Journal homepage www.jzs.univsul.edu.iq
Journal of Zankoy Sulaimani
Part-A- (Pure and Applied Sciences)

Synthesis and Characterization of some new 2,5-disubstituted-1,3,4-oxadiazole derivatives Containing Antipyrine moiety

Mohammad Amin Mohammad Rashid[*]*& Sewara Jalal Mohammed*[*]

Faculty of Science and Science Education, School of Science, Department of Chemistry, University of Sulaimani, Kurdistan region, Iraq

[*]*Email: 46mohrashid@web.de*

Article info

Original: 12.07.2015
Revised: 08.09.2015
Accepted: 12.11.2015
Published online: 20.06.2016

***Key words**:*
4-Aminoantipyrine
Ethyl acetoacetate
Enaminone
Hydrazide
Oxadiazole derivatives

Abstract

Some new 2,5-disubstituted-1,3,4-oxadiazolels of type (E)-4-((1-(5-(substitutedphenyl) 1,3,4-oxadiazol-2-yl)pro-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-1H-pyrazol-3(2H)-one were synthesized in (60-81%) yield under solvent free conditions using grinding technique through the reaction of hydrazide intermediate with benzaldehyde or different substituted benzaldehydes in the presence of catalytic amounts of iodine molecular as a single step. The structures of all the synthesized compounds were confirmed on the basis of their physical properties, IR, ^{1}H-NMR and Mass spectral data.

Introduction

It was previously reported that five-membered ring compounds containing N, O or S atoms have an important biological and pharmacological activities ***[1-6]***. Among these the 2,5-disubstituted-1,3,4-oxadiazole was considered as an pharmacological important heterocyclic compounds which contains two nitrogen atoms with one oxygen atom. These compounds have been showed to possess various biological properties such as anticonvulsant ***[7]***, antimicrobial ***[8]***, anti-tubercular ***[9]***, antifungal ***[10]***, antiviral ***[11]***, anti HIV ***[12]***, anticancer ***[13]***, anti-inflammatory ***[14]***, analgesic ***[15]***, antioxidant ***[16]***, antimalarial ***[17]***, hypnotic ***[18]***, antipyretic ***[19]***, antibacterial ***[20]***, antiparkinson ***[21]***, hypoglycemic ***[22]***, insecticidal ***[23]***, herbicidal ***[24]***, virucidal ***[25]***, anthelmintic ***[26]*** and muscle-relaxants activities ***[27]***. Therefore this significant properties made the 1,3,4-oxadiazole derivatives to be used as a drug for treatment of infection diseases in the field of medicine. On the basis of these results a large number of researchers encouraged to synthesize and develop these compounds in order to get new compounds with higher biological activities and lower risks. Accordingly we have synthesized some new 2,5-disubstituted-1,3,4-oxadiazole derivatives.

Experimental

Analytical Techniques

All melting points of the synthesized compounds were measured in capillary tubes on an Electro Thermal digital melting point apparatus of type Bamstead-Electrothermal 9100. The purity of the synthesized compounds and progress of reactions were monitored by thin layer chromatography using TLC plates aluminum silica gel 60 F_{254}. The spots resolved were visualized using UV light (254-366nm) model UVGL-58, upland CA 91786 U.S.A. The IR spectra were recorded on a Perkin- Elmer FT/IR spectrometer using KBr pellets (ν_{max} in cm^{-1}). ^{1}H-NMR (250 MHz) spectra were recorded on a Bruker DRX 250 spectrometer in $CDCl_3$ or deuterated DMSO as a solvent with tetramethylsilane (TMS) as internal standard reference. The mass spectra were obtained by using Agilent Technology (HP) and MS model 5973 Network mass selective detector operating by technique at 70eV.

Synthesis:

Preparation of ethyl (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)amino]2-Butenoate (1)

Ethyl acetoacetate (52.056g, 50.54mL, 0.4mol) was added to an ethanolic solution (100mL) of 4-aminoantipyrine(4AA) (40.65g, 0.2mol) in a conical flask. The mixture was stirring and scratching for twenty minutes at room temperature. The light yellow solid was filtered, washed twice with diethyl ether affording 56g of the product. Petroleum ether was added to the mother solution and allowed to cool in freezer and then 3.3g of the product was precipitated, dried and recrystallized from ethanol as light yellow crystals (total product is 59.3g) in 94% yield, M.P.161-163 ^{0}C ·(ref.[28] M.P.128-130^{0}C Z-isomer). **IR** (KBr) ν_{max} in cm^{-1}: 3245 (N-H), 3056 (C-H aromatic), 2975 (C-H aliphatic), 1678 (C=O ester), 1660 (C=O 4AA), 1604 (C=C aromatic), 1275 (C-N), 1133 (C-O). **^{1}H-NMR** (250MHz, $CDCl_3$, 25^{0}C): δ= 1.31 (t, $^2J_{H,H}$ = 6.58Hz, 3H, O-C-CH_3), 1.95 (s, 3H, -C=C-CH_3), 2.26 (s, 3H, N-C-CH_3), 3.1 (s, 3H, N-CH_3), 4.16 (q, $^3J_{H,H}$ = 6.58Hz, 2H, O-CH_2-), 4.74 (s, 1H, -C=CH), 7.3-7.52 (m, 5H, Ar-H), 9.42 (s, 1H, NH-C=C) ppm. **MS** m/z: found 315$[M]^+$, 316$[M+1]^+$, calc..315.

Synthesis of (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)amino]but-2-enehydrazide (2)

A mixture of ester compound **(1)** (50.46g, 0.16mol) and hydrazine hydrate (99%) (12.014g, 11.66mL, 0.24mol) in ethanol (400mL) was refluxed in water-bath for six hours. The excess of solvent was removed by rotatory evaporator. The separated solid was filtered, washed with diethyl ether and petroleum ether, dried and purified by recrystallization with ethanol to give dark yellow crystals (47.94g) in 95 % yield. M.P.101-102^{0}C. **IR** (KBr), ν_{max} in cm^{-1}: 3432, 3327 (N-H & NH_2), 2914 (C-H aliphatic), 1670 (C=O amide), 1649 (C=O 4-AA), 1590 (C=C), 1274 (C-N). **^{1}H- NMR** (250MHz, DMSO-d_6, 25^{0}C): δ=2.09 (s, 6H, -C=C-CH_3 & N-C-CH_3), 2.5 (s, 2H, -NH_2), 2.74 (s, 3H, N-CH_3), 3.83 (s, 1H, NH-C=C), 5.22 (s, 1H, -C=CH), 7.2-7.49 (m, 5H, Ar-H), 10.28 (s, 1H, O=C-NH) ppm. **MS** m/z: found 301$[M]^+$ calc. 301,fragmented ion at 203.

General procedure for synthesis of 2,5-disubstituted-1,3,4-oxadiazoles by using grinding technique (3-9)

A mixture of compound **(2)** (5mmol) and benzaldehyde or substituted aromatic aldehyde (5mmol) was grinded with iodine (0.253g, 1mmol) for (15 minutes) in a mortar by a pestle. The completion of the reaction was checked on TLC by using petroleum ether: ethyl acetate: ethanol (6.5: 1.5: 2) as a solvent system. The ice cold solution of sodium thiosulphate (10%, 50mL) was added to the reaction mixture to remove iodine. The solid that separated out was filtered, washed with water, dried and purified by recrystallization technique.

(E)-1,5-dimethyl-2-phenyl-4-((1-(5-phenyl-1,3,.4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1H-pyrazol-3(2H)-one (3)

Recrystallized from ethanol as light brown crystals (1.099g) in 73 % yield. M.P. 179-180 ^{0}C.**IR**(KBr) ν_{max} in cm^{-1}: 3445 (N-H), 3036 (Ar-H), 1650(C=O), 1594 (C=N), 1567 (C=C Aromatic), 1494 (C=C alkene), 1306 (C-N), 1129 (C-O-C). **^{1}H-NMR** (250 MHz, $CDCl_3$, 25C^O) :δ= 2.49 & 3.14 (2s, 9H, -C=C-CH_3, -N-C-CH_3 & N-CH_3), 7.42-7.88 (m, 11H, Ar-H & C=CH), 9.76 (s, 1H, NH-C=C) ppm. **MS** m/z : found 387 $[M]^+$, calc. 387, fragmented ion at 291.

(E)-4-((1-(5-(2-hydroxyphenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-IH-pyrazol-3(2H)-one (4)

Recrystallized from ethanol as dark yellow crystals (1.33g) in 66 % yield. M.P. 205-207 ^{0}C. **IR** (KBr) ν_{max} in cm^{-1}: 3502 (broad peak, N-H & O-H) 3061 (Ar-H), 1654 (C=O), 1591 (C=N), 1492 (C=C), 1306 (C-N), 1139 (C-O-C)**. ^{1}H-NMR** (250 MHz, $CDCl_3$, 25 ^{0}C): δ= 2.43 & 3.19 (2S, 9H, -C=C-CH_3, -N-C-CH_3 & -N-CH_3), 6.92-6.96 (d, J=7.85Hz, 1H, C=CH), 6.99-7.55 (m, J=7.85Hz, 9H, Ar-H), 9.86 (s, 1H, NH-C=C), 13.4 (s, 1H, OH) ppm. **MS** m/z: found 392 $[M-11]^{+,}$ 420 $[M+17]^+$, calc.403 $[M]^+$, fragmented ion at 307.

(E)-4-((1-(5-(3-hydroxyphenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-IH-pyrazol-3(2H)-one (5)

Recrystallized from DMF as dark yellow crystals (1.21g) in 60 % yield. M.P. 281-282 ^{0}C. **IR** (KBr) ν_{max} in cm^{-1}: 3430 (-OH), 3148 (N-H), 1618 (C=O), 1591 (C=N), 1558 (C=C), 1286 (C-N), 1146 (C-O-C). ^{1}**H- NMR** (250 MHz, DMSO-d_6, 25^{0}C): δ= 2.45 (s, 3H, -C=C-CH_3), 3.18 (s, 3H, -N-C-CH_3), 3.36 (s, 3H, N-CH_3), 6.81-6.84 (d, J=7.18Hz, 1H,-C=CH), 7.17-7.55 (m, J=7.18Hz, 9H, Ar-H), 9.49 (s, 1H, -C=C-NH), 9.52(s, 1H, OH) ppm. **MS** m/z: found 403 $[M]^+$calc. 403, fragmented ion at 307.

(E)-4-((1-(5-(4-hydroxyphenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-IH-pyrazol-3(2H)-one (6)

Recrystallized from ethanol as reddish brown crystals (1.63g) in 81 % yield .M.P. 219-220 ^{0}C. **IR** (KBr) ν_{max} in cm^{-1}: 3445 (broad peak, N-H & OH), 1665 (C=O), 1610 (C=N), 1581 (C=C), 1257 (C-N), 1158 (C-O-C). ^{1}**H - NMR** (250MHz, DMSO-d_6, 25^{0}C): δ= 2.42 (s, 3H, -C=C-CH_3), 3.13 (s, 3H, -N-C-CH_3), 3.37 (s, 3H, N-CH_3), 6.82-7,67 (m, J=7.81Hz, 10H,Ar-H & -C=CH), 9.47 (s,1H, -C=C-NH), 9.94 (s, 1H, OH) ppm. **MS** m/z: found 403$[M]^+$ calc. 403, fragmented ion at 307.

(E)-4-((1-(5-(3,4-dihydroxyphenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-IH-pyrazol-3(2H)-one (7)

Recrystallized from DMF as pistachio green crystals (1.467g) in 70 % yield. M.P. 292-293 ^{0}C. **IR** (KBr) ν_{max} in cm^{-1}: 3494 (N-H & OH), 3024 (Ar-H), 1618 (C=O), 1603 (C=N), 1589 (C=C), 1290 (C-N), 1138 (C-O-C). **^{1}H-NMR** (250MHz, DMSO-d$_6$, 25^{0}C): δ= 2.41 (s, 3H, -C=C-CH$_3$), 3.12 (s, 3H, -N-C-CH$_3$), 3.36 (s, 3H, N-CH$_3$), 6.78-6.82 (d, J=7.52Hz, 1H, C=CH), 7.02-7.55 (m, J=7.52Hz, 8H, Ar-H), 9.18 (s, 1H, -C=C-NH), 9.40 (s, 2H, 2OH) ppm. **MS** m/z: found 419 [M]$^+$ calc. 419,fragmented ion at 323.

(E)-1,5-dimethyl-4-((1-(5-(3-nitrophenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5-dimethyl-2-phenyl-IH-pyrazol-3(2H)-one (8)

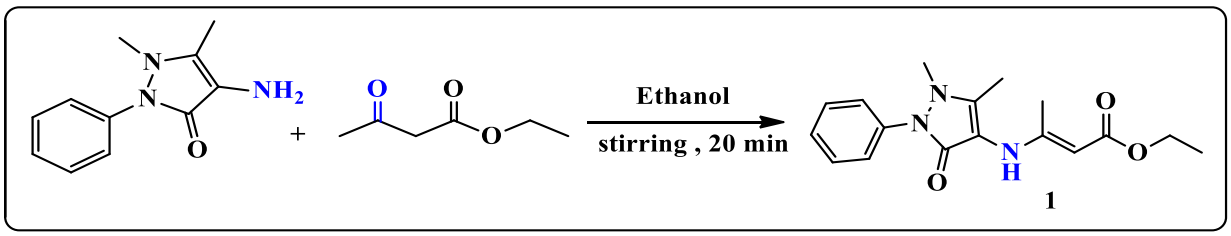
Recrystallized from ethanol as dark brown crystals (1.685g) in 78 % yield, M.P. 214-215 ^{0}C. **IR (**KBr) ν_{max} in cm^{-1}: 3436 (N-H), 1648 (C=O), 1593 (C=N), 1568 (C=C), 1523 & 1347 (NO_2), 1310 (C-N), 1136 (C-O-C).**^{1}H- NMR** (250 MHz, DMSO-d$_6$, 25 ^{0}C): δ= 2.57 & 3.25 (2s, 9H, -C=C-CH$_3$, -N-C-CH$_3$ & N-CH$_3$), 7.30-8.25 (m, J=8.01Hz, 9H, Ar-H), 8.79 (s, 1H,-C=CH), 9.84 (s, 1H, NH-C=C)ppm. **MS** m/z: found 432 [M]$^+$ cacl. 432, fragmented ion at 336.

(E)-4-((1-(5-(4-(dimethylamino)phenyl)-1,3,4-oxadiazol-2-yl)prop-1-en-2-yl)amino)-1,5- dimethyl-2-phenyl-IH-pyrazol-3(2H) (9)

Recrystallized from ethanol as reddish brown (1.591g) in 74 % yield. M.P. 223-224 ^{0}C. **IR** (KBr) ν_{max} in cm^{-1}: 3436 (N-H), 2922 (C-H aliphatic), 1647 (C=O), 1610 (C=N), 1580 (C=C), 1310 (C-N), 1137 (C-O-C). **^{1}H-NMR** (250MHz, DMSO-d$_6$, 25^{0}C): δ= 2.98 (s, 6H, -C=C-CH$_3$ & -N-CH$_3$), 3.32 (s, 9H, 3N-CH$_3$), 6.74-7.65 (m, J=8.57Hz, 10H, Ar-H & -C=CH), 9.43 (s, 1H, -C=C-NH) ppm. **MS** m/z : found 430 [M]$^+$ calc. 430, fragmented ion at 334.

Results and Discussions

Ethyl (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)amino]2-butenoate **(1)** was synthesized by condensing 4-aminoantipyrine with ethyl acetoacetate in ethanol under stirring and scratching for 20 minutes without using any catalyst at room temperature (Scheme 1). The results and physical properties of the product are summarized in Table (1).

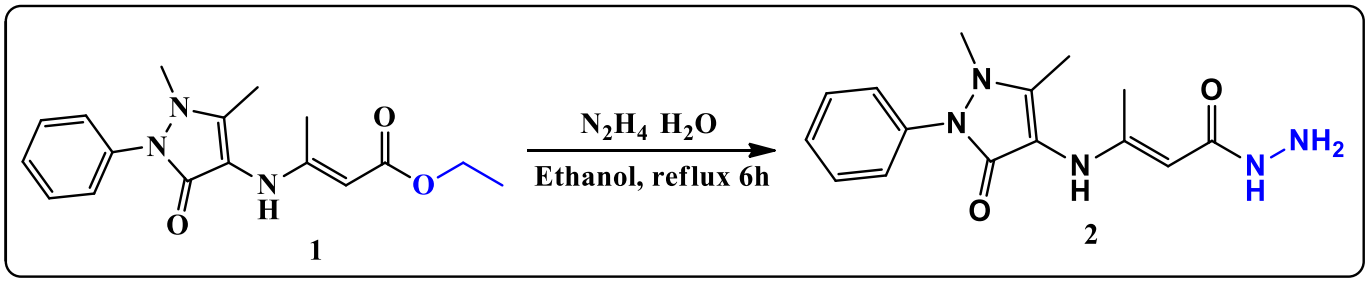


Scheme-1: Preparation of ethyl (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)amino]2-Butenoate

Table 1: Physical Properties of Synthesized Compounds (1-2)

Comp. No	Molecular formula	Molecular weight	% Yield	M.P. ^{0}C	Color	Rf
1	$C_{17}H_{21}N_3O_3$	315.367	94	161-162	Light Yellow	0.78
2	$C_{15}H_{19}N_5O_2$	301.344	95	101-102	Dark Yellow	0.6

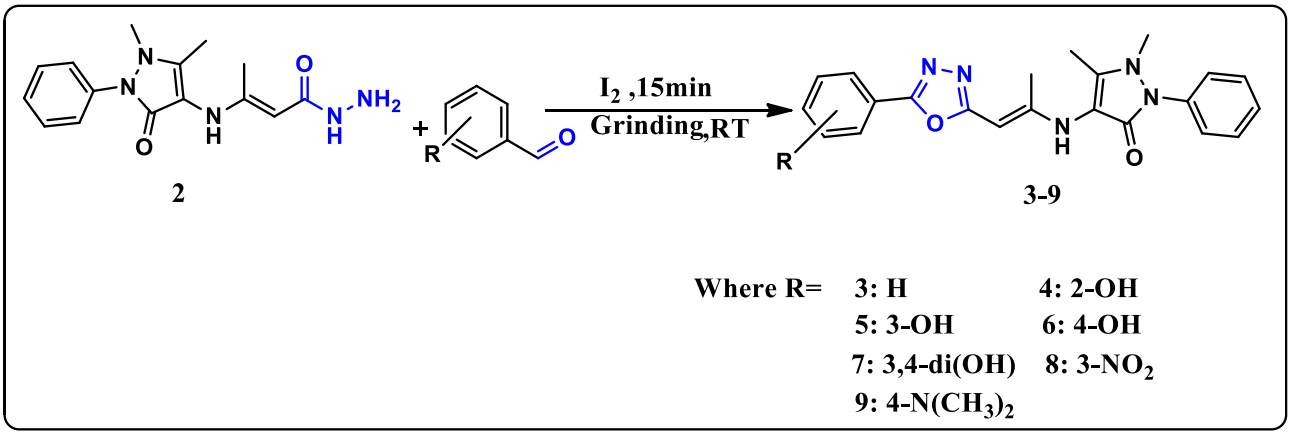
Compound **(1)** was obtained in excellent yields with high purity which regard as the key material for synthesis of the corresponding hydrazide derivative. The structure of compound **(1)** was assigned by the IR spectroscopy through disappearance of absorption band at 3432cm^{-1} for NH_2 stretching group of 4-aminoantipyrine[29] and appearance of the new absorption band at 3245cm^{-1} due to the presence of NH stretching group adjacent to C=C bond. Further more evidence about confirming structure of compound **(1)** was obtained through detection of a weak absorption peak at 3056cm^{-1} for the aromatic protons band and the appearance of two bands at 1678cm^{-1} and 1660cm^{-1} which were characteristic for carbonyl group of ester and carbonyl group of antipyrine unit respectively as shown in Figure (1). In addition to the IR spectrum, the compound **(1)** was confirmed by both ^{1}H-NMR and mass spectroscopy. The ^{1}H-NMR spectrum of compound **(1)** was taken in $CDCl_3$, the appearance of singlet signal at 9.42ppm confirmed the presence of NH nearby C=C bond, singlet signal of CH proton at 4.74ppm revealed the formation of NH-C=CH bond, quartet signal at 4.16ppm for protons of (-OCH_2-) and a triplet band at 1.31ppm referred to the protons of methyl of ester group as shown in Figure (2). The molecular formula of the compound (1) is $C_{17}H_{21}N_3O_3$ and the mass spectrum of (1) showed a molecular ion peak at m/z 315 which confirmed its molecular weight as shown in Figure (3). But the synthesis of (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl) but-2-enehydrazide **(2)** was obtained by reaction of compound **(1)** with hydrazine hydrate in ethanol under reflux of 6 hours (Scheme 2). This compound was identified on the bases of physical properties, IR,^{1}H-NMR and mass spectral data.



Scheme-2: Synthesis of (E)-3-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)amino]but-2-enehydrazide

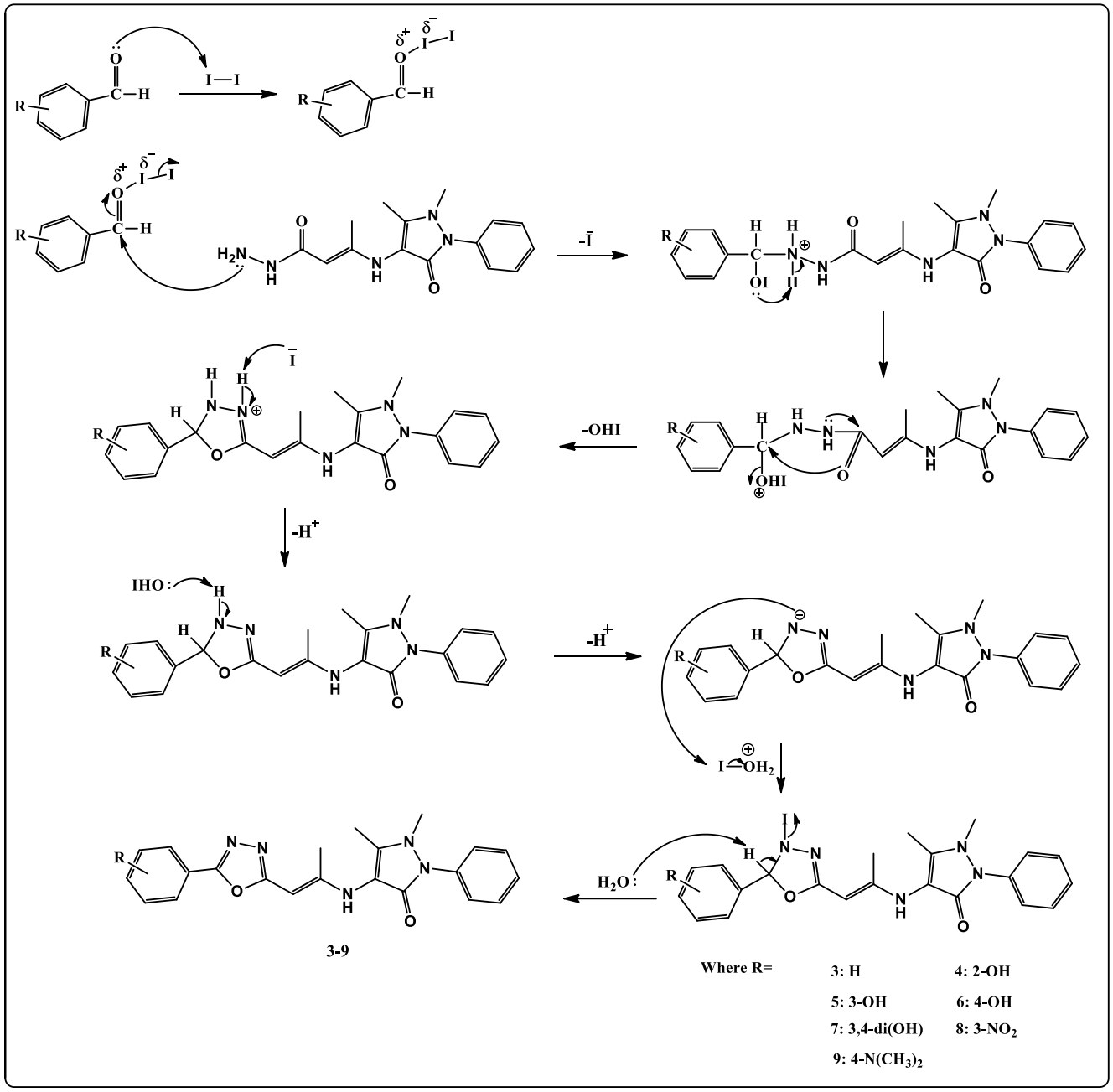
The IR spectrum was showed the appearance of characteristic absorption band in the range of 3327-3432cm^{-1} due to the presence of NH_2-NH stretching group together with two separated bands at 1670 cm^{-1} and 1649 cm^{-1} were attributed to the hydrazide carbonyl and carbonyl of antipyrine unit while the peak belonging to the carbonyl absorption of ester group at 1678cm^{-1} was disappeared as shown in Figure (4). The ^{1}H-NMR spectrum confirmed the correct structure of compound **(2)** through appearance of a new singlet peak at 2.5ppm that was attributed to the presence of NH_2 linked to the nitrogen of hydrazide group and disappearance of ethyl protons of ester group

of the starting material **(1)** as shown in Figure (5). Finally the mass spectrum showed a molecular ion peak at m/z 301 which confirmed the precise correct molecular weight of this compound as shown in Figure (6).While the synthesis of 2,5-disubstituted-1,3,4-oxadiazoles were proceeded by grinding of hydrazide intermediate **(2)** with benzaldehyde or substituted-benzaldehydes as shown in (Scheme 3). The specific advantage of this method are rapid and simple work-up procedure, high efficiency, short reaction time, avoiding the use of organic solvents at any stage of the reaction, ecofriendly and good yields(60-81%).



Scheme-3: Synthesis of 2,5-disubstituted-1,3,4-oxadiazoles

The mechanism of this reaction proceeds via Nucleophilic addition on the carbonyl group. The oxygen atom of carbonyl group is first iodinated by iodine then it has been attacked by the hydrazide compound **(2)** as illustrated in following suggested mechanism (Scheme 4).



Scheme-4: Suggest Mechanism for synthesis of Compounds (3-9)

The formation of synthesized 2,5-disubstituted-1,3,4-oxadiazoles were confirmed by IR,^{1}H-NMR ,mass spectral data with other physical properties (Table 2).

Table 2: Physical Properties of synthesized Compounds (3-9)

Comp. No	R	Molecular formula	Molecular weight	% Yield	M.P. ^{0}C	Color	Rf
3	H	$C_{22}H_{21}N_5O_2$	387.434	72.6	179-180	Light Brown	0.73
4	2-OH	$C_{22}H_{21}N_5O_3$	403.434	66.3	205-207	Dark Yellow	0.70
5	3-OH	$C_{22}H_{21}N_5O_3$	403.434	60	281-282	Dark Yellow	0.79
6	4-OH	$C_{22}H_{21}N_5O_3$	403.434	81	219-220	Reddish Brown	0.66
7	3,4-OH	$C_{22}H_{21}N_5O_4$	419.433	70	292-293	Pistachio Green	0.74
8	3-NO_2	$C_{22}H_{20}N_6O_4$	432.432	77.9	214-215	Dark Brown	0.76
9	4-$N(CH_3)_2$	$C_{24}H_{26}N_6O_2$	430.502	74	223-224	Reddish Brown	0.75

The IR spectra showed the disappearance of two absorption bands at 3432 cm^{-1} and 3327 cm^{-1} for $NHNH_2$ group of the starting material and appearing some expected bands for the characteristic groups such as N-H, C=O and C=N together with another specific band for C-O-C bond at (3109-3445cm^{-1}), (1618-1654 cm^{-1}), (1450-1592 cm^{-1}) and (1129-1158 cm^{-1}) in oxadiazole ring respectively for all synthesized 2,5-disubstituted-oxadiazoles as shown in some example Figures (7) and (10). But the ^{1}H-NMR was showed the disappearance of a signal due to the NH_2 group of the $NHNH_2$ species of starting material, Figures (8 & 11). This confirmed the transformations of hydrazide and substituted aromatic aldehydes to oxadiazole ring by condensation process. In addition of that the structure of these compounds were assigned by mass spectroscopy which showed a correct molecular weight through determination of their molecular ion peaks as shown in Figures (9 & 12).

Conclusion

Some new 2,5-disubstituted-1,3,4-oxadiazoles that contain both antipyrine and oxadiazole entities in a single molecule were synthesized by using grinding technique as a green method. In this process hydrazide derivatives reacted with aromatic aldehydes under solvent free condition by using iodine as condensation and cyclization catalyst. All the synthesized compounds were characterized by using IR, ^{1}H NMR and Mass spectra.

References

[1] Katritzky A. R., Ramsden C. A., Scriven E. F. V., Taylor R. J. K. *Eds. In Comprehensive* Heterocyclic Chemistry III; Elsevier: Oxford. , 3, (2008)

[2] Gil C., Bräse S. J. Comb. Chem. , *9*, PP. 175 ,(2009).

[3] Carey J. S., Laffan D., Thomson C., Williams M. T. Org. Biomol. Chem., 4, PP. 2337, (2006).

[4] Dömling A. Chem. Rev. , 106, PP.17 , (2006).

[5] Rück-Braun K., Freysoldt T. H. E., Wierschem F. *Chem. Soc. Rev.* , 34, PP.507, (2005).

[6] O'Mahony G. E., Kelly P., Lawrence S. E., Maguire A. R. Arkivoc , (i), PP.1,(2011).
[7] Patli S.G. ; Badiger M.;Kudari S.M. and Purohit M.G., Indian J.Heterocyclic Chem.,17,PP.37, (2007).
[8] Sridhara AM ; Reddy KRV; Keshavayya J; Goud PSK; Somashekar BC and Bose P., Eur J Med Chem., 45, PP.4983, (2010).
[9] Dhansay D ;Alok P; Sivakumar T; Rajavel D and Dhar D., International Journal of Chem Tech Research. ,2,PP.1397, (2010).
[10] Manish S; Deepak S; Aashish Singh K and Gokulan P., Journal of Current Pharmaceutical Research. ,4,PP.20 ,(2010).
[11] Elmagd W.S.I.A. ;Hashem A.I.; Youssef A.S.A and Kandeel K.A., Eur. J. Med Chem. ,42(7),PP. 934, (2007).
[12] Ali A; EI-Emam ; Omer A; AL-Deeb A. ;Mohamed A and Jochen L. Bioorganic and Medicinal Chemistry. ,12, PP.5107, (2004).
[13] Sanmati K ; Arvind K and Pragya N., International Journal of Pharmaceutical Sciences and Drug Research. **,** 3,PP.230 ,(2011).
[14] Harish R; Murli D ;Kharya B and Pradeep M., Indian Journal of Chemistry. , 45 , PP.2506, (2006).
[15] Sudhir B; Bharat P; Narendra P and Sharma V., Archives of Applied Science Research**.,** 3,PP.558,(2011)
[16] Ariffin A and Abdulla M.A., Molecules, 19,PP.3436, (2014).
[17] Kagthara PR; Shah NS; Doshi RK and Parekh HH. , Indian J Chem. **,** 38B,PP.572, (1999).
[18] Maillard J; Vincent M; Morin R and Bernard M., French Pat. M379.Chem Abstr. 1962,57,15251g
[19] Ravindra K.C.; Vogdevi M and Vaidya V.P., Indian J Chem,B,42, PP.2506, (2006).
[20] Ravitas D; Jha A.K; Alok Singh T and Dhansay D., International Journal of Research in Pharmaceutical and Biomedical Sciences , 2, PP.215, (2011).
[21] Nagaraj Chaluvaraju K; Niranjan M and Kiran S .,International Journal of Pharmacy and Pharmaceutical Science , 3, PP.8, (2011).
[22] Sahin E; Kelicen P.C; Demiradamar R and Altinok G.,ArzneimForsch Drug Res., 51,PP. 478, (2001).
[23] Mohan TP; VishalakshiB,Bhat KS and Kendappa GN., Indian J Chem. , 43B,PP. 1798 ,(2004).
[24] Kennedy DA , and Summers LA., J Heterocyclic Chem. , 18,PP.409 ,(1981).
[25] Chauhn D; Chauhan JS; Singh J; Bajpai SK and Joshi MN., Indian J.Chem., 42B, PP.215, (2003).
[26] Bharathi D; Hemalatha S; Devadass G; Kumar PR; Shanmugasundaram P and Aanandhi MV., International Journal of Chem Tech Research .,2(4),PP.1867, (2010).
[27] Yale HI and Losee K., J Med Chem. , 9,PP.478, (1966).
[28] Silvio Cunha; Shana M. Oliveira; Manoel T. Rodrigues Jr.; Rodrigo M. Bastos; JailtonFerrar; Cecı´lia M.A. de Oliveira; Lucı´lia Kato; Hamilton B. Napolitano; Ivo Vencato and CarlitoLariucci., Journal of Molecular Structure., 752 , PP.32–39, (2005).
[29] Rajasekar K.; Ramachandramoorthy T. and Balasubramaniyan S. ,Chem.Sci. Trans., 2(3), pp. 877-882, (2013)

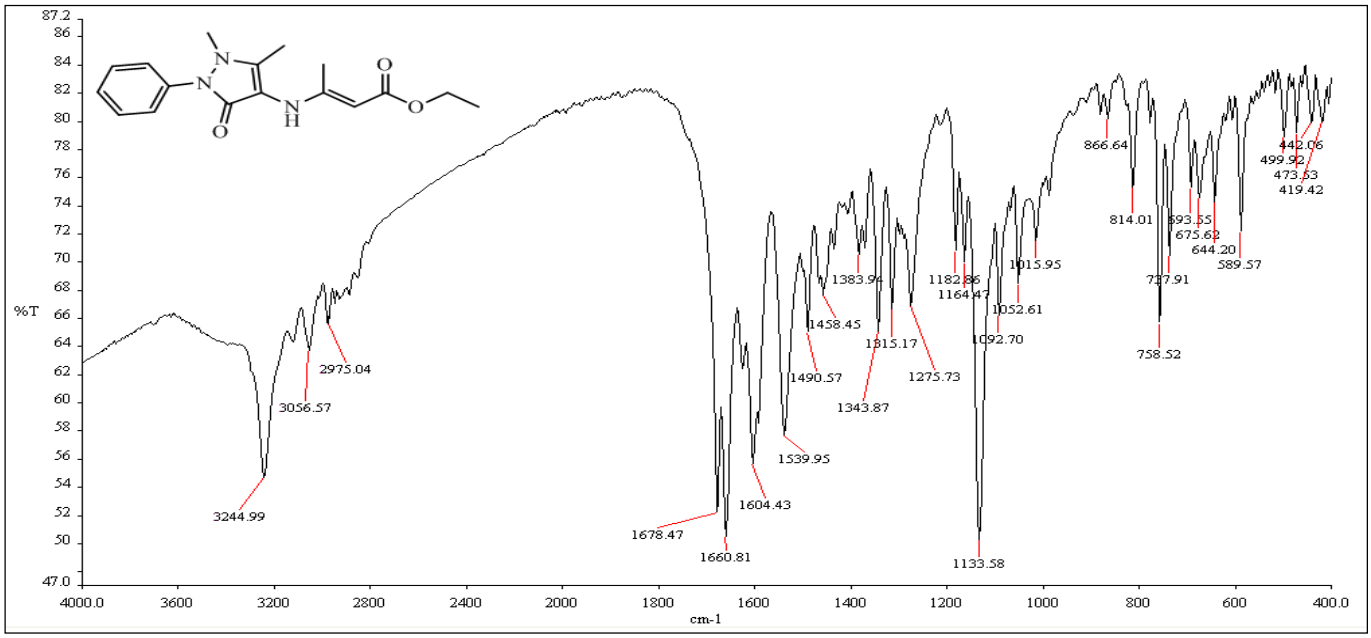


Figure-1: IR Spectrum for Compound (1)

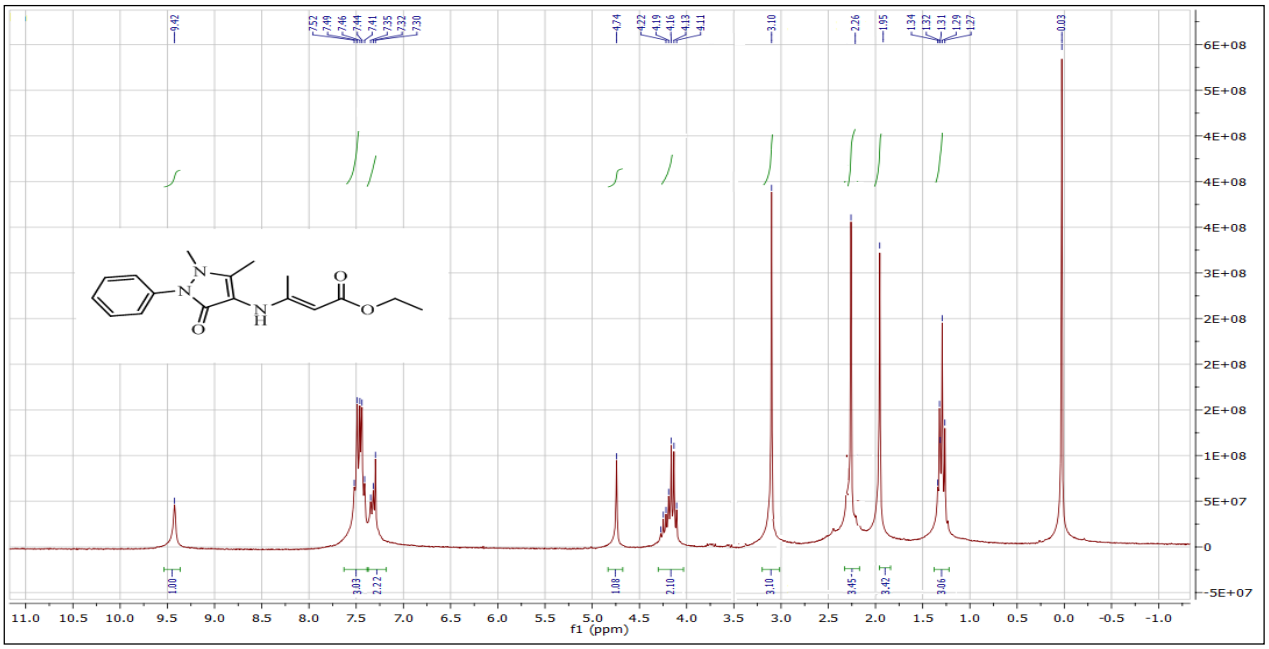


Figure-2: ^{1}H-NMR Spectrum for Compound (1)

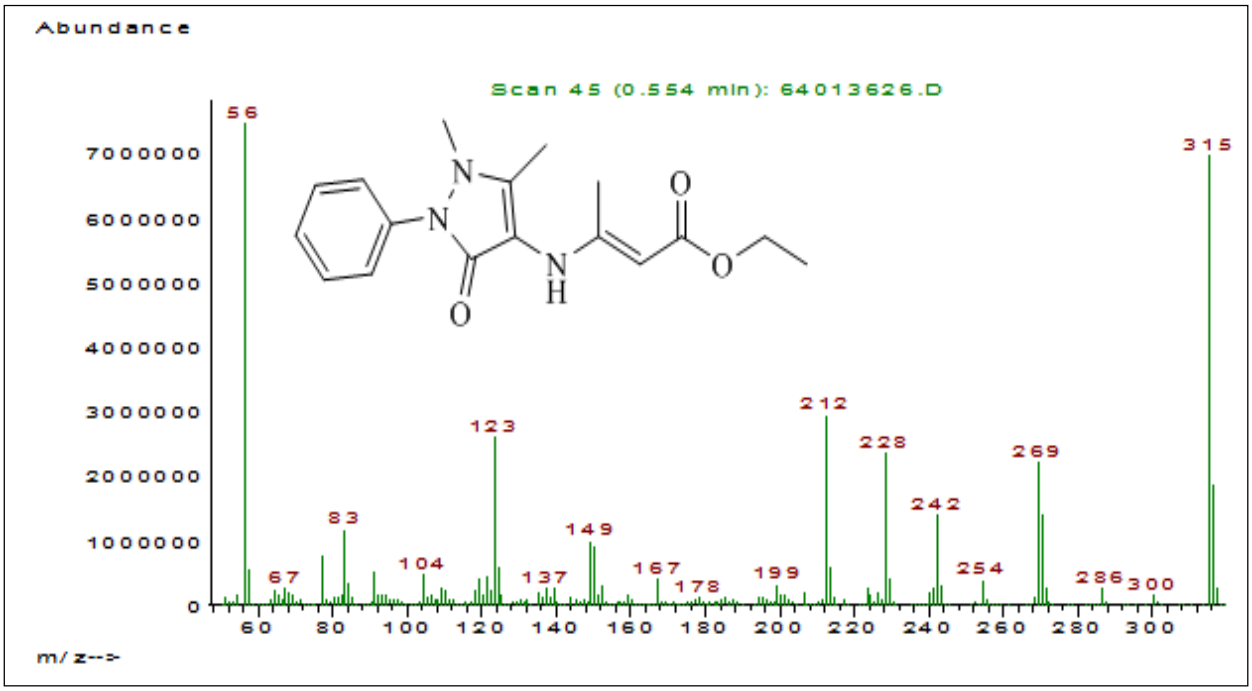


Figure-3: Mass Spectrum for Compound (1)

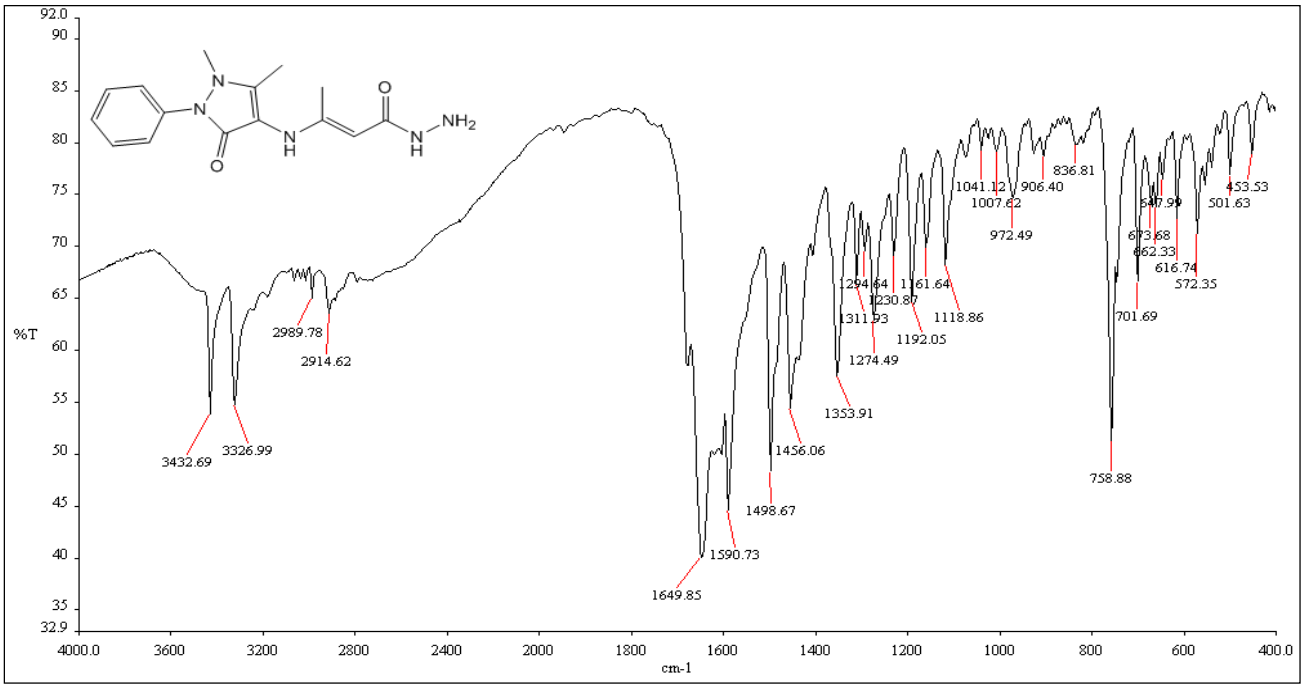


Figure-4: IR Spectrum for Compound (2)

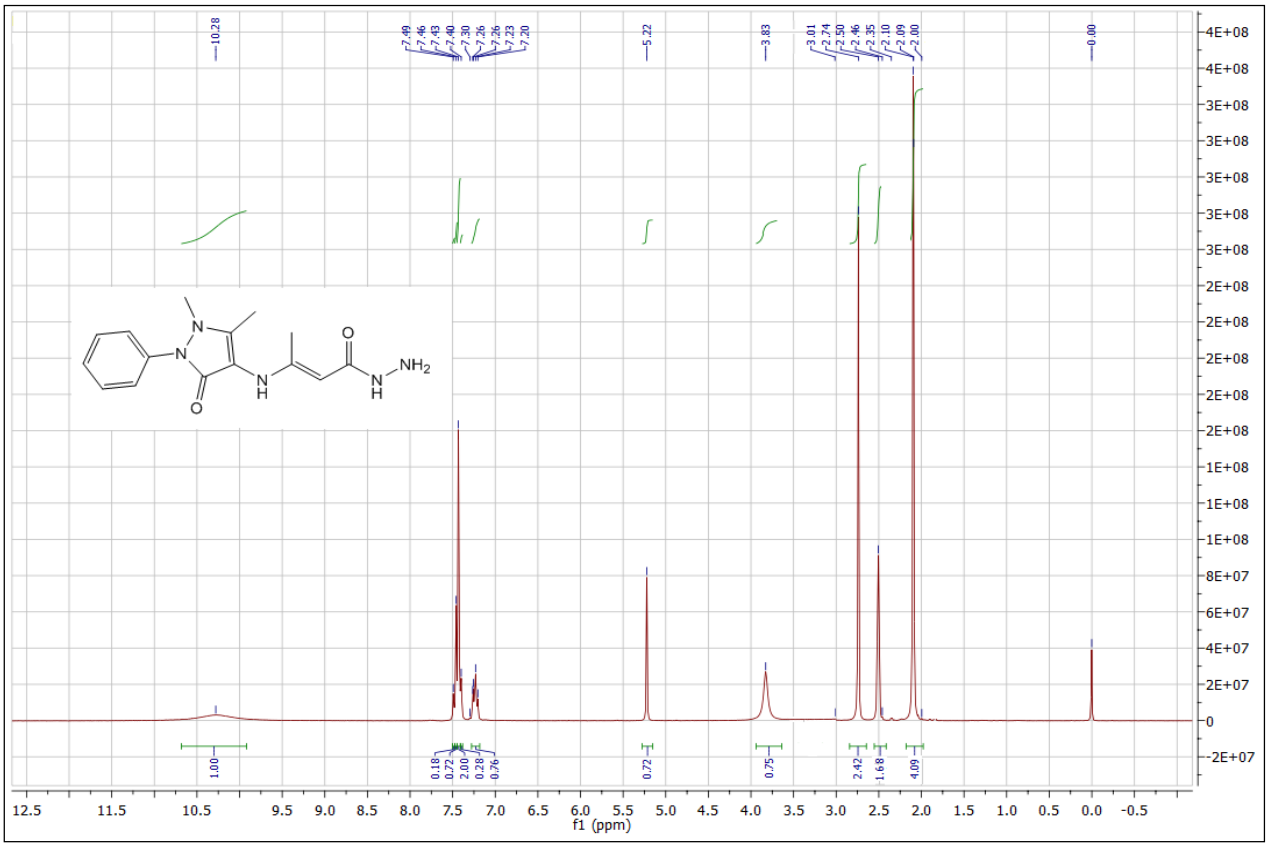


Figure (5): ^{1}H-NMR Spectrum for Compound (2)

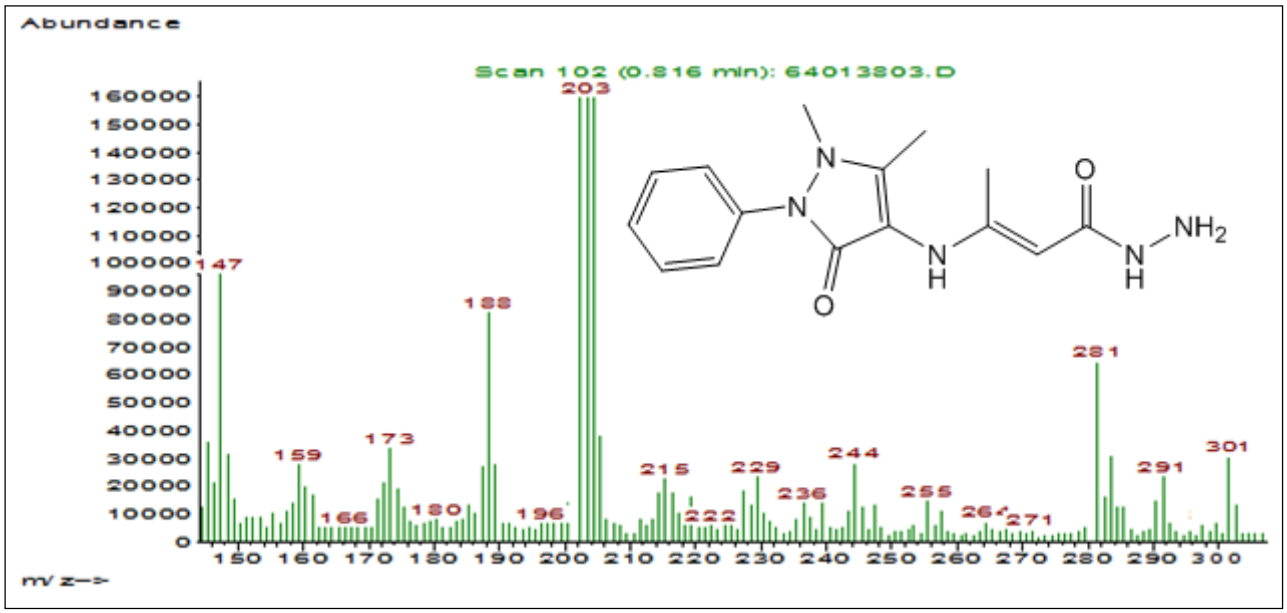


Figure -6: Mass Spectrum for Compound (2)

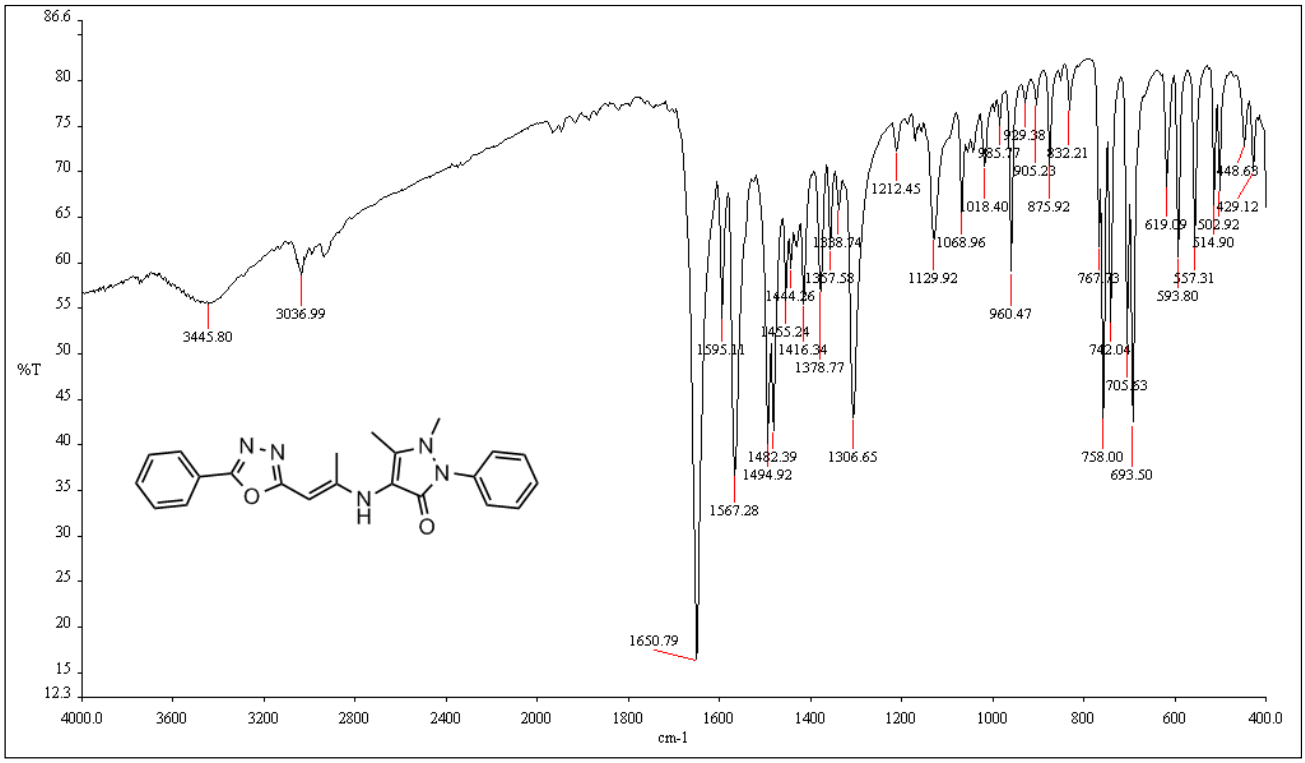


Figure-7: IR Spectrum for Compound (3)

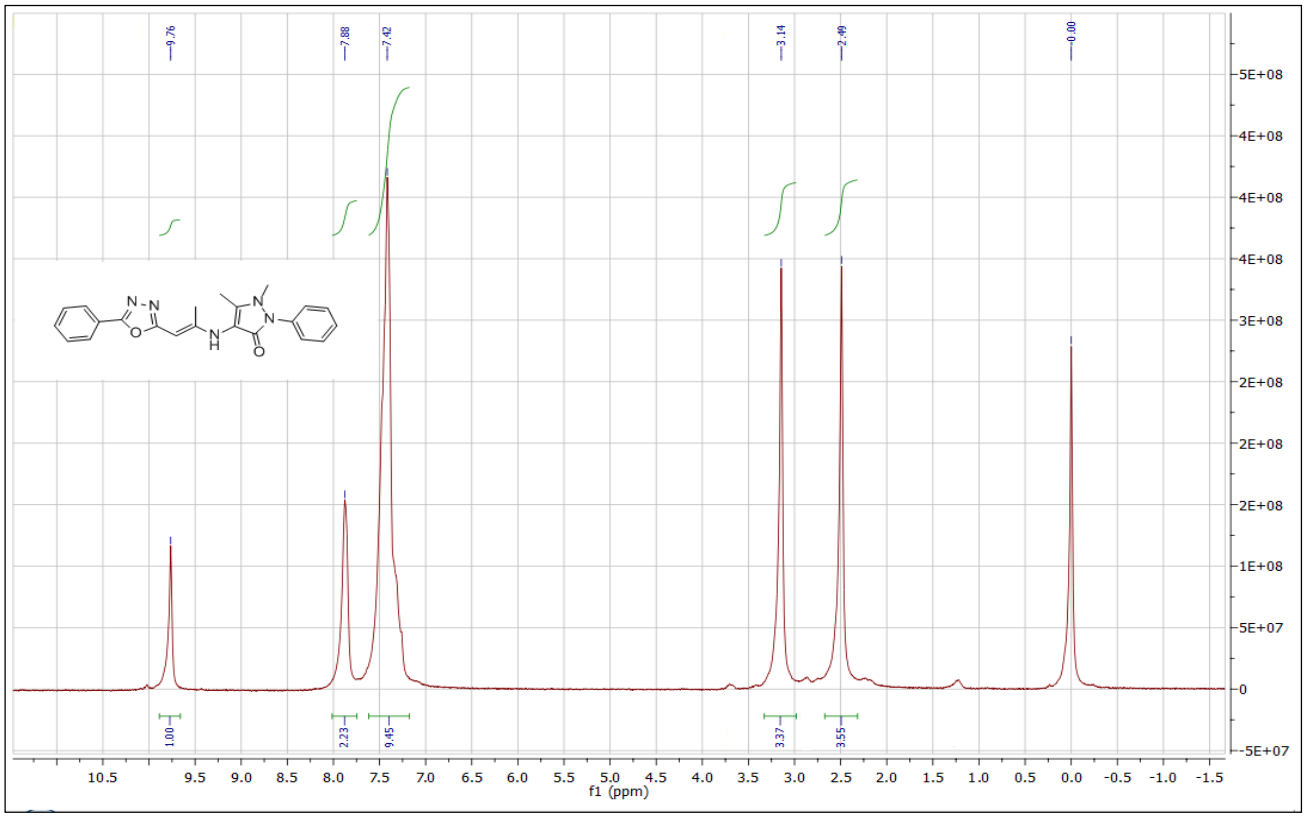


Figure-8: ^{1}H-NMR Spectrum for Compound (3)

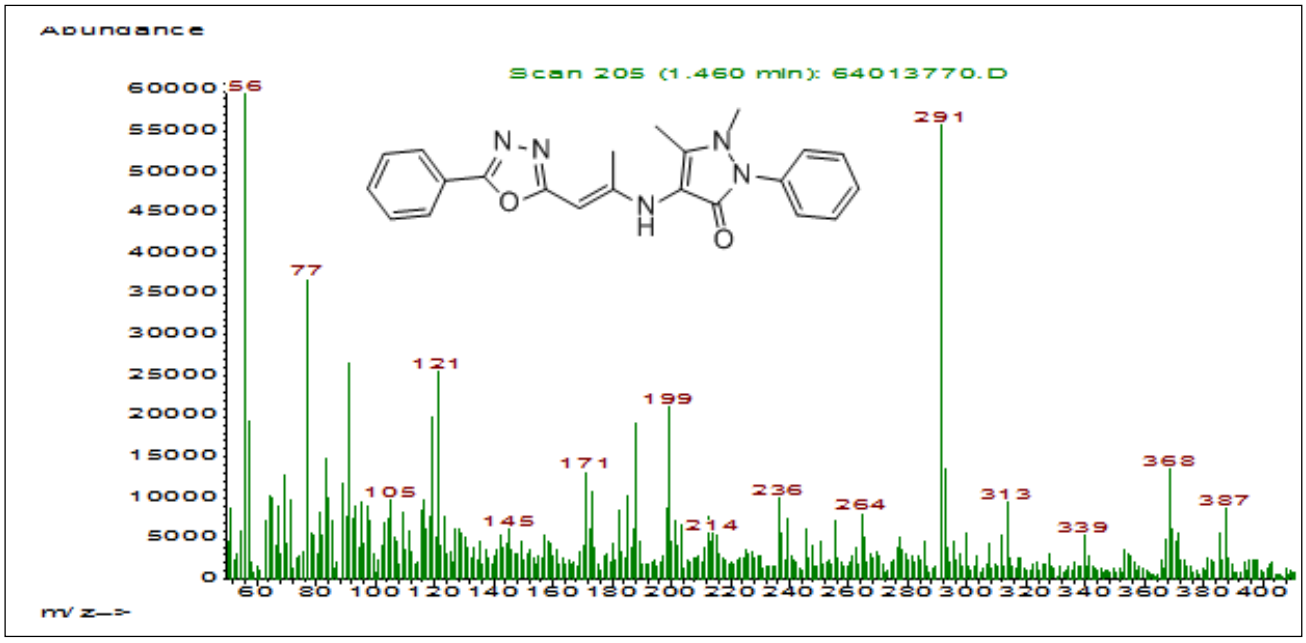


Figure-9: Mass Spectrum for Compound (3**)**

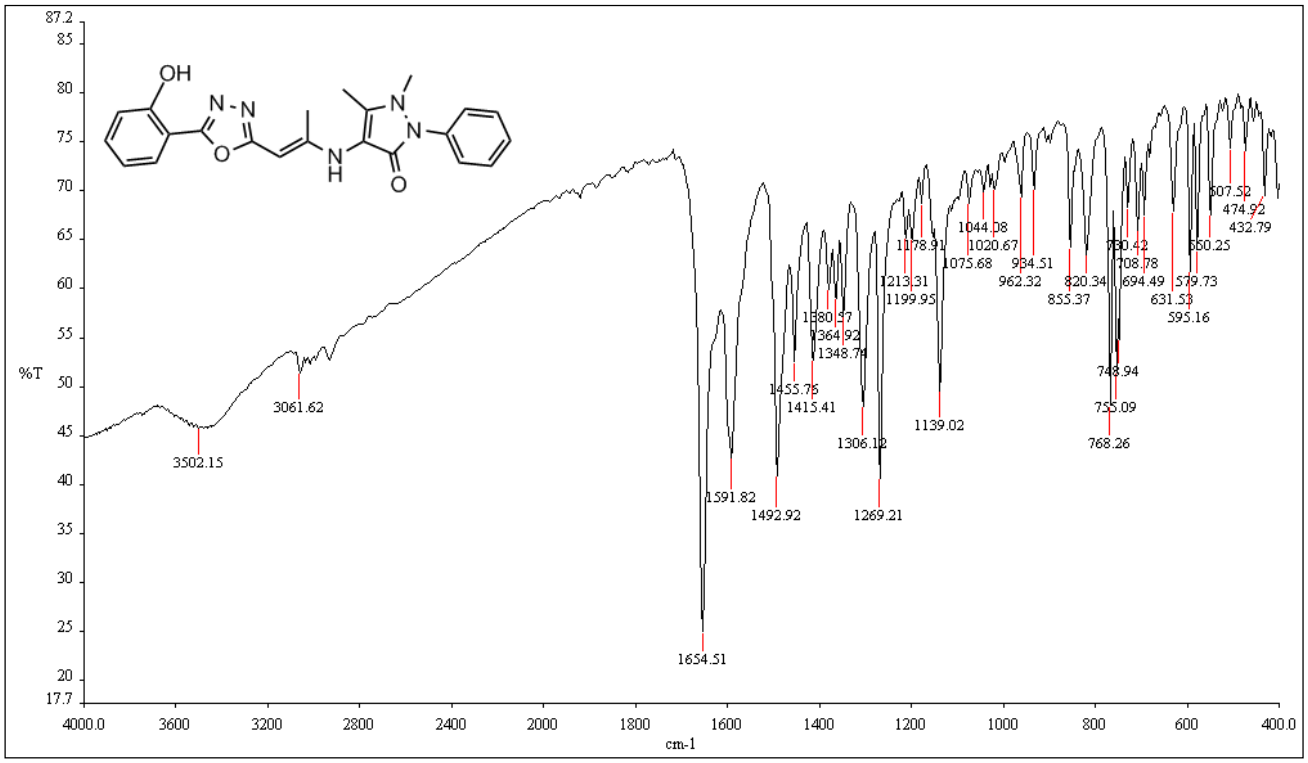


Figure-10: IR Spectrum for Compound (4)

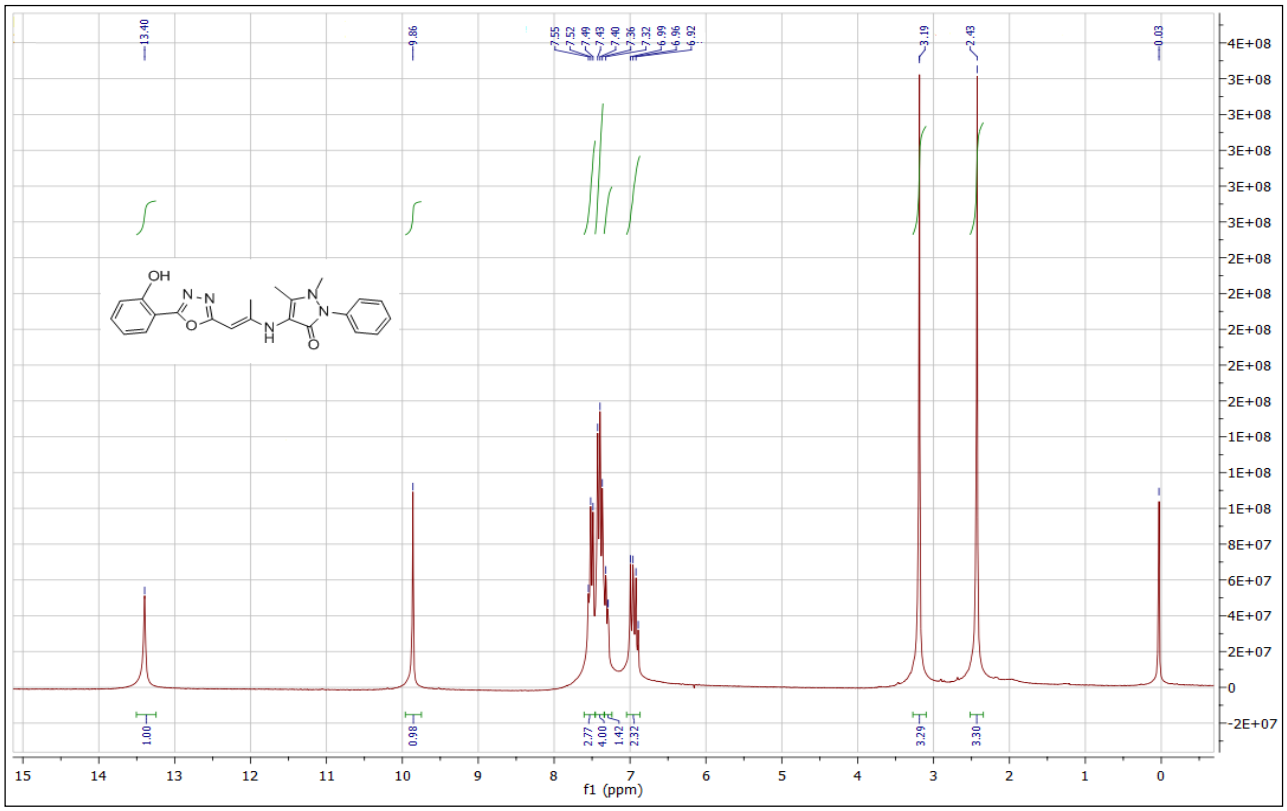


Figure-11: ^{1}H-NMR Spectrum for Compound (4)

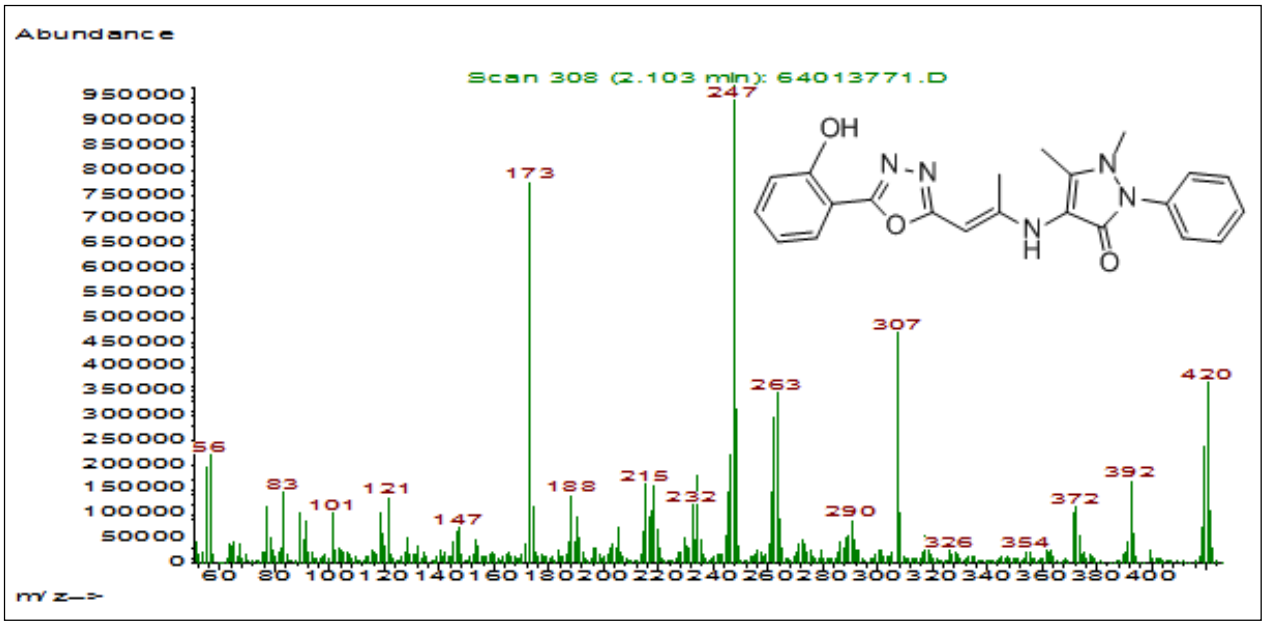


Figure-12: Mass Spectrum for Compound (4)