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The implementing of the EVOP method at the industrial level

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Abstract

Assuring a high level of efficiency of the production process comprises a set of systematic and planned activities implemented in the technological flow in order to optimize the process.

The solving of the quality related problems, and subsequently the efficiency problems can be made by the management of the company, applying corrections or preventive measures.

Applying these measures implies the use of evaluation methods and tools, the analysis and the control of the stages of the technological flow, like the EVOP method.

Keywords: quality, optimization, EVOP method, blanching, peas.

1. Introduction

Saving the time resource that adds to the efficiency and quality concepts makes up the triad of the decisional performances, requires more and more the use of methods, techniques and tools offered by the statistical management [3,4,7,20].

Using statistical-management techniques we can know better the processes, which leads to the accomplishment of the objectives with a smaller variation between anticipated and accomplished [13, 14].

In the speciality literature there are numerous methods that can be applied to specific decision problems that can be divided due to efficiency reasons in concepts, tools and methods.

The concepts, for example the 14 concepts regarding the Deming decisions can classify the philosophy of an entrepreneur regarding quality and efficiency.

The tools [8] represent in the management processes elementary but strictly necessary means in order to ensure the required quality and to obtain the desired efficiency. The specialty literature from our country and abroad indicates the following elementary tools for quality and efficiency: the ABC analysis, the cause – effect diagram, the distribution of frequency, the configuration card, the error list, the gathering of the data and the planned procedure.

The methods are recommended especially to those managers that want to keep everything under control, to know all the details, formally enhancing their authority. The QFD (Quality Function Deployment) method is recommended to be used in the strategic development of the purposes connected to the market of the product and the lifetime of the factory, starting from the design phase all the way to the behaviour of the product as a consumed good. The experimental Taguchi method offers us a systematic and efficient way of conducting experiments made in a company, using orthogonal matrixes.

The evolution method EVOP (Evolutionary Operation) is a preventive method that is recommended to any type of company that has as its main concern efficiency and quality management [11]. Using this method, the optimization of the process is getting better in time and through small and firm steps the company progresses.

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The implementing of the EVOP method leads to a continuous assurance and improvement in the quality of the blanching process [6].

2. Materials and Method

Tables The EVOP method – Evolutionary operation = the analysis of the factors that influence the process aims at the industrial improvement in time in comparison with the process elaborated in the laboratory (the improvement in colour in the case of the peas by correlating the maturity degree with the blanching regime (temperature, time) and the freezing regime (temperature, time).

3. Results and Discussion

According to the experimental data gathered from industry it can be noticed that the blanching process is not well correlated according to the structure-texture stiffness of the peas (fig. 1).

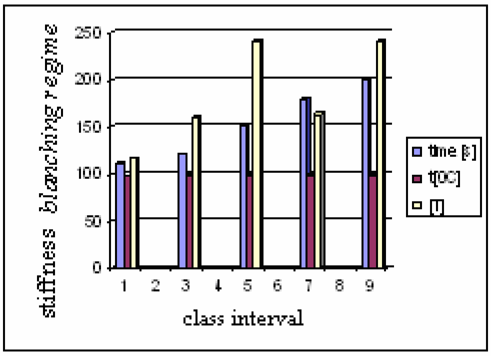


Figura 1: The values of the structural-textural stiffness according to the blanching regime [confidential]

From figure 1 it can be noticed that at different values of the structural-textural stiffness the temperature varies insignificantly, while the variation of the blanching process time is increasing.

Experience has shown that defining some blanching parameters for every vegetable is impossible. Consequently, in all the cases the blanching regime must be established according to the quality of the harvested product, in order to reduce the fading of the colour (the degradation of the chlorophyll) and the loss of the soluble nutrient substances (salts, sugars, vitamins) in the blanching water.

In order to accomplish this we will use the EVOP method for the optimization of the blanching process (fig.2).

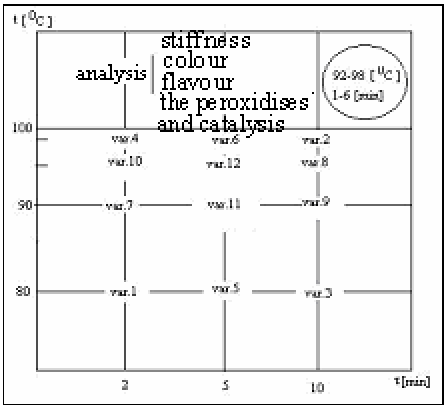


Figura 2: The EVOP optimization scheme of the blanching regime

Starting from the hypothesis [2,10, 12] that the synthesis processes are characterised by an increase in volume, surface and weight, by the absorption of glucoses, proteins, peptic substances, fat acids, pigments, vitamins, flavours and with a dense and firm structure and texture, we can determine some of these characteristics that will help us in establishing a blanching process correspondent to the structural-textural stiffness of the peas that come in the factory (table 1).

After harvesting these processes are reduced in intensity, and by the establishing of the *blanching regime* [17, 18, 19] these processes will produce an improvement in taste, to enhance the juiciness, flavour and the colour will exteriorize through an intense pigmentation with live and powerful gloss.

In order to accomplish that, a scale for the colour according to the structural-textural stiffness is made (fig.3).

The structural-textural stiffness is changed using the enzymatic decomposition of the proto-peptide and subsequently of the peptide components.

Table 1. The quality characteristics for the harvested peas [Chirila,2008]

Nr Crt	Dimension, Φ[mm]	Shape	Greutate specifica,[g]	Stiffness, [kgf]	Flavour (smell and taste)	Colour
1	9	Spherical	0.6	4.354	Sweet-sour	Dark green
2	9	Spherical	0.6	2.133	Floury	Bright green
3	8	Spherical	0.6	2.567	Floury	Bright green
4	8	Spherical	0.6	1.833	Floury	Pale green
5	8	Spherical	0.7	4.229	Sweet-sour	Dark green
6	8	Spherical	0.6	3.787	Sweet-sour	Light green
7	9	Spherical	0.6	3.722	Sweet-sour	Light green
8	9	Spherical	0.6	4.235	Sweet-sour	Dark green
9	10	Spherical	0.7	3.680	Sweet-sour	Light green
10	9	Spherical	0.7	4.697	Sweet-sour	Dark green

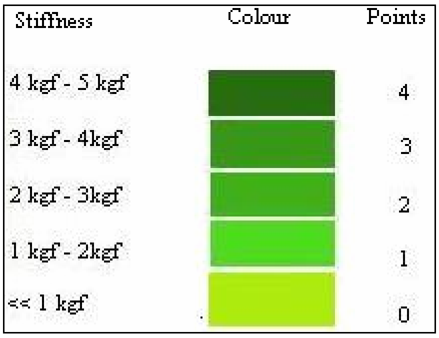


Figure 1. Colour scale according to the structural-textural stiffness [Chirila,2008]

The colour is changed due to the addition of the porfirinic pigments (chlorophyll) into the blanching water.

In the description of the flavour [5] it is stated the intensity of the taste and smell using points from 0 to 4 (Table 2) and the amplitude of these on a scale from 0 to 3 (Table 3).

The taste changes due to the gradual evolution of the glucose content, organic acids and tanoid (phenol) substances. The flavour is due by the formation of characteristic volatile substances [15, 16].

The development of all these modifications [9], biochemical polymerization or depolymerisation processes, biosynthesis or degradation, in their complexity rely upon the existence, the activation or the inactivation of the *peroxidise and the catalysis (tab.4)*.

Table 2: Intensity scale for flavour (taste and smell) [1]

Nr. Crt.	Characteristic	Flavour	
		Smell [points]	Taste, [points]
1	Strong	4	4
2	Middling	3	3
3	Very small	2	2
4	Just perceptible	1	1
5	No present	0	0

Table 3: Amplitude scale for flavour (taste and smell) [1]

Nr. Crt.	Characteristic	Flavour	
		Smell [points]	Taste [points]
1	Strong	3	3
2	Middle	2	2
3	Small	1	1
4	Very small	0	0

Table 4: The result of the test for the inactivation of the peroxidises / catalysis for the structural-textural stiffness value of 4,354 kgf for the 12 types of blanching regime [Chirila,2008]

Nr. Crt.	Stiffness, [kgf]	*Blanching regime, (t, τ)*	Stiffness [kgf]	Colour, [pct]	Flavour, [pct]		*Peroxidise* [UE]	*Catalysis* [UE]
					intensity	amplitude		
1	4.354	Var.1	2.878	2	2	2	0.64	1.1
2	4.354	Var.2	1.928	1	3	2	-	-
3	4.354	Var.3	1.293	1	2	1	0.405	0.9
4	4.354	Var.4	3.270	3	4	3	-	-
5	4.354	Var.5	2.332	2	2	2	0.481	1.15
6	4.354	Var.6	2.680	2	3	3	-	-
7	4.354	Var.7	2.990	2	3	2	0.255	0.9
8	4.354	Var.8	2.284	2	2	1	-	-
9	4.354	Var.9	1.452	1	2	1	0.219	0.4
10	4.354	Var.10	3.772	3	3	2	0.193	0.65
11	4.354	Var.11	2.086	2	3	2	0.245	0.45
12	4.354	Var.12	3.252	3	4	3	-	-

After applying the 12 blanching regimes upon the peas with structural-textural stiffness of 4,354 kgf there are obtain new correlations between the stiffness of the blanched peas and the enzymatic activity (Figure 4), as well as between the types of the blanching regimes and the organoleptic characteristics: colour and flavour (smell and taste) (Fig.5a, 5b).

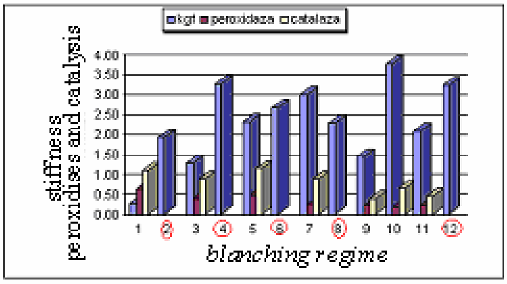
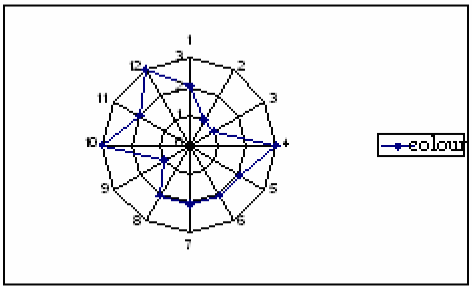
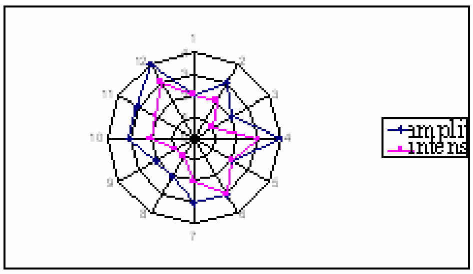


Figure 4: The correlation of the structural-textural and enzymatic stiffness with the blanching regime

In Figure 4 it can be noticed that the types of the blanching regime 2, 4, 6, 8, 12 have inactivated the activity of peroxidise and catalysis, while in figures 5a and 5b it can be noticed that the maximum score regarding the quality of the colour is obtained in the types 4, 10, 12, and the optimum intensity and amplitude appears in the case of the 4 and 12 types.



(a)



(b)

Figure 5: The correlation of the blanching regime with the quality characteristics of the peas: a. Colour; b. Flavour

4. Conclusion

During the blanching process the gases and a part of the soluble substances from the intercellular spaces and vacuole from the cellular and vacuole juice are removed. This phenomenon produces the modification of the intensity of the bonds between structure and texture, respectively the bonding of the cells in the tissue, the detachment of the epidermis from the mezocarp. Also with the modification of the nature, respectively of the quantity of the dry substance compounds (cellulose, peptide, tanoids, starch, fitin, substances that are insoluble in alcohol and water) it can be noticed the structural differentiation between the values of the structural-textural stiffness of the analysed peas.

In the case of the blanching regime type 2, 4, 6, 8, 12 the inactivation of the peroxidises and catalysis was made possible due to the degradation of its proteins.

In the other blanching regime types the inactivation of the peroxidises and catalysis is partial which means that it is possible to appear modifications in taste and flavour due to the indirect oxidation of the ascorbic acid and the disturbance of the oxidizing-reduction potential.

Another aspect that we must take into account for the establishing of the blanching regime is connected to the physical-chemical properties of the blanching water.

Acknowledgements

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