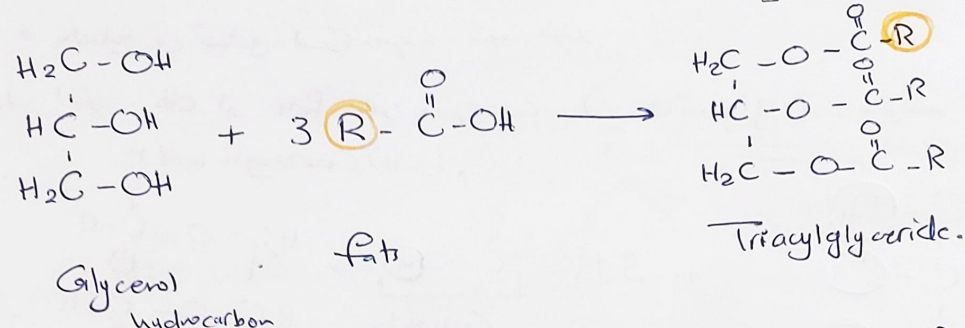


* نرجح لتكدر التفاعل بالمائيوان لأنه الكتورة كدلت على شرح.

* هذا ممكن الكتورة ١- هذا التفاعل ممكن ينتج عنه Solid fat و oil ،
طبع من هالكي بصر.



R هي عليها دائرة هي اي بتحد اي هي (fatty acid chain)

[1] اذا كانت لا تحتوي على double bond تكون Saturated hydrocarbon chain
اي Solid fat ← بالمنتجات الحيوانية.

[2] اذا كانت تحتوي على double bond تكون unsaturated hydrocarbon chain
اي liquid oil وصران هاي يكون بالمنتجات النباتية ممكن بصرها
(hydrogenation) هدرجة لهاي double bond ونرجح ال double bond ويظهر Solid
ولكن أكلها هاي ال Fats الحايمة من النباتات ما يفرطوها ويكوا عنها هدرجة.

* properties of fats : insoluble in water , soluble in organic solvent

- * fixed oils has high melting points
- * larger the number of carbon atoms, higher melting point.
- * larger number of double bond, lower melting point.

- * عدد الكربونات في (R) , melting point طردي .
- * عدد double bonds في (R) , melting point عكسي .

* Other properties of fixed oils : 1) tasteless 2) odorless
تسبب ضار انا انا → hydrolyzed or ~~hydrolyzed~~ hydrolyzed Rancidity of oil.
3) easily oxidized or ~~hydrolyzed~~ hydrolyzed
بسبب تعرضها لـ oxygen, air , moisture
بتتأكسد وبسبب ضار الزيت .

* Method of oil extraction : expression
نرجح بوجودة ليطلع الزيت : عصر
chemical methods : Organic solvent extraction
نرجحنا الزيتون بجدن

* الطريقتين صدرن موجودين بالمائيوان بس الكتورة حكيم
لهيك احفظهم .

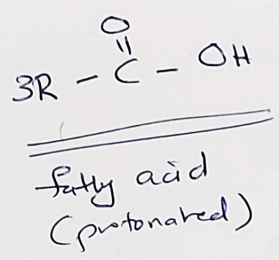
* Texture of oil: greasy : لزجة

بعضها صلب مثل المايونيز
ذكرتها بالفيدو واللبات في
دكترة ذكروها.

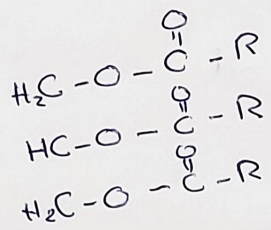
Formation of Triacylglyceride *
3 or 2 fatty acids و glycerol
بمربعين : hydrolysis زي ما صار لها

- 2 method for hydrolysis
- 1) Acid hydrolysis → fatty acid protonated ~~Triacylglyceride~~
 - 2) base hydrolysis → fatty acid deprotonated

يعني عند الهالة acid
base " " + Acid
positive charge يتركب fatty acid و triacylglyceride
negative charge and loss (H) يتركب fatty acid و " "

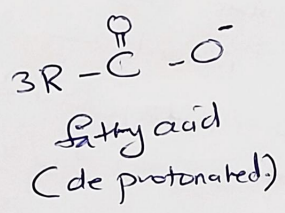


In acid hydrolysis



Triacylglyceride

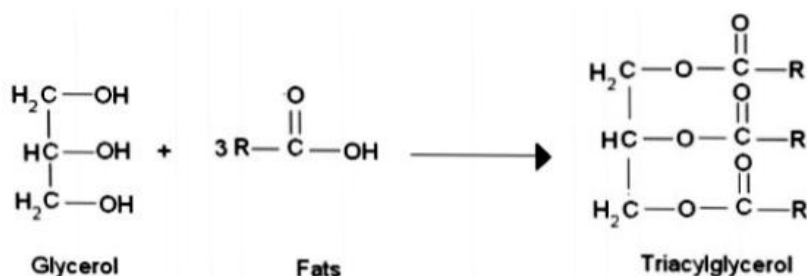
In base hydrolysis.



Experiment (6)

Determination of Fixed Oils from British Pharmacopoeia (BP)

Fixed oil is a triglyceride that can be extracted from vegetable origins, such as nuts or seeds of the botanical sources (e.g., almond, olive, sunflower.....etc.). Triglyceride is an ester derived from glycerol and three fatty acids. Fatty acid is a carboxylic acid with a long aliphatic chain, which is either saturated or unsaturated. The characteristics of oils are related to the properties of the fatty acids that they contain. **The larger the number of carbon atoms, the higher the melting point: the larger the number of double bonds, the lower the melting point.**



physical constant
ما بهموني
لهاد الارب

❖ **Physicochemical properties** of oil like **density, viscosity, boiling point, specific gravity, saponification value (SV), iodine value (IV), acid value (AV) and peroxide value (PV)** were studied to evaluate the compositional quality of oils and their commercial importance.

هدول الي بهموني بهاد الارب
الي هم chemical

I. Determination of Peroxide Value (Test for presence of Rancidity): Properties

More judgmental

Fixed oils are odorless but some time it can emit a faint nutty aroma. **When** For fixed oil fixed oils are exposed to air they react with the oxygen or water vapor to form a series of breakdown products in stages, starting with primary oxidation products (Peroxides, Dienes, Free fatty acid), then secondary products (Carbonyls, Aldehydes, Trienes) and finally tertiary products. The short-chain acids are volatile and have unpleasant smells and tastes. This oxidation process is called **Rancidification**.

Oxidation progresses at different rates depending on number of factors such as: storage temperature, light exposure, availability of oxygen, and the presence of moisture and metals. Oils with a high degree of unsaturation are most susceptible to oxidation. **The peroxide value is a**

②

acid value , iodine value , saponification value , peroxide value .

صدق به بهوتا : edibility □ قابلية الأكل
rancidity □
quality of fixed oil □

* كل مازات كمية triglyceride كلما كمية fatty acid أقل high quality ←

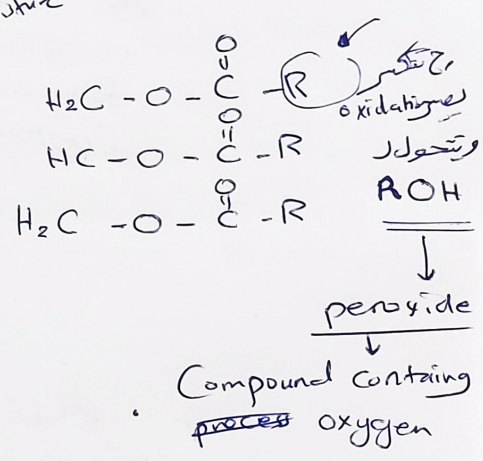
* كل ما كانت fatty acid كلما ester bond مع glycerol كلما high quality of fixed oils

* كل مازات نسبة ar fats أكثر معانا ar oil ← more rancid فاسد

→ peroxide : oxygen containing compound.

ما يعرفه للواء، حرارة، ضوء، هواء، moisture

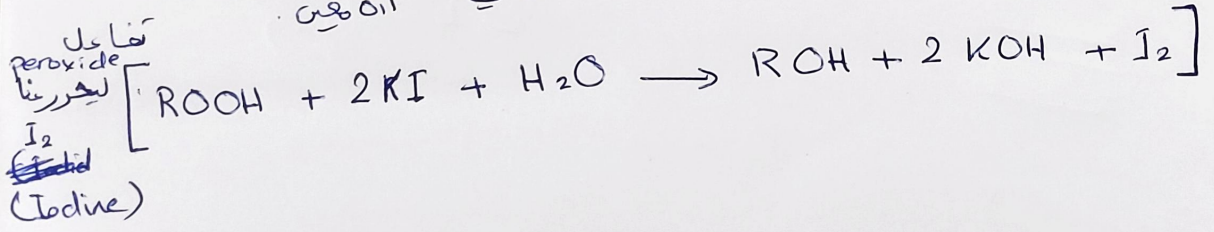
Triacyl glyceride يتكون منها
alkyl group مرتبطة فيها oxygen
لا يتغير ar fixed oil لطول oxygen, light, heat
rancid ←



لهين الزيت ينشط بكميات هائلة لخلق لحدوث فاسد
يعني لحدوثه يسهل oxidation fatty acid
ويكسر السلسلة side chain

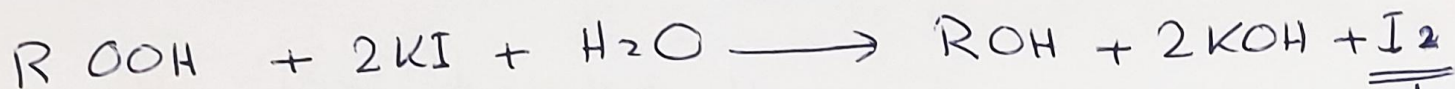
* procedure فيها صفحة (55) لالبيان لال peroxide value

* peroxide value : Rancidity
ايها كية fatty acid الفاسدة في
اوهين



5

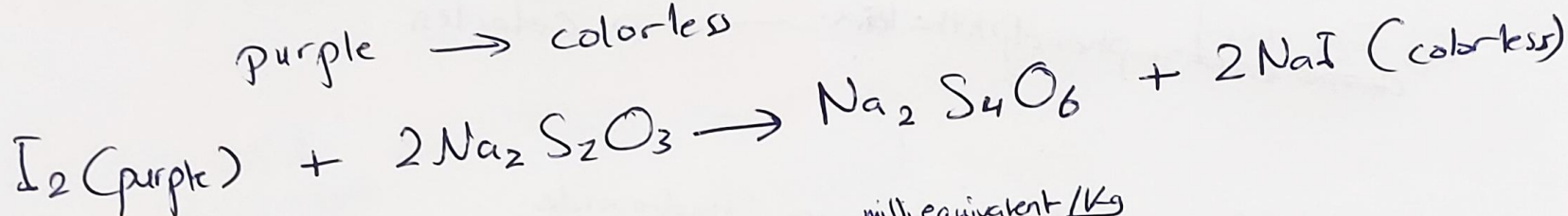
Peroxide value :



لأنه يس حرزاه بح قيس كمية peroxide الموجودة بهذا ایل لانه نسبة Peroxide لـ I_2 1%
 صون حرزنا ال Iodine (2) ~~بج~~ ^{بناطريه} ح نزل titration باستخدام Sodium thiosulfate
 ويتغير اللون من yellow $\rightarrow$ colorless

* حين نقص ال Iodine اراي شت (Indicator) : Starch solution .
 يوجب colorless

purple $\rightarrow$ colorless



PV of fresh oils are less than 10 $\frac{\text{mEq}}{\text{Kg}}$ ^{milliequivalent / Kg}
 = of rancid oils ~~are~~ ^{زيت فاسد} between 30 - 40 $\frac{\text{mEq}}{\text{Kg}}$

* الدكتورة عدلت في المعادلة

$$POV \left[\frac{\text{mEq}}{\text{Kg}} \right] = \frac{(V_1 - V_0) * C * 1000 * T}{m}$$

6:21



Chegg

$$\begin{aligned} c &= 0.1 \\ m &= 5 \text{ g} \end{aligned}$$



To determine the POV, use the formula below:

$$\text{POV} \left[\frac{\text{meq}}{\text{kg}} \right] = \frac{(V_1 - V_0) \cdot c \cdot 1000 \cdot T}{m}$$

POV = peroxide value

V_1 = volume of sodium thiosulfate solution used to titrate the sample

V_0 = volume of sodium thiosulfate solution used to titrate the blank

c = molar concentration of the sodium thiosulfate solution

T = titre of the thiosulfate solution (i.e., the number of moles of peroxide corresponding to one mole of sodium thiosulfate)

m = weight of the oil sample in grams



① Determination of acid value (free fatty acid)

کل ما زاد = fatty acid کی ٹاکن اور oil میں سے ~~edible~~

acid value : ethanol + ether (50:50)
ethyl ether ~~ethanol~~ (1:1)

10 g oil + 50 ml
+ color indicator (phenolphthalein)

~~free fatty acid~~ + phenolphthalein → colorless

→ titration with potassium hydroxide .

colorless → pink (basic media)

Saponification value : → base hydrolysis
oil → Sapon strong base
* لا بھلے بیجیو ای زیت قدیم + زیت زیتون، زیت فی و بیجیو اعلیٰ strong base
لصن صیرنا صابون :

طبعاً لا بھون ہا ان زیت قدیم بھون ہا کثرت فatty acids کا حکم
کل ما زاد = fatty acids کی oil کی quality
K



وہو strong base کی بھست لصلہ الصابون

* ↑ fatty acid → ↑ Saponification value (علیٰ قدر)

↑ Molecular weight of triacylglyceride → ↓ Saponification value

liberated by hydrolysis of triglycerides due to the action of moisture and temperature. It is a measure of hydrolytic rancidity which is used to determine the quality, age, edibility, and suitability of oil for industrial use (Pharmaceutical oil must not have any acidity. Refined oils which referred to neutralized or low acidity oils are used in industry).

❖ **Acid value** is a relative measure of hydrolytic rancidity because raw and crude oils are naturally hydrolyzed and consequently have a high acid value and it may be overestimated if other acid components are present in the system e.g., amino acids.

- The acid value is defined as the number of milligrams of potassium hydroxide required to neutralize the free fatty acids present in one gram of oil.
- The acid value is determined by directly titrating the oil with a standard solution of potassium hydroxide using Phenolphthalein as a color indicator.

❖ **Calculate the Acid Value:**

$$AV = (M * M_w * V) / W = (0.1 * 56.11 * V) / W$$

M_w = molecular weight of potassium hydroxide, 56.11. V = volume (mL)
 M = molarity of the potassium hydroxide solution, 0.1.
 W = weight of the sample taken (g)

❖ **Saponification value:**

ليعملوا صابون

- The Saponification Value is the number of mg of potassium hydroxide required to neutralize the free acids and saponify the esters contained in 1.0 g of the substance.

Saponification is the process of breaking down a neutral fat into glycerol and fatty acid salt by treatment with strong base. Saponification value is a measure of the average molecular weight of the triglyceride in a sample. The smaller the SV the larger the average molecular weight of the triglyceride present. The long chain fatty acid found in fats have low SV because they have a relatively fewer number of carboxylic functional

⑤ Iodine value :

* سونچي؟
او سونچي؟
يحدو ڪم يوج double bond
unsaturated fatty acid

fat - ar oil

* ڪل ما زار = iodine value ڪي double bond
Fatty acid ← double bond

rancid ← oxidation

page 54
اول سطر ٻلائيون

→ unsaturated fatty acids can be converted into saturated by
the process of hydrogenation
هڊرجن

زي صاحب ڪيا قبل ، يعني ملائڪول الزيون انبائي
Solid ←

بصريحنا Saturated ڪي طريقه اي
hydrogenation

دانشي ڪل double bond موجود ڪي هئا
fat

group per unit mass of the fat and therefore high molecular weight.

❖ **Iodine value:**

عدد کم double bonds
Fat II

Unsaturated fatty acids can be converted into saturated by the process of hydrogenation. Depending upon the degree of unsaturation, the fatty acids can combine with oxygen or halogens to form saturated fatty acids.

The iodine value gives a measure of the degree of unsaturation of a lipid. An increase in IV indicates high susceptibility of lipid to oxidative rancidity due to high degree of unsaturation.

- *The Iodine Value represents the number of g of iodine absorbed by 100 g of the substance.*