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**FORMATION OF AROMATIC SUBSTANCES IN TABLE APPLE WINE  
MATERIALS DEPENDING ON STORAGE LENGTH OF FRUIT**

**V. VOYTSEKHIVSKIY**

*National University of Life and Environmental Sciences, Kiev, Ukraine*

**A. TOKAR**

*National university of horticulture, Uman*

**I. SMETANSKA**

*University of Applied Sciences Weihenstephan-Triesdorf, Agricultural Faculty,  
Weidenbach, Germany*

*E-mail: vinodel@i.ua*

**Abstract.** *The research results of changes that happen with aromatic substances (of terpene alcohols) in apple wine material depending on storage length of fruit are submitted. The research found that for getting qualitative table wine materials is reasonable to storage fruit Rubinove Duky sort in the storehouses without artificial cooling no longer than 10 days.*

**Keywords:** *fruit, apple-tree, wine materials, terpenoids, storing, quality*

Quality of fruit wines and drinks depends on interrelated factors complex. Light aromatic substances are causing pleasant scent of fruit that appears intensely only in the process of fruit maturing. These are chemical compounds such as terpenes, higher alcohols, monocarboxylic acids, esters, ketones and aldehydes, but they can acetify very fast, turn into polymers, and lose their properties under the influence of oxygen, storing, yeast etc. [1-3, 7]. The composition of aromatic compounds some kinds of fruit largely depends on sort, ripeness, growing and storage conditions. Among many aromatic components there are specific for kind or sort of fruit. The main role in the scent formation for certain fruit and products for processing is played by esters, terpenes and aldehydes; higher alcohols and volatile acids play a minor role [1,4]. In plants, terpenoids synthesized from 20-40moreover one -two substances are in significant concentrations and other are in quite low. In most cases the main role in the formation of sortscent fruit and food for processing belongs terpene alcohols, which are concentrated in fruit in free and bound conditions [2, 5]. There are data that the intensity of the scent also depends on the concentration

of esters [12]. In fruit juices aromatic substances undergo significant changes: during crushing, pressing, fermentation esters destruct to organic acids and alcohols, unstable aldehydes with intense scent and the decreasing of terpenes is observing [3, 4, 6, 12].

In spring, during the mass harvesting of fruit is not always possible and reasonable the transportation and processing of large mass of material. According to the main rules of fruit apple wine production before processing fruit should be on the raw plat form no more than two days [9], when under the current technological instruction in production of juices is allowed to store apples of autumn-winter sorts on the raw platform during 5-7 days and for 40-60 days with the temperature 0-3 °C in cooling storages [11]. Fruit raw often storage in the specialized storage houses with or without artificial cooling. There are not enough data about impact of storage length on the amount of juice and change of terpene compounds concentration in apple wine materials, quality and suitability of fruit to processing. This was the reason to research.

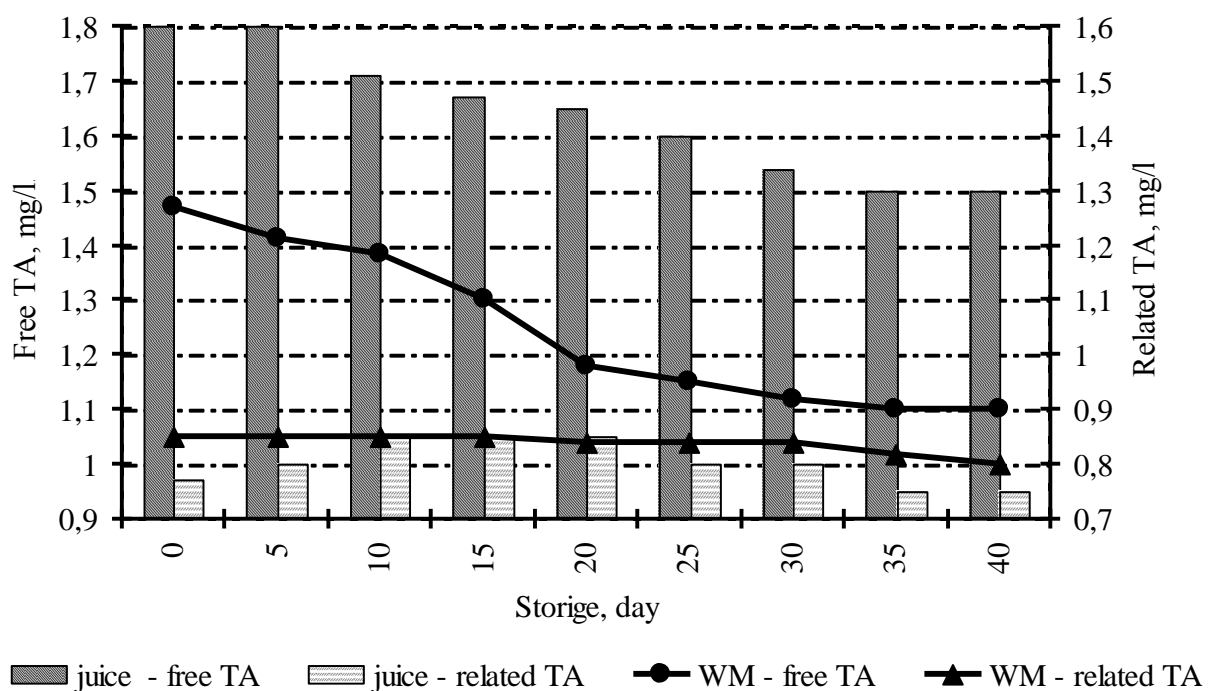
Goal – the research of impact on amount of juice by apples storage length in the specialized storage house without artificial cooling, scent formation and quality of fruit wine materials.

**Material and methods of the research.** The research is done in the laboratory of innovative food technologies Institute of Horticulture (IH) NAAS, department of storage technology, processing and product standardization at the B. V. Lesyk of NULES of Ukraine and at the department of storage technology and processing of fruits and vegetables Uman National University of Horticulture. Apples Rubinove Duky sort (selected as an example of high technological reserve of aromatic substances) is on the stage of maturity crew were laying on short-term storage at research farm «Novosilky» Research Institute NAAS. Raw for processing was stored in specialized storehouse without artificial cooling in containers (200-220 kilo). Fruit for processing selected with an interval 5 days then juice was extracted, settled and fermented, then it was left for storing in a hermetic container. Samples of wine materials (WM) which were got investigated by biochemical and organoleptic

characteristics. Organoleptic assessment carried out by eight-point scale, the chemical composition of the wort before fermentation and wine materials were determined by the methods adopted in winemaking [8, 10].

**Results of the research.** During storage in fruit happen physiological and physical processes such as respiration and evaporation of water. Loss of fruit moisture changes its technological characteristics, especially juice yield. Juice yield from apples of Rubinove Duky sort at the moment of storage deposition was 62 %, in 10 days it increased by 3 % and was 65 %, but then the amount of juice was decreasing: on the 20<sup>th</sup> day of apple storage in the specialized storehouse without cooling it was by 9 % less.

During the fermentation of apple mash undergoes significant quantitative and qualitative changes all the biochemical composition. Established that reducing the concentration of free terpene alcohols (TA) in mash was more than 29 % related – 12 % (figure).



**Figure. Changes of free and bound terpene alcohols (TA) in apple table wine materials.**

In the resulting fruit juices after storage for various terms contained varying concentration of the aromatics compared with the control (without storage). depending on the duration of fruit storage. In all samples of fruit juices noted a concentration decreasing of free terpene alcohols after 10-20 storing days was 5,0 – 8,3 %, 40 days – 16,7 %, at the same time a content of bounded TA was increasing during fruit storage for 15-20 days by 7,6 % and after 40<sup>th</sup> day was decreasing by 2,1 %.

Wine materials obtained from the fruit of the varying storage length contain much lower concentrations of studied substances. Content of free terpene alcohols in the WM prepared from the fruit after 10-15 days of storage decreased by 6.3 %, 20 days – by 25,2 %, 30 and 40 days – by 27,2 % and 29,7 % respectively. Content bounded terpene alcohols barely decreased after 20 days of storage at 1.2 %, after 40 days at 5.8 %, the data value within the error of research. These changes are associated with a lower content of these substances for fermentation, oxidation of free terpene alcohols to less non-aromatic substances, but at the same time bounded terpenoids are changing into free.

Samples of apple table wine differed in optical density (transparency) and organoleptic marks (table).

### **Organoleptic indexes of apple table WM from Rubinove Duky**

Storage, day	Characteristic of wine materials	Optical density, D <sub>420</sub>	Testing mark, ball
control sample	light opal, harmonious aroma, full taste	0,41	7,90
5	light opal, harmonious aroma, harmonious taste	0,40	7,90
10	light opal, expressed varietal aroma, harmonious taste	0,40	7,80
15	opal, expressed varietal aroma, full harmonious taste	0,44	7,79
20	opal, expressed varietal aroma, full taste	0,48	7,75
25	opal, less expressed aroma than control sample and sample №4, notfull taste	0,50	7,65
30	opal, less expressed aroma than control sample, not full taste	0,55	7,60
35	muddy sample, aroma is weaker than the storage of 25 days, the taste has light foreign tones	0,60	7,50
40	muddy sample, weaker aroma, the taste has light foreign tones	0,62	7,45

Analysis of the data revealed that transparency WM made from the fruit after 15 days storage worsened by 10 %, 20 days – by 20 %, after 40 days – by 51,2 %. Organoleptic indexes of WM which were got from apples after 10-20 days storage were at 0,10-0,15 points lower than the control sample, after 30 and 40 days storage they decreased respectively by 0,30 and 0,45 points.

**Conclusion.** The amount of juice from apples of Rubinove Duky sort after 10 days storage increases by 3 % but for further storage it decreases. The result of the research of changes terpene alcohols during fermentation of apple table wine materials set that a free terpene alcohols concentration decreases by 29 % but bounded just by 12 %. To prepare quality apple table wine materials advisable to minimize the storage time before processing fruits. If necessary, it is advisable to keep the fruit of Rubinove Duky sort maximum 10 days, which doesn't degrade the quality of wine materials. Prolonged storage from 20 to 40 days causes a significant decreasing of free terpene alcohols (40 %) and bounded (15 %) in wine materials, the juice yield decreases by 9 % and quality in general. Making wine materials from the fruit after storage leads to reduced transparency (optical density), after 15-20 days by 10 % and 20 %, and after 40 days by 51,2 % that negatively effect on the organoleptic properties and quality of wine materials. The data is expedient to consider when planning storage and processing of apple fruit to produce quality and competitive domestic products, including fruit alcoholic beverages.

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## **ФОРМУВАННЯ АРОМАТИЧНИХ РЕЧОВИН У СТОЛОВИХ ЯБЛУЧНИХ ВІНОМАТЕРІАЛАХ ЗАЛЕЖНО ВІД ТРИВАЛОСТІ ЗБЕРІГАННЯ ПЛОДІВ**

**В. Войцехівський, А. Токар, І. Сметанська**

*Анотація.* Представлені результати дослідження змін ароматичних речовин (терпенових спиртів) у яблучних виноматеріалах залежно від терміну зберігання плодів. Дослідженнями встановлено, що для отримання якісних столових виноматеріалів доцільно зберігати плоди сорту Рубінове Дуки у сховищі без штучного охолодження не довше 10 діб.

**Ключові слова:** *плоди, яблуна, виноматеріали, терпеноїди, зберігання, якість*

**ФОРМИРОВАНИЕ АРОМАТИЧЕСКИХ ВЕЩЕСТВ В СТОЛОВЫХ  
ЯБЛОЧНЫХ ВИНМАТЕРИАЛАХ В ЗАВИСИМОСТИ ОТ  
ДЛИТЕЛЬНОСТИ ХРАНЕНИЯ ПЛОДОВ**  
**В. Войцеховский, А. Токарь, И. Сметанская**

*Аннотация.* Представлены результаты исследований изменения ароматических веществ (терпеновых спиртов) в яблочных виноматериалах в зависимости от продолжительности хранения плодов. Исследованиями установлено, что для получения качественных столовых виноматериалов целесообразно хранить плоды сорта Рубиновые Дуки в специализированном хранилище без искусственного охлаждения не более 10 суток.

**Ключевые слова:** плоды, яблоня, виноматериал, терпеноиды, хранение, качество