Journal of Saffron Research (semi-annual)
Vol.10, No.2, Fall & winter, 2022-2023
p.245 - 257
http://dx.doi.org/10.22077/JSR.2022.5151.1180

University of Birjand

Original Article:

Feasibility Study of Saffron Cultivation and Extraction of Its Effective Materials in Different Parts of Lorestan Province

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Received 08 April 2022; Accepted 12 June 2022

Extended Abstract

Introduction: Saffron (*Crocus sativus* L.) as the most expensive spice in the world, has a special situation among Iran's export products. In addition to Iran, this plant is cultivated in Spain, India, Italy and Greece. The purpose of saffron cultivation is to harvest its stigma and long style, which is transparent red in color and has a lot of medicinal and nutritional value. The performance of saffron is related to several factors such as soil, density, planting method, corm size, geographical location, atmospheric factors such as temperature fluctuations, especially during flowering time, rainfall, crop management and exploitation period. Therefore, in order to make saffron cultivation feasible, it is necessary to identify the susceptible areas in terms of climatic factors in the country in order to increase the production of saffron in the country. One of the ways to increase the yield of saffron is to increase its cultivated area by identifying areas prone to cultivation and production of this valuable medicinal plant for domestic use, export, and also to extract the important compounds in its essential oil. Therefore, this study was conducted in order to investigate the different areas prone to saffron cultivation in Lorestan province and the effect of the weather conditions of each city on the important compounds in saffron essential oil.

Materials and Methods: This study was performed to investigate the compatibility of saffron and also changes in its essential oil components in different parts of Lorestan province. The experiment was conducted in the crop year 2020-21 as a randomized complete block design with three replications. In this study, 12 different cities of Lorestan province including Khorramabad, Boroujerd, Doroud, Kuhdasht, Azna, Aligudarz, Selseleh, Delfan, Aleshtar, Poldakhtar, Doreh Chegni and Romeshkan were considered as the experimental treatment.

Results and Discussion: The results showed that the effect of location treatment on fresh weight of flowers, fresh weight of stigmas, dry weight of stigmas, ratio of fresh weight of stigmas to fresh weight of flowers, maximum moisture and volatiles, safranal, crocin and picrocrocin was significant at 1% probability level. The results showed that out of 12 studied cities, the amount of saffron yield was economic only in 4 cities Boroujerd, Azna, Khorramabad and Selseleh. Among these four cities, the highest flower yield (79.66 $g.m^{-2}$), fresh weight of stigma (6.77 $g.m^{-2}$), dry weight of stigma (1.13 $g.m^{-2}$) and stigma to flower ratio (0.085) was obtained in saffron cultivated in Azna city. The results also showed that the highest amount of safranal essential oil was obtained in saffron cultivated in Dorud city with a maximum absorption of 54. Also, the highest amount of crocin (maximum absorption 343.5) and picrocrocin (maximum absorption 144) were obtained. After Borujerd city, the amount of picrogrosin present in saffron essential oil cultivated in Elshatr (maximum absorption 126.5) and Selesh (maximum absorption 122) cities was more than other cities of Lorestan province, and the difference between them was statistically significant. Saffron essential oil cultivated in Kohdasht city (maximum absorption 80.5) had the lowest amount of picrocrocin. There was a difference between the saffron cultivated in different cities of Lorestan province in terms of the maximum amount of moisture and volatile substances, and it was found that the saffron cultivated in Borujerd city had the highest amount of moisture and volatile compounds at the rate of 0.094%, and after this city, Dure Chegeni had the highest amount of moisture and volatile compounds of 0.082%.

Conclusion: Investigating the feasibility of saffron cultivation in different parts of the country can increase its production in order to increase the country's exports. There have been different climatic areas in the country that have the ability to produce saffron, but currently they are unknown and the feasibility of cultivation should be done in them. In this study, it was found that saffron production was not possible in all the cities of Lorestan province, and the results showed that only 4 cities had the ability to produce saffron economically, and the highest production rate was in Azna city. Also, considering that the quality of saffron essential oil depends on its ingredients, based on these results, it was determined that the highest amount of safranal, crocin and picrocrocin was obtained in the saffron essential oil grown in cities with moderate climate such as Borujerd and Durud.

Conflict of Interest: The authors declare no potential conflict of interest related to the work.

Keywords: Saffron, Stigma, Lorestan, Safranal, Crocin.

Five Important References

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Table 1. Analysis of variance (mean of squares) for yield components of saffron cultivated in different regions of Lorestan province.

Stigma/flower ratio	Dry weight of stigma	Fresh weight of stigma	Fresh weight of flower	DF	S.O.V
0.000005	0.004	0.05	89.15	2	**(Block)**
0.0008**	1.44**	20.68**	1916**	3	**(Location treatment)**
0.000002	0.002	0.04	18.89	6	**(Error)**
2.34	8.69	7.66	10.4		**CV(%)**

*** and ** significant at 5% and 1% probability level, respectively**

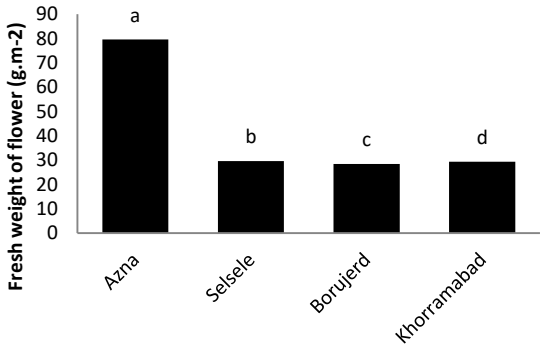

Fig 1. Amount of fresh weight of saffron flower cultivated in different regions of Lorestan province -Column with at least one same letter have no significant difference based on LSD test.

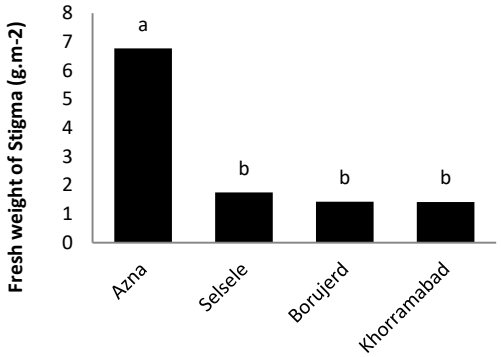

Fig 2. fresh weight of saffron stigma cultivated in different regions of Lorestan province -Column with at least one same letter have no significant difference based on LSD test.

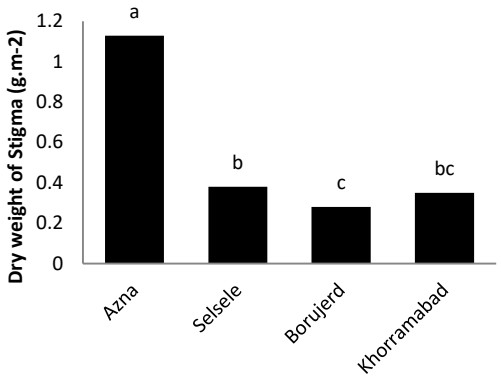

Fig 3. dry weight of saffron stigma cultivated in different regions of Lorestan province -Means with at least one same letter have no significant difference based on LSD test.

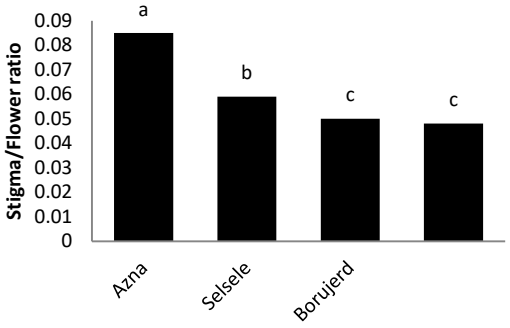

Fig 4. Ratio of fresh weight of saffron stigma/flower cultivated in different regions of Lorestan province -Means with at least one similar letter have no significant difference based on LSD test.

Table 2. Coefficient of correlation between yield components of saffron cultivated in different regions of Lorestan province.

4	3	2	1	
			1	**Flower weight**
		1	0.99**	**Fresh weight of Stigma**
	1	0.99**	0.99**	**Dry weight of Stigma**
1	0.96**	0.96**	0.94**	**Stigma/Flower ratio**

*** and ** significant at 5% and 1% probability level respectively**

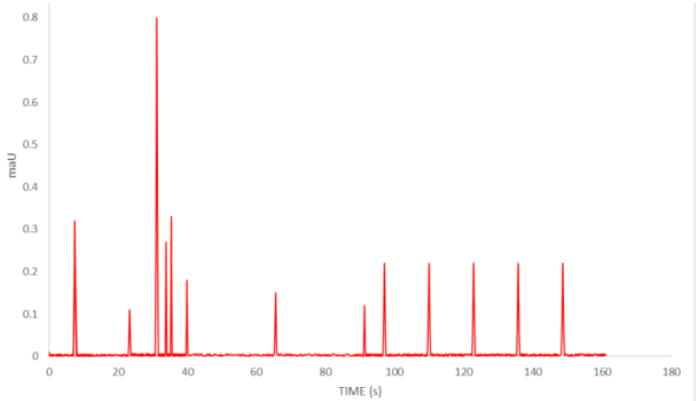

Fig 5. Chromatograpgy diagram for saffron essential oil using HPLC device

Table 3. Analysis of variance (mean of squares) for main essentioal oil components of saffron cultivated in different regions of Lorestan province.

Picrocrocin	Crocin	Safranal	Humidity and volatile compunds	DF	S.O.V
221	675	139	0.0002	2	**(Block)**
1178**	3081**	186**	0.007**	11	**(Location) treatment**
3.61	294	45	0.000009	22	**(Error)**
1.87	1.53	3.1	4.86		**CV(%)**

*** and ** significant in 5% and 1% probability level respectively**

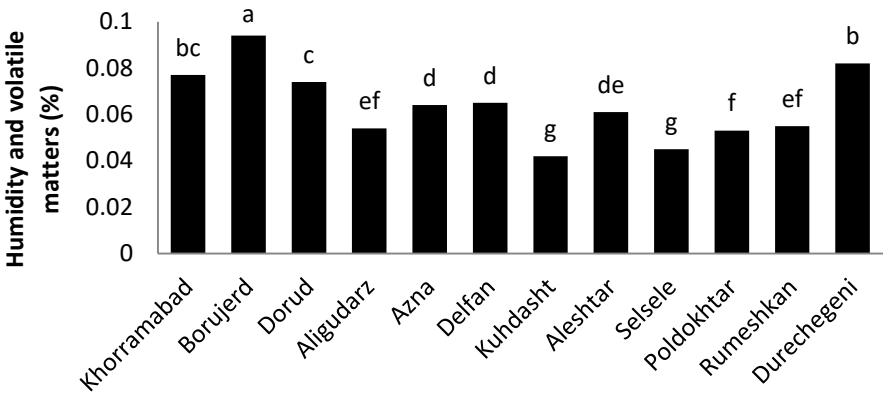

Fig 6. Humidity and volatile components in essential oil of saffron cultivated in different regions of Lorestan province
-Column with at least one same letters had no significant difference based on LSD test.

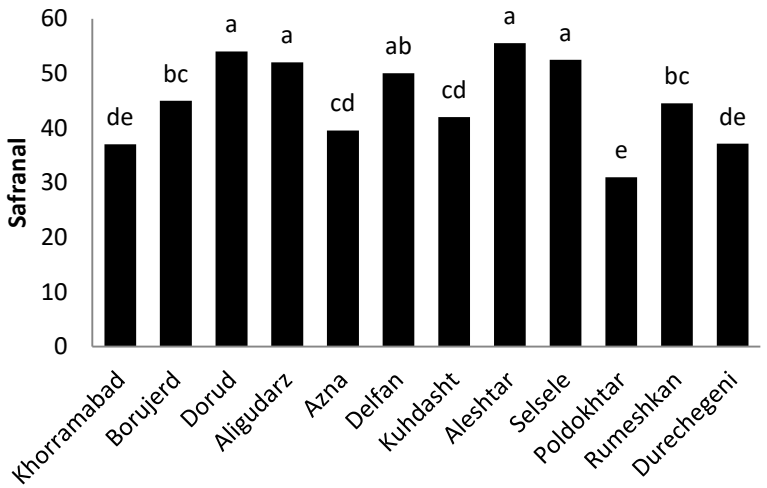

Fig 7. Measured safranal in essential oil of saffron cultivated in different regions of Lorestan province
-Column with at least one same letter have no significant difference based on LSD test.

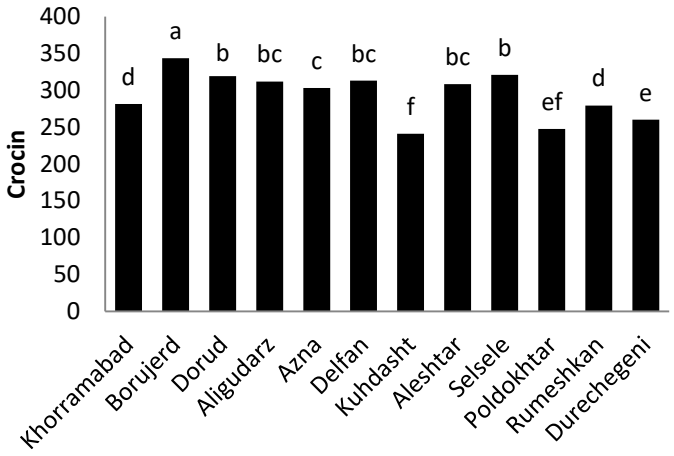

Fig 8. Measured crocin in essential oil of saffron cultivated in different regions of Lorestan province -Column with at least one same letter have no significant difference based on LSD test.

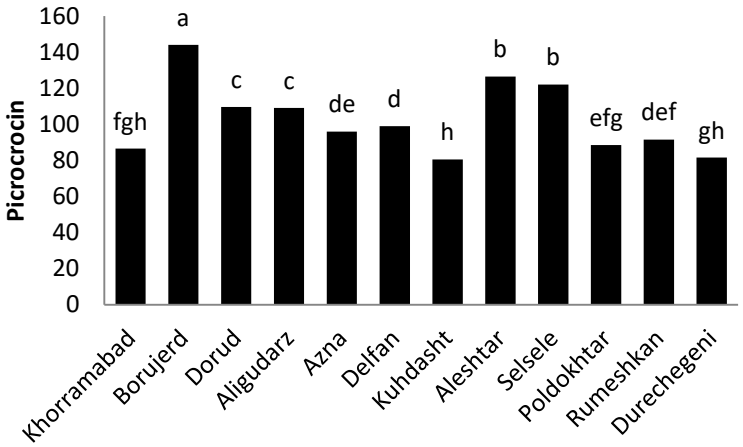

Fig 9. Measured picrocrocin in essential oil of saffron cultivated in different regions of Lorestan province -Column with at least one same letter have no significant difference based on LSD test.

Table 4. Coefficient of correlations between main essentioal oil components of saffron cultivated in different regions of Lorestan province.

4	3	2	1	
			1	**Humidity and volatile matters**
		1	0.29	**Picrocrocin**
	1	0.63**	-0.07	**Safranal**
1	0.69**	0.85**	0.39*	**Crocin**

*** and ** significant at 5% and 1% level respectively**