# RESEARCHES REGARDING THE QUALITY OF SOME VINEGAR ASSORTMENTS TRADED IN THE MUNICIPALITY OF IAŞI

## CERCETĂRI PRIVIND CALITATEA UNOR SORTIMENTE DE OȚET, COMERCIALIZATE ÎN MUNICIPIUL IAŞI

***BECEANU D., ANGHEL Roxana Mihaela***
University of Agricultural Sciences and Veterinary Medicine Iaşi, Romania

***Abstract.*** *Vinegar is a conservation product and also an aromatic substance used in the food industry and the culinary art. We studied a number of 14 samples representing common (regular) vinegars from different sources and aromatic vinegars produced by traditional companies: from wine – 5 assortments (1 with pepper, 2 with herbs, 1 from fermentation and a common one), 2 assortments from cider (France), 1 assortment from apples, 1 assortment from alcohol, 1 assortment from rice (Japan) and 3 assortments of balsamic vinegar (from Modena, Colavita - Italy and Kalamata - Greece). They were analyzed in terms of density, total dry extract, ashes (mineral content), total acidity (expressed in acetic acid) and colour. In parallel, we effectuated complex qualitative determinations according to the existing standard norms.*

**Key words:** vinegar, quality, assortments

***Rezumat.*** *Oțetul este un produs de conservare şi totodată un aromatizant utilizat în industria alimentară şi în arta culinară. S-au luat în studiu un număr de 14 probe, reprezentând oțeturi comune (obişnuite) de diferite proveniențe şi oțeturi aromatizate produse de firme tradiționale: din vin – 5 sortimente (1 cu piper, 2 cu plante aromate, 1 de fermentație şi 1 comun), 2 sortimente din cidru (Franța), 1 sortiment din mere, 1 sortiment din alcool,1 sortiment din orez (Japonia) şi 3 sortimente de oțet balsamic (de Modena, Colavita - Italia şi Kalamata - Grecia). Ele au fost analizate în privința densității, extractului sec total, cenuşii (conținut mineral), acidității totale (exprimată în acid acetic) şi culorii. În paralel s-au efectuat determinări calitative complexe, conform normelor standard existente.*

**Cuvinte cheie:** oțet, calitate, sortimente

The technology of food vinegars is highly diversified offering consumers natural but expensive products as well as industrial vinegars produced from cheap raw matters or imitations of the expensive products. (Alessi A., 1996)

## MATERIAL AD METHOD

To evaluate the samples, we used the existing European norms and standards. The appreciation of colour was made according to CIE-Lab norms. On this occasion, we noticed that in some members states of the EU there are national provisions that have not been adopted at the level of the European Community. (Beceanu D., 2009)

We analysed (table 1) vinegars from different sources (from red/white wine, balsamic, from alcohol, from apples/cider or from rice, supplied as such or aromatized, non-matured or matured). The Vinegretto product is a vinegar-based sauce containing spices and herbs, sugar etc. Most packages were from glass (11 assortments), only 3 assortments being packed in plastic material containers (PET).

**Material used** *Table 1*

| Nr. crt. | Products | Package | Weight | Ingredients | Producer/Distributor |
|---|---|---|---|---|---|
| 1 | Aceto di vino aromatizzato al pepe nero | Glass Bottle | 250 mL | - wine vinegar, natural flavors, antioxidant: sulfur dioxide. | CARREFOUR România |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | Glass Bottle | 250 mL | - white wine vinegar, natural flavors of sage, rosemary. | CARREFOUR România |
| 3 | Aceto Balsamico di Mondena | Glass Bottle | 1000 mL | - concentrated grape must, wine vinegar, coloring: caramel E 150 d, E 224 (contains sulphites). | Acetificio M. de Nigris Afragola - Italia/ |
| 4 | Colavita Condimento Balsamico Bianco | Glass Bottle | 500 mL | - white wine vinegar, concentrated grape, antioxidant E 224. | DARINNE DISTRIBUTION S.R.L. |
| 5 | Balsamic vinegar Kalamata | Glass Bottle | 250 mL | - is a natural product produced from dried grapes from vineyards only peloponesiene. | C.C PAPADIMITROIU S.A România |
| 6 | Vinegar Kräuter | Glass Bottle | 500 mL | - wine vinegar, apple vinegar, salt, acidity regulator, sodium acetate, hardener carrageen, herbs, natural extracts of herbs. | MATRA INTERNATIONAL |
| 7 | Vinegar Fermentation | Plastic Bottle | 1000 mL | - obtained exclusively from natural acetic fermentation | S.C. PRODALCOOL |
| 8 | Alcohol vinegar | Plastic Bottle | 1000 mL | - vinegar fermentation of ethyl alcohol, coloring: caramel food, E 150 c. | S.C. SIENANA S.R.L. |
| 9 | Apple vinegar | Plastic Bottle | 500 mL | - apple vinegar obtained by the classical method of natural fermentation. | VINCON VRANCEA |
| 10 | Japanese rice vinegar | Glass Bottle | 150 mL | - distilled vinegar (made from wheat, cooking sake, rice and corn), water, salt. | ROCON DISTRIBUTION 2000 |
| 11 | Vinaigre de cidre au cidre de Normandie | Glass Bottle | 750 mL | - apple vinegar, E 223. | CARREFOUR România |
| 12 | Vinaigre de cidre aux pommes du verger | Glass Bottle | 750 mL | - apple vinegar, E 224. | CARREFOUR România |
| 13 | Vinigretto | Glass Bottle | 500 mL | - wine vinegar, sugar, natural extract of garlic, pepper, coriander, chives, bay leaves, mustard seeds | S.C. CRAMELE HALEWOOD S.A. |
| 14 | Wine Vinegar | Glass Bottle | 750 mL | - wine vinegar, preservative sulfur dioxide. | CIRIO - Roma Italia |

The ingredients and the recipe differ very much from one assortment to another and it is presented in short. At the same time, they mention the producing countries and distributors from Romania. The Romanian products are 4 in number, 5 from Italy, 2 from France, and 1 assortment from the Great Britain, Greece and Germany. The balsamic vinegars from Italy and Greece drew our attention since they are obtained from concentrated grapes must. Most assortments contain $SO_2$ as preservative.

## RESULTS AND DISCUSSIONS

From chemical analysis and physical determinations were obtained the following results:

There is not always an obvious correlation between density and refraction index (table 2). Density (specific mass) of the vinegars under study ranged between 1.109 and 1.007 g/cm$^3$. We noticed that 5 assortments had a density close to that of water, namely between 1.010 g/cm$^3$ and 1.007 g/cm$^3$. 6 samples had a relatively higher density (between 1.022 g/cm$^3$ and 1.013 g/cm$^3$). Only 3 samples of balsamic vinegars had a more important density between 1.109 g/cm$^3$ and 1.075 g/cm$^3$.

In most cases, the refraction index registered the value of 1.34, except the 2 samples of balsamic vinegar of Italian origin.

*Table 2*

**Density and refraction index**

| Nr. crt. | Products | Density g/cm$^3$ | Refraction index |
|---|---|---|---|
| 1 | Aceto di vino aromatizzato al pepe nero | 1,013 | 1,341 |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | 1,013 | 1,340 |
| 3 | Aceto Balsamico di Mondena | 1,075 | 1,362 |
| 4 | Colavita Condimento Balsamico Bianco | 1,100 | **1,372** |
| 5 | Balsamic vinegar Kalamata | **1,109** | **1,337** |
| 6 | Vinegar Kräuter | 1,022 | 1,341 |
| 7 | Vinegar Fermentation | 1,013 | 1,341 |
| 8 | Alcohol vinegar | 1,010 | 1,339 |
| 9 | Apple vinegar | **1,007** | 1,338 |
| 10 | Japanese rice vinegar | 1,016 | 1,339 |
| 11 | Vinaigre de cidre au cidre de Normandie | 1,010 | 1,339 |
| 12 | Vinaigre de cidre aux pommes du verger | 1,010 | 1,339 |
| 13 | Vinigretto | 1,020 | 1,343 |
| 14 | Wine Vinegar | 1,010 | 1,338 |

For the total dry extract (table 3), we noticed a situation similar to that for density meaning that the highest values were registered by the balsamic vinegars (between 16.3 and 26.4 g/L). There is an intermediate segment with an extract higher than 1 g/L (between about 3.1 and 1.3 g/L) registered by 7 samples. A number of 4 samples registered an extract smaller than 1 g/L.

*Table 3*

**Total dry extract**

| Nr. crt. | Products | Total dry extract | |
|---|---|---|---|
| | | g/L | % |
| 1 | Aceto di vino aromatizzato al pepe nero | 1,39 | 0,137 |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | 1,31 | 0,129 |
| 3 | Aceto Balsamico di Mondena | 16,26 | 1,513 |
| 4 | Colavita Condimento Balsamico Bianco | 26,01 | 2,365 |
| 5 | Balsamic vinegar Kalamata | 26,39 | **2,380** |
| 6 | Vinegar Kräuter | 2,36 | 0,231 |
| 7 | Vinegar Fermentation | 0,75 | 0,074 |
| 8 | Alcohol vinegar | 0,07 | **0,007** |
| 9 | Apple vinegar | 0,91 | 0,091 |
| 10 | Japanese rice vinegar | 2,37 | 0,233 |
| 11 | Vinaigre de cidre au cidre de Normandie | 1,64 | 0,163 |
| 12 | Vinaigre de cidre aux pommes du verger | 1,61 | 0,159 |
| 13 | Vinigretto | 3,06 | 0,300 |
| 14 | Wine Vinegar | 0,89 | 0,088 |

The mineral content (table 4) of the samples under study registered fewer extreme values. Thus, Kräuter vinegar and rice vinegar's content was above 10g/L. Most samples' content ranged between 2 and 6 g/L (7 assortments). At the same time, 5 assortments registered values below 2 g/L, among which one smaller than 1 g/L (vinegar from alcohol). Not always did we notice a correspondence between the quantity of ashes g/L and its alkalinity expressed in g$K_2CO_3$/L.

*Table 4*

**Determination of ash and ash alkalinity**

| Nr. crt. | Products | Ashes g/L | Ash alkalinity | |
|---|---|---|---|---|
| | | | meq/L | g/L $K_2CO_3$ |
| 1 | Aceto di vino aromatizzato al pepe nero | 2,15 | 28,0 | 1,93 |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | 1,79 | 29,0 | 2,00 |
| 3 | Aceto Balsamico di Mondena | 4,28 | 24,5 | **1,79** |
| 4 | Colavita Condimento Balsamico Bianco | 1,35 | 30,5 | 2,10 |
| 5 | Balsamic vinegar Kalamata | 6,36 | 38,0 | 2,62 |
| 6 | Vinegar Kräuter | **17,4** | 42,5 | **2,93** |
| 7 | Vinegar Fermentation | 2,36 | 33,0 | 2,28 |
| 8 | Alcohol vinegar | **0,32** | 26,0 | 1,69 |
| 9 | Apple vinegar | 1,29 | 32,5 | 2,24 |
| 10 | Japanese rice vinegar | 10,9 | 26,0 | 1,79 |
| 11 | Vinaigre de cidre au cidre de Normandie | 2,89 | 40,0 | 2,76 |
| 12 | Vinaigre de cidre aux pommes du verger | 5,48 | 32,5 | 2,24 |
| 13 | Vinigretto | 3,36 | 32,5 | 2,24 |
| 14 | Wine Vinegar | 1,54 | 29,5 | 2,04 |

Total acidity (table 5) expressed in g/100mL acetic acid oscillated within very large limits (from about 10 to 4.5). We may group samples in several classes of acetic content:

1. Prodalcool Vaslui fermentation vinegar and Seini alcohol vinegar's content in acetic acid was above 9%

2. The acetic acid content of 6 samples was between 6 and 8% acetic acid (4

Italian vinegars, the German vinegar and Vinegretto – vinegar-based product)

3. A content smaller than 6% acetic acid was registered by 6 samples, 2 of them having a content even below 5 % acetic acid (Kalamata balsamic vinegar and the rice vinegar). We also noticed that all vinegars from apples/cider had a quite similar content of acetic acid (5.2-5.3% acetic acid).

*Table 5*

**Total acidity**

| Nr. crt | Products | Total acidity g/100mL a. acetic |
|---|---|---|
| 1 | Aceto di vino aromatizzato al pepe nero | 7,516 |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | 7,543 |
| 3 | Aceto Balsamico di Mondena | 6,842 |
| 4 | Colavita Condimento Balsamico Bianco | 5,657 |
| 5 | Balsamic vinegar Kalamata | 4,665 |
| 6 | Vinegar Kräuter | 6,142 |
| 7 | Vinegar Fermentation | **9,967** |
| 8 | Alcohol vinegar | 9,482 |
| 9 | Apple vinegar | 5,388 |
| 10 | Japanese rice vinegar | **4,472** |
| 11 | Vinaigre de cidre au cidre de Normandie | 5,226 |
| 12 | Vinaigre de cidre aux pommes du verger | 5,307 |
| 13 | Vinigretto | 6,627 |
| 14 | Wine Vinegar | 6,088 |

Most assortments analyzed (table 6) were clear (9 samples), three samples were opalescent and Modena balsamic vinegar was practically opaque to sunlight. As for the coordinate of complementary colour **a,** 6 samples may be classified under the predominant red colour, among which the cider vinegar, the vinegar from orchard fruits and especially the aromatic vinegar with black pepper had the most significant values; the rest of 8 samples may be classified under the predominant green colour without having a more important value.

*Table 6*

**Determination of chromatic parameters**

| Nr.crt. | Products | L- | a | b |
|---|---|---|---|---|
| 1 | Aceto di vino aromatizzato al pepe nero | 57,91 | 31,3 | 47,68 |
| 2 | Aceto di vino bianco aromatizzato alle erbe fini | 96,98 | -1,62 | 15,85 |
| 3 | Aceto Balsamico di Mondena | 2,05 | 1,50 | 3,53 |
| 4 | Colavita Condimento Balsamico Bianco | 94,78 | -0,32 | 19,69 |
| 5 | Balsamic vinegar Kalamata | 6,87 | 3,69 | 1,19 |
| 6 | Vinegar Kräuter | 96,06 | -0,77 | 8,16 |
| 7 | Vinegar Fermentation | 96,95 | -1,57 | 15,45 |
| 8 | Alcohol vinegar | 98,97 | -0,65 | 4,96 |
| 9 | Apple vinegar | 97,11 | 0,58 | 9,68 |
| 10 | Japanese rice vinegar | 96,72 | -1,19 | 13,80 |
| 11 | Vinaigre de cidre au cidre de Normandie | 95,21 | -0,51 | 21,70 |
| 12 | Vinaigre de cidre aux pommes du verger | 65,24 | 19,3 | 64,12 |
| 13 | Vinigretto | 79,38 | 6,76 | 28,90 |
| 14 | Wine Vinegar | 97,43 | -0,70 | 10,12 |

**L- brightness, a - coordinate complementary color red (+) and green (-),**
**b - coordinate complementary colors yellow (+) and blue (-)**

As for the coordinate of complementary colour **b,** all variants were predominantly yellow and few assortments even had an intense yellow colour: the cider vinegar and the aromatic vinegar with black pepper.

Consequently, we may affirm that the vinegars under study were mostly yellow with a greenish hue, very less obvious. There were also samples having an obvious reddish hue (2 assortments).

## CONCLUSIONS

1. The vinegar samples under study presented highly differentiated characteristics in terms of origin and processing technology.

2. We may group these products in several commercial categories:

- strong vinegars with reduced extract (Prodalcool Vaslui vinegar and Seini alcohol vinegar)
- vinegars with an acetic content between 6 and 8% g acetic acid (most of them from Italy and Germany), among which the balsamic ones had a high extract quantity and the aromatic ones had a more reduced extract.
- vinegars with a lower acetic acid content (vinegars from apples and cider as well as the Greek balsamic vinegar – Kalamata and the rice vinegar). The vinegars from apples and cider registered relatively reduced extract content whereas the rice vinegar and especially the Kalamata balsamic vinegar had high/very high content of extract.

3. The mineral content (ashes g%) is not always correlated with the appreciation criteria used. Thus, the aromatic vinegar (Kräuter) registered the maximum value followed by the rice vinegar. We may distinguish two following groups in terms of mineral content: between 6 and 2 g% (7 assortments, Kalamata balsamic vinegar, 2 cider vinegars, Modena balsamic vinegar, Prodalcool Vaslui fermentation vinegar, aromatic wine with black pepper and Vinegretto). Less than 2 g% of mineral content was registered by 5 samples (white wine aromatic vinegar, Wine Vinegar, Colavita balsamic vinegar, Vrancea apple vinegar and Seini alcohol vinegar. The reduced mineral content may lea to the suspicion of counterfeit.

4. The colour of the samples under analysis was mostly yellow with a slight greenish hue. Only two samples were yellow with a significant red hue.

### REFERENCES


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