmenagogue and diaphoretic.

Saffron can protect brain from oxygen deprivation; it can be used in case of broken bones, dislocated joints, sprains, painful joints, purpura, eczema, rheumatoid arthritis, and measles; it can also be used for treatment of enlargement of the liver and spleen.

Saffron is also used in the treatment of disorders of nervous system. It can be used for relieving asthma, pertusis and inflammations and is good to tonify stomach.

Modern saffron cultivation in Europe

Saffron cultivation in Europe declined after the fall of Western Roman Empire (5th century AD) and for several centuries saffron cultivation was rare. Saffron came back to Europe by the Muslim in 10th century AD (Abrishami 1987; Abrishami 2004). During the middle ages, saffron was rare and highly in demand; it was the reason of "Saffron

War" in 14th century when a shipment of saffron was hijacked. In Nuremberg of 15th century, harsh rules such as pyre were set to prevent saffron adulteration (Winterhalter and Straubinger 2000; Giaccio 2004).

Saffron is one of the historical ingredients in European medicine and cuisine and nowadays the spice is still used for traditional fish and seafood dishes in Italy, France and Spain and is used in the German saffron cake 'Gugelhupf' (Abrishami 1997; Winterhalter and Straubinger 2000).

Spanish saffron

Modern saffron cultivation in Europe began in Spain in the 10th century AD after Muslim campaigns in 712 AD. After conquering Iran, Muslims brought the knowledge of cultivating saffron from Persia to Spain. Later the proliferation of saffron began to spread throughout Europe (Abrishami 1987; Abrishami 2004). Today Spain is the biggest exporter of saffron in the world. It produces about 5 tons each year, but it also imports saffron from Iran, Greece and Morocco, to supply its market (Dadkhah, Ehtesham et al. 2003). Every year, a saffron festival (Fiesta de la Rosa del Azafran) takes place in Spain, consisting of competition for the best saffron dish and saffron picking contest. In Spain there are many dishes which need saffron; the most important one is Paella (Abrishami 1987; Winterhalter and Straubinger 2000; Dadkhah, Ehtesham et al. 2003).

England

Although saffron was mentioned in a pharmacopoeia in the 10th century AD in England, data show that it was brought to England in the 14th century. In 16th century, a town in Essex changed its name to Saffron Walden where they cultivated and exported saffron. They also used it as a dye, a spice and for seasoning. Although nowadays saffron cultivation in this region is rare, there are still paintings of saffron flower in Parish

Church and on guard clothes. There has been remained some recipes for saffron cakes and breads for festivals and saints' days (Abrishami 1987; Robinson 1995; Abrishami 1997; Dadkhah, Ehtesham et al. 2003; Abrishami 2004).

Saffron has been mentioned in the Culpeper's Complete Herbal; where it has been written that saffron is growing mainly in Walden in Essex and in Cambridgeshire. Saffron was supposed to strengthen the heart (in normal amounts), quicken the brain, combat difficult breathing and jaundice (CULPEPER 1652; Abrishami 1997).

Other countries

Some historical data show that first harvest of saffron in Turkey was about 13th-14th centuries AD. The town of Safranbolu took its name from saffron as it has been the main local producer (Abrishami 1997).

Nowadays Iran is the first producer of saffron; other countries are: Spain, India, Turkey, Greece, Morocco, China, France, Italy, Germany, Japan, Russia and Pakistan (Dadkhah, Ehtesham et al. 2003).

Conclusion

Saffron is a spice known by many ancient civilisations for its various properties; especially the medicinal uses. Although some of them have been forgotten throughout the years, there is an increasing interest in re-understanding it. The results of this study can be helpful in using traditional medical knowledge for production of new modern drugs in the era of re-interest in herbal medicine.

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Nüremberg, Germany; and the second International Symposium of saffron biology

References

Abrishami MH. 1997. Persian Saffron, a Comprehensive Cultural and Agricultural History. Mashhad, Astan Ghods Razavi Publication.

Abrishami MH. 2004. Saffron, from yesterday till today, an encyclopaedia of its production, trade and use. Tehran, Amirkabir.

Abrishami MH. 1987. Understanding of Iranian Saffron Tehran, Tous.

Avicenna 1997. The Canon of Medicine Tehran, Soroush.

Bathaie SZ and Mousavi SZ. Critical Reviews in Food Science and Nutrition.

Behmanesh A. 1959. The history of ancient Greece. Tehran, Tehran University publication.

Behnia MR. 1991. Saffron, botany, cultivation and production Tehran, Tehran University publication.

Blois Ld and Spek RJvd. 2005. An Introduction to the Ancient World. Tehran, Ghoghnu.

"Ceremonial saffron." Royal saffron Retrieved 26 August, 2007, from <http://www.royalsaffron.com/ceremony.htm>.

Chaqmini 2006. Small Canon. Tehran, Iran University of Medical Sciences and Health Services.

Christensen AE. 2004. L'Iran sous les Sassanides. Tehran, Negah.

Chu JHK. "Complementary and Alternative Healing University" Retrieved 11 June, 2007, from http://www.alternativehealing.org/hong_hua.htm.

Claus EP. 1962. Pharmacognosy. Philadelphia, Lea and Febiger.

Colledge MAR. 2005. Parthians. Tehran, Hirmand.

CULPEPER N. 1652. The Herbal: Culpeper's Complete Herbal.

Dadkhah M, Ehtesham M, Fekrat H. 2003. Iranian Saffron an unknown jewel. Tehran, Shahr Ashub Publication.

Dalby A. 2000. Dangerous Tastes, The Story of Spices. Berkeley, Los Angeles, University of California Press.

and biotechnology, 2006, Iran.

Ferdowsi 2002. The Shanameh of Ferdowsi. Tehran, Zohre.

Ferrence SC and Bendersky G. 2004. Therapy with saffron and the goddess at Thera. *Perspect Biol Med* 47(2):199-226.

"From the ancient, historic fields of Kashmir " Royal saffron Retrieved 24 August, 2007, from <http://www.royalsaffron.com/ancient.htm>.

Giaccio M. 2004. Crocetin from Saffron: An Active Component of an Ancient Spice. *Critical Rev Food Sci Nutr* 44(3):155-172.

"History of Saffron." Retrieved 25 February, 2007, from http://en.wikipedia.org/wiki/History_of_saffron.

Hoseini MM. 1980. Treasure of Hakim Momen. Tehran, Mahmoudi.

Jorjani SE. 1998. Khofi Alaie. Tehran, Etela'at.

Kafi M, Koocheki A, Rashed MH, Nassiri M. 2006. Saffron (Crocus Sativus): Production and Processing Science Publishers.

Khorasani A. 1992. Collection of Drugs (Materia Medica) Tehran, Enqelab-e Eslami Publishing and Educational Organization.

Mir Heidar H. 2004. Herbal knowledge: Usage of herbs in prevention and treatment of diseases, with latest research around the world. Tehran, Daftare Nashre Farhange Eslami.

Munby L. 1992. Concise encyclopedia of world history. Tehran, Elm o Zendegi.

Papaodysseus C, Fragoulis DK, Panagopoulos M, Panagopoulos T, Rousopoulos P, Exarhos M, Skembris A. 2006. Determination of the method of construction of 1650 B.C. wall paintings. *IEEE Trans Pattern Anal Mach Intell* 28(9): 1361-71.

Pirnia H. 2006. Ancient Persia Tehran, Negah.

R. Howes M-J, Perry NSL, Houghton PJ. 2003. Plants with traditional uses and activities, relevant to the management of Alzheimer's disease and other cognitive disorders. *Phytpther res* 17(1):1-18.

Ríos JL, Recio MC, Giner RM, Máñez S. 1996. An Update Review of Saffron and its Active Constituents. *Phytpther res* 10:189-193.

- Robinson A. 1995. Notes on the saffron plant (*Crocus sativus*,L.). *Pharm Hist (Lond)* 25(2):2-3.
- "SAFFRON A - Z (I)." Retrieved March 19, 2007, from http://www.saffronspecialist.co.uk/Information/Saffron_A-Z/I.htm.
- Schmidt M, Betti G, Hensel A. 2007. Saffron in phytotherapy: pharmacology and clinical uses. *Wien Med Wochenschr* 157(13-14):315-9.
- Shabani R. 2001. A Short Reviw on Iran History, from Medes to Qajar. Tehran, Sokhan.
- Sigerist HE. 1955. Primitive and archaic medicine. New York, Oxford University Press.
- "Spiritual saffron." Royal saffron Retrieved 26 August, 2007, from <http://www.royalsaffron.com/spirit.htm>.
- "Therapy and saffron." Royal saffron Retrieved 26 August, 2007, from <http://www.royalsaffron.com/therapy.htm>.
- Tolner R. 2005. *Illustrierte Geschichte der Medizin*. Tehran, Encyclopedia of medical history publications.
- "Uses in medicine." Royal saffron Retrieved 26 August, 2007, from <http://www.royalsaffron.com/medicine.htm#takecare>.
- Wilson N. 2006. *Encyclopedia of Ancient Greece*. New York, Routledge, Taylor & Francis Group.
- Winterhalter P and Straubinger M 2000. Saffron—Renewed Interest in an Ancient Spice. *Food Rev Int* 16(1):39-59.
- Zargari A. 1997. *Medicinal plants*. Tehran, Tehran University publication.

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