

Influence of Foliar Fertilization on Yield of Saffron (*Crocus sativus* L.)

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Abstract

Excessive application of chemical fertilizers and alkalinity of most cultivated soils cause foliar fertilization to be applied. Because of the increasing importance of saffron in the economics of central and southern Khorasan during two successive years and in two locations (Ghaen & Bejestan), the effect of urea fertilizer and compound liquid fertilizer on foliar uptake and the increase of saffron yield was evaluated. Experimental design was R.C.B.D. with 4 replicates and 13 treatments. Fertilizers were applied separately with the concentration of 7 gr per 1000 ml water. Results obtained from annual and combined analysis of variance showed significant difference among yield of treatments ($P<0.01$).

Application of fertilizer spraying in months of winter caused number of flowers to be increased. The highest yield obtained from application of compound fertilizer once in March 5 that accounted for 33% increase in yield. In biology of saffron, months February and March have considerable importance because young corms that are formed on mother corms up to February have no roots, and for continuing of vital activities during March and April saffron plant relies on its leaves through photosynthesis and absorbing nutrients from rainfall. So, application of foliar fertilizers during March is very useful.

INTRODUCTION

Importance of saffron is very evident in national economy of Iran. In early 1971 Saffron cultivation was 3,000 ha, while at present the surface area is more than 40,000 ha. Among diverse researches conducted on saffron, nutrition problem has been very important. Sadeghi et al. (1987, 1988) observed that saffron plant responds positively to nitrogen in soils with low organic content. Sadeghi and Torabi (1987) suggested that in old farms saffron yields better under application of animal manure due to absorption of macro and microelements and pH adjustment. Sadeghi and Razavi (1989) showed that in old farm treatments NPK, NP, and animal manure affect on the size of corms.

Boynton (1954) has reported about influence of foliar fertilization for elimination of nutrients deficiency in crop and horticultural plants.

Relatively high alkalinity of crop lands under saffron cultivation in central and southern Khorasan, that prohibits optimum absorption of most macro- and micro elements particularly trace elements and over application of chemical fertilizers by farmers, cause degradation of the lands and the environment.

Application of foliar fertilization, thus, provides a sustainable situation and reduction of rate of chemical fertilizers. Saffron plant is rootless in February and March and can absorb nutrients via leaves.

So, due to above reasons influence of foliar fertilization on saffron yield was evaluated and the results were recommended to saffron farmers.

MATERIALS AND METHODS

This experimental design was conducted for two years 1996 and 1997 in two farms and in two locations. A traditional four-year-old farm in Bejestan and a similar farm were chosen in Ghaen. Both farms were moderate in fertility. The farms were uniform and row spacing was 20 cm. There were four replicates and 13 treatments, as follows: Spraying with urea and complete fertilizer separately in early January, early

February, early March, Jan + Feb, Feb+March, Jan + Feb + March, and control (without spraying). The fertilizers were urea (46%) and complete fertilizer (no.6) Jonoobgan with macro- and microelements. The capacity of sprayer was 20 lit.

Experimental plots were $2 \times 1.5 \text{ m}^2$ with 1 meter spacing.

Concentration of solution was 7/1000 on the basis of 1000-lit water in ha. Picking flowers were early in the morning during three weeks and were counted, and then were statistically analyzed.

RESULTS AND DISCUSSION

In annually and combined analysis it was shown that application of liquid fertilizers with urea or complete fertilizer is useful in all months Jan, Feb and March in saffron farms for the following year (Table 1).

Means at least with one common letter on the basis of Duncan's test are not significant in 5% for first year and in 1% in the second year (Table 1). Figure 1 shows that highest yields were related to four treatments, respectively, complete fertilizer early March, complete fertilizer early Jan, repeated application of urea for three months, and complete fertilizer in Feb. Thus, the best result has been obtained from treatment complete fertilizer in early March. 33% increase in yield has been reported (table 2 and Figure 1).

Literature Cited

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Tables

Table 1. Mean comparisons of saffron yields in different treatments (no. of flowers/ m^2) in Ghaen and Bejestan separately for first year (1996) and second year (1997).

Times of spraying fertilizers	No. of flowers/ m^2		No. of flowers/ m^2	
	Ghaen (first yr.)	Bejestan (first yr.)	Ghaen (second yr.)	Bejestan (second yr.)
Urea- early Jan	193.4 ^a	95.90 ^{ab}	132.1 ^b	203.4 ^b
Urea- early Feb	205.8 ^a	106.3 ^{ab}	131.4 ^b	240.8 ^{ab}
Urea-early March	190.1 ^a	99.57 ^{ab}	125.8 ^b	209.2 ^{ab}
Urea- Jan+Feb	215.3 ^a	91.90 ^{ab}	143 ^{ab}	201.6 ^b
Urea- Feb+March	197.9 ^a	89.97 ^{ab}	129.9 ^b	195.4 ^b
Urea-Jan+Feb+March	226 ^a	98.95 ^{ab}	167.4 ^a	214.4 ^{ab}
Complete- early June	216.8 ^a	104.6 ^{ab}	167.8 ^a	220.1 ^{ab}
Complete- early Feb	227.1 ^a	85.87 ^{ab}	166.5 ^a	210.2 ^{ab}
Complete- early March	217.8 ^a	111 ^a	128.6 ^b	252.7 ^a
Complete- Jan+Feb	184.1 ^a	111.8 ^a	125.1 ^b	212.8 ^{ab}
Complete- Feb+March	218.1 ^a	88.22 ^{ab}	132.8 ^b	193.9 ^b
Complete-Jan+Feb+March	175.8 ^a	100.3 ^{ab}	129.5 ^b	202.7 ^b
Control	181.2 ^a	74.22 ^b	132 ^b	148.3 ^c

Table 2. Mean comparisons in combined analysis of treatments on two years in two locations Ghaen and Bejestan.

	Times of spraying	No. of flowers/m ²
1	Urea- early Jan	156.2 ^e
2	Urea- early Feb	171.1 ^b
3	Urea-early March	156.1 ^e
4	Urea- Jan+Feb	162.9 ^c
5	Urea- Feb+March	153.3 ^f
6	Urea-Jan+Feb+March	176.7 ^a
7	Complete- early June	177.3 ^a
8	Complete- early Feb	172.4 ^b
9	Complete- early March	177.5 ^a
10	Complete- Jan+Feb	158.5 ^d
11	Complete- Feb+March	158.2 ^d
12	Complete-Jan+Feb+March	152.1 ^f
13	Control- with spraying	133.9 ^g

Means at least with one common letter are not significant (P<0.01) on the basis of Duncan's test.

Figures

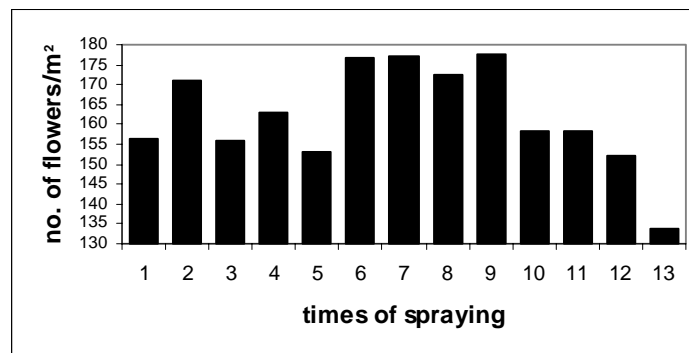


Fig. 1. Influence of fertilizer spraying (urea and complete) in winter months on increasing saffron yield in Ghaen and Bejestan in years 1996 and 1997.