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Conclusions

1. New esters compounds have been prepared not available previously.
2. The properties of new esters compounds resulting from synthesis were studied.
3. The esters were manufactured in new different techniques as new compounds were given a new name and a new composition.
4. The results of the chemical studies which scheduled in the research plan were consistent with the research theoretical framework.

Recommendation

From the knowledge gained during this study, the following can be identified as important for further research, the further research must be conducted on the following:

1. Extensive study of the biological properties of compounds prepared.
2. Study the influence of weather conditions such as a change in temperature degrees and humidity on ester compounds.
3. Preparation of new complex compounds not previously prepared and comparing their therapeutic properties with esters.
4. To synthesis new esters, the esterification process can be performed by using sugars instead of alcohol.
5. Studying the possibility of preparing liquid crystals and diagnosing their behavior.
6. The possibility of preparing bioactive compounds and antifungal agents of the same prepared compounds.

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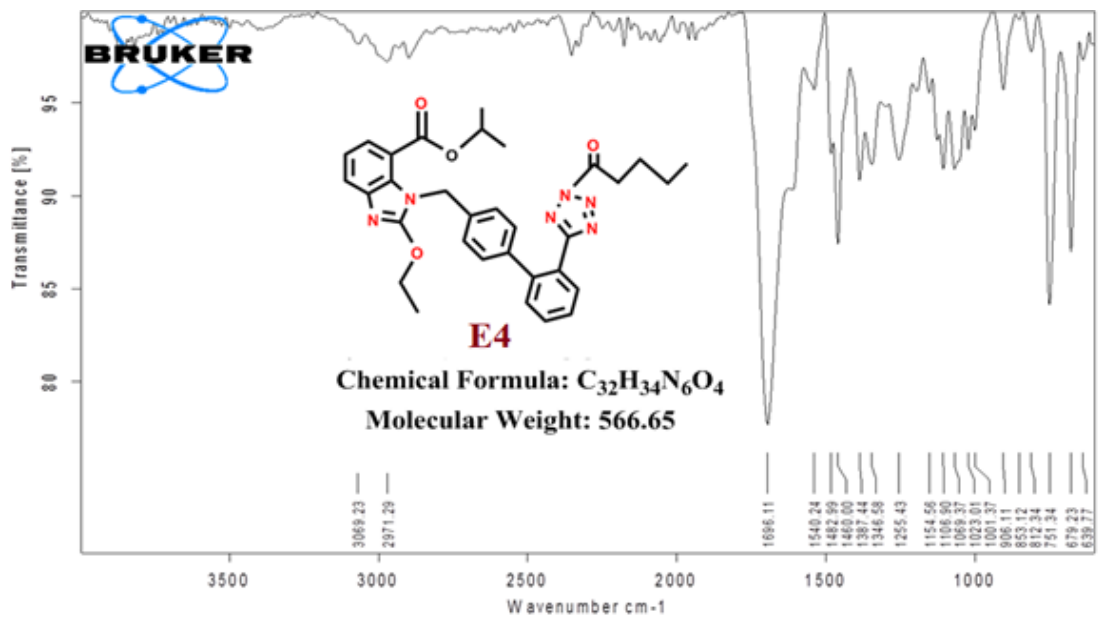

Figure .3.7 : FT-IR spectrum for compound E4

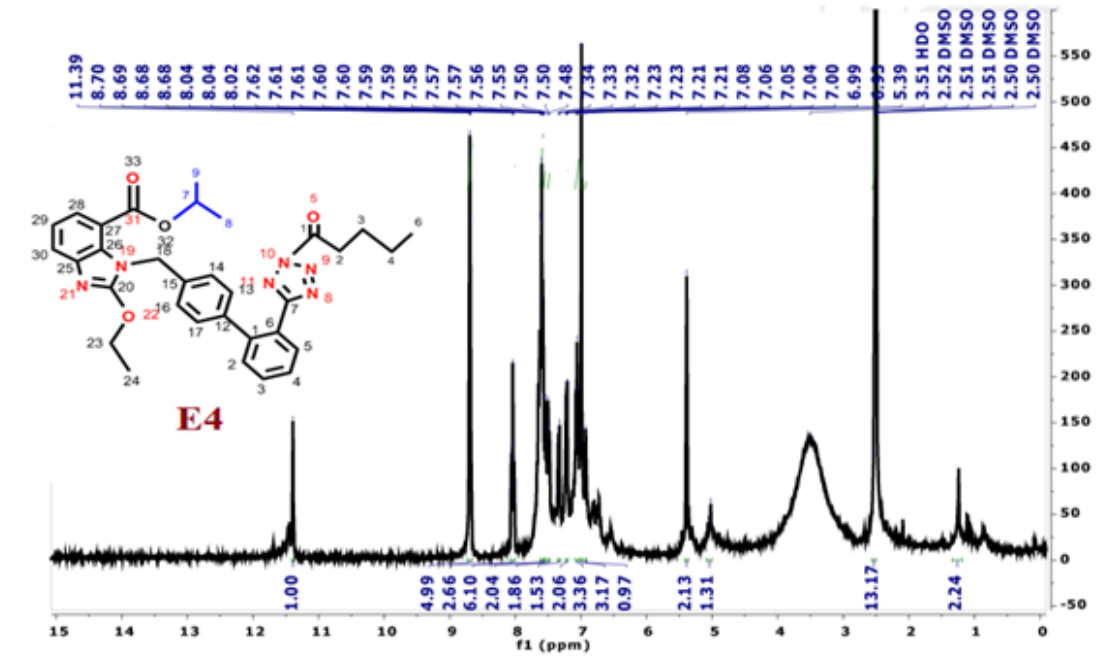

Figure .3.8: 1H-NMR spectrum for compound E4

3.4. Characterization Of isopropyl 2- ethoxy -1- ((2'- (2- pentanoyl -2H- tetrazol -5- yl) - [1,1'- biphenyl] -4- yl) methyl) -1H- benzo [d]imidazole -7- carboxylate (E4).

E_4 was prepared by the interaction of carboxylic acid with Iso propanol by thionyl chloride. In this reaction, the solution was added to the beaker which contain the ice, in addition the dilute hydrochloric acid was added to beaker to crystallization the solution. crystallization materials was separated by filter paper. Where, the compound characterization determine by melting point was **(175180- °C)** and monitoring the interaction by thin layer chromatography technique. The compound was characterized with infrared spectroscopy carbonyl esters where the value reached to **(1697.35 Cm^{-1})**. where signals of Esters appear at **(3.67 ppm)**. [15].

TABLE. 3.1:
FT-IR Spectral Properties Of all Compounds E1,E4

COMPOUND NO	=CH-H	CH_2	C=O	C=C	C=N	C-O	O-C-O
E1	3137	2935	1697	1541	1351	1252	1201
E2	3382	2935	1679	1540	1349	1250	1200
E3	3389	2829	1701	1540	1348	1252	1225
E4	3069	2835	1696	1540	1346	1255	1225

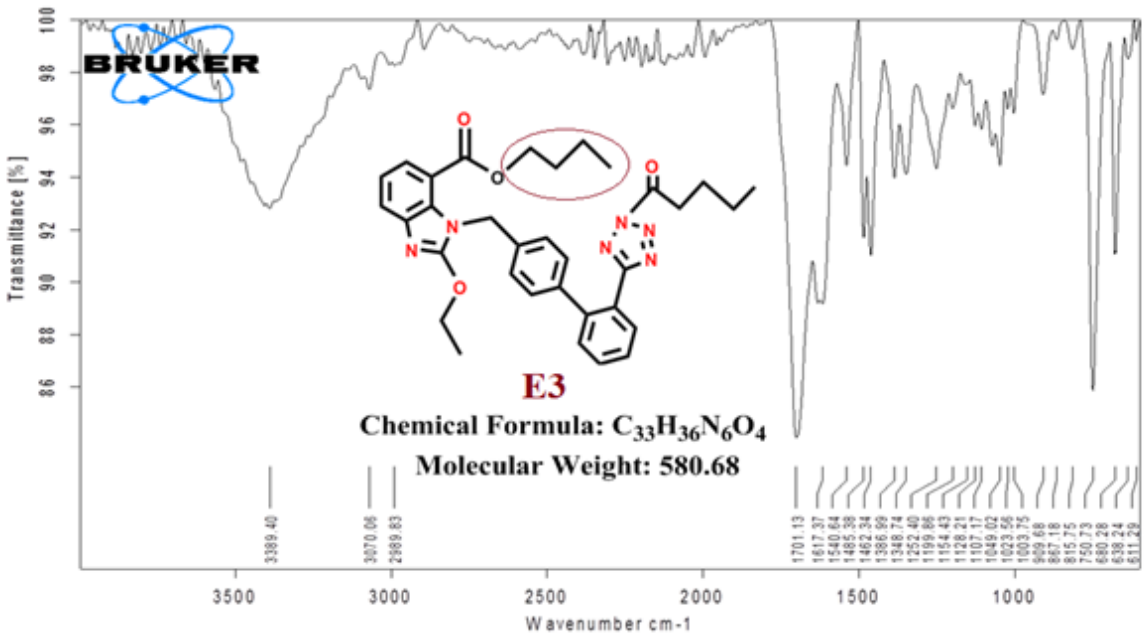

Figure .3.5 : FT-IR spectrum for compound E_3

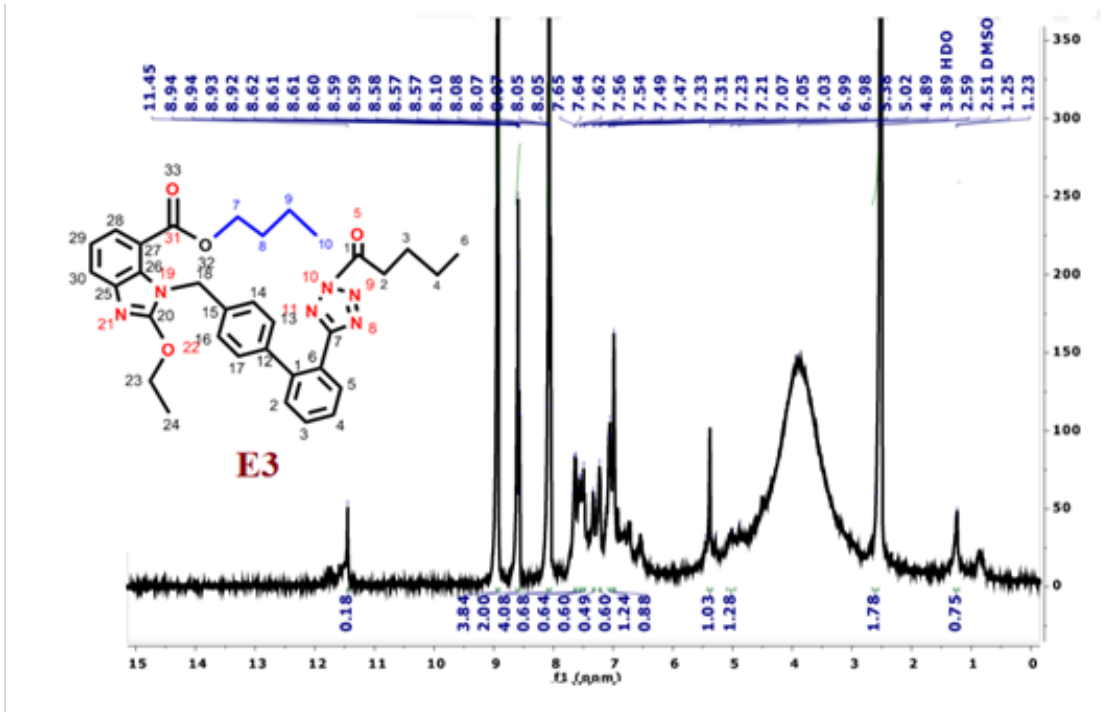

Figure .3.6: ^{1}H-NMR spectrum for compound E_3

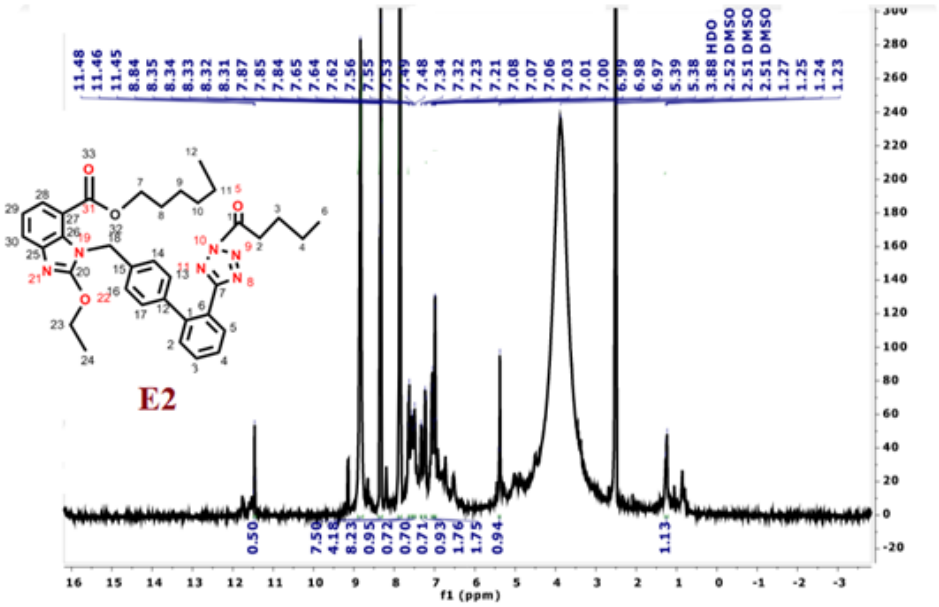

Figure .3.4: 1H-NMR spectrum for compound E_2

3.3 : Characterization Of butyl 2- ethoxy -1- ((2'- (2- pentanoyl -2H- tetrazol -5- yl) - [1,1'-biphenyl] -4- yl) methyl) -1H- benzo [d]imidazole -7- carboxylate (E_3).

E_3 was prepared by the interaction of carboxylic acid with Butanol by thionyl chloride. To ensure the achievement of the interaction, diffrent moles ratios were used. a pyridine use to dissolve carboxylic acid, moreover butanol drops were added and stirring the reaction for three hours until the dark nutty color appearance. After that, E3 was characterization by the melting point about **(135140- °C)** and monitoring the interaction by thin layer chromatography technique. The compound was characterized with infrared spectroscopy carbonyl esters where the value reached to **(1701Cm^{-1})**. [14].

The resulting compound yield (85%) was higher value compared with the others resulting compounds. Nuclear Magnetic Resonance Spectrometry **(^{1}H-NMR)** is a technique used to determine the physical and chemical properties of molecules. where signals of Esters appear at **(3.67 ppm)**.

E_3 Yield 85 %. FT-IR (D., cm^{-1}): 3312 (=CH-H), 1701.1 (C=O),. 'H NMR(DMSO-2.489 ppm): .1.201.25-8)H, m, 4CH2), 3.306) 3.36-H, m, 3CH2) 4.25 (1H, s, CH), 4.58 (1H, s, CH), 7.26 (1H, s, arH), 7.51 (1H, s, arH),

3.2 . Characterization Of hexyl 2- ethoxy -1- ((2'- (2- pentanoyl -2H- tetrazol -5- yl) - [1,1'-biphenyl] -4- yl) methyl) -1H- benzo [d]imidazole -7- carboxylate (E_2).

E_2 was prepared by the interaction of carboxylic acid with Haxanol by thionyl chloride. In this reaction, the solution was added to the beaker which contain the ice, in addition the dilute hydrochloric acid was added to beaker to crystallization the solution. crystallization materials was separated by filter paper. Where, the compound characterization determine by melting point was **(100110°-C)**. The color of product compound was light brown. Also, when use the infrared spectrum to compound characterization was observed disappearance of the peak of curve for carboxylic group. While, the ester carbonyl group appear and the value was **(1697.79 cm^{-1})**. Another characterization was by the **^{1}HNMR** spectrometer.

E_2 Yield 78 %. FT-IR (D., cm-1): 3312 (=CH-H), 1697.5 (C=O),. 'H NMR(DMSO2.489 ppm) .1.751.70-8)H, m, 4CH2), 3.346) 3.38-H, m, 3CH2) 4.28 (1H, s, CH), 4.57 (1H, s, CH), 7.26 (1H, s, arH), 7.60 (1H, s, arH),

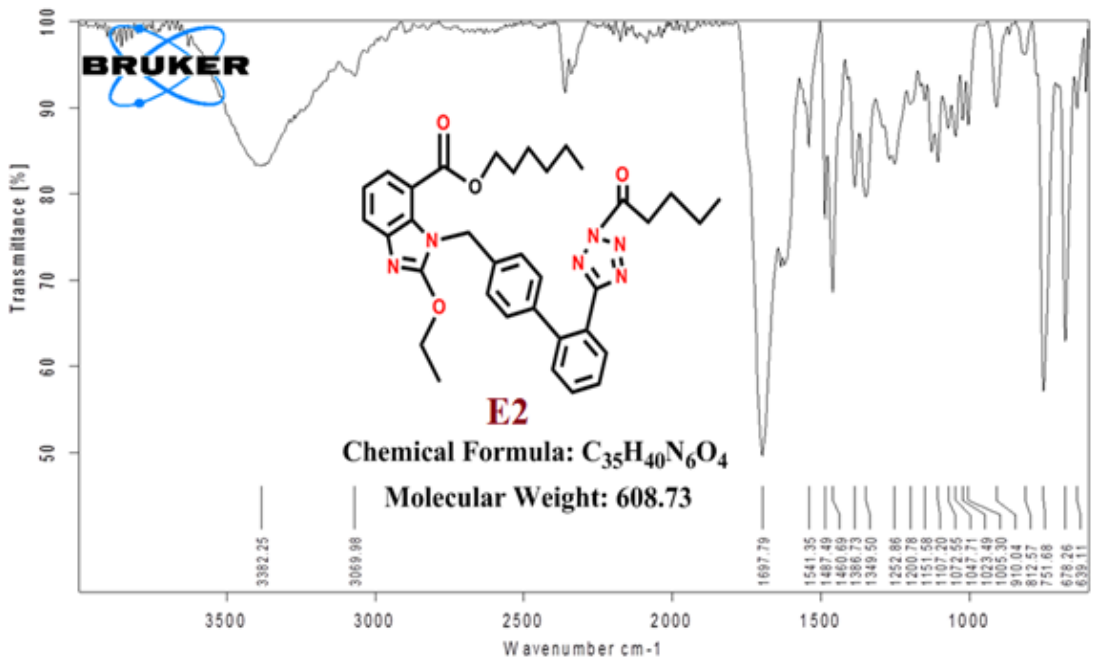

Figure .3.3 : FT-IR spectrum for compound E_2

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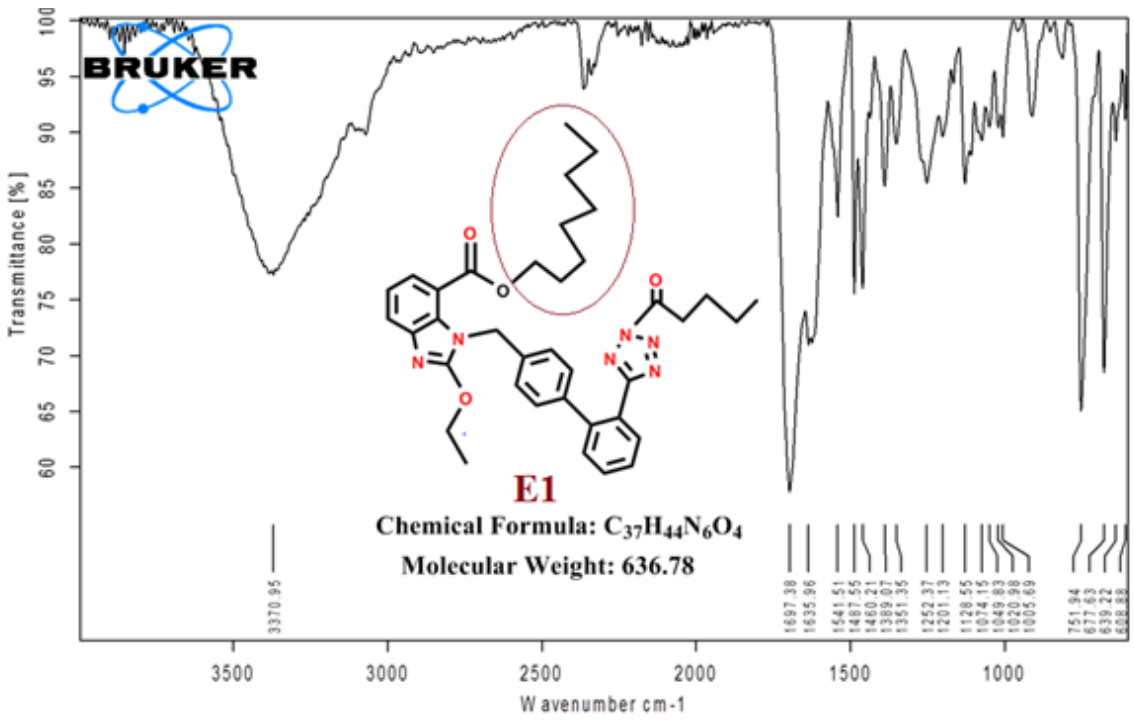

Figure .3.1 : FT-IR spectrum for compound E_1

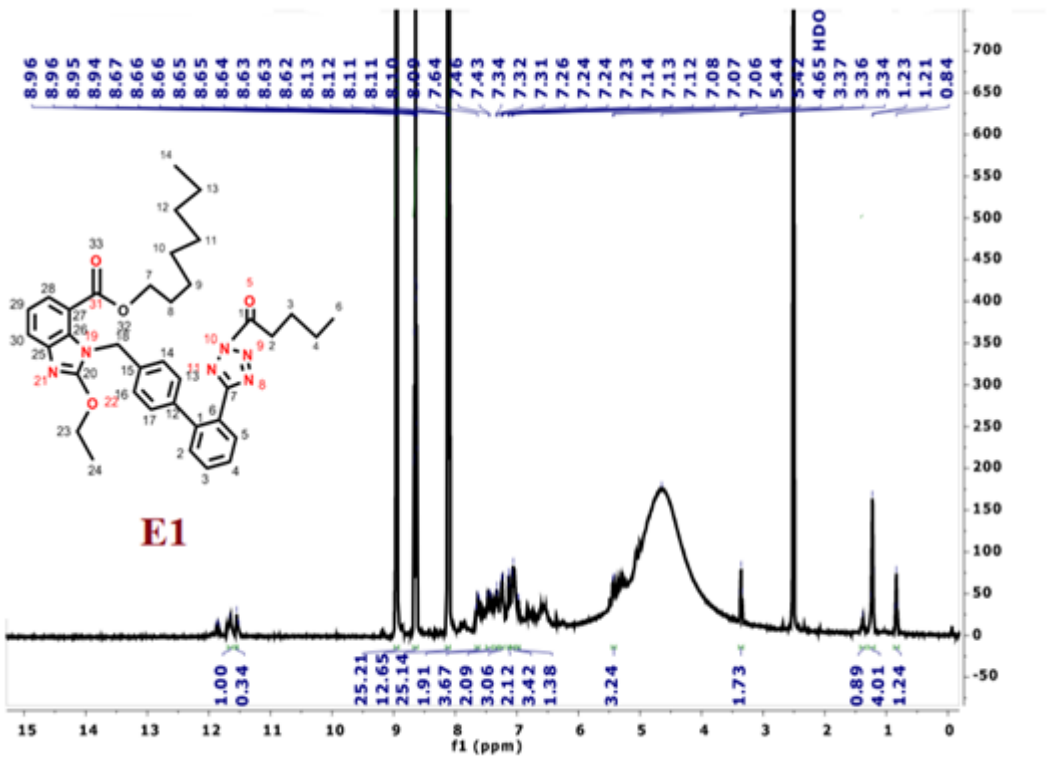

Figure .3.2: 1H-NMR spectrum for compound E_1

3. RESULT AND DISCUSION

3.1. Characterization Of octyl 2- ethoxy -1- ((2'- (2-pentanoyl -2H-tetrazol-5-yl) - [1,1'- biphenyl] -4- yl) methyl) -1H-benzo [d]imidazole -7- carboxylate (E1).

(E1) prepared by the interaction of carboxylic acid with octanol by thionyl chloride and the reaction is done by **(SN_2)** mechanism. **SN_2** is a common reaction mechanism. Where, one bond is cracked and one is formed simultaneously as shown in To ensure the achievement of the interaction, un-equivalent moles ratios were used[11]..

a pyridine use to dissolve carboxylic acid, moreover Octanol drops were added and stirring the reaction for two hours until the nutty color appearance. After that, **E1** was characterization by the melting point about **(120125°-C)** and monitoring the interaction by thin layer chromatography technique. The compound was characterized with infrared spectroscopy carbonyl esters where the value reached to **(1697.35)** [12]. .

Nuclear Magnetic Resonance Spectrometry **(^{1}HNMR)** is a technique used to determine the physical and chemical properties of molecules. where signals of Esters appear at **(3.67ppm)** [13].

E_1 Yield 80 %. FT-IR (D., cm^{-1}): 3137 (=CH-H), 1697 (C=O),. 'H NMR (DMSO-2.487 ppm): .1.738) 1.75-H, m, 4CH2), 3.336) 3.38-H, m, 3CH2) 4.25 (1H, s, CH), 4.58(1H, s, CH), 7.46 (1H, s, arH), , 7.64 (1H, s, arH), 10.08 (2H, s, 20H).

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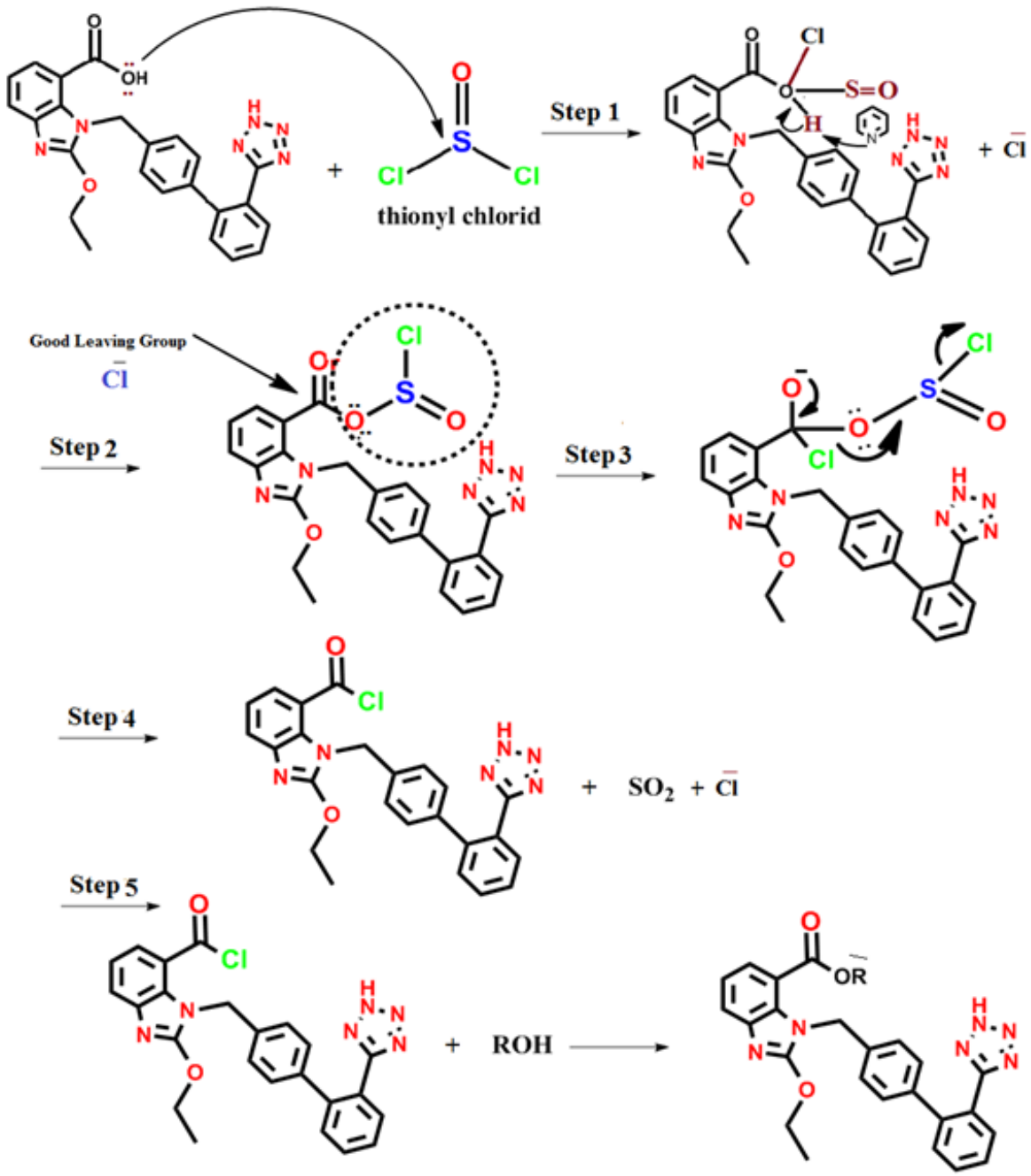

Figure .2.3 : Mechanism formation of all compounds[10].

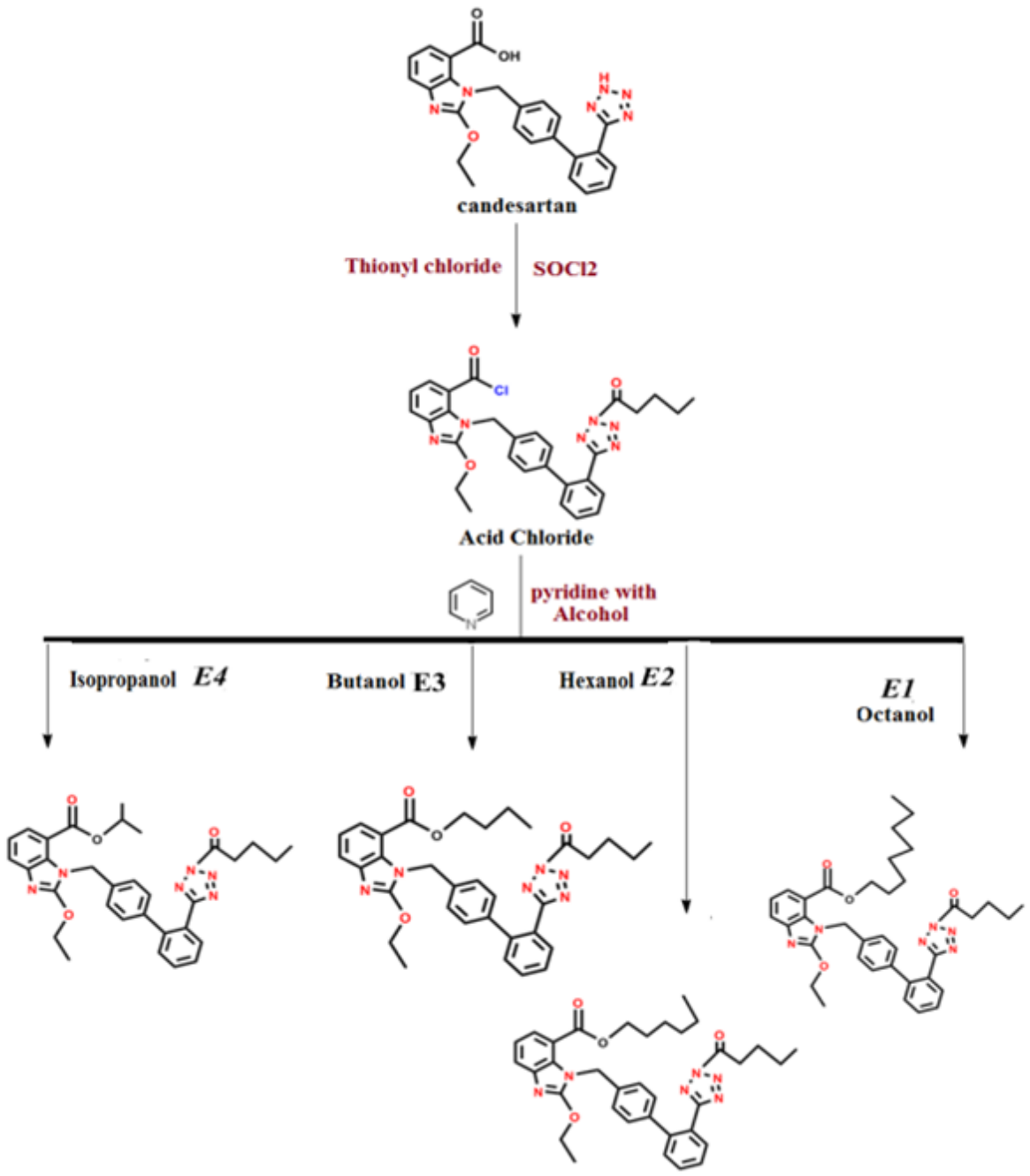

Figure . 2.2 : General Scheme for synthesis compounds (E1-E4)

precipitation was dissolved in 10 mL of thionyl chloride at **70 °C** at 2 hours by the reflex device. Under troubled pressure the distillation was used to remove the solvent. The remainder of the sample was withdrawn by the pipette and placed in a closed glass tube until it was used.Thus, we were able to prepare acid chloride, the chloride is a good leaving group.

2.3. General Method For Synthesis Compounds(E3,E4)

E3,E4 was Synthesized According to the method :Reaction of Acid chloride with Alcohols.In the other side, dissolve **(0.3 g.0.0005mole)** of chloride acid in 1.5 ml of pyridine. The solution was placed in round to stir about 90 minutes at **25 °C. 0.06 g** of Alcohols was added in the drops form. The analytical data for compounds is summarized as below.

Compd.No	M.p. ° C	Mol.Formula	Yield%	Color	Solubility
E1	100-110 C °	636.78	80%	White	DMSO
E2	120-125 ° C	608.73	78%	Yellow	DMSO
E3	135-140 ° C	580.68	85%	Yellow	DMSO
E4	175-180 ° C	566.65	75%	Blue	DMSO

Table 2.1: physical and analytical data for compounds E1-E4.

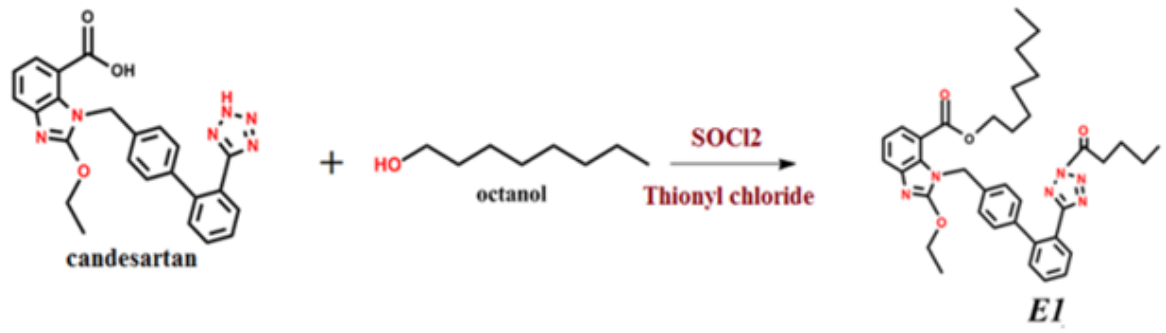

Figure .2.1 : Chemical equation for synthesis compound E1

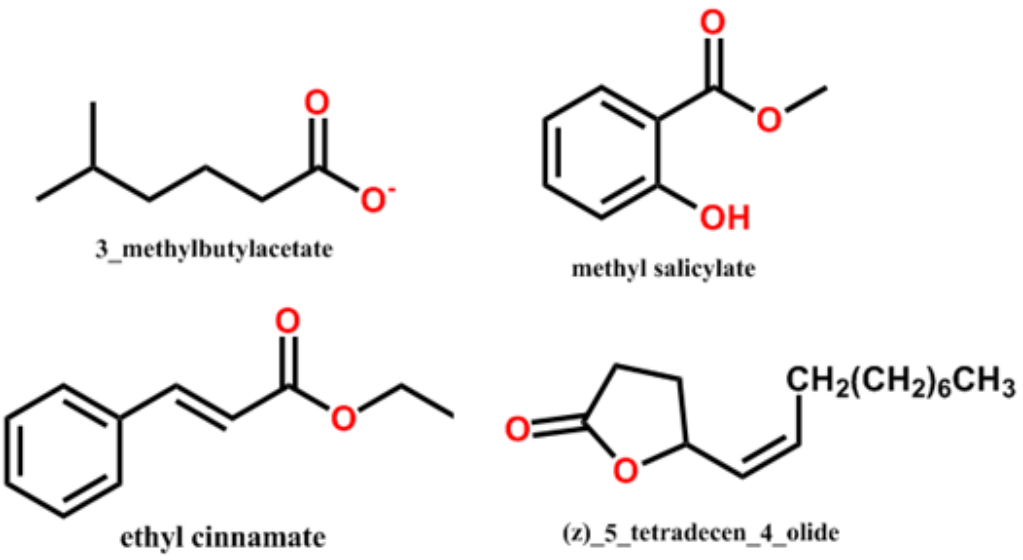

Figure .1.2 examples on natural esters [9].

2. Experimental part :

2.1 Instrumentals

The interactions were monitored by a thin layer chromatography (**TLC**), all fusion points were not corrected, and were identified by a fusion point device. Infrared spectra were determined using a BRUKER device. The **^{1}H-NMR** spectra using **brucker** proton 1 H NMR-Avance **400 (400 MHz)** was performed in DMSO-d6 as a solvent using tetra methyl silane (**TMS**) as an internal standard.

2.2. General Method For Synthesis Compounds (E1,E2)

E1,E2 was Synthesized According to the method **(1 g ,0.002mole)** of 2-ethoxy -3- [[4- [2-(2H - tetrazo l-5 yl) phenyl] phenyl] methyl] benzimidazole -4- carboxylic acid (Can). was dissolved in **5 ml** of Pyridine. The dissolved solution was then mixed with **(0.48g,0.004mole)** of pentanoyl chloride to protect the tetrazole ring from dissolution. The reaction was leave about two hours by stirring at room temperature. The mixture was then placed in Beaker and the reaction was cooled at a temperature of **(04- ° C)** .The diluted hydrochloric acid was added to increase the precipitation. The filtration process was then initiated to achieve the precipitation. **(0.65g,0.001mole)** of

Introduction

1.1. Candesartan

Chemically, Candesartan is 2-ethoxy -3-[[4-[2- (2H-tetrazol-5 yl) phenyl] phenyl] methyl] benzimidazole-4-carboxylic acid[1].

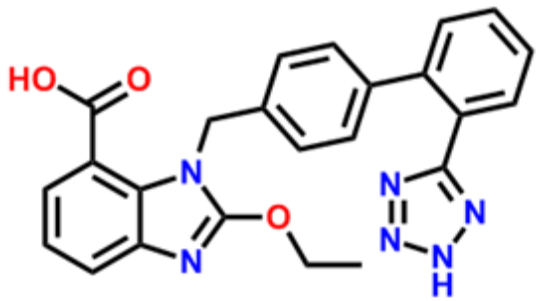

Figure 1.1. candesartan chemical structure[2]

Candesartan is categorized as a type 1 antagonist of the angiotensin **II** receptor. Angiotensin **II** type 1 receptor antagonists are commonly used in treating illnesses such as diabetic nephropathy, high blood pressure, myocardial infarction and heart failure[3]..

1.2. Esters

Esters contain dipoles of carbonyl (C = O) and ether (O-C) resulted from the covalent bonding of electronically neutral carbon atoms with electronegative oxygen atoms. This is the stronger of the two dipole due to the carbonyl (C= O) bonding arrangement [4]. The existence of these dipoles makes it possible for esters to act as acceptors of hydrogen bonds [5].

1.3. Esters as antioxidants

Esters can be used as food additives, preservative and flavoring agents. Easters containing phenolic functional groups may exhibit antioxidant activity. These antioxidants not only have a wide range of uses as food preservative, but also are used in cosmetics, pharmaceuticals and industrial products. Examples of such antioxidants are Octyl, Dodecyl, Tetradecyl, Hexadecyl, and Octadecyl gallates [7, 8].].The antioxidant activity of phenolic acids alkyl esters also shows high levels of potency [9].

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Synthesis and Characterization of Medicinal Compounds of Esters and the Study of Industrial Application

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Abstract :

The research includes the preparation of the new non-prepared medical esters, and the interaction was followed by thin layer chromatography technique (TLC), which was diagnosed by measuring the degree of fusion and the spectrum of infrared (FT_IR) and the spectrum of magnetic resonance (1HNMR). Preparation of compound (E1) octyl 2-ethoxy-1-((2'-(2-pentanoyl-2H-tetrazol-5-yl)-[1,1'-biphenyl]-4-yl)methyl)-1H-benzo[d]imidazole-7-carboxylate. Preparation of compound (E2) hexyl 2-ethoxy-1-((2'-(2-pentanoyl-2H-tetrazol-5-yl)-[1,1'-biphenyl]-4-yl) methyl)-1H-benzo[d]imidazole-7-carboxylate. Preparation of compound (E3) butyl 2-ethoxy-1-((2'-(2-pentanoyl-2H-tetrazol-5-yl)-[1,1'-biphenyl]-4-yl)methyl)-1H-benzo[d]imidazole-7-carboxylate. Preparation of compound (E4) isopropyl 2-ethoxy-1-((2'-(2-pentanoyl-2H-tetrazol-5-yl)-[1,1'-biphenyl]-4-yl)methyl)-1H-benzo[d]imidazole-7-carboxylate .

Key words: Candesartan, Organic synthesis, FTIR,1 HNMR , Thionyl chloride, Esters.

تحضير وتشخيص المركبات الطبية للاسترات ودراسة تطبيقاتها الصناعية

عبد الرحمن خالد مصدف , طارق عبد الجليل منديل
*جامعة الانبار / كلية العلوم

خلاصة :

يتضمن البحث تحضير عدد من الأسترات الدوائية الجديدة غير المحضرة سابقا وتم متابعه سير التفاعل باستعمال (TLC) وتم تشخيصها بواسطه قياس درجات الانصهار وقياس طيف الأشعة تحت الحمراء FTIR وطيف الرنين النووي المغناطيسي ^{1}HNMR و جاءت النتائج العملية متطابقة مع الافتراضات النظرية إلى حد كبير جداً .