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QUALITY CHANGES OF INDUSTRIAL AND TRADITIONAL AJVAR IN THE POLOG REGION

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Abstract

Ajvar's production in our country is a very important and prospective potential sector for the agro-processing industry. Because of the high nutritional value, the species represents the most important vegetable culture in the country. The analyses were carried out in the raw material and in the ajvar of industrial and traditional production for their nutritional values: dry matter, moisture, total acidity, pH, vitamin C, capsanthin, ash, sugars and cellulose. The analyzed nutritional components in fresh peppers of Prilep and Tetovo showed a higher value in dry matter and a significantly ($p< 0,05$) higher concentration in vitamin C in the Tetovo region (130.5 mg / 100g) compared to the Prilep region (99mg / 100g). The vitamin C and the capsanthin content in the fruit of the pepper varies depending on the cultivar, agro-technical measures and processing methods. In the industrial production there was a higher amount of sugar and cellulose compared to the traditional ajvar.

Keywords: Capsanthin, Vitamin C, Cellulose, Sugar, Ajvar

1. Introduction

Ajvar is a product obtained from grated or roasted peppers (without seeds), with a percentage of 15-20% of dry matter and the introduction of spices according to taste. The product is specific and important to our region, and highly valued in the world market. (Markoviq & Vraçar, 1998)

Ajvar is produced by processing (grinding, etc.) of red pepper and eggplant with the addition of one or more other types of vegetables, then spices, vegetable extracts and sugar (sucrose), while the total amount of species from other vegetables, except peppers, should not be greater than 25%. (Regulation 69, 2014). Ajvar is a pasteurized product, made with roasted, chopped and homogenized peppers, cooked and fried in open containers up to the specific content. Vegetable oil, salt max. 2%, sugar and optionally, vinegar, garlic, etc., can be used as supplements (Karakasova et al., 2008).

Pepper belongs to the Solanaceae family, *Capsicum annuum* L. peppers and is an important vegetable culture, always used because of its economic importance and chemical composition. There are different types of pepper, colored in different colors (green, yellow, orange, red and purple), in different shapes and sizes and with characteristic flavors (Lucier et al., 2001).

In addition to being used for fresh-food consumption, large quantities are also used in the processing industry as semi-products (semi-frozen, frozen, dried, peppers in vinegar, barrel-type) and final product (ajvar, lutenica, puddhur, hazae, roasted peppers, fried peppers and peppers in vinegar).

Industrial pepper *Kurtovska kapija* is the most requested by the processing industry due to its quality of storage and processing into ajvar and one of the most requested products abroad. It is exported as fresh or purchased from domestic traders and processors. Industrial production in 2010 was 10.3 tonnes, expressed in percentage 22%, and in the traditional way (homemade) 2.1 or 4.5% (2011).

The purpose of this paper is to analyze the quality of the product, and to make comparisons between ajvar in traditional and industrial conditions.

2. Material and methods

Sampling
The nutritional values of the ajvar produced in industrial and traditional conditions as well as the fresh raw material of kurtovska kapia from two regions, Polog and Pelagonia, used for Ajvar production, were analyzed. The study was carried out in 2017, using raw material (red species) from the 'Green product', Tetovo vegetable processing factory, which is provided by two regions. The research focused on the analysis of quality parameters: dry matter, pH, total acidity, ash, vitamin C and capsanthin, cellulose and sugars in industrial and traditional ajvar. The analyses were done according to standard laboratory methods (Vracar, 2001). Also, an industrial ajvar sample of 680 g, was provided by the 'Green Produkt' company, and another traditional ajvar sample of 700g was provided from homemade production. The samples were analyzed at the Laboratories of the Faculty of Food Technology and Nutrition at the University of Tetova.

Ajvar Processing Technology
Ajvar is a very widespread product in our country. It's traditional and widely used in our region. The Ajvar technological processing was carried out in the industrial enterprise 'Green Produkt', Tetovo. The preparation was carried out by manual grading of peppers, according to the color and size equation, where the size of the breaks is particularly important and should be calculated according to the needs of the grinding machine. Then peppers were cut and stems and seeds were removed manually. The final product is obtained by grinding ripe or unripe peppers, to which seasonal spices are added. Boiling until a much-matched mass is obtained, while the sparkling water obtained by spraying is spilled gradually up to a certain point.

Chemical analysis of herbal material
In order to determine the quality and nutritional value of fresh peppers and ajvar, the following chemical parameters have been analyzed:*Dry matter* - by gravimetric method, drying samples in dryers at 105 ºC in constant mass, (Method by drying in oven at 105 ° - for determining dry matter in peppers and ajvar (Vraçar et al 2011)*Total Acidity* - applying a volumetric method where 0.1 M digestion of NaOH is used as a titration solvent; (Titration method with NaOH - determination of acidity (Voća et al, 2011).*The ash* was determined by combustion of the samples in the Moffle furnace (Nabertherm) gravimetric method (AOAC, 1995) at a temperature of 550 ° C.

Content of Vitamin C and Capsanthin
Vitamin C was determined by applying an iodometric method, using a solution of 0.1 N (I_2) for titration. The results were expressed in mg of ascorbic acid per 100 grams of pepper (Schweizerisches Lebensmittelbuch – Method 703.1 Determination of ascorbic acid in fruit and vegetable juices, iodometric. Vitamins such as vitamin C are sensitive and can be degraded by the influence of temperature, the presence of oxygen, light moisture, pH and the duration of the undergone treatment (Rebouças et al, 2013)

Capsanthin- The determination of the capsantin was based on the method (FAO JECFA monograph 5 (2008) The material extract 1 ml was carried out in 10 ml of acetone to determine the contents of the capsanthin. Absorption was measured at a wavelength of 460 nm at a spectrophotometer ULTRASPEC 5300PRO) in 1 cm quartz cutter.

Determination of total sugars
Determination of cellulose was performed by the method ISO 6865 2000 Sensory analysis. The determination of this analysis was based on the Practice (Vracar, 2001). Regarding the evaluation points, which are altogether 20, the data collected were analyzed and the average for each according to the table was determined.

Sensory evaluation for paprika ajvar's
The panelists were asked to rate the samples for their saturation, lightness and visual quality on a score card. Quantitative descriptive analysis (Stone et al., 1974) was used to quantify the perceived responses.

Statistical Analyzes The variance analysis was performed using the linear generic model (SAS - 1995) where the treatment and repetition effects were used as the responsible variables. The Tukay test that is used, is a multiple comparing test and is used to compare treatment averages. The level of differentiation signal between the treatments was considered in $p<0.05$.

3. Results and Discussions

Physico-chemical results of fresh pepper

The analyzed results of the fresh pepper variety, of two localities, are presented in the table 1:

Tabel. 1 Results of fresh pepper physical-chemical analysis

Parametres	Kurtovska kapia of Prilep	Kurtovska kapia of Tetovo	ANOVA
Dry matter (%)	8.61 ± 0.15	8.15 ± 0.39	NS
Ash (%)	0.83 ± 0.24	0.65 ± 0.46	NS
Total acidity %	0.60 ± 0.05	0.52 ± 0.03	NS
pH	4.42 ± 0.03	4.50 ± 0.02	*
Vitamin C (mg/100g)	99 ± 1.41	130.5 ± 0.71	*
Capsanthin (%)	1.64 ± 0.01	1.04 ± 0.21	*

*Significance for P<*0.05*, Average ±SD, NS non significant

The observed moisture content of the red pepper from Prilep region (91.39%) and Tetovo region (91.85%) are in accordance with the findings of Gordana, (1989). The dry matter in Prilep peppers was 8.61% and in the Tetovo region 8.15%. The low value of dry matter in both regions is influenced by the agroecological conditions that dominated during vegetation. Ash content of 0.83% for Prilep and 0.65% for Tetovo specimen is approximate with the author's findgins (Gordana, 1989) from 0.5-1.2%. Variety of Kurtovska Kapia has shown a high percentage of water and low content of dry matter in fresh peppers. The total acidity of the Prilep peppers is 0.60% and of Tetovo's peppers is 0.52%. According to the results presented in Table 1, there are no significant differences in the content of dry matter, water, ash and general acidity between the two regions according to ANOVA statistical processing. The pH value of fresh Prilep specimen is 4.42 and of Tetovo is 4.50. The highest content of Vitamin C resulted in the red pepper of the Tetovo region with 130.5mg / 100g, and the lowest in the Prilep region with 99mg / 100g, which is comparable to many other authors such as Karakašova et al., 2008). As other studies show, the highest or lower values of vitamin C in *Capsicum annuum* are dependent on varieties and phases of fruit ripening (Khadi et al., 1987; Howard et al., 2000).

Capsanthin contributes 30-70% of carotenoids to most varieties and cultivars. The percentage of capsanthin and capsarubin grow in the advanced stages of ripening (Deli et al., 1996). Regarding the capsanthus, the comparison of peppers from the two regions indicates that during the maturation phase the higher content of the capsanthin was found in the fresh peppers from Prilep with 1.64 and the lowest content was found in Tetova's peppers with 1.04. According to the author (Arimboor et al., 2014), the content of the capsantin ranges from 0.1 to 3.2 g / 100 g of dry matter.

According to statistical data, we can say that the last three parameters, pH, vitamin C, and capsantine, are distinctive ($p < 0.05$) compared in fresh red pepper from the two regions.

Results of the qualitative analysis of industrial and traditional ajvar

The chemical content of industrial and traditional ajvar is given in the table 2.

Table 2. Characteristics of ajvar quality

Parameters analyzed	Industrial Ajvar	Homemade Ajvar	ANOVA
Dry matter %	24.00 ± 0.76	50.74 ± 0.87	*
Cinder %	3.29 ± 0.90	4.76 ± 0.18	*
Total Acidity %	0.67 ± 0.03	0.72 ± 0.01	NS
pH	4.82 ± 0.02	4.32 ± 0.03	*
Vitamin C (mg/100g)	41.00 ± 1.41	25.5 ± 2.12	*
Capsanthin (%)	1.60 ± 0.01	1.56 ± 0.06	NS

*Significance for *P<0.05*, Average ±SD, NS non significant

The results showed that the dry matter content of the ajvar prepared in the domestic conditions is significantly different compared to the industrial one.

This difference is closely related to the high-boiling time that peppers have passed during roasting. The table shows that the industrial ajvar is with 76.01% moisture and 24.00% dry matter, while the home made ajvar with 49.26% moisture and 50.74% dry matter.
The ash content compared to the higher peat values has an increase in ash percentages, with the industrial ajvar averaging 3.29%, while the home-made ajvar with 4.76%.
There is also a positive correlation of dry matter and ash in the ajvar of both productions. Regarding dry matter and ash at home-made and industrial ajvar there is a significant difference ($p < 0.05$),
The total acidity of industrial and home-made ajvar varies between 0.67% and 0.72%, respectively these data do not have a significant difference.
The pH of industrial ajvar is 4.82 and homemade ajvar is 4.32. By comparing these two, it results that the homemade ajvar is slightly more acidic than the industrial one and it is closely related to the above commented results on the total acidity.
Vitamin C has significant decrease from raw material values as a result of high temperatures during ajvar's production and between industrial and homemade ajvar there is a significant difference ($p < 0.05$).
Determination of the capsantin as a pigment in ajvar resulted: industrial ajvar with 1.60% and home-made ajvar with 1.56%. The differences in the content of Capanthin are not significant. Its parameters are not meaningful. Compared with the raw material, there are no significant differences in the variability of the contents of the capsanthin in the industrial and homemade ajvar.
The low percentage of cellulose, in the traditional conditions, is probarly because the preparation of ajvar in traditional conditions is done after roasting and peeling off peppers.

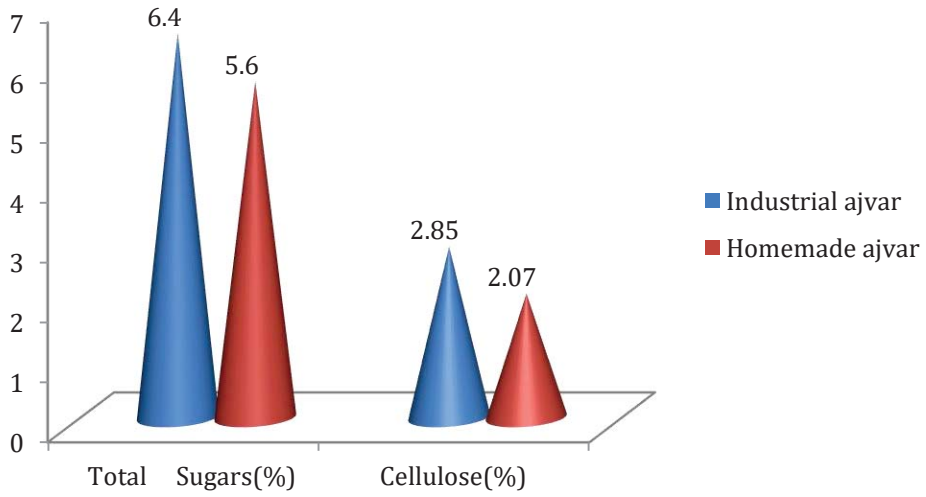
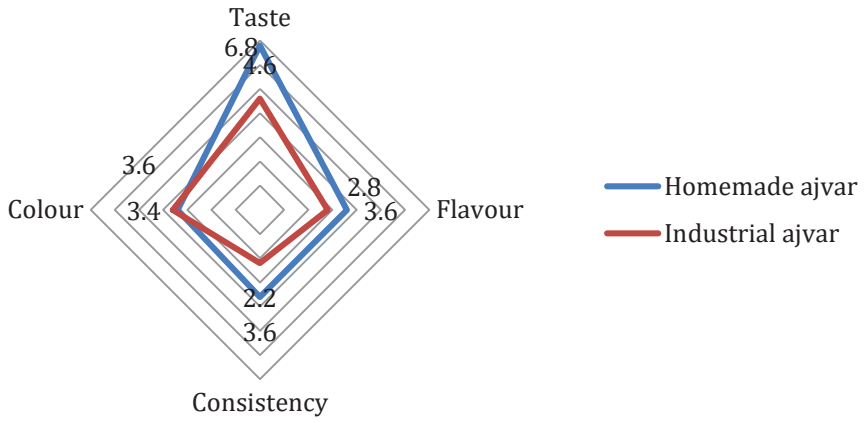


Figure 1 Sugar and cellulose content in industrial and homemade ajvar

Organic sensory qualities of traditional and industrial ajvar

The points given by the five panel members are located in the following figure for each parameter. These points reflect the analysis of the quality of the ajvar produced under traditional and industrial conditions, where each member expressed his grades from 1-7 for four given parameters.



Graph 2 sensory analysis

According to this evaluation, the highest scores for the taste, 6.8 points were given to the homemade ajvar.From the calculated average of scores given by the five members of the tasting panel, we conclude that the total points earned for the homemade ajvar are 17.3 while for the industrial ajvar 14.2.

From all sensory parameters it is noted that the highest scores are given to the taste which really distinguishes and has its own specific taste given the production mode and the relevant production formula.

4. Conclusion

Red pepper varieties of Kurtovska kapija differ in terms of chemical content depending on the locality where they are cultivated, ie, there are differences when comparing relevant parameters from peppers cultivated in different places.We conclude that the total amount of acids increases slightly in homemade ajvar in comparison to the industrial one, and this is because a certain amount of sugar is fermented during cooking.Vitamin C content decreases with prolonged thermal treatment, as is the case with homemade ajvar. Decrease in Vitamin C content is proportional to the thermal treatment of peppers until reaching the desired product.

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