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Indigenous Sour Cherry (*Prunus cerasus* L.) Germplasm of Lake Van Basin

Tarik Yarılgac, M. Fikret Balta, Koray Özrenk and Ferhad Muradoğlu
Department of Horticulture, Faculty of Agriculture, Yüzüncü Yıl University, 65080 Van, Turkey

Abstract: Situated on the eastern Anatolia of Turkey, Lake Van basin with a microclimatic character has genetic resources of sour cherry. This study evaluated fruit characteristics of thirty sour cherry genotypes during 2002-2004. Sour cherry genotypes were selected from the population consisting of native seedling trees. Some physical and chemical traits of 30 promising genotypes were described in comparison with the standard cultivar Kutahya for future breeding efforts. They had a range of 2.01 ± 0.09 to 5.19 ± 0.18 g in fruit weight, 39.8-92.4 mm in fruit stalk length, 0.22 ± 0.01 - 0.53 ± 0.27 g in seed weight, 1.28-2.95% in acidity and 11.0-20.1% in soluble solid contents. The percentage of fruit cracking was 0% in all genotypes. The majority of genotypes had light-dark colored fruit skins, red colored fruit flesh and free separating stones.

Key words: Sour cherry, germplasm, genotype, selecting, Van

INTRODUCTION

The sour cherry originated from an area around the Caspian Sea and close to Black Sea^[1-5]. Anatolia is among origin centers of sour cherry and has its rich genetic resources. In Anatolia, sour cherries have been widely spread out from Amasya, Tokat, Van and Kars provinces and still these provinces are rich in wild germplasm of sour cherry^[6,7]. With annual production of 140.000 tons, Turkey is the 3rd sour cherry producing (1.035.650) country in the world^[8].

Sour cherry breeding usually aims at developing cultivars with improved fruit quality, delayed bloom time to avoid spring freezes and a range of ripening dates. However, many flower and fruit traits such as bloom date, ripening date, fruit dimension, fruit weight, kernel (pit) weight, fruit soluble solids concentration, fruit colour, flesh colour, stem length and thickness, diseases resistance and season of maturity are important for selection in sour cherry breeding criteria^[9,10]. The resistance to spring freeze damage is of the most important breeding objectives for sour cherry in the United States. Spring freeze damage highly limits to sour cherry production and cause significant yield reductions about every three years^[4]. Yield per tree, easily separating of seed from fruit flesh, fitness to the mechanical harvest and resistance to diseases and insects are important criteria in sour cherry cultivars^[9,11,12].

Anatolia is currently rich in native germplasm of sour cherry. Sour cherry production of Turkey comes from not only standard foreign and domestic cultivars, but also seedling trees. Although the Lake Van Region is located

at the East Anatolia region with hard climate structure, it has a microclimatic characteristics due to the effect of high mountains in its around and the Lake Van. In the Lake Van Region, seedling trees of sour cherries are mostly grown. They are not usually affected by late spring frosts. Therefore, the region is suitable to sour cherry production.

The objective of this study was to select promising genotypes in wild sour cherry population and to describe their important fruit characteristics for future breeding efforts.

MATERIALS AND METHODS

Although Lake Van region is situated on eastern Anatolia of Turkey, it displays a microclimatic character. This study was carried out during 2002 and 2004. The altitude of working area was about 1725-1750 m higher than sea level. The material of the study was native sour cherry population which consists of a large number of seedling trees. Taking into consideration the important fruit characteristics for sweet cherry breeding objectives, all wild population was screened. The study evaluated fruit characteristics of thirty sour cherry genotypes selected from the native population. Physico-chemical properties such as fruit width (mm), fruit length (mm), fruit weight (g), fruit stalk length (mm), stone weight (g), acidity (mL), pH, soluble solids (%), fruit cracking (%), stone separation, fruit sourness, fruit skin color and fruit flesh color in comparison with the standard cultivar Kutahya for future breeding efforts for two years. The cultivar Kutahya was grafted onto seedling rootstocks

of *Prunus avium* L. To determine fruit characteristics of each genotype, randomly chosen 30 fruits were used. The harvested fruits were brought to the laboratory and 25 samples from each tree were analyzed by physically and chemically. Weights of fruits and seeds were weight by 0.01 g sensitive balance. The measurement of length and diameter of fruits, the length and diameter of seeds, the length and diameter of fruit stalk was done by using 0.05 mm sensitive-caliper compass. The amount of Soluble Solid Content (SSC %) was determined by a refractometer and pH values of the fruits were taken by a Hanna mark pH meter. The outer and inner colour of hull of fruit, fruit flesh colour, the state of separation of flesh from seed and the taste of fruits are organoleptically evaluated.

RESULTS AND DISCUSSION

As is seen from the tables that the weights of sour cherries changed between 2.01 ± 0.09 and 5.19 ± 0.18 g (Fig. 2 and Table 1). As average, fruit weight of Kutahya sour cherry grafted on *P. avium* was 4.05 g. These values were some over than those of Early Richmond and Kütahya 1355 varieties, which was reported by Karaca *et al.*^[13] as 2.54 and 4.41 g, respectively.

The lengths of fruits were found between 13.9 ± 0.2 and 20.1 ± 0.2 mm and diameter of fruits

15.1 ± 0.3 to 21.3 ± 0.1 mm, fruit stalk lengths 47.2 ± 3.1 to 92.4 ± 2.8 mm, weights of seeds 0.22 ± 0.01 (Fig. 3 and Table 1) -0.53 ± 0.27 g. Traits of “Kutahya” sour cherry cultivar was 17.9 ± 0.2 , 18.4 ± 0.3 , 72.3 ± 2.1 and 0.30 ± 0.03 mm, respectively (Table 1). Similar results were reported by Tekintaş *et al.*^[14] for the varieties of Edremit local area. Skin color is another commonly used indicator of harvest maturity^[11]. According to the results obtained from organoleptical analysis, the fruit skin color of 4 types was red, of 24 types dark red and of 2 types light red. The fruit flesh color of 20 types was red, of 7 types was light red and of 7 types dark red. Fruit flesh color and fruit skin color of Kutahya sour cherry grafted on *P. avium* were red and dark red. The fruit sourness of 12 types was medium and of 9 types was much. The length of fruit-stalk of the 17 genotypes was over 50 mm and these are in the category of the varieties having long fruit-stalk as stated by Christensen^[15].

The balance between Soluble Solid Contents (SSC), pH and titratable acidity is very important and is the most commonly used indicator of harvest maturity. VS-26 had the highest SSC (Fig. 1 and Table 1). As mean value of SSC, total acid and pH of the fruits are in the range of literature (soluble solid contents was between 12-17%, total acid between 1.5-1.8%, pH between 3.1-3.3)^[10,11,16,17]. Thus, SSC 26 of types were researched was over 12%. On the

Table 1: Some fruit attributes of native sour cherry genotypes in comparison with Kutahya cultivar (2002-2004)

Genotype No.	Fruit width (mm)	Fruit length (mm)	Fruit weight (g)	Fruit stalk length (mm)	Seed weight (g)	Acidity (mL)	pH	Soluble solids (%)	Fruit cracking (%)
VS-1	19.9±0.2	17.8±0.2	4.34±0.12	47.2±3.1	0.25±0.01	1.66	3.34	14.2	0
VS-2	16.5±0.2	14.8±0.3	2.76±0.13	63.2±2.1	0.26±0.05	2.49	3.02	17.6	0
VS-3	19.2±0.1	15.6±0.1	3.72±0.07	39.8±1.8	0.22±0.01	1.28	3.46	13.9	0
VS-4	20.0±0.2	19.3±0.2	4.23±0.13	78.4±1.9	0.32±0.01	2.55	3.00	14.5	0
VS-5	19.7±0.2	18.5±0.2	4.20±0.16	72.0±2.3	0.30±0.01	1.81	3.10	14.3	0
VS-6	17.7±0.2	14.1±0.1	2.98±0.10	66.1±1.4	0.30±0.01	2.41	3.28	13.4	0
VS-7	16.4±0.2	14.6±0.2	2.36±0.06	47.0±1.8	0.23±0.06	2.31	3.32	14.3	0
VS-8	16.9±0.1	15.4±0.2	3.18±0.05	63.8±2.3	0.27±0.07	2.24	3.06	13.9	0
VS-9	15.7±0.2	14.5±0.1	2.28±0.07	55.5±1.2	0.23±0.07	2.17	3.25	14.6	0
VS-10	15.1±0.3	13.9±0.2	2.01±0.09	51.6±1.8	0.25±0.06	2.12	3.27	15.0	0
VS-11	17.6±0.2	15.4±0.1	3.30±0.07	64.3±1.5	0.34±0.06	2.95	3.45	11.8	0
VS-12	20.1±0.3	18.0±0.3	4.48±0.23	74.0±1.4	0.41±0.05	2.16	3.02	11.0	0
VS-13	19.1±0.2	17.1±0.1	3.90±0.09	72.5±2.2	0.53±0.27	2.64	2.98	12.8	0
VS-14	18.3±0.2	16.0±0.2	3.44±0.10	67.3±0.7	0.25±0.05	2.17	3.30	14.4	0
VS-15	19.9±0.2	17.8±0.2	4.35±0.16	57.9±2.3	0.29±0.01	2.64	3.35	16.4	0
VS-16	18.8±0.3	17.5±0.2	4.06±0.08	75.7±2.3	0.25±0.05	2.30	3.09	13.2	0
VS-17	19.4±1.0	18.3±0.1	4.40±0.90	71.3±2.0	0.34±0.01	2.27	3.44	12.0	0
VS-18	19.8±0.2	17.9±0.2	4.19±0.15	59.6±1.7	0.30±0.08	2.65	3.10	15.4	0
VS-19	19.8±0.2	18.0±0.2	4.33±0.15	80.6±3.8	0.30±0.01	2.15	3.96	11.6	0
VS-20	20.4±0.1	18.6±0.1	4.90±0.13	66.0±1.0	0.27±0.08	2.14	3.32	12.0	0
VS-21	21.3±0.1	19.2±0.1	5.11±0.07	69.1±2.3	0.29±0.06	2.35	2.88	14.2	0
VS-22	20.8±0.2	18.6±0.1	4.97±0.17	74.3±2.0	0.35±0.08	2.57	3.18	11.8	0
VS-23	19.9±0.4	17.9±0.2	4.70±0.13	52.2±2.8	0.29±0.07	2.58	3.20	15.4	0
VS-24	14.8±0.1	14.1±0.1	2.16±0.06	53.1±1.8	0.25±0.01	2.83	3.22	14.8	0
VS-25	14.6±0.1	14.2±0.1	2.13±0.06	60.0±3.1	0.24±0.05	3.25	3.22	18.6	0
VS-26	16.3±0.2	14.8±0.1	2.81±0.06	67.7±2.9	0.25±0.05	2.65	3.18	20.1	0
VS-27	16.5±0.2	14.9±0.2	2.90±0.09	69.0±3.0	0.26±0.06	2.52	3.22	16.6	0
VS-28	19.1±0.3	18.4±0.3	4.51±0.23	66.9±3.0	0.31±0.01	2.40	3.01	15.3	0
VS-29	19.6±0.1	19.2±0.2	4.47±0.12	80.8±2.2	0.30±0.10	2.48	3.16	12.0	0
VS-30	20.5±0.3	20.1±0.2	5.19±0.18	92.4±2.8	0.39±0.01	2.54	3.15	14.6	0
Kutahya cv.	18.4±0.3	17.9±0.2	4.05±0.07	72.3±2.1	0.30±0.03	2.67	3.89	16.3	0

Table 1: Continue

Genotype No.	Stone separation	Fruit skin color	Fruit sourness	Fruit flesh color
VS-1	Good	Light-red	Less	Light-red
VS-2	Good	Dark-red	Much	Dark-red
VS-3	Good	Light-red	Less	Light-red
VS-4	Good	Dark-red	Medium	Red
VS-5	Good	Dark-red	Medium	Red
VS-6	Good	Dark-red	Medium	Red
VS-7	Good	Dark-red	Much	Red
VS-8	Good	Dark-red	Less	Red
VS-9	Good	Dark-red	Medium	Light-red
VS-10	Good	Dark-red	Less	Red
VS-11	Good	Dark-red	Much	Light-red
VS-12	Good	Red	Medium	Red
VS-13	Medium	Dark-red	Medium	Red
VS-14	Good	Dark-red	Medium	Red
VS-15	Medium	Dark-red	Much	Dark-red
VS-16	Medium	Dark-red	Less	Red
VS-17	Good	Dark-red	Medium	Red
VS-18	Good	Dark-red	Much	Red
VS-19	Good	Dark-red	Less	Red
VS-20	Medium	Dark-red	Less	Red
VS-21	Medium	Dark-red	Medium	Red
VS-22	Medium	Red	Medium	Light-red
VS-23	Good	Dark-red	Much	Red
VS-24	Good	Dark-red	Medium	Red
VS-25	Medium	Dark-red	Much	Red
VS-26	Good	Dark-red	Much	Dark-red
VS-27	Good	Red	Medium	Red
VS-28	Medium	Red	Less	Red
VS-29	Medium	Dark-red	Much	Red
VS-30	Medium	Red	Less	Red
Kutahya cv.	Medium	Dark-red	Medium	Red



Fig. 1: Fruits of VS-26 with the highest SSC

other hand, SSC of the fruits obtained was over than those reported by Tekintaş *et al.*^[4].

The results showed that some sour cherry genotypes grown in Van province had promising characteristics for local breeding efforts in the region when the other varieties grown in the some part of the world are compared. It should be pointed out that climate of the province with 1725 m altitude is very heavy and winter duration takes about 5 or 6 months and temperature sometimes goes as low as -28 and -29°C. Additionally,



Fig. 2: Fruits of VS-30 with the highest fruit stalk length and fruit weight

softness effect of the lake Van (the biggest lake of Turkey) on the climate creates the characteristics of microclimate.

Moreover, all fruit trees investigated during this study were in the family gardens and except irrigation no another care activities were observed. Therefore, it is



Fig. 3: Fruits of VS-3 with the lowest seed weight

certain that in case of more appropriate care conditions, it will be possible to get more productive and good quality sour cherries. As a suggestion, all types having fruit weights more than 3 g and with high quality of fruits investigated in this study should be propagated by vegetative propagation methods and thus these natural forms should be studied in more detail related to good fruit properties and resistance to cold climate conditions.

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