A strong and haunting aroma, a characteristic bittersweet taste, saffron bestows a golden hue to all the dishes it graces. A high value and low volume cash crop, and highly labour intensive, saffron is one of the world’s most expensive spices. It is used mainly as a source of secondary metabolites which have incredible aromatic, medicinal and therapeutic values.

The name saffron is derived from the Arabic word Zaffran, which means yellow. Saffron is called Kesar in Punjabi, Kum kum, Keshara and Arsika in Sanskrit, Zaffran in Hindi, Urdu, Arabic, Persian, and Koung in Kashmiri. Cultivation of saffron dates back to 550 A.D.

The saffron crop was first cultivated in Greece. Today, it is cultivated from the eastern Mediterranean to India. The saffron growing areas are located at an altitude of 1600-2100 metres above the sea level. The largest producers of saffron include Iran, Spain and India, which together account for more than 95% of the world production. France, Italy, Greece, Turkey, Azerbaijan and Morocco are the other producers of saffron. In India, about thousands of hectares of land are under cultivation in Kashmir and Himachal Pradesh. India produces about 10% of the world’s supply of saffron.

Kashmir has the proud privilege of being one of the few places in the world where saffron is grown. Pampore, located about 13 kilometres from Srinagar, is a place where this high-priced crop is grown on the elevated (karewa) topography. The karewa soils are brown to yellowish brown and slightly alkaline in nature. Kashmiri saffron is considered the best in the world due to its distinctive long silky threads with a dark red colour and thicker heads, pleasant aroma, powerful colouring and flavouring qualities.

Saffron consists of the dried stigmas and tops of the styles of the flower of the plant *Crocus sativus*, which belongs to the Iridaceae family. Pure saffron consists of only the orange-red stigmas of the saffron plant. Although the yellow stamens are also harvested, they do not have the same aromatic odour and colour properties compared to stigmas. Saffron stigmas should be red with orange tips. Threads that lack orange tips may be dyed, hence should be avoided.

Saffron stigmas are available in two forms: unprocessed stigmas and powdered form. There are three grades of saffron available in the Indian market: Saffron Lachha, Saffron Mongra and Saffron Zarda. There are three grades of saffron classified based on colour, floral waste content and foreign matter:

- Special (Moongra)
- Standard (Lacha), and
- Grade standard (Guchi)

The Lacha saffron yields Moongra when style position is removed from it through sieving. Guchi grade (stigma and style) is prepared mainly at the time of trimming of flowers. Each Guchi is made from 120-150 flowers fetching a very good price. The price of saffron is generally decided by the physical appearance of the product, colour and percentage of floral wastes and foreign matter.

### Grades of Commercial Saffron as per ISI Standards

<table>
<thead>
<tr>
<th>Commercial grade</th>
<th>ISI grade</th>
<th>Color</th>
<th>Floral wastage %</th>
<th>Foreign matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mongra</td>
<td>Special</td>
<td>Deep red</td>
<td>5.0 (50g/Kg)</td>
<td>0.5 (5g/Kg)</td>
</tr>
<tr>
<td>Lacha</td>
<td>Standard</td>
<td>Light reddish</td>
<td>10.0 (100g/Kg)</td>
<td>1.0 (10g/Kg)</td>
</tr>
<tr>
<td>Guchi</td>
<td>Grade standard</td>
<td>Bright red</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Cultivation and Collection of Saffron

Saffron is mainly a rain-fed crop requiring cool and sunny climate and flourishes best at an altitude of 2140 metres in slightly alkaline soils. Saffron cultivation requires loose, friable, low density, well watered and well drained clay calcareous soils with high organic content.

Saffron is a perennial herb with corm. A corm survives for one season, producing through this vegetative division up to ten cormlets that can grow into new plants in the next season. Each saffron corm bears up to four flowers which are purple in colour. Each flower grows to a height of 8-12 inches with three stigmas and two styles/stamens.

The first flowering takes place in October or November of the following year. About 100-150 millimeters of rainfall is essential for the growth of the plant during pre-flowering stage. The number of saffron flowers and the time of blooming in any year is dependent upon the temperature prevalent in spring and autumn and upon the amount of rainfall.

The flowers are gathered in the early morning, placed in baskets or hampers and conveyed to the picking house. The picker takes each flower in the left hand and breaks the style just below the stigmas with the nail of the right thumb. The detached stigmas are dried by artificial heat, usually charcoal stores, placed in hair sieves and after about 30-45 minutes the cooled and stored.

Proper drying of saffron is essential to maintain appropriate concentration of its various constituents. Traditional sun drying may take longer time due to the low temperature prevailing during the autumn which results in quality deterioration as well as contamination by insects and pathogens. Therefore, solar hot air dryers have been devised with the help of which saffron drying has become possible in 4-6 hours without bringing any change in pigment concentration. Low cost saffron driers have also been developed for farmers. It has shown excellent results by drying the saffron in just 3-4 hours and maintaining the crocin content up to 13.5%.

Dry saffron is highly sensitive to fluctuating pH levels, and rapidly breaks down chemically in the presence of light and oxidizing agents. It must be, therefore, stored away from light and oxygen in air tight containers in a cool and dry place. Saffron is somewhat resistant to heat.

Chemical Constituents

Saffron contains more than 150 volatile and aroma producing compounds mainly terpenes, terpene alcohols and esters. It also contains many non-volatile compounds most of which are carotenoids (tetra terpenes) including Zeaxanthin, Lycopene, and various alpha and beta carotenes.

There are specific laboratory tests to distinguish fake saffron from the real including chromatographic methods, chemical tests, colour change reaction tests, microscopic evaluation tests, etc.

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>14.5-15.5</td>
</tr>
<tr>
<td>Protein</td>
<td>12.5-13.5</td>
</tr>
<tr>
<td>Total Nitrogen free extract</td>
<td>54.5-57.5</td>
</tr>
<tr>
<td>Essential oils</td>
<td>4.7-8.5</td>
</tr>
<tr>
<td>Ash</td>
<td>4.0-4.5</td>
</tr>
<tr>
<td>Potassium, Phosphorous and Boron</td>
<td>In traces</td>
</tr>
</tbody>
</table>

The commercial saffron contains the constituents as shown above.

According to the Laboratory of Experimental Oncology, National Institute of Pediatrics, Mexico City, saffron extract itself as well as its main constituents such as carotenoids possess chemopreventive properties. Crocetin affects the growth of cancer cells by inhibiting nucleic acid synthesis, enhancing antioxidative system, including apoptosis and hindering growth factor signaling pathways.

The aqueous extract of saffron has been found to have hypotensive properties which appear to be due to the actions of two of its major constituents — Crocin and Safranal. Of these two, Safranal is considered more potent than Crocin for lowering blood pressure. Saffron aqueous extract and Safranal also have hypolipaemic, anxiolytic, hypnotic and anti-depressant properties.
Features Article

Uses of Saffron

- Colouring and flavoring agent in foods like biryanis, Indian sweets such as kheer, rasmalai, lassi, and makhanina lassi. Ingredient of kaesar pulao, kaesar kulfi and kaesar paeda.
- Antispasmodic, emmenagogue and stimulant.
- Has powerful antioxidant constituents and hence possesses anti-cancer, anti-arthritic, anti-hypertensive properties.
- Improves digestion and appetite, provides relief from gas and acidity problems.
- Treats cough, insomnia, skin-related problems like dry skin.
- Enhances and lightens the skin tone.
- Purifies blood and improves circulation especially to the organs of digestion.
- Possesses insecticidal and pesticidal properties (picro-crocin).
- Volatile or essential oil of saffron is used in the treatment of enlarged liver and spleen, fevers, catarrh, melancholia and depression.
- Used in perfumes and dyes.
- Additive in culinary, bakery, for making saffron cakes and confectionery preparations.
- Acts as a strengthening agent for the heart and a cooling agent for the brain.
- In Ayurveda, Unani, Chinese and Tibetan medicine, it is popularly known as stimulant, warm and dry in action, and helps in urinary, digestive and uterine troubles.
- In Ayurveda, it is used to treat cold and cough, acne and several skin diseases and certain chronic diseases such as asthma and arthritis.

Sporious versus Genuine Saffron?

Saffron is the most expensive spice in the world, and its high price of ten leads to its adulteration. Different materials used as adulterants include floral parts of saffron other than stigma, which are mixed with genuine materials as such or after being dyed. Examples of these include corn silk, fibres of shredded meat dyed with saffron water, fibrous roots of various grasses, coloured nylon fibre, florets of marigold and slender roots of willow. Besides, fats, oils, and glycerine are also sometimes used to increase the weight.

There are specific laboratory tests also to distinguish fake saffron from the real including chromatographic methods, chemical tests, colour change reaction tests, microscopic evaluation tests, etc. When we add a drop of sulphuric acid to dry stigma, it turns blue in colour, gradually changing to purple, and finally purplish red.

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