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Studying The Chemical Composition Of Apple Fruits Of Different Ecological And Geographical Groups

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ABSTRACT

The article presents the results of studying the chemical composition of fruits of different varieties of apple trees. The study of the chemical composition of apple fruits showed that the place of breeding and growth of the variety directly depends on the increase in the chemical composition of the fruit. The following apple varieties were identified: by dry matter - Afghan 255603, Roksa Red Delicious; by the amount of sugars - Georges kav, Jonared; by the amount of sucrose - Carnel Red, Georges Kav, Zarya Podolia, Mariorik Pia; for titratable acidity - Afghan 255603; for ascorbic acid - Grafenstein red, Calville Lezanne, Renet June, Apple-tree Gissar. These varieties can be used in breeding programs and introduced into production.

KEYWORDS

Apple tree, variety, chemical composition of fruits, dry matter, sugar, titratable acidity, pectin substances, sugar-acid index.

INTRODUCTION

When determining the value of a particular apple variety, the biochemical characteristics of the fruits are of great importance. The chemical composition determines the taste, nutritional, therapeutic and prophylactic and technological qualities of the fruit. A significant number of works by both domestic

and foreign authors are devoted to the study of the chemical composition of apples [1-4].

Interest in apple fruits as a source of vitamins and other valuable nutrients has increased significantly in recent years. The advantage of apples in relation to the fruits of other fruits and berries is the possibility of growing them

in a wider range and fresh consumption all year round.

The chemical composition of the fruit depends on the biological characteristics of the variety, growing conditions, degree of maturity and a number of other reasons. It is not the same for varieties of different ripening periods and growing areas.

A significant improvement in the chemical composition of apple fruits can be achieved by selection, as well as the introduction of introduced and local varieties into production.

RESEARCH METHODOLOGY

We have studied the chemical composition of fruits of different varieties of apple trees in the Scientific Research Institute of Horticulture, Viticulture and Winemaking named after Academician M. Mirzaev and the Scientific Research Institute of Plant Growing. Experiments and analyzes were carried out according to the method of biochemical research of plants [1].

RESEARCH RESULTS

At the Research Institute of SViV, we studied the chemical composition of the apple-tree fruits of the Institute's selection and foreign varieties (Fig. 1-6).

According to long-term data, the study of the chemical composition of apple fruits has shown that the variety Seyanets Aporta (SRI SViV) is on average higher in the content of ascorbic acid and P-active catechins. At the same time, the fluctuations of these two indicators differ greatly: ascorbic acid - 1.03-25.70 mg% and P-active catechins - 132-382 mg%. Also, the variety of the institute's selection - Chulpan, in terms of dissolved pectin (1.10%) and protopectin (0.64%) has a higher rate than other varieties. This means that varieties created at the place of growth

are more chemically rich and can be used in breeding and introduced into production.

The fluctuation over the years of ascorbic acid ranges from 3.90-4.90 mg% (Calvil Tashkent) to 1.03-25.70 mg% (Seedling Aport); dissolved pectin - from 0.22-0.58 mg% (Seedling Aporta) to 0.82-1.53% (Chulpan); protopectin - from 0.41-0.57% (Tashkent Calvil) to 0.22-0.82% (Aporta Seedling); P-active catechin - from 64-70 mg% (Calvil Tashkent) to 132-382 mg% (Seedling Aporta); tannins and dyes - from 93-107 mg% (Aport Seedling) to 91-132 mg% (Chulpan); titratable acidity - from 0.70-1.0% (Winter gold Parmen) to 0.79-1.74% (Tashkent Kalvil). High and low fluctuations in these indicators are clearly manifested in rainy years, dry years, cool springs and hot summers (Table 1).

At the Research Institute of Plant Growing (Botanika village, Kibray district, Tashkent region, Uzbekistan), we also studied the chemical composition of the fruits of various apple varieties in collection plantations. As our research has shown, the dry matter in apple fruits varies from 16.3% to 19.8%; the amount of sugars is from 7.6 to 11.2%; titratable acidity from 0.4 to 1.2%; ascorbic acid from 2.0 to 4.2 mg / 100 g. Among the many varieties, the following apple varieties stand out in terms of the richness of the chemical composition of the fruits: on dry matter - Afghan 255603, Roxa Red Delicious; by the amount of sugars - Georges kav, Jonared; by the amount of sucrose - Carnel Red, Georges Kav, Zarya Podolia, Mariorik Pia; for titratable acidity - Afghan 255603; for ascorbic acid - Grafenstein red, Calville Lezanne, Renet June, Apple-tree Gissar.

Figure: 1. Diagram of ascorbic acid by apple varieties, mg%

Figure: 2. Diagram of dissolved pectin by apple varieties, % on wet weight

Figure: 3. Diagram of protopectin by apple varieties, % on wet weight

Figure: 4. Diagram of catechins by apple varieties, mg%

Figure: 5. Diagram of tannins and dyes by apple varieties, mg%

Figure: 6. Diagram of titratable acidity by apple varieties, % on wet weight

Note: V - Vainsep, K - Tashkent Kalvil, P - Winter golden Parmen, S - Aporta Seedling, Ch - Chulpan.

Table 1.

The chemical composition of the fruits studied at the N.V. acad. M. Mirzaeva (on average for 1969-1989)

Indicators \ Varieties	Weinsep	Calvil Tashkent	Parmen winter gold	Seedling Aport	Chulpan
Ascorbic acid, mg%	5,37 (1,64-7,89)	4,35 (3,90-4,90)	2,90 (1,96-4,0)	12,07 (1,03-25,70)	4,99 (3,0-13,30)
Pectin substances,% wet weight:					
dissolved pectin	0,84 (0,44-1,17)	0,83 (0,40-0,99)	0,99 (0,74-1,13)	0,48 (0,22-0,58)	1,10 (0,82-1,53)
protopectin	0,39 (0,26-0,67)	0,50 (0,41-0,57)	0,59 (0,45-0,98)	0,59 (0,22-0,82)	0,64 (0,53-0,96)
P-active substances, mg%:					
catechins	136,48 (105-176)	66,13 (64-70)	129,64 (106-167)	216,24 (132-382)	109,67 (76-133)
tanning and dyeing substances	95,50 (84-111)	115,0 (106-123)	110,80 (96-133)	97,60 (93-107)	104,43 (91-132)
Titrateable acidity,% wet weight	0,83 (0,56-1,14)	1,17 (0,79-1,74)	0,91 (0,70-1,0)	0,72 (0,60-0,99)	0,72 (0,30-1,16)

Note: in brackets are the minimum and maximum values of the indicators of the chemical composition.

The ratio of sugar to acid characterizes the taste of the fruit. With high acidity or low sugar content, the sugar-acid ratio is less than 10, the fruits are usually of low taste. It is desirable that the sugar-acid ratio is 15-30. Varieties with fruits of high taste had a sugar-

acid coefficient of 20-34: Jonared, Low Red Rom Beauty (25.5), Registani (24.0), Zarya Podolya (23.5), Goldenspur, Souvenir (23.0), Carnel ed, Stark red gold (22.5), Huukas Red Delicious (22.0), Starking (21.5), Laspi (20.5). The results are shown in Table-2.

Table 2.

Study of the chemical composition of fruits of various apple varieties in collection plantations (NIIR, 2009-2011).

Variety name	Dry matter, %	Sugar, %		Titratable acidity	Vitamin C, mg / 100 g	Sugar acid index
		sum	including sucrose			
Afghan 255592	19,0	8,2	2,0	1,0	3,8	8,2
Afghan 255602	19,5	8,5	1,4	1,0	4,0	8,5
Afghan 255603	19,8	8,0	1,2	1,2	3,7	6,7
Bath beauty	18,7	8,8	2,0	0,6	2,8	14,7
Weinespur	18,0	9,2	1,0	0,5	3,2	18,4
Valentine	19,0	8,4	2,0	0,5	3,0	16,8
Golden spy	18,4	10,0	1,0	0,6	3,0	16,7
Goldenspur	18,2	9,2	1,8	0,4	3,4	23,0
Grafenstein red	17,5	10,0	1,8	0,6	4,2	16,7
Grushovka almaty	19,0	8,0	2,4	0,8	4,0	10,0
Jonared	18,6	10,2	1,5	0,4	4,0	25,5
Jonathan M-41	18,6	8,8	1,0	0,6	3,2	14,7
Julie ed	19,4	9,2	2,4	0,6	2,5	15,3
Georges Cave	19,2	11,2	3,0	0,8	3,5	14,0
Zarya Podillya	18,8	9,4	3,0	0,4	2,2	23,5
June peach	17,0	8,2	1,0	0,6	3,0	13,7
Calville Lezana	19,4	8,8	1,0	0,5	4,2	17,6
Calvil snow	18,6	9,2	1,0	0,5	3,0	18,4
Canada red	18,5	10,0	1,8	0,6	4,0	16,7
Carnel ed	19,4	9,0	3,2	0,4	2,8	22,5
Kyzyl taram alma	19,2	8,5	1,2	0,6	3,2	14,2
Kizgish	18,2	9,0	1,0	0,8	3,5	11,3
Kyzyl alma early	18,8	8,4	1,4	0,5	3,0	16,8
Cooper 50	18,0	9,0	2,0	0,6	3,4	15,0
Cooper 7dL2	17,8	9,7	2,1	0,6	2,0	16,2
Laspi	18,8	8,2	1,0	0,4	2,8	20,5
Liberty	19,0	8,2	1,8	0,6	2,6	13,7
Lowe Red Rom Beauty	18,0	10,2	1,2	0,4	3,7	25,5
Mariorik pia	18,8	9,2	3,0	0,5	3,0	18,4
Morspur Golden Delicious	18,8	9,7	1,5	0,6	3,0	16,2

Neiser Claratel	19,2	8,0	1,6	0,6	4,0	13,3
Niagara	18,6	9,0	2,0	0,5	3,6	18,0
Ottawa 0342	19,0	8,2	1,2	0,5	3,4	16,4
Peach Irish	17,2	9,0	1,0	0,8	3,5	11,3
Register	18,8	9,6	2,4	0,4	2,4	24,0
Red Atlas	19,0	9,8	1,8	0,6	3,7	16,3
Reneth pineapple	17,2	8,5	1,5	1,0	4,0	8,5
Reneth June	18,2	7,8	1,0	0,8	4,2	9,8
Pink table	18,7	8,2	1,0	0,7	3,0	11,7
Roxa Red Delicious	19,8	8,8	2,8	0,8	4,0	11,0
Blush Almaty	18,6	9,3	2,6	0,8	4,0	11,6
Samir	18,0	9,2	2,0	0,5	3,0	18,4
Segledi	18,0	10,2	2,4	0,6	4,0	17,0
Stark red gold	18,0	9,0	1,0	0,4	3,7	22,5
Starking	19,2	8,6	1,0	0,4	3,0	21,5
Starkspur ed	19,4	9,6	2,8	0,6	4,0	16,0
Starkspoor Airleyblaze	17,0	8,0	1,0	0,8	3,5	10,0
Souvenir	16,5	9,2	1,0	0,4	2,7	23,0
Surprise	18,2	9,4	1,0	0,8	3,2	11,8
Tabiston	16,3	10,0	1,2	0,7	2,3	14,3
Hucas Red Delicious	19,0	8,8	2,8	0,4	2,8	22,0
Shah alma	18,2	8,3	1,0	0,6	3,5	13,8
Steyr Maskankir	18,6	9,4	1,0	0,6	2,8	15,7
Edelrother	18,4	8,0	2,0	0,4	3,0	20,0
Airlieblaze	17,0	8,0	1,0	0,8	3,5	10,0
Apple-tree Hissar	17,4	7,6	2,8	0,8	4,2	9,5
min.	16,3	7,6	1,0	0,4	2,0	6,7
Max.	19,8	11,2	3,2	1,2	4,2	25,5
Wednesday	18,5	9,0	1,7	0,6	3,3	15,8
Dispersion, s ²	0,646	0,579	0,484	0,034	0,324	22,344
Standard. off, s	0,804	0,761	0,696	0,184	0,569	4,727
Coef. variations, V	4,356	8,488	41,194	29,814	17,066	29,850
Sampling error,	0,107	0,102	0,093	0,025	0,076	0,632

CONCLUSIONS

1. Long-term experiments on the study of the chemical composition of apple fruits have proved that the place of breeding and growth of the variety directly depends on the increase in the chemical composition of the fruit.
2. Strong and weak fluctuations in the indicators of the chemical composition depends on the weather conditions of the year and the variety.
3. In the study of collection varieties of apple trees were identified: dry matter - Afghan 255603, Roxsa Red Delicious; by the amount of sugars - Georges kav,

Jonared; by the amount of sucrose - Carnel Red, Georges Kav, Zarya Podolia, Mariorik Pia; for titratable acidity - Afghan 255603; for ascorbic acid - Grafenstein red, Calville Lezanne, Renet June, Apple-tree Gissar. These varieties can be used in breeding programs and introduced into production.

4. For a complete study of the chemical composition of apple fruits, it is necessary to replenish the collection plantations of the research institute with local varieties and forms.
5. It is necessary to expand the use of varieties with a rich chemical composition of fruits in the diet of the population.

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