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FINDING AUTHENTICITY OF VARIOUS VEGETAL OILS IN BREAD

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Abstract

In this paper there has been studied the possibility of finding bread authenticity with vegetal oils adding by identifying the type of fat used by methods of finding the hardening index and the iodine index. For this purpose, first of all there has been extracted the fat by Soxhlet method, then on the resulted extract the two indices were determined. There has also been analyzed the fat influence upon sensorial properties, upon freshness and energy value of bread. Samples of bread have been tested with addition of: olive, corn, sun flower and soy oil, in various concentrations of: 3%, 3.5% respectively 4%.
***Keywords**: bread, vegetal oil, authenticity, iodine index, hardening index.*

Introduction

Fats used in bread making are represented by sunflower or soy oil, to obtain bread, and butter, margarine, lard, shortenings for bread specialties, patisserie and cafeteria specialties. Lately, more and more often there have been used in bread making technology olive and corn oils, owing to their composition poor in saturated fat acids but also to their rich composition of essential fat acids (Swyngedau, 1991; Keetels (1996).

Introduced in the dough the fats influence both rheological properties of dough, because of their absorbing at the surface of proteins and starch granules, reducing their hydration and their quantity of water used for mixing, and in the same time there is improvement in mechanical making of the dough, by reducing its sticking to working organs of the machines. They also improve the quality of bread by enhancing of flexibility of the core and crust and maintaining the freshness of bread. Being a good solvent for flavor substances, they help to keep themselves in the bread during baking. Nevertheless, the addition of these in proportions bigger than 10%, prevents the action of fermentation of east because of their absorbing at the surface of the cells (Romanian Standards, 1998).

Lipids have a major role also in the biology of the whole human body, being necessary for the right development of metabolic processes and for maintaining of health. From physiological point of view, the fats accomplish two main functions: energy sources and structural-functional role (Costache, 2001).

Experimental

Fat determination was made by petroleum ether extraction by Soxhlet method. Previously there has been analyzed the material weighed, it has been introduced in the extractor cartridge, where we adapt a distillation balloon heated on water, sand or electrical bath. We pour petroleum ether in the extractor and it is attached to the machine refrigerator. The extraction lasts for approximately 3 hours, when 12 or 13 airings happen. After finishing the extraction, the petroleum ether in the balloon is distilled, the fat balloon maintaining on the water bath another 10 minutes till the marks of ether evaporate.

Subsequently there has been determined the hardening index to extracted fat, by Soxhlet method, and the iodine index for identifying the type of used oil in making bread (Romanian Standards, 1998).

Iodine index was determined by Hanus method. For this, over each sample of previously extracted fat chloroform is added, continuously stirring, and Hanus solution. After mixing, it is covered with the cork and rested in the dark for 60 minutes. Then we add potassium iodine and distilled water. It is quickly treated with sodium tiosulphate 0.1N. When treating is almost over (color yellow - pale), 1 ml of starch solution is added 1% and treating is continued, drop by drop, till sudden disappearing of blue color.

For finding hardening index, from each fat sample extracted by Soxhlet method, we introduce 2 g in a boiling balloon, over which we add alcoholic solution of potassium hydroxide. This is then attached to an air refrigerator and the source of heat is acted so that it makes a moderate and uniform boiling. After hardening we put away the refrigerator and we treat the cooled sample with hydrochloric acid 0.5N in the presence of phenolphthalein (Costache, 2001; Dragomir, 2002).

Results and Discussions

The total amount of fat found by Soxhlet method in the 12 samples we analyzed has the values enhanced in table 1, being calculated with formulae 1:

$$\text{Fat content (\%)} = \frac{m_1 - m_2}{m} \cdot \frac{100}{100 - A} \cdot 100 \qquad (1)$$

where: m = mass of fat balloon, [g];

m_1 = mass of the balloon, [g];

m_2 = mass of the sample to determine, [g];

A = water content of the analyzed sample, [%]

Table 1. Variation of total fat depending on the type of vegetal oil and its proportion in the recipe.

Sample name	Concentration in oil [%]	Total amount of fat [%]
Sunflower oil bread	3.0	1.530
Sunflower oil bread	3.5	1.920
Sunflower oil bread	4.0	2.706
Corn oil bread	3.0	1.066
Corn oil bread	3.5	1.443
Corn oil bread	4.0	2.426
Soy oil bread	3.0	1324
Soy oil bread	3.5	1.713
Soy oil bread	4.0	2.617
Olive oil bread	3.0	1.082
Olive oil bread	3.5	1.495
Sunflower oil bread	4.0	2.534

As we can see in the table, at the same concentrations in the recipe, the total amount of fat varies pretty little with the type of used oil, this test not being conclusive to establish its authenticity in bread composition.

The hardening index was calculated with equation 2, and the hardening index values for different type oils are expressed in figure 1.

$$\text{Hardening index} = \frac{28.05 \cdot (V - V_1)}{m} \qquad (2)$$

where: V= volume of chlorine acid used to treat the sample [ml];

V_1 = volume of chlorine acid used to treat the analyzed sample [ml];
m = mass of sample, [g];
28.05 = quantity of potassium hydroxide corresponding to 1ml hydrochloric acid 0.5N, [mg]

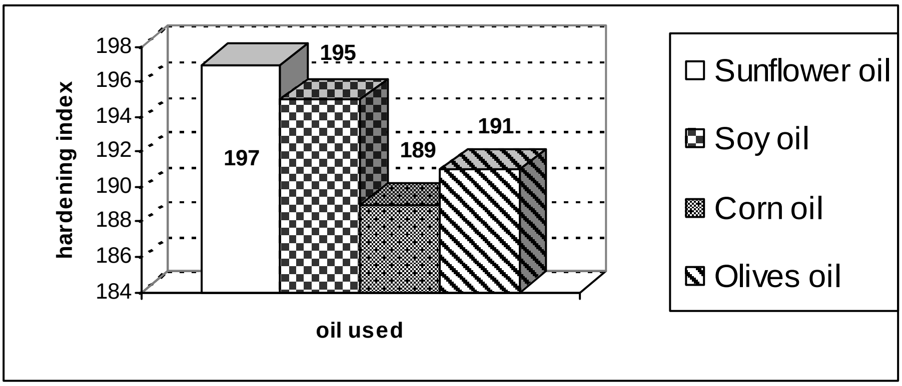

Fig. 1. Variation of hardening index depending of the used oil.

Analyzing figure 1 we can understand that the corn fat, having the biggest content of non saturated fat acids, by determination of hardening index there has been consumed the lowest quantity of potassium hydroxide. Nevertheless, the differences between values are little, this being the reason why we cannot say for sure that the used fat was recognized. For this, we proceeded to finding the iodine index, which was calculated with relation 3:

$$\text{Iodine index} = \frac{0.01269 \cdot (V - V_1)}{m} \cdot 100 \qquad (3)$$

where : V = volume of sodium tiosulphate 0.1N used to treat the witness sample, [ml];

V_1 = volume of sodium tiosulphate 0.1N used to treat the analyzed sample, [ml];
m = quantity of fat in work, [g];
0.01269 = quantity of iodine corresponding to 1ml sodium tiosulphate 0.1N, [g].

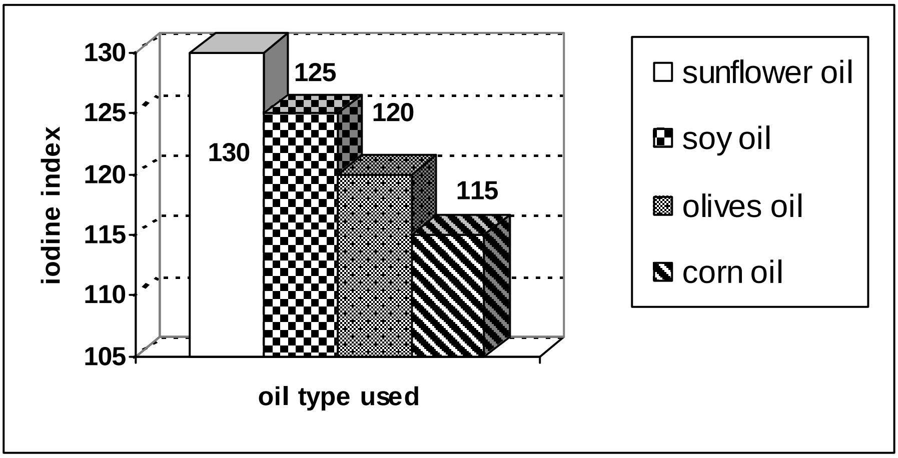

Fig. 2. Variation of iodine index depending of the type of used oil

Analyzing this figure we conclude that iodine index varies from a type of vegetal fat to another, this increasing with the concentration of non saturated fat acids, in our case from corn oil to that of sunflower.

From the results obtained after the tests we have made, we can conclude that both the values of hardening index, and those of iodine index can be used to describe the authenticity of vegetal fat used in bread making recipes, when, at least economically speaking, there is a tendency of producers to substitute the olives or corn oil, with that of sunflower, which is cheaper and handiest (Mencinicopschi. 2005).

Conclusions

Nevertheless, taking into the consideration the composition of fat acids of used oils, which is pretty resembling in the case of the four types we analyzed , that of sunflower being the richest in saturated fat acids, and the corn oil, the richest in non saturated fat acids, we can conclude that the values of iodine index, put next to the hardening index can give us information pretty precise concerning the origin of used fat.

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