

Saffron (*Crocus sativus* L.) production in the Italian alps: high quality production from family farm to family table

Giorgi A¹, Panseri S², Bertoni D³, Manzo A¹



¹ Centre for Applied Studies in the Sustainable Management and Protection of the Mountain Environment Ge.S.Di.Mont.-University of Milan, Via Morino 8, 25048 Edolo, Brescia, Italy

² Department of Veterinary Science and Public Health-University of Milan, Via Celoria 2, 20133 Milan, Italy

³ Department of Economics, Management and Quantitative Methods-University of Milan, Via Celoria 2, 20133 Milan, Italy

Introduction

Saffron is one of the most expensive food spices obtained from the flower stigmas of *Crocus sativus* L., a member of the Iridaceae family. For a long time, saffron cultivation was neglected by researchers and farmers since it was considered a minor crop. Only in the last few years has interest increased in using it as an alternative crop for the diversification of agricultural production and as an important new source of income, particularly for multifunctional family farms.

According to ISO 3632 1,2: 2010/2011, saffron can be classified into three categories of quality (I, II, III) depending on the concentration of the three main metabolites: Picrocrocin, Safranal and Crocin. This study represents the first investigation of the quality of saffron produced in the Central Italian Alps evaluated by spectrophotometric analysis. A preliminary assessment of the economic viability of high quality saffron production for local market was also performed.

Materials and Methods

Plant Materials and Extraction

The experiments were conducted on *Crocus sativus* stigmas produced in two consecutive years, 2012-2013 and 2013-2014, in different areas of the Central Italian Alps (Valle Camonica, Brescia; Val Trompia, Brescia; Valtellina, Sondrio)

Sample Code	Site	Sample Year	Altitude m a.s.l.
A	Edolo (BS), Valle Camonica	2012/2013	720
B	Vico (BS), Valle Camonica	2012/2013	950
C	Malonno (BS), Valle Camonica	2012/2013	1050
D	Bovegno loc. Zerma (BS), Val Trompia	2012/2013	1200
E	Mazzunno (BS), Valle Camonica	2013/2014	550
F	Ossimo (BS), Valle Camonica	2013/2014	850
G	Bovegno loc. Zerma (BS), Val Trompia	2013/2014	1200
H	Malonno (BS), Valle Camonica	2013/2014	1050
I	Vico (BS), Valle Camonica	2013/2014	950
L	Tresivio (SO), Valtellina	2013/2014	520
M	Castionetto di Chiuro (SO), Valtellina	2013/2014	389
N	Ponte in Valtellina (SO), Valtellina	2013/2014	486
O	Sondrio (SO), Valtellina	2013/2014	307



Spectrophotometric Analysis

The spectrophotometric analysis was conducted on powdered samples (Ratsch MM400: 30 Hz x 1 min). Aqueous extract was obtained following a step-by-step method according to ISO 3632 1,2: 2010/2011.

Picrocrocin, Safranal and Crocin were expressed as direct reading of the absorbance of 1% aqueous solution of powdered saffron at 257, 330 and 440 nm respectively.

$E^{1\%}_{1cm}$ 257 nm, $E^{1\%}_{1cm}$ 330 nm, $E^{1\%}_{1cm}$ 440 nm were calculated according to ISO 3632 1,2: 2010/2011.

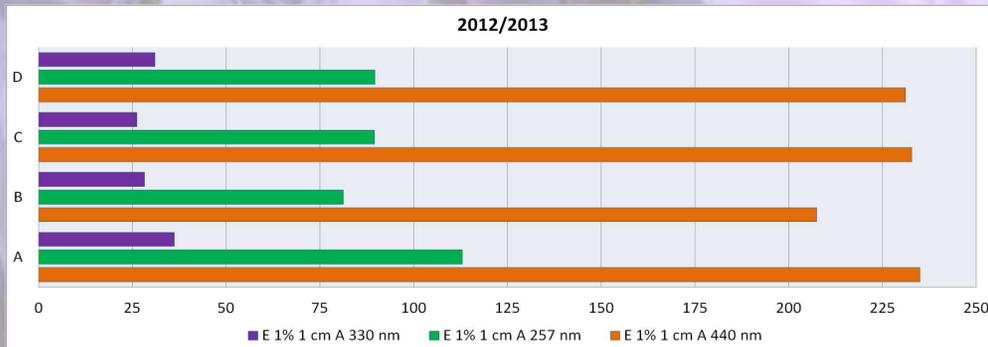


Preliminary Economic Analysis

In our work we performed a preliminary cost-benefit analysis of saffron cultivation in the Lombardy mountain area, collecting technical and economic data with a very detailed survey of ten producers located in the study area.

All technical and economical parameters used to perform the simulation represent the average value observed in the sample.

Results and Discussions



All saffron samples analyzed fulfilled the ISO specifications for category I regarding moisture and the main spectrophotometric characteristics. In particular 70, 20 and 200 representing the minimum value to be obtained the first category degree.

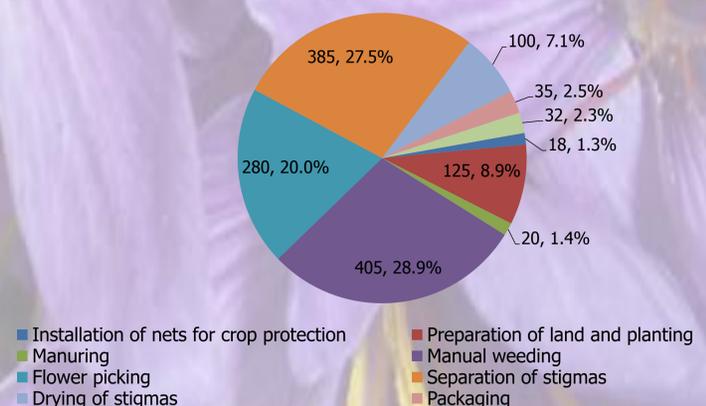
The different values found among the sites are normally due to the different environmental conditions and cultivation practices.

In our simulation we hypothesized a crop cycle of five years and a cultivated surface of 500 sqm. All farming operations (except for land preparation) were performed by means of family manual labor. The 5-years yield of dried saffron stigmas was evaluated at 700 grams per 500 sqm. The market price of saffron was quoted at 20 € per gram.

In the 5-years cycle the total revenue amounts at 23,500 € (40% from the corms), while the total operating income is 15,865 €. The family labour hour was remunerated 11.33 € of operating income.

A preliminary cost-benefit analysis of saffron cultivation in the Italian Alps (€/500sqm)							
Year	Total Output	Operating costs	Operating income	Cum. total output	Cum. operating costs	Cum. operating income	Work hours
1st	1,500	6,323	- 4,823	1,500	6,323	- 4,823	282
2nd	2,000	255	1,745	3,500	6,578	- 3,078	215
3rd	2,500	288	2,213	6,000	6,865	2,213	241
4th	4,000	385	3,615	10,000	7,250	5,828	315
5th	13,500	385	13,115	23,500	7,635	13,115	347
Total	23,500	7,635	15,865				1,400
Operating income per work hour (€/hour)							11.33

Work hours per farming operation (for all the cultivation cycle)



Conclusions

Our study shows that the analysis carried out have given some valid information about the quality of the saffron produced in the alpine areas. This high quality saffron production obviously cannot compete in the world market with saffron from low-cost manual labor-intensive countries, but should aim at a potential high quality niche market.

The preliminary economic analysis, performed in Lombardy mountain area, suggests that the cultivation of saffron represents a viable opportunity to diversify agricultural income in multifunctional farms in mountain areas.

References

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