ISSN: 0067-2904

Time of store effect on the structure and photophysical properties of the heated fat of the plant

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Abstract

Vegetable sold oils (fat of the plant) were studied spectroscopy to determine its properties when it heating more than once, in this study the number of heating was 20 times and show the fat of the plant has been greatly affected by the heat. Aluminum and stainless steel were adopted for heating purposes. It turns out that the quality of the heating pot affects the spectrum specification. Changing the registered spectrum specifications for vegetable fat means a change in the characteristics of the same substance, which makes cooking use a second time with risks. Results were re-examined after six months showing significant risk of storage after heating to 300 ^{o}C the study proved that the structure of heating the vegetable oils changes and thus become edible cooking oil is not healthy and may be have toxic effects.

Keywords: Vegetable sold oils, Edible oils, Nutrition, frying, palm oil

تأثير زمن الخزن على التركيب والمواصفات الضوئية الفيزيائية للزيوت النباتية المسخنة

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الخلاصة

تمت دراسة الزيوت النباتية بطريقة التحديد الطيفي لتحديد خصائصه عند تسخينه اكثر من مرة ، في هذه الدراسة كانت عدد مرات التسخين 20 مرة ويظهر ان الدهون النباتية تأثرت بدرجه كبيرة بالحرارة ، تم اعتماد الالمنيوم والفولاذ المقاوم للصدأ لأغراض التسخين وتبين ان نوعية الوعاء تؤثر على مواصفات الطيف المسجل وان تغير هذه المواصفات يعني حدوث تغير في خصائص المادة نفسها مما يجعل الطهي مرة ثانية بعد التسخين عرضة للمخاطر . تم اعادة فحص النتائج بعد ستة اشهر بعد تسخينها الى 300 درجة مئوية واثبتت الدراسة ان بنية الزيوت النباتية تتغير وبالتالي اصبح الزيت غير صالح وغير صحي وقد تكون له تأثيرات سمية .

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Introduction

One of the most edible oil is palm oil obtained from fruits of palm. The most production of this type of oil in the worlds is East of the Asia, like Indonesia or Malaysia mostly. Edible oils of this type are the primary responsible for atherosclerosis and hypertension, and also other dangerous disease like deficiency of vitamin A, cancer, disease of brain. World health organizations, including the United States, have confirmed that such oils are more lethal than their use this is stated The American Journal of Clinical Nutrition [1] .Oil of palm is used industrially also for manufacturing waxes, cosmetics, soaps, lubricants, ink , and toothpaste . This type of oil contains two type of oils
unsaturated and saturated fats, beta-carotene, and vitamin E. this oil may bet have antioxidant problem [1]. Greater yield of palm oil offering a far low the cost of predicted is very low compare with cooking edible vegetable oils. This one of the most reason of the most production of this oil is rapidly increasing [2]. This type of oil has been studied because most of the Iraqi kitchens and families use palm oil from all world originators because of cheap prices.

Spectral technology was adopted in this study, taking into account the frequency of heating up to twenty times [3]. To demonstrate the effect of the cooking pan on the structure of the oil two type of frying pan was used one was stainless steel and the other was aluminum. The study was re-examined after six months to determine the effect of storage after first heating, it turns out that storage oil after first heating show significant behavior mainly increasing the absorption edge [4]. In the previous study [5,6], which showed through FTIR study that heating breaks the double bonds that may be generate new compounds in most cases have a percentage of toxicity.

Experimental

The present study has dealt with palm oils the health importance and unique specifications and wide use of this oil cooking [7,8]. A fixed volume of oil individually heated to the frying degree. palm oil in this study can take to used and record the pre- heating readings RT, then heat the oil by placing it inside the stainless steel and aluminum pan and heating it to a temperature of (50^{o}C), then placing it inside the quartz cell to measuring both the absorption, fluorescence spectra of this oil. The previous step was repeated several times until reach the temperature of frying up to 300 ^{o}C by increasing the temperature 50 degrees each step of heating. After each heating and transferred the sample after placing it in a cell of quartz as mention above and placed in measuring system to get the absorption and emission spectra by using, UV-visible absorption recordings system SV2100 (UV-Vis Spectrometer Detector,) spectral response 250nm~800nm with grating 400/600 line Figure-1.

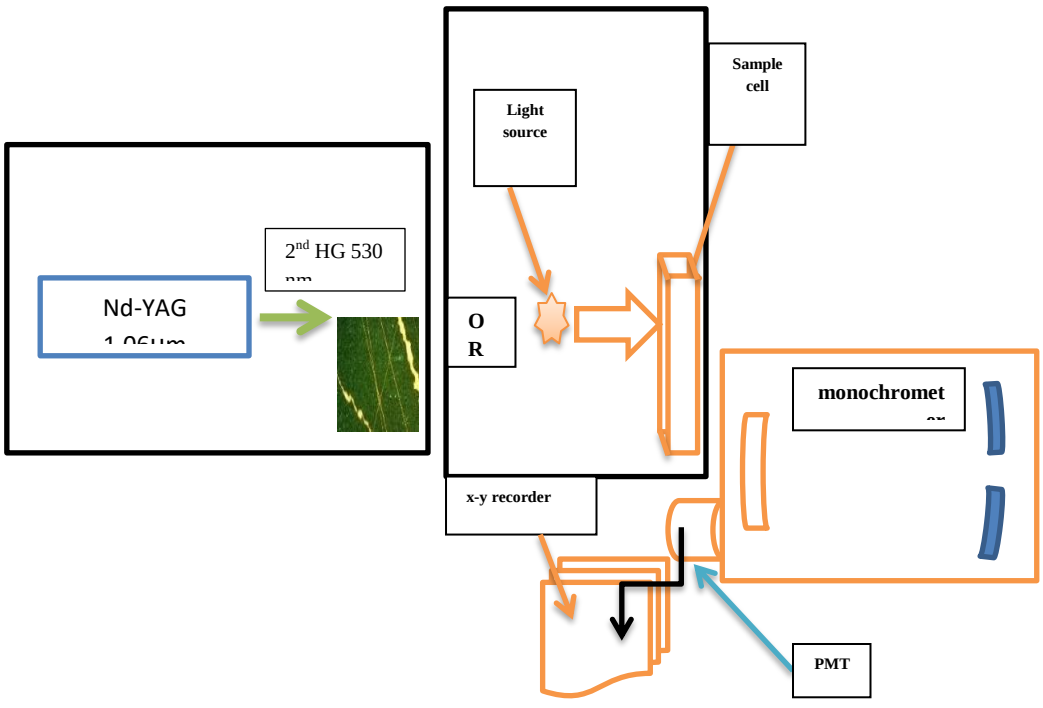

Figure1-setup for photophysical spectra

Figure 2-photographic picture of vegetable oil hated and stored six months in stainless steel pan.

Figure 3-photographic picture of vegetable oil hated and stored six months in Aluminum pan.

In this study, these steps were repeated twenty times. To study the effects of storage on the oils after the first heating process then be examine another time after six months later.

Result and discussion:

The palm oil used in this study was heated to a different degree of temperature after that measurements were taken on the absorption of heated samples at each heating. It was observed that the behavior of the absorbance spectra of the heated palm oil. After six months the heated palm oils and stored to know the effect of the storage time on the specifications of the oil spectrum and thus to conclude the structural and specifications of the heated oil that it store. It is noted that there is a precipitant of solid oil precipitated below the storage package. All samples were re-examined and the absorption spectra after heating to 300^{o}C Figure-4 were studied the results showed the appearance of high absorbent flux. after heating to 300^{o}C Figure-5 shows the influence of the plant oils after heating, It observe that in the region below 350 nm the samples are highly absorbent.

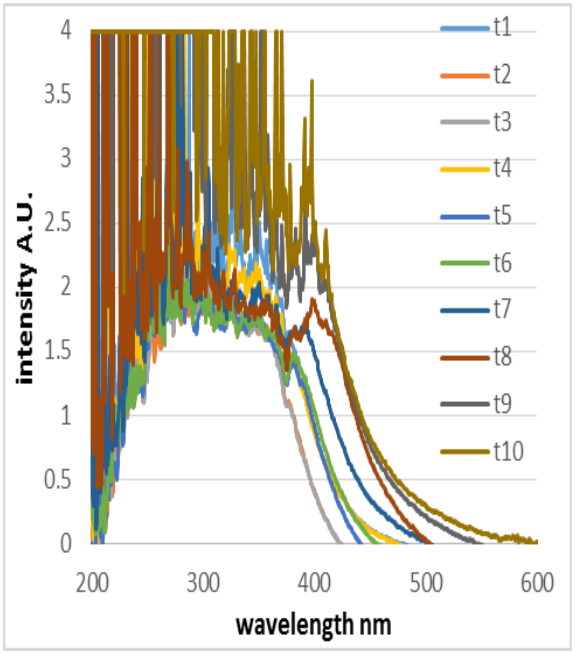

Figure 4-show absorption spectrum of plant oil for different No. of heating

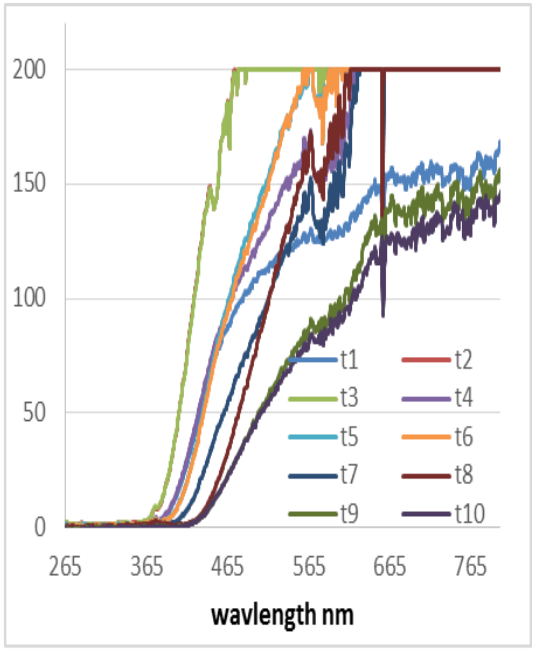

Figure 5- show transition spectrum of plant oil for different No. of heating

Figure-6 showed the fluorescence spectrums of re-heated palm oils this figures represented different behavior from original heated palm oil the samples of oils after six month shows that the structure of stored heated oils changes in its structures and the SP^2 hypred with π bonds may be broken and make other sigma bond with high energy which lead to complex health problem or become edible cooking oil is not healthy and may be have toxic effects.

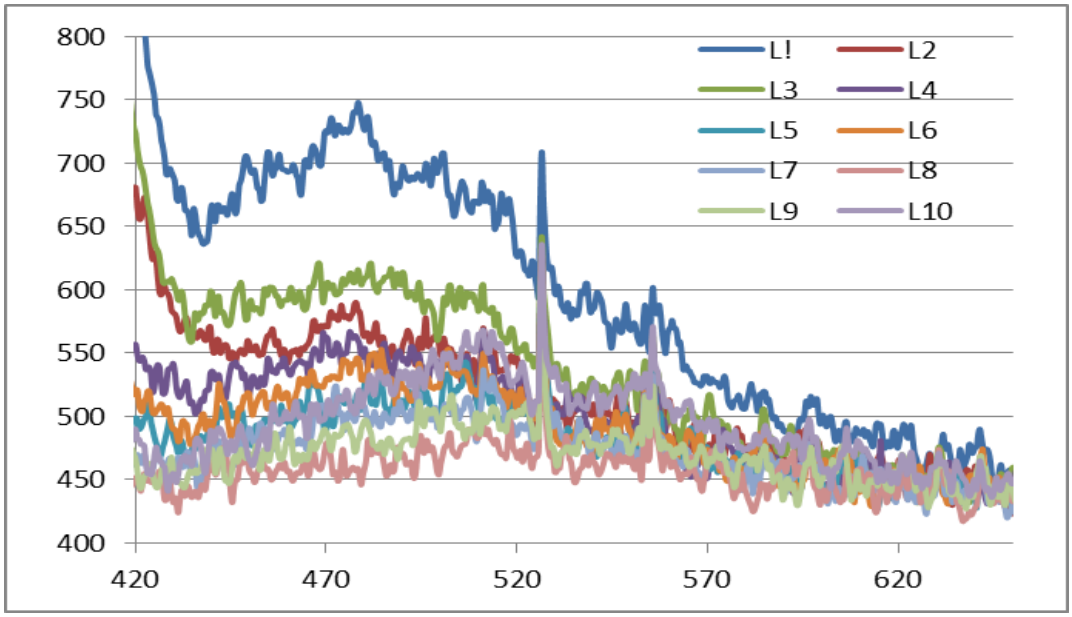

Figure 6-showed the fluorescence spectrums of re-heated palm oils after six months

The fluorescence spectral results showed the emergence of new interstitial bands that is mean the SP^2 hybridization with **π** bonds may be it can break and σ bonds formation as indicated in the absorption spectra and the appearance of absorption bands at short wavelengths, this is why the emission spectra look different from their behavior at higher temperatures than at low temperatures. It was observed that the behavior of the absorbance spectra of the heated palm oil remained almost constant behavior to nearly above 50°C Figures-(7a, b) but when the heating is approaching 100°C

that there are new spectrum compositions appear at the short wavelengths, which indicate for formation of new compounds resulting from the fracture units of original palm oils, but the whole structure of the spectrum still unchanged Figure- (7c) but with red shift. in Figure-(7d) for the samples heated to 150°C the spectrum structure changed clearly but when reaching to 200°C the spectrum totally changed, because increasing heating caused to broking more palm oil[. The FTIR spectrum of the samples that heated from one to twenty once Figure- 8 for two pikers

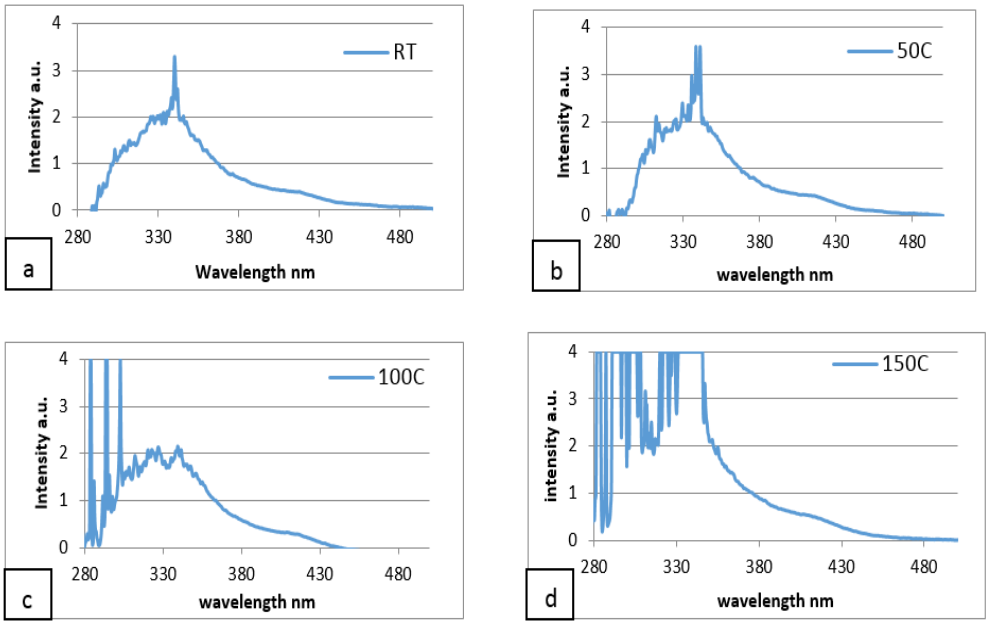

Figure 7-fluorescence spectrum of plant oil for different no of heating from 200 to 420 nm

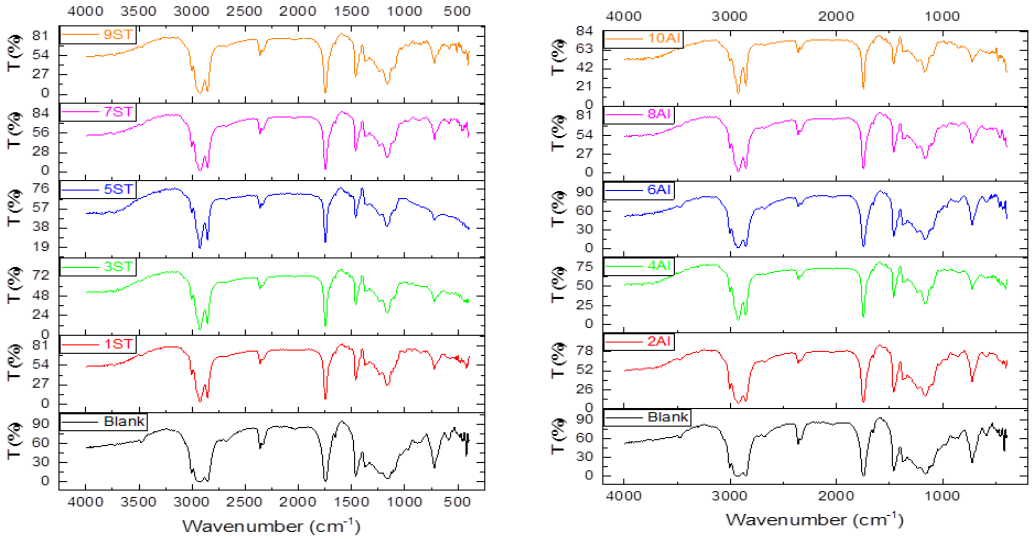

Figure 8-FTIR spectrum of heated vegetable oil

Conclotions:

The study showed that the heating of vegetable oils can lead to change of internal structure of the oils, especially the double bonds in $SP^{2,3}$ hybriaization to generate sigma bonds which is a strong type of bond and thus become edible cooking oil is not healthy and may be have toxic effects.

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