

# Design-Syntheses, Characterization and Biological Activity Studies of Azobenzene-P,P'-Di(3,1-Benzoxazin-4-One-2yl) and Azobenzene-P,P'-Di[(3-Substituted-4(3H)Quinazolinone-2yl) Derivatives

Zakaria H Aiube<sup>1</sup> and Zainab A Jabarah<sup>2\*</sup>

<sup>1</sup>Chemistry Department, College of Education for Pure Science, University of Baghdad, Ibn-al-Haitham, Baghdad, Iraq

<sup>2</sup>Basic Science Division, College of Agriculture, University of Baghdad, Baghdad, Iraq

## Abstract

Sixteen azobenzene-p,p'-di[3-substituted-4(3H)quinazolinone-2yl] were synthesized from reaction of azobenzene-p,p'-di(3,1-benzoxazin-4-one-2yl) with amino-moieties nucleophiles, like hydrazinehydrate, hydroxylamine, p,toluidine, p-aminobenzene sulphonamide, 2-pyrimidine, 5-nitro-2-aminopyridine, ethyleneamine, 5-(p-bromo) phenyl-2-aminothiazol, p,p'-diamino diphenyl sulphone, quinidine hydrochloride, urea, thiourea, 3,5-dimethyl-2-phenyl-4-aminopyrazolin-3-one, N(5-methyl-3-isoxazolyl)-p-aminobenzene sulphonamide, semicarbazide and thiosemicarbazide, in a molar ratio (1:2) respectively. azobenzene-p,p'-di(3,1-benzoxazin-4-one-2yl), was synthesized by following serial synthetic pathway. Reductive-condensation of p-nitrobenzoic acid in basic media give azobenzene-p,p'-dicarboxylic acid, then treated with thionyl chloride to give azobenzene-p,p'-diacid chloride. It condensed with anthranilic acid to give azobenzene-p,p'-[(dibenzoic acid-2yl)dicarboxamide], upon treatment with thionyl chloride give azobenzene-p,p'-di(3,1-benzoxazin-4-one-2yl). All synthesized compounds characterized by FTIR, <sup>1</sup>HNMR, <sup>13</sup>CNMR and mass spectral analyses. All synthesized azobenzene-p,p'-di(3,1-benzoxazin-4-one-2yl), and sixteen azobenzene-p,p'-di[3-substituted-4(3H)quinazolinone-2yl] compounds, were examined as antibacterial agents against gm(+ve and -ve) bacteria, and antifungal agents. Results showed broad extended to moderate effects as antibacterial and antifungal agents.

**Keywords:** Azobenzene; Benzoxazinone; Quinazolinone; Antibacterial; Antifungal

## Introduction

2-substituted-3,1-benzoxazin-4-one derivatives can be considered as semi-acid anhydrides, which undergo many reactions of true acid anhydrides, but at a slower rate [1]. This special reactivity allows these types of heterocyclic compounds to have broad spectrum in medical, biological and industrial fields [1,2]. This class of compounds, found to be useful as antimicrobial [3], anti-platelet aggregation [4], human leukocyte elastase inhibitors [5], receptor agonist active [6], receptor antagonist active [7], enzyme inhibitor [8], protease inhibitor [9-11], fungicidal [12], pesticidal [7]. Also 2-substituted-3,1-benzoxazin-4-one derivatives, showed some important industrial applications in syntheses of polymeric material [13], optical bleaching agent [14], and cosmetic [15]. On the other hand, they are used as precursors for syntheses of variety of 2,3-disubstituted quinazolin-4-one derivatives [16-19]. Which are known to have medical and biological properties, through reaction with nitrogen nucleophiles [20]. Quinazolinones are class of fused heterocyclic compounds, of two fused benzene and pyrimidinone rings; they are active compounds, exhibiting a broader spectrum of biological activities in animal, as well as in human [21,22]. Literature studies on quinazolinones have shown, that these derivatives possess a wide variety of biological activities, such as antioxidant [23], antifungal [24], antibacterial [25], anticonvulsant [26], anti-inflammatory [27], antihyperlipidemic [28], anticancer [29], antimalarial [30], antispasmodial [31], analgesic [32], antiviral [33], antitubercular [34] and antimicrobial activities [35]. In our work we design syntheses many of di[(3-substituted-4(3H)quinazolinone-2yl) moieties, substituted at (p,p')-position of bridged azobenzene molecule, via di(3,1-benzoxazin-4-one-2yl) moiety, substituted at (p,p')-positions of bridged azobenzene molecule.

## Materials and Methods

### Synthesis of azobenzene-p,p'-dicarboxylic acid [I]

This compound was obtained by condensation of p-nitrobenzoic acid with itself in basic media in presence of reducing agent like glucose, then upon air-oxidation give azobenzene-p,p'-dicarboxylic acid, yield 48%, m.p. 302, lit. >300°C [36].

### Synthesis of azobenzene-p,p'-diacid chloride [II]

A mixture of azobenzene-p,p'-dicarboxylic acid (0.27 gm, 0.001mol), excess of thionyl chloride (10 ml), and dry pyridine (3 ml), was refluxed for 2 hours. Reaction mixture was extracted several times with n-hexane, and then rotary evaporated. Resulting residue was washed with dry diethyl ether, recrystallized from petroleum ether to give compound [II]. 0.28 gm, yield 91.2%, m.p. 154°C.

### Synthesis of azobenzene-p,p'-[(dibenzoic acid-2yl)di carboxamide] [III]

To a clear stirred solution of azobenzene-p,p'-diacid chloride (0.307 gm, 0.001mol) in dry benzene (50 ml) containing dry pyridine (5 ml), anthranilic acid (0.274 gm, 0.002mol) was added. Reaction mixture

\*Corresponding author: Zainab A Jabarah, Basic Science Division, College of Agriculture, University of Baghdad, Baghdad, Iraq, Tel: 009647901300655; E-mail: zainab2004a@yahoo.com

Received May 22, 2017; Accepted May 24, 2017; Published June 12, 2017

**Citation:** Aiube ZH, Jabarah ZA (2017) Design-Syntheses, Characterization and Biological Activity Studies of Azobenzene-P,P'-Di(3,1-Benzoxazin-4-One-2yl) and Azobenzene-P,P'-Di[(3-Substituted-4(3H)Quinazolinone-2yl) Derivatives. Chem Sci J 8: 156. doi: 10.4172/2150-3494.1000156

**Copyright:** © 2017 Aiube ZH, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

was stirred for further 5 hours, until completion of reaction which was monitored by TLC, using ethyl acetate: ethanol [2:3] eluent. A precipitate was formed, filtered, washed with distilled water, recrystallized from benzene, to give compound [III]. 0.4 gm, yield 80.7%, m.p. 288-290°C.

### Synthesis of azobenzen-p,p'-di[3,1-benzoxazine-4-one-2yl] [IV]

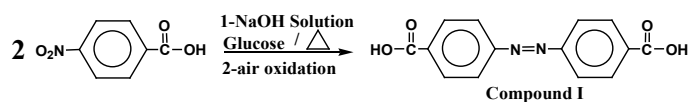
To a clear solution of azobenzen-p,p'-[(dibenzoic acid-2yl) dicarboxamide] (0.508 gm, 0.001mol) in excess of thionyl chloride (10 ml), dry pyridine (5 ml), was reflux for 2 hours, until completion of reaction which was monitored by TLC, using ethyl acetate : ethanol [2:3] eluent. A solid was formed. Reaction mixture was cooled; solid was formed, filtered and washed with dry diethyl ether, recrystallized from DMF, to give compound [IV]. 0.4 gm, yield 84.74%, m.p. 320°C.

### Syntheses of azobenzen-p,p'-di[3-substituted-4(3H)-quinazolinone-2yl] [Va-Vp]

A mixture of azobenzen-p,p'-di[3,1-benzoxazine-4-one-2yl] (0.472 gm: 0.001 mol), and amino moieties compounds, like hydrazine hydrate, hydroxylamine hydrochloride, quinidine, urea, thiourea, semicarbazide, thiosemicarbazide, aromatic and hetro-aromatic amines, 1,2-diaminoethane dihydrochloride (0.002 mol) (Table 1) in DMF (25 ml), was refluxed for a time (Table 1), until completion of reactions were monitored by TLC using petroleum ether : ethyl acetate [3:2] eluent. Solids were separated, filtered and purified by crystallization from suitable solvents (mentioned in Table 1), to give azobenzen-p,p'-di[3-substituted -4(3H)-quinazolinone-2yl] [Va-Vp].

### Discussion

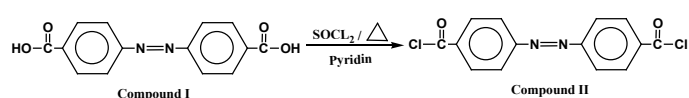
Chemistry of benzoxazine, quinazolin, quinazolinone and their derivatives have much considerable attention, due to effective biological and pharmacological importance. Awing to these reasons, we design to synthesis anew benzoaxazin-4-one and quinazolin-4-one derivatives. We design syntheses many of di[(3-substituted-4(3H)quinazolinone-2yl) moieties, substituted at (p,p')-position of bridged azobenzene molecule, via di(3,1-benzoxazin-4-one-2yl) moiety, substituted at (p,p')-positions of bridged azobenzene molecule, according to the following synthetic routes.



### Synthesis of azobenzene-p,p'-dicarboxylic acid [I] [36]

This compound was synthesized in by reductive-condensation, then air-oxidation of basic solution of p-nitrobenzoic acid. Characterized by CHN-analysis and FTIR-spectral analysis, CHN-analysis was agreed with theoretical data. FTIR-spectrum of this compound [I], showed stretching bands of (-OH broad), (C=O and N=N) groups at (3437-2544, 1693 and 1693 cm<sup>-1</sup>) respectively.

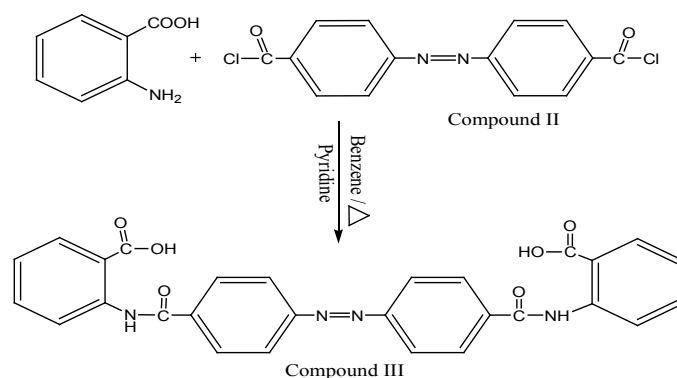
### Synthesis of azobenzen-p,p'-diacid chloride [II]



Heating compound [I] with excess of thionyl chloride in presence of pyridine, give good yield of compound [II], which was characterized by CHN- analysis, FTIR, 1H NMR, 13 CNMR and mass spectral analyses.

CHN- analysis was agreed with theoretical data. IR-spectrum of this compound [II], showed stretching bonds vibration of C=O and N=N at 1774 and 1577 cm<sup>-1</sup> respectively. While 1H NMR-spectrum showed only aromatic protons (8H,m) at (7.9 - 8.2) ppm. 13C NMR-spectrum showed C=O and aromatic carbons signals at (166 and 122-134) ppm respectively. Mass spectral analysis showed molecular ion (M+2) and (M+2H)+2 ions at m/z 307 and 309 respectively.

### Synthesis of azobenzene-p,p'-[(dibenzoic acid-2yl)dicarboxamide] [III]



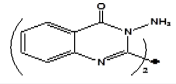
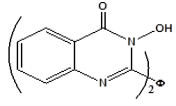
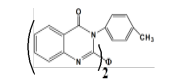
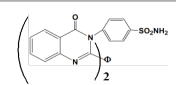
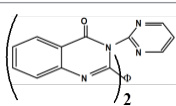
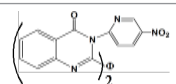
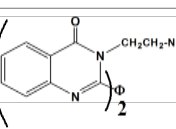
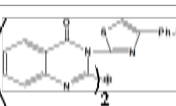
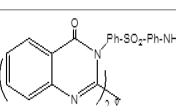
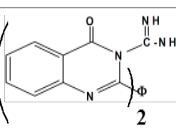
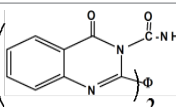
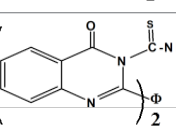
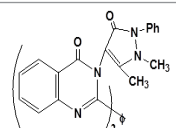
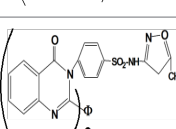
Condensation of compound[II] with anthranilic acid in molar ratio (1:2) in presence of pyridine give compound[III], which was characterized by CHN-analysis, FTIR, 1H NMR, 13C NMR and Mass spectral analysis. CHN- analysis was agreed with calculated data. IR-spectrum showed stretching bands of (OH, NH, C=O, and N=N) groups at 3232, 3309 (broad), 3230, 1676 and 1450 cm<sup>-1</sup> respectively, beside (C=O), (amide I) and (NH)-bending (amide II) bands at 1608 and 1584 cm<sup>-1</sup> respectively. While 1H NMR-spectral analysis showed protons of carboxyl as (2H, s) at (12) ppm, amide NH as (2H,s) at (8.6 ppm) and aromatic as (16H,m) at (7.1-8.5) ppm [37]. But 13C NMR-spectrum showed carboxyl and carboxamide carbon as a singlet signals at (169, 164) ppm respectively, beside multiplet signal of aromatic carbons at (120 - 153) ppm. Mass spectrum showed, (M+H)+2 and (M+2H)+2 ions at m/z=(309 and 310) respectively.

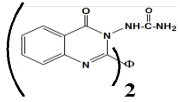
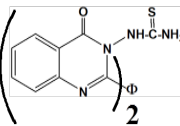
### Synthesis of azobenzene p,p'-di[3,1-benzoxazine-4-one-2yl] [IV]

Heating compound [III] with excess of thionyl chloride in presence of pyridine, to give compound [IV], Which was characterized by CHN-analysis, FTIR, 1H NMR, 13C NMR and Mass spectral analysis. CHN-analysis was identical to calculated data. IR-spectrum show C=O cyclic ester), C=N and N=N stretching bands at 1762, 1604, 1570 cm<sup>-1</sup> respectively. 1H NMR- spectrum showed only aromatic proton as (16H,m) at (7.5-8.5) ppm. While 13C NMR showed C=O (cyclic ester), C=N carbons as singlet signal at (179, 153 ppm), beside multiplet aromatic carbon at (117 - 150) ppm respectively. Mass spectral analysis does not show molecular ion M+2 at m/z (472), but showed fragmented ions m/z (236), probably obtained from molecular ion decomposition with charge is considered to be localized at azo-nitrogen atoms of synthesized molecule of compound [IV] as in the following fragments:

### Synthesis of azobenzen-p,p'-di[3-substituted-4(3H)-quinazolinone-2yl] [Va-Vp]

Heating compound [IV] with amino-moiety compounds, given in Table 1, in molar ratio (1:2) give azobenzen-p,p'-di[3-substituted-4(3H)-quinazolinone-2yl] [Va-Vp], which were characterized by FTIR-

No	Amino-moieties	Refluxed time	No	Structure formula	Weight of product(gm)	Yield%	Crystallizing solvent
1	Hydrazine hydrate	8 hr	Va		0.53	88	DMF
2	Hydroxylammonium chloride	6 hr	Vb		0.4	78	DMF
4	p-toluidine	7 hr	Vc		0.3	46	DMSO
5	p-Aminobenzenesulphonamide	8 hr	Vd		0.4	51	DMF
6	2-aminopyrimidine	6 hr	Ve		0.48	77	DMSO
7	2-amino-5-nitropyridine	8 hr	Vf		0.44	61	DMSO
8	1,2-diaminoethanedihydrochloride	6 hr	Vg		0.45	81	DMF
9	2-Amino-5(p-bromo)phenyl-1,3-thiazole	7 hr	Vh		0.42	49	DMSO
10	4,4'-diaminodiphenylsulphone	8 hr	Vi		0.45	52	DMF
11	Quinidine hydrochloride	5 hr	Vj		0.47	85	DMF
12	Urea	5 hr	Vk		0.43	77	DMF
13	Thiourea	5 hr	VI		0.42	71	DMSO
14	4-amin-1,5-dimethyl-2-phenyl-3-pyrazolin-5-one(amino antipyrine)	10 hr	Vm		0.38	46	DMF
15	4-amino-N(5-methyl-3-isoxaly) benzenesulphonamide	10 hr	Vn		0.41	43	DMSO

16	Semicarbazide	8 hr	Vo		0.4	71	DMF
17	Thiosemicarbazide	8 hr	Vp		0.4	69	DMF

**Table 1:** Reaction of azobenzen-p,p'-di(3,1-benzoxazin-4-one-2yl)[4], with amino-moieties to give azobenzene-p,p'-di[(3-substituted)-4(3H)quinazolinone-2yl] compounds [5a-5p].

No.	FTIR $\nu$ $\text{cm}^{-1}$					$^1\text{H}$ NMR $\delta$ ppm		$^{13}\text{C}$ NMR		
	$\text{NH}_2$	OH	CH Ar.	C=O	N=N	CH Ar.	others	CH Ar.	C=N	C=O
Va	3307-3215	-	3051	1664	1583	7.2-8.1	-	121-153	153	170
Vb	-	3417	3066	1635	1489	6.8-9	10.2 OH	119-131	153	168
Vc	-	-	2929, 3180	1653	1444	6.5-9.2	4.01 $\text{CH}_3$	120-135	153	164
Vd	3464 3236	-	3116	1670	1450	6.5-8.2	9.9 $\text{NH}_2$	112-152	152	179
Ve	-	-	3068	1676	1455	7.2-8.2	-	117-153	153	168
Vf	-	-	3118	1666	1450	-	-	-	-	-
Vg	3433 3213	-	3050	1661	1450	6.3-8.4	4.01 $\text{CH}_2$	111-153	153	164
Vh	-	-	3100	1629	1454	-	-	-	-	-
Vi	3275 3210	-	3116	1666	1446	-	-	-	-	-
Vj	3414 3332 3221	-	3095	1620	1448	6.3-8.8	8.5 $\text{NH}_2$	119-153	153	162
Vk	3367 3217	-	3036	1654	1446	6.2-8.4	8.4 $\text{NH}_2$	120-158	158	161 183
VI	3367 3174	-	3082	1677	1450	6.2-9.9	8.5 $\text{NH}_2$	110-137	154	162 192
Vm	-	-	2935 2808 3045	1672	1446	-	-	-	-	-
Vn	3226	-	2995 3118	1680	1444	-	-	-	-	-
Vo	3400 3398 3220	-	3178	1670	1450	7.04-8.3	9.9, 10.7 NH & NH <sub>2</sub>	119-140	153	160 177
Vp	3429 3309 3217	-	3101	1670	1469	7.2-8.3	10.5	110-153	153	180 194

**Table 2:** Physical parameter of Synthesis for azobenzen-p,p'-di[(3-substituted)-4(3H)-quinazolinone 2yl][Va-Vp].

No.	Name of compounds	Mean of Inhibition zone Diameter (mm)					
		<i>Staphylococcus aureus</i>	<i>Bacillus</i>	<i>Escherichia coli</i>	No. <i>Klebsiella pneumonia</i>	<i>Aspergillus flavus</i>	<i>Penicillium</i>
IV	Azobenzen-p,p'-di[3,1-benzoxazine-4-one-2-yl]	22	-	16	10	13	10
Va	Azobenzen-p,p'-di[3-amino-4(3H)quinazolinone-2yl]	20	17	8	12	12	-
Vb	Azobenzen-p,p'-di[3-hydroxy-4(3H)quinazolinone-2yl]	23	30	8	10	11	13
Vc	Azobenzen-p,p'-di[3,p-touldino-4(3H)quinazolinone-2yl]	17	-	-	11	8	16
Vd	Azobenzen-p,p'-di[3,p-benzenesulfoneamido-4(3H)quinazolinone-2yl]	20	9	8	12	12	25
Ve	Azobenzen-p,p'-di[3,p-pyrimidino-4(3H)quinazolinone-2yl]	8	-	8	8	10	12
Vf	Azobenzen-p,p'-di[3,5'-nitro-2'-pyridin-2'-yl-4(3H)quinazolinone-2yl]	9	13	8	8	9	12
Vg	Azobenzen-p,p'-di[3,2'-ethylamino-4(3H)quinazolinone-2yl]	8	8	8	8	-	-
Vh	Azobenzene-p,p'-di[3,4'-p-bromophenyl-2'-(1',3'-thiozoly)-4(3H)quinazolinone-2yl]	16	15	15	15	11	28
Vi	Azobenzen-p,p'-di[3(p-4'-aminodiphenylsulfone)-4(3H)quinazolinone-2yl]	8	15	8	15	15	16
Vj	Azobenzen-p,p'-di[3-imidino-4(3H)quinazolinone-2yl]	8	11	10	10	-	-
Vk	Azobenzen-p,p'-di[3-carbomido-4(3H)quinazolinone-2yl]	8	8	-	8	-	-

Vl	Azobenzen-p,p'-di[3-thiocarbomido-4(3H)quinazolinone-2yl]	8	13	10	9	12	9
Vm	Azobenzen-p,p'-di[3-(1',5'-dimethyl-2'-phenyl-3'-pyrazolinone)-4(3H)quinazolinone-2yl]	8	15	9	8	-	-
Vn	Azobenzen-p,p'-di[3-(5'-methyl-3'-isoxazolyl)benzenesulfoneamido-4(3H)quinazolinone-2yl]	8	8	8	9	14	9
Vo	Azobenzen-p,p'-di[3,N-ureido-4(3H)quinazolinone-2yl]	8	14	8	8	12	-
Vp	Azobenzen-p,p'-di[3,N-thioureido-4(3H)quinazolinone-2yl]	8	11	8	9	12	-

Table 3: Antimicrobial activity of compounds [IV-Vp].

spectral analysis, many of them characterized by <sup>1</sup>H NMR, <sup>13</sup>C NMR, and some of them by mass spectral analyses. IR-spectral analysis of compounds [Va-Vp], showed quinazolin-4-one ring stretching bonds C=O, and C=N, at rang (1680-1620), and (1635-1591) cm<sup>-1</sup>, azo-group (N=N) stretching bonds at rang (1489-1444) cm<sup>-1</sup>, as well as to starching of 3-substituted moieties [37] are given in Table 2 [37]. <sup>1</sup>H NMR spectrum of compounds [V(a, b, c, g, j, k, l, n, o, p)], showed beside quinazolinone aromatic proton as (16,m) at rang (6.5-9.2) ppm, protons signals of 3-substituted moieties, which were shown in Table 2. <sup>13</sup>C NMR- spectral analysis of compounds [V(a, b, c, g, j, k, l, n, o, p)], showed quinazolinone, (aromatic, C=O, C=N) carbon signals at (110-140), (163-180), (152-164) ppm, respectively, beside carbon signals of 3-substituted moieties, which are given in Table 2. Mass spectral analysis of compounds [Va, Vd] showed M+2 ions m/z (500, 780), and [Vb] showed [M-H]+2 ions at m/z (501), compound [Ve] dose not showed (M)+2 ions at m/z (626), but show fragmented ion at m/z (236), probably abstained by decomposition of molecular ion, with charge considered to be localized at azo-nitrogen atoms of this symmetrical compounds to give following fragmented ion:

### Anti-microbial study

Synthetic compounds [IV, V(a-p)], were examined as antibacterial agents against gm (+ve) *Staphylococcus aureus*, *Bacillus* bacteria, and gm (-ve) *Escherichia coli*, *Klebsiella*, *Pneumonia* bacteria, in comparison with effect of Cephalixin, Amoxicillin, Tetracycline Lincomycin antibiotics. Also these compound [IV, V(a-p)], were examined as agents against *Aspergillus flavus* and *Penicillium*, Fungi in comparison with effect of Nystatine and Fluconazole antifungal treatments. According to the results given in Table 3, following observation would be deduced.

- First: compounds [V(a, b, h, i)], were found to have a broadening effect on gram (+ve) *Bacillus* bacteria in comparison with effect of Cephalixin, Amoxicillin, Tetracycline antibiotics.
- Second: compounds [V(a, b, c, d)], were found to have moderate to higher antibacterial effect on gram (+ve) *Staphylococcus aureus* bacteria in comparison with effect of Cephalixin, Amoxicillin, and Tetracycline antibiotics.
- Third: compounds [V(a, d, h, i)], were found to have good to excellent antibacterial effect, against gram (-ve) *Klebsilla pneumonia* bacteria, in comparison with effect of Tetracycline antibiotics.
- Fourth: compounds [V(a, d, I, l, n, o, p)], were found to have a moderate to excellent antifungal effect on *Aspergillus fungi* in comparison with the effect of Nystatin and Fluconazole antifungal treatment. But compounds [V(c, d, h, i)], were found

to have moderate to excellent antifungal effect on *Penicillium* fungi in comparison with the effect of Nystatin and Fluconazole antifungal treatments.

### References

1. Maher A, Sameh A, Fakhry A (2012) Use of 2-Ethoxy(4H)-3,1-benzoxazin-4-one as a Precursor for Synthesis of Quinazolinone and Quinazolinone Starting Materials. Chemical and Process Engineering Research 2: 2225-0913.
2. Mehdi SH, Mohd W, Zuriati Z (2013) One-pot synthesis of 2-substituted H-3,1-benzoxazin-4-one derivatives under mild conditions using iminium cation from cyanuric chloride/dimethylformamide as a cyclizing agent. Chem Cent J 7: 58.
3. Mathew BP, Kumar A, Sharma S, Shukla PK, Nath M (2010) An eco-friendly synthesis and antimicrobial activities of dihydro-2H-benzo- and naphtho-1,3-oxazine derivatives. Eur J Med Chem 45: 1502-1507.
4. Pritchard KM, Rawi JA, Bradley C (2007) Synthesis, identification and antiplatelet evaluation of 2-morpholino substituted benzoxazines. Eur J Med Chem 42: 1200-1210.
5. Pei-Wen H, Tsong-Long H, Chin-Chung W, Fang-Rong C, Tsai-Wei T, et al. (2005) The evaluation of 2,8-disubstituted benzoxazinone derivatives as anti-inflammatory and anti-platelet aggregation agents. Bioorg Med Chem Lett 15: 2786-2789.
6. Ward E, Johnson N, Lovell JP, Smith W, Thewlis KM, et al. (2007) Studies on a series of potent, orally bioavailable, 5-HT(1) receptor ligands. Bioorg Med Chem Lett 17: 5214-5217.
7. Deswal S, Roy N (2006) Quantitative structure activity relationship of benzoxazinone derivatives as neuropeptide Y Y5 receptor antagonists. Eur J Med Chem 41: 552-557.
8. Peet NP, Angelastro MR, Burkhart JP (1997) Novel orally-active elastase inhibitors inhibitors. Germany, EP Patent 0529568.
9. Colson E, Wallach J, Hauteville M (2005) Synthesis and anti-elastase properties of amino-2-phenyl-3, 1-benzoxazin-4-one aminoacyl and dipeptidyl derivatives. Biochimie 87: 223-230.
10. Oshida J, Kawabata H, Kato Y, Kokubo M, Uejima Y (1991) 4H-3,1-benzoxazin-4-one compound and elastase inhibitor composition containing the same EP. Patent WO 1991012245 A1.
11. Krantz A, Spencer R, Tam T (1990) 4h-3,1-benzoxazin-4-ones and related compounds, pharmaceutical compositions containing them, and processes for their preparation. US Patent and Trademark Office: Washington, DC.
12. Besson T, Rees CW, Cottenceau G, Pons AM (1996) Antimicrobial evaluation of benzoxazin-4-ones, 3, 1-benzothiazin-4-ones, 4-alkoxyquinazolin-2-carbonitriles and-arylimino-1, 2, 3-dithiazoles. Bioorg Med Chem Lett 6: 2343-2348.
13. Bühler KU (1978) Spezial plaste. Berlin, Akademie, Spezial plaste, Berlin, Akademie.
14. El-Badry YA (2008) New routes for the synthesis of polysubstituted 4H-3,1-Benzoxazinone and polysubstituted quinazolinone derivatives and some studies with these derivatives. Shipro Kasei Kaisha Ltd, Japan.
15. Parkanyi C, Yuan HL, Stromberg BHE, Evenzahav A (1992) Synthesis of 5-fluoro-2-methyl-3-(2-trifluoromethyl-1,3,4-thiadiazol-5-yl)-4(3H)-quinazolinone and related compounds with, potential antiviral and anticancer activities. J Heterocycl Chem 29: 749.
16. Rastogi VK, Parmer SS, Singh SP, Akers TK (1978) Synthesis of 2-methyl-3-(3,5-diallyl-4-hydroxyphenyl)-4-quinazolones as possible anticonvulsants. J Heterocycl Chem 15: 497.

17. Kornet MJ, Varia T, Beaven W (1983) Synthesis and anticonvulsant activity of 3-amino-4(3H-quinazolinones. *J Heterocycl Chem* 20: 1553.
18. Khajavi MS, Montazari N, Hossaini SSS (1997) Reaction of Anthranilic Acid with Orthoesters a New Facile One-pot Synthesis of 2-Substituted 4H-3,1-Benzoxazin-4-ones. *J Chem Research S* 8: 1-8.
19. Connolly DJ, Cusack D, O'Sullivan TP, Guiry PJ (2005) Synthesis of quinazolinones and quinazolines. *Tetrahedron* 61: 10153-10202.
20. Srivastava M, Mishra B, Nizamuddin I. Cyclization of 2-ethylene ketal-cyclohexyl-1-propionamide in PPA-AcOH. *Ind J Chem* 40: 1248-1250.
21. Ueda M, Komatsu S (2017) *J Polym Sci Polym Chem* 27: 1017.
22. Venakata RR, Nadendla RR, Raja RR, Suthakaran R (2014) Microwave Assisted Synthesis, Characterization and Pharmacological Evaluation of Imidazo Quinazolinone Derivatives. *Int J Pharm Sci Rev Res* 29: 1-4.
23. Ahmed M, Rajab AEH, Sami AZ, Mohammed I, Mahmoud A, et al. (2015) Synthesis, Characterization and Antifungal Activity of Some Metal Complexes Derived from Quinoxaloylhydrazone. *World Journal of Organic Chemistry* 3: 1-8.
24. Nagaraju G, Naroop T, Manjusha V, Srinivasarao M, Poornima B (2013) Synthesis, characterization and biological evaluation of iodoquinazolinone derivatives. *AJPAMC* 1: 48-53.
25. Mohamed FZ (2014) *Journal of Taibah University Medical Sciences* 9: 104-109.
26. Abdel-Monem MF, Kouser AH, Mohamed AI (2013) Synthesis and Reactivity of 6-Iodo-4H-3,1-Benzoxazin-4-one Towards Nitrogen Nucleophiles and Their Antimicrobial Activities. *Chemical and Process Engineering Research* 15: 1-7.
27. Channe GD (2015) *Bioorganic & Medicinal Chemistry Letters* 25: 1072-1077.
28. Fawzia MR, Amr Y, Soad MAG, Aida MI, Mona AM (2005) The antihyperlipidemic activities of 4(3H) quinazolinone and two halogenated derivatives in rats. *Lipids in Health and Disease* 4: 22.
29. Yuvaraj G, Sathyamoorthy S, Venkatesh K, Vijyalakshmi M, Vivek V (2009) A Synthesis and In-vivo Anticancer Screening of 2-[[Bis-(2-Chloroethyl) Amino] Methyl]- 6, 8-Dinitro-1- (4-Substituted Ethyl)-1h-quinazolin-4-One Derivatives. *Academic Journal of Cancer Research* 2: 73-77.
30. Mohammed HB, Ariaya H, Belayneh K (2015) Synthesis and In- Vivo Pharmacological Evaluation of Some Novel 4(3h)-Quinazolinone Derivatives as Potential Anti-Malarial Agents. *IAJPR* 5: 1-10.
31. Belén Z, Andrés J, Lidia ML, Ignacio A, Antonio M (2006) Antiplasmodial activity of 3-trifluoromethyl-2-carbonylquinoxaline di-N-oxide derivatives. *Brazilian Journal of Pharmaceutical Sciences* 42: 357-361.
32. Rajveer CH, Kumaraswamy D, Sudharshini V, Stephen R (2010) Synthesis of some 6-bromo quinazolinone derivatives for their pharmacological activities. *Int J Pharma and Bio Sci* 1: 1-10
33. Ratnakar S, Kurwar PS, Milind P, Mohammad SY (2013) Synthesis and Anti-microbial Screening of some Novel Quinazolinone Derivatives. *IJPCBS* 3: 1269-1275.
34. Rahul VP, Premalata K, Dhanji PR, Kishor H (2012) Synthesis of Potential Antimicrobial/Antitubercular s-Triazine Scaffolds Endowed with Quinoline and Quinazolinone Heterocycles. *International Journal of Drug Design and Discovery* 3: 739.
35. Sucheta G, Dharmendra M, Ranjit S, Pal DK (2012) Synthesis Of Some Novel 4, 6-Disubstituted Derivatives and Evaluation of their Antimicrobial Activity. *IJPCBS* 2: 97-103.
36. Khalil F, Mohsen H (2007) New Aromatic Polyamide with Azo and Phosphine Oxide Groups in the Main Chain. *Turk J Chem* 31: 65-73.
37. Erno P, Philippe B, Martin B (2009) Structure determination of organic compounds. Springer.

**Citation:** Aiube ZH, Jabarah ZA (2017) Design-Syntheses, Characterization and Biological Activity Studies of Azobenzen-P,P'-Di(3,1-Benzoxazin-4-One-2yl) and Azobenzen-P,P'-Di[(3-Substituted-4(3h)Quinazolinone-2yl] Derivatives. Chem Sci J 8: 156. doi: [10.4172/2150-3494.1000156](https://doi.org/10.4172/2150-3494.1000156)

### OMICS International: Open Access Publication Benefits & Features

#### Unique features:

- Increased global visibility of articles through worldwide distribution and indexing
- Showcasing recent research output in a timely and updated manner
- Special issues on the current trends of scientific research

#### Special features:

- 700+ Open Access Journals
- 50,000+ editorial team
- Rapid review process
- Quality and quick editorial, review and publication processing
- Indexing at major indexing services
- Sharing Option: Social Networking Enabled
- Authors, Reviewers and Editors rewarded with online Scientific Credits
- Better discount for your subsequent articles

Submit your manuscript at: <http://www.omicsonline.org/submission>