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The Fresh Petal of Persian Musk Rose (*Rosa moschata* Hermm) as Sources of Nutraceutical Foods

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Abstract

In this study, flowers of Persian musk rose (*Rosa moschata* Hermm.) were harvested on May 11, May 21, June 1 and September 10 to evaluate the effect of harvest date on total phenols, ascorbic acid (AA), carotenoids, and mineral elements in the petals. The highest Total phenol and vitamin C content were observed in June 1 (25.67 mg GAE/100 ml and 54.5 mg/100 ml). Mineral compositions of petals were shown significantly different in harvest times, e.g., P, K was highest in June 1, Mg in May 21, Ca, Fe and Mn in September harvest time. Carotenoid content was decreased from the first to the third harvest and varied between 0.1951 and 0.1373 mg g^{-1} but was not significantly different in harvest dates.

Keywords: Ascorbic acid; Total phenols; Mineral nutrients; *Rosa moschata*

Introduction

The Rosaceae family is one of the largest flowering plant families with more than 100 genera and 2000 species of trees, shrubs and herbs [1-3]. The genus Rosa that comprises approximately 200 Species and thousands of cultivars is commercially important for its essential oil fragrance and for its rosewater, which is used traditionally as flavoring agent [4-7]. *R. moschata* commonly known as Persian musk rose, Nastrana in Persian, is native to Iran and is widely grown in Iran as a landscape plant or for essence and related products. Its flowers have been traditionally used for 'attar of roses' and 'rose water' production [8,9]. As a medicinal plant, the flowers, leaves, fruits of Persian musk rose is used for eyes' disorders, diarrhea, wounds healing, stomach disorders, gout, hydronephrosis delivery cases and in bilious diseases. An antimicrobial effect of the Persian musk rose essential oil has been recently reported [2]. Hence, the current study was conducted to determine the effect of harvest time on total phenol, ascorbic acid and some mineral elements of Persian musk rose flowers [5,10,11].

Material and Methods

Plant material

Fresh flowers of Persian musk rose were collected from the campus landscape of the College of Agriculture of Shiraz University (59°35' E, 29° 43' N, Altitude 1810 m) during their flowering period at May 11, May 21 and June 1, 2014. The flowers were handpicked from 6:00 to 9:00 am. A specimen (Voucher Number: PC 87-23) has been deposited in the Herbarium of the Faculty of Sciences, Shiraz University.

Determination of ascorbic acid and total phenols

The amount of ascorbic acid of the petals was determined according to the Klein and Perry [8] method. Total phenolic contents of rose petals were determined by the Folin-Ciocalteu method. For ascorbic acid determination, petals were weighed (1 g), pulverized by liquid nitrogen, and dissolved in 3 ml methanol. 100 µL of this solution was mixed with (1% MPA and 50 µM 2, 6-dichlorophenolindophenol (DCPIP)). The absorbance of the reaction mixture absorbance was measured at 515 nm on a spectrophotometer (Epoch USA).

For determination of total phenol, 1 g of petals was mixed with methanol (1:3 (w/v)) and were kept in the refrigerator for 24 hrs. After centrifuge using 900 µL of 2% sodium carbonate (Na_2CO_3), and 180 µL 50% Folin-Ciocalteau reagent. After incubation at room temperature for 30 min, the absorbance of the reaction mixture absorbance was measured at 650 nm on a spectrophotometer (UV-160A, Shimadzu, Japan). Gallic acid (GA) was chosen as a standard.

Determination of nitrogen and mineral elements

Total nitrogen was determined by Kjeldahl method. Concentration of copper, zinc, iron, manganese was determined using an atomic absorption spectrometer (FMD4) and Ca and Mg were determined using an atomic absorption spectrometer (perkin-elemer 3030). Potassium was determined by a flame photometer (JENWAY PEP7). Phosphorus content of the extract was determined according to Olsen et al. [9] method.

Determination of total carotenoids

Fresh flowers (0.5 g) were homogenized in 80% acetone (80% acetone: 20% water (v/v)) in dark and centrifuged at 8000 g for 10 min. The absorbance of the supernatant was measured at 470, 645 and 663 nm using a spectrophotometer (Biowave II UV/vis spectrophotometer, Biochrom Ltd.). The chlorophyll and carotenoids were estimated by the following formula: chl a (mg/g leaf)=(12.7 × Abs 663)-(2.6 × Abs 645) × ml acetone/leaf chl b (mg/g leaf)=(22.9 × Abs 645)–(4.68 × Abs 663) × ml acetone/mg leaf Total chl=chl a+chl b

Total carotenoids (mg g^{-1} leaf)=(1000 × Abs 470–1.8 × chl a–85.02 × chl b)/198) × ml acetone /mg leaf.

Statistical analysis

The experiment was conducted based on completely randomized design with three replications. The analyses of variance and mean separation (LSD test, $P \leq 0.05$) were performed using Statistic v. 8. The data were represented as mean values of the replications.

Results and Discussion

Ascorbic acid and total phenols

The ascorbic acid and total phenols in Persian musk rose petals are given in Table 1. Ascorbic acid contents of the rose petals were found to be 23.5 mg/100 ml (May 11) and 54.5 mg/100 ml (June 1) (Table 1). The highest amount of total phenol was observed in June 1 and May 11 (25.67 mg GAE/100 ml), however the lowest of it has in May (19.49 mg GAE/100 ml).

	May 11	May 21	June 1	September 10
Phenol (mgGAE/100 ml)	19.49b*	21.22b	25.67a	-
Vitamin C (mg/100 ml)	23.5bc	32.0b	54.5a	-

Table 1: Total phenol and vitamin C contents in Persian musk rose petals in different harvest dates. *Means in each row having the same letter, have not significant difference ($P \leq 0.05$) according to Duncan's new multiple range test (DMRT).

Carotenoids

The concentration of carotenoids in the petals was not statistically different in different harvest dates, however the highest carotenoid concentration (0.1951 mg g^{-1} FW) was found in the first harvest samples (May 11) and the least concentration was observed in the third harvest time (June 1) (Table 2).

	May 11	May 21	June 1	September 10
Carotenoids	0.1951a*	0.1742a	0.1373a	-

Table 2: Carotenoid contents in Persian musk rose petals in different harvest times.
*Means in each row having the same letter, have not significant difference ($P \leq 0.05$) according to Duncan's new multiple range test (DMRT).

Mineral nutrients

Concentration of the mineral nutrients in Persian musk rose petals is shown in Table 3. Significant differences in petal mineral composition were observed at different harvest dates (Table 3). The nitogen values of petals was not significant different and varied from 1.175% in 21 May to 1.201% in June 1. The concentration of P and K in petals were significantly different ($P<0.05$). The highest concentrations of P and K were found in the third harvest.

The P-values varied from 2.015 mg kg^{-1} DW in the September harvest to 4.07 mg kg^{-1} DW in the June harvest, and K concentration of petals were 519 mg kg^{-1} DW (the June) and 345 mg kg^{-1} DW (last harvest). According to our data, Ca concentration ranged between 1208 mg kg^{-1} DW at the May 11 (fist harvest) to 4355 mg kg^{-1} DW in the September harvest. Mg content in second time was 1770 mg kg^{-1} and 1607 mg kg^{-1} in the September. Mn content was 36.2 mg kg^{-1} in the September and 27.9 mg kg-1 in the June. Cu concentration was significantly lower in the September (9.62 mg kg^{-1}) however; Fe was significantly higher in last harvest (144.35 mg kg^{-1}). Zn was not significantly different at different harvests. The mineral composition of petals depended not only on genotype, but also on the environmental factors such as temperature, humidity and light. Regarding the mineral composition, study from Turkey reported that the fruits of *R. canina* contains N, K, P, Fe, Zn, Mn, Mg and Ca. In another study in the *R. alba*, Hosni [6] reported that the organs of this plant to be rich in essential mineral such as K, Ca, P and Mg.

Minerals	May 11	May 21	June 1	September 10
N%	1.1825a*	1.175a	1.2015a	1.137a
P mg kg^{-1}	3.10b	2.150c	4.07a	2.015c
K mg kg^{-1}	385.0b	393.50b	519.0a	345.0c
Ca mg kg^{-1}	1208.0c	1305.5b	1288.8b	4355.0a
mg mg kg^{-1}	1697.0ab	1770.0a	1702.5ab	1607.0b
Cu mg kg^{-1}	11.65a	11.555a	11.325a	9.6250b
Mn mg kg^{-1}	28.575b	28.505b	27.995b	36.20a
Fe mg kg^{-1}	72.975b	70.605b	72.675b	144.35a
Zn mg kg^{-1}	17.775a	13.215ab	11.450ab	10.650b

Table 3: Mineral element contents in Persian musk rose petals harvested at different times. *Means in each row having the same letter, have not significant difference ($P \leq 0.05$) according to Duncan's new multiple range test (DMRT).

Conclusion

In general, the present investigation showed that the flowers of Persian Musk rose as source of vitamin and mineral nutrition. Furthermore, it was show that these characteristics as influenced by harvest times. In addition, chemo protective properties of edible flowers of roses may be classified as nutraceutical products.

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