



UDC 634.11:577.1

## GROUNDING OF USE OF MODERN APPLE VARIETIES FOR THE PRODUCTION OF FRUIT WINES AND FRESH CONSUMPTION BASED ON BIOCHEMICAL RESEARCH

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**Abstract.** Complex of biochemical indicators modern late varieties of apples, which forming nutritional and biological value of fruits was analyzed. Calculated rating grade of the researching varieties. Florina, Champion, Radoghost, Scythian gold, Todes and Pearl of Kyiv are the most valuable varieties according to the researching indicators.

**Keywords:** apple, fruit, biochemical composition, grade, stability.

### Introduction.

Apples are very common grown species all over the world. Importance of apple fruits as a source of easily digestible biologically active substances for population and processing industry difficult to grade. World marketable production of apples is more than 76 million tons. Leader of production China – more than half (more than 40 million tons), second state EU – more than 12, USA – 4,7, Turkey – 4,3, India 2.3 and others [1,2,4].

In recent years Ukraine exports fruits to more than 65 countries, export volumes are always growing. Therefore, Ukraine becomes a strong player in apple market of the Europe and world [2].

Fruit quality is determined by complex of indicators, which characterizing their special properties, consumer value and purpose (size, shape, color, scent, taste, freshness, ripeness, skin and flesh defects, etc). Biochemical composition of fruits is characterizing biological value of products, so balanced diet allows effectively resist



to stress factors, prevention and progressing of many human diseases [3, 8].

For providing production competitive products and providing humanity valuable products it is advisable to select varieties, which characterizing high productivity, marketability, suitability for mechanized harvesting, resistance to diseases, suitability for processing, and high indicators of important nutrients. In Ukraine consumption of apples is more than 15 kg for human now, but tendency is unstoppable growing. Experts predict, that in a closest time this indicator will reach the European level - 23 kg/year per person. And it will cause increase the demand in the inner market. At the same time in Ukraine consumption of fruits, berries and grapes is 53 kg on average [3, 5,6].

Volumes of consumption of fruit products by the population have influence on a health of the nation. Therefore, buying fresh products, the consumer hopes to receive not only structured water and fiber, but a complex of vital nutrients necessary for their bodies. Currently, there is a large number of varieties on the market that are different in shape, color, size, chemical-technological indicators, with different nutritional value, but they do not have enough experimentally confirmed data regarding the comparison of the chemical composition of the fruits and their suitability for the production of juices and ciders [3].

#### **Research materials and methods.**

The research was conducted in data Institute of Horticulture NAAS of Ukraine and at the department of technology of storage, processing and standardization of planting products named after B.V. Lesika, NULES of Ukraine. Long-term data Institute of Horticulture NAAS of Ukraine were used for the analysis. Fruits were selected in the consumer degree of maturity according to STU 8323:2015, the sample size for analysis accorded ISO 874-2002. Dry soluble substances (DSS) were determined by ISO 2173-2013, amount of sugars – STU 4954:2008, of titrated acids (TA) – STU 4957:2008, polyphenols substance (PhS) – STU 4373:2005, pectin substances – STU 8069:2015, ascorbic acid (AA) – ISO 6557-2:2014. The stability of the indicator was determined by the value of the coefficient of variation. The best variety is selected by ranking all indicators by value. Statistical data processing was carried out according to generally accepted methods [7].

#### **Results and their discussion.**

The presented analysis of long-term research on the study of fruits of late varieties of apples revealed a different ability to form valuable components of the biochemical composition.

The average content by varieties is 13.2%, at the same time, the lowest value of this indicator was noted in the fruits of the variety Scythian gold (10,14%), and the highest – Florina (15%) (table). The coefficient of variation over the years of research did not exceed 10%, in the varietal section, the highest values were observed in the following varieties: Renet Semerenko (9,4%), Scythian gold (11,5) and Champion (8,1%). The investigated indicator was characterized by high stability.

The average sugar content of the studied varieties is 8.7%. The minimum amount of sugars is noted in the variety Remo (7,77 %), and maximum amount – Florina (10,96 %). The highest stability of this indicator was observed in varieties Radoghost, Scythian gold and Florina (до 5 %). The coefficient of variation of more



than 10% was noted in the varieties: Amulet, Renet Semerenko, The pearl of Kyiv and Todes.

### Biochemical indicators of apples

Variety	DSS <sup>1</sup>		Sugars		TA <sup>2</sup>		SAI <sup>3</sup>	
	%	V, %	%	V, %	%	V, %		V, %
Amulet	12,97	5,6	8,61	10,4	0,41	36,6	24,36	36,2
The pearl of Kyiv	13,61	4,7	8,42	12,6	0,57	15,0	15,34	18,7
Radoghost	13,31	3,4	8,23	2,9	0,62	23,7	14,16	23,7
Revena	13,08	7,3	9,04	9,9	0,83	39,3	14,82	55,8
Remo	13,09	4,2	7,77	9,3	0,88	5,4	8,95	15,5
Renet Semerenko	12,29	9,4	8,22	10,9	0,89	7,1	9,43	17,9
Scythian gold	13,16	11,5	9,50	3,6	0,72	19,7	13,81	15,1
Todes	12,63	2,2	8,39	10,5	0,77	9,5	11,16	16,4
Champion	13,33	8,1	8,73	9,1	0,68	11,0	13,22	19,7
Florina	14,58	1,9	10,04	4,5	0,38	49,3	32,78	27,7
Average	13,20	3,1	8,70	3,9	0,67	13,0	15,80	24,67
LSD <sub>0.95</sub>	1,34	3,6	1,23	3,1	0,23	7,8	11,35	18,44

<sup>1</sup>Dry soluble substances, <sup>2</sup>Titrated acidity, <sup>3</sup>Sugar-acid index

Variety	PhS <sup>4</sup>		PS <sup>5</sup>		AA <sup>6</sup>	
	mg/100 g	V, %	mg/100 g	V, %	mg/100 g	V, %
Amulet	148,25	11,4	0,81	16,71	3,45	63,04
The pearl of Kyiv	161,00	39,1	1,05	22,41	3,25	47,69
Radoghost	179,75	6,8	1,03	17,49	6,45	39,53
Revena	144,50	36,3	0,96	29,59	5,00	63,00
Remo	106,75	16,2	1,01	15,33	2,65	36,79
Renet Semerenko	124,00	21,4	0,99	18,59	3,35	30,60
Scythian gold	130,25	21,0	0,89	23,49	4,70	37,23
Todes	116,25	7,8	0,94	17,30	6,53	36,40
Champion	168,00	20,2	0,79	2,19	7,31	28,58
Florina	121,75	12,8	0,63	10,12	5,23	27,27
Average	140,05	19,3	0,91	31,25	4,79	41,01
LSD <sub>0.95</sub>	22,3	9,4	0,23	5,7	1,4	14,8

<sup>4</sup>Phenol substances, <sup>5</sup>Pectin substances, <sup>6</sup>Ascorbic acid.

An important technological indicator is the amount of titrated acids. The average amount of this indicator for these varieties is 0.67%. The highest value of this indicator was noted in the fruits of the varieties (more than 0.8%, such fruits are characterized by a sweet-sour taste): Revena, Remo and Renet Semerenko. A low value of this indicator causes the predominance of the sweet taste of fruits, which introduces disharmony into the tasting evaluation. A low TA content (below 0.5%) was noted in the following varieties: Amulet and Florina. The coefficient of variation of this indicator varies by variety. Varieties were characterized by higher stability (up to 10%): Remo, Renet Semerenko and Todes.

The taste characteristics of the fruits were analyzed using the sugar-acid index. Fruits with an index of 15-20 are characterized by a harmonious (sweet-sour) taste, the following varieties can be included here: The pearl of Kyiv, Radoghost and Revena.



The sour taste prevailed in the fruits of the varieties: Remo, Renet Semerenko and Todes. Sweet taste prevailed in fruits of Amulet and Florina. This indicator is quite unstable.

Complex of natural polyphenol is an important component of taste of fruits and wine materials. The average value of these compounds in the investigated varieties is – 140 mg/100 g of crude substance. More of these compounds are able to accumulate varieties: Radogost and Champion . The most stable indicator was in grades Radogost and Todes.

Pectin substances are of great importance in the formation of biological value of fruits, but have a negative impact on stability of wine materials. The most pectin substances are formed in the fruits of varieties: Pearl of Kyiv, Radogost and Remo. The most stable according to this indicator is the sort of Champion.

Apple tree fruits unable to form large concentrations of AA and in the process of fermentation this compound is fully used by yeast. But given the availability of this product for the population and for the processing industry, apples are excellent raw materials. The average content of the AA by the investigated varieties is – 1,4 mg/100 g of raw weight. The largest content of AA is marked in the grade of Reven. The coefficient of variation indicates that this indicator is completely unstable and depends on many factors.

Analyzing the complex of indicators of biochemical composition of apple fruits of modern varieties, found the most valuable Florina, Champion, Radogost, Scythian gold, Todes and Pearl of Kyiv. Fruits of these varieties are recommended for preparation of high-quality cider wine materials.

### **Conclusions and suggestions.**

The investigation revealed differences in biochemical composition and stability of the investigated indicators. The most valuable fruits for consumption and theoretical preparation of high-quality cider wine materials are varieties: Florin, Champion, Radogost, Scythian gold, Todes and Pearl of Kyiv. Further research will be carried out by preparation of cider wine materials from these varieties. The obtained data should be taken into account in selection of grades for production of dietary output of improved quality and child nutrition.

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