

## Extraction and Evaluation of Saffron Oleoresin

Qadir Rajabzadeh<sup>1</sup>, Reza Malekzadeh<sup>1</sup> and Ali Sharif<sup>2</sup>

<sup>1</sup>Khorasan Science and Technology Park (KSTP), Mashad, POB: 91735-139

<sup>2</sup>Ferdowsi University of Mashad, Mashad  
Iran

**Keywords:** analytical evaluation, *Crocus sativus* L., solvent extraction

### Abstract

Oleoresin of saffron obtained from stigmas of *Crocus sativus* L., extracted with different solvents, i.e. methanol, ethanol, propanol, acetone, ethyl acetate and petroleum ether. The variables studied were nature of extracting solvent, extraction temperature, extraction yield, solvent stripping. The quality of oleoresin extract was evaluated using high performance liquid chromatographic and spectrophotometric methods.

This study attempts to get the best condition for the extraction process that gives the best yield and quality of oleoresin from dried saffron.

### INTRODUCTION

Saffron, obtained from stigmas of *Crocus sativus* L. has been valued since antiquity for its flavor, aroma and the color. It is currently used as a source of food additive, colorant and as a component of traditional medicines.

Microbial and enzymatic contamination accompanied with spices, including saffron, could cause severe problems for final products that they are used. Food manufacturers, forced by the raising cost of raw materials and machinery, are compelling to examine their products and processes in term of quality to make them as official as possible. Although it is well known that essential oils can be used to replace most herbs and spices quite effectively, in terms of aroma, the oleoresin produces the subtle roundness of the natural flavor. In some foods, a mixture of the essential oils and oleoresin is necessary for product acceptance by the consumer. Consumption of spice oleoresin and essential oils is growing at an annual rate of 7% (Meer, 1995). Production and using oleoresin is an approach to improve productivity and quality control (Staniforth, 1973). Another advantageous of oleoresins such as stability, uniform standard flavor is reported in literature (Deline, 1985; Balakrishnan, 1991; Hainrihar, 1991; Griffin, 1992; Leissner, 1994).

This study seeks to determine the optimum operational extraction parameters and conditions such as extracting solvent and temperature for main principles of saffron.

### MATERIALS AND METHODS

#### Materials

Ground saffron sample was prepared in the Technopan Co. Ltd. (Mashad, Iran). The ground sample was of 400- 600 µm particles and 8% water content. All spectrophotometric and high performance liquid chromatographic (HPLC) grade and extracting organic solvents were from Sigma-Aldrich. The standard materials used for qualification and quantification was purchased from Fluka.

#### Methods

**1. Extraction Procedure.** Extraction of ground saffron with six solvents in a wide range of polarity including methanol, ethanol, propanol, acetone, ethyl acetate and petroleum ether was examined and compared in cold percolation and soxhlet condition.

For cold percolation 2.00 g. of saffron allowed to stand in 100 ml. of solvent with subtle agitation for a night. After that it was filtered and the mother liquor treated with Sodium carbonate and the solvent evaporated in reduced pressure. The remaining solvent

removed by blowing the Nitrogen through the viscose liquid and the residue subjected to spectrophotometric and chromatographic examination.

For soxhlete extraction 2.00 g. of the saffron soxhleted with 100 ml. of solvent for a night and the extract dried with sodium sulfate and desolvated as the same manner as mentioned above.

**2. UV.-Visible Spectrophotometric Analysis.** UV.Vis. Spectrophotometer was used to analyze the extracted main components of extracted oleoresin. This was accomplished on a Cecil 2021, 2000 Series Spectrophotometer.

**3. High Performance Liquid Chromatographic Analysis.** HPLC was used to analyze the extracted main components and support the results obtained by spectrophotometric method. This was achieved on a Lichrosphere C18 column (25 cm x 0.46 id). The chromatographic system used was a Cecil 1200 Series HPLC system. Gradient elution solvents were water- Acetonitril at a rate of 10 ml. min<sup>-1</sup>. Detector was based on UV detection.

## RESULTS AND DISCUSSION

Saffron oleoresin is a reddish brown semisolid. It is soluble in water as well as polar organic solvents such as alcohols.

The results of extraction studies using six different solvents for cold percolation are given in Table 1 and those of soxhlet conditions are given in Table 2. The results are according to ISO/ WD 3632- 2 (E). HPLC analysis of the samples supported the data obtained from UV/Vis spectrophotometric data, especially in the case of picrocrocin and safranal.

The efficiency of total extraction of the soxhlet and the cold percolation showed higher yield of the extraction in the soxhlet method. In the case of Acetone, it was found to be superior to Methanol in giving a higher yield of Picrocrocin in soxhlet condition. It can be seen that Methanol is more reliable for extraction of safranal and crocines, even though using higher temperature in soxhlet extraction causes lack of safranal in the final product.

Cold percolation method is a slow process with a slightly lower yield of extraction, but the safranal content of oleoresin remain more intact in this method. In the case of soxhlet extraction of the powdered saffron, it appeared that the solvent had not seeped well into the powder mass, possibly due to caking the powder. Thus while the particles in the periphery of the powder mass were well extracted, those in the middle were not fully extracted.

Since saffron oleoresin is free from bacteria and other microorganisms and it doesn't content moisture, it is believed that its shelf life is longer than that of saffron and it can be a good alternative for saffron.

## ACKNOWLEDGMENTS

The authors wish to thank the Technopan Co. Ltd. (Mashad, Iran), especially Mrs. Razzaghy, for her technical support.

## Literature Cited

- Balakrishnan, K.V. 1991. An insight into spice extractives. *Indian Spices* 28: 22-26.
- Deline, G.D. 1985. Modern spice alternatives. *Cereal Food World* 30: 697-700.
- Griffin, J. 1992. Spicing up food profits. *Food Ind.* 45: 3, 5, 7, 21.
- Hainrihar, G. 1991. Spice oleoresins: Production, benefits and application. *Int. Food Ing.* 4: 52-57.
- Leissner, O. 1994. A complete taste experience. *Livsmedelsteknik* 36: 14-16.
- Meer, G. 1995. Spice oleoresins contribute consistent flavour. *Food Technol. Eur.* 2: 56-58.
- Staniforth, V. 1973. Spices or oleoresins: A choice? *Trp. Prod. Inst. Conf. Papers* 193-197.

## Tables

Table 1.  $E_{1cm}^{1\%}$  of the main component of saffron oleoresin obtained from cold percolation.

Solvent \ Component	Picrocrocin (257 nm)	Safranal (330 nm)	Crocines (440 nm)
Acetone	213.5	-----	15.91
Methanol	97.2	-----	174.9
Ethanol	72.3	5.17	135.4
Propanol	49.73	21.91	85.45
Ethyl Acetate	29.66	-----	-----
Petroleum ether	-----	-----	2.15

Table 2.  $E_{1cm}^{1\%}$  of the main component of saffron oleoresin obtained from soxhlet method.

Solvent \ Component	Picrocrocin (257 nm)	Safranal (330 nm)	Crocines (440 nm)
Acetone	15.81	0.6	27.42
Methanol	64.55	28.3	191.6
Ethanol	40.32	14.42	121.8
Propanol	13.22	2.24	7.38
Ethyl Acetate	3.27	0.42	0.58
Petroleum ether	-----	0.154	0.188

## Figures

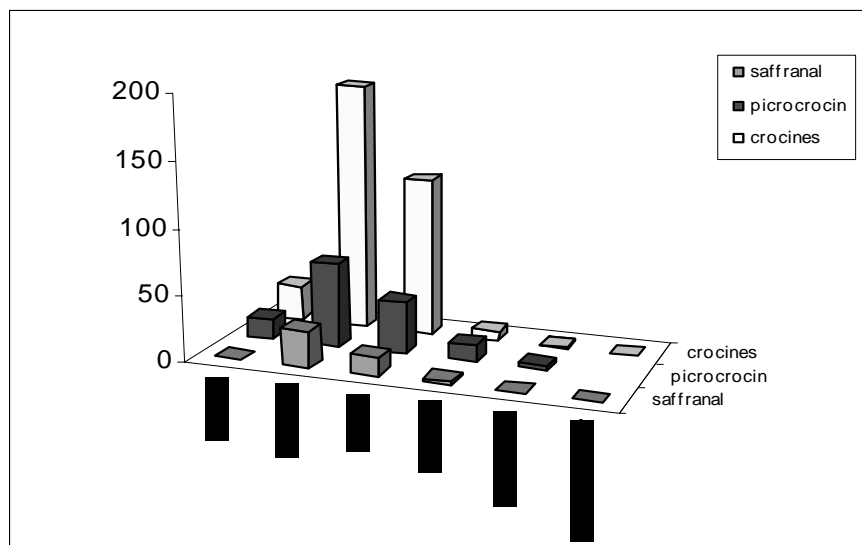


Fig. 1.  $E_{1cm}^{1\%}$  of the main component of saffron oleoresin obtained from cold percolation.

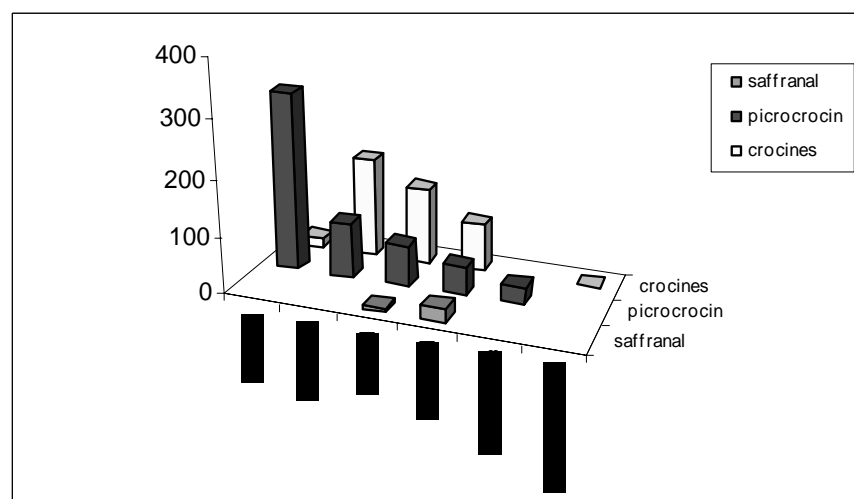


Fig. 2.  $E_{1cm}^{1\%}$  of the main component of saffron oleoresin obtained from soxhlet method.