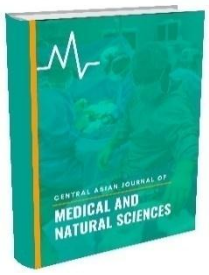
CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES



Volume: 04 Issue: 05 | Sep-Oct 2023 ISSN: 2660-4159

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Synthesis, Identification, and Antibacterial Effect Assessment of Some New Pyrazoline and 4,5-Dihydroisoxazole Compounds Derived from Substituted Dicinnamyle Acetone

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Received 2nd Aug 2023,
Accepted 19th Aug 2023,
Online 26th Sep 2023

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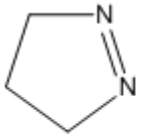
Abstract: A number of novel heterocyclic compounds were prepared, specifically pyrazoline compounds (A_{1-5}), 4,5-dihydroisoxazole compounds (B_{1-5}), derived from 1,9-Diphenyl-1,3,6,8-nonatetraen-5-one and its substitutes. These compounds have important uses in the fields of organic, medical and pharmaceutical chemistry. The prepared compounds were characterized using (FT-IR), (^{1}H-NMR), (^{13}C-NMR) techniques. Antibacterial activities of these compounds were proven against (*Escherichia coli*) and (*staphylococcus*) results were compared with ciprofloxacin, levofloxacin, and gentamicin.

Key words: dicinnamylidene acetone, pyrazoline, isoxazoline, 4,5-dihydroisoxazole, Escherichia coli, staphylococcus.

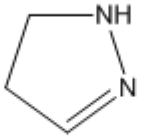
Introduction

Pyrazoline is a five-membered heterocyclic compound with two coupled nitrogen atoms within the ring [1]. that possess wide biological activity and are included in the design of many drugs [1] . N-N bond in pyrazoline is the key factor in their biological activities. Living organisms cannot establish these bonds easily [2], therefore N-N bonds not available widely in nature (Ahmad et al., 2016). Pyrazoline compounds have a variety of biological activities such as antibacterial [3], antifungal [4] , antiviral [1] , analgesic, antidepressant [5], anti-inflammatory [6] and antitumor activities [7].

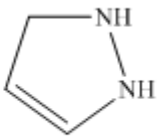
Pyrozoline compounds are classified depending on the site of the endocyclic double bond to three types; 1-pyrazoline, 2-pyrazoline, and 3-pyrazoline [8].



4,5-dihydro-3*H*-pyrazole



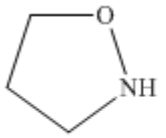
4,5-dihydro-1*H*-pyrazole



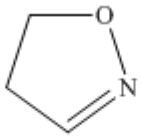
2,3-dihydro-1*H*-pyrazole

4,5-dihydroisoxazole are important class of five membered heterocyclic compounds that containing oxygen and nitrogen [9]. The weak nitrogen-oxygen bond in the isoxazoline ring allows the ring to dissociate easily [10], thus, isoxazoline are valuable intermediates in numerous synthetic methods, Therefore, chemists were interested in synthesis this type of compound for the development of medicines and medical treatments [11].

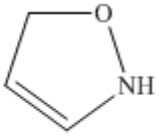
Isoxazoline can be derived from cyclisation of a nitrileoxidewith with dipolarophilein in 1,3-dipolarcycloaddition reaction [12].



isoxazolidine



4,5-dihydroisoxazole



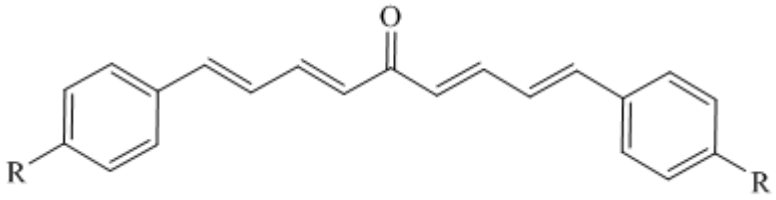
2,5-dihydroisoxazole

Experimental

Synthesis of 1,9-diphenyl-1,3,6,8-nonatetraen-5-one derivatives:

(0.005mol, 0.65 g) of Cinnamaldehyde and its derivatives were reacted with acetone using (0.0025) mol in an alkaline medium by placing drops of sodium hydroxide at a concentration of 10% at room temperature. Obtained compounds was filtered and recrystallized from ethanol. The precipitate was dried and recrystallized with absolute ethanol. The reaction process was followed by thin layer chromatography (TLC) at a ratio of (4 - 1) (ethanol - benzene) [12].

Table 1: Physical properties of the compounds (A_{1-5})

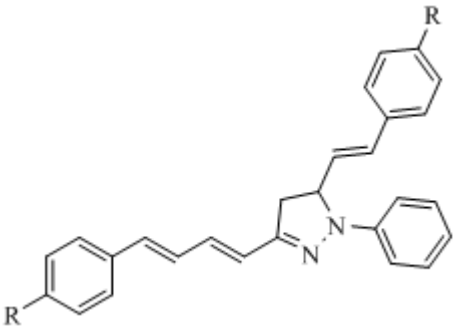


Com. No.	R	M. F	M. Wt. g/mole	Colour	M. P.°C	Yield %
A_1	H	$C_{21}H_{18}O$	286.36	Yellow	104-107	72
A_2	Cl	$C_{21}H_{16}Cl_2O$	355.25	Yellow	123-125	60
A_3	Br	$C_{21}H_{16}Br_2O$	444.16	Yellow	138-140	56
A_4	CH_3	$C_{23}H_{22}O$	314.42	Yellow	112-125	75
A_5	OCH_3	$C_{23}H_{22}O_3$	346.42	Yellow	117-120	78

Synthesis of pyrozoline derivatives (Z_{1-5}):

Pyrazoline derivatives was synthesized through cyclization reaction of Phenyl hydrazine (Ph-NH_2NH_2) (0.002 mol) with previously prepared dicinnamylidene- acetone derivatives (A1-A5) (0.005 mol) in acidic media hated at refluxed for 8 hr then poured onto crushed ice. The precipitate was dried and recrystallized with absolute ethanol. The reaction process was followed by thin layer chromatography (TLC) at a ratio of (4 - 1) (ethanol - benzene). Table (2) shows Physical properties of the compounds (Z_{1-5})

Table 2: Physical properties of the compounds (Z_{1-5})

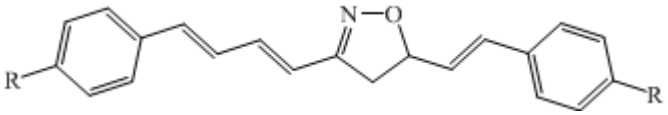


Com. No.	R	M.F	M. Wt. g/mole	M. P. °C	Colour	Yield %
Z_1	H	$C_{27}H_{30}N_2$	382.54	166-168	Olive	63
Z_2	Cl	$C_{27}H_{28}Cl_2N_2$	451	180-183	Yellow	71
Z_3	Br	$C_{27}H_{28}Br_2N_2$	540.4	186-189	Yellow	59
Z_4	CH_3	$C_{29}H_{34}N_2$	410	152-154	Green	55
Z_5	OCH_3	$C_{29}H_{34}N_2O_2$	442.6	188-190	Orange	76

Synthesis of 4,5-dihydroisoxazole derivatives (B_{1-5}):

(0.005 mole) of dicinnamylidene-acetone and its substitutes were mixed with (0.0048 mole) of hydroxylamine, and the components of the mixture were dissolved in (30 ml) of absolute ethanol, (10 ml) of acetic acid with a concentration of (10%). The reaction was carried out by sublimation at a temperature of (85-80 °C) and refluxed for (5 hours). The precipitate was dried and recrystallized with absolute ethanol. The reaction process was followed by thin layer chromatography (TLC) at a ratio of (4 - 1) (ethanol - benzene) [12]. Table (3) shows Physical properties of the compounds (B_{1-5}).

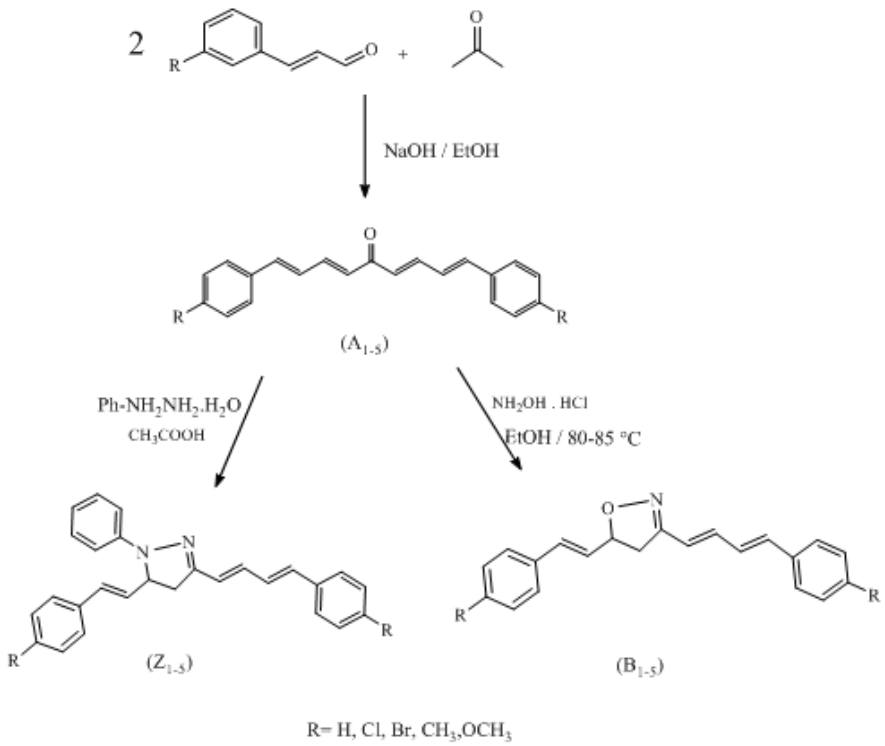
Table 3: Physical properties of the compounds (B_{1-5}).



Com. No.	R	M.F	M. Wt g/mole	Colour	M. P.°C	Yield %
B_1	H	$C_{21}H_{19}NO$	301.38	Yellow	144-146	78
B_2	4-Cl	$C_{21}H_{17}C_{l2}NO$	370.28	Red	152-255	67
B_3	4-Br	$C_{21}H_{17}Br_2NO$	459	Orange	173-175	81
B_4	4-CH_3	$C_{23}H_{23}NO$	329.4	Olive	147-150	75
B_5	4-OCH_3	$C_{23}H_{23}NO_3$	361.4	Yellow	179-181	84

Result and Discussion

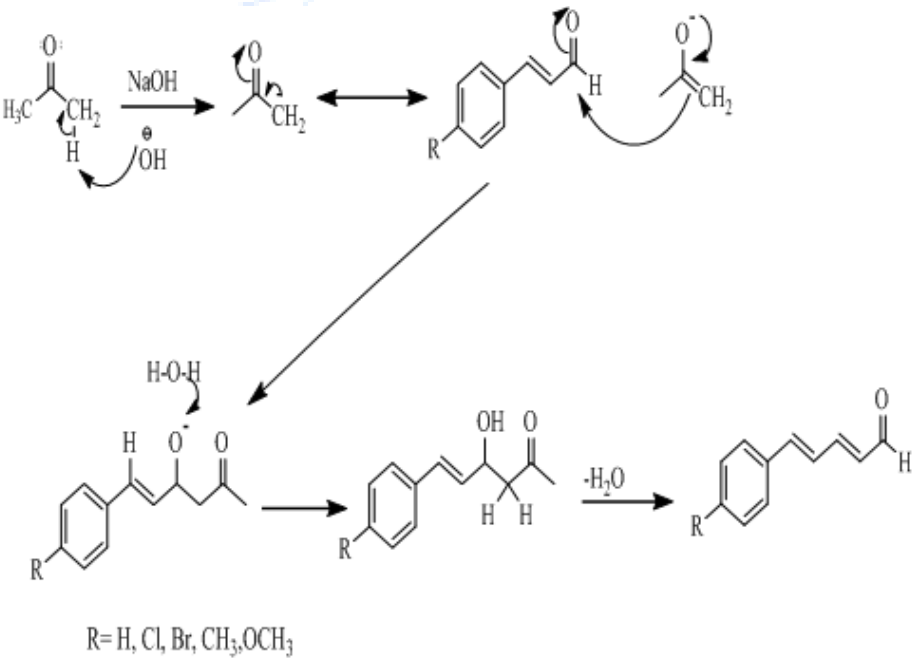
dicinnamylidene acetone and substituted dicinnamylidene acetone were prepared by Claisen -Schmidt condensation using %10 NaOH. pyrazoline, and 4,5-dihydroisoxazole were prepared by cyclization reaction of dicinnamylidene acetone and its substituted with phenyl hydrazine and hydroxylamine respectively. These compounds were fully characterized using FT-IR, ^{1}H-NMR, and ^{13}C-NMR. Antibacterial activity was tested using (Mueller-Hinton) method.



Scheme 1: Synthesis of compounds (A_{1-5}), (B_{1-5}) and (Z_{1-5})

Preparation of dicinnamylidineacetone compounds (A_{1-5}):

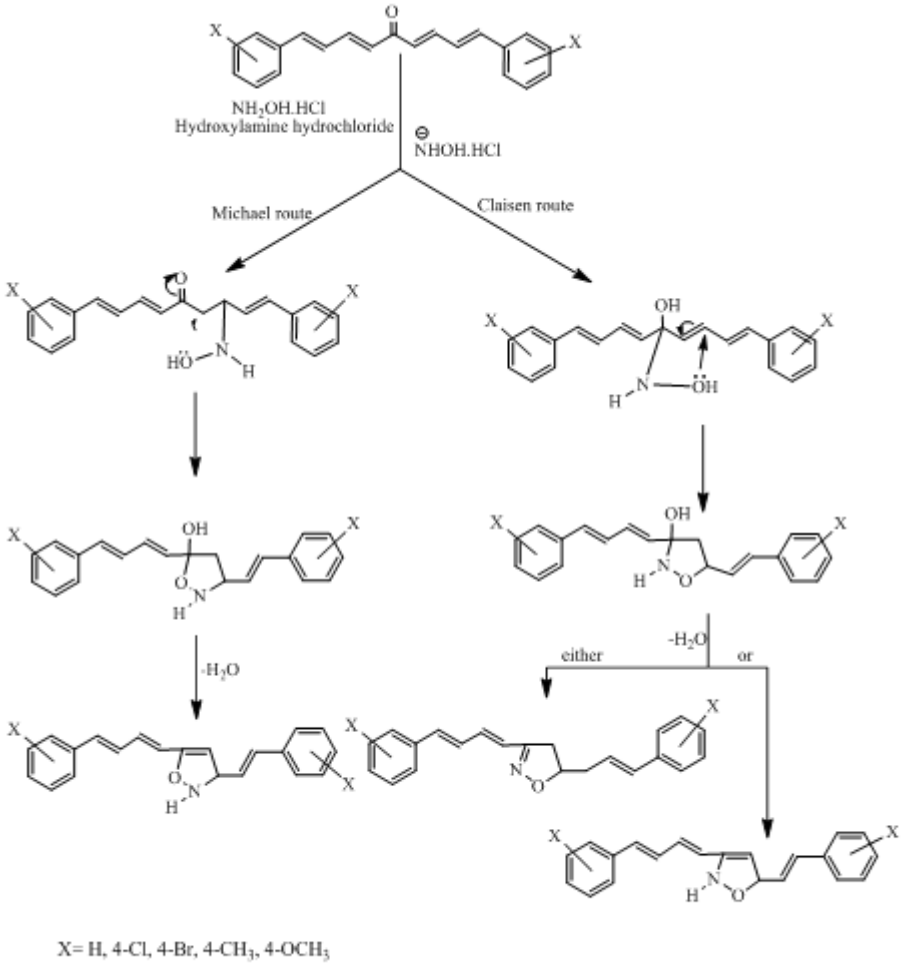
Substituted cinnamaldehyde were reacted with acetone using Claisen-Shmidt condensation methodology in the presence of % 10 sodium hydroxide. This reaction gave rise to the compounds (A_{1-5}) [13].



Scheme 2: Synthesis of dicinnamaylidine-acetone derivatives (A_{1-5}).

Synthesis of 4,5-dihydroisoxazole compounds (B_{1-5})

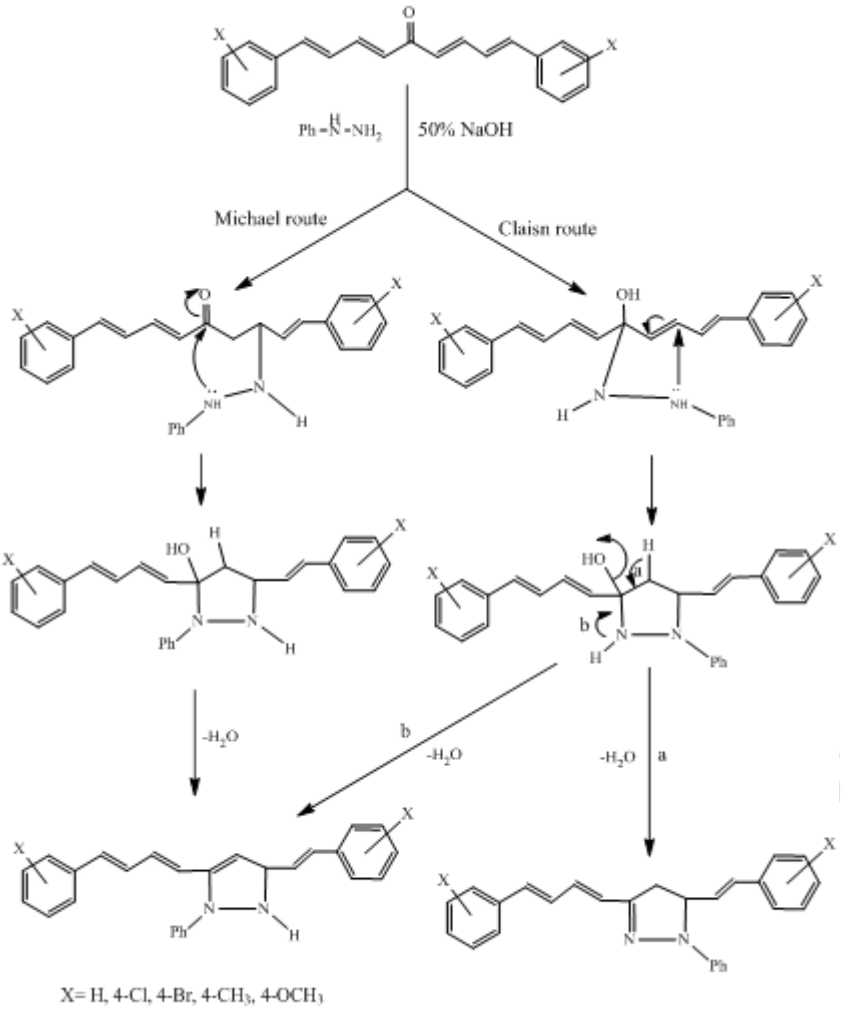
Substituted 1,9-Diphenyl-1,3,6,8-nonatetraen-5-one were reacted with phenyl hydrazine give rise to the required products (B_{1-5}) this was similar to the work of [14]. And according to the mechanics below:



Scheme 3: Mechanism of synthesis of 4,5-dihydroisoxazole compounds (B_{1-5})

Synthesis of pyrozoline compounds (Z_{1-5})

Hydrazine or phenyl hydrazine were reacted with dicinnamaylidene-acetone and its substituted give rise to the required products (Z_{1-5}).



Scheme 4: Mechanism of synthesis of pyrozoline compounds (Z_{1-5})

FT-IR data of compounds (B_{1-5}), (Z_{1-5}).

Table 4: FT-IR spectra data for (B_{1-5}) and (Z_{1-5}).

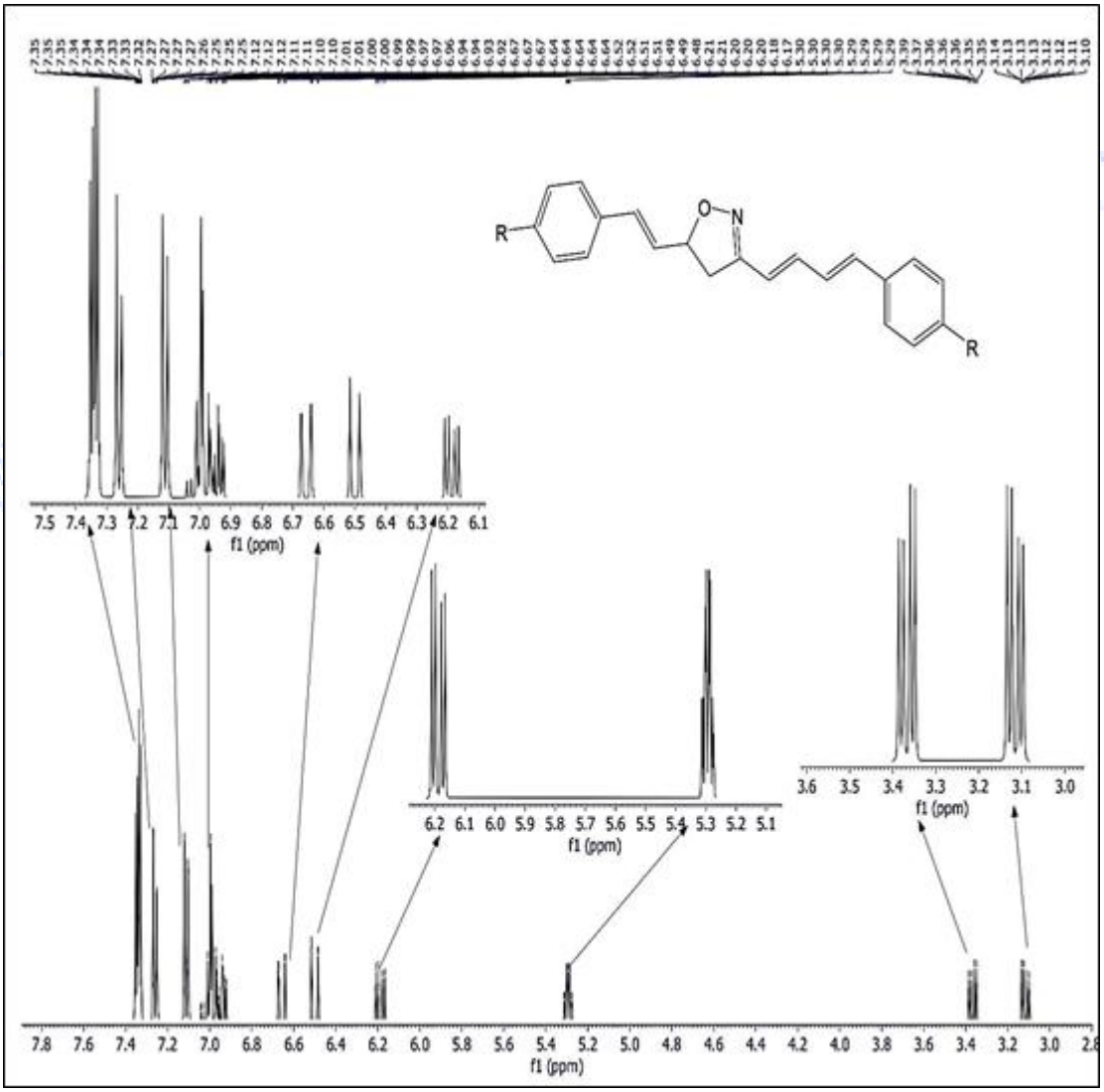
Comp. No.	R	IR (KBr) cm^{-1}					
		υ (C-H) Arom.	υ (N-H)	υ (C=N)	υ (C=C) Arom. Sym., Asy.	υ (C-N)	Others
B2	Cl	3010, 2864	3280	1632	1534 1586	1264	υ (C-Cl) 754
B3	Br	3044	3277	1628	1532 1576	1229	υ (C-Br) 967
B4	OCH_3	3027	3292	1629	1552 1594	1265	υ (OCH_3) Sym.(1314) Asy.(1478)
B5	CH_3	3010	3278	1625	1567 1594	1242	υ (CH_3) Sym.(1321) Asy.(1492)
Z2	Cl	3068	3412	1620	1536 1622	3213	υ (C-Cl) 831

Z3	Br	3071	3246	1629	1524 1586	1255	υ (C- Br) 829
Z4	OCH_3	3038	3217	1624	1544 1733	1267	υ (OCH_3) Sym.(1322) Asy.(1564) υ (C-Cl) 820
Z5	CH_3	3044	3235	1633	1543 1632	1262	υ (CH_3) Sym.(1313) Asy.(1488) υ (C-Cl) 831

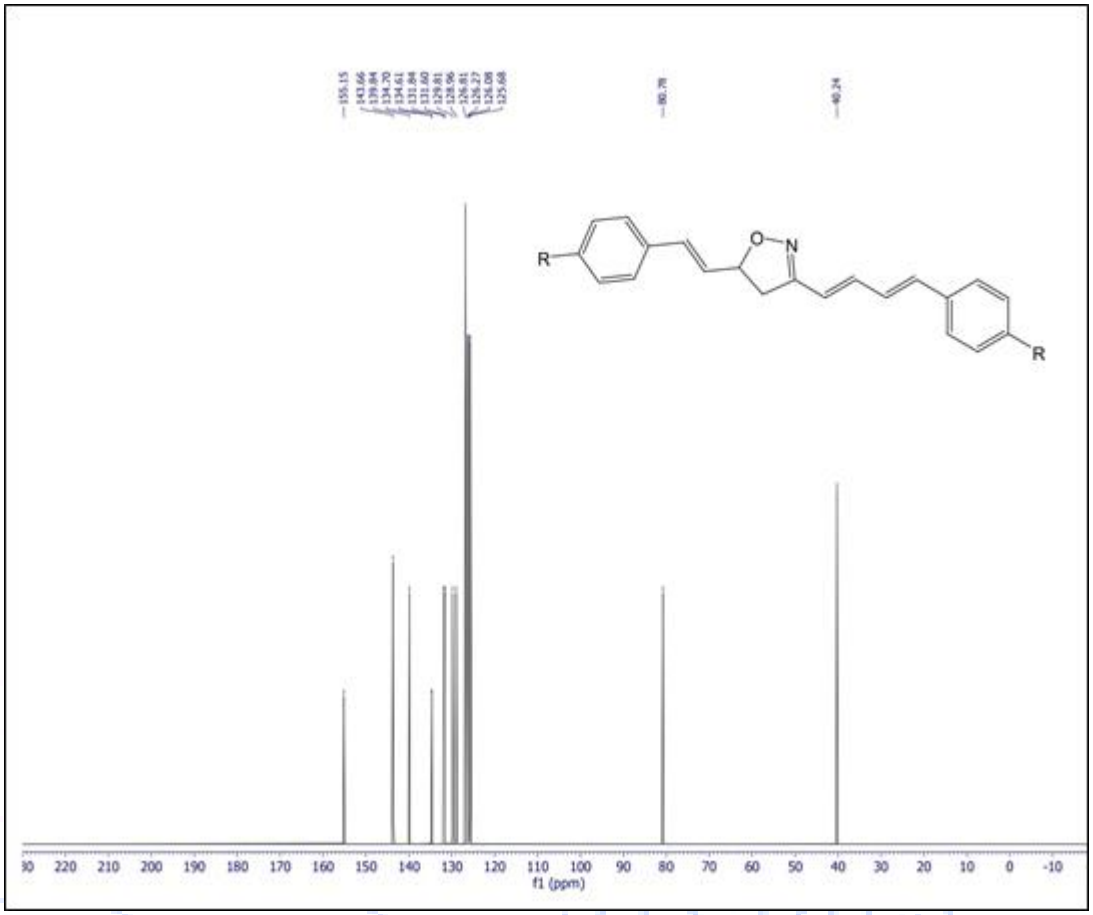
^{1}H-NMR, ^{13}C-NMR spectrum of prepared compounds.

B1:

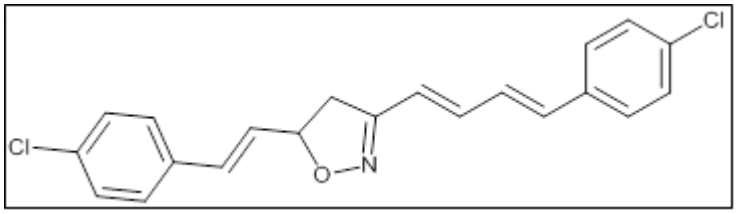
^{1}H-NMR



^{13}C-NMR



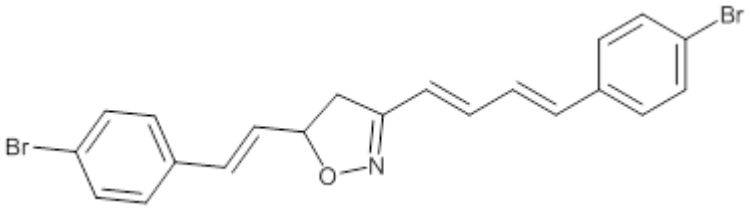
B2:



^{1}H NMR: δ 2.99-3.14 (2H, 3.06 (dd, *J* = 12.0, 6.8 Hz), 3.07 (dd, *J* = 12.0, 7.9 Hz)), 5.65 (1H, ddd, *J* = 7.9, 6.8, 3.9 Hz), 6.12 (1H, d, *J* = 15.9 Hz), 6.30-6.57 (2H, 6.38 (dd, *J* = 17.5, 3.9 Hz), 6.50 (d, *J* = 17.5 Hz)), 6.73-7.10 (3H, 6.82 (dd, *J* = 17.7, 10.1 Hz), 6.92 (dd, *J* = 15.9, 10.1 Hz), 7.02 (d, *J* = 17.7 Hz)), 7.22-7.55 (8H, 7.28 (ddd, *J* = 8.0, 1.7, 0.5 Hz), 7.40 (ddd, *J* = 8.2, 1.4, 0.5 Hz), 7.45 (ddd, *J* = 8.0, 1.5, 0.5 Hz), 7.49 (ddd, *J* = 8.2, 1.2, 0.5 Hz)).

^{13}C NMR: δ 41.8 (1C, s), 73.9 (1C, s), 116.8 (1C, s), 126.9 (1C, s), 128.0 (1C, s), 128.6-128.8 (4C, 128.7 (s), 128.7 (s)), 129.8-130.0 (4C, 129.9 (s), 129.9 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 131.9 (1C, s), 132.4 (1C, s), 133.6-133.8 (2C, 133.7 (s), 133.7 (s)), 141.3 (1C, s), 151.7 (1C, s).

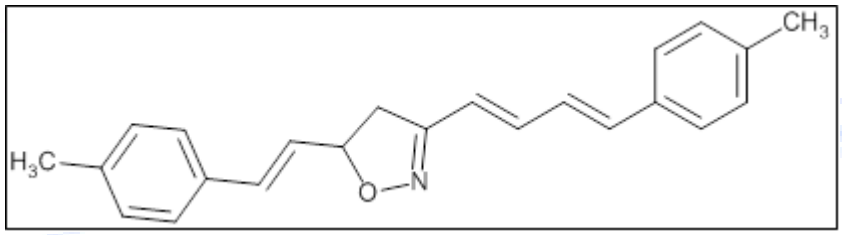
B3:



^{1}H NMR: δ 3.00-3.17 (2H, 3.07 (dd, *J* = 12.0, 7.9 Hz), 3.10 (dd, *J* = 12.0, 6.8 Hz)), 5.64 (1H, ddd, *J* = 7.9, 6.8, 3.9 Hz), 6.07 (1H, d, *J* = 15.9 Hz), 6.32 (1H, dd, *J* = 17.5, 3.9 Hz), 6.47 (1H, d, *J* = 17.5 Hz), 6.66-7.08 (3H, 6.75 (dd, *J* = 17.7, 10.1 Hz), 6.90 (dd, *J* = 15.9, 10.1 Hz), 7.01 (d, *J* = 17.7 Hz)), 7.20-7.45 (8H, 7.26 (ddd, *J* = 8.0, 1.6, 0.5 Hz), 7.35 (ddd, *J* = 8.0, 1.6, 0.5 Hz), 7.38 (ddd, *J* = 8.0, 1.4, 0.5 Hz), 7.39 (ddd, *J* = 8.0, 1.3, 0.5 Hz)).

^{13}C NMR: δ 41.8 (1C, s), 73.9 (1C, s), 116.8 (1C, s), 122.3-122.3 (2C, 122.3 (s), 122.3 (s)), 126.9 (1C, s), 127.8-127.9 (4C, 127.9 (s), 127.9 (s)), 128.0 (1C, s), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 131.6-131.8 (4C, 131.7 (s), 131.7 (s)), 131.9 (1C, s), 132.4 (1C, s), 141.3 (1C, s), 151.7 (1C, s).

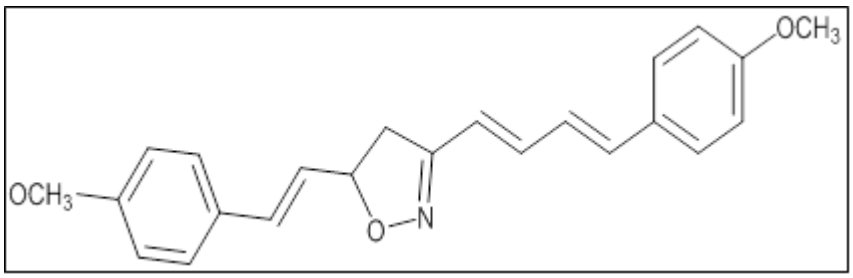
B4:



^{1}H NMR: δ 2.14 (3H, s), 2.27 (3H, s), 3.00-3.15 (2H, 3.07 (dd, *J* = 12.0, 7.9 Hz), 3.08 (dd, *J* = 12.0, 6.8 Hz)), 5.66 (1H, ddd, *J* = 7.9, 6.8, 3.9 Hz), 6.14 (1H, d, *J* = 15.9 Hz), 6.28-6.56 (2H, 6.35 (dd, *J* = 17.4, 3.9 Hz), 6.49 (d, *J* = 17.4 Hz)), 6.76-7.33 (9H, 6.84 (dd, *J* = 17.8, 10.1 Hz), 6.94 (dd, *J* = 15.9, 10.1 Hz), 7.03 (d, *J* = 17.8 Hz), 7.16 (ddd, *J* = 7.9, 1.6, 0.4 Hz), 7.19 (ddd, *J* = 8.0, 1.3, 0.4 Hz), 7.27 (ddd, *J* = 7.9, 1.8, 0.4 Hz)), 7.48 (2H, ddd, *J* = 8.0, 1.6, 0.4 Hz).

^{13}C NMR: δ 21.3-21.4 (2C, 21.3 (s), 21.3 (s)), 41.8 (1C, s), 73.9 (1C, s), 116.8 (1C, s), 126.8-127.0 (5C, 126.9 (s), 126.9 (s), 126.9 (s)), 128.0 (1C, s), 129.0-129.2 (4C, 129.1 (s), 129.1 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 131.9 (1C, s), 132.4 (1C, s), 141.3 (1C, s), 141.4-141.6 (2C, 141.5 (s), 141.5 (s)), 151.7 (1C, s).

B5:

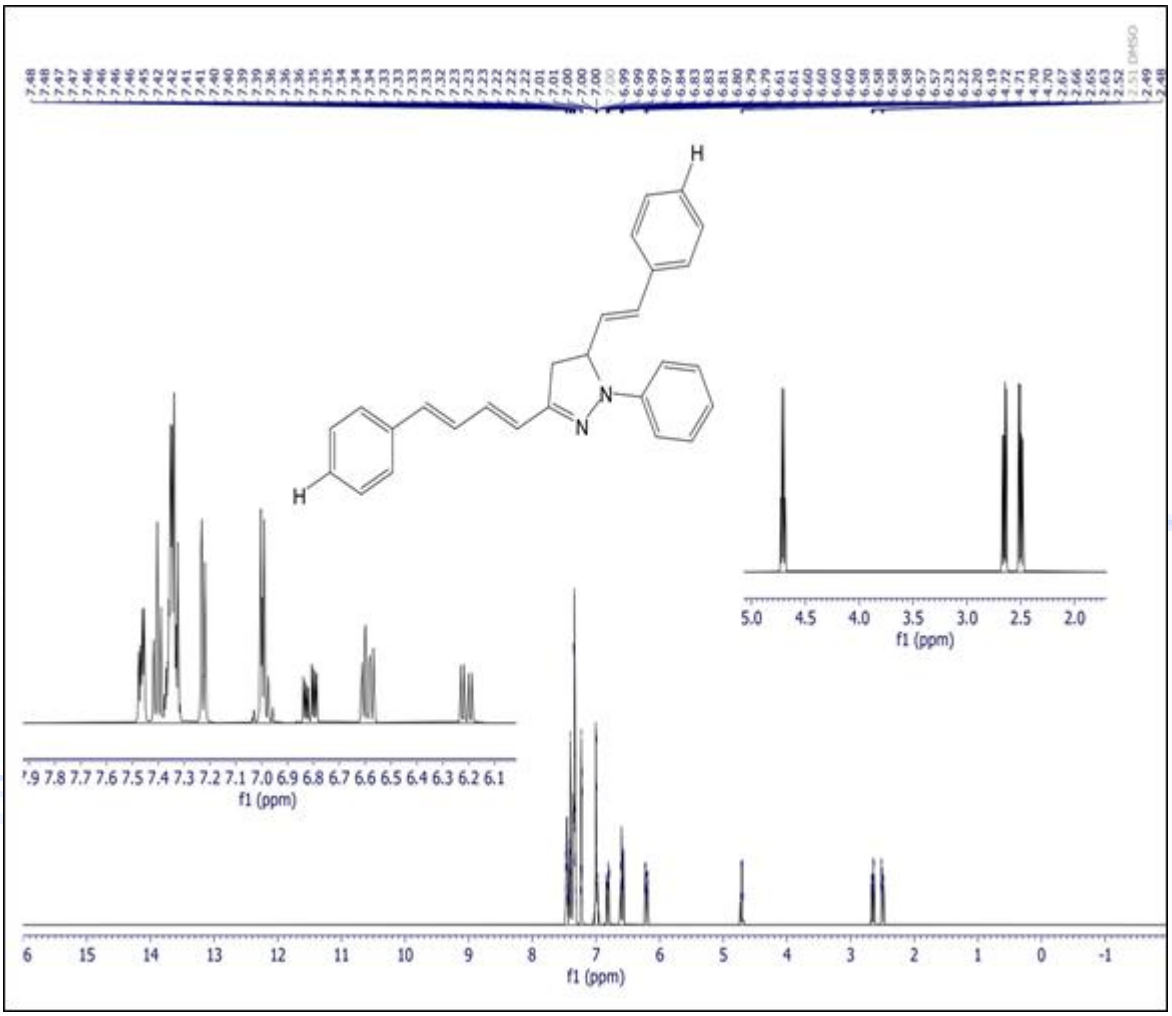


^{1}H NMR: δ 2.90 (1H, dd, *J* = 14.4, 7.9 Hz), 3.06 (1H, dd, *J* = 14.4, 6.8 Hz), 3.73-3.86 (6H, 3.78 (s), 3.81 (s)), 5.61 (1H, ddd, *J* = 7.9, 6.8, 3.8 Hz), 5.99 (1H, d, *J* = 15.9 Hz), 6.28 (1H, dd, *J* = 17.4, 3.8 Hz), 6.45 (1H, d, *J* = 17.4 Hz), 6.71 (1H, dd, *J* = 17.6, 10.1 Hz), 6.79-7.06 (4H, 6.86 (ddd, *J* = 8.8, 2.5, 0.5 Hz), 6.89 (dd, *J* = 15.9, 10.1 Hz), 6.99 (d, *J* = 17.6 Hz)), 7.10-7.46 (6H, 7.16 (ddd, *J* = 8.8, 1.2, 0.5 Hz), 7.28 (ddd, *J* = 8.8, 1.9, 0.5 Hz), 7.40 (ddd, *J* = 8.8, 1.8, 0.5 Hz)).

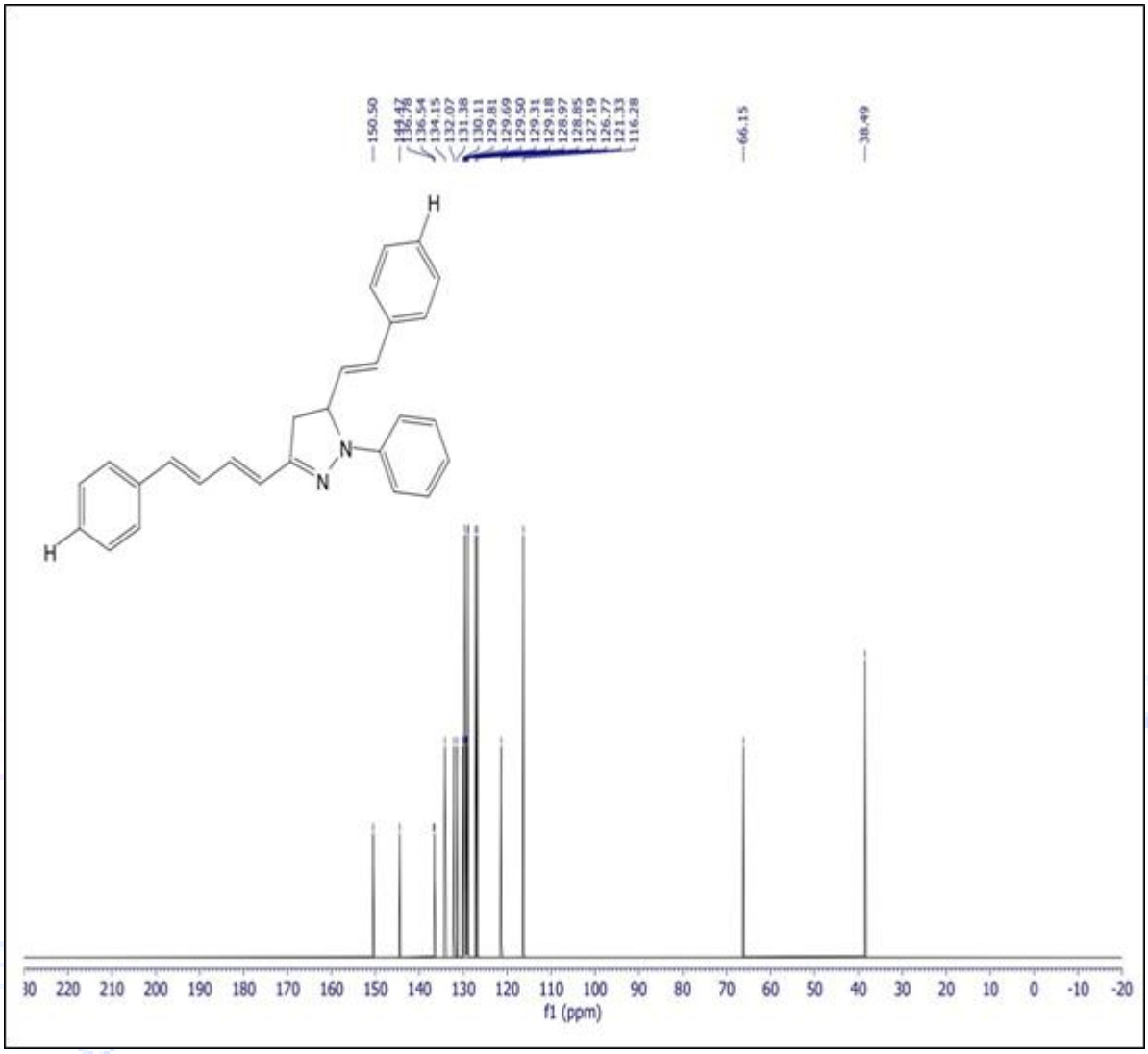
^{13}C NMR: δ 41.8 (1C, s), 56.0-56.0 (2C, 56.0 (s), 56.0 (s)), 73.9 (1C, s), 114.3-114.3 (4C, 114.3 (s), 114.3 (s)), 116.8 (1C, s), 126.9 (1C, s), 128.0 (1C, s), 128.6-128.8 (4C, 128.7 (s), 128.7 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 131.9 (1C, s), 132.4 (1C, s), 141.3 (1C, s), 151.7 (1C, s), 159.8-159.9 (2C, 159.8 (s), 159.8 (s)).

Z1:

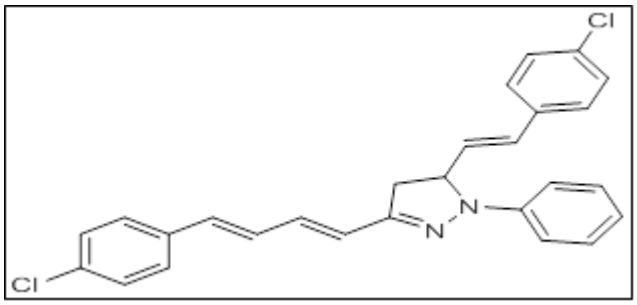
^{1}H-NMR



^{13}C-NMR



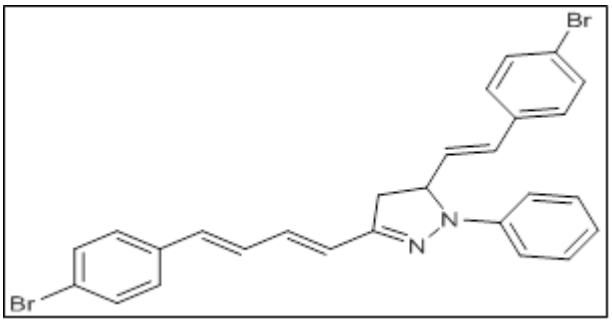
Z2:



^{1}H NMR: δ 3.08 (1H, dd, *J* = 11.4, 4.3 Hz), 3.35 (1H, dd, *J* = 11.4, 8.1 Hz), 5.06 (1H, ddd, *J* = 8.1, 4.3, 3.8 Hz), 6.00 (1H, d, *J* = 15.8 Hz), 6.42-6.66 (3H, 6.49 (dd, *J* = 17.0, 3.8 Hz), 6.53 (d, *J* = 17.0 Hz), 6.58 (dd, *J* = 15.8, 10.1 Hz)), 6.68-6.84 (2H, 6.76 (dd, *J* = 17.4, 10.1 Hz), 6.75 (d, *J* = 17.4 Hz)), 7.12 (2H, dtd, *J* = 8.1, 1.2, 0.5 Hz), 7.21-7.51 (9H, 7.27 (ddd, *J* = 8.0, 1.7, 0.5 Hz), 7.27 (ddd, *J* = 8.0, 1.7, 0.6 Hz), 7.33 (tt, *J* = 7.8, 1.2 Hz), 7.42 (ddd, *J* = 8.0, 1.5, 0.6 Hz), 7.45 (ddd, *J* = 8.0, 1.5, 0.5 Hz)), 7.61 (2H, dddd, *J* = 8.1, 7.8, 1.4, 0.5 Hz).

^{13}C NMR: δ 46.1 (1C, s), 56.6 (1C, s), 116.8 (1C, s), 122.8 (2C, s), 126.9 (1C, s), 127.8 (1C, s), 128.0 (1C, s), 128.2 (2C, s), 128.6-128.8 (4C, 128.7 (s), 128.7 (s)), 129.8-130.0 (4C, 129.9 (s), 129.9 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 133.6-133.8 (2C, 133.7 (s), 133.7 (s)), 134.4 (1C, s), 140.3-140.6 (2C, 140.4 (s), 140.5 (s)), 141.3 (1C, s), 151.7 (1C, s).

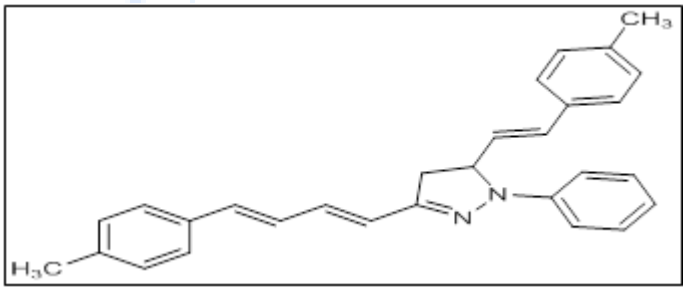
Z3:



^{1}H NMR: δ 3.12 (1H, dd, *J* = 9.0, 4.3 Hz), 3.37 (1H, dd, *J* = 9.0, 8.1 Hz), 5.09 (1H, ddd, *J* = 8.1, 4.3, 3.8 Hz), 5.97 (1H, d, *J* = 15.8 Hz), 6.35-6.81 (5H, 6.43 (dd, *J* = 17.1, 3.8 Hz), 6.50 (d, *J* = 17.1 Hz), 6.58 (dd, *J* = 15.8, 10.1 Hz), 6.69 (dd, *J* = 17.3, 10.1 Hz), 6.73 (d, *J* = 17.3 Hz)), 7.05-7.50 (11H, 7.12 (dtd, *J* = 8.1, 1.2, 0.5 Hz), 7.18 (ddd, *J* = 8.1, 1.7, 0.5 Hz), 7.25 (ddd, *J* = 8.3, 1.6, 0.6 Hz), 7.33 (tt, *J* = 7.8, 1.2 Hz), 7.35 (ddd, *J* = 8.1, 1.6, 0.5 Hz), 7.44 (ddd, *J* = 8.3, 1.5, 0.6 Hz)), 7.61 (2H, dddd, *J* = 8.1, 7.8, 1.4, 0.5 Hz).

^{13}C NMR: δ 46.1 (1C, s), 56.6 (1C, s), 116.8 (1C, s), 122.3-122.3 (2C, 122.3 (s), 122.3 (s)), 122.8 (2C, s), 126.9 (1C, s), 127.8-127.9 (5C, 127.8 (s), 127.9 (s), 127.9 (s)), 128.0 (1C, s), 128.2 (2C, s), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 131.6-131.8 (4C, 131.7 (s), 131.7 (s)), 134.4 (1C, s), 140.3-140.6 (2C, 140.4 (s), 140.5 (s)), 141.3 (1C, s), 151.7 (1C, s).

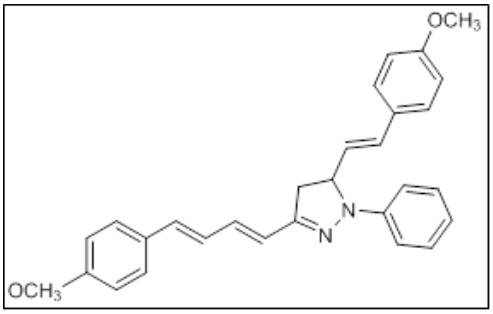
Z4:



^{1}H NMR: δ 2.12 (3H, s), 2.27 (3H, s), 3.10 (1H, dd, *J* = 11.3, 4.3 Hz), 3.37 (1H, dd, *J* = 11.3, 8.1 Hz), 5.15 (1H, ddd, *J* = 8.1, 4.3, 3.8 Hz), 6.01 (1H, d, *J* = 15.8 Hz), 6.41-6.64 (3H, 6.48 (dd, *J* = 17.0, 3.8 Hz), 6.55 (dd, *J* = 15.8, 10.1 Hz), 6.56 (d, *J* = 17.0 Hz)), 6.69-6.86 (2H, 6.76 (d, *J* = 17.4 Hz), 6.78 (dd, *J* = 17.4, 10.1 Hz)), 7.10-7.39 (11H, 7.16 (ddd, *J* = 7.9, 1.6, 0.4 Hz), 7.17 (ddd, *J* = 7.8, 1.5, 0.5 Hz), 7.21 (dtd, *J* = 8.1, 1.2, 0.5 Hz), 7.26 (ddd, *J* = 7.9, 1.9, 0.4 Hz), 7.28 (ddd, *J* = 7.8, 1.9, 0.5 Hz), 7.33 (tt, *J* = 7.8, 1.2 Hz)), 7.61 (2H, dddd, *J* = 8.1, 7.8, 1.4, 0.5 Hz).

^{13}C NMR: δ 21.3-21.4 (2C, 21.3 (s), 21.3 (s)), 46.1 (1C, s), 56.6 (1C, s), 116.8 (1C, s), 122.8 (2C, s), 126.8-127.0 (5C, 126.9 (s), 126.9 (s), 126.9 (s)), 127.8 (1C, s), 128.0 (1C, s), 128.2 (2C, s), 129.0-129.2 (4C, 129.1 (s), 129.1 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 134.4 (1C, s), 140.3-140.6 (2C, 140.4 (s), 140.5 (s)), 141.3 (1C, s), 141.4-141.6 (2C, 141.5 (s), 141.5 (s)), 151.7 (1C, s).

Z5:



[1]H NMR: δ 3.08 (1H, dd, *J* = 13.8, 8.1 Hz), 3.26 (1H, dd, *J* = 13.8, 4.3 Hz), 3.73-3.86 (6H, 3.78 (s), 3.81 (s)), 4.83 (1H, ddd, *J* = 8.1, 4.3, 3.8 Hz), 5.93 (1H, d, *J* = 15.9 Hz), 6.33-6.73 (5H, 6.41 (dd, *J* = 17.2, 3.8 Hz), 6.48 (d, *J* = 17.2 Hz), 6.57 (dd, *J* = 15.9, 10.1 Hz), 6.63 (d, *J* = 17.2 Hz), 6.64 (dd, *J* = 17.2, 10.1 Hz)), 6.83 (2H, ddd, *J* = 8.8, 2.5, 0.5 Hz), 6.97 (2H, ddd, *J* = 8.8, 1.9, 0.4 Hz), 7.05-7.19 (4H, 7.12 (dtd, *J* = 8.1, 1.2, 0.5 Hz), 7.13 (ddd, *J* = 8.8, 1.4, 0.4 Hz)), 7.22-7.39 (3H, 7.29 (ddd, *J* = 8.8, 1.9, 0.5 Hz), 7.33 (tt, *J* = 7.8, 1.2 Hz)), 7.61 (2H, dddd, *J* = 8.1, 7.8, 1.4, 0.5 Hz).

[13]C NMR: δ 46.1 (1C, s), 56.0-56.0 (2C, 56.0 (s), 56.0 (s)), 56.6 (1C, s), 114.3-114.3 (4C, 114.3 (s), 114.3 (s)), 116.8 (1C, s), 122.8 (2C, s), 126.9 (1C, s), 127.8 (1C, s), 128.0 (1C, s), 128.2 (2C, s), 128.6-128.8 (4C, 128.7 (s), 128.7 (s)), 130.3-130.4 (2C, 130.3 (s), 130.3 (s)), 134.4 (1C, s), 140.3-140.6 (2C, 140.4 (s), 140.5 (s)), 141.3 (1C, s), 151.7 (1C, s), 159.8-159.9 (2C, 159.8 (s), 159.8 (s)).

Anti-bacterial activity of prepared compounds.

Anti-bacterial effect of prepared compounds (B_{1-5}), (Z_{1-5}) were evaluated toward one type of gram-positive bacteria (*Staphylococcus Aureus*) and gram-negative bacteria (*Escherichia Coli*). The antibacterial activity was carried out using the Disk Diffusion Method using (Mueller-Hinton agar) medium, which is similar to what was done by the researcher [15]. These bacteria were chosen because of their importance in the medical fields, as well It causes many serious diseases and is resistant to antibiotics. Different concentrations of the samples for which the biological activity was intended were prepared by dissolving them in a specific volume of the common solvent (DMSO).

Table 5: Antibacterial activity of compounds (B_{1-5}), (Z_{1-5}) in (mm).

Co No	*Staphylococcus aureus* Conc. g / ml.		*Escherichia coli* Conc. g / ml.	
-	0.01	0.001	0.01	0.001
B1	22	*20*	16	10
B2	15	12	14	9
B3	12	8	11	8
B4	0	0	13	9
B5	0	0	11	7
Z1	15	10	0	0
Z2	24	19	0	0
Z3	20	16	18	13
Z4	0	0	19	14
Z5	0	0	16	12
Amoxicillin	0	0	22	22
Celecoxib	0	0	0	0
Gentamicin	28	28	34	34
DMSO	0	0	0	0

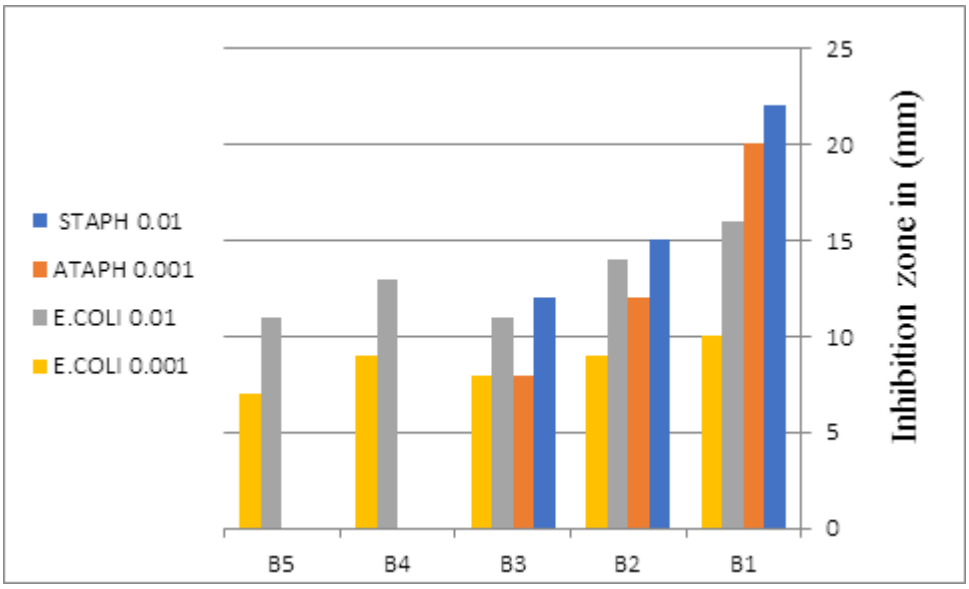


Figure (1): Shows antibacterial activity of (B_{1-5}) against (Staphylococcus aureus) and (Escherichia coli).

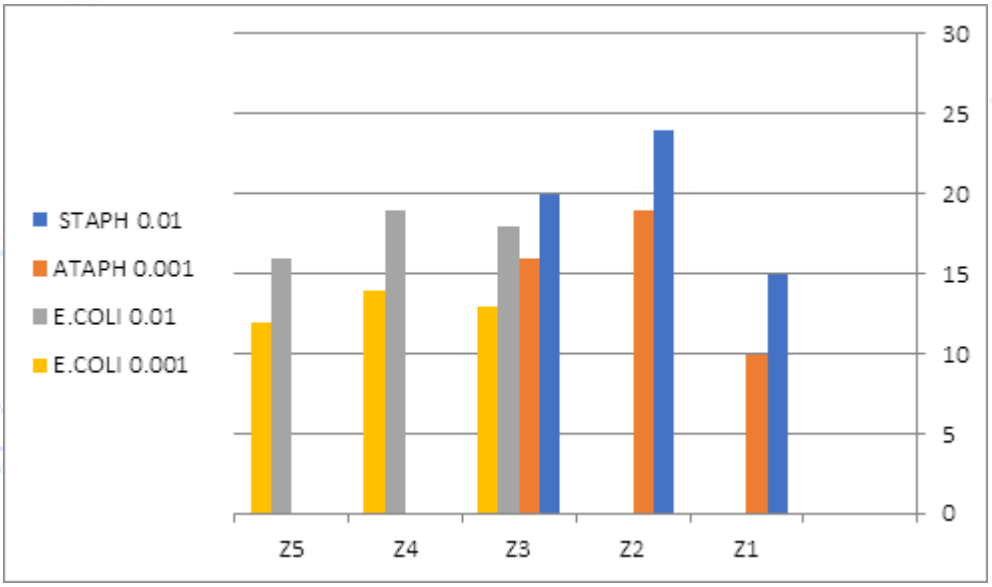


Figure (2): Shows antibacterial activity of (Z_{1-5}) against (Staphylococcus aureus) and (Escherichia coli).

CONCLUSION

The results shows that compounds (A1,B2,B3) have broad antibacterial activity against gram-positive bacteria (Staphylococcus aureus), and Zero antibacterial activity against gram-negative bacteria (Eschericha coli). Also shows that compounds (A2,A3,A4,B4) have good antibacterial activity against gram-negative bacteria and zero antibacterial activity against (Staphylococcus aureus).

RECOMMENDATION

1. Studying the possibility of using some of the derivatives prepared in this research in the medical field, especially in the field of antibiotics industry.
2. The use of microwave technology to prepare a large number of new compounds and save a lot of time.

3. Focusing on the preparation of pyrazoline and 4,5-dihydroisoxazole derivatives due to the the importance of these compounds in the medical field.
4. Studying the biological activity of the prepared compounds on living organisms through toxicity tests in mice and rabbits, especially the compounds that showed biological activity against Gram-positive bacteria.
5. Studying the effect of the prepared compounds on some types of pathogenic bacteria associated with humans, such as typhoid fever bacteria.

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