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The peroxyde index evolution of some nonrefined maize and sunflower oils, under the influence of storage conditions

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Abstract

This work tries to evidence, comparatively, the evolution of the peroxyde index of some maize and sunflower nonrefined oil samples stored under certain conditions (temperature, light, addition of carroten) during 60 days. The material for experiment was represented by raw oil samples, whose peroxyde index has been determined at once after processing, as well as at 5, 30 and 60 days of keeping at +4ºC (in dark) and at +20-22ºC (in dark and light). Beside thermal and lighting regime, in some oil samples has been also used an addition of carroten (10% carrot fresh juice) to evidence if these provitamins have an antioxydant role within these experimental conditions. The analyse of peroxyde index values in samples stored 5, 30 şi 60 days has evidenced that in the both types of raw oils the index value was higher in samples kept in light conditions, beside those ones kept in dark conditions. Between samples with carroten addition have been certain differences. Thus, the samples stored in dark have registered less values of this index as compared to samples exposed to light. After 30 days of storage to +20-22□C, the peroxyde index has registered higher values in maize raw oil, but after 60 days its values have been higher in sunflower, mainly in samples stored in light conditions and with carroten addition.

Keywords: peroxyde index, carroten, sample, nonrefined oil.

1. Introduction

The lipids from food raw materials can suffer modifications, which, depending on processing and storage conditions, can be: lipolyse, when mainly act enzymes from tissues and those ones produced by micoorganisms, oxidation, produced through microorganisms action (β-oxidation of short chain fatty acids) or through air oxygen (autooxidation or aldedydic rancidation) with peroxydes formation, and thermal degradation in the presence of oxygen (7, 1, 5, 4, 3, 2).

The autooxidation of unsaturated fatty acids from vegetable oils resulting hydroperoxydes and/or peroxydes is a process due to some chemical, photochemical or microbiological factors, where the presence of oxygen is decisive. This oxidation proces, determining the oil peroxyde index increase and which, finally, makes produce to get unpleasant taste and odour, can be interrupt through addition of some antioxidative substances, such as: vit. E, carrotenoids, quinons, phenols etc. (5).

Knowing the weight of unsaturated fatty acids within maize and sunflower oils, in this work it has studied, comparatively, the peroxyde index evolution of some samples belonging to these nonrefined oils, stored under certain conditions (temperature, lighting, antioxydants) during 60 days.

2. Materials and Method

The material of experience was represented by maize and sunflower nonrefined oil samples, whose peroxyde index was determined at once after obtaining (table 1), as well as at 5, 30 and 60 days of keeping under certain conditions.

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Table 1 Peroxyde index values of maize and sunflower fresh nonrefined oils

Determination	**Peroxyde index (% Iodine)**	
Produce	Maize oil	Sunflower oil
Values	0,02	0,01

Some oil samples coming from the both seed species have been stored at +4ºC (in dark) and others at +20-22ºC (in dark and light). Beside thermal and lighting conditions, in some samples there were used carrotens, to evidence if these provitamins play an antioxidative role within all conditions of our experiment. As carrotens source it was used carrots fresh juice, whose volume was 10% beside oil quantity from respective sample. These samples with carroten addition have been subjected 3 minutes to strong shakes, from hour to hour (during the day time).

The peroxyde index determination was made by means a titratable methods, based on titration with $Na_2S_2O_3$ of iodine released by peroxydes from KI (6).

3. Results and Discussion

In the table 2 are reproduced the values of peroxyde index in maize oil samples.

As seen in the table 2, the maize oil peroxyde index, determined at 5 days of storage, has registered various values, depending on conditions (temperature, light presence) and on work variants (with and without carrotens).

Thus, after 5 days of storage at +4°C, this index, which can indicate possible modifications determined by oxidative processes, has shown very small values (0,02% iodine), both for sample without carroten and for sample with carroten addition, identically with those ones of fresh produce. After 5 days of storage, but at +20-22°C, the values have modified depending on carroten presence and lighting regime. Thus, if in dark and without carrotens addition the peroxyde index was 0,035% iodine, under light conditions and without carrotens additions increased to 0,042% iodine, but in light and with carrotens addition became 0,056% iodine. Beside samples kept in dark, at those ones stored in light conditions the index value was higher. Also, between samples with carroten addition have been differences; those ones stored in dark have registered less values of this index, as compared to samples exposed to light.

After 30 days of storage, the peroxyde index values of maize nonrefined oil has registered spectacular increase, especially in samples kept at +20-22°C. Thus, at +4°C the oil samples with and without carrotens addition have had light increase, comparatively with samples stored 5 days, reaching values of 0,03% iodine, which characterizes the type of fresh fat, but unrecommendable for keeping. After 30 days, in oil kept at +20-22°C the values have risen very much, comparatively with first 5 days, reaching 0,2% iodine in sample kept in light, with carrotens addition. This value characterizes spoiled (altered) fat. There were differences both between samples stored in dark and those ones exposed to light, and between samples with and without carroten addition. The highest peroxyde index values have registered samples exposed to light, and among these ones, the sample with carroten addition.

After 60 days of storage, the maize nonrefined oil peroxyde index has risen more, as compared to values registered after 30 days. The least values were registered in oil kept at +4°C, and the highest ones in oil samples kept at +20-22°C. After 60 days of keeping at +4°C, the peroxyde index of oil samples has reached values specific to a fresh fat, but unrecommendable for keeping (0,045% iodine), while at +20-22°C the values have been specific either to a fat with doubtful freshness or to a spoiled (altered) fat. Also in this case, there were defferences, both between samples kept in dark and those ones exposed to light, and between samples with and those ones without carroten addition. The highest peroxyde index values were registered in samples exposed to light, and among those ones, the sample with carroten addition (0,6% iodine).

It is known the antioxidative effect of carrotens on fats. This effect of carrots juice (containing β-carroten) it can notice in analysed maize oil samples, with the mention that, if in dark conditions the addition of juice has led to constant maintainance or to moderate increase of peroxyde values, in samples exposed to light the effect was inverse. In the last case, the carroten addition has led to the accelerated increase of peroxyde index, because in light presence the carrotens effect was prooxidative and not antioxidative.

The peroxyde index indicates the oxidation degree of lipids by means of oxygen, temperature and light actions, and the above mentioned data explain thoroughly the influence of oxygen, temperature and light upon maize nonrefined oil samples, stored certain time periods under experimental conditions achieved. The table 3 reproduces the peroxyde value of sunflower oil samples.

Table 2. Maize oil peroxyde index values (% iodine) at certain time intervals

Thermic regime	**+4ºC**		**+20-22ºC**			
Lighting regime	Dark		Dark		Light	
Addition Time intervals*	CF	C	CF	C	CF	C
5 days	0,020	0,020	0,035	0,030	0,042	0,056
30 days	0,032	0,030	0,045	0,038	0,070	0,200
60 days	0,045	0,045	0,060	0,045	0,120	0,600

CF = Carroten free samples; C = Samples with carrotens; * = Time intervals of determination

Table 3. Sunflower oil peroxyde index values (% iodine) at certain time intervals

Thermic regime	**+4ºC**		**+20-22ºC**			
Lighting regime	Dark		Dark		Light	
Addition Time intervals*	CF	C	CF	C	CF	C
5 days	0,010	0,010	0,040	0,030	0,050	0,060
30 days	0,035	0,030	0,045	0,050	0,060	0,150
60 days	0,040	0,035	0,070	0,050	0,250	0,700

CF = Carroten free samples; C = Samples with carroten; * = Time intervals of determination

As seen in the table 3, the sunflower oil peroxyde index, determined at 5 days of storage, has also registered various values, depending on conditions (temperature, light presence) and on work variants (with and without carrotens).

Thus, after 5 days of storage at +4°C, this index has had very small values, identically with those ones of fresh produce, both in sample with carrotens and in sample without carrotens additions (0,01% iodine). Also after 5 days of storage, but at +20-22°C, the values have modified depending on carroten presence and on light regime. Thus, if in dark conditions and without carroten the peroxyde index was 0,04% iodine, under light conditions and without carroten adition the index has risen to 0,05% iodine, and in light with carroten addition it reached 0,06% iodine. Beside samples kept in dark, in those ones kept in light the index value was higher.

Also, between samples with carroten addition have been differences; the samples kept in dark have registered less values of this index, as compared to samples exposed to light.

At 30 days of storage, the peroxyde index values of sunflower nonrefined oil have registered marked increase, especially in samples stored at temperatures of +20-22°C.

Thus, at +4°C the oil samples without and with carroten addition have had light increase, comparatively with samples kept 5 days, reaching value of 0,035% iodine, which characterizes the type of fresh fat, but unrecommendable for keeping. After 30 days, in oil kept at +20-22°C the values have risen very much, as compared to the first 5 days, reaching 0,15% iodine in sample kept in light with carroten addition. This value characterizes an altered fat. There were differences both between samples stored in dark and those ones exposed to light, and between samples with and without carroten addition. The highest peroxyde index values were registered in samples exposed to light, and among those ones, the sample with carroten addition.

After 60 days of storage, the sunflower unrefined oil peroxyde index has risen more, as compared to values registered after 30 days. The least values were registered in oil kept at +4°C, and the highest ones in oil samples kept at +20-22°C.

At samples kept at +4°C, the peroxyde index has reached values specific to a fresh fat, but unrecommendable for keeping (0,04% iodine), while at +20-22°C the values have been specific either to a fat with doubtful freshness or to a spoiled (altered) fat. Also in this case, there were differences, both between samples kept in dark and those ones exposed to light, and between samples with and those ones without carroten addition. The highest peroxyde index values were registered in samples exposed to light, and among those ones, the sample with carroten addition (0,7% iodine).

The carroten addition, whose purpose is to prevent or slow down the fatty acids oxidation process in the both types of oils, has had good results only in samples kept +4°C and less at +20-22°C, in dark conditions.

The fig. 1 and 2 reproduce, comparatively, the peroxyde index values of analysed oils, after 30 and 60 days of storage at 20-22°C.

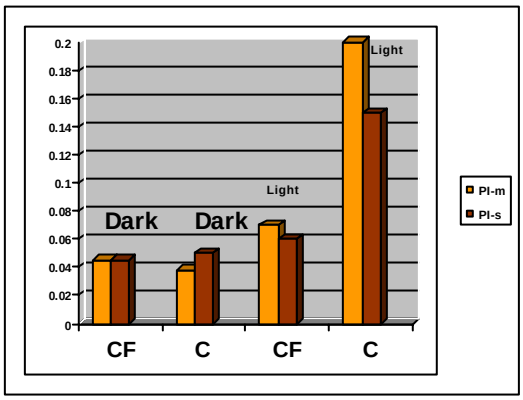

Figure 1. The peroxyde index values of oil samples stored 30 days at +20-22°C
PI-m = peroxyde index of maize oil samples;
PI-s = peroxyde index of sunflower oil samples;
CF = carroten free samples;
C = samples with carroten.

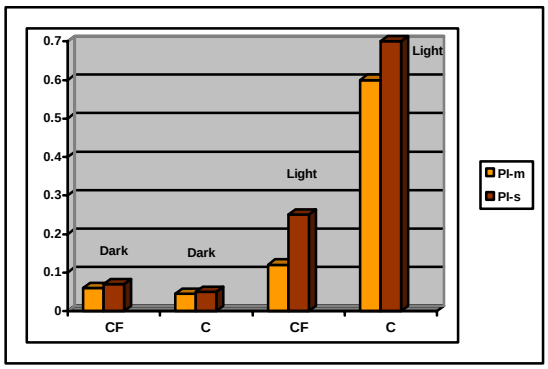

Fig. 2. The peroxyde index values of oil samples stored 60 days at +20-22°C
PI-m = peroxyde index of maize oil samples;
PI-s = peroxyde index of sunflower oil samples;
CF = carroten free samples;
C = samples with carroten

After 30 days of storage at +20-22°C, the peroxyde index has registered higher values in maize nonrefined oil (fig. 1), but after 60 days of storage the values of the same index has been higher in sunflower nonrefined oil, mainly in samples kept in light conditions (fig. 2).

In seems that sunflower nonrefined oil has been more sensitive to the extended action of light (combined with temperature) than maize nonrefined oil.

4. Conclusion

The study of some samples of maize and sunflower nonrefined oils stored 60 days under various conditions (at +4ºC / +20-22ºC, in light / dark, with / without carroten addition) has shown modifications of the peroxyde index determined at certain time intervals, depending on thermal regime, presence of light, carrotens or combination between these factors.

Analysing the peroxyde index values of samples stored 5, 30 and 60 days under above mentioned conditions, it can state that in the both oil types the index value was higher in samples kept in light, beside those ones kept in dark. Between samples with carroten addition have been differences; namely those ones kept in dark have registered lower values of this index, as compared to samples exposed to light.

After 30 days of storage at +20-22ºC, the peroxyde index has had higher values in maize nonrefined oil, but after 60 days the values of the same index have been higher in sunflower nonrefined oil, mainly in samples kept in light and with carroten addition.

The carroten addition, whose purpose was to prevent or to slow down the fatty acids oxidation process within composition of the both types of oils, has had good results only in samples kept at +4ºC and less at +20-22ºC, in dark conditions

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