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Research article

Synthesis, characterization, antimicrobial and anticancer evaluation of (E)-N'-benzylidene-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide derivatives

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ABSTRACT

The synthesis of a novel family of pyrimidine derivatives has been completed. Infrared–infrared (IR) and proton nuclear magnetic resonance (1H NMR) spectrum data were used to describe these pyrimidine derivatives. All the compounds were evaluated for their *in vitro* antimicrobial activity against Gram negative strain (*Escherichia coli*) and Gram positive strains (*Bacillus subtilis* and *Staphylococcus aureus*) and fungal strain (*Candida albicans* and *Aspergillus niger*) and anticancer potential against Human breast cancer cell line (MCF-7). Results of antimicrobial and anticancer study revealed that compounds (E)-N'-(3-nitrobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (4) and (E)-N'-(3-chlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (10) were found to be the most potent antimicrobial and anticancer agents respectively.

Keywords: Pyrimidine, Anti-microbial activity, Anti-cancer activity, Benzaldehyde, Pyrimidine derivatives.

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INTRODUCTION

Infectious diseases caused by microorganisms have reached alarming levels all across the world, with about 50,000 people dying every day [1]. In recent decades, several drug-resistant human pathogenic bacteria have been found, creating a serious public health hazard in a variety of infectious illnesses. Microorganism resistance is the most prevalent cause of antimicrobial treatment failure, which raises mortality risks and can also lead to comorbidities. The most effective technique for overcoming the Molecules problem is to find and produce novel bioactive compounds that will be effective against resistant strains [2].

Cancer is a deadly disease that strikes individuals all over the world. Multidrug resistance (MDR) is a serious impediment to existing treatment techniques including chemotherapy and radiotherapy. In affluent countries, cancer remains the top cause of mortality, accounting for more than 20% of all fatalities. The discovery of innovative, more effective, and less harmful chemicals for the treatment of cancer is one of the most important jobs in medicine [3,4].

So, there is an immediate need to discover new antimicrobial and anticancer agents. The chemistry of heterocycles is a key to drug development [5]. Pyrimidine and its derivatives are significant pharmacophores with potent antibacterial and anticancer properties [6-11].

It's an aromatic molecule that serves as the foundation for a variety of biological molecules. Antimicrobial drugs such as ciprofloxacin, chloramphenicol, griseofulvin, and nystatin are commonly available for bacterial and fungal infections [12].

Pyrimidine is a heterocyclic compound having nitrogen groups at positions 1st and 3rd. It is the structural unit of DNA and RNA, which plays a crucial part in the progression of life. Pyrimidine rings complexed with diverse heterocyclic moiety are found in natural goods, agrochemicals, and veterinary products [12]. These cyclic amines, also known as m-diazine or 1,3-diazine, have a variety of biological actions, including antibacterial, anticancer, anti-inflammatory, antioxidant, antiplatelet, analgesic, and antiviral properties [13].

MATERIALS AND METHODS

Melting points were determined in open capillary tubes and are uncorrected. Infrared spectra were recorded in KBr phase on a Perkin Elmer Spectrum RXI FTIR spectrophotometric. ^{1}H NMR spectra were run on BRUKER spectrometer (400 MHz liquid state NMR spectrometer) using Tetramethyl silane (TMS) as an internal standard. The purity of the synthesized compounds was ascertained by thin layer chromatography on silica gel G in solvent system ethyl acetate: benzene (6:4, v/v) using iodine vapors as detecting agent.

Chemistry

The reaction between -Nitro benzaldehyde (2.0 M), ethyl

acetoacetate and urea (1.5 M) in ethanol yielded corresponding ethyl 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (2), which on reaction with hydrazine hydrate afforded the corresponding hydrazides (3) in appreciable yield. Further, the hydrazides of pyrimidine were condensed with substituted aldehydes to yield the title compounds (4) (Scheme 1). Pyrimidine derivatives were characterized on the basis of the spectral and analytical studies.

General procedure for synthesis of hydrazone derivatives of pyrimidine Synthesis of ethyl 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4 - tetrahydropyrimidine-5-carboxylate.

To a mixture of 2-Nitro benzaldehyde (2.0 mmol), ethyl acetoacetate and urea (1.5 mmol) in ethanol, 4 drops of concentrated hydrochloric acid was added and refluxed for three hours. Progress of reaction was monitored by TLC. After completion of the reaction, the solid precipitate was cooled and filtered and washed with cold water and ethanol under reduced pressure and the residue was recrystallized from ethanol or ethyl acetate:hexane (1:3) to afford the pure product [14].

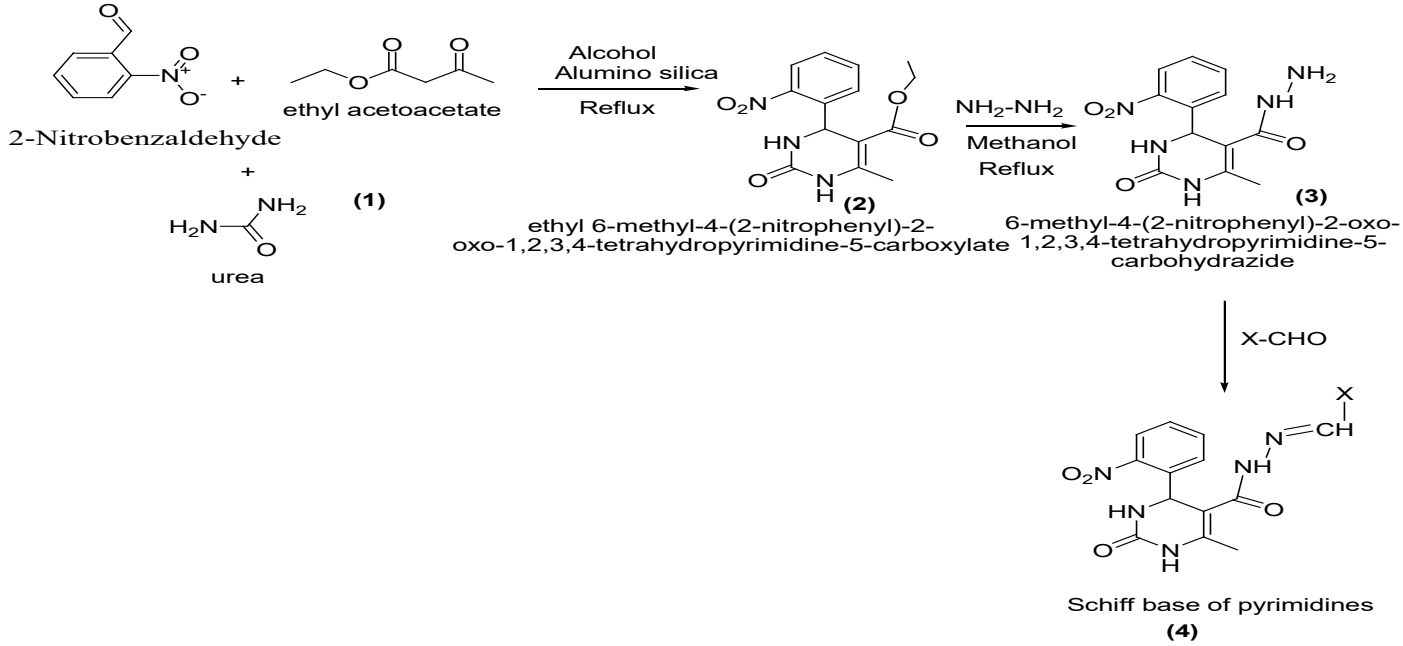
Synthesis of 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide.

A mixture of (0.2M) ethyl 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxylate (2) and excess of hydrazine hydrate (0.30 M, 15 ml), ethanol (250 ml) was refluxed for about 3 h and cooled. The solid was separated by filtration and recrystallized from ethanol to afford 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide.

Synthesis of pyrimidine hydrazone derivatives.

A mixture of (0.025 M) 6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (3) and required amount of aromatic aldehydes (0.025 M) was refluxed in methanol (50 ml) in the presence of a catalytic amount of glacial acetic acid for about 2 h. The mixture was cooled; the solid was separated by filtration and recrystallized from methanol to give the corresponding hydrazones [15].

Figure 1: Mixture



Scheme-1

Table 1: Physical data of Pyrimidine derivatives (H1-H20)

Comp.	Molecular Formula	X	Melting Point (°C)	Molecular Weight	R_f value*	% yield
1	$C_{19}H_{17}N_5O_4$	Benzaldehyde	129-131	379.37	0.67	72
2	$C_{20}H_{19}N_5O_5$	4-methoxy benzaldehyde	134-136	409.40	0.69	82
3	$C_{19}H_{17}N_5O_5$	2-hydroxy benzaldehyde	123-125	395.37	0.78	74
4	$C_{19}H_{16}N_6O_6$	3-nitro benzaldehyde	115-117	424.37	0.71	74
5	$C_{19}H_{16}N_6O_6$	2-nitro benzaldehyde	140-142	424.37	0.65	77
6	$C_{19}H_{17}N_5O_5$	4-hydroxy benzaldehyde	159-161	395.37	0.60	83
7	$C_{20}H_{19}N_5O_5$	3-methoxy benzaldehyde	110-112	409.40	0.64	68
8	$C_{20}H_{19}N_5O_5$	2-methoxy benzaldehyde	141-143	409.40	0.71	76
9	$C_{19}H_{16}N_6O_6$	4-nitro benzaldehyde	122-124	424.37	0.79	70
10	$C_{19}H_{16}ClN_5O_4$	3-chloro benzaldehyde	119-121	413.81	0.73	81
11	$C_{19}H_{16}BrN_5O_4$	4-bromo benzaldehyde	109-111	458.27	0.68	72
12	$C_{21}H_{22}N_6O_4$	4-dimethyl amino benzaldehyde	129-131	422.44	0.74	75
13	$C_{20}H_{19}N_5O^6$	4-hydroxy-3-methoxy benzaldehyde	142-144	425.39	0.71	63
14	$C_{23}H_{26}N_6O_4$	4-diethylamino benzaldehyde	131-133	450.49	0.62	75
15	$C_{19}H_{16}ClN_5O_4$	4-chloro benzaldehyde	125-127	413.81	0.62	69
16	$C_{19}H_{15}Cl_2N_5O_4$	2,4-dichloro benzaldehyde	135-137	448.26	0.74	68
17	$C_{19}H_{16}ClN_5O_4$	2-chloro benzaldehyde	127-129	413.81	0.67	78
18	$C_{19}H_{16}BrN_5O_4$	3-bromo benzaldehyde	117-119	458.271	0.63	71
19	$C_{21}H_{21}N_5O_6$	3,4-dimethoxy benzaldehyde	136-138	439.42	0.75	69
20	$C_{20}H_{19}N_5O_4$	4-methyl benzaldehyde	152-155	393.40	0.59	67

Spectral data

(E)-N'-benzylidene-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H1)

IR (KBr, cm^{-1}): 3440(NH), 3148 (C-H Ar), 1672 (C=O), 1593(C=C Ar), 1522 (NO_2), ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.16-5.67 (m, 10H, ArH), 8.10 (s, 1H, CH=N), 8.04 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 1.08 (s, 3H, CH_3).

(E)-N'-(4-methoxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H2)

IR (KBr, cm^{-1}): 3440(NH), 3299 (C-H Ar), 2800 (CH_3), 1672 (C=O), 1594(C=C Ar), 1523 (NO_2), 1194 (OCH_3); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.63-5.67 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 3.82(s, 3H, OCH_3), 1.06 (s, 3H, CH_3).

(E)-N'-(2-hydroxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H3)

IR (KBr, cm^{-1}): 3479 (OH), 3440(NH), 3148 (C-H Ar), 2879(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2); ^{1}H NMR (DMSO-*d*6, 400 MHz): 9.01-5.68 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 5.41(s, 1H, OH), 1.06 (s, 3H, CH_3).

(E)-N'-(3-nitrobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H4)

IR (KBr, cm^{-1}): 3440(NH), 3148 (C-H Ar), 2878(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.93-5.68 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(2-nitrobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H5)

IR (KBr, cm^{-1}): 3440(NH), 3148 (C-H Ar), 2879(CH_3), 1670 (C=O), 1593(C=C Ar), 1522 (NO_2); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.97-5.69 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(3-methoxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H7)

IR (KBr, cm^{-1}): 3479 (OH), 3440(NH), 3299 (C-H Ar), 1672 (C=O), 1594(C=C Ar), 1523 (NO_2), 1155 (OCH_3); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.09-5.66 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.72 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 3.37 (s, 3H, OCH_3),1.06 (s, 3H, CH_3).

(E)-N'-(2-methoxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H8)

IR (KBr, cm^{-1}): 3440(NH), 3299 (C-H Ar), 1672 (C=O), 1594(C=C Ar), 1523 (NO_2), 1155 (OCH_3); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.16-5.69 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 3.40 (s, 3H, OCH_3), 1.06 (s, 3H, CH_3).

(E)-N'-(3-chlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H10)

IR (KBr, cm^{-1}): 3479(NH), 3149 (C-H Ar), 1672 (C=O), 1594(C=C Ar), 1523 (NO_2), 716(Cl); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.73-5.70 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.53 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(4-bromobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H11)

IR (KBr, cm^{-1}): 3440(NH), 3298 (C-H Ar), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2), 601(Br); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.73-5.68 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.53 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(4-hydroxy-3-methoxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H13)

IR (KBr, cm^{-1}): 3479 (OH), 3440(NH), 3147 (C-H Ar), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2) 1155(OCH_3); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.14-5.61 (m, 8H, ArH), 8.07 (s, 1H, CH=N), 7.67 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 5.33(s, 1H, OH), 3.84(s, 3H, OCH_3), 1.06 (s, 3H, CH_3).

(E)-N'-(4-chlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H15)

IR (KBr, cm^{-1}): 3440(NH), 3143 (C-H Ar), 2824(CH_3), 1665 (C=O), 1593(C=C Ar), 1523 (NO_2),740(Cl); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.71-5.40 (m, 9H, ArH), 8.01 (s, 1H, CH=N), 7.74 (s, 1H, NH), 6.53 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(2,4-dichlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H16)

IR (KBr, cm^{-1}): 3440(NH), 3146 (C-H Ar), 2824(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2),740(Cl); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.92-5.54 (m, 8H, ArH), 8.04 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 1.08 (s, 3H, CH_3).

(E)-N'-(2-chlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H17)

IR (KBr, cm^{-1}): 3440(NH), 3146 (C-H Ar), 2880(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2),740(Cl); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.09-5.41 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 1.06 (s, 3H, CH_3).

(E)-N'-(3,4-dimethoxybenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H19)

IR (KBr, cm^{-1}): 3440(NH), 3146 (C-H Ar), 2881(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2), 1155(OCH_3); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.64-5.69 (m, 8H, ArH), 8.07 (s, 1H, CH=N), 7.61 (s, 1H, NH), 6.53 (s, 2H, NH pyrimidine), 3.83(s, 6H, OCH_3), 1.08 (s, 3H, CH_3).

(E)-N'-(4-methylbenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbohydrazide (H20)

IR (KBr, cm^{-1}): 3440(NH), 3147 (C-H Ar), 2881(CH_3), 1671 (C=O), 1593(C=C Ar), 1522 (NO_2); ^{1}H NMR (DMSO-*d*6, 400 MHz): 8.09-5.40 (m, 9H, ArH), 8.07 (s, 1H, CH=N), 7.73 (s, 1H, NH), 6.52 (s, 2H, NH pyrimidine), 2.32- 1.06 (s, 6H, CH_3).

RESULTS AND DISCUSSION

Antimicrobial assay

Determination of Minimum Inhibitory Concentrations (MIC). The antimicrobial activity of synthesized compounds was performed against Gram-positive bacteria: *Staphylococcus aureus* MTCC 3160, *Bacillus subtilis* MTCC 441, Gram-negative bacterium: *Escherichia coli* MTCC 443 and fungal strains: *Candida albicans* MTCC 227 and *Aspergillus niger* MTCC 281 using tube dilution method. Dilutions of test and standard compounds were prepared in double strength nutrient broth – I.P. (bacteria) or Sabouraud dextrose broth I.P. (fungi). The samples were incubated at 37 ^{0}C for 24 h (bacteria), at 25 ^{0}C for 7 d (*A. niger*) and at 37 ^{0}C for 48 h (*C. albicans*) and the results were recorded in terms of MIC [16,17].

Sulforhodamine B (SRB) Assay

The cell lines were grown in RPMI 1640 medium containing 10% fetal bovine serum and 2 mM L-glutamine. For present screening experiment, cells were inoculated into 96 well microtiter plates in 90 µL at 5000 cells per well. After cell

inoculation, the microtiter plates were incubated at 37°C, 5%CO2, 95% air and 100 % relative humidity for 24 h prior to addition of experimental drugs. Experimental drugs were solubilized in appropriate solvent to prepare stock of 10^{-2} concentration. At the time of experiment four 10-fold serial dilutions were made using complete medium. Aliquots of 10 µl of these different drug dilutions were added to the appropriate micro-titer wells already containing 90 µl of medium, resulting in the required final drug concentrations.

After compound addition, plates were incubated at standard conditions for 48 hours and assay was terminated by the addition of cold TCA. Cells were fixed *in situ* by the gentle addition of 50 µl of cold 30 % (w/v) TCA (final concentration, 10 % TCA) and incubated for 60 minutes at 4°C. The supernatant was discarded; the plates were washed five times with tap water and air dried. Sulforhodamine B (SRB) solution (50 µl) at 0.4 % (w/v) in 1 % acetic acid was added to each of the wells, and plates were incubated for 20 minutes at room temperature. After staining, unbound dye was recovered and the residual dye was removed by washing five times with 1 % acetic acid. The plates were air dried. Bound stain was subsequently eluted with 10 mM trizma base, and the absorbance was read on an Elisa plate reader at a wavelength of 540 nm with 690 nm reference wavelength.

Percent growth was calculated on a plate-by-plate basis for test wells relative to control wells. Percent Growth was expressed as the ratio of average absorbance of the test well to the average absorbance of the control wells * 100. Using the six absorbance measurements [time zero (Tz), control growth (C), and test growth in the presence of drug at the four concentration levels (Ti)], the percentage growth was calculated at each of the drug concentration levels.

Table 2: *In vitro* Antimicrobial Activity of the Title Compounds (**H1-H20)**

Compound	Minimum inhibitory concentration (µg ml^{-1})				
	Bacterial Strains			Fungal Strains	
	E. coli	***S. aureus***	***B. subtilis***	***C. albicans***	**A. *Niger***
H1	25	12.5	25	12.5	25
H2	25	25	12.5	6.25	25
H3	12.5	25	50	12.5	12.5
H4	**3.12**	**1.56**	**1.56**	**3.12**	**1.56**
H5	12.5	25	12.5	6.25	12.5
H6	12.5	12.5	25	12.5	25
H7	12.5	25	50	12.5	12.5
H8	12.5	6.25	6.25	12.5	12.5
H9	12.5	25	12.5	50	12.5
H10	25	3.12	25	12.5	6.25
H11	3.12	12.5	25	50	25
H12	3.12	12.5	3.12	6.25	25
H13	12.5	12.5	6.25	12.5	12.5
H14	12.5	25	12.5	50	25
H15	6.25	3.12	6.25	25	25
H16	25	25	25	25	12.5
H17	25	25	25	25	25
H18	25	12.5	25	12.5	25
H19	25	25	12.5	6.25	25
H20	12.5	25	12.5	12.5	25
Ciprofloxacin (standard)	0.01	0.15	0.12	---	--
Clotrimazole (standard)	--	--	--	0.10	0.30

The dose response parameters were calculated for each test article. The LC50 (concentration of drug resulting in a 50% reduction in the measured protein at the end of the drug treatment as compared to that at the beginning) indicating a net loss of cells following treatment is calculated from [(Ti-Tz)/Tz] x 100 = -50 [18-19].

Table 3: Anticancer activity of titled compounds

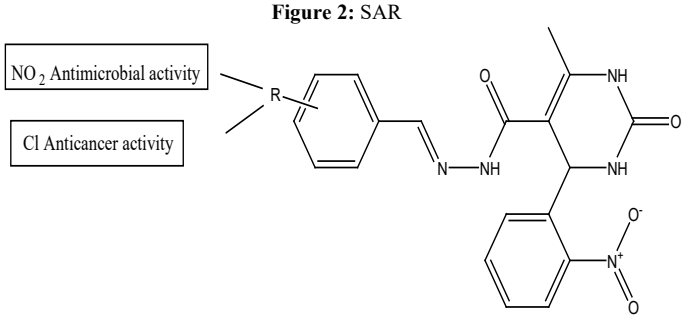
Compound No	Cancer cell line (Human Breast Cancer Cell Line MCF-7) **LC_{50} (**µMolar)
H1	0.22
H2	0.53
H3	0.19
H4	0.11
H5	0.18
H6	>100
H7	>100
H8	>100
H9	>100
H10	**0.09**
H11	>100
H12	>100
H13	>100
H14	>100
H15	>100
H16	>100
H17	>100
H18	>100
H19	>100
H20	>100
Adriamycin (Doxorubicin)	**0.005**

Pyrimidine derivatives (H1–H20) were synthesized using the synthetic procedure given in Scheme 1. The synthesized compounds were characterized by physicochemical as well as spectral means. Physicochemical properties, antimicrobial and anticancer activity results of the synthesized compounds are presented in Table 1, Table 2 and Table 3.

Antimicrobial activity

The antimicrobial activity results (Table 2) indicated that the synthesized compounds were having good antimicrobial activity and compound 4 (*E. coli=3.12 µg/ml, S.aureus=1.56 µg/ml, B.subtilis=1.56 µg/ml, C.albicans= 3.12 µg/ml and A.niger=1.56µg/ml* Table 2) was the most potent antimicrobial agent as compared to standard drugs Ciprofloxacin (*E. coli=0.01, S.aureus=0.15 µg/ml, B.subtilis=0.12 µg/ml,*) and Clotrimazole (*C.albicans= 0.10 µg/ml and A.niger=0.30µg/ml*), may serve as important lead for the discovery of novel antimicrobial agents. To evaluate the biological usefulness of the synthetic pyrimidine derivative, these compounds were also tested against Human Breast Cancer Cell Line MCF-7 (Table 3).

Figure 2: SAR



Compound 10 ((E)-N'-(3-chlorobenzylidene)-6-methyl-4-(2-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carbo hydrazide) demonstrated significant anti-proliferative activity against Human Breast Cancer Cell Line MCF-7 (LC_{50} =0.09 µMolar) as compared to standard drug Adriamycin (Doxorubicin) (LC_{50} =0.005 µMolar).

CONCLUSIONS

A series of novel Pyrimidine derivatives (H1–H20) were synthesized and evaluated for its antimicrobial and anticancer potential. In general, some synthesized compounds were found to be good antimicrobial and anticancer agents. Anticancer screening results indicated that compound 10 (LC_{50} =0.09 µMolar) was the most active anticancer agent as compared to standard drug Adriamycin (Doxorubicin) ((LC_{50} =0.005 µMolar). Antimicrobial activity results indicated that compound 4 was the most active antimicrobial agent and may serve as important lead for the discovery of novel antimicrobial agents.

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