Synthesis and characterization of New Polyols Compounds Derivated From Epoxide Sesame Oil with some fatty acids and Evaluation their Microbial Effects

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Abstract

In this study, a new polyols that was derived from locale produced sesame oil was prepared. This preparation was carried out in two steps. The first step was to prepare the epoxidized oil from the reaction of the oil with the formic acid in the presence of hydrogen peroxide. The second step was the reaction of the epoxidized oil with a number of fatty acids like (acetic, stearic, palmitic, butyric, oleic and linoleic acid) to form the polyols. The oil and the prepared compounds were characterized using FT-IR, NMR and C13NMR Spectroscopy.

The iodine number, the acid value, the epoxide number, the peroxide number of the oil, and the prepared compounds were determined. Also the biological activity of the oil and the prepared compounds were studied by using two types of bacteria and a type of fungi, which were found that some of the compounds had a positive effect, to fungi and bacteria, E. coli but they was no effect on S.aureus , which can be attributed to the use of low concentrations

***Keywords**: Polyols, Epoxide Sesame Oil, fatty acids*

تخليق وتشخيص مركبات جديده للبولي اولات مشتقة من تفاعلات ايبوكسيد زيت السمسم مع بعض الاحماض الدهنية ودراسة تأثيراتها البيولوجية

المخلص

في هذا البحث تم تحضير بولي اولات جديدة مشتقة من زيت السمسم المنتج محليا, حيث تم تحضير هذه المركبات على خطوتين الخطوة الاولى حصر فيها ايبوكسيد زيت السمسم من تفاعل الزيت مع حمض الفورميك في وجود فوق اكسيد الهيدروجين , الخطوة الثانية حضر فيها مركبات البولي اولات من تفاعل الايبوكسيد المحضر مع بعض الاحماض الدهنية وهي(اسيتيك , بيوتريك , ستيريك ,بلمتيك ,اوليك , لينوليك). تم تشخيص الزيت والمركبات المحضرة باستخدام اطياف الاشعة تحت الحمراء(FT-IR) واطياف الرنين النوي المغناطيسي(NMR)وكربون 13(C13NMR). بعض الخواص الفيز وكيميائية قد درست مثل(الرقم اليودي , الرقم البيروكسيد, الرقم الايبوكسيدي , القيمة الحامضية) للزيت والمركبات المحضرة, ايضا تم دراسة الفاعلية البيولوجية للمركبات مع نوعين من البكتريا ونوع من الفطريات وقد وجد ان بعض هذه المركبات لها تأثير ايجابي سواء على البكتريا او الفطريات عدى بكتريا سيرس ايريس والذي اعزيا الى استخدام تراكيز منخفضة.

Introduction

Vegetable oils are part of a broader family of chemical compounds known as fats or lipids, consisting mainly of glycerol triesters with fatty acids which can be transformed into high-oleochemicals for various industries (Pryde, et al 1981). The composition of fatty acids in vegetable oils would decide the future use of oils; the conversion of oil seed crops into bioplastics may compete with petroleum chemicals plastics (Hong, 2005 p591; Badri, 2001 p384; Zlatanic, 2004 p80 9). Vegetable oils are considered to be environmentally friendly, abundant, cost, and have excellent properties products can be produced and used for useful polymeric materials (Narine, 2007 p55; Narine2007 p65; Lin 2008 p113).

Due to some vegetable oils derivatives are used as polymerizable monomers in a radiation curable device. In addition, the long fatty acid chains of vegetable oils give certain brittle resin systems, such as epoxy, urethane, and polyester resins, desirable strength and toughness (Prashnntha, 2001 p535). Vegetable oils are non-toxic, natural resources and alternatives to synthetic fluids are lower in cost (Randles 1992 p145, Asadauskas 1996 p877). They have low volatility, excellent lubricity, good viscosity temperature and higher solubilizing potential for contaminants and additives.

The epoxide ring-opening reaction is a widespread method for the functionalization of vegetable oils. Indeed, epoxidation of vegetable oils is an industrial process, mature, well controlled, and little expensive (Sylvain 2012 p1447).

Because they can be easily prepared from a number of other functional groups, epoxides are among the most versatile intermediates in synthesis (Sylvain 2002 p1374). In the preparation of polyfunctional compounds (monoesters of diols) [Yunus 2003p 35], nucleophilic ring opening reactions, mediated by the use of suitable homogeneous acid catalysts (Méndez 2009 p21), are extremely significant. Intermediate ester compounds have a range of industrial uses including solvents, plasticisers, resins, paints, coatings, perfumes, sauces, soaps, drugs, biofuels, and biolubricants (Kaufmann 1990 p1034). The chemical modifications include acylation as a synthesis step to enhance the properties of the biolubricant base stock. With the loss of chloride ion (Cary 2007 p, Desroches2012,), the acetyl compound reforms the carbonyl group.

Epoxidized oils with acid catalysts may undergo an accelerated alcoholysis to yield hydroxylated oils and with monoalcohols. This process leads to polyols with secondary hydroxyl functions (Goud ,2006 p1564, 19) being formed.

The preparation of polyols from oils has been the subject of many studies, but limited attention has been paid to the effect of different alcohol of small molecular weight, used as the ring opening reagents with soy epoxide oil (Honghai 2009 p261).

(Gryglewicz, 2003 p 35) initially indicates that biopolyesters have the benefit of simulating many extracellular matrix features and have the benefit of polymerizing sesame oil through peroxide contacts by using this polymer peroxide in ethylene glycol polymerization to obtain sesame oil-based polyols refers to converting double bonds to hydroxyl groups.

Sesame oil is of essential significance and is used as a food grade oil and a fat additive (halva) in small quantities (Bang 2014 p1354). The interest in trans esterifying sesame oil into biodiesel fuel is caused by a large cant production and competitive price in relation to other oils (Saydut, 2008 p6656). With respect to a high content of sterols, tocopherols and other unsaponifiable matter (terpene alcohols, hydrocarbons, other phenolic compounds), it can be used as a natural antioxidant for biodiesel and also for food applications, particularly in a brown variation oil from roasted sesame seeds (Mohamed,1998 p269. The unsaponifi capable material can be extracted at room temperature after saponification of oil (Mordret, 1986 p389).

Alt of from polyols and poly esters of sesame oil were synthetics (Prabha, 2013 484, Ocheje,2015 , Marlena,2018) .

In this study, we prepared epoxidized sesame oil from sesame oil and prepared 6 polyols from the reaction of epoxidized sesame oil with some fatty acids. Both the oil and the prepared compounds were characterized with a study of the physiochemical properties and spectra of FTIR, H-NMR and C13-NMR. Also, the biological efficacy of the oil and prepared Compound ware studied.

2. Experimental details

2.1Materials

Sesame Oil , Hydrogen peroxide, Formic acid, Linoleic acid, Butyric acid, Oleic acid all were supplied by Fluka but Palmitic acid, stearic acid, were supplied by Scharlau.

2.2 Methods

2.2.1 Preparation of Epoxidized Sesame Oil

Sesame oil (50ml) and formic acid (15ml) were placed in a (125-ml)and2%H_2SO_4 as catalyst Erlenmeyer flask equipped with the thermometer and dropping funnel. Hydrogen Peroxide solution (35%, 35 ml) was gradually added into the mixture during the first 2.5h of reaction and the reaction temperature was controlled at (50 ^{0}C). After adding H_2O_2 was completed, the reaction continued by mixing and controlling the temperature at (50 ^{0}C) for a further (4 - 5 h) . After that, the mixture was cooled down and washed by water. The water phase was separated using separation funnel and the water traces was further removed by rotary evaporator. The dried product was kept for further characterization and experiments (Meyer 2008 p1).

2.2.2 Polyols and esters derivative via epoxidized Sesame oil

(20g) Epoxidized Sesame oil (ESO) was dissolved in toluene in 250 ml three-neck flask equipped with a cooler, magnetic stir par, thermometer and dropping funnel. After that the mixture was heated to (50^{0}C) and stirred , 10-15g carboxylic acid was added, with H_2SO_4 as catalyst, to the mixture during the first hour of reaction according to table (2.2). Then, the heat of reaction was increased to (100 ^{0}C) and continued for 3 h. Finally, the solvent was removed by rotary evaporator and the dried product was kept for further characterization and experiments (Jumat, 2009 p216).

2.3 Characterizations

2.3.1Measurement of phiscochemical properties

2.3.1.1 Iodine value

1 g of oil sample was weighed into 250 ml stoppered dry glass bottle and 10 ml of carbon tetrachloride was added to the oil. About 20 ml of wijs solution was then added and allowed to stand in the dark for 30 min. After that, 15 ml of (10%) potassium iodide and 100 ml of water was added and then titrated with 0.1 N thiosulphate solution using starch as indicator. A blank was also prepared alongside the oil samples. The iodine value was determined using eq (1), (Pearson 1970 p510)

$$\textbf{Iodine value} = \frac{\mathbf{1.269\ (V * - V)}}{\boldsymbol{W}} \qquad \ldots\ldots\ \boldsymbol{eq}\ (\mathbf{1})$$

Where

V* = no ml of alkali consumed for titration of 35 ml of (wijs) solution

V = no ML of alkali used for titration of (I2)

W = weight of sample in gm

2.3.1.2 Peroxide value

The oil sample 1 g was weighed into a tube and 1 g of powdered potassium iodide with 20 ml of solvent mixture (Glacial acetic acid and chloroform) were added. This was then placed in

boiling water for 30 sec. The content was then poured into a flask containing 20 ml of 5% iodide solution. The tube was then washed out with 25 ml of distilled water and titrated with 0.002 N sodium thiosulphate sulotion using starch as indicator. A blank was also prepared alongside the oil samples. The peroxide value was determined using eq (2), (Pearson 1970 p510).

$$\textbf{Peroxide value} = \frac{\mathbf{1000\ (V\ x\ N)}}{\boldsymbol{W}} \quad \ldots\ldots\ \boldsymbol{eq}\ (\mathbf{2})$$

Where

V = no ml of alkali

N = normality of alkali

W = weight of sample in gm.

2.3.1.3 Acid value determination

5 g of the oil was weighed and 50 ml of hot neutral alcohol was added with a few drops of phenolphthalein. The mixture was shaken vigorously and titrated with 0.5 N NaOH solution with constant shaking until the pink coloration remains permanent. The acid value was determined using eq (3), [Pearson 1970 p510]

$$\textbf{Acid value} = \frac{\mathbf{V\ x\ 0.141}}{\boldsymbol{W}} \qquad \ldots\ldots\ldots\ \boldsymbol{eq}\ (\mathbf{3})$$

Where

V = no ml of alkali

W = weight of sample in gm.

2.3.1.4 Epoxide equivalent determination

1.5 g of the ESO and polyols derivatives was dissolved in 25ml n-propanol – in 125ml conical flask. The mixture brought to reflux while stirring. When the ESO was dissolved, 20 drops of the indicator solution (0.1gm bromophenol blue in 99.9gm n- propanol) and the freshly prepared potassium iodide solution (3.0g KI in 5.0ml distilled water) was added. The resulting mixture was brought to reflux and then titrated with 1N HCL until a yellow end point was attained (Al-

The epoxide content was determined using eq (4).

2.3.2 Instrument.

Fourier Transform Infra-Red (FT-IR) spectra of oils(so), epoxidized oil (ESO) and polyols were recorded on (Nicolet 6700 FT-IR, Thermo Scientific. The reflectance/absorbance spectra (attenuated total reflectance, ATR) of each sample was directly collected of the wavelength number between 400 and 4000 cm-1 without any treatment using a diamond crystal reflector (Smart orbit Diamond 30,000 – 200 cm-1; Thermo Scientific) equipped with FT-IR.

NMR Spectroscopy all(1HNMR and 13CNMR) spectra of oil(SO) ,epoxidized oil(ESO) and polyols were recorded quantitatively with a (DELTA_NMR spectrometer (JEOL) operating frequency of 400 MHz and a probe temperature of 21.7 degree Celsius).

All measurements FT-IR and NMR were done by king Saud university, Saudi Arabia.

2.4.Antibacterial and fungus a testing

The tested compounds were first dissolved in distilled water and dimethylsulfoxide. Then, three different concentration were prepared to all compounds (0.1N,0.02N,0.004N). In order to ensure that the solvent (DMSO) had no effect on bacteria growth , an inoculated control test was performed with only (DMSO) at the same dilution used in our experiment and found inactive in culture media. Culture were incubated for 24hr at 37c° for bacteria and (120hr)for candida. Results are recorded as average diameter of inhibition zone in mm Microorganisms used in antimicrobial tests were isolated from human patients include Staphylococcus aureus (gram positive bacteria) ,Escherichia coli (gram negative bacteria) and candied (yeast). Each isolate was prepared by the used method L'antibiogramme.

3. Results and Discussion

In this study, epoxidized Sesame oil (ESO) was prepared from the reaction of sesame oil with formic acid in there hydrogen peroxide at (50Co) shown in scheme (1).

In the second step, six types of polyols were prepared from the reaction of some fatty acids with the ESO as shown in Table (1) and according to Scheme. (2).

3.1 phiscochemialproperties

Table (2) shows some of the chemical properties of (SO) ,(ESO) and the prepared polyols. In the first step, epoxidized sesame oil(ESO) was prepared from the oil according to the scheme (1) ,from Tabl2 from1-2 absorved Lowering of iodine values indicates oxidation of double bonds in the sesame oil the double bond has turned into a ring of opoxide. This was supported by the Epoxy content or the oxirane oxygen, which is the highest value in the epoxidized sesameoil (SO)[Habib 2011 p317]. Also, the acid values and the peroxide values for both the oil and the epoxidized oil were low, indicating their stability in the direction of decomposition and oxidation.

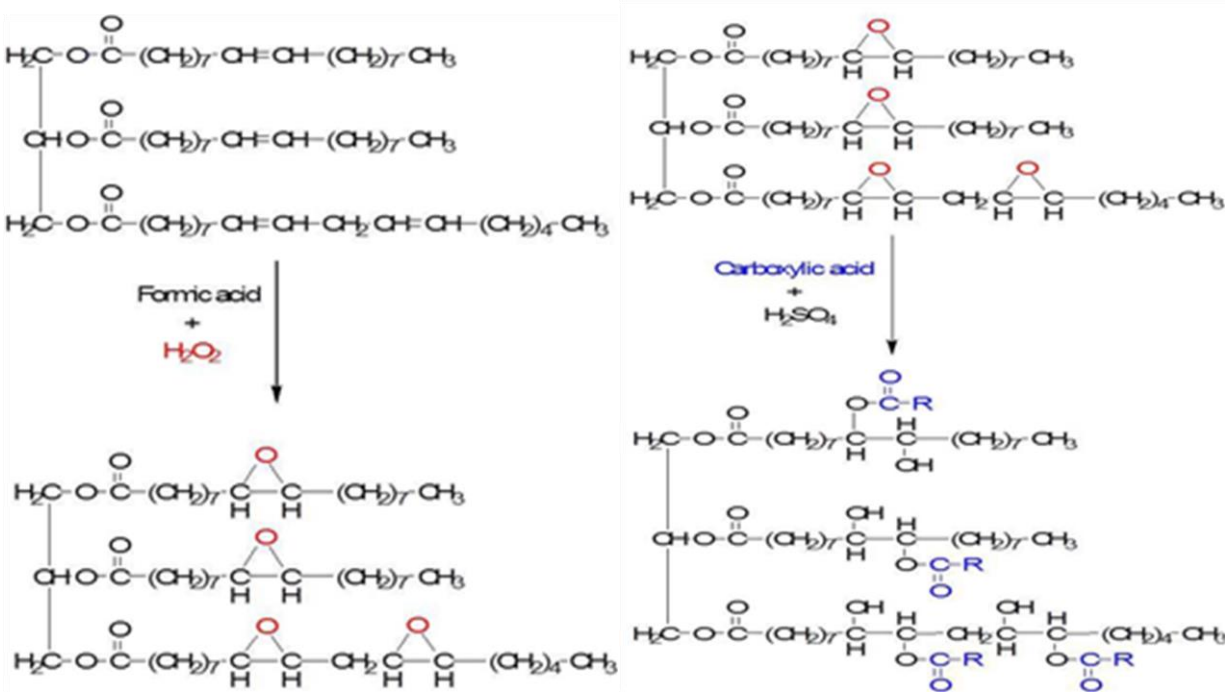
but in the poly oils from Tabl2 from 3-7 the iodine value decreased when the molecular of fatty acids and increased as was shown from number 3-5 but from 6-7 the iodine number increases due to the increase in the unsaturated bonds in the fatty acid. Also, it was observed that the acid value of the polyols was increased by increasing the molecular weight of the fatty acid used in preparing the polyols, which can be attributed to the acidity efficacy with low molecular weight, and therefore no degradation of the epoxides occurs during the opening of the ring.

3.2 FT-IR characterization

In Table (3) and Figure (1) where shown

The characteristic peak near 3006.94 cm–1 and. Peak at1655 cm -1 for sesame oil(SO) (Figure 1SO) can be attributed to= CH stretching and. bond C = C both unsaturation bond. (Figure 1ESO) shows disappearance of C = C and =C-H of epoxidizide sesame oil(ESO) and appearance peak at 822 is attributed to C-O-C. This indicates the formation of an epoxy ring as a result of converting the unsaturated bond into an epoxy ring addition to appears peak at 3450 of-OH which may be due to some side reactions like epoxy ring opening or ring rupture.

As for the prepared polyols, it is observed from the spectra in the form of (EESO-p, EESO-s) , Table3shows the appearance of an absorbing peak at 3447, 3448 which indicates the hydroxyl group to open the epoxy ring and turn it into hydroxyl groups in addition to the disappearance of the peak at 822 for the ring of epoxy but the broad bands around 3445-3453 cm-1 assigned to –OH group of the opened ESO have become weaker and slightly shifted to higher wave numbers after esterification operation. These results indicate different location of –OH in EESO products as well as [Soo 2004 p109].



(Scheme 2.1) The Chemical structure of preparation ESO from SO

(Scheme 2.2) The Chemical structure of preparation polyols

Table (1) Names and chemical structures of carboxylic acids used in the preparation of polyols and abbreviations for them

carboxylic acid	The chemical structures	Abbreviation of polyols
Acetic Acid	CH_3 OR CH_3COOH	EESOA
Butyric Acid	-OOC-$(CH_2)_2$ CH_3	EESO-B
Palmitic Acid	-OOC $(CH_2)_{14}$ CH_3	EESO-P
Stearic Acid	-OOC $(CH_2)_{16}$ CH_3	EESO-S
Oleic Acid	H-OOC $(CH_2)_7$ CH=CH $(CH_2)_7$ CH_3	EESO-O
Linoleic Acid	-OOC $(CH_2)_7$ CH=CH CH_2 -CH=CH- $(CH_2)_4$ CH_3	EESO-L

Table 2 *Test physicochemical properties characterizing the SO, ESO and polyols*

number	Material	Test methods			
	Typ of method	Iodine value g of I_2 /100g oil	Peroxide value m eq O_2/1000g oil	Acid value Mg KOH/g oil	Epoxy Content (moles epoxy/ kg)
1	SO	93	0.5	1.64	0.3
2	ESO	2.5	1.4	1.15	31.10
3	PEESO-S	0.5	-	2.1	-
4	PEESO-P	0.3	-	2.8	-
5	PEESO-A	0.1	-	1.2	-
6	PEESO-B	0.1	-	1.4	-
7	PEESO-O	8	-	2.0	-
8	PEESO-L	15	-	2.5	-

Table 3: FTIR spectrum of SO, ESO and poly oils properties

compound	C=C	=CH	v (oH)	CH_2,CH_3	C=O	C-O-C
SO	1655	3006	3425	2865،2987	1708	
ESO	-	-	3441	2872،2946	1738	**822**
EESOA	-	-	3453	2830،2945	1730	-
EESO-B	-	-	3445	2826،2943	1727	-
EESO-P	-	-	3447	2830,2942	1725	-
EESO-S	-	-	3448	2829,2941	1726	-
EESO-O	1710	3008	3450	2984,2863	1738	-
EESO-L	1710	3008	3450	2985,2860	1738	-

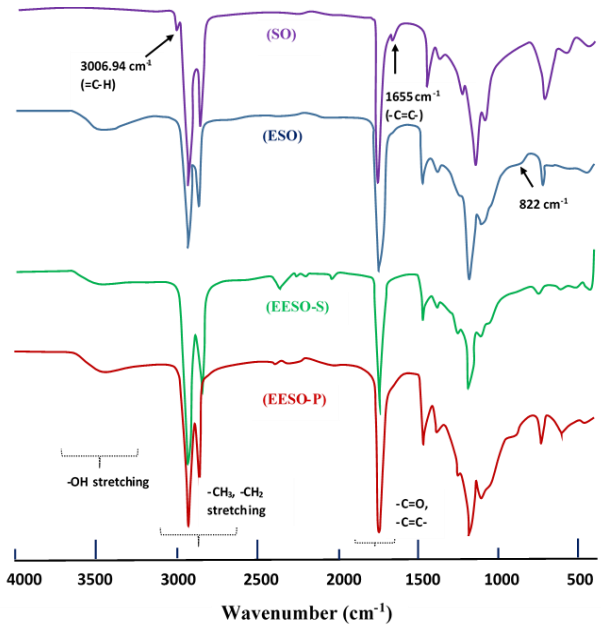


Figure 1: FTIR spectrum of(SO,ESO,EESO-S,EESO-P)

3.3. NMR

The structures of the SO and ESO were confirmed by NMR analyses. The 1H NMR spectra of the SO and ESO are presented in Fig.2, The 1H NMR of SO is similar to other vegetable oils showing characteristic signals at 3.75- 4.36ppm for the four methylene proton in glycerol center and another peak at 5.2ppm for the methine proton of glycerol. The peaks at 5.32-5.34 ppm arise from protons on the carbon double bonds (CH=CH). The peaks in the region 1.96-2.03 ppm correspond to methylene groups. surrounded by single bonded atoms[Akintayo 2013 p984] 1H NMR of ESO show the characteristic glycerol methylene and methine at 5.2and 3.75- 4.36ppm respectively but only residual HC=CH at 5.32-5.34ppm . However, there is the appearance of new peaks in the region 3.19ppm indicating the presence of epoxy protons. The peak at 5.32-5.34 ppm disappeared correspond to the double bond hydrogene band C=C . As for the acidic reactions with the epoxdizied oils to form the polyols ((EESOS,EESOP,…atc) as shown in Figure 3C and D. The peak of the epoxy ring protons has disappeared (at 3.19) and there was appearance of new peaks instead of the proton alcoholic -CHOH at 3.3-3.4 ppm.[Field 2013 p14]

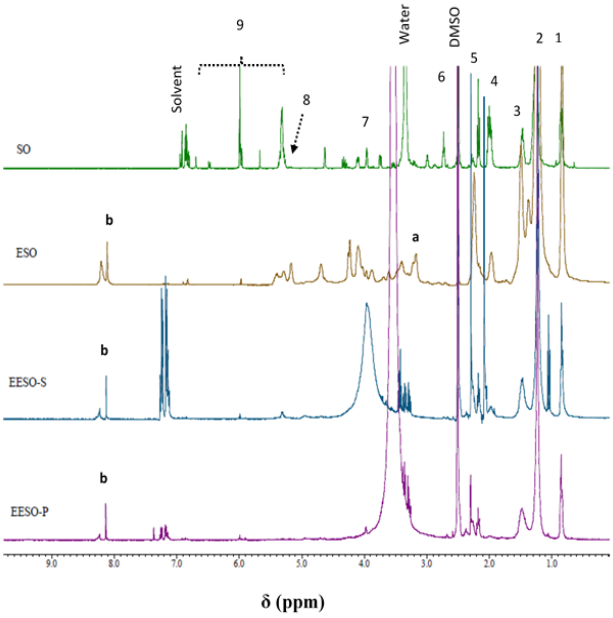


Figure 2. H-NMR of(SO,ESO,EESO-S,EESO-L)

3.4. C13 NMR Characterization

In the 13C spectrum of ESO, the signals at 52. 56. ppm were due to the carbons of the oxirane ring; and the main signal 102-145 ppm for the double bond disappeared. Furthermore, in the 13C NMR spectra, the signals of polyols (EESOS, EESOP,… atc) from160-180 attributed to the new ester carbonyl groups in addition to disappearance of the signals at 52. 56. ppm were due to the carbon of the oxirane ring (Sliverstien 2005 p). (Fig 3).

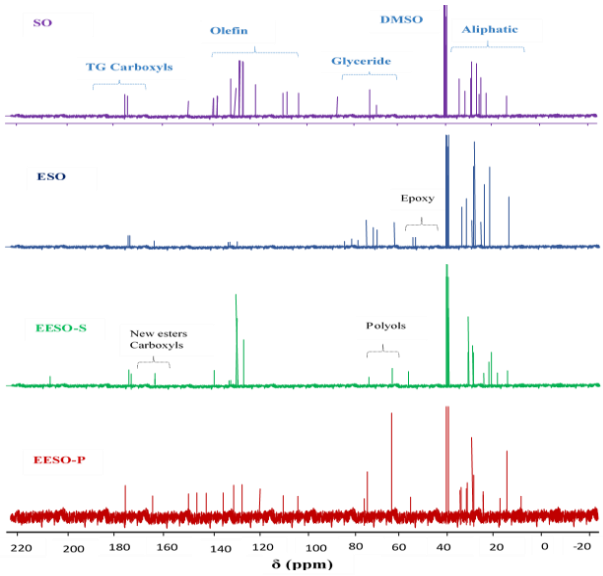


Figure 3.C13NMR of polols(EESO-B,EESO-O,EESO-L)

3.5. Biological Activity.

The biological efficacy of two bacteria and fungi were studied using the methods described in the practical shear.

According to the results above in Tables (4,5) it was clear that sesame oil had a considerable antimicrobial activity. Several previous studies mentioned the antibacterial activity of sesame leaves extract and oil against different G+ and G- bacteria such as Streptococcus mutans, Lactobacilli acidophilus, and total bacteria (Anand 2008 p063). The oil also showed an excellent result when it was used against a nosocomial isolate of S. aureus (Reza 2017 p13). Unlike many studies, the oil of sesame showed here inactivity against S. urease, and this may due to several factors related to one or more of plant, oil, and microbial strain characteristics. A discrepancy in the results of antimicrobial efficacy tests was previously for other oils such as lemon and thyme (Hazem 2017p14). In the in vtro examining of antimicrobial activity, the concentrations play an essential role, and it may cause the inactivity of sesame oil against S aureus in the current study (Darshika 2015 p88). The active components of sesame oil which showed antibacterial activity include carboxylic acids and phenolic groups, besides, the most potent antioxidants known to man like sesamol, sesamolin, and sesamin [Bankole 2007 p427]. In vitro test of sesamol indicated that its antibacterial assays against food borne pathogens with minimal inhibitory concentration (MIC) of 2 mg /ml. Its activity was synergistic with γ-tocopherol, also present in sesame seeds . The antibacterial mechanism of plant essential oils or extracts was generally suggested to be due to its major compounds especially polyphenolic compounds which is able to interact with cytoplasmic membrane of bacterial cells and later cause the escape of cellular components .Sesame seed lignans are known to inhibit the growth of bacterial. The mechanisms includes inhibition of the various biochemical pathway and critical enzymes and development of pores and cavities in bacterial cell membrane (Mahendra 2014 p2934).

According to the results above in Table (6) Oil of sesame effect on yeast and mycelia form of candida. Yeast that causes candidiasis were isolated from different infections (oral, skin, vulvovaginal…etc) and the antifungal activity of sesame oil presented remarkable results (Fatemeh 219). Sesame oil has numerous mechanisms against Candida cell to reduce the pathogenicity and the reproduction the critical steps include the effects on DNA repair, functions of mitochondria, biofilm and dimorphic formation, beside disrupts homeostasis of the cell membrane (Ansari 2016p140).

Table (4)Zone of inhibition observed against E.coli by the test compounds,

Compound	Diameter of inhibition zone in mm 200 µg dw/disc			%inhibition zone
	Diameter of inhibition zone mm at (0.1N)	Diameter of inhibition zone mm at (0.02N)	Diameter of inhibition zone mm at (0.004N)	
SO	0	0	0	0%
PEESO-A	20	25	20	90%
PEESO-B	18	20	10	85%
PEESO-P	0	0	0	%
PEESO-S	12	10	10	70%
ESO	0	0	0	0%
PEESO-O	0	0	0	0%
PEESO-L	0	0	0	0%
***Ampicillin**	25	18	18	88%
***Amoxicillin**	10	8	7	15%

*** = standard antibiotic dw' = dry weigh**

Table (5):Antimicrobial screening results of the tested compounds and antibiotics Third concentration (0.004N) with S.aur eus

MicroorganismS.aureus			
Compounds	***First concentration (0.1N)***	***Second concentration(0.02N)***	*Third concentration (0.004N)*
SO	***0***	***0***	*0*
PEESO-A	***0***	***0***	*0*
PEESO-B	***0***	***0***	*0*
PEESO-P	***0***	***0***	*0*
PEESO-S	***0***	***0***	*0*
ESO	***0***	***0***	*0*
PEESO-O	***0***	***0***	*0*
PEESO-L	***0***	***0***	*0*

Table (6): Zone of inhibition observed against Candida albicans by the test chemicals

Compounds	Diameter of inhibition zone in mm 200 µgdw/disc			
	Diameter of inhibition zone mm at (0.1N)	**Di Diameter of inhibition zone mm at (0.02N)**	**Diameter of inhibition zone mm at (0.004N)**	**% inhibition zone**
SE	0	0	0	0%
PEESO-A	14	15	19	80%
PEESO-B	10	10	8	15%
PEESO-P	0	0	0	0%
PEESO-S	11	8	12	70%
ESO	0	0	0	0%
PEESO-O	0	0	0	0%
PEESO-L	0	0	0	0%

***' = standard antibiotic dw' = dry weigh**

Conclusions

From our study, we reached the following conclusions

1-Vegetable oils are materials with renewable energy that can be used in making environmentally friendly plastic materials (biodegradable in the environment) and polyols are compounds that can be used in the manufacture of polyurethanes as well as lubricants

2-Sesame oil is one of the locally produced vegetable oils, which closely resembles olive oil and sunflower oil, containing unsaturated bonds.

3-The epoxide of oil and polyols is stable towards oxidation, as evidenced by a decrease in the value of peroxide and the value of free acids.

4- The double bonds in the oil have turned into an epoxide ring due to the evidence of acute decreased in the iodine value and an increase in the value of the epoxy content as well as spectrums characterization

5-The polyols was obtained by opening the epoxide ring using the fatty acids, which was proven through the spectra, where the epoxy ring disappeared and the appearance of hydroxyl groups in addition to the appeared of new esters group of polyols.

6- The study of the biological activity against two types of bacteria showed that some of the compounds had a positive effect, especially on bacteria, E.coli but they were S.aureus because they affected bacteria, which can be attributed to the use of low concentrations.

7. As for the biological effect on the aromatics, it was positive because sesame oil has a mechanism against the cell of flashes, especially its effect on nucleic acid and mitochondria

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