ORIGINAL PAPER

EXPLORING TOMATOES DEHYDRATION TECHNOLOGIES: EFFECTS ON NUTRITIONAL AND FUNCTIONAL QUALITY

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Abstract. *Tomatoes (Lycopersicum esculentum) are important sources of vitamin A, C, folic acid, potassium, as well as fiber and healthy fats, constituents that can ensure a healthy diet. The rich nutritional composition of tomatoes includes phenolics and carotenoids that position them as a functional food. Drying is an essential method for avoiding microbial spoilage of food. Dehydration of tomatoes leads not only to biological stability but also to a large variety of food available all year round, without requiring particular storage conditions such as refrigeration. Dried tomatoes contain nutrients and antioxidants such as lycopene and beta-carotene, which give them their red color. The processing methods are critical for the quality of the dried tomatoes. This study investigated the influence of pretreatment (i.e., ultrasonication), hot air drying, and vacuum drying on the quality attributes of two cherry tomatoes, namely Aurora and Rutgers. Ultrasonic-hot air drying led to an increase of the dry matter (d.m.) content from 33.87 ± 0.08% to 79.37 ± 0.21% (Aurora variety), respectively from 34.32 ± 0.17% to 78.69 ± 0.24% (Rutgers variety). Comparing the drying methods, ultrasonic-vacuum air drying can be recommended to dehydrate tomato samples to avoid a high degradation of lycopene. Applying this method, the amount of lycopene ranged from 9.71 ± 0.16 mg/100g d.m. (Aurora variety) and 8.69 ± 0.12 mg/100g d.m. (Rutgers variety) in fresh tomatoes to 8.50 ± 0.20 mg/100g d.m. (Aurora variety) and 7.75 ± 0.10 mg/100g d.m. (Rutgers variety) In dehydrated products. Vacuum drying proved to be a suitable technique for obtaining dehydrated tomatoes with good quality, a further detailed assessment of other changes in sensorial and chemical terms being needed.*

Keywords: *Tomatoes; dehydration; ultrasonication; vacuum.*

1. INTRODUCTION

Tomatoes (*Lycopersicum esculentum*) are rich sources of health functional compounds such as phenolics, vitamins (ascorbic acid, vitamin E, and folic acid), and microelements (mainly potassium) in addition to basic nutritional compounds [1-3]. The high concentration of antioxidants present in tomatoes, such as phenolics, ascorbic acid, and carotenoids, is correlated with their biological value, including the ability to prevent some kinds of cancers in humans [4].

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Tomatoes are relatively easy perishable vegetables. Damaging the integrity of their skin allows the cell sap to be outsourced with increased potential for moulds attack. Besides the wastage issue [5-7], a surplus during peak harvesting period and unavailability during off-seasons [8] can occur. At least for these reasons, new food products can be obtained through processing tomatoes into concentrated juices, pastes, or ketchup. These ones are stable and marketable all year round [4]. Although dried tomatoes could be added to the previous list, they are not well known and largely accepted by consumers yet, although a high potential in this sense is registered both at the local and global levels.

Drying is known as one of the oldest and most effective means of food preservation. In a dry state and appropriately packaged, many foods can be protected from spoilage for years, without special storing conditions, such as refrigeration, being needed [9,10]. Dehydration is the method by which the natural water content of fruits and vegetables is reduced to a certain limit that prevents the activity of microorganisms without destroying the tissues. Usually it takes place at 70ºC, but it is recommended not to exceed 80ºC to keep the nutritional value of the dried products. During the drying process, the weight of the products decreases on average by 4-6 times for fruits and 5-6 times for vegetables, while their volume decreases by 15-20 times, thus requiring much lower transport, handling, and storage costs [11]. Tomatoes are subjected to drying as halves, slices, or quarters, depending on their dimensions and the commercial aim to be followed. The processing is generally made at high temperatures in the presence of oxygen, tomatoes thus showing the highest sensitivity to oxidative damage [12]. Consequently, dehydrated tomatoes are not so popular, due to tissue browning, changes in the flavour profile, and alteration of the nutritional content of tomatoes [4, 13].

Ameliorating the undesirable above mentioned aspects and expediting the drying process can be fulfilled by different pretreatments applied to tomatoes. Immersion pretreatment methods using calcium chloride, potassium metabisulfite, or citric acid were reported [4, 15]. Drying of heat-sensitive materials can be made by vacuum drying; this mode of moisture migration is pressure-driven flow [16]. Vacuum technology is combined with additional drying technologies (i.e., microwave drying) for efficient and effective drying of fruits and vegetables. Although it can protect some constituents from oxidation, the vacuum technology is not feasible in economic terms [17].

This paper aimed to investigate the effects of dehydration of two tomato cherry varieties in a forced air oven and in a vacuum oven, respectively, on some chemical parameters, important both in nutritional and biological terms, to optimize the technological process. Exploration into drying approaches with and without preliminary treatments, namely, ultrasonication treatment, is an underexplored area of research. The present work addresses this gap to provide insights into optimal conditions for producing dehydrated tomatoes with high preservation and quality. Specifically, this study aims to compare the effectiveness of drying methods in terms of best retention of constituents such as ascorbic acid, β-carotene, and lycopene.

2. MATERIALS AND METHODS

2.1. MATERIALS

Two varieties of fresh cherry tomatoes were used in this study, namely Aurora and Rutgers, both bought from a local market (Dambovita County, Romania). Aurora is a tomato variety that produces round-shaped fruits, weighing about 250 g, with good firmness, so they can be easily transported. The diameter of tomatoes was about 20 mm. Rutgers tomatoes are distinguished by their special appearance and perfect suitability for processing. The tomatoes have an oval shape, plum-like, weighing 100-110 grams. The diameter of tomatoes was about 25 mm. Regardless of variety, only tomatoes with uniform size, color, and degree of ripeness were selected for drying.

The tomatoes were conditioned by sorting, washing, and removing the inedible parts. Then, they were uniformly pricked with a device with a view to facilitating the water removal during dehydration. Each variety was treated as follows: dehydration at 70ºC in a forced air oven with removable trays (Aurora_AO and Rutgers_AO); ultrasonication for 30 minutes and dehydration at 70ºC in a forced air oven (Aurora_USAO and Rutgers_USAO); dehydration at 60ºC in vacuum oven (Aurora_VO and Rutgers_VO); and ultrasonication for 30 minutes and dehydration at 60ºC in vacuum oven (Aurora_USVO and Rutgers_USVO). All the above-mentioned treatments are graphically described in Fig. 1.

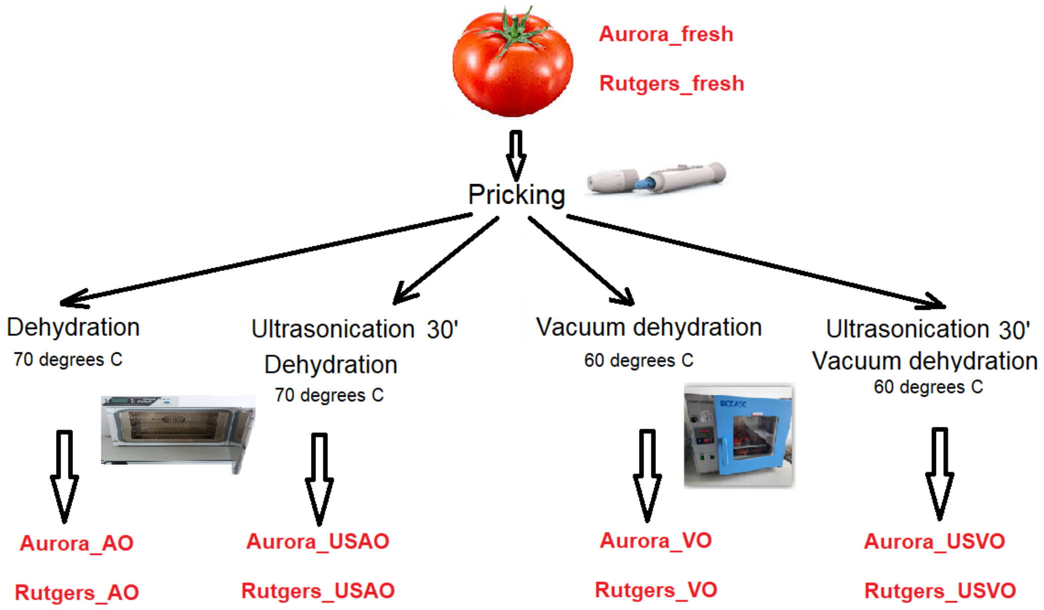

Figure 1. Experimental design of this work.

The whole fresh tomatoes were placed in glass dishes, in a single layer, without clumping. The ultrasonication was made using an ultrasonic cleaner at a frequency of 40 kHz with a power of 180 watts. During this process, the temperature of the tomatoes reached around 27°C. Hot air drying was performed using the SLN STD 53/115/240 oven, operated by forced air convection, with an air control damper opening of 20%. Drying was performed in the vacuum equipment at a pressure of 0.08 MPa. All samples were dried to a moisture content of 20-23%, as verified by periodic weighing.

2.2. METHODS

The dry matter (d.m.) content of all the samples was determined by a standardized method of drying to constant mass (105ºC for 3 hours). The titratable acidity of the samples, expressed as g citric acid/100 g d.m., was determined by the titrimetric method. Reducing sugars were determined by the method of Fehling's solution. The sugar content, expressed as g glucose/100g d.m., was determined by the method with 3,5-dinitrosalicylic acid, measuring the absorbance at a wavelength of 540 nm. The ascorbic acid content was determined by the iodometric method, the results being expressed in mg ascorbic acid/100g d.m. The beta-carotene and lycopene were determined spectrofotometrically, at wavelengths of 451 nm and 472 nm, respectively.

The statistical analyses were conducted using IBM SPSS Statistics V26. T-test and ANOVA (Analysis of Variance) were employed for comparisons of means (significance level of $p < 0.05$). Additionally, Factor Analysis and K-Means Cluster Analysis were applied to experimental data.

3. RESULTS AND DISCUSSION

3.1. RESULTS

The pretreatments usage, different methods of drying, time, and temperature of drying tomatoes showed different effects on their physicochemical characteristics.

The time of dehydration varied largely, depending on tomato variety and treatments applied too. Thus, drying tomatoes in a cabinet with forced air circulation, both as a unique treatment or in combination with ultrasonication, led to a total time of 19 hours for the Aurora variety, respectively 21 hours for the Rutgers variety until reaching the dry matter ranging between 80 and 85%. In terms of drying tomatoes in a vacuum, the time of dehydration was shorter, by only 8 hours for each variety.

The comparative analysis of the dry matter content of the samples, before and at the end of drying, is shown in Fig. 2. The pulp content of tomato varieties can be responsible for the relative high content of both fresh samples. The Rutger variety displayed a high amount of dry matter comparatively to the Aurora variety. After drying, the group of samples treated in vacuum reached closely values of dry matter, regardless of the variety and the presence/absence of the pretreatment of ultrasonication.

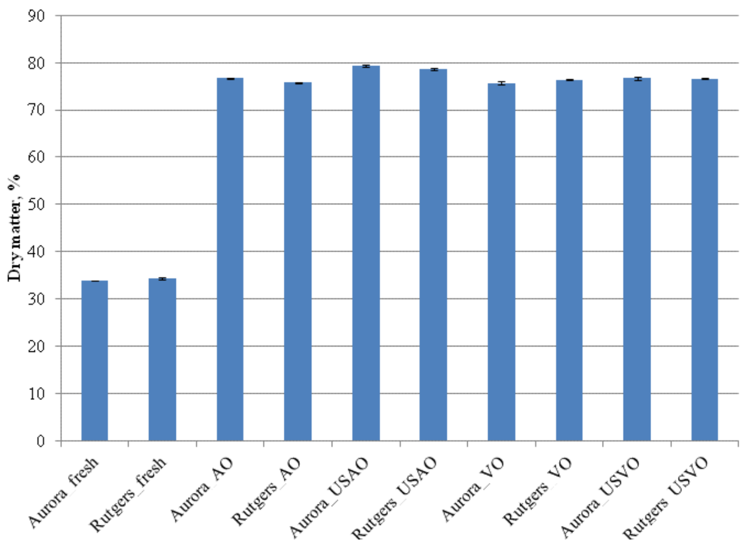

Figure 2. Dry matter content of fresh and dried (oven and vacuum) tomato samples.

The titratable acidity of tomatoes contributes to their taste and preservation. The acidity of the tomatoes in all experimental variants is shown in Fig. 3. Significant differences between fresh tomatoes were determined, the acidity of the Aurora variety being about 16% higher than Rutgers variety. As result of dehydration, in all samples was registered a decreasing of the acidity, probably rather due to the time of the heat treatment than the temperature applied. Thus, the organic acids can suffer minimal decomposition or volatilization, but they can participate in slow reactions with other constituents, such as metallic ions or sugars.

The acidity of the tomatoes was higher in the samples dehydrated under vacuum, the highest values being determined in the sample Aurora_VO. It should be taken into account that the titratable acidity of Aurora_fresh was 1.18 times higher than the titratable acidity of Rutgers_fresh. Among the experimental variants combining ultrasonation with drying, only Rutgers_USAO exhibited the highest titratable acidity comparatively to the sample without pretreatment.

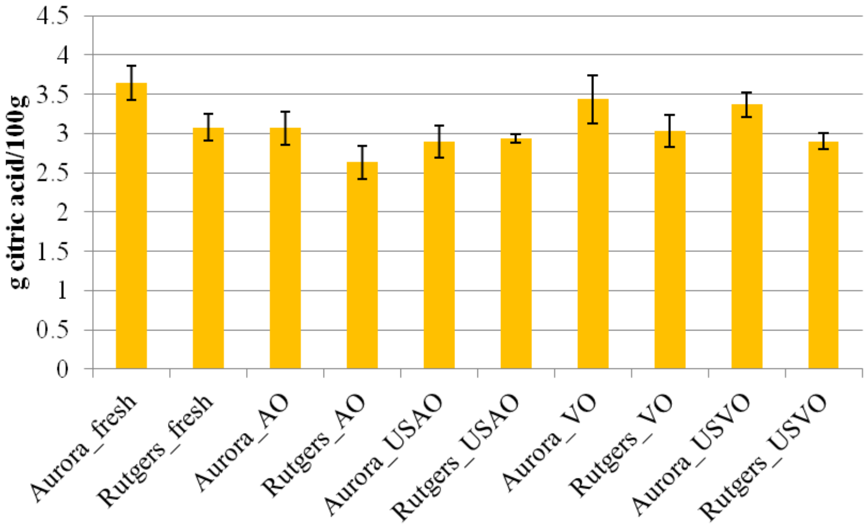

Figure 3. Titratable acidity of fresh and dried (oven and vacuum) tomato samples.

The sugar content provides tomatoes' sensorial characteristics, being, at the same time, a fermentable substrate for microorganisms, especially for yeasts. The preservation methods should take into account its level, because in some cases the drying can be mild if part of the sugars are bound with the available water of food products, making the latter unavailable to microorganisms. The content of glucose in all the fresh and dehydrated samples is shown in Fig. 4.

Regardless of the tomato variety, the sugar content decreased in different proportions. In the case of the Aurora variety, the highest decrease was observed for Aurora_USAO (3.73%), followed by Aurora_VO (2.46%). In the case of Rutgers variety, the losses were much higher than in the case of Aurora tomatoes, as follows: Rutgers_USAO (9.43%) > Rutgers_AO (3.39%) > Rutgers_VO (2.42%) > Rutgers_USVO (2.16%). For both varieties, it seems that ultrasonication combined with drying in an oven with convective circulation of air led to a significant decrease in the sugar content of the raw material comparatively to the other treatments applied. Depending on temperature and time of dehydration, respectively, other supportive factors from the food matrix (i.e., pH), the reducing sugars can react with aminoacids or proteins (Maillard reaction).

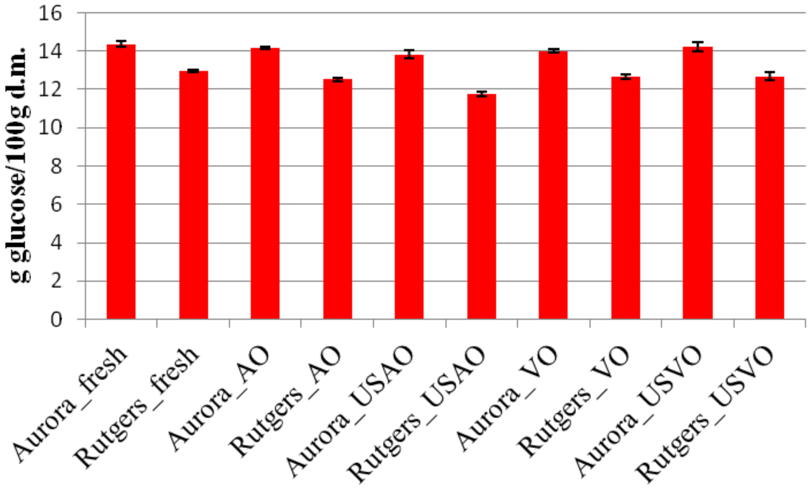

Figure 4. Sugar content of fresh and dried (oven and vacuum) tomato samples.

The variation of the ascorbic acid content, depending on the treatment applied to each variety, is represented in Fig. 5.

Significant losses of ascorbic acid content were registered in all experiments. However, the retention of vitamin C was found to be highest in the Aurora variety if vacuum dehydration was applied, both as a singular treatment or in combination with ultrasonication treatment. As expected, taking into account the known adverse effect of oxygen on ascorbic acid, the vacuum dehydration had a positive influence comparatively to the dehydration in the forced air oven, if preventing the vitamin C destruction is discussed.

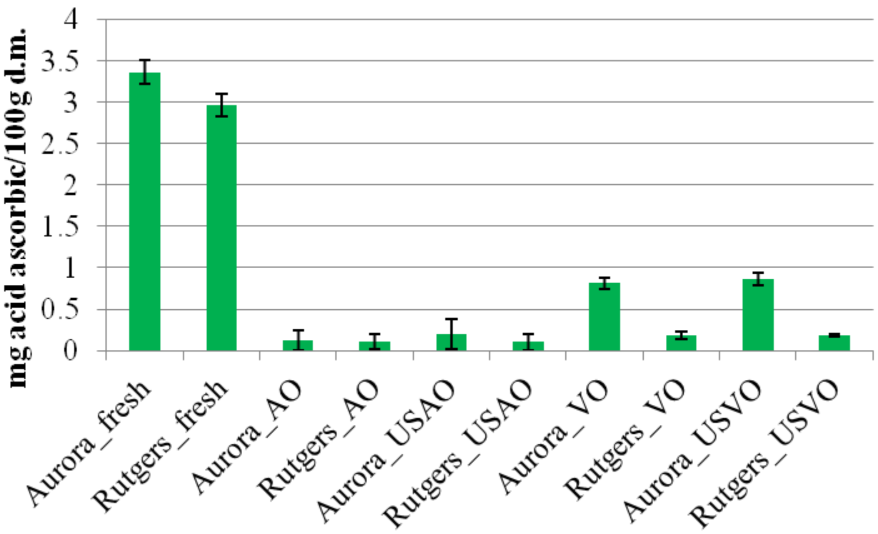

Figure 5. Ascorbic acid content of fresh and dried (oven and vacuum) tomato samples.

The carotene and lycopene content of tomatoes, fresh and after drying through different treatments, are represented in Figs. 6 and 7, respectively.

The dehydration methods influenced the amounts of the studied bioactive compounds in the final products. As in the case of vitamin C, vacuum dehydration proved to be protective in relation to carotene and lycopene comparatively to the dehydration in the convective oven. The losses of β-carotene for each tomato variety were registered as follows: Aurora_USAO (72.54%) > Aurora_AO (65.65%) > Aurora_USVO (53.3%) > Aurora_VO (51.44%), respectively Rutgers_USAO (68.58%) > Rutgers_AO (67.6%) > Rutgers_VO (58.72%) > Rutgers_USVO (58.38%). Ultrasonication treatment in combination with vacuum dehydration seemed to have some positive effect on β-carotene retention in the case of the Rutgers variety.

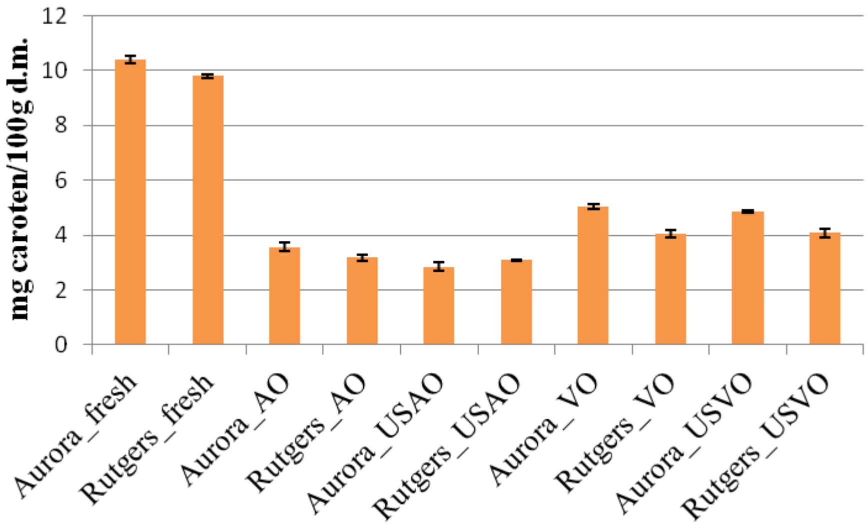

Figure 6. β-carotene content of fresh and dried (oven and vacuum) tomato samples.

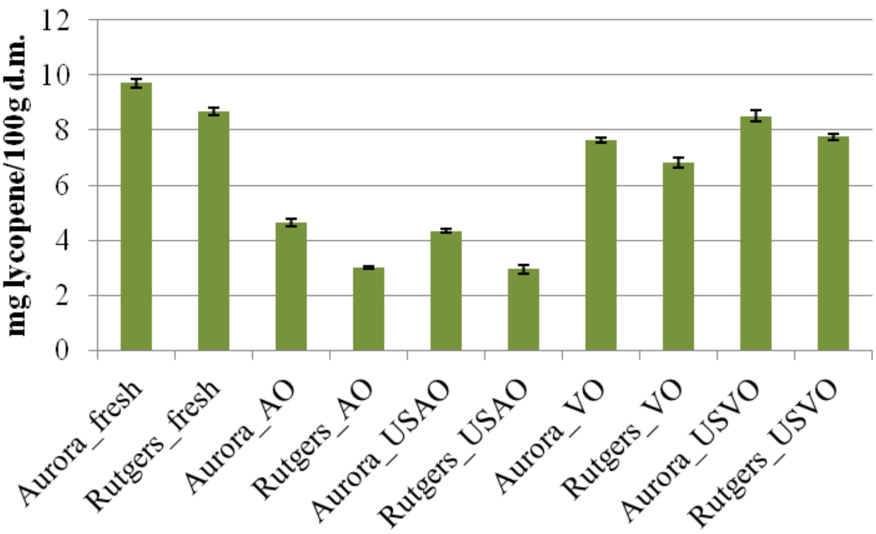

Figure 7. Lycopene content of fresh and dried (oven and vacuum) tomato samples.

Fig. 7 emphasizes the protective effect of the tomato vacuum dehydration on their lycopene content, regardless of the variety and treatment applied. The lycopene losses were highest for the Rutgers variety compared to the Aurora variety, excepting the combined ultrasonication and vacuum dehydration treatment.

The losses of lycopene for each tomato variety were smaller than those of β-carotene below mentioned, being determined as follows: Aurora_USAO (55.33%) > Aurora_AO (52.11%) > Aurora_VO (21.28%) > Aurora_USVO (12.42%), respectively Rutgers_USAO (66.14%) > Rutgers_AO (65.45%) > Rutgers_VO (21.58%) > Rutgers_USVO (10.85%).

In all experiments, higher losses of bioactive compounds were recorded if drying of tomatoes was preceded by ultrasonication treatment, probably due to supplementary heating of the samples.

The Pearson correlation of parameters (Table 1) shows strong and significant inverse relationships between dry matter and ascorbic acid ($r = -0.974$, $p < 0.01$), respectively dry matter and β-carotene ($r = -0.973$, $p < 0.01$), emphasizing the negative impact of water removing by dehydration on vitamin C and provitamin A from tomatoes. The Pearson coefficient was determined as 0.990 ($p < 0.01$) for the existing relationship between ascorbic acid and β-carotene. Strong and positive correlations were established between lycopene-titratable acidity ($r = 0.758$, $p < 0.05$) and lycopene-β-carotene ($r = 0.767$, $p < 0.01$).

Table 1. Pearson correlation matrix of data in dehydrated tomatoes.

	Dry matter	Titratable acidity	Ascorbic acid	Reducing sugars	β-carotene	Lycopene
Dry matter	1	-0.476	**-0.974****	-0.209	**-0.973****	-0.618
Titratable acidity		1	0.635*	0.705*	0.637*	**0.758***
Ascorbic acid			1	0.350	**0.990****	0.716*
Reducing sugars				1	0.320	0.487
β-carotene					1	**0.767****
Lycopene						1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Factor Analysis was applied to the data characterizing the dehydrated tomatoes, both the Aurora and Rutgers varieties. Two components were extracted (Fig. 8), summarizing the association between the parameters of tomatoes.

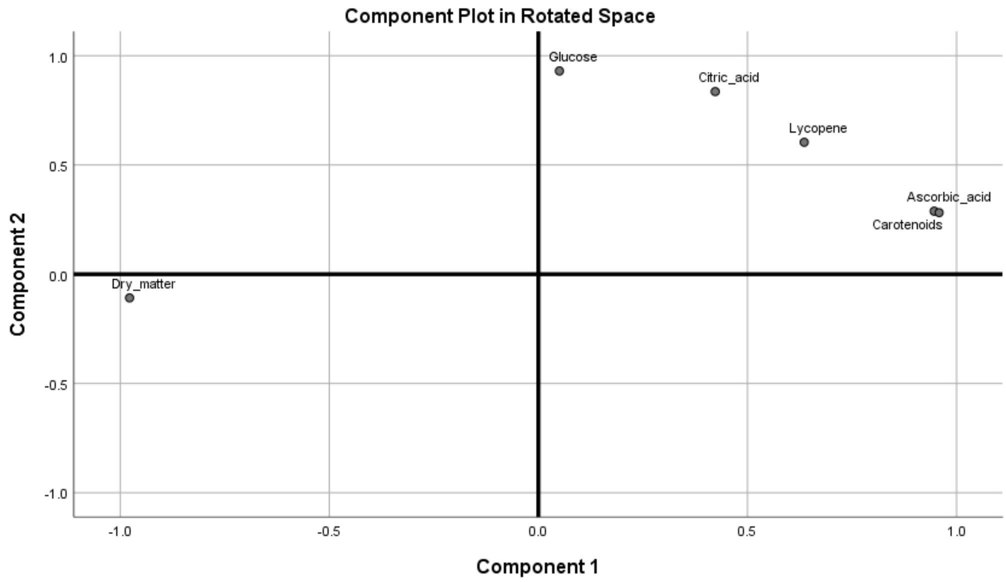

Figure 8. Principal Component Analysis of chemical parameters.

The two principal components describe 90.97% of the total variability of compounds (Table 2). The first principal component (55.93%) distinguishes in its negative part the dry matter content of the samples, while in its positive part, all the constituents known for their biological role, namely vitamin C, β-carotene, and lycopene. The structure of PC1 underlines the results of Pearson analysis and the strong relationships existing between the dry matter content of tomatoes, which increases during drying, and their antioxidant compounds.

Table 2. Factor loadings (Varimax normalized).

	Eigenvalue	Dry matter	Titratable acidity	Ascorbic acid	Reducing sugars	β-carotene	Lycopene
Component 1	4.293	-0.978	0.423	0.947	0.05	0.958	0.636
Component 2	1.165	-0.108	0.836	0.288	0.930	0.282	0.604

The second principal component (35.04%) differentiated the citric acid content and reducing sugars content of the dehydrated tomatoes from the other constituents. These compounds are concentrated in dry matter during processing, while the bioactive compounds are adversely affected by the drying temperature.

Hierarchical Cluster Analysis (HCA) was applied both on the experimental data (chemical constituents of dehydrated tomatoes) and on the values of descriptors (Aurora and Rutgers varieties, in all experimental variants).

The Average Linkage Method (between groups) and the Squared Euclidean Distance were used in clustering. The dendrogram associated with the analysis is shown in Fig. 9. Two clusters were obtained in the first stage of clusterization, as follows:

Cluster 1: Aurora and Rutgers fresh tomatoes (2 samples)

Cluster 2: Aurora and Rutgers dried tomatoes, in all experimentals (8 samples)

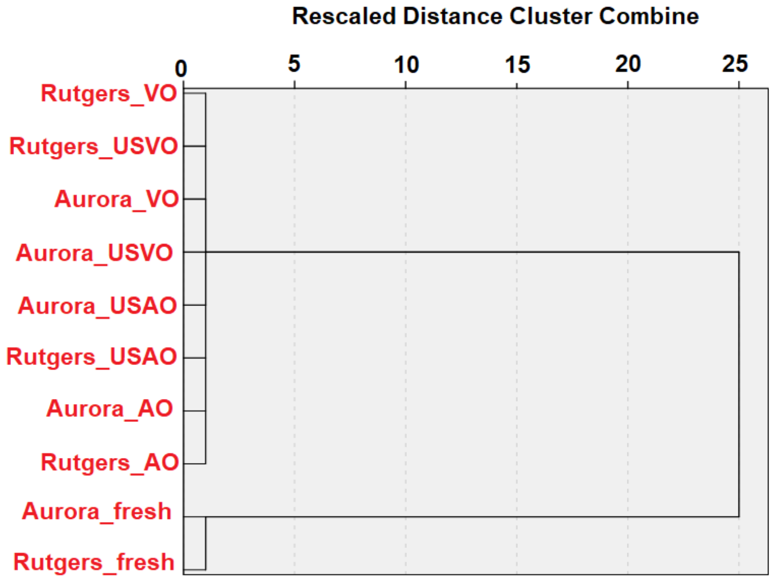

Figure 9. Dendrogram of variables of interest.

The separation of fresh and dehydrated samples is attributed to the significant differences in all the analyzed parameters, before and after drying.

In agreement with the results of PCA, HCA revealed that dehydrated tomatoes are similar to each other in terms of content of bioactive compounds and macronutrients determined in this study. The vacuum-treated samples were close to each other in terms of the variety rather than the treatment applied.

3.2. DISCUSSION

The vacuum dehydration time of tomatoes was reduced by nearly half compared to the dehydration time in a cabinet with convective air circulation. This is important in the research context because, as stated in the literature, the degradation kinetics of tomato components are greatly influenced not only by drying temperature but also by the duration of drying [10].

In this research, Aurora tomatoes lost a higher quantity of water in comparison with the Rutgers variety, probably due to their smaller size. If different treatments applied to tomatoes are discussed, tomatoes dehydrated in a forced air convection oven and previously ultrasonicated lost a greater amount of water comparatively with untreated ones, as follows: Aurora_USAO 53.27%, while Aurora_AO only 52.84%; Rutgers_USAO 51.83%, while Rutgers_AO only 51.35%. The same situation occurred in tomatoes dehydrated under vacuum, emphasizing the positive effect of the ultrasonication on the main scope of drying, namely, the water removal until the biological stability of the food product. This can be explained by improving mass transfer through ultrasound treatment, which is demonstrated by the effectiveness of the ultrasound-assisted method for extracting bioactive compounds [14], including flavonoids.

The tomatoes' acidity is responsible for their organoleptic characteristics and also for the preservation management. High acidity of the raw materials subjected to canning may impose a less severe thermal regime, taking into account that bacteria are sensitive to an acidic medium.

The titratable acidity of fresh tomatoes as a measure of their acidity is reported in literature, ranging in large limits as follows: 5.19 ± 0.14% [3]; 102.4 ± 2.39 mg/100g [15]; 6.12 g/100g [18]; 0.28 ± 0.02 g/L [19]. Values of this parameter are strongly related to tomato variety, their conditions of growth, and the stage of maturity too.

The reducing sugars can react with the nitrogenous compounds during oven drying of tomatoes, leading to brown pigment formation [4]. Although less likely due to relatively low temperatures applied during dehydration, a decrease in the content of reducing sugars can be attributed to the formation of 5-hydroxymethylfurfural (HMF), which involves hexoses through acid-catalyzed dehydration and cyclisation. HMF is a thermal damage marker for processed foods [20].

Contrary to what was mentioned above and unlike the results obtained in our work, Tan *et al.* [21] reported an increase in the content of reducing sugars in dehydrated tomatoes compared with the fresh ones (i.e., from 397.31 ± 2.25 mg/g d.m. to 501.12 ± 3.38 mg/g d.m.). The authors explained this increase as a result of Maillard reactions or the splitting of large hydrocarbons.

Tomatoes are a rich source of ascorbic acid, a vitamin sensitive to different factors. It is obvious that processing, including exposure to a long time at high temperature, caused losses in vitamin C.

Gümüșay et al. (2015) reported that the ascorbic acid content in fresh tomatoes (*Solanum lycopersicum*) submitted to drying in different experiments was 310.34±7.23 mg/100 g dm [22]. For oven and vacuum oven-dried tomatoes, the vitamin C contents were 4.14±1.29 mg/100 g dm. and 17.37±1.25 mg/100 g dm. respectively. The authors reported that the ascorbic acid content in dried tomatoes was less than in the fresh ones.

High amounts of ascorbic acid, by 544.8 mg/100 g d.m., were reported in fresh tomato quarters by Demiray et al. [10]. Drying at 60ºC for 20 hours, respectively at 100ºC for 5 hours, led to a decrease of this content until 135.55 mg/100 g d.m., respectively until 39.23 mg/100 g d.m. Under the studied conditions, the authors [10] found that ascorbic acid was more sensitive to variations in drying temperature compared to lycopene or β-carotene.

Numerous studies indicated the presence of oxygen and heat as responsible for the degradation of ascorbic acid [10, 23-25]. The decrease of the vitamin C content varied largely, between 88% [24] and 61% [26], depending on tomato variety, its chemical composition, and the processing method applied. Jorge et al. stated that tomatoes dried in the oven at 70°C for 24 hours contained no ascorbic acid [27].

Demiray *et al.* found that the most effective temperature change in tomato quarters of the Rio Grande variety for ascorbic acid degradation was from 60 to 70ºC [10]. The moisture content of the final product was also reported as one of the factors correlated with the level of the loss of ascorbic acid from tomatoes [26, 28]. Other factors affecting the loss of vitamin C activity were identified, such as pH and metal ion catalysis [29].

Beyond its activity as vitamin, ascorbic acid has antioxidant activity, important both in nutritional terms and also for utilization in the food industry. Thus, Gümüșay et al. considered that a decrease in the antioxidant activity of tomato samples may have been due to the lower levels of ascorbic acid and phenolics [22].

The carotenoids play a key role in the color formation in tomatoes, their presence in the diet being largely linked to positive effects on human health [10]. Lycopene, one of the major carotenoids of tomatoes whose concentration increases with their maturity, is responsible for the red colour of the tomato berries [21,30] and also acts as an antioxidant and anticarcinogenic agent [31, 32].

The degradation of β-carotene increases with temperature. In a previous study by Demiray et al., drying at 60ºC led to a decrease of β-carotene content from 305.24 mg/100 g d.m. (fresh tomatoes) to 58.02 mg/100 g d.m. (dried tomatoes) [10]. Other studies highlight that the degradation of β-carotene was highly influenced by the length of drying. Thus, the content of β-carotene in cherry tomatoes of *Shiren* variety decreased from 38.0 mg/100 g d.m. to 28.6 mg/100 g d.m. after drying for 29 hours at 40ºC, respectively until 34.8 mg/100 g d.m. if the temperature was by 80ºC for only 4 hours [4].

The lycopene contributes to the biological value of tomatoes. In particular, it is assigned the ability to reduce the risk of cancer in humans, because it acts as a „*scavenger*" against free radicals [4]. Tomatoes and tomato products provide up to 95% of lycopene in the human diet [3].

In this study, ultrasonication pretreatment exhibited better lycopene retention in the case of samples vacuum-treated for dehydration. The positive influence on retention or the increase of the content of lycopene and β-carotene was explained by enhancing their diffusion to the medium as a result of the disruption of cell walls with cavitation microbubbles that collapsed violently [32].

Lycopene degradation in tomato products as a result of processing and storage conditions was reported [33-35]. Decreasing of the lycopene content during conventional tomato processing was also attributed to its conversion from the *trans* form into the less bioactive *cis* isomer [4].

Lycopene content of fresh tomatoes varies in large limits, depending on the variety and the applied method of analysis. For Rio Grande variety were found values by 913.86 mg/100 g d.m., corresponding to 50 mg/100 g fresh weight [10] and 18.4 to 25.4 mg/100 g fresh weight, respectively [36]. For other tomato varieties, a total lycopene content ranging from 7.6 mg/100g d.m. [37] to 250 mg/100 g d.m. [38] was reported. An intermediate value, by 99.8 mg/100g d.m., was reported by Muratore et al. [4]. Zalewska et al. stated that fresh red tomatoes of the Framboo cultivar contained 5.41±0.07 mg lycopene/100 g fresh weight [3]. These authors emphasized that regardless of the drying method applied (vacuum/convection), the lowest content of lycopene was recorded in samples dried at 80°C for 4 hours, while vacuum drying at 60°C highly preserved the lycopene content of fresh tomatoes. The lower loss rate of lycopene can be due to the absence of oxygen in a drying environment.

Temperatures lower than 70ºC were recommended for better retention of lycopene and β-carotene in dried tomatoes [10]. However, studies are reporting an increase in the bioaccessible lycopene content in tomatoes during their drying [23]. It was explained that thermal processing releases phytochemicals from the matrix.

The inconsistent results in the literature were attributed to various factors, including ripening stage, tomato genotype, and drying conditions [21]. Besides these ones, it was emphasized that lycopene cannot be completely extracted under the condition of high content of moisture; thus, the reported values cannot represent its real content [21,39].

4. CONCLUSIONS

The consumers' interest in dehydrated tomatoes with intermediate humidity is on the rise, due to their sensorial characteristics and various possibilities of use. The increased stability of these ones recommends them as a replacement for fresh tomatoes in different recipes, regardless of the season of the year. Besides the above-mentioned advantages, the dehydrated tomatoes are characterized by high nutritional and biological value, in a strong relationship with the methods of processing applied.

This study investigated the effect of ultrasonication pretreatment and two dehydration treatments on some constituents of two cherry tomato varieties, including the health-beneficial constituents, namely ascorbic acid, carotene, and lycopene. Ultrasonication pretreatment emerges as a favourable technique for water removal from the vegetable tissue. At the industrial level, the economic and feasibility issues should be taken into account.

Tomatoes dried by vacuum showed better appearance, ascorbic acid, and β-carotene than those dried by oven drying. As regards lycopene, which plays a significant role in carotenoid intake in human nutrition, the tomato-based products in dehydrated status contained a high level of this constituent compared with fresh tomatoes if drying was made in a vacuum. Ultrasonic-vacuum drying was the optimum experimental method in terms of preserving the lycopene from the raw material. Hot air drying proved to have positive effects on the content of carotene and lycopene, respectively, compared with the ascorbic acid content retained in the dehydrated tomatoes. The amount of vitamin C dropped drastically for both hot air dying and ultrasonic-hot – hot air drying treatments.

The influence of tomato genotype on the results of dehydration cannot be evaded. Thus, if the ascorbic acid content of final products is discussed, the variety Aurora showed better results comparatively with Rutgers one, especially for vacuum and ultrasonic–vacuum drying treatments.

The tomatoes dehydrated in vacuum emerged as a performing variant because they showed a shorter duration of dehydration, while preserving ascorbic acid, carotene, and lycopene. The ultrasonication pretreatment was shown to be beneficial for retaining some constituents (i.e., lycopene) and detrimental for others, such as ascorbic acid.

Future research is needed for optimization of drying conditions, which include other factors and chemical parameters important for the total quality of dried tomatoes. Last but not least, the evaluation of the biological stability of dehydrated tomatoes must be performed and correlated with the results of physicochemical analyses for a comprehensive understanding of the process.

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