Influence of some pre and post-harvest practices on quality of saffron stigmata

Hamid-Reza Fallahi, Mahsa Aghhavani-Shajari, Hossein Sahabi, Mohammad Ali Behdani, Mohammad Hassan Sayyari-Zohan and Safieh Vatandoost

Scientia Horticulturae 278: 109846. (2021)

Abstract

Saffron (*Crocus sativus* L.) yield and quality are affected by many pre and post-harvest activities. Therefore, four separate experiments were carried out to investigate the effect of some agronomic (irrigation, fertilization, and organic/ conventional cultivation) and post-harvest practices on color parameters (*L*, *a*, *b*, *h*°, and *C*) and apocarotenoid content (crocin, picrocrocin, and safranal) in stigmata. Required plots for the first and the second experiments were constructed in September 2013 and again in 2014 for corm planting. Sampling of the first experiment was done one year after each planting. When two years passed since corm planting, sampling was done for the second experiment. In the first study, the combined effect of the production system (one-year-old organic or conventional fields) and drying temperature (25 °C at shade; 55 and 75 °C in the electric oven) were evaluated during two flowering seasons of 2014 and 2015. In both production systems, oven-dried samples at 55 °C had better quality. In the second experiment, the organic and non-organic stigmata (obtained from two-year-old fields in flowering seasons of 2015 and 2016) were stored for 1, 2, or 3 years under room temperature in a dark place. Color coordinates (*a*, *a/b,* and *C*) increased by longer storage duration. The maximum crocin and safranal contents were obtained from organic samples, which were being stored for less than one year. In the third experiment, the effect of irrigation level (3600, 4200, and 4600 m^3 ha^{-1}) and fertilization (humic acid, *Rhizophagus irregularis,* and unfertilized control) was evaluated during two flowering seasons (2016 and 2017) on saffron yield and quality. Deficit irrigation treatment (3600 m^3 ha^{-1}), associated with the use of humic acid, had the highest yields of flower and stigmata. However, the effect of mycorrhizal inoculation was negative on flowering. Lower water availability plus mycorrhizal inoculation had the highest picrocrocin and

safranal content but the lowest *C*, *a/b,* and *a* color parameters. In the fourth experiment, 48 stigmata samples were collected, and then the relationships between color parameters and apocarotenoids content were evaluated using correlation and regression procedures. Safranal had a correlation with *a* (-0.411**), *b* (0.295*), *a/b* (-0.454**) and *h*° (0.410**). Similarly, crocin had a positive correlation with *b* and *h*°, but a negative one with *a* and *a/b* indexes. Overall, the results of four separate experiments revealed that saffron stigmata quality is highly affected by pre and post-harvest practices. It was also concluded that stigmata quality assessment is somewhat possible through measurement of color parameters as a quick and cheap method.