

## Fruit Properties of Promising Rose Hips (*Rosa* spp.) from the North-eastern Anatolia Region of Turkey

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This study was conducted to select promising Rose hip (*Rosa* spp.) phenotypes in an area situated in North-eastern Anatolia of Turkey from 1993 to 1995. The native rose hip populations consisted of approximately 2500 seedling shrubs and were examined with regard to shrub and fruit properties. Among phenotypes, nine of these, three *Rosa dumalis*, two *Rosa canina* and one *Rosa hirtissima*, *Rosa pisiformis*, *Rosa villosa* and *Rosa montana* found to be superior were selected and evaluated for fruit characteristics. Promising selections exhibited a range of 3.01–5.49 g fruit weight, 61.67–74.20% fruit flesh ratio, 29.02–37.09% total soluble solid and 348–911 mg/100 g ascorbic acid, respectively. These results suggest that the rose hips selected may be suitable for commercial cultivation in the region

**Key Words:** Fruit properties, Rose hips, Anatolia region.

### INTRODUCTION

Most *Rosa* species have a very high content of desirable nutritious substances in their hips. They are also suitable for preventing soil erosion and provide valuable raw materials for processing industry<sup>1, 2</sup>. As one of the native places of *Rosa* species, Anatolia where rose hip growing goes back to very ancient times has valuable rose hip genetic resources<sup>3</sup>.

Since rose hips were grown from seeds for thousands of years, the country currently exhibits a view of native rose hip museum consisting of seedling shrubs. These seedlings with different characteristics are distributed throughout the country in different geographic and climatic conditions. These shrub populations, which may have considerable cultivar breeding characteristics, are adapted to areas with various climatic and soil conditions almost all over the country<sup>3</sup>.

Commercial rose hip orchards must be planted with homogeneous material that ripens simultaneously and has a growth habit suitable for mechanical harvesting<sup>3</sup>. Selection is an important goal for processing companies because they would receive a more uniform product that could have a better industrial yield. If high yielding and high quality fruit phenotypes were selected and propagated, rose hip production could be increased.

The aim of this research was to select fruitful and high quality wild rose hip phenotypes from North-eastern Anatolia to be used in the future breeding studies and to increase the yield of rose hip with the aid of vegetative propagation.

## EXPERIMENTAL

This study was conducted on naturally grown rose hip populations in the Gumushane province in Turkey evaluating approximately 2500 seedling rose hip types during 1993–1995. Previous studies<sup>1</sup> showed that the dominant rose species naturally grown in Gumushane region were *Rosa canina*, *Rosa dumalis*, *Rosa pimpinellifolia*, *Rosa villosa*, *Rosa montana* and their interspecies crossing. One hundred and seventy-nine shrubs were selected as research material in 1993. In the 1994 trial, 35 phenotypes were selected among them. Finally, in 1995, 9 phenotypes were selected from 35 phenotypes.

Average fruit weight (g), fruit dimensions (mm), fruit flesh ratio (%) and seed number per fruit were determined on 30 randomly chosen individual fruit samples. Fruits identified as ripe or otherwise ready for harvest and preparation were picked to get a minimum 500 g. Fruit samples were shipped frozen by air (3 h) to the laboratory in well-packed insulated boxes and kept at  $-20^{\circ}\text{C}$  until analysis. Total soluble solids (TSS) of the fruits were determined using a hand refractometer. Total dry weight (TDW) was obtained after drying at  $70^{\circ}\text{C}$  to constant weight. Ascorbic acid and total sugars were determined by titrimetric and spectrophotometric methods<sup>6</sup>. The selections were named as Gumushane Rose Hip Selection (GRS).

Fruit characteristics were evaluated based on the Weighted-Ranked Method<sup>7</sup>. The total point of each phenotype was recorded with multiplication of these values. The fresh weight of 30 fruits was based for point.

## RESULTS AND DISCUSSION

In the first year (1993), 179 rose hip phenotypes were examined with respect to fruit traits. Fruit weights, fruit width, fruit length, fruit flesh ratio and seed number per fruit of 179 shrubs studied were found between 1.62–6.02 g, 11.42–23.15 mm, 14.63–34.56 mm, 54.88–91.86% and 4.43–51.25, respectively. Fruits of these phenotypes contained 132–1274 mg/100 mL ascorbic acid, 20.36–36.12% TSS and 26.94–41.08% TDW.

The total points of all phenotypes were based on Weighted-Ranked Method. Those that have higher than 600 were chosen in order to assess the next year. 35 phenotypes were selected from 179 phenotypes in first year.

Therefore, the results of 1994 year included data of 35 phenotypes. Fruit weights, fruit width, fruit length, fruit flesh ratio and seed number per fruit of 35 shrubs studied were found between 1.69–6.18 g, 13.68–21.61 mm, 14.77–32.53 mm, 60.23–91.93% and 4.11–44.17, respectively. Fruits of these phenotypes contained 267–1044 mg/100 mL ascorbic acid, 24.36–38.07% TSS, 30.87–41.96% TDW and 0.80–2.16% acidity.

The pomological data of the third year (1995) described 9 promising phenotypes (GRS 6, GRS 8, GRS 10, GRS 13, GRS 14, GRS 16, GRS 26, GRS 51, GRS 54) chosen from 35 phenotypes, which had higher than 630 points. Promising selections exhibited a range of 3.01–5.49 g fruit weight, 61.67–74.20% fruit flesh ratio, 29.02–37.09% total soluble solid and 348–911 mg/100 g ascorbic acid, respectively (Tables 1 and 2).

TABLE-1  
SOME FRUIT CHARACTERISTICS OF NATIVE ROSE HIP PHENOTYPES SELECTED FROM GUMUSHANE PROVINCE

GRS selection	Fruit weight (g)	Fruit width (mm)	Fruit length (mm)	Flesh ratio (%)	Seed number per fruit
GRS 6	4.92 ± 0.30	21.02 ± 3.65	25.08 ± 4.13	61.67 ± 5.46	39.40 ± 7.95
GRS 8	3.15 ± 0.25	15.67 ± 3.66	28.74 ± 3.50	73.05 ± 4.99	32.45 ± 7.06
GRS 10	3.29 ± 0.27	16.14 ± 3.16	27.73 ± 2.05	74.20 ± 4.61	25.58 ± 3.83
GRS 13	5.49 ± 0.28	20.01 ± 3.30	33.55 ± 3.01	67.39 ± 3.98	45.66 ± 4.72
GRS 14	3.01 ± 0.29	15.99 ± 4.34	20.44 ± 2.84	68.38 ± 4.17	32.48 ± 6.89
GRS 16	3.87 ± 0.19	18.05 ± 2.83	24.18 ± 2.73	69.29 ± 3.76	29.89 ± 4.17
GRS 26	3.24 ± 0.27	13.45 ± 2.93	30.58 ± 4.94	72.56 ± 4.36	20.12 ± 4.59
GRS 51	3.91 ± 0.41	20.12 ± 3.90	24.48 ± 2.00	63.99 ± 4.30	41.29 ± 6.33
GRS 54	3.72 ± 0.14	19.18 ± 4.77	26.40 ± 4.78	69.64 ± 4.95	32.03 ± 3.41

TABLE-2  
THE CHEMICAL CHARACTERISTICS OF NATIVE ROSE HIP PHENOTYPES SELECTED FROM GUMUSHANE PROVINCE

GRS selections	Species	Altitude (m)	Vitamin C (mg/100 g)	TSS (%)	TDW (%)	Total sugar (%)	Thorn
GRS 6	<i>R. dumalis</i> subsp. <i>boissieri</i>	1540	523	32.85	35.70	16.0	Thorny
GRS 8	<i>R. hirtissima</i>	1545	405	29.76	36.63	12.3	Thorny
GRS 10	<i>R. villosa</i>	1615	562	29.02	33.10	13.3	Thorny
GRS 13	<i>R. dumalis</i> subsp. <i>boissieri</i>	2010	509	37.09	40.64	17.4	Thornless
GRS 14	<i>R. canina</i>	2005	545	37.00	39.30	13.5	Thorny
GRS 16	<i>R. canina</i>	1425	348	29.89	34.66	16.4	Thorny
GRS 26	<i>R. pisiformis</i>	1670	471	31.79	37.35	15.8	Thorny
GRS 51	<i>R. dumalis</i>	1910	911	35.67	39.20	16.7	Thorny
GRS 54	<i>R. montana</i>	1945	730	33.28	37.17	15.8	Thorny

In the selection of rose hip, fruit weight is considered as a main criterion<sup>8</sup>. Our promising selections exhibited a range of 3.01 (GRS 14) to 5.49 g (GRS 14) for fruit weight. Some studies carried out<sup>1,8,9</sup> in different parts of Turkey, reported fruit weight ranging between 1.57 and 4.44 g.

One of the most favoured physical characteristics of rose hips is a high fruit flesh ratio. The fruit flesh ratio varied from 61.67–74.20% (Table-1). The highest fruit flesh ratio obtained was 74.20% with phenotype GRS 10, followed by phenotype GRS 8 with 73.05% (Table-1). Values for fruit flesh ratio were within the values reported<sup>1,8,9</sup> for native rose hip selections from various areas of Anatolia.

Vitamin C (ascorbic acid) is the vitamin routinely reported for rose hips in literature; however, interpreting the data is again complicated by lack of

information of exact species or analytical method used. Kovacz *et al.*<sup>10</sup> reported rose hips with 130–504 mg ascorbic acid per 100 g, whereas Sojak and Hricovsky<sup>11</sup> reported 700–1500 mg ascorbic acid per 100 g. The difference in ascorbic acid values may be due to different species or cultivars and environmental conditions. On the other hand, ascorbic acid content of rose hips grown in Middle Anatolia<sup>12</sup> was between 234–650 mg per 100 g, which is in accord with the present results.

Rose hip fruits are generally not consumed fresh. They are used for processing jam, jelly and marmalade<sup>13</sup>. Therefore, higher TSS and TDW characteristics of rose hips are desirable and important fruit properties for processing. TSS and TDW are also considerably affected by different environmental conditions, especially altitude and species or cultivars<sup>6</sup>. We measured 29.76–37.09% TSS content, which is within the limits of the data in literature<sup>2, 14, 15</sup>, where the TSS content was reported to be between 28 and 48%.

In conclusion, the environment and the genetic background may influence variability in the data collected. Further evaluations will be performed for commercial plantings, management and industrial processing.

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