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Synthesis of Novel Organic Compounds from Cyanuric Chloride Containing 1-(4-(7-Chloroquinolin-4-ylamino)phenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one Chalcone for Biological Applications

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This article reported the synthesis of triazine having quinoline chalcone moiety and its derivatives. Cyanuric chloride, 1-(4-(7-chloroquinolin-4-ylamino)phenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (KKC), aniline, 4-nitro aniline and 1-naphthol used for the synthesis. Triazine having chlorine atom was periodically replaced by the above materials to synthesize the desired product. Synthesized triazine based organic molecules were characterized using elemental analysis, FT-IR, ^{1}H NMR and UV-visible spectroscopic techniques. Antibacterial activity of synthesized compounds was found on Gram-positive and Gram-negative bacteria by utilizing MIC method, most of the synthesized compound shows higher activity on Gram-positive bacteria *Staphylococcus aureus* with the value of 7.81 (mg/mL) than Gram-negative *Escherichia coli*. The presence of quinoline chalcone moiety and electron rich species responsible for higher antibacterial activity of the compounds on the tested bacteria.

Keywords: Quinoline, Chalcone, Triazine, Synthesis, Antimicrobial activity.

INTRODUCTION

Condensed products of substituted aromatic aldehydes with simple or various substituted acetophenones are referred to as chalcones. Chalcone is a basic molecule that has been frequently utilized in drug development as a template. Antimicrobial [1], anti-inflammatory [2], analgesic [3], antiulcerative [4], immune-modulatory [5], antimalarial [6], anticancer, antiviral [7], antileishmanial [8], antioxidant [9], antiplatelet and antihyperglycemic [10] activities are all found in compounds with a chalcone backbone. This has been established in the literature. The synthesis of quinolinyl chalcones was disclosed by Dominguez *et al.* [11], who claimed that their compounds possessed antimalarial effects. Compounds with chalcone scaffold have been shown to have a variety of biological actions for many infectious illnesses, including malaria, as an important category of secondary metabolites of the flavonoid family [12]. Chalcone compounds including phenyl, allyl, alkoxy and hydroxyl groups have been shown to have excellent antibacterial activity [13]. These substituents have the ability to improve a compound's lipophilicity, which is a key characteristic in antimalarial action. In addition to that, the enone group in chalcone, which is situated between the phenyl rings, is crucial for antimalarial action because it binds better to the parasite's active sites [14,15]. Because natural supplies of chalcone compounds are insufficient to meet demand, these compounds can be manufactured and can be used for treating major diseases. Chalcone is a well-known precursor for making a variety of heterocyclic compounds. When chalcone is cyclized, it produces heterocyclic compounds with nitrogen-containing rings, such as pyrazoline and pyrimidine, which may have antimalarial properties. Pyrazoline is a five-membered heterocyclic ring with two adjacent nitrogen atoms [16-18], one is pyrrole-like nitrogen, which is non-basic and aromatic and has a lone pair involved in aromaticity and the other is pyridine like nitrogen, which is basic and nucleophilic and has a lone pair on a sp^2 orbital. Pyrazoline and pyrimidine also find excellent biological application especially antibacterial activity over many bacteria's [19].

Chalcone containing heterocyclic molecules show high biological activities, for this purpose triazine were used as an excellent intermediate for the preparation of various chalcone

derivatives. Last few years, antibacterial drug based on triazine attract attention of researchers to discover novel drug molecule. Especially agro based chemicals and variety of antibacterial drugs were derived from triazine containing chalcone moiety [20-23]. The presence of more than one chalcone moiety reveals wonderful anticancer activity of triazine containing chloro chalcone moiety which was previously confirmed by us using *in silico* method [24]. Anticancer activity increases with respect to the concentration of chloro chalcone.

Triazine is an excellent compound which can carry three different functional group in an alternate position [25]. The derivatives of triazine widely used as a drug molecule. Triazine derivatives of chalcone found applications in medicinal field especially used as an anticancer, antiviral and antifungal [26]. Most of the infections caused by bacteria, it is important to found new bacterial drug to overcome the bacterial diseases. Chalcone and its derivatives used as antibacterial drug over a decade. *S. aureus* bacteria is a harmful pathogen which causes serious infection even life threatening disease, chalcone having chloro atoms showed excellent activity over *S. aureus* [27].

Quinoline compounds are broadly used as a parent compound to make drugs (particularly antimalarial medicines), fungicides, biocides, alkaloids, dyes, rubber chemicals and flavouring agents. They have antiseptic and antipyretic properties. They are also used as catalyst, corrosion inhibitor, preservative and as solvent for resins and terpenes. They are used in transition-metal complex catalyst chemistry for uniform polymerization and luminescence chemistry. They are used as antifoaming agent in refinery field. Quinolines derivatives are significant compounds due to their biological applications such as antimalarial, anti-inflammatory and tyrosine kinase inhibiting agents. A few quinoline based chalcones are reported in literature [28,29]. Most of the quinolinyl chalcones are used as antimalarial [30,31], cytotoxicity in K 562 human leukaemia cell lines [32,33], antimalarial chemotherapy [34,35]. Antimalarials such as chloroquine and amodiaquine has 7-chloroquinoline moiety as an active pharmacophore which can facilitating binding to heme and consequently inhibiting hemozoin formation [36,37].

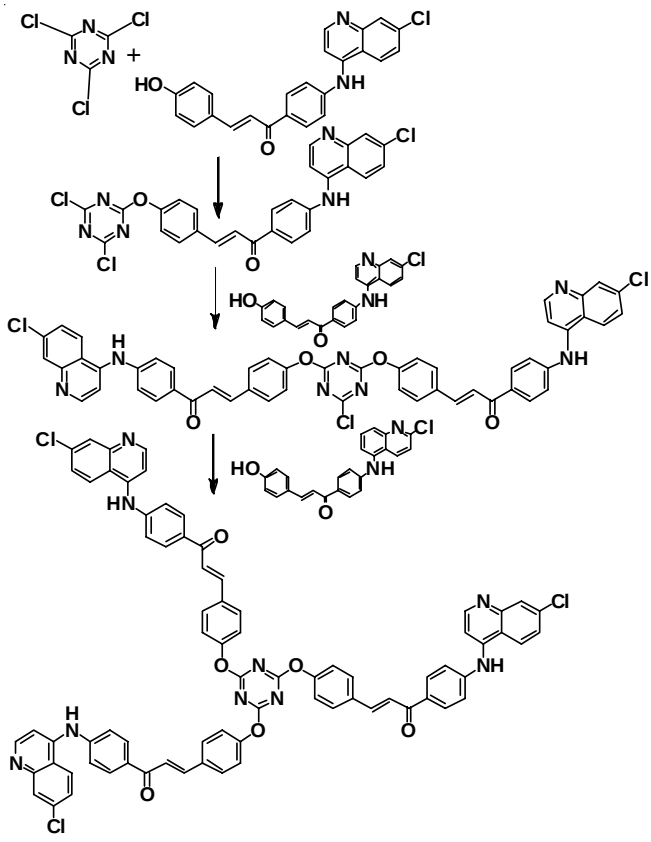
In present study, the synthesis of quinoline based chalcone derivatives using cyanuric chloride were synthesized and evaluated for the effective antibacterial activity. The synthesized compounds are confirmed by elemental analysis, FT-IR, ^{1}H NMR and UV-visible spectrometry techniques.

EXPERIMENTAL

All the solvents and chemicals *viz*. 4,7-dichloroquinoline (4,7-QL) and 4-aminoacetophenone (PAAP) were purchased from Merck and used as such 4-Hydroxybenzaldehyde, aniline, 4-nitroaniline, 1-naphthol and cyanuric chloride were procured from Aldrich Chemicals and used as such. The chalcone, 1-(4-(2-chloroquinolin-5-ylamino)phenyl)-3-(4-hydroxyphenyl)-prop-2-en-1-one (KKC) was synthesized according to the reported procedure [38].

^{1}H NMR spectra of the samples were run on a Bruker FT NMR spectrophotometer operating at 400 MHz using $CDCl_3$ (or) DMSO-d_6 as a solvent and TMS was used as an internal reference. ALPHA Bruker FT-IR spectrophotometer was used for recording IR spectrum and the spectra recorded using KBr pellet method. UV-absorption measurements were recorded using LABINDIA model UV 320 instrument by dissolving synthesized samples in HPLC grade THF. Melting points of all the synthesized compounds were determined in an open capillary method and are uncorrected.

Synthesis of 1-(4-((7-chloroquinolin-4-yl)amino)phenyl)-3-(4-((4,6-dichloro1,3,5-triazine-2-yl)(oxy)phenyl)prop-2-en-1-one (e_1): Cyanuric chloride (0.001 mol) dissolved in acetone was added slowly to a solution of 1-(4-(2-chloroquinolin-5-ylamino)phenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (KKC) (0.001 mol) dissolved in acetone containing 250 mL round bottom flask. To this solution, 10% Na_2CO_3 solution were added and the reaction was carried out for 3 h at 0-5 ºC. After the stirring, conversion was confirmed by TLC then the contents were poured in cold water with stirring, which results in the formation of the product as precipitate. The precipitate was separated out by filtration, washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-I**). FT-IR (KBr, ν_{max}, cm^{-1}): 3484 (NH), 3093 (Ar-CH-), 2959 (aliph. CH-), 1554 (CH=CH), 1664 (CO), 805 (CN) and 780 (C-Cl). UV (nm): 220 (CH=CH), 260 (CH=CH) and 316 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-8.2 (13 Ar-H), 6.9-7.0 (vinylic H) and 4.0 (NH).



Scheme-I: Synthesis of e_1, e_{11} and e_{111}

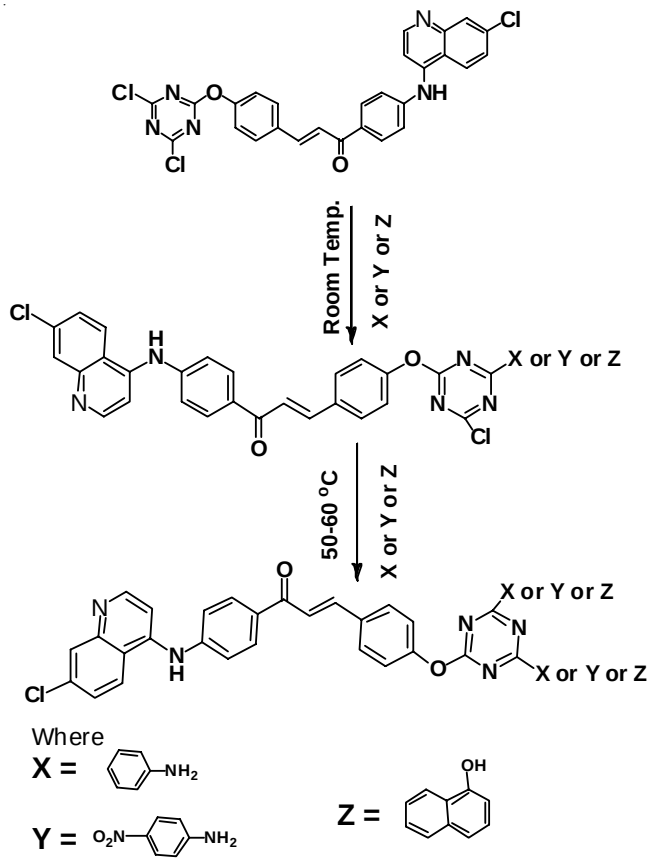
Synthesis of 3,3′-(((6-chloro-1,3,5-triazine-2,4-diyl)-*bis*)(oxy))*bis*(4,1-phenylene)*bis*(1-(4-((7-chloroquinolin-4-yl)amino)phenyl)prop-2-en-1-one (e_{11}): Compound e_1 (0.001

mol) dissolved in acetone was added slowly to a solution of 1-(2,4-dichlorophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (KKC) (0.001 mol) dissolved in acetone containing 250 mL round bottom flask to this solution 10% Na_2CO_3 solution were added and the reaction was carried out for 3 h at 30-40 ºC. After the stirring, conversion was confirmed by TLC and then the contents were poured in cold water with stirring, which results in the formation of product as precipitate. The precipitate was then separated out by filtration, washed several times using cold water, dried in vacuum at 50 ºC and then recrystallized with ethanol (**Scheme-I**). FT-IR (KBr, ν_{max}, cm^{-1}): 3493 (NH), 3075 (Ar-CH-), 2971 (aliphatic CH-), 1554 (CH=CH), 1652 (CO), 792 (CN) and 780 (C-Cl). UV (nm): 224 (CH=CH), 270 (CH=CH) and 322 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-8.0 (26 Ar-H), 6.9-7.0 (vinylic H) and 4.0 (2 NH).

Synthesis of 3,3′,3″-(((1,3,5-triazine-2,4,6-triyl)*tris*)-(oxy))*tris*(benzene-4,1-diyl)*tris*(1-(4-((7-chloroquinolin-4-yl)-amino)phenyl)prop-2-en-1-one (e_{111}): Compound e_{11} (0.001 mol) dissolved in acetone was added slowly to a solution of 1-(2,4-dichlorophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (KKC) (0.001 mol) dissolved in acetone. To this solution, 10% Na_2CO_3 solution was added and the reaction was carried out 3 h at 60-80 ºC. After the stirring, conversion was confirmed by TLC then poured the contents in cold water with stirring, which results in the formation of product e_{111} as precipitate. The precipitate was separated out by filtration, washed several times using cold water, dried in vacuum at 50 ºC and finally recrystallized with ethanol (**Scheme-I**). FT-IR (KBr, ν_{max}, cm^{-1}): 3466 (NH), 3071 (Ar-CH-), 2965 (aliph. CH-), 1563 (CH=CH), 1668 (CO), 808 (C≡N) and 780 (C-Cl). UV (nm): 226 (CH=CH), 278 (CH=CH) and 332 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-8.2 (39 Ar-H), 6.9-7.0 (vinylic 6H) and 4.0 (3NH).

Synthesis 3-(4-((4-chloro-6-(phenylamino)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4-((7-chloroquinolin-4-yl)amino)-phenyl)prop-2-en-1-one (f_1): Compound e_1 (0.001 mol) dissolved in acetone was added slowly to a solution of aniline (0.001 mol) dissolved in acetone followed by the addition of 10% Na_2CO_3 solution and the reaction was carried out for 3 h at 30-40 ºC. After the constant stirring, conversion was confirmed by TLC, then the contents were poured in cold water, which results in the formation of product as precipitate. The precipitate was separated out by filtration and washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-II**). FT-IR (KBr, ν_{max}, cm^{-1}): 3482 (NH), 3073 (Ar-CH-), 2921 (aliph. CH-), 1567 (CH=CH), 1654 (CO), 805 (CN) and 714 (C-Cl). UV (nm): 252 (CH=CH) and 308 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-8.0 (18 Ar-H), 6.9-7.0 (vinylic 2H) and 4.0 (2NH).

Synthesis of 3-(4-((4,6-*bis*((phenylamino)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4((7-chloroquinolin-4-yl)amino)-phenyl)prop-2-en-1-one (f_{11}): Compound f_1 (0.001 mol) dissolved in acetone was added slowly to a solution of aniline (0.001 mol) dissolved in acetone followed by the addition of 10% Na_2CO_3 solution and then the reaction was carried out for 3 h at 60-80 ºC. After the constant stirring, conversion was confirmed by TLC and then the contents were poured in cold water, which results in the formation of product as precipitate.



Scheme-II: Synthesis of f_1, g_1, h_1, f_{11}, g_{11} and h_{11}

The precipitate was separated out by filtration and washed several times using cold water and dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-II**). FT-IR (KBr, ν_{max}, cm^{-1}): 3489 (NH), 3098 (Ar-CH-), 2917 (aliph. CH-), 1567 (CH=CH), 1668 (CO) and 820 (CN). UV (nm): 262 (CH=CH) and 328 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-7.8 (23 Ar-H), 6.9-7.0 (vinylic 2H) and 4.0 (3NH).

Synthesis of 3-(4-((4-chloro-6-(nitrophenyl)amino)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4 ((7-chloroquinolin-4-yl)amino)phenyl)prop-2-en-1-one (g_1): Compound e_1 (0.001 mol) dissolved in acetone was added slowly to a solution of 4-nitroaniline (0.001 mol) dissolved in acetone followed by the addition of 10% Na_2CO_3 solution and the reaction was carried out for 3 h at 30-40 ºC. After the constant stirring, conversion was confirmed by TLC and then the contents were poured in cold water, which results in the formation of the product as precipitate. The precipitate was separated out by filtration and washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-II**). FT-IR (KBr, ν_{max}, cm^{-1}): 3489 (NH), 3032 (Ar-CH-), 2917 (aliph. CH-), 1590 (CH=CH), 1658 (CO), 1570 (Ar-NO_3) and 814 (CN). UV (nm): 256 (CH=CH) and 328 (n–π^*). ^{1}H NMR (δ, ppm): 7.3-8.2 (17 Ar-H), 6.9-7.0 (vinylic 2H) and 3.9 (2NH).

Synthesis of 3-(4-((4,6-*bis*(nitrophenyl)amino)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4((7-chloroquinolin-4-yl)amino)-phenyl)prop-2-en-1-one (g_{11}): Compound g_1 (0.001 mol) dissolved in acetone was added slowly to a solution of 4-nitroaniline (0.001 mol) dissolved in acetone followed by

the addition of 10% Na_2CO_3 solution and then the reaction was carried out for 3 h at 60-80 ºC. After the stirring, conversion was confirmed by TLC and then the contents were poured in the cold water, which results in the formation of compound as precipitate. The precipitate was separated out by filtration and washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-II**). FT-IR (KBr, ν_{max}, cm^{-1}): 3489 (NH), 3032 (Ar-CH-), 2917 (aliph. CH-), 1597 (CH=CH), 1659 (CO), 1569 (Ar-NO_3) and 811 (C≡N). UV (nm): 254 (CH=CH) and 322 (n–π^*). ^{1}H NMR (δ, ppm): 7.4-8.2 (21 Ar-H), 6.9-7.0 (vinylic 3H) and 4 (3NH).

Synthesis of 3-(4-((4-chloro-6-(naphthalen-1-yloxy)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4 ((7-chloroquinolin-4-yl)amino)phenyl)prop-2-en-1-one (h_1): Compound e_1 (0.001 mol) dissolved in acetone was added slowly to a solution of 4-nitroaniline (0.001 mol) dissolved in acetone followed by the addition of 10% Na_2CO_3 solution and then the reaction was carried out for 3 h at 30-40 ºC. After the constant stirring, conversion was confirmed by TLC and then the contents were poured in cold water with stirring, which results in the formation of product as precipitate. The precipitate was separated out by filtration, washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol (**Scheme-II**). FT-IR (KBr, ν_{max}, cm^{-1}): 3032 (Ar-CH-), 2990 (aliph. CH-), 1597 (CH=CH), 1643 (CO) and 811 (C≡N). UV (nm): 216 (CH=CH) and 332 (n–π^*). ^{1}H NMR (δ, ppm): 7.1-8.2 (20 Ar-H), 6.9-7.0 (vinylic 2H) and 4 (NH).

Synthesis of 3-(4-((4,6-*bis*(naphthalen-1-yloxy)-1,3,5-triazin-2-yl)oxy)phenyl)-1-(4((7-chloroquinolin-4-yl)-amino)phenyl)prop-2-en-1-one (h_{11}): Compound h_1 (0.001 mol) dissolved in acetone was added slowly to a solution of 4-nitroaniline (0.001 mol) dissolved in acetone followed by the addition of 10% Na_2CO_3 solution were added and the reaction was carried out for 3 h at 60-80 ºC. After the stirring, conversion was confirmed by TLC and then the contents were poured in cold water with constant stirring, which results in the formation of precipitate **(Scheme-II)**. The precipitate was separated out by filtration, washed several times using cold water, dried in vacuum at 50 ºC and recrystallized with ethanol. FT-IR (KBr, ν_{max}, cm^{-1}): 3032 (Ar-CH-), 2990 (aliph. CH-), 1597 (CH=CH), 1645 (CO) and 811 (C≡N). UV (nm): 262 (CH=CH) and 336 (n–π^*). ^{1}H NMR (δ, ppm): 7.4-8.0 (27 Ar-H), 6.9-7.0 (vinylic 2H) and 4 (NH).

Antimicrobial activity: All synthesized compounds were screened for their antibacterial activity by MIC method [24] using the *Staphylococcus aureus* MTCC3381 (Gram-positive) and *Escherichia coli* MTCC739 (Gram-negative) bacteria.

Minimum inhibitory concentration (MIC): The minimum inhibitory concentration (MIC), which is considered as the least concentration of the sample inhibits the visible growth of a microbe was determined by the broth dilution method.

Preparation of inoculate: Organisms were subcultured on nutrient agar, followed by incubation for 24 h at 37 ºC. Inoculate were prepared by transferring several colonies of microorganisms to sterile nutrient broth. The suspensions were mixed and incubated for 24 h at 37 ºC. Required volume of suspension culture was diluted to match the turbidity of 0.5 McFarland standards (1.5×10^8 CFU/mL).

Preparation of sample: Samples were prepared in DMSO at the concentration of 2 mg/mL.

Broth dilution assay: A series of 15 tubes were filled with 0.5 mL sterilized nutrient broth. Sequentially, test tubes 2-14 received an additional 0.5 mL of the sample serially diluted to create a concentration sequence from 500-0.06 µg/mL. The first tube served as the control. All the tubes received 0.5 mL of inoculums. The tubes were vortexed and incubated for 24 h at 37 ºC. The resulting turbidity was observed and after 24 h MIC was determined to be where growth was no longer visible by assessment of turbidity by optical density readings at 600 nm.

RESULTS AND DISCUSSION

The physico-chemical parameters of all the synthesised novel compounds e_1, e_{11}, e_{111} with cyanuric chloride and 1-(4-(2-chloroquinolin-5-ylamino)-phenyl)-3-(4-hydroxyphenyl)-prop-2-en-1-one (KKC) and six other compounds namely f_1, f_{11}, g_1, g_{11}, h_1 and h_{11}, were synthesized using e_1, aniline, 4-nitroaniline and 1-naphthol are given in Table-1. The synthesized compounds are freely soluble in DMSO, DMF, acetone, $CDCl_3$ and tetrahydrofuran, but insoluble in hexane, benzene (Table-2).

The entire synthesized molecules were characterized with FT-IR, NMR and UV spectroscopic techniques. The FT-IR analysis confirmed the formation of the synthesized molecules, the absence of stretching vibration around 3030 cm^{-1} in compounds e_1, e_{11} and e_{111} confirmed the incorporation of synthesized

TABLE-1
PHYSICO-CHEMICAL DATA OF THE SYNTHESIZED COMPOUNDS AND ITS MIC VALUES

Compd.	m.w.	m.p. (°C)	Elemental analysis (Found) (%)					MIC value (µg/mL)	
			C	H	Cl	N	O	*S. aureus*	*E. coli*
CY	–	–	–	–	–	–	–	31.25	31.25
e_1	548.8	160-162	59.09	2.94	19.38	12.76	5.83	31.25	31.25
e_{11}	931.2	228-230	67.08	3.53	11.65	10.74	7.0	7.85	15.63
e_{111}	1277	277-278	70.51	3.79	8.32	9.87	7.51	15.63	31.25
f_1	605.3	102-103	65.46	3.66	11.71	13.88	5.28	15.63	31.25
f_{11}	661.9	173-174	69.69	3.53	10.80	10.67	7.31	7.81	31.25
g_1	650.5	181-182	64.34	3.60	5.76	15.92	10.39	62.5	62.5
g_{11}	752.1	205-206	70.74	4.26	5.35	14.81	4.83	125	125
h_1	656.5	185-186	73.87	3.96	4.64	9.16	8.37	62.5	250
h_{11}	764.2	208-210	62.28	3.48	4.71	16.76	12.76	125	125

TABLE-2
SOLUBILITY DATA OF THE SYNTHESIZED COMPOUNDS

Synthesized compounds	H_2O	MeOH	EtOH	CCl_4	$CHCl_3$	DMSO	DMF	Acetone	C_6H_6	THF	*n*-Hexane
KKC	–	+	+	+	+	+	+	+	+	+	–
$\mathbf{e_1}$	–	+	+	+	+	+	+	+	±	+	–
$\mathbf{e_{11}}$	–	+	+	+	+	+	+	+	–	+	–
$\mathbf{e_{111}}$	–	+	+	+	+	+	+	+	–	+	–
$\mathbf{f_1}$	–	+	+	+	+	+	+	+	±	+	–
$\mathbf{f_{11}}$	–	+	+	+	+	+	+	+	–	+	–
$\mathbf{g_1}$	–	+	+	+	+	+	+	+	±	+	–
$\mathbf{g_{11}}$	–	+	+	+	+	+	+	+	–	+	–
$\mathbf{h_1}$	–	+	+	+	+	+	+	+	±	+	–
$\mathbf{h_{11}}$	–	+	+	+	+	+	+	+	–	+	–

+ = Soluble, – = Insoluble and ± = Partially soluble

chalcone KKC into CY. Similarly, incorporation of aniline, 4-nitroaniline and 1-naphthol were also confirmed by obtained FT-IR spectrum of $\mathbf{f_1}$, $\mathbf{f_{11}}$, $\mathbf{g_1}$, $\mathbf{g_{11}}$, $\mathbf{h_1}$ and $\mathbf{h_{11}}$. The UV-visible spectral analysis confirms the presence of two types transitions related to aromatic and aliphatic -CH=CH- (π-π^*) electronic transition around 250 nm and at 320 nm, respectively. The NMR spectrum of the synthesized compounds $\mathbf{e_1}$, $\mathbf{e_{11}}$, $\mathbf{e_{111}}$ confirmed the incorporation of KKC chalcone into CY. The exact values of the obtained UV-visible transition are given in Table-3.

Antimicrobial activity of the synthesized compounds: All the synthesized compounds contains chlorine moiety,which were derived from the parent cyanuric chloride containing quinoline based chalcone. The MIC values of all the compounds are reported in Table-1 and the data showed that all the synthesized compounds were active against *S. aureus* than *E. coli*. There is a difference in MIC values, when we compare the obtained MIC values of synthesized compounds with parental cyanuric chloride except compound $\mathbf{e_1}$, which shows similar activity as cyanuric chloride. The synthesized compounds $\mathbf{e_{11}}$ and $\mathbf{f_{11}}$ showed highest activity of 7.81 (mg/mL) towards Gram-positive bacteria *Staphylococcus aureus* clearly suggesting that the presence of chlorine atom in the quinoline skeleton enhance the antimicrobial activity. The synthesized compounds $\mathbf{e_{111}}$ and $\mathbf{f_1}$ showed similar high activity 15.63 (mg/mL) on Gram-positive bacteria *S. aureus*. Among the synthesized compound $\mathbf{e_{11}}$ alone shows greater activity 15.63 (mg/mL) against Gram-negative *E. coli* than the parental compound. The synthesized compound $\mathbf{g_1}$, $\mathbf{g_{11}}$, $\mathbf{h_1}$ and $\mathbf{h_{11}}$ showed poor activity than the parental cyanuric chloride indicates the least availability of chlorine.

Conclusion

Quinoline based chalcone, 1-(4-(2-chloroquinolin-5-yl-amino)phenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (KKC)

TABLE-3
FT-IR, UV AND NMR DATA OF THE SYNTHESIZED COMPOUND

Compd.	FTIR								
	OH	NH	C-H	Ali C-H	CH=CH	C=O	C-N	C-Cl	Ar-No_3
KKC	3184	3030	–	3030	1609	1672	–	–	–
$\mathbf{e_1}$	–	3484	3093	2959	1554	1664	805	780	–
$\mathbf{e_{11}}$	–	3493	3075	2965	1554	1652	792	780	–
$\mathbf{e_{111}}$	–	3466	3071	2921	1563	1668	808	780	–
$\mathbf{f_1}$	–	3482	3073	2917	1567	1654	803	714	–
$\mathbf{f_{11}}$	–	3489	3098	2917	1567	1668	820	–	–
$\mathbf{g_1}$	–	3489	3032	2917	1590	1658	814	–	1570
$\mathbf{g_{11}}$	–	3489	3032	2917	1597	1659	811	–	1569
$\mathbf{h_1}$	–	–	3032	2990	1597	1643	811	–	–
$\mathbf{h_{11}}$	–	–	3032	2990	1597	1645	811	–	–

	UV		NMR			
	CH=CH	n-π^*	OH	Aromatic	Vinylic	Amino
KKC	246	290	8.3	7.4-8.7	6.9-7.0	4.0
$\mathbf{e_1}$	220, 260	316	–	7.1-8.2 (13H)	6.9-7.0 (2H)	4.0 (NH)
$\mathbf{e_{11}}$	224, 270	322	–	7.1-8.0 (26H)	6.9-7.0 (4H)	4.0 (2NH)
$\mathbf{e_{111}}$	226, 278	332	–	7.1-8.2 (39H)	6.9-7.0 (6H)	4.0 (3NH)
$\mathbf{f_1}$	252	308	–	7.1-8.0 (18H)	6.9-7.0 (2H)	4.0 (2NH)
$\mathbf{f_{11}}$	262	328	–	7.1-7.8 (23H)	6.9-7.0 (2H)	4.0 (3NH)
$\mathbf{g_1}$	256	328	–	7.3-8.2 (17H)	6.9-7.0 (2H)	4.0 (2NH)
$\mathbf{g_{11}}$	254	322	–	7.4-8.2 (21H)	6.9-7.0 (2H)	4.0 (3NH)
$\mathbf{h_1}$	216	332	–	7.1-8.2 (20H)	6.9-7.0 (2H)	4.0 (NH)
$\mathbf{h_{11}}$	262	336	–	7.4-8.0 (27H)	6.9-7.0 (2H)	4.0 (NH)

was prepared by reacting 1-(4-(2-chloroquinolin-5-ylamino)-phenyl)ethanone (CE) and 4-hydroxybenzaldehyde. Cyanuric chloride derivatives, **e_1, e_{11}** and **e_{111}** were synthesized with cyanuric chloride and synthesized quinoline based chalcone KKC. The **f_1, f_{11}, g_1, g_{11}, h_1** and **h_{11}**, were prepared using **e_1**, aniline, 4-nitroaniline and 1-naphthol. All the synthesized compounds were characterized by FT-IR, NMR and UV spectroscopic techniques. Antimicrobial activity of all the synthesized compounds was tested on *Staphylococcus aureus* and *Escherichia coli*. The synthesized compound **e_{11}** and **f_{11}** showed highest activity of 7.81 (mg/mL) towards Gram-positive bacteria *Staphylococcus aureus.* All the synthesized chalcones were completely soluble in polar protic solvents like acetone, alcohol, DMSO, THF, ether but insoluble in water. Melting points of all the synthesized compounds were determined in an open capillary and found to be dependent on the molecular weight of the compounds.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests regarding the publication of this article.

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