

Saffron Guide

1. What is saffron?

The spice we know as saffron consists of the dried stigma of the flower of *Crocus sativus* Linnaeus, a plant belonging to the genus *Crocus*, order of Lilacs, Iridaceae family. This species is a perennial herbaceous plant with a normal height from 10 to 25 cm, which has a corm, thickening of the stalk (commonly called bulb or onion), from which the leaves and flowers sprout. The 3 stigma are also called threads, filaments or strings.

The spice is characterised by its bitter taste, its aroma and fundamentally by its pigmentation capacity. There are 3 components that, to a large extent, are responsible for these characteristics: the bitter tasting picrocrocin, the safranal that provides the aroma, and the crocin its distinctive colour.

Saffron is used in many different cultures for different purposes and it is highly valued internationally, basically due to the difficulty of its production and gathering. As a representative fact, one must state that 160,000 saffron flowers barely provide 1 Kg of commercial saffron.

2. History

2.1. Etymology

Although the origin of the term saffron is not clearly known, the word is quite similar in different languages such as, for example: *zafarân* (Arabic), *safranum* (Latin), *saffron* (English), *zafferano* (Italian) or *safran* (French). In Arabic, the word *zafarân* means yellow, and that is believed to be a possible origin of the term. Curiously, the term saffron is one of the words that is most similar in different languages and that seems to prove how ancient use of this spice is. There is no other cultivated plant that has conserved its root name for so long. The word *Crocus*, that provides the name of the genus, comes from the Greek word *krokos*, that means filament or fibre.

Other terms in different languages are: *saframi* (Finnish), *saffran* (German), *safran* (Polish),



Photograph 1. *Crocus sativus* L.

sáfrány (Hungarian), *safranu* (Romanian), *safrána* (Latvian), *khekhrum* (Armenian), *shafran* (Russian), *zaferen* (Turkish), *kurkum* (Farsi), *kesar* or *zafran* (India), *safárum* (Malaysian), *safrà* (Catalonian), *azafrán* (Galician) or *azafrai* (Basque).

2.2. Origins

The saffron plant supposedly originates in the Eastern Mediterranean. The first clear reference we have to saffron growing dates back to 2300 B.C.. Sargon, founder of the **acadian empire**,

was born in an unknown city on the banks of the river Euphrates called Azupirano, a name that might perhaps mean “City of Saffron”.

However, the first unarguable reference to its use is by the **minoan civilisation**. That civilisation developed on the island of Crete and was a forerunner of Greek civilisation. The English archaeologist Sir Arthur John Evans discovered some frescoes on the archaeological site of the palace of Knossos, dating from 1600 B.C. that represent a blue figure gathering whole Crocus plants. In another later fresco, (1500 B.C.) found on the Isle of Thera (now Santorini), some youths are seen collecting just the stigma of the flower.

According to the Egyptologists, in the ancient **egyptian civilisation**, saffron was mainly used for medicinal purposes. The Ebers papyrus (discovered by Georg Ebers in a tomb in Thebes) dated to 1600 B.C., which is the most important known medical papyrus in the history of Egypt, mentions saffron as a substance that cures kidney problems.

It is believed that the **Phoenecians** (1400 B.C.), major sea traders, were the first to trade saffron throughout the Mediterranean, as they did with many other products. It is also mentioned in the Bible as *Krakom* in the “Song of Songs”, that tells how the plant was held in high esteem in the time of **Solomon** (10th Century B.C.) to whom these verses are attributed.

Diverse authors from **greek culture** cite it as *krokos* in their literature. Hippocrates (470 – 377 B.C.) used the word *krokos* as a reference to the medicinal use made of saffron. Sophocles (496-406 B.C.) mentions it in his famous work “Oedipus the King” and also Homer (10th Century B.C.) refers to it in cantos IX and XII of the Iliad.

Its use was also very widespread during the **Roman Empire**. Virgil (70 B.C. – 19 B.C.), Roman poet, sings the praise of the saffron on the mountains of Tmolus, in the province of Lidia, in present day Turkey.

It is believed to be the Romans, not the Arabs, as generally thought, who first introduced it to Spain. The Romans traded with it a lot within the Empire as a colouring substance for medicinal or magic purposes, but also for culinary use. During Nero’s reign in Rome, in the 1st Century A.D.,



Photograph 2. Frescoes in the isle of Thera.

Dioscorides, the physician to the Roman navy, attributed magical-medicinal properties to saffron.

Although it is true that the Romans who originally introduced it to Spain, it was **the Arabs** who began widespread growing in La Mancha region, which is now the main production zone in Spain.

In the Middle Ages, from the 5th Century A.D. to 15th Century A.D., the main European saffron trading centre was Venice and the most important buyers were German. At that time, in Venice, there was an armed guard called *Ufficio dello zafferano* whose duty it was to inspect the saffron traders and avoid possible forgery or adulteration. In 1358, a law known as “Safranschau” was enacted in Nuremberg. This was one of the first known laws on food and exclusively concerned the quality of commercial saffron. The law provided for capital punishment in certain cases and several people were even executed by being burned alive with their adulterated products.

As of the Middle Ages, there are a great number of existing references to saffron. To cite an example in Spain, the book of sayings *Refranes y Proverbios* (1557) by Hernán Núñez records two sayings that refer to cultivation of this plant. These sayings are:

- August rain is good for saffron, honey and grape must.
- At Saint Luke's, saffron by the basket.

In the 19th Century, the first chemical studies of saffron colour were carried out by Aschoff S. (1818), who names crocin as the substance that provides the colour.

3. Growing and production

The saffron plant is grown in areas of Spain where the temperatures range from 35 or 40 ° C in summer to –15 or –20 ° C in winter (absolute maximum and minimum). The plant bears these temperature changes well, although it is true that very low temperatures during critical periods of the plant's development may cause alterations in the corm.

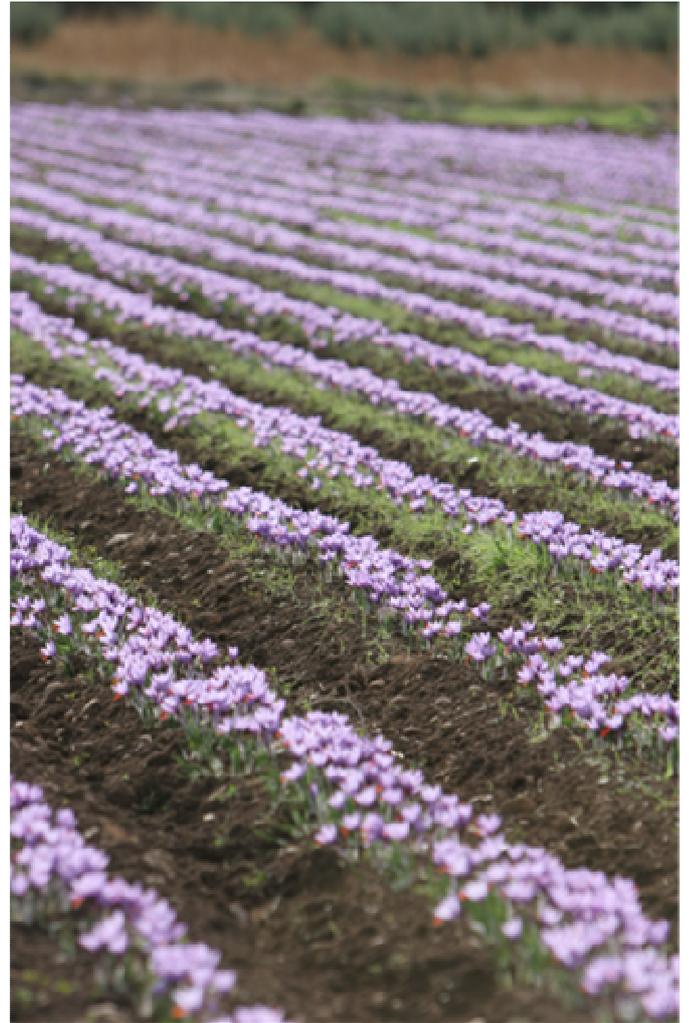
Saffron is also grown in many other countries, such as Greece, Italy, Morocco, Iran, India or New Zealand. In each country, depending on diverse factors such as the climate, the soil type, or the farming techniques, these characteristics vary.

The crop is not demanding with regard to soil as it prospers on different types of ground, the best being those of permeable average consistency. It grows well in clay-silex, calcareous silex, clayey-silex-ferruginous soil. It also prospers in sandy soil when fertilised with organic matter.

In Spain, the soil where the plant is grown must be deep, light and aerated. Saffron temporarily exhausts the ground for the same crop. The recommended saffron cropping cycle is 3 to 5 years maximum, depending on the density of the existing corms. Once that time has elapsed, the saffron field must be "uplifted" and left fallow for about 10 to 12 years before growing saffron again. The corms harvested must be carefully cleaned and stored at a temperature of 5° C and a relative humidity of 70 % or 80 %. These corms will be used for new crops.

Prior to planting the corms, the soil must be ploughed deep, down to about 50 cm, to aerate and avoid erosion of the ground. Corm planting is usually performed between May and June. Prior to this, it is recommendable to submit the bulbs to a disinfection treatment.

Saffron has traditionally been planted on fresh dry lands, in spite of which it is recommendable to



Photograph 3. Saffron field grown by Safinter, in la Mancha Oct. 2006© Safinter, S.A

irrigate the soil there it is planted. There are two seasons when irrigation is limiting, when sprouting begins (end of September – October) and in Spring when the corms propagate.

Afterward, during the month of September, a surface tilling between the furrows must be performed in order to break up the surface crust that forms at the end of summer.

In October, approximately between the 10th and 25th, the plants begin to flower. The most intense flowering days are commonly known as the "blanket days" and these last for two to six days, although the full flowering period may last about 3 weeks. The flowers that have appeared during the previous night must be collected daily. It is recommendable to begin the task at dawn, when the flower is still closed, safeguarding the



Photograph 4. Saffron “Monda” (stripping) in La Mancha © Safinter, S.A.

properties of the saffron and thus increasing the quality of the end product.

The flower must be picked under the insertion point of the stigma. Once the flowers are picked, they are placed in esparto grass baskets and transferred to the warehouse where they will be deposited in not very thick layers on sacks, canvas or directly on the floor. Having reached that point, the manual removal of the stigma from the rest of the flower, known as “stripping”, is performed. The stigma must not be cut either too high, as the threads would be separated, nor too low, because the yellow coloured style would remain attached to them and would diminish its quality.

The stigma drying or “toasting” process is the last one performed by the farmer and it must be done carefully on a daily basis, at not too high temperatures (60°C), as the threads would be burned otherwise. Once they are dried, the threads lose weight (80%) and size to about 2 cm long, taking on an opaque dark red colour. Only one kg of “toasted” saffron is obtained from five kilos of fresh saffron.

4. Main Components

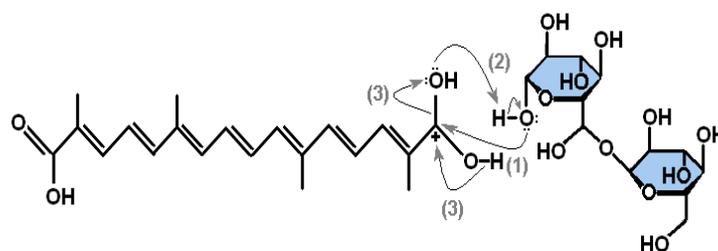
Saffron contains hundreds of components, some of which are volatile, and other active principles that provide its properties as a product. The main component is a carotenoid called α -crocin (approximately 10%) which is responsible for the yellowy-orange colour. Its main feature is that it is hydrophilous, which distinguishes it from other fat-soluble carotenoids such as capsaicin, and its

oft mentioned pigmentation properties.

Picrocrocin, is a bitter glucoside responsible for the bitter taste of saffron, that may make up to 4% of the dried saffron mass.

Safranal is a volatile compound that is formed in the drying process, due to the action of enzymes and heat. This compound adds up to approximately 70 % of volatile fraction.

After seeing the active principles of saffron, one must emphasise that their degradation, mainly, arises in the crocin and picrocrocin. This degradation is accelerated by the presence of light, high temperatures and oxidating agents. As that oxidation takes place, the content of these substances in the saffron decreases and it thus affects their properties.



Photograph 5. Formation of Crocin

5. Quality and standardisation

Since 1980, there has been a quality standard for saffron, ISO/TS 3632, to classify the product and provide information to industrialists and consumers. That ISO standard was developed with collaboration by the company Safinter, S.A. and shows the commitment to quality the company has always had.

Standard ISO/TS 3632 was updated in 2003, giving rise to the present standard for the quality of the product. This standard is applicable to the 2 types of saffron it trades, filament saffron and ground or powder saffron.

The standard classifies the saffron in 3 categories, mainly based on the physical-chemical characteristics that are shown in the table n.1.

In addition to classifying the saffron in these 3 categories, the standard also specifies the

Characteristics	Specification			Test Method
	I	II	III	
Moisture and volatile matter content (mass fraction), (% max.) Saffron in filaments Saffron in powder	12 10	12 10	12 10	ISO/TS 3632-2:2003, Clause 7
Total ash (mass), as dry matter, (% max.)	8	8	8	ISO 928:1997. Clause 8, and ISO/TS 3632-2:2003, Clause 12
Acid-insoluble ash (mass fraction), %, as dry matter, max.	1,0	1,0	1,5	ISO 930:1997. Clause 7, and ISO/TS 3632-2:2003, Clause 13
Soluble extract in cold water (mass fraction), as dry matter, max.	65	65	65	ISO 941:1980, Clause 7
1% E 1cm 257nm, on dry basis min: (at this wavelength it has the maximum absorbance of pricocrocine)	70	55	40	ISO/TS 3632-2:2003, Clause 14
1% E 1cm 330nm, on dry basis: min. max. (at this wavelength it has the maximum absorbance of safranal)	20 50	20 50	20 50	ISO/TS 3632-2:2003, Clause 14
1% Colouring strength, E 1cm 440nm, on dry basis. (at this wavelength it has the maximum absorbance of crocines)	190	150	100	ISO/TS 3632-2:2003, Clause 14
Artificial water-soluble acid colorants	Absent	Absent	Absent	ISO/TS 3632-2:2003, Clause 16 and/or Clause 17

Table 1. ISO 3632 “Saffron” Standard Specification

characteristics of how the packaging and labelling of the product must be performed.

Since 1993, the company Safinter S.A. has labelled all its products by category according to this standard. This is the best way to make the specification known and inform distributors and end users.

6. Saffron Uses

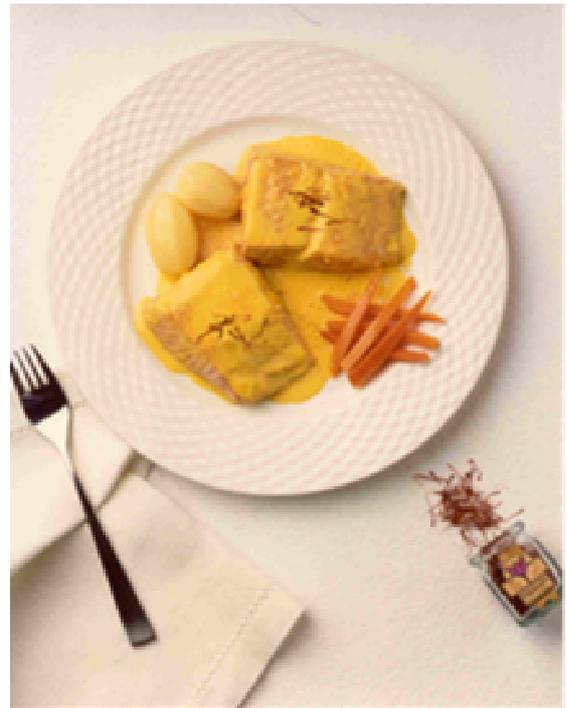
Saffron is the most famous spice and the most valued of all. It has multiple uses worldwide and we have references to it dating back to the Mesopotamian era. It is used and has been used as a culinary spice, colouring and also as a natural medicine. The most outstanding uses of this spice are:

Culinary

Saffron is a hydrosoluble condiment, that is, it dissolves in water, broth and milk. This property is basic to know its possibilities for cooking. In India, saffron is used to prepare spice mixes such as *Garam Masala*, ice cream such as *Kulfi* using pistachio, cardamom and saffron, and in general, for chicken dishes such as *Biriani gosh*, and it is highly appreciated in the rice dish called *Pulao*, based on spices and saffron. It is also used a lot on the Asian continent dissolved in milk and as a colouring for dairy products and to enhance flavour.

A starter called *Shollehzard* is made in the Middle East, from rice pudding made with saffron. It is often used with rice; in Afghanistan, a well known dish is *Qabali*, and in Iran *Adas Polow*. In Iran deserts are also made with olive oil and saffron and even coffee is added. The Arab countries in the Gulf also welcome visitors with coffee mixed with saffron and cardamom. It is also dissolved in tea and saffron syrup may be prepared at home.

In Europe, it is used in a large variety of dishes. In the United Kingdom, it is mainly used to prepare leak, fish or vegetable soups with saffron. It is also used to make cakes and ice cream. Saffron cakes are also typical in Sweden. Use of the spice in Mediterranean cuisine is highly varied, notably with rice: *Paella Valenciana* in Spain, or *Risotto a la Milanese* in Italy, but also in fish dishes, such as the famous French *Boulliabaise*, or the traditional *Zarzuela de*



Photograph 6. Salmon with saffron © Safinter, S.A

Pescado, a Spanish fish and seafood assortment. In fact, it is used in all kinds of dishes in Spain: meat dishes (*Stewed partridge*) or starters (*Chick peas with saffron*).

Saffron has become very widespread as a condiment and is used in modern cuisine to prepare rice, mixed with hot milk, with pasta, with deserts, in beverages, in fish dishes and in many vegetarian dishes. The food industry also uses it in many products.

Medicinal

There is a medical papyrus dating from Ancient Egypt that describes the medicinal properties of saffron in kidney ailments. In Ancient Greece, such doctors as Dioscorides, Hippocrates or Galen attribute medicinal properties to saffron, such as stimulating the appetite, being a remedy for stomach problems, calming infant teething pain, or a remedy for coughs and bronchitis.

It is also often mentioned in the Pharmacopoeias of Renaissance Europe, which were collections of Renaissance prescriptions of curative products; and it was also used to regulate menstruation, for rejuvenation, as an antidepressive, as an aphrodisiac or against headache.

Saffron is considered an astringent, that is, it astringes or restricts the intestinal processes; it is a diuretic, calms the stomach and is a stimulant. It is used for a multitude of conditions such as fevers, loss of appetite, asthma, infections of the respiratory tracts, diarrhoea, dysentery, epilepsy or dyspepsia.

It has been scientifically proven to be anti-tumour. Its anticarcinogenic effects on the stomach and also on the skin and papillomas have also been studied.

Even nowadays, it is used in some places as a home remedy against headache, neuralgic pain, bruises and open wounds, stomach pain or cough, applied externally as a paste.

There is a branch of natural medicine in India called Ayurveda, that uses saffron. One of the products that it uses is made using saffron and applied to combat hair loss.

Cosmetic

In olden days, saffron mixed with liquids was used as a cosmetic by aristocratic women. Saffron based face masks were used for spots and eruptions. It was not only used to soften the skin, but also as makeup. Nowadays, saffron use in the cosmetics industry is widespread and is present in numerous formulations, although it is not known to the public at large.

Perfume

Saffron is also used as an ingredient in many internationally famed perfumes. Due to its relaxing properties and as a cure for headache, a blend of saffron and sandal is prepared in the Middle East. It was the Romans who used it as a perfume for the first time.

Gift

In many cultures, saffron is considered a luxury product, which is highly valued, which is why it is used as a wedding present, for religious celebrations, parties and other commitments such as Christmas, Ramadan or Diwali.

Tobacco

It has been used mixed with tobacco for hundreds

of years to enhance and provide flavour and there is a saffron aroma tobacco in India called "Zaafрани Zarda".

Dye

In the times of the Phoenicians and Carthaginians, it was used to dye brides' veils. Buddhist monks use it to dye their robes. It is used to paint the bridegroom during wedding ceremonies in India. It is used to paint kimonos in Japan and to dye wool by the Irish. It is also used as a pigment in artistic painting as a pigment. There is a product called safranin in biology that is used in tinctures and is originally obtained from saffron.

7. Adulteration and fraud

As we previously remarked, saffron is a product that has been adulterated throughout history due to its high commercial value. Many techniques have been used in time to stretch the product further, such as to sell less amount than declared on the package, to add external substances to increase the weight (load) and to increase the humidity, among others.

In 2002, Safinter S.A. drafted a bibliographic study of saffron adulterations in history. This resulted in reference to more than 120 substances used at some time in history to forge or adulterate saffron. Imitations with organic substances (such as *Carthamus tinctorius* or *Caléndula officinalis*), with inorganic substances such as salts or sugar, and the use of artificial colourings to mask these are the most common substances described over the centuries. However, the addition of other parts of the Crocus flower, such as styles, stamen or dyed parts of the stalk are more usual, which we may find on any international market.

Due to this, we shall now try to provide some bases to be able to distinguish between the false or adulterated product and the genuine one.

a) Saffron should not be sticky or soft to the touch, and even more so when some months have elapsed from it being packed.

b) Whenever possible, the stigmas must be joined together by the style (except for *coupé* saffron: which is saffron cut at , about 10-15 mm to



Photograph 7. Saffron stigmas
© Safinter, S.A.

completely eliminate the style).

c) The part that joins the stigmas and which ends in a filament is called style. The style is yellowy white so, if it is red after the joint, it has been dyed. It is not recommendable to buy fully red saffron if it is not *coupé*.

d) The stigmas must have a length between 2 and 4 cm and the colour must be dark red.

e) If small pink stains, crystals or shiny material is found, it is an unmistakable sign that the product has been adulterated.

f) If the saffron tastes salty or sweet when tried, it has been adulterated.

g) If there are doubts concerning whether the product has been adulterated, or is completely false, one may proceed to submerge the filaments in cold water or milk and the dye colour will be quickly released. Genuine saffron will only colour water or milk when these are hot and after a few minutes. Unfortunately, this method will only detect "bad" falsifications or adulterations.

h) When buying saffron, it is difficult to check whether it is genuine simply by looking, so we recommend always buying recognised brands, and even more so in the case of ground saffron. One must remember that it is not possible to buy cheap saffron, so if it is acquired at a low price, there will be some kind of problem.

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