

UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE
“ION IONESCU DE LA BRAD” IAȘI
HORTICULTURAL FACULTY
DOMAIN: HORTICULTURE
SPECIALIZATION: FOOD PRODUCT TECHNOLOGY

ABSTRACT

Key words: quality, concentration, apple juice.

Since ancient times, the apple has been a component of our daily food. With 22 known varieties, the offer was extremely reduced then as compared to nowadays when we have more than 1100 species at our disposal.

In nature's medicine, the apple has always occupied a special place. Even if most often it is considered as just a simple food, apples have curative properties anticipated ever since ancient times. Apples make part of our life representing an important part of the “foundation” of the human body.

Fresh state apples are consumed out of pleasure due to taste, flavour and attracting aspect. Out of the most spread 11 types of products that may be currently obtained by processing apples (mainly jams, marmalades, compotes, juices, nectars, concentrates, dehydrates, cider, brandies, calvados and apple vinegar), apple juices and nectars have a special benefic action on the human body due to their nutritional, dietetic and therapeutical value.

Apple juice is the fermentescible but unfermented product obtained from healthy and ripe fruits, fresh or refrigerated, exhibiting the colour, flavour and taste specific to an apple (OMAPDR nr.768/2003).

The concentrated apple juice is the product obtained from apple juice through the physical elimination of some quantity of water content. If the product is meant for direct consumption, the water quantity eliminated is at least 50%.

The concentrated apple juice is a viscous limp tasteless liquid lacking the caramel smell having the colour and consistency of bee honey and a dry substance content of about 65 °Bx. They will subsequently obtain apple juice from it by water dilution operation.

These qualities must be guaranteed for at least 6 months. Flawed concentrated juices (turbid, jellified or caramelized aspect) may not be used in the preparation of apple juices since they may be transmitted to the final product (OMAPDR nr.768/2003).

By concentrating juices they obviously register low costs for manipulation and transport. At the same time, by concentration they also register a diminution of water activity leading to the increase of microbiological stability and extension of storage time in determined conditions.

The so-called “commercially sterile juices concentrates” are meant for marketing (dilutable juices). They also may be stored and used as a raw material for subsequent processing (Taylor, 2007).

Fruit juice from concentrate is the product obtained through adding in the concentrated fruit juice of some quantity of water extracted from such juice during concentration and by reconstituting flavors and, if necessary, the pulp eliminated from juice but recovered during the process of production of such juice (“cloudy” concentrate).

The water added must have adequate characteristics from the chemical, microbiological and organoleptic viewpoint, according to the regulations in force, so as to guarantee the essential qualities of juice (OMAPDR nr.768/2003).

The recipe components (softened water and concentrates) are mixed together, diluted, dissolved, blended and homogenized.

Filtration follows after about 24-48 hours of rest and then comes pasteurization as a mandatory phase in case of refreshments having a longer validity term.

If the processing and packaging juices after the pasteurization is made in a steril way, a term of 14 days of stability will be assured at 25°C. Storage temperatures of 4-5 °C are needed in order to guarantee more than 14 days days of stability for product (<http://www.cablurisi>).

Apple nectar is the fermentescible but unfermented product obtained by adding water and sugars and/or honey in the fresh apple juice, the concentrated apple juice or the dehydrated apple juice, the apple purée or a mixture of these products.

The sugar and/or honey adding is allowed only in quantities of 20% of the total mass of the final product.

All over the world, the demand for juices and nectars obtains from fruits has been larger and larger, so the interest for the research programmes in this field has been developed lately.

Due to the modern production methods of soft drinks a very large volume of finished product is obtained, especially through its preparation on the basis of one or more concentrated juice.

In our country, the consumption of non-alcoholic drinks become one of the most dynamic and profitable sector of drink trade taking into account the consumption habits, diversity of products and the pace supported by development.

Eastern Europe has also recorded a substantial increase of the annual consumption per capita. Regional increase depends on the life standard, but potential buyers are attracted to packing, content and novelty.

Though great competitors are known, one may notice the increase of the number of manufacturers and the diversification of assortments.

As long as industry may adapt to the market and change permanently, it must understand and know consumers' (also changing) needs.

Consumers should be kept as receptive as possible to the innovating offer.

In these conditions, the increase registered in recent years may be sustained and even improved (Roethenbaugh, 2005).

The thesis is structured in two large parts: Stage of knowledge and Our own contributions.

Part I comprises two chapters.

In **chapter I** is presented the current stage of researches regarding the raw material for apple juices and the importance of apple juice. The raw material – apples have a special role in human being's nutrition given their benefic effects on the human body, especially by the significant contribution in fibers. Due to other components, such as organic acids, glucides and mineral salts, apple has a high dietetic value and it cannot miss from our daily food.

In fresh state, apples may be eaten throughout the year due to the existence of a wide variety of species reaching their consumption maturity ever since June (early apples) until October (tardy apples) and the possibility to store them in refrigerators for 6-8 months.

The apple juice from fresh apples obtained according to a specific technology largely keeps the components of raw material. Only fibers lack, what makes nutritionists affirm that it is a partially denaturated product.

The economic importance of apple juice both at national and world level results from the large consumption recorded.

For industrialization they use fruits that do not exhibit a quality satisfactory to be delivered in the market for consumption. Being a species of maximum importance in terms of production, it results that the fruit offer for industrialization, including the juice production, is equally important. There are apple species that were specially created for industrialization, with high productivity and characteristic features (thin epicarp, high content of glucides etc).

At ICCP Pitesti, they started a research programme by which they make observations and recorded dates related to characteristic features, productivity and also evaluated the suitability for processing under the form of juice of 20 apple genotypes (Jalea and colab.,1990).

In **chapter II** entitled “Current stage of researches regarding the technologies used to obtain apple juice”, is presented the flow sheet for the obtaining of apple juice, both the variants known at national and international level, as well as the flow sheet within S.C. Agrana Juice SRL Vaslui, from where we took samples and analysed them.

Part II comprises chapters 3, 4 and 5.

In **chapter III**, we presented the organizational and institutional framework in which researches were carried out, namely S.C. Agrana Juice SRL Vaslui and the Technology of horticultural products and Oenology test labs within “Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine of Iași.

The objectives of the study described in **chapter IV** are the following:

Study of origin of the raw material – analysis of suppliers and purchase costs.

Study of the main qualitative indicators for the apples meant for apple juice.

Qualitative determinations for flow sheet – enzymed/non-enzymed apple brandy, primary juice, decanted juice.

Determination of the quality of the finished product – concentrated juice and comparison of the product of SC Agrana Juice SRL with other products existing in the market.

Identification of components of the secondary product – flavor obtained at SC Agrana Juice SRL Vaslui.

Calculation of production cost and identification of the methods for the optimization of the flow sheet so as to render the activity efficient.

Thus, we analysed: non-enzymed minced apples, enzymed minced apples, unexhausted apple brandy, exhausted apple brandy (marc) primary juice, decanted juice and concentrated juice. Moreover, we also analysed the flavor extract as a secondary product.

The work methods used were:

- Sensorial analysis of apple juice, of apple concentrate and apple flavour;
- Determination of the starch content through the iodine test;
- Determination of ascorbic acid (vitamin C) content by titrimetric method with 2,6 dichlorophenolindophenol;
- Determination of catalasis activity;
- Determination of the ash content and its alkalinity;
- Determination of titrating acidity;
- Determination of dry soluble substance by refractometric method;
- Chromatographic analysis by CIE Lab-76 method;
- Chromatographic and spectrometric analysis, by using ITEX System;
- Statistical interpretation of results using Fischer Test

The main conclusions drawn from **chapter V** were:

The study offers data related to the optimal conditions for the obtaining of apple concentrate and flavour at SC Agrana Juice SRL Vaslui.

The raw material used at SC Agrana Juice SRL Vaslui are fresh apples for industry, mainly the species more encountered such as Golden delicious, Starkrimson and Jonathan.

Since 2009, we may notice a change of the purchase price policy for the raw material with an adaptation to demand and offer, in other words a good position in the business environment as compared to the market's needs.

By correlating the values of the soluble dry substance to those of titrating acidity and reducing glucides, we may notice that the company required a raw material with significant soluble dry substance content and relatively low malic acid content.

All apples were collected in their final phase of maturation without having entered in their stage of physiological decline.

Titration acidity expressed in g of malic acid/100 g of product presents an descending trend for the primary stages of flow sheet and ascending for the last two stages of it.

The soluble dry substance has an ascending trend for the flow sheet up to the phase of obtaining the decanted juice.

Subsequently, due to evaporation of a large content of water during the four stages of concentration, the quantity of soluble dry substance considerably augments up to the desired value.

The antioxidizing action of catalasis decreases as the technological process advances to obtain apple juice due to the contact with oxygen and the applied temperature.

By processing, ascorbic acid practically disappeared and the quantities registered in the concentrated juice are below 0,5 mg/100 g of product.

Organoleptic analysis and physical-chemical determinations carried out comparatively for the 14 assortments of apple juice purchased from the Romanian and international market offers us a margin of confidence when choosing and drinking apple juice and nectar.

According to the tests run, SC Agrana Juice SRL of Vaslui obtains a safe product – an apple concentrate safe from the viewpoint of food innocuousness, of high quality so that it may meet the consumer's requirements and expectations.

The qualitative analysis through gas chromatography coupled to the mass spectrometer of the variants of flavour concentrate allowed for the identification of 110 -135 flavour compounds, depending the method used.

The most numerous and important compounds in terms of flavour release identified in the variants under study belong to the class of esters (63), alcohols (27) and aldehydes (15).

The characteristic features of flavour for the variants under study were fruity, green and fruity green. The optimization of the technological process is possible by increasing output and productivity.