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ABSTRACT. An evaluation of the types of natural rose hip (*Rosa* spp.) populations was carried out in the Bursa region of Turkey where the rose hip has been traditionally grown intensively. Phenological development (first flowering, full flowering, fruit set, ripening), morphological characteristics (color of flower, number of leaflets, thornlessness), pomological qualities (fruit weight, fruit length and width, seed number, fruit flesh/seed ratio, fruit color) and chemical composition (soluble solids concentration, pH, total acidity, vitamin C, invert sugar, total sugar) were determined as evaluation parameters.

KEYWORDS. Fruit, quality, chemical composition

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INTRODUCTION

Rose hips are the fruit of a rose that develop after the petals have fallen (Halloran, 2000). Among the species of rose particularly valued for the hips are *Rosa rugosa*, known as Japanese rose; *R. canina*, known variously as wild briar, witches brier, dog rose, hip fruit, or hip tree; *R. acicularis*; and *R. cinnamomea*. Kurt and Yamankaradeniz (1983) examined the composition of *Rosa dumalis*, *R. canina*, *R. pulverulenta* and *R. montana* from the Anatolia region of Turkey. The *R. canina* hips are said to contain the highest amounts of vitamin C of all the species. Rose hips are highly rich in vitamin C (800 mg/100 g) having 10 to 50 times that of an orange. If dried and ground into powder they preserve this vitamin better than almost any other plant. In England, during the second World War, the scarcity of citrus products led to a nationwide effort to harvest and process the nutritional hips of the dog rose. The dog rose hips, abundant in the countryside, provided the populace with adequate vitamin C to prevent the onset of the deficiency disease known as scurvy. In addition to being a highly recognized source of vitamin C and bioflavonoids, and they also contain vitamins E and K, and the B vitamins riboflavin and folate, potassium, phosphorus, calcium, and iron (Ozcan, 2002). Rose hips have a tangy yet sweet flavor and can be used fresh, dried or preserved in a wide range of dishes, including syrups, preserves, jams and jellies, sauces, breads and desserts, purees, fruit soups, teas, wine and health drinks. In herbal medicine rose hips are recommended for fighting infection, curbing stress, and for bladder problems. There is a high unsaturated fatty acid content in the seeds so it is significant not only for the food industry but also for the cosmetic industry (Demir and Ozcam, 2001; Ozcan, 2002; Szentmihalya et al., 2002). Additionally, roots and flowers of rose hip are used in the leather industry (Anşin, 1996; Hilmioğlu et al., 1996). Storage and preservation of rose hip fruits have been examined by Mamadrizohonov et al. (1994) and Mou (1988).

Anatolia, Turkey is located in the motherland of rose hip (*Rosa* spp.), which has become widespread around the world. More than 100 species of rose hip have been identified (Arslan et al., 1996). There are about 27 species of rose hip under cultivation in every geographical region of Turkey (Davis, 1972). The genetic variation *Rosa caninae* and the domestication of this species for rose hip production has been investigated in Sweden (Nybom et al., 1998; Uggla and Nybom, 1998).

In recent years the importance of rose hips has been expanding as interest has increased in its use for different purposes such as dietary sup-

plements, ornamental rose growing, landscape design incorporation, and its use in the prevention of erosion on unfertile lands (Eryılmaz et al., 1996).

Recently Ercisli and Esitken (2004) examined about 10,000 seedling rose shrubs in the Erzurum province of eastern Turkey in regard to plant and fruit properties. Twelve promising rose hip genotypes were selected, six of which belong to *R. dumalis*, four to *R. canina*, and one genotype was selected in both *R. pulverulanta* and *R. montana*. The genotypes exhibited a range of 3.2 to 4.8 g for fruit weight, 63.1 to 71.1% for fruit flesh ratio, 1074 to 2557 mg/100 g for ascorbic acid, 31.0 to 36.7% for total soluble solids, and 34.8 to 40.2% for total dry weight.

Rose hip makes a considerable contribution to the agricultural economy of the Bursa region of Turkey. In the present study an evaluation and selection of types of rose hip seedling (*Rosa* spp.) populations was conducted.

MATERIALS AND METHODS

Rose hip (*Rosa* spp.) seedlings used in this study were selected from populations found growing in the region around Bursa, Turkey. Twenty nine plants were chosen for observation and analysis in 1998. Phenological development (first flowering, full flowering, fruit set, ripening), morphological characteristics (color of flower, number of leaflets, thornlessness), pomological qualities (fruit weight, fruit length and width, seed number, fruit flesh/seed ratio, fruit color) and chemical composition (soluble solids concentration, pH, total acidity, vitamin C, invert sugar, total sugar) were determined as evaluation parameters.

The results were analyzed according to a randomized design with three replicates and the mean values were compared by LSD test at 1% significance level.

RESULTS AND DISCUSSION

Ecological differences of localities affected the phenological phases and maturation and ripening of rose hips. The ripening period began on August 20, 1998 and continued until September 20, 1998. It was generally observed that all types were thorny and the flower color varied from white to dark pink (Table 1).

TABLE 1. Some phenological and morphological features of selected rose hips (*Rosa* spp.).

Selection	First flowering	Full flowering	Fruit set	Ripening*	Flower color	Thornyness	Number of leaflets
AK-03	2/5	17/5	22/5	20/8	Dark pink	Thorny	5
KA-36	3/5	17/5	24/5	24/8	Pink	Thorny	5
KA-37	5/5	17/5	24/5	25/8	Pink	Thorny	7
HA-24	3/5	17/5	25/5	26/8	Pink	Thorny	5-7
HA-28	2/5	17/5	25/5	26/8	Pink	Thorny	5
AD-37	8/5	18/5	26/5	27/8	Cream	Thorny	5
SÜ -41	5/5	18/5	24/5	25/8	Pink	Thorny	5
SÜ-42	3/5	18/5	24/5	23/8	Pink	Thorny	5
SÜ-43	10/5	18/5	24/5	25/8	Cream	Thorny	5
SÜ-49	7/5	18/5	24/5	25/8	White	Few Thorns	5
SÜ-50	20/4	17/5	23-24/5	3/9	Pink	Thorny	5-7
GR-01	20/4	17/5	21-24/5	15/9	Pink	Thorny	5-7
GR-02	20/4	17/5	21-24/5	14/9	White	Thorny	5-7
GR-03	20/4	17/5	21-24/5	15/9	Pink	Thorny	5-7
GR-04	20/4	17/5	21-24/5	18/9	White	Thorny	5-7
GR-05	20/4	17/5	21-24/5	13/9	White	Thorny	5-7
GR-06	20/4	17/5	21-24/5	18/9	Pink	Thorny	5-7
GR-07	20/4	17/5	21-24/5	12/9	Pink	Thorny	5-7
GR-08	20/4	17/5	21-24/5	18/9	Pink	Thorny	5-7
GR-09	20/4	17/5	21-24/5	18/9	Pink	Thorny	5-7
GR-10	20/4	17/5	21-24/5	15/9	White	Thorny	5
GB-11	20/4	17/5	23-24/5	18/9	Pink	Thorny	5
GB-12	20/4	17/5	23-24/5	20/9	Pink	Thorny	5
GB-13	4/5	10/5	21/5	16/9	Pink	Thorny	5
GB-14	4/5	10/5	21/5	16/9	Pink	Thorny	5
GB-15	4/5	10/5	21/5	16/9	Pink	Thorny	5
GB-16	4/5	10/5	21/5	16/9	Pink	Thorny	5
GB-17	27/4	10/5	21/5	10/9	White	Thorny	5
GB-18	27/4	10/5	21/5	11/9	Yellow-Pink	Thorny	5

*Ripening was the period when the color of the hyphontium changed from red to orange.

Pomological and fruit color features are given at Tables 2 and 3. The main part of the rose hip that is of commercial interest is the flesh. Large fruit with a high flesh to seed ratio are most desirable. Since rose hips are mostly processed as a raw material in the food industry, the ratio of

TABLE 2. Some pomological features of rose hip selections (*Rosa* spp.).

Type	Fruit weight (g)	Fruit length (mm)	Fruit width	Seed number	Flesh/Seed (g/g)
AK-03	1.70 def	18.57 de	13.93 abc	26.33 cdefghi	3.73 ab
KA-36	1.23 jklm	17.73 efg	12.07 ghijk	11.00 k	5.34 a
KA-37	2.07 ab	19.10 cd	14.33 ab	26.53 cdefgh	1.45 c
HA-24	1.10 lmn	16.10 ijkl	11.43 jkl	26.53 cdefgh	2.59 bc
HA-28	1.03 no	15.33 l	11.27 kl	29.00 bcde	1.92 c
AD-37	0.88 o	15.57 kl	10.27 m	20.23 ij	1.70 c
SÜ-41	1.07 lmno	16.27 hijkl	11.60 ijkl	30.00 abcd	2.14 bc
SÜ-42	1.97 bc	18.07 def	14.53 a	30.20 abcd	2.13 bc
SÜ-43	1.45 ghi	16.20 hijkl	12.10 ghijk	22.57 fghij	2.28 bc
SÜ-49	1.53 fgh	19.23 cd	12.33 fghij	30.23 abcd	2.89 bc
SÜ-50	1.38 hij	17.03 fghij	11.33 kl	26.37 cdefghi	1.29 c
GR-01	1.68 def	20.30 bc	12.53 efghi	24.67 defghij	1.98 c
GR-02	1.78 cde	20.60 ab	12.80 defg	28.43 cdef	1.82 c
GR-03	1.82 cd	18.17 def	13.47 bcd	35.33 a	2.76 bc
GR-04	1.25 jkl	17.40 efghi	11.47 jkl	23.77 efghij	2.46 bc
GR-05	1.73 de	17.53 efgh	13.47 bcd	32.23 abc	1.94 c
GR-06	1.75 de	18.60 de	12.97 cdefg	27.47 cdefg	2.43 bc
GR-07	1.18 klmn	16.67 ghijk	11.33 kl	23.77 efghij	1.92 c
GR-08	1.05 mno	15.83 jkl	10.90 lm	19.00 j	1.63 c
GR-09	1.18 klmn	17.13 fghij	10.90 lm	20.67 hij	1.95 c
GR-10	1.33 ijk	18.70 de	11.70 hijkl	21.87 ghij	1.71 c
GB-11	1.62 efg	20.40 bc	12.57 defgh	28.80 bcde	1.34 c
GB-12	1.78 cde	19.17 cd	13.33 cde	23.33 efghij	2.18 bc
GB-13	2.22 a	21.83 a	13.77 abc	26.77 cdefgh	2.07 bc
GB-14	1.17 klmn	15..90 jkl	11.67 hijkl	30.23 abcd	1.56 c
GB-15	1.67 def	16.50 ghijkl	13.17 cdef	34.67 ab	1.56 c
GB-16	1.70 def	19.40 bcd	12.70 defg	29.47 abcde	1.83 c
GB-17	1.25 jkl	17.73 efg	11.23 klm	19.10 j	1.21 c
GB-18	1.13 lmn	17.53 efgh	10.87 lm	21.47 ghij	2.14 bc

TABLE 3. Fruit color measurements of selected rose hips (*Rosa* spp.).

Selection	Color*		
	L	C	h
AK-03	35.82	49.24	28.1
KA-36	43.77	54.85	38.2
KA-37	45.02	57.93	39.9
HA-24	39.03	48.53	34.9
HA-28	41.28	44.81	43.0
AD-37	37.46	46.88	32.2
ŞÜ-41	39.36	51.04	34.4
ŞÜ-42	39.64	51.70	31.5
ŞÜ-43	38.15	52.86	28.6
ŞÜ-49	43.05	54.83	37.1
ŞÜ-50	39.78	47.45	38.8
GR-01	41.21	49.00	37.8
GR-02	47.84	55.43	45.8
GR-03	48.65	59.02	43.7
GR-04	42.03	52.66	35.0
GR-05	47.92	58.29	42.3
GR-06	48.98	61.53	43.0
GR-07	48.19	56.77	44.8
GR-08	45.98	57.67	40.9
GR-09	48.15	52.92	48.3
GR-10	48.60	58.70	45.6
GB-11	47.50	52.63	45.9
GB-12	44.04	50.27	40.7
GB-13	52.58	53.19	57.7
GB-14	39.75	51.80	32.8
GB-15	50.01	58.39	46.1
GB-16	44.09	54.17	40.3
GB-17	59.10	54.95	64.6
GB-18	44.27	55.33	37.8

* L, C, h color reflectance using a Minolta color spectrophotometer.

flesh to seed is an important consideration in addition to fruit size. In terms of the fruit flesh/seed ratio, KA-36 was the best followed by AK-03. The seeds of rose hip are also used to a limited degree. The number of seeds per fruit ranged from 11.0 to 35.3. The highest seed number was found in GR-03 and the lowest in KA-36. Colors of fruit

ranged from red to orange depending on the type of rose hip. The results obtained in this study generally agree with previously published literature (Davis, 1972; Kiseleva, 1978; Ercişli and Güleryüz, 1996).

Rose hip types have a wide diversity in respect to the chemical features examined (Table 4). These differences result from a broad genetic diversity as they grow wild in nature, and from extremes in ecological conditions in which they are found growing. The amount of vitamin C

TABLE 4. Some fruit chemical features of selected rose hips (*Rosa* spp.).

Selection	T.S.S (%)	pH	Total acidity * (g/100g)	Vitamin C (mg/100g)	Invert sugars (g/100 g)	Total sugars (g/100g)
AK-03	35.00 f	3.65 j	2.53 d	40.38 n	18.67 a	21.28 a
KA-36	29.59 s	3.59 lm	2.44 ef	38.69 r	18.36 b	17.73 i
KA-37	27.38 w	3.42 k	2.46 e	36.93 u	09.09 v	12.67 u
HA-24	36.66 c	3.30 p	3.27 b	39.32 q	11.82 p	12.02 v
HA-28	31.00 p	3.42 k	3.50 a	40.64 m	15.24 f	16.83 k
AD-37	34.23 h	3.36 n	3.27 b	34.44 w	13.81 k	14.67 p
ŞÜ-41	36.85 b	3.35 no	2.52 d	40.12 o	11.31 s	13.05 t
ŞÜ-42	34.71 g	3.38 m	2.06 i	38.16 s	11.82 p	13.46 r
ŞÜ-43	28.57 u	3.39 lm	2.42 f	39.23 q	12.39 n	15.77 m
ŞÜ-49	30.55 q	3.40 l	2.06 i	37.55 t	12.12 o	19.44 d
ŞÜ-50	40.32 a	3.34 o	2.94 c	38.61 r	15.42 e	17.30 j
GR-01	32.00 m	4.03 e	2.17 h	39.85 p	13.75 k	16.82 k
GR-02	28.25 v	4.20 c	1.52 p	42.68 kl	11.51 r	14.74 o
GR-03	36.25 e	3.94 h	1.69 n	39..85 p	13.75 k	15.55 n
GR-04	31.75 n	3.85 i	2.46 e	45.51 g	13.27 m	17.90 h
GR-05	36.50 d	4.00 f	2.06 i	45.51 g	13.42 l	18.49 f
GR-06	32.75 nk	3.95 h	1.79 l	45.16 h	14.46 i	19.78 c
GR-07	33.75 i	4.03 e	1.93 j	50.12 f	16.11 c	19.96 b
GR-08	30.50 q	3.97 g	1.85 k	42.83 jk	13.75 k	18.95 e
GR-09	29.00 t	4.28 b	1.56 o	35.86 v	09.09 v	14.74 o
GR-10	33.25 j	4.00 f	2.30 g	43.04 j	15.88 d	18.04 g
GB-11	28.50 u	4.27 b	1.51 p	42.50 l	10.00 u	15.77 m
GB-12	27.25 x	4.12 d	1.69 n	30.11 x	10.25 t	14.01 q
GB-13	22.75 y	4.19 c	1.50 p	55.96 c	11.75 q	13.27 s
GB-14	29.75 r	4.02 e	1.77 l	55.26 d	15.04 g	19.96 b
GB-15	32.50 l	4.08 a	1.87 k	56.32 b	13.92 j	15.88 l
GB-16	31.47 o	3.98 g	1.77 l	54.81 e	13.27 m	14.64 p
GB-17	22.00 z	3.98 g	1.79 l	57.91 a	14.95 h	17.36 j
GB-18	29.75 r	3.95 h	1.75 m	43.38 i	14.94 h	15.76 m

* As citric acid

in the fruit recorded in this study was much lower than previously reported results (Kiseleva, 1978; Yamankaradeniz, 1983; Ercişli and Güleryüz, 1996). The content of vitamin C is affected by genetic factors as well as ecological, climatic, and edaphic influences. It has been observed that long rainy periods during the growing season decreases the amount of vitamin C. Plants growing at higher altitudes receive greater light intensities which increases the amount of vitamin C in fruit. In addition, lack of phosphorus and or an excess of potassium in the soil decreases the amount of vitamin C. These factors may contribute to explaining why the rose hips in this region are not rich in vitamin C.

In this study KA-36, AK-03, SÜ-49, GR-03, and HA-24 were found to have fruit with the best flesh/seed ratio, while GB-17, GB-15, GB-13, GB-14, and GB-16 had the highest vitamin C content (Tables 2 and 4). These plants were found to show the most promise as potential commercial selections. In the future, other selection studies in different regions of Turkey will increase possibility of finding higher quality rose hip types.

The rose hips grown in Bursa vicinity were found to have a diversity of different physical and chemical features. These differences indicate the existence of a rich genetic population in the area. Rose hips are a promising cash crop particularly for use in the food supplement industry.

REFERENCES

Anşin, R. 1996. Classification of *Rosa* L. grown east of Black Sea. Symp. on Rose Hip. (5-6 September 1996), Gümüşhane, Turkey, 85-95.

Arslan, N., B. Gürbüz, and A. Gümüşçü. 1996. The principles of culturing and breeding rose hip. Symp. on Rose Hip (5-6 September 1996), Gümüşhane, Turkey, pp. 149-156.

Davis, P. H. 1972. Flora of Turkey and East Aegean Islands. Vol: 4, Edinburgh Univ. Press., UK, pp. 106-128.

Demir, F. and M. Ozcan. 2001. Chemical and technological properties of rose (*Rosa canina* L.) fruits grown wild in Turkey. J. Food Eng. 47 (4): 333-336.

Ercişli, S. and A. Eşitken. 2004. Fruit characteristics of native rose hip (*Rosa* spp.) selections from Erzurum province Turkey. New Zealand J. Crop Hort. Sci. 32: 51-53.

Ercişli, S. and M. Güleryüz. 1996. Breeding by selection for rose hip (*Rosa* spp.) grown in Gümüşhane. Symp. on Rose Hip (5-6 September 1996), Gümüşhane, Turkey, pp. 157-165.

Eryılmaz, Y., C. Gümüş, and M. Batı. 1996. Importance of rose hip for developing forestry villages in Gümüşhane. Symp. on Rose Hip (5-6 September 1996), Gümüşhane, Turkey, pp. 21-28.

Halloran, K. 2000. Hips: The fruit of the rose. Organic Gardening 47 (5): 20.
Hilmioğlu, N. D., M. Şişmanoğlu, A. E. Yıldırım, and S. Tülbentçi. 1996. Producing food color pigment from rose hip. Symp. on Rose Hip (5-6 September 1996), Gümüşhane, Turkey, pp. 339-346.
Kiseleva, A. S. 1978. Rosa varieties. Hort. Abstr. 48 (10): 9966.
Kurt, A. and R. Yamankaradeniz. 1983. Hip composition of roses growing wild in the province of Erzurun and possibilities for processing hips to produce various products. Doga Bilim Dergisi, D2 (Tarim ve Ormancilik) 7 (3): 243-248.
Mamadrizohonov, A. A., R. S. Mirzobekov, and Z. H. Buribekov. 1994. Storage of rose-hip. Acta Hort. 386: 706-711.
Mou, J. F. 1988. Preservation of the fruits of *Rosa roxburghii* Tratt. Transactions Chinese Soc. Agr. Machinery (2): 49-60.
Nybom, H., G. Werlemark, U. Carlsson-Nilsson, A. Olsson, and M. Uggla. 1998. Genetic variation in a new crop-dogreses (Rosas sect. Caninae) for commercial rosehip production. Acta Hort. 484: 139-145.
Ozcan, M. 2002. Nutrient composition of rose (*Rosa canina L.*) seed and oils. J. Medicinal Food 5 (3): 137-140.
Szentmihalyi, K., P. Vinkler, B. Lakatos, V. Illes, and M. Then. 2002. Rose hip (*Rosa canina*) oil obtained from waste hip seeds by different extraction methods. Biosource Technol. 82 (2): 195-201.
Uggla, M. and H. Nybom. 1998. Domestication of a new crop in Sweden-dogreses (*Rosa* sect. Caninae) for commercial rose hip production. Acta Hort. 484: 147-151.
Yamankaradeniz, R. 1983. Physical and chemical features of rose hip in different ripening stages. Food 8 (4): 151-156.