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SAFFRON CROCIN

(Crocus sativus)



PREFACE

The saffron (*Crocus sativus*) cultivation in Iran is related to more than 3000 years ago and is known as red gold. Iran produces approximately 90% of the world production of saffron. This medicinal plant is perennial, colorful, and expensive.



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The global saffron market size is expected to reach USD 1.6 billion by 2027, registering a revenue-based CAGR of 7.3% over the forecast period. The growing food industry, improved standard of living, and increasing consumer disposable income are likely to trigger the demand for saffron products over the coming years. It is majorly used in the food industry to add flavor, aroma, and color to the food products. Expansion of healthcare sector is anticipated to remain a driving force for the market over the forecast period.

Saffron has crocin and safranal that are known to cure various types of diseases. It is used in several herbal and pharmaceutical drugs owing to rising awareness among consumers regarding health benefits of saffron.



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Each 100 kg of saffron flowers (200 to 300 thousand flowers) is included 5 kg of fresh saffron stigma or 1 kg dry stigma.



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SaffexCrocin is produced in Iran using highest techniques among extraction methods and standardized by Crocin.

SaffexCrocin: Each 1 kg is obtained from 5 kg pure and dried saffron

SaffexCrocin is used for food, cosmetic, and drug.

SaffexCrocin is benefit for:
Anxiety, Mental health, Cognitive memory, Eye health, Rejuvenation of skin, and etc.

SaffexCrocin Advantage ; The active compounds are extracted from pure saffron without an additives.

Common Dosage: 30 mg/day



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Saffron extract powder

Ingredients: 100% Standardized Saffron Extract

Identity: Crocin 40-60 %

Moisture: <7.0% max

Solubility: Soluble in water and ethanol

Production: 20 Kilogram Per Month

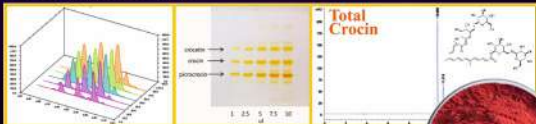
Microbial and heavy metal analysis:

Pesticide Evaluation: Absent

Heavy metals: <5mg/kg (As, Hg, Pb, Cd)

Yeast and Mold: Max 100 cfu/g

Bacteria: Max 100 cfu/g



HPTLC and HPLC chromatograms of SaffexCrocin extract.



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Storage Conditions & shelf life:

- Recommended storage temperature 2-8° C.
- Moisture sensitive, light sensitive.
- Shelf life is two years in good conditions.



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Here there are some of the benefits of "saffron extract" over the "saffron powder"

One of the main points of the difference between saffron and saffron extract is due to the presence of moisture in the stigmas of saffron that most likely absorb the fungal agents such as *Aspergillus*, producing aflatoxin. Thus, the saffron with poor kept and stored in poor conditions, cannot be sold in developed countries such as the US and Europe.



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next point is that saffron tends to darken when stored in bulks of kilograms, and finally, in the course of time, it will lose the active compound, meaning losing the quality.

in order to extract saffron's active components by traditional and common methods, a great amount of solvent and various equipment are needed, however the efficiency is low and it is costly.



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In common method, 200 liters of solvent are needed for extraction of only one kilogram of saffron; therefore, on one hand, the cost and time of extraction increase and on the other hand, complete solvent drainage does not happen affecting the product. Subsequently, the final product lacks the sufficient purity and quality to be used in pharmaceutical and cosmetic fields.



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- Finally, due to the insolubility in low density of crocin in saffron powder, saffron extracting is a must, which leads to enrichment and condensing the active components. This helps to have a product with higher amount of crocin.



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We implemented a new protocol, which made us capable of optimizing the saffron extraction, and now we have an end product with the following characteristics;

- Extremely high quality and pure extract.
- Absence of any toxic compounds such as aflatoxin
- Long period of storage without special requirements or any added preservatives.



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- Reduction in the volume of saffron stigma exportation but increase in the added value.
- Directly usable in the food industry with the highest quality in terms of colour, flavor, and aroma with no time wasted on processing and preparation.



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Material Safety Data Sheet (MSDS)



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SECTION 1

CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identification

Product Name: SaffexCrocin (80 % ethanol v/v)

Botanical source: *Crocus sativus* L.

Relevant identified uses and non-recommended uses

Possible constituent of

- Aromas and Colorants
- Food and food supplements
- Pharmaceutical products
- Cosmetics

Non-recommended use:

None known



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SECTION 2

HAZARDS IDENTIFICATION SUMMARY

Classification (substance or mixture)

Directive 1272/2008/EC

Not classified as a dangerous good

Pictograms according to Directive 1272/2008/EC

No pictogram applicable.

Precautionary Statements:

Avoid contact with eyes, skin or clothes

Do not eat, drink or smoke when using this product

Wear protective gloves, protective clothing and eye protection while handling

If in the eyes, rinse cautiously with water for several minutes.

Remove contact lenses if present and easy to do. Continue rinsing.

Get medical attention if you feel unwell.

If on skin: Wash with plenty of soap and water.

Store in a dry place. Store in a closed container.

Protect from sunlight.



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SECTION 3

COMPOSITION, INFORMATION OF INGREDIENTS

Chemical characterization:

• Description:

Saffron dry extract with 40-60 % Crocin

Chemical characterization: Herbal extract, minimum content
40% Crocin

Excipients: Maltodextrin



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SECTION 4 FIRST AID MEASURES

Description of first-aid measures

General advice:

Remove contaminated clothing. Consult your physician in case of impaired health

After Inhalation:

Remove to fresh air. Get medical attention if irritation occurs.

After Skin contact:

Rinse with water. Get medical attention if irritation develops.

After Eye contact:

Check for and remove contact lenses. Flush eyes with plenty of water for at least 15 minutes.

Get medical attention if irritation occurs.



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SECTION 4 FIRST AID MEASURES

Ingestion:

Rinse mouth with water. Do not induce vomiting unless directed to do so by medical personnel. If symptoms of toxicity occur, call a physician. Most important acute or delayed symptoms or effects None known.

Indication of any immediate medical attention and special treatment needed None known.



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SECTION 5 FIRE FIGHTING MEASURES

- Extinguishing media
- Suitable extinguishing agents:
Foam, CO2, powder.
- Special hazards arising from the substance or mixture:
None known.
- Advice for firefighters:
Do not use water jet.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Accidental release of dusts and vapours which are damaging to health can be ruled out.

- Personal precautions, protective equipment and emergency procedures
Avoid contact with eyes and skin.



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Protective equipment for fire-fighters: See Section 8.

- Environmental precautions:

Dilute with water. No environmental risks are known. The product is fully biodegradable.

- Methods and material for containment and cleaning up:
In case of spills use conventional cleaning. Finish cleaning surfaces with water.

- Reference to other sections

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.



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SECTION 7 HANDLING AND STORAGE

Handling:

- Precautions for safe handling:

Keep away from heat.

Do not eat, drink or smoke during handling.

- Information about protection against explosions and fires:

No particular measures are required in the provided form.

- Conditions for safe storage, including any incompatibilities

- Storage:

Store in the original container. Keep container tightly closed.

Store at room temperature in a well-ventilated area with protection from light.

Avoid significant temperature variations in the storage area.

Recommended storage temperature: Ambient temperature.

Do not re-use the empty containers.

Specific end uses

As an ingredient for pharmaceutical, food or cosmetic products.



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SECTION 8

EXPOSURE CONTROLS, PERSONAL PROTECTION

Parameters for monitoring

None known. No limit concentrations for exposure have been defined.

Limitation and monitoring of exposure / Personal protective equipment

Technical protective measures:

Handle in a well-ventilated area.

Personal protective equipment:

Ocular protection: Wear standard laboratory safety glasses.

Skin protection: Wear standard lab coat and approved gloves.

In case of spills remove contaminated clothing.



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PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state and appearance: Dry powder.

Odour: Spicy, woody, typical of saffron



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Colour: Brightly orange

pH-value: 6.5-7.5

Solubility: Fully soluble in water and ethanol-water mixtures.

Data relevant for safety:

Danger of explosion: The product is not explosive. Powders of organic substances can form explosive mixtures with air.

No known risk of explosion in the presence of mechanical impact.

No known risk of explosion in the presence of static discharge.

Ignition point: Not available.

Auto-ignition temperature: Not available.

Flash-point: Not available.

Melting point: Not applicable.

Boiling point: Not applicable.

Relative density: Not available.

Vapour pressure: Not applicable

Volatility: Not available

Solubility in / Miscibility with Water: Soluble.

Other indications

No other data on physical/chemical stability are available.



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SECTION 10 STABILITY AND REACTIVITY

Reactivity

Incompatibilities with container materials or other substances have not been observed. The product is non-corrosive.

Chemical stability

Under usual storage conditions the product is expected to be stable for at least 18 months starting from delivery.

Possibility of dangerous reactions

No dangerous reactions are to be expected upon intended use.

Conditions to be avoided

None known.

Incompatible materials

None known.

Dangerous degradation products

None known.



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SECTION 11 TOXICOLOGICAL INFORMATION

- Information on toxicological effects
- Acute toxicity:

It has been shown that toxicological data on saffron safety is not uniform. Findings exhibited that LD50 values of saffron stigma and petal extracts were 1.6 and 6 g/kg, respectively in mice after IP exposure. The LD50 value of saffron was 4120+556 mg/kg after oral administration in BALB/c mice. It has been found that oral administration of 3 g/kg crocin within 2 days in mice did not cause mortality. A similar result was observed after IP exposure at same dose. Crocin administration (IP) at 0.5, 1, 1.5, 2 and 3 g/kg did not induce any mortality after 24 and 48 hr. It can be concluded that crocin is a practically low-toxic



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SECTION 12 ECOLOGICAL INFORMATION

- Toxicity
- Aquatic toxicity: No further relevant information available.
- Persistence and degradability: The product is fully biodegradable.
- Behavior in environmental systems:
- Bioaccumulative potential No further relevant information available.
- Mobility in soil: No further relevant information available.
- Additional ecological information:
- General notes: No information is available on ecotoxic effects or biodegradation products. With regular handling no ecotoxic risk is to be expected.
- Results of PBT and vPVB assessment
- PBT: Not applicable.
- VPVB: Not applicable.
- Other adverse effects: Not applicable.



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SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

- Recommendation: Observe official regulations.
- Uncleaned packagings: Not applicable.

Attention:

Empty storage containers can be cleaned with water. Waste and containers must be disposed of in accordance with regulations for household waste. For residual quantities of the product destruction by incineration is recommended.



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SECTION 14

TRANSPORT INFORMATION

UN-Number

Not classified: not a dangerous good

Regular UN shipping label

ADR (Street)/RID (Railway): no restriction

IMDG-Code (Maritime transport): No restriction

ICAO-TI / IATA-DGR (Air freight): no restriction

Transport hazard class

ADR/ RID /IMDG-Code / ICAO-TI/IATA-DGR

Class 3

Packaging class

III (Substances with minor hazard

Environmental risk

Labelling of substances with environmental hazards

ADR / RID / IMDG-Code: no

ICAO-TI / IATA-DGR: no

Specific precautions for users



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See sections 6-8.

Mass transport according to Annex II of the MARPOL agreement 73/78 and according to IBC code

Shipment is exclusively made in individual containers suitable and admissible for transport.

SECTION 15

REGULATORY INFORMATION

- Safety, health and environmental regulations/legislation specific for the substance or mixture
- Sara
- Section 355 (extremely hazardous substances):
None of the ingredient is listed.
- Section 313 (Specific toxic chemical listings):



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Not applicable

• TSCA (Toxic Substances Control Act):

Not applicable

• Hazardous Air Pollutants

Not applicable

• Proposition 65

• Chemicals known to cause cancer:

Not applicable

• Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed.

• Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed.

• Chemicals known to cause developmental toxicity:

None of the ingredients is listed.

• TV (Threshold Limit Value established by ACGIH)

None of the ingredients is listed.

• NIOSH-Ca (National Institute for Occupational Safety and Health)

None of the ingredients is listed.



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- National regulations:
- Information about limitation of use:
Employment restrictions concerning pregnant and lactating women must be observed.
If people have a medical condition (esp. bleeding disorder) or take medications, please consult with your doctor before use.
- Technical instructions (air): The emission values and limitations must be observed!
- Water hazard class:
WGK1 (weak hazard; self-assessment)
- Other regulations, limitations and prohibitive regulations e.g.
Protective measures according to TRGS 500
Storage class according to TRGS 510: No restrictions
- Chemical safety assessment:
The product has not been subject of a safety assessment.



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SECTION 16 OTHER INFORMATION

This information is based on our present knowledge and we tried to be correct and accurate in the presentation of our information. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship. We make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

Data of preparation/last revision: December, 2021



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CERTIFICATE

Saffron Extract Analysis



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Saffron extract powder:

Ingredients: 100% Standardized Saffron Extract

Identity: Crocins 40-60 %

Moisture: <7.0% max

Solubility: Soluble in water and ethanol

Production: 20 Kilogram Per Month



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HPLC-DAD analysis:

We analyzed saffron extracts using a high-performance liquid chromatography with diode array detection (HPLC-DAD) method and evaluate the quality of saffron extract according to crocetin esters by preparing an aqueous extract according to the ISO 3632 standard. Two main compounds of crocetin esters are included trans-crocetin di(β -d-gentiobiosyl) ester (trans-4-GG) and trans-crocetin (β -d-glucosyl)-(β -d-gentiobiosyl) ester (trans-3-Gg) as standards.



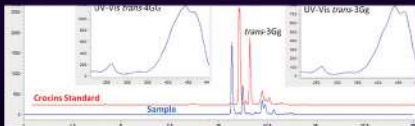
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Method:

A total of 20 μL of each sample (saffron aqueous extracts) were injected into an Agilent 1200 HPLC chromatograph using C18 column (5 μm , 250 x 4.6 mm), that was equilibrated at 30 $^{\circ}\text{C}$. The separation of main compounds was achieved by binary gradient elution using water and acetonitrile. The DAD detector was at 440 nm for crocetin ester detection.



Chromatogram of Saffron extract (440nm)



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