JAP&T
TPA-Timişoara

Available online at http://journal-of-agroalimentary.ro

Journal of Agroalimentary Processes and Technologies 2015, 21(4), 389-391

Journal of Agroalimentary Processes and Technologies

Generalized model for the characterization of fortified pasta with high nutritional value

Petru Bogdan Rădoi[1*], Daniela Stoin[1], Ersilia Alexa[1], Georgiana Olteanu[2], Minodora Iovan[1], Teodor – Ioan Trașcă[1]

[1]*Faculty of Food Processing, Banat's University of Agricultural Sciences and Veterinary Medicine ''King Michael I of Romania'' from Timisoara, 300645 – Timişoara, Calea Aradului 119, Romania*

[2]*Faculty of Agriculture, Banat's University of Agricultural Sciences and Veterinary Medicine ''King Michael I of Romania'' from Timisoara, 300645 – Timişoara, Calea Aradului 119, Romania*

Received: 07 November 2015; Accepted: 29 November 2015

Abstract

The aim of this paper was to elaborate a generalized input – output model that shows the different steps to produce and characterize fortified pasta. The authors identified all the influence factors on the pasta production process and the analyses that must be done to characterize the final products. In this way, further researchers and pasta producers will have a generalized model for the production technology and characterization of this type of pasta.

Keywords: pasta, nutritional value

1. Introduction

To produce functional food with high nutritional, an important role plays the active components of the composition. Cereals are an important source of elements and chemical compounds with potential biological activity, such as phenolic compounds. The phenols in cereals can be divided into acids derived from either benzoic acid or cinnamic acid (CA). The main cinnamic acids are ferulic acid, p-coumaric, caffeic and synapses. From these, the ferulic acid is one of the mostly abundant cinnamic acids in the cereals. Cinnamic acids have biological significance through their antioxidant, anticancer and antiimflamatory properties [1, 2, 4, 5, 8, 9].

The purpose of fortifying foods is to increase the nutritional value by adding nutrients or biological active compounds. Pasta with fruit fortification is relatively unusual. An example to obtain new dietary foods with high nutritional potential is to add rice flour with banana flour and in thiese way to obtaine gluten-free pasta [3, 6, 7, 8].

To design a generalized input - output model for a given operation has to go out from be three groups of variables [10]:

I. Group of input variables, which are that initial variables due to which the whole operation / entire process can be controlled and ordered;

II. Group of output variables representing the results from the variation of the initial parameters (input variables);

III. Group of control variables whose variation controls and orders either the input or output variables

IV. 2. The input - output model

V. To develop a generalized input - output model assume an experimental study, mainly focused on [8]:

Corresponding author: *e-mail:* bogdan_radoi@yahoo.com

VI. a) Obtaining pasta from certain raw material – rice flour, added with different proportions of dried fruit (example banana)

VII.b) Characterization of the obtained products in terms of polyphenols, cinnamic acid, contents of macro- and microelements.

VIII. We identified groups of variables and made the generalized input - output model shown in figure 1, as follow:

IX. **I. GROUP OF INPUT VARIABLES**, split into three subgroups:

X. 1. **Microelements determination –** flame atomic absorption spectroscopy method (AAS) with graphite furnace (sample quantity, burning time, burning temperature; ash dissolution).

XI. 2. **Total phenolic content (TP) determination** – Arranz modified method, 2010 [2] (pasta quantity, extraction time, extraction temperature, extraction solution, centrifugation time, centrifugation speed, incubation time, incubation temperature).

XII.3. **Main cinnamic acids (CA) determination** (ferulic, caffeic and cumaric acids) – high performance liquid chromatographic method (HPLC) (chromatograph characteristics, chromatographic conditions).

XIII. **II. GROUP OF OUTPUT VARIABLES**, represented by:

XIV. 4. **Microelements content** (ppm) in fortified pasta

XV. 5. **Total phenolic content** (TP) and main **cinnamic acids content** (CA) in fortified pasta (μg/g)

XVI. **III. GROUP OF CONTROL VARIABLES,** represented by the pasta production technology:

XVII. 6. **Characteristics of the raw materials** (concentrations)

XVIII. 7. **Parameters of the pasta machine** (rotation speed, process time)

XIX. 8. **Parameters of the drying operation** (time, temperature).

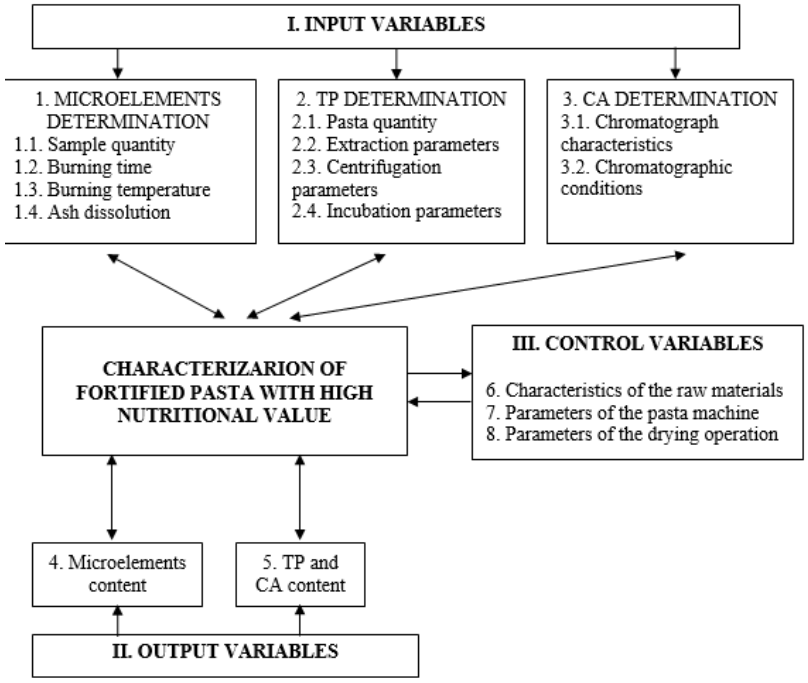

Figure 1. Structure of the generalized input – output model for the characterization of fortified pasta with high nutritional value

3. Conclusions

Outgoing from the developed generalized input – output model it can be seen that the characterization of the fortified pasta can be controlled and ordered through the variation of the three categories of variables: input, output, control. Achieving this generalized model allows mathematical modeling of the entire production process.

Acknowledgements: Thanks for support from European Social Fund, Human Resources Development Operational Programme, ID Project: 132765, POSDRU/ 159/1.5/S/132765.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

References

1. Anson, N.M., Van der Berg, R., Havenaar, R., Bast, A., Haenen G., Bioavailability of ferulic acid is determined by its bioaccessibility, *Journal of Cereal Science* **2009**, *49*, 296
2. Arranz, S., Calixto, F.S., Analysis of polyphenols in cereals may be improved performing acidic hydrolysis: A study in wheat flour and wheat bran and cereals of the diet, *Journal of Cereal Science* **2010**, *51*, 313
3. Hernandez-Nava, R.G., Berrios, J. de J., Pan, J., Osorio-Diaz, P., Bello-Perez, L.A., Development and characterization of spaghetti with high resistant starch content supplemented with banana starch, *Food Science and Technology International* **2009**, *15 (1)*, 73
4. Liu, R.H., Whole grain phytochemicals and health, *Journal of Cereal Science* **2007**, *46*, 207
5. Naczka, M., Shahidib, F., Phenolics in cereals, fruits and vegetables: Occurrence, extraction and analysis, *Journal of Pharmaceutical and Biomedical Analysis* **2006**, *41*, 1523
6. Noor, A.A.A., Lee-Hoon, H., Baharin, A., Rajeev, B., Lai-Hoong, C., Mohamad, N., Mohamad, I., Chemical and functional properties of the native banana (Musa acuminate balbisiana Colla cv. Awak) pseudo-stem and pseudo-stem tender core flours, *Food Chemistry* **2011**, *128*, 748
7. Ovando-Martinez, M., Sayago-Ayerdi, S., Agama-Acevedo, E., Goni, I., Bello-Perez, L.A., Unripe banana flour as an ingredient to increase the undigestible carbohydrates of pasta, *Food Chemistry* **2009**, *113(1)*, 121
8. Rădoi, P.B., Alexa, Ersilia, Radulov, Isidora, Morvay, A., Stroe Mihai, Cristiana Sorina, Trașcă, T.-I., Total Phenolic, Cinnamic Acids and Selected Microelements in Gluten Free Pasta Fortified with Banana, *Revista de Chimie* **2015**, *66(8)*, 1162-1165
9. Verma, B., Hucl, P., Chibbar, R.N., Phenolic acid composition and antioxidant capacity of acid and alkali hydrolysed wheat bran fractions, *Food Chemistry* **2009**, *116*, 947
10. Trașcă, T.-I., Clenciu, Mioara-Olivia, Consideraţii privind elaborarea unui model generalizat pentru procesul tehnologic de fabricare prin extrudare a pastelor făinoase, *Sisteme integrate pentru producţia agroalimentară* **1998**, Editura Orizonturi Universitare, Timişoara, 185-188