STATISTICAL CORELATIONS BETWEEN BIOPHYSICAL CHARACTERISTICS FOR SOME GREEN VEGETABLE JUICES

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• **Abstract**: *Natural green plant juices have excellent nutritional properties and many functional qualities being used very often in the modern diets. Due to their biological and therapeutic values, this types of juices are considered functional foods having substantial benefits for health and body balance. The therapy with green plant juices improve physical and emotional state of the body. Natural juices offer the nutritional benefits of components in a concentrated form with the possibility of a very easy and rapid absorption in the human body. In this study natural juices from green apples (Malus domestica), cucumbers (Cucumis Sativus), parsley (Petroselinum crispum), lime and spinach (Spinacia oleracea) was analyzed by the point of view of some biophysical characteristics such as density, viscosity, pH, electrical conductivity, surface tension and refractive index. The objective of this study was to evaluate and compare these characteristics for five distinct juices samples. All the data was statistically analyzed using Statistica10. The results showed a statistical correlation between the physicochemical parameters for the analyzed types of juices samples. These linear correlations determine the linear dependency between the studied biophysical parameters. In conclusion a plant juices therapy is an effective alternative for cell reconstruction and regeneration to an optimal body health. A moderate consumption of green plant juices, as part of well-balanced daily diet, offers benefits in maintaining good health and reducing the risk of illness.*

• Introduction

• Fruits and vegetables are part of foods category, most important to human, being necessary to maintain life and health. In the rational good nutrition, the important role of fruits and vegetables is well known through the valuable intake of vitamins, sugars, enzymes, pectic substances, cellulose, organic acids, flavors and minerals. Fruit juices are known all over the world, not only because of their taste and freshness, but also because of their beneficial health effects when are consumed regularly. Natural juices have a beneficial effect on the body due to the multitude of nutrients that are assimilated in a very short time

• Material and method

• It was prepared five distinct samples of apple juice, cucumber, spinach, parsley, limes of about 200 ml, separately and also another mixed sample resulting from the mixture of this five ingredients. The mixture of green plant juices from vegetables and fruits was obtained to the following recipe: 2 green apples 250g, spinach baby 150g, cucumber 250g, parsley 50g, 1/2 green lime. Samples of fruits and vegetables were purchased randomly from agro-food markets in Timisoara.

• Natural juices from green plants were obtained using a Centrifugal Juicer, a pressing robot for fruits and vegetables. The resulting juice was a 100% natural product, without additives or preservatives, made with the robot device by mastication that extracts, crushes and presses, thus contributing to release the nutrients. For each of the fresh and clear prepared juices, taken into study, the physicochemical parameters were determined (pH, electrical conductivity, dynamic viscosity, refractive index, superficial tension and density) according to AOAC Official Methods of Analysis, 2000 (AOAC, 2000).

• The aim of the study was to evaluate and test the linear relations between some characteristics (pH, electrical conductivity, dynamic viscosity, refractive index, superficial tension and density) in case of various types of juice samples obtained from apples, spinach, cucumber, parsley and lime taken separately and all in the mixture

The pH and the electrical conductivity (G) were determined using the multiparameter analysis device CONSORT 3010. This is a multiparameter analysis equipment that allows measurement of pH, electrical conductivity and temperature. The refractive index was measured using the refractometry method, with the Abbe refractometer corrected to the equivalent reading at 20°C. The dynamic viscosity was obtained using the Ostwald-type viscometer by known formulas. For the relative density was used the pycnometer method and for the surface tension coefficient has been used the stalagmometric method.

The data were statistically processed using Statistica10 program. The purpose of the statistical analysis was to highlight the correlations between the analysed parameters expressed by a linear functional dependence.

• Results and discussions

Analysis of the physico-chemical parameters (pH, G, n, η, σ, ρ) are a basic indicator in investigating the nutritional properties of the natural green plant juices taken into study. Electrical conductivity is one of the parameters that verifies the authenticity, freshness of a product. The electrical conductivity of a food product is a function of product characteristics (composition, sugar content and salts, pH, etc.) and is also influenced by the heating process, especially temperature.

The highest value was obtained for natural spinach juice (13,78 mS) and the smallest at natural green apple juice (2,05mS). Natural juices contain a range of minerals, organic acids, fibers, salts and other bioactive substances.

Being a measure of the acid or basic character of a solution, pH is an important factor in the processing of fruit and vegetable products. From table 1 the pH values of the analyzed green juices at 20°C varies between 2.38 and 6.97. The lowest value was obtained for lime juice (2.38) and the highest value for green spinach juice (6.97). Sugar (sucrose) is a carbohydrate that naturally occurs in fruits and vegetables. The high sugar concentration in fruit juices provides a high refractive index value. Regarding the refractive index, the smallest value (1.3439) was obtained in case of mixed natural juice with all ingredients and the highest value (1.3620) was obtained for the natural apple juice due to the soluble substance content, the sugar in the composition.

Viscosity is considered an important physical property for the quality of liquid foods. Natural plant juices generally present Newtonian fluid behavior, the increase in viscosity is the result of increased fiber, pectin and the amount of sugar present. From table1, the minimum values of the dynamic viscosity are 1. 0012cP in case of mixed green plant juice while the maximum viscosity values are 1.7478 for lime juice. If the natural herbal juices contain considerable amounts of pulp or are highly concentrated, they may have additional flow resistance represented by a higher stretching request From the Pearson matrix of linear correlation coefficients, there is a significant positive correlation between the pH and the electrical conductivity G. The linear functional dependence is mathematically represented by the equation of the regression line, $y = b_0 + b_1x$. This was used as a mathematical model to approximate the functional relation examined. The pH can be expressed according to the electrical conductivity G by the equation: $pH = 2,3147 + 0.33111 \cdot G$

• Conclusions

• Evaluations of physicochemical parameters (pH, electric conductivity, refractive index, viscosity, surface tension, relative density) represents a significant indicator in the appreciation of biophysical properties. For analyzed green juices samples (apples, spinach, cucumbers, parsley, lime and mixed) it was noticed that their values differ from one category to another, results being comparable to the data from the literature.

• The matrix of linear correlations between parameters reveals a positive and statistically significant correlation between the pH and electric conductivity also between the refractive index n and the electric conductivity for the analyzed plant juices.

• There is a strong linear relationship, a statistically significant correlation between pH and G for the analyzed green plant juices. The soluble salts, minerals and other constituents contribute also in electrical conductivity differences. The results are according to the literature.

• Rich in vitamins, minerals, antioxidants, pigments, dietary fiber and other nutrients, fresh juices from green vegetables and fruits act as a functional food, recommended to be consumed daily being fast assimilated in a very short time.

• Nowadays, plant juice therapy, easy to digest and assimilated is recognized as a simple, affordable and effective alternative for cell reconstruction and regeneration to an optimal body health.