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## Improvement processing technology of obtaining the current and raspberry natural juices and nectar

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### Abstract

*While performing detailed research upon the technological processing of obtaining the currant and raspberry clear natural juices and nectar upon the best fit raspberry varieties: Cayuga, Newburgh, Autumn Bliss, Sopska Allena, Latham G, etc; black currant varieties: Black Reward, Kerry, Lissil, Invigo, Cruseder, Tsena, Big Black, Abanos, Cotswald Cross, etc. and red currant varieties: Early Red, Knight, London Market, Lopper Summer, etc.*

*The utilization of enzyme preparations, may several other activities, reduction of the oxidative enzyme quantities; the increase of utility substances quantities anthocyanins, colour, sugar substances, organic acid, vitamins, mineral substances, etc., reducing the viscosity of clear natural juices and increasing the productivity into “raw juice” ( $\eta$ ). When recommended some different temperatures for the termic treated of fruits (currant and raspberry), it should be possible to inactivity the oxidativ enzymes and soaking texture of fruit pulp.*

*The utilization of some different ratios of cupping for each varieties of (fruits, mash of fruits/ sugar syrup: 40/60 and 50/50), sugar quantity and ascorbic acid for obtaining the nectar.*

**Keywords:** currant, raspberry, technology, juices, nectar

### Introduction

Black currant berries, red currant berries and raspberry consist of raw material importance for human alimentary. Aroma, color and ascorbic acid content are the most important quality parameters of this fruits.

These fruits are considered finite products when consumed fresh and are raw material for food industry, when put to process of transformation, resulting into finite products, with different properties given by the fruits in fresh condition.

These products are clear natural juices and nectar (juices with pulp of fruits), which occupy significant place in human food, being real vitamins concentrate, anthocyanins and organic acid.

The research was proposed for improving the technological process for obtaining black currant, red currant and raspberry clear natural juices and nectar, from improvement several stages in the classical technology process, modernized according to national and international standards.

## Materials and Methods

The experiments has been performed in the laboratory as part of The Institute of Research Development Industriality Marketing of Horticol Products–Horting, Bucharest, Romania, was utilized upon the best fit currant and raspberry varieties harvested from three fruit-growing Research Station of Romania: SCPP Baneasa of Bucharest, ICPP Maracineni of Pitesti and SC Ceder of Sibiu (The Institute of Montanology, Halchiu Centre of Brasov) – each of the varieties was analyzed from a physical-chemical and organoleptical poin of view; different dosage of pectolitic enzymes, clearness and stabilization agents by food galatin, bentonite, vitamin C and citric acid; laboratory apparatus and glassware; industrial tehnological equipment; glass bottles (200 mL or 250 mL).

### *Currant and raspberry clear natural juices processing*

The tehnological processing for obtaining black currant, red currant and raspberry clear natural juices whithout any addition sugar (natural juice 100%) is presented according to **Figure 1**.

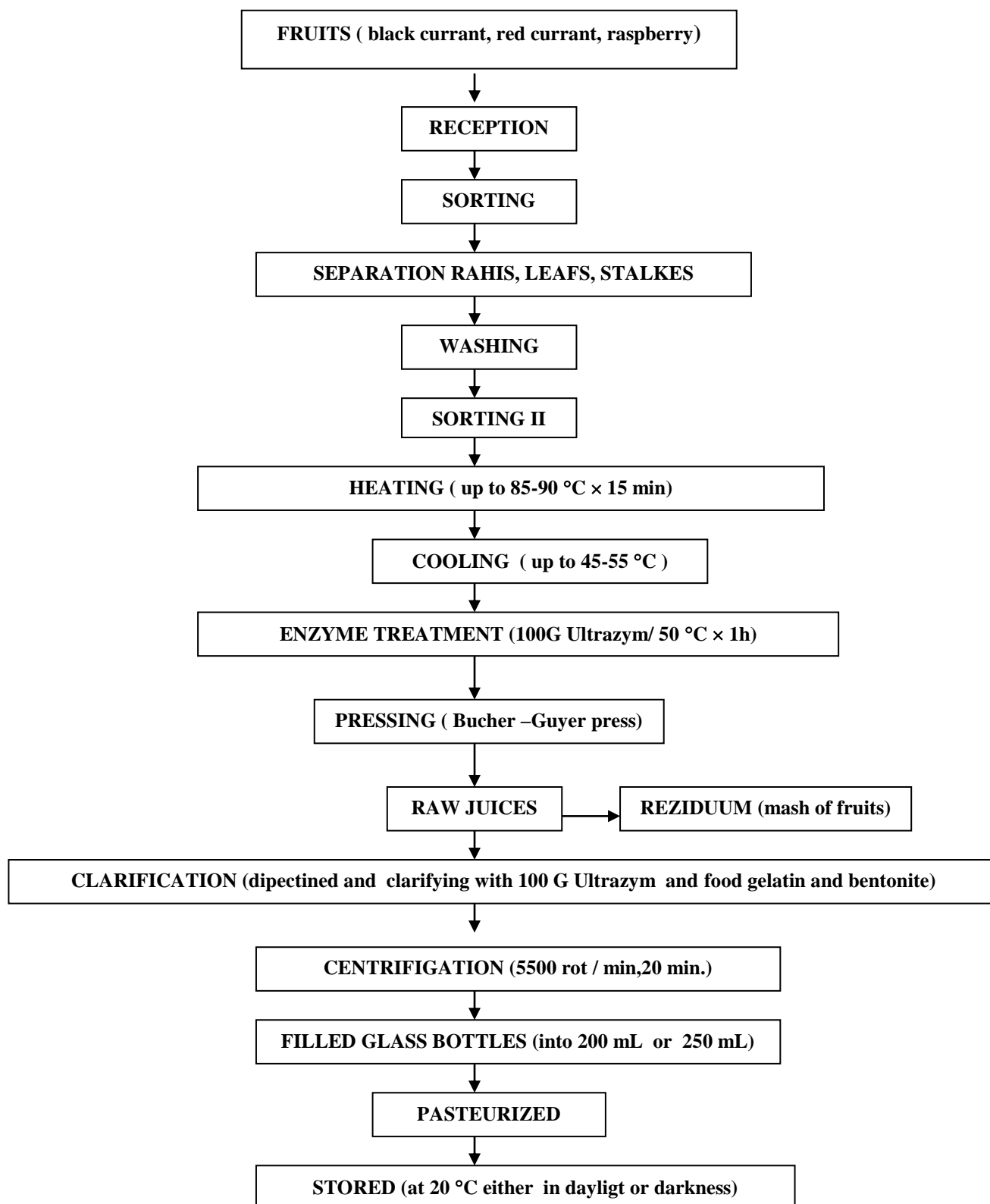
The clarification process of the fruit juices was very important for the food industry in the last decade, being the same for every fruit (currant and raspberry), but the condition tehnology are different for each variety of fruit, these being in case of nature the raw material, of the pectolytic enzyme, gelatin and bentonite dosage, of the temperature and of the time clarification process of the raw juice, obtained after pressing (Bucher-Guyer press) [ 1 ].

Pectolytic enzymes are normally used during juice processing to improve juice productivity ( $\eta$ ) [ 5 ].

The improvement tehnological processing (**Figure 1**) and the production technique of the clear natural fruit juices was achieved in our laboratory, in more experimental variant, as to:

- ◆ the varieties of black currant, red currant and raspberry (different from of technological physical and chemical quality parameters);
- ◆ the various dosage of pectolytic enzymes (100 G Ultrazym) necessary the enzyme treatment at 40 – 45 °C (hot treatment) and the raw juices clarification at 40 – 45 °C, obtained after pressing: 2 – 3 g/100 L and 5-6 g/100 L respectively;
- ◆ the time of enzyme treatment (about 1h) for an most colour extraction and for favouement the pressing stage;
- ◆ reported of pectolitic enzyme quantities which was realized at finit products mass;
- ◆ the time which is necessary for the clarification of the raw juice (dipectined at 40 - 45°C, between 1 - 4 h);
- ◆ the time necessary for the clarifying of the raw juice, from the addition of food gelatine quantities (1g/1 L raw juice) at 5 - 10°C, between 12 - 24 h, about the raspberry clear natural juice;
- ◆ unrecommended food gelatine quantities (1g/1 L raw juice) for obtaining black currant and red currant juices, because of the appearance of some adherent sediment, involved contain very high levels of both anthocyanins and pectin substances of berries;
- ◆ the time necessary for the clarification with silica gel (clay) and bentonite quantities (2 g/ 1L raw juice), between 30 minutes - 3 h;
- ◆ the time of the centrifugation (for everyting the variante): 5500 rot/min, at 20 minutes;
- ◆ juice productivity ( $\eta$ ).

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**Figure 1.** The improvement processing technology for obtaining the black currant, red currant and raspberry clear natural juices.

### *Currant and raspberry nectar processing*

The technological processing for obtaining the black currant, red currant and raspberry nectar (juices with pulp of fruits) were prepared from homogenizing the mash of fruits with sugar syrup, after the addition of ascorbic acid (vitamin C) and citric acid, is presented according to **Figure 2**, flowsheet for the nectar improvement processing.

Aroma, colour and ascorbic acid content are the most important quality parameters of black currant and raspberry nectar. Aroma changes during berries nectar processing, but from this the technological process was intended to improve the flow sheet for black currant and raspberry nectar.

The improvement of technological processing (Figure 2) and the production technique of the fruits nectar, was realized in our laboratory, in more experimental variante, as to:

- ◆ the fruits may be the most, healthy, with pronounced aroma, without a trace of phytopharmaceutics, stage smell and taste;
- ◆ thermo break is composed of the fruits heating at different temperatures for each varieties, in the following way: between 85 - 90 °C (for raspberry); 87 °C (for black currant) and 95 °C (for red currant), the time was between 3 – 5 minutes, keeping into account the pulp steadiness in the object of oxidativ enzymes inactivity and soaking texture of fruit pulp.
- ◆ water quantity which is necessary for the thermo break;
- ◆ the ratios of cupping mash of fruits/sugar syrup has been: 40/60 and 50/50 (the pulp was used for the production of fruit nectar having 50% and 40% pulp content and the mash refractometrical extract value of 14 °R);
- ◆ the sugar syrup concentration was established from the calculation, the mash refractometrical extract value being necessary the fruit products refractometrical extract value (°R);
- ◆ of added citric acid quantity established from the calculation, being necessary the mash acidity (%) and the finite products acidity (%);
- ◆ of added ascorbic acid (vitamin C) quantity, it was established from calculation at of the finite product mass (10 g/ 100 Kg product);
- ◆ the expiry date is of 9 months from production.

### **Result and Discussions**

Our current objective was to improve technological processing of the currant and raspberry clear natural juices and nectar.

The most important is the organoleptical characteristic of finite products: aspect, aroma, colour, smell and taste. The clear natural juices and nectar which was produced in our laboratory, were analysed physically, chemically, microbiologically and organoleptically.

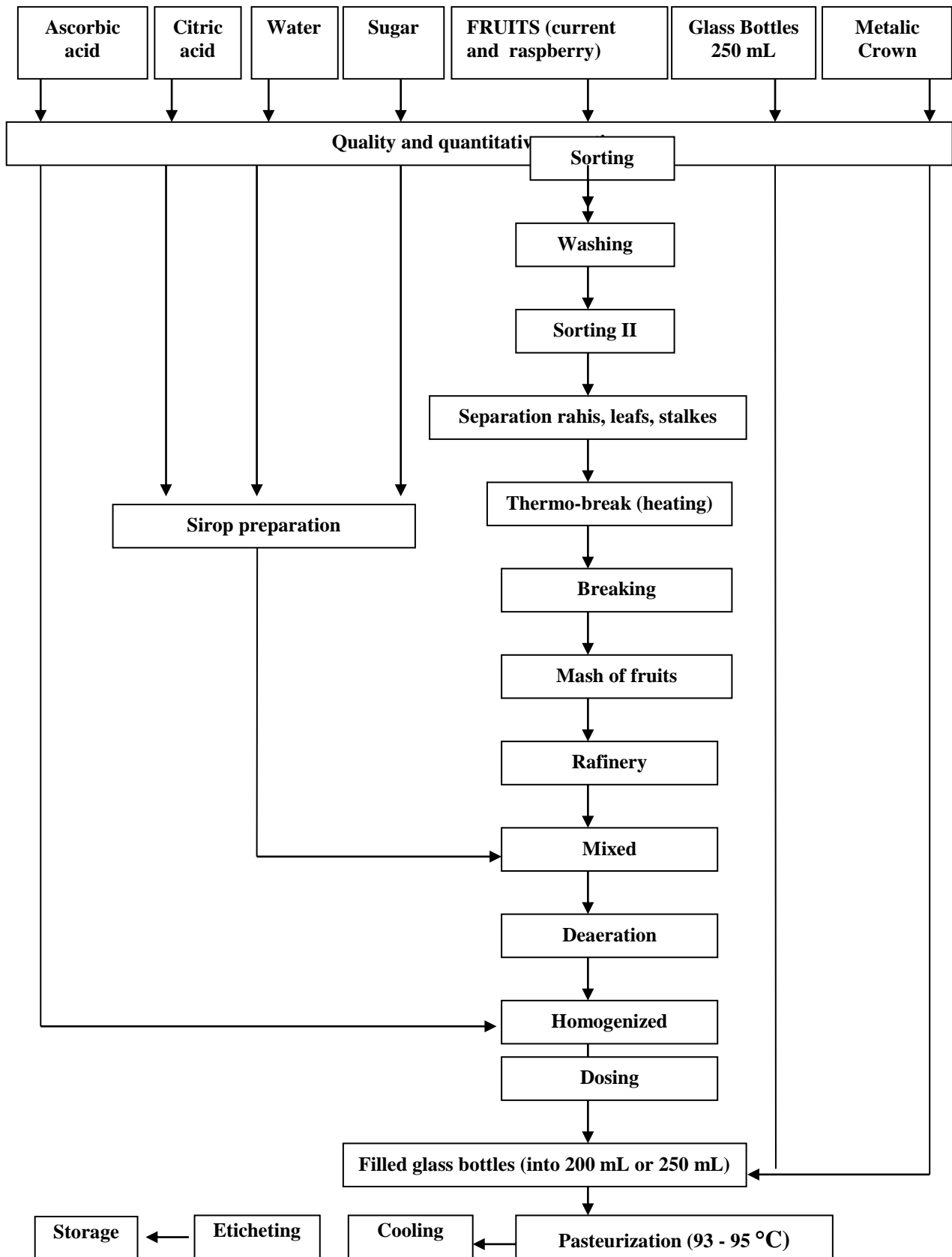
Microbiological analysis consisted in the determination of the total number of germs, dregs and the mould. The total absence of these microorganism was observed.

The chemical composition of this products included the determination of total sugars (%), total dry soluble substances – T.S.S. (°R), total acidity (%), ascorbic acid (mg/100g).

The chemical composition of clear natural juices prepared berries and juice productivity ( $\eta$ ) were given in **Table 1, 2 and 3**.

The chemical, microbiological and organoleptical composition of nectar prepared from berries and energetic values, were given in **Table 4**.

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**Figure 2.** The improvement of technological processing for obtaining the black currant, red currant and raspberry nectar.

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**Table 1.** Chemical composition of black currant juices and juice productivity ( $\eta$ ):

<b>Black currant varieties</b>	<b>T.S.S. at 20°C (°R)</b>	<b>Total acidity (g malic acid /100 g)</b>	<b>Total sugar (g / 100 g)</b>	<b>Ascorbic acid (mg / 100 g)</b>	<b>Juice productivity (<math>\eta</math>) %</b>
<b>MICIURIN `86-V<sub>1</sub></b> (Baneasa)	11,50	2,38	10,03	104,30	51,43
<b>BLACK REWARD-V<sub>2</sub></b> (Baneasa)	15,20	2,21	11,76	125,44	66,25
<b>FRENEK -V<sub>3</sub></b> (Baneasa)	16,50	1,87	12,15	111,05	63,30
<b>LISSIL - V<sub>4</sub></b> (Baneasa)	17,20	2,37	13,15	112,85	51,43
<b>KERRY -V<sub>5</sub></b> (Baneasa)	16,30	2,44	12,15	109,35	61,92
<b>BANG ` UP -V<sub>6</sub></b> (Baneasa)	15,70	2,25	11,73	115,85	57,60
<b>OLDEN `S BLACK - V<sub>7</sub></b> (Baneasa)	17,50	2,40	13,35	88,75	65,08
<b>INVIGO - V<sub>8</sub></b> (Baneasa)	16,50	2,18	12,63	117,75	66,83
<b>CRUSADER - V<sub>9</sub></b> (Baneasa)	13,50	2,31	9,55	125,86	70,92
<b>TSEMA - V<sub>10</sub></b> (Baneasa)	15,30	2,26	9,24	93,85	71,93
<b>NOIRE DE BOURGOINE - V<sub>11</sub></b> (Baneasa)	15,00	2,35	11,45	128,35	60,93
<b>SLITSA - V<sub>12</sub></b> (Baneasa)	16,50	2,14	12,83	118,35	70,83
<b>BLACK DOWN -V<sub>13</sub></b> (Baneasa)	15,20	2,21	11,76	125,44	69,30
<b>COTSWOLD CROSS -V<sub>14</sub></b> (Baneasa)	12,50	2,25	9,62	119,05	73,15
<b>TSEMA</b> (Maracineni)	12,10	2,05	9,24	101,20	65,37
<b>ABANOS</b> (Maracineni)	12,00	2,30	8,12	81,65	63,76

**Table 2.** Chemical composition of red currant juices and juice productivity ( $\eta$ ):

<b>Red currant varieties</b>	<b>T.S.S. at 20°C (°R)</b>	<b>Total acidity (g malic acid /100 g)</b>	<b>Total sugar (g / 100 g)</b>	<b>Ascorbic acid (mg / 100 g)</b>	<b>Juice productivity (<math>\eta</math>) %</b>
<b>LOPPER SUMMER</b> (Baneasa)	10,5	1,55	7,35	18,30	58,09
<b>EARLY RED</b> (Baneasa)	10,7	1,94	6,72	15,25	69,20
<b>LONDON MARKET</b> (Baneasa)	10,2	1,63	5,87	17,57	68,39
<b>RED OF HOLLAND</b> (Baneasa)	11,8	1,55	6,98	19,87	65,78
<b>NETWON CASTLE</b> (Baneasa)	7,9	1,23	2,90	13,45	58,67
<b>WILLDER</b> (Baneasa)	12,7	1,85	6,57	21,78	66,76
<b>ROTET</b> (Baneasa)	10,4	1,08	5,34	24,34	59,85
<b>STANZA</b>	9,7	1,78	4,86	14,56	54,28

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<b>(Baneasa)</b>					
<b>RED LAKE (Baneasa)</b>	10,1	1,77	6,14	17,89	67,89
<b>EARLY RED (Maracineni)</b>	11,2	1,55	6,45	23,28	70,97
<b>KNIGHT (Maracineni)</b>	10,0	1,77	6,14	14,55	67,65

**Table 3.** Chemical composition of raspberry juices and juice productivity ( $\eta$ ):

Raspberry Varieties	T.S.S. at 20°C (°R)	Total acidity (g malic acid /100 g)	Total sugar (g / 100 g)	Ascorbic acid (mg / 100 g)	Juice productivity ( $\eta$ ) %
<b>CAYUGA (Baneasa)</b>	9,8	0,70	8,06	11,24	73,56
<b>NEWBOURGH (Baneasa)</b>	11,0	0,49	8,35	10,95	66,13
<b>LATHAM G (Baneasa)</b>	7,8	0,41	5,85	10,75	69,20
<b>SOPSKA ALLENA (Maracineni)</b>	9,4	0,81	7,08	11,25	69,71
<b>CAYUGA (Maracineni)</b>	11,5	0,75	9,60	12,35	69,40
<b>AUTUM BLISS (Maracineni)</b>	8,5	0,79	6,52	13,47	63,98
<b>HERITAGE (Maracineni)</b>	7,9	0,67	11,02	5,12	63,30

**Table 4.** Chemical, microbiological and organoleptical composition and energetic valory of black currant, red currant and raspberry nectar (juices with pulps fruits).

Chemical, microbiological and organoleptic	Black Currant Nectar (variety Big Black)	Black Currant Nectar (variety Ronix)	Black Currant Nectar (variety 88-7-88/4)	Black Currant Nectar (variety Deea)	Red Currant Nectar (variety Early Red)	Raspberry Nectar (variety The Latham Ameliorat)	Raspberry Nectar (variety Heritage)	Raspberry Nectar (variety Autum Bliss)	Raspberry Nectar (variety Rubin)
Pulp of fruits	50%	40%	50%	50%	40%	40%	50%	40%	40%
T.S.S. at 20°C (°R)	17,2	18,8	19,4	19,2	16,0	14,0	17,5	17,0	20,0
Total acidity (acid citric) g/100g	0,854	0,966	0,737	1,087	1,320	0,743	1,110	0,932	0,854
Ascorbic acid mg/100g	142,25	121,40	130,50	123,50	22,75	12,75	16,45	18,85	13,45
Total percentage of ash, g%	0,217	0,414	0,209	0,160	0,253	0,152	0,168	0,147	0,190
Dimension medium of particle, $\mu$	200	200	200	200	180	150	150	150	150
Energetic valory Kcal/100g	70,80	77,82	81,23	79,04	68,56	59,97	68,03	65,28	70,09
The products aspect	Opalescent liquid, homogenous with superficial sediment								
Colour	Purple black				Dark red	Light red			
Taste and smell	Pleasant, typical of fruit, strong								
Foreign corps	Absent								
Aerobic, mesophyle and thermophyle bacterium	Absent								
Anaerobic, mesophyle and thermophyle bacterium	Absent								
Dregs and mouled	Absent								

## Conclusions

From the results presented, we can conclude that:

- ◆ At the clear natural juices and nectar of fruits from the technological processing applied, it was followed extraction and conservation in this products the most important substances of fresh fruits, in the pleasant form, not included without any addition sugar or with utilization the small addition sugar in this juices [ 3 ];
  - ◆ As part of the technological process of clear natural juices was analyzed several stages in the clarification of the juice from the utilization enzyme preparation, may have several other activities, reduction of the oxidative enzyme quantities; the increase of utility substances quantities (anthocyanins colour, sugar substances, organic acid, vitamins, mineral substances, etc., reducing the viscosity of clear natural juices and the increase productivity into “raw juice” ( $\eta$ );
  - ◆ The clarification of the raw juice, from the addition of pectolytic enzyme, food gelatine and bentonite quantities is necessary for the conducting to the production of some clear juices without foreign corps, with pronounced aroma, taste and smell typical of fresh fruits;
  - ◆ When recommended some different temperatures for the termic treatment of fruit (currant and raspberry), it should be possible to inactivity the oxidative enzymes and soaking texture of fruit pulp;
  - ◆ We employed the different ratios of cupping for each varieties of fruit (mash of fruits/sugar syrup has been 40/60 and 50/50 - the pulp was used for the production of fruits nectar having 50% and 40% pulp content and the mash refractometrical extract value of 14 °R);
  - ◆ The vitamin C (ascorbic acid) protecting aroma and colour of the berries nectar;
  - ◆ The deaeration of nectar was of no value for ascorbic acid stability;
  - ◆ The black currant varieties which may be adapted for industrialization under the clear natural juices, are the following: Black Reward, Kerry, Tsema, Noire de Bourgogne, Costwold cross and Abanos;
  - ◆ The red currant varieties which may be adapted for industrialization under the clear natural juices, are the following: Red of Holland, Early Red, Rotet and Red Lake;
  - ◆ The raspberry varieties which may be adapted for at industrialization under the clear natural juices, are the following: Cayuga, Newbourg, Heritage and Sopska Allena;
  - ◆ The black currant varieties which may be adapted for at industrialization under the nectar, are the following: Ronix, 88-7-88/4 and Big Black;
  - ◆ The red currant and raspberry varieties which may be adapted for to a industrialization under the clear natural juices, are the following: Early Red, Heritage, The Latham , Rubin;
- We tried to give you an overview of the possibilities to increase the positive image of fruit clear natural juice and nectar and how they may contribute to a modern and healthy nutrition.

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