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RESEARCH ARTICLE

SYNTHESIS, CHARACTERIZATION AND EVALUATION OF ANTICANCER ACTIVITY OF SOME NOVEL 4-THIAZOLIDINONE DERIVATIVES

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ABSTRACT

The objective of the present work was the synthesis of N-(2-(4-substituted phenyl)-4-oxo-1,3-thiazolidine-3-yl)-2-(naphthalene-2-yloxy)acetamide and evaluation of *in-vitro* anticancer activity. Based on this a new series of compound had been planned to synthesize by reacting β-naphthol, ethyl chloroacetate, hydrazinemonohydrate, ethylalcohol and various aromatic aldehydes in presence of anhydrous potassium carbonate The synthesized compounds were characterized by IR, NMR, and Mass spectroscopy. The *in-vitro* anticancer studies were carried out against Human Acute Monocytic Leukemia - HL- 60 cell line and Human Breast Carcinoma- MCF- 7 cell lines and MTT assay was used to analyze the cell growth inhibition of the both. The results showed that compound A3, A4, A2, A5, A1,and A6 were possessed a very good anticancer activity (at 20 µg/ml) against both Human Acute Monocytic Leukemia - HL- 60 cell line and Human Breast Carcinoma- MCF- 7 cell lines and doxorubicin (at 10µg/ml) was used as a standard drug for both cancer cell lines. The IC_{50} values for the synthesized compounds were found to be A3 (IC_{50} of 2.4µg/ml), A4 (IC_{50} of 2.6µg/ml), A2 (IC_{50} of 2.9µg/ml), A5 (IC_{50} of 3.4µg/ml), A1(IC_{50} of 3.9µg/ml) and A6 (IC_{50} of 4.5µg/ml) against Human Acute Monocytic Leukemia - HL- 60 and A3 (IC_{50} of 2.3µg/ml), A4 (IC_{50} of 2.6µg/ml), A2 (IC_{50} of 2.7µg/ml), A5 (IC_{50} of 3.3µg/ml), A1(IC_{50} of 3.1µg/ml) and A6 (IC_{50} of 4.5µg/ml) against Human Breast Carcinoma- MCF- 7.

INTRODUCTION

4-thiazolidinones are the derivatives of thiazolidine with a carbonyl group at the 4 position. Several methods for the synthesis are available. The synthesis of 2-amino 4-thiazolidinones-4-C has been reported by using thiourea and sodium salt of labeled monochloroacetic acid (Vittoria Diurono *et al.,* 1992). Another method of synthesis of 4-thiazolidinones is by using of thiocyanate, alkylisothiocyanate with hydrazide/acetamide followed by the treatment with ethylchloro or ethylbromo acetate and sodium acetate (Maria. L. Barreca *et al.,* 2002). The literature survey revealed that 4-thiazolidinone and their derivatives were possessed a wide range of pharmacological activities such as anti-inflammatory, analgesic, anticonvulsant, antimicrobial, local and spinal anesthetics, CNS stimulants, hypnotics, anti HIV, anti diabetic, anticancer, FSH receptor antagonist and CFTR inhibitor etc (Frances.C.Brown, 1961 Jain *et al.,* 2012) The objective of the present work is the synthesis of N-(2-(4-substituted phenyl)-4-oxo-1,3-thiazolidine-3-yl)-2-(naphthalene-2-yloxy) acetamide and evaluation of anticancer activity. Based on this a new series of compound have been planned to synthesize by reacting β-napthol, ethylchloroacetate, hydrazinemonohydrate, ethylalcohol and various aromatic aldehydes in the presence of anhydrous potassium carbonate.

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MATERIALS AND METHODS

The all chemicals used for the synthesis were of laboratory grade and analytical grade. The melting points of newly synthesized thiazolidinone compounds were determined by open capillary method. The IR spectra of synthesized compounds were recorded by ABB Bomen FT-IR spectrometer MB 104 IR spectra recorder with KBr pellets. The H^1-NMR spectra of synthesized compounds were recorded by BRUKER NMR spectrometer in DMSO. The Mass spectra of synthesized compounds were recorded by JEOL GCmate. The purification of newly synthesiszed compounds were done by TLC method. TLC plates are pre-coated silica gel (HF254-200 mesh) aluminium plate using ethyl acetate and n-hexane as an solvent

system and spots were visualized under U.V chamber. The IR, H^1-NMR and Mass spectra were assigned to elucidate the structure of synthesized compounds (A1-A10).

Steps involved in the synthesis of target compound (Erhn Palaska *et al.*, 2002)

Step-1: Preparation of ethyl-2-naphthalene -6-yloxy acetate:

2-napthol (1.44 gm, 10mmol), anhydrous potassium carbonate (1gm) and ethylchloroactate (1.67gm, 10mmol) in 50ml of anhydrous acetone were refluxed on oil bath for 6 hours. The reaction mixure was filtered and the excess solvent was removed by distillation under pressure.

Step-2: Preparation of 2-(naphthalene-6-yloxy) acetohydrazide:

The residue and 1gm hydrazine monohydrate (20 mmol) were dissolved in 50 ml of absolute ethanol and refluxed on a steam bath for 1 hour. The solute must was filtered and dried and recrystalized from ethanol.

Step-3: Preparation of substituted benzaldehyde derivatives:

0.01mol of substituted benzaldehyde and 0.01mol of substance and 2-3 drops of glacial acetic acid and 20ml of ethanol were taken in round bottom flask and reflux for 6 hours on water bath. After cooling add ice cold water to the mixture to give solid white mass. Filtered and dried. Recrystallized from chloroform-methanol mixture.

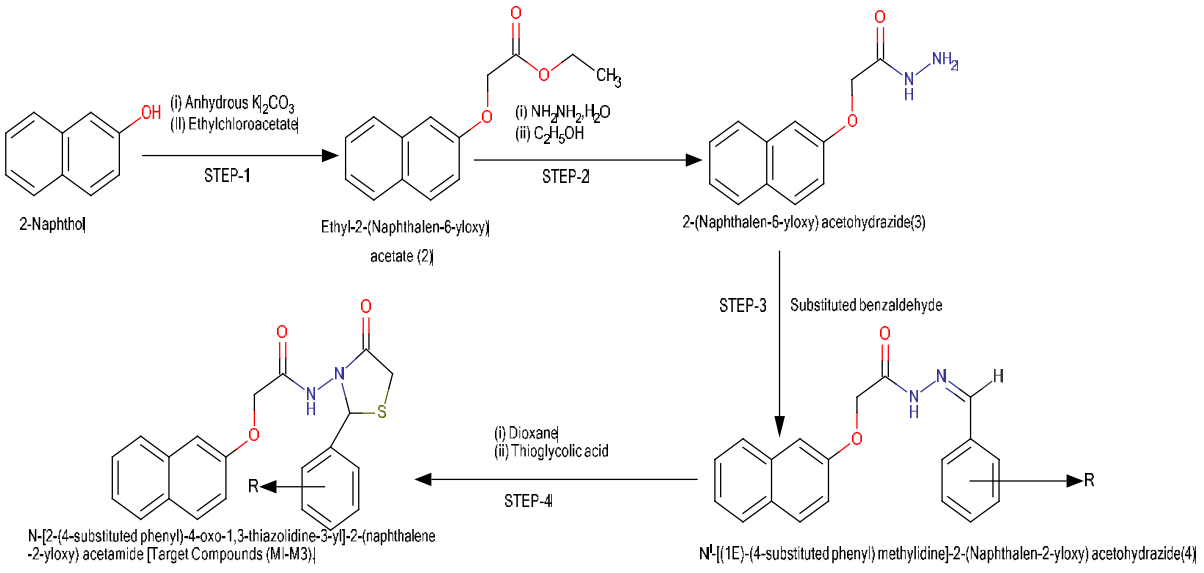
chloride (0.5mg) was added and refluxed for 8 hours. The reaction was then cooled to 30°C and the resulting solid was washed with sodium bicarbonate solution. The final compound recrystallized from absolute ethanol.

Spectral data

Compound A1: N-(2-(4-hydroxyphenyl)-4-oxo-1,3-thiazolidin -3-yl-2-(naphthalene-2-yloxylacetamide. M.F- $C_{21}H_{18}N_2O_4S$, M.W 394.44 ,M.P-180^{O}c, R_f-0.55, Yield-62.1%, IR (KBr) ν (cm^{-1}): 1624.11cm^{-1}(Ar-C=C),3177.12cm^{-1}(aliph-N-H),1026.57 cm^{-1}(N-N),747.42cm^{-1}(C-S),3610.57cm^{-1}(O-H phe), 1689.24 cm^{-1}(C=O),1269.54cm^{-1}(C-N),1728.62cm^{-1}(C=O-thiazolidine), ^{1}H-NMR δ (ppm): 8.0(1H,-NH-),6.8-7.9(11H,Ar-H),5.92(1H,-N-CH-S-),5.21(1H,Ar-OH),5.0(2H,-O-CH_2-CO-),3.8(2H,-S-CH_2), Mass (m/e value): 394.5(30%)(M^+), 395.4(25%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7 (67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0 (44%), 100.4(100%)B

Copound A2: N-(2(4-chlorophenyl-4-oxo-1,3-thiazolidin-3-yl)-2-(naphthalene-2-yloxy)acetamide.M.F: $C_{21}H_{17}ClN_2O_3S$, MW-412.89, M.P-172^{0}c, R_f- 0.46, Yield-65.2%, IR (KBr) ν (cm^{-1}): 1611.20cm^{-1} (Ar-C=C) ,3186.99cm^{-1} (Aliph-N-H), 1086.99cm^{-} ^{1}(N-N) ,695.56cm^{-1} (C-S) ,1668.87cm^{-} ^{1}(C=O), 1267.68cm^{-1} (C-N) ,750.35cm^{-1} (Ar-C-Cl) ,1716.32cm^{-1} (C=O-thiazolidine), ^{1}H-NMR δ (ppm): 8.3 (1H,-NH-) ,6.8-7.9 (11H,Ar-H) ,5.80 (1H,-N-CH-S-) ,5.0 (2H,-O-CH_2-CO-), 3.3(2H,-S-CH_2), Mass (m/e value): 412.9(24%)(M^+), 413.8(20%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Synthetic scheme



Step-4: General method of synthesis of thiazolidinone derivatives

A mixture of Schiff base (0.001mmol) and Thioglycolic acid (0.001mol) dissolved in 1,4-dioxane (20ml), anhydrous zinc

Copound A3: N(2-(4-fluorophenyl)-4-oxo-1,3-thiazolidin-3-yl)-2-(naphthalene)acetamide. M.F- $C_{21}H_{17}FN_2O_3S$, MW-396.43, M.P-175^{0}c, R_f- 0.48, Yield- 55.7%, IR (KBr) ν (cm^{-1}): 1609.09cm^{-1}(Ar-C=C),3194.42cm^{-1}(Aliph-N-H),1026.76cm^{-}

[1](N-N) 1256.34cm^{-1} (C-N), 705.10cm^{-1}(C-S), 1662.09 cm^{-1}(C=O), 1000.62cm^{-1} (Ar-C-F),1721.94cm^{-1} (C=O-thiazolidin), [1]H-NMR δ (ppm): 8.20(1H,-NH-),6.8-7.9(11H,Ar-H),6.0(1H,-N-CH-S-),4.90(2H,-O-CH_2-CO-),3.5(2H,-S-CH_2-), Mass (m/e value): 396.5(13%)(M^+), 397.4(11%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%), 100.4(100%)B.

Copound A4: N-(2-(4-bromophenyl)-4-oxo-1,3-thiazolidin-3-yl)-2-(naphthalene-2-yloxy)acetamide. M.F- $C_{21}H_{17}BrN_2O_3S$, M.W-457.34, M.P- 178^{0}c, R_f- 0.51, Yield- 64.96%, IR (KBr) ν (cm^{-1}): 1621.73cm^{-1}(Ar-C=C), 3198.97 cm^{-1}(Aliph-N-H), 1031.38 cm^{-1}(N-N), 758.36 cm^{-1}(C-S), 1681.77 cm^{-1}(C=O), 1530.18 cm^{-1}(Ar-C-Br), 1721.46 cm^{-1}(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.0(1H,-NH-), 6.8-7.9(11H,Ar-H), 5.9(1H,-N-CH-S-), 5.2(2H,-O-CH_2-CO-), & 3.3(2H,-S-CH_2-), Mass (m/e value): 457.4(10%)(M^+), 458.3(9%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A5: 2-(naphthalene-2-yloxy)-N-(2-(4-nitrophenyl)-4-oxo-1,3-thiazolidin-3-yl)acetamide. M.F- $C_{21}H_{17}N_3O_5S$, M.W- 423.44, M.P- 160^{0}c, R_f- 0.71,Yield- 68.2%, IR (KBr) ν (cm^{-1}): 1605.0cm^{-1}(Ar-C=C), 3181.81 cm^{-1},(Aliph-N-H), 1050.57 cm^{-1}(N-N), 1248.07 cm^{-1}(C-N), 752.45 cm^{-1}(C-S), 1685.27 cm^{-1}(C=O), 1521.57 cm^{-1}(Ar-NO_2), 1721.09 cm^{-1}(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.2(1H,-NH-), 6.8-7.9(11H, Ar-H), 5.8(1H,-N-CH-S-), 5.1(2H, -O=CH_2-CO-), & 3.4(2H, -S-CH_2-), Mass (m/e value) **:** 423.5(11%)(M^+), 424.4(9%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A6: 2(naphthalene-2-yloxy)-N-(2-nitrophenyl)-4-oxo-1,3-thiazolidin-3-yl)acetamide. M.F- $C_{21}H_{17}N_3O_5S$, M.W-423.44, M.P- 165^{0}c, R_f. 0.69, Yield- 68.2%, IR (KBr) ν (cm^{-1}): 1613.0cm-1(Ar-C=C), 3211.27 cm-1(Aliph-N-H), 1061.45 cm-1(N-N), 1248.01 cm-1(C-N), 774.86 cm-1(C-S),1681.31 cm-1(C=O),1516.23 cm-1(NO_2), 1717.68 cm-1(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.2(1H, -NH-), 6.8-7.9(11-H, Ar-H), 5.8(1H,-N-CH-S-), 5.2(2H,-O-CH_2-CO-),3.4(2H, -S-CH_2-), Mass (m/e value): 423.5(9%)(M^+), 424.4(8%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A7 N-(2-(3,4-dimethoxyphenyl)-4-oxo-thiazolidin-3-yl)-2-(naphthalene-2-yloxy)acetamide.M.F- $C_{23}H_{22}N_2O_5S$,M.W-438.12, M.P-185^{0}c, R_f-0.66, Yield-58.6%, IR (KBr) ν (cm^{-1}): 1619.0cm-1(Ar-C=C), 3202.17cm-1(Aliph-N-H), 1026.57cm-1(N-N), 1265.59cm-1(C-N), 747.42cm-1(C-S), 1663.99cm-1(C=O), 1126.82cm-1(-C-O-C-), 1723.15cm-1(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.2(1H, -NH-), 6.8-7.9(11H, Ar-H), 6.1(1H, -N-CH-S-), 5.3(2H, -O-CH_2-CO-), 3.8(6H, -O-CH_3), 3.4(2H, -S-CH_2-), Mass (m/e value): 438.1(6%)(M^+), 439.1(5%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A8: N-(2-(2-chlorophenyl)-4-oxo-1,3-thiazolidin-3-yl)-2-(naphthalene-2-yloxy)acetamide. M.F- $C_{21}H_{17}ClN_2O_3S$, M.W- 412.89, M.P- 198^{0}C, R_f – 0.44, Yield-71.2%, IR (KBr) ν (cm^{-1}): 1614.07cm-1(Ar-C=C), 3188.27cm-1(Aliph-N-H), 1048.26cm-1(N-N), 1267.13cm-1(C-N), 774.55cm-1(C-S), 1685.07cm-1(C=O), 700.46cm-1(Ar-C-Cl), 1721.07cm-1(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.4(1H, -NH-), 6.8-7.9(11H, Ar-H), 6.2(1H, -N-CH-S-), 5.2(2H, -O-CH_2-CO-), 3.7(2H, -S-CH_2-), Mass (m/e value): 412.9(14%)(M^+), 413.8(13%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A9: 2-(naphthalene-2-yloxy)-N-(2-(3-nitrophenyl)-4-oxo-1,3-thiazolidin-3-yl)acetamide. M.F- $C_{21}H_{17}N_3O_5S$, M.W-423.44, M.P-166^{0}c, R_f - 0.68, Yield-71.5%, IR (KBr) ν (cm^{-1}): 1612.32cm-1(Ar-C=C), 3217.42cm-1(Aliph-N-H), 1050.57cm-1(N-N), 1237.20cm-1(C-N), 703.59cm-1(C-S), 1682.57cm-1(C=O), 1507.14cm-1(Ar-NO_2), 1721.38cm-1(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.2(1H, -NH-), 6.8-7.9(11H, Ar-H), 6.1(1H, -N-CH-S-), 5.1(2H, -O-CH_2-CO-), 3.6(2H, -S-CH_2-), Mass (m/e value): 423.5(9%)(M^+), 424.4(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Copound A10: N-(2-(3-hydroxyphenyl)-4-oxo-1,3-thiazolidin-3-yl)-2-(naphthalene-2-yloxy)- acetamide. M.F- $C_{21}H_{18}N_2O_4S$, M.W-394.44, M.P- 187^{0}c, R_f0.58, Yield- 62.3%, IR (KBr) ν (cm^{-1}): 1603.86cm-1(Ar- C=C), 3210.68cm-1(Aliph-N-H), 1048.26cm-1(N-N), 1258.95cm-1(C-N), 703.47cm-1(C-S), 1686.85cm-1(C=O),3610.93cm-1(O-H-Ph), 1721.63cm-1(C=O-thiazolidine), [1]H-NMR δ (ppm): 8.3(1H, -NH-), 6.8-7.9(11H, Ar-H), 6.1(1H, -N-CH-S-), 5.2(2H, -O-CH_2-CO-), 4.9(1H, Ar-OH), 3.3(2H, -S-CH_2-), Mass (m/e value): 394.5(26%)(M^+), 395.4(25%)(M+1), 377.1(50%), 301.0(70%), 274.0(38%), 228.1(58%), 200.7(67%), 185.1(24%), 157.1(48%), 127.1(73%), 102.0(44%),100.4(100%)B.

Evaluation of in vitro anticancer activity by mtt assay (Master Rw 2000; Mosman T 1983; Wilson AP 2000; Kuete *et al.* 2011 and Sathish *et al.*, 2011)

Cell culture

The Human Acute Monocytic Leukemia - HL- 60 cell lines and Human Breast Carcinoma- MCF- 7 cell lines were provided by National Centre for Cell Science (NCCS), Pune and were grown in Eagles Minimum Essential Medium (EMEM) which contained 10% fetal bovine serum (FBS). All cells were maintained at 37°C, 100% relative humidity, 5% CO2, 95% air and the culture medium was changed twice a week.

Cell treatment

The monolayer cells were detached and single cell suspensions were made using trypsin-ethylenediaminetetraacetic acid (EDTA). A hemocytometer was used to count the viable cells and the cell suspension was diluted with a medium containing 5% FBS in order to obtain final density of 1x10^5 cells/ml. 96-well plates at plating density of 10,000 cells/well were seeded

with one hundred microlitres per well of cell suspension and incubated for cell attachment at 37° C, 5% CO2, 95% air and 100% relative humidity. The cells were treated with serial concentrations of the test samples after 24 hr. Serial dilution method was used for preparing test samples of fixed concentration. Cells were initially dissolved in dimethylsulfoxide (DMSO) and further diluted with serum free medium to obtain twice the desired final maximum test concentration. The required final drug concentrations of 1.50 µg/ml was obtained by adding aliquots of 100 µl of drug dilutions to the appropriate wells already containing 100 µl of medium. After addition of the drug the plates were incubated for an additional 48 hr at 37° C, 5% CO2, 95% air and 100% relative humidity. The medium without samples served as control and triplicate was maintained for all concentrations.

MTT ASSAY

After 48 hrs of incubation, to each well 15 µl of MTT (5mg/ml) in phosphate buffered saline (PBS) was added and incubated at 37° C for 4 hrs. The medium with MTT was flicked off and the formed formazan crystals were solubilized in 100µl of DMSO. Using micro plate reader the absorbances were measured at 570 nm. The % cell inhibition was determined using the following formula:

% Cell Inhibition = (100- Abs (sample)/Abs (control)) x100.)

DISCUSSION

Chemistry

The synthesis of target compound-N-(2-(4-substituted phenyl)-4-oxo-1,3-thiazolidine-3-yl)-2-(naphthalene-2-yloxy)acetamide was carried out by reacting β-napthol, ethylchloroacetate, hydrazinemonohydrate, ethylalcohol and various aromatic aldehydes in the presence of anhydrous potassiumcarbonate. The synthesized compounds were characterized by IR, NMR, and Mass spectroscopy and proposed the structure by spectral data The purity of the synthesized compounds were ascertained by TLC and spectral analysis.

Biological screening

These synthesis compounds were evaluated for their in vitro anticancer activity using MTT assay. A preliminary screening against both Human Acute Monocytic Leukemia - HL- 60 cell lines and Human Breast Carcinoma- MCF- 7 cell lines showed that the compounds A3, A4, A2, A5, A1 and A6 (at 20µg/ml) as well as standard drug doxorubicin at concentration 10µg/ml were able to inhibit the proliferation of more than 50% cells (Fig. 1 and 2). It is appeared that compounds A3, A4, A2, A5, A1 and A6 displayed cytotoxic activities with IC_{50} values below 100 µg/ml against these both cancer cell lines. In the USNCI screening program a compound is generally considered to have in vitro cytotoxic activity, if the IC_{50} value following incubation between 48 hrs and 72 hrs is less than 4 µg/ml or 10 µM.

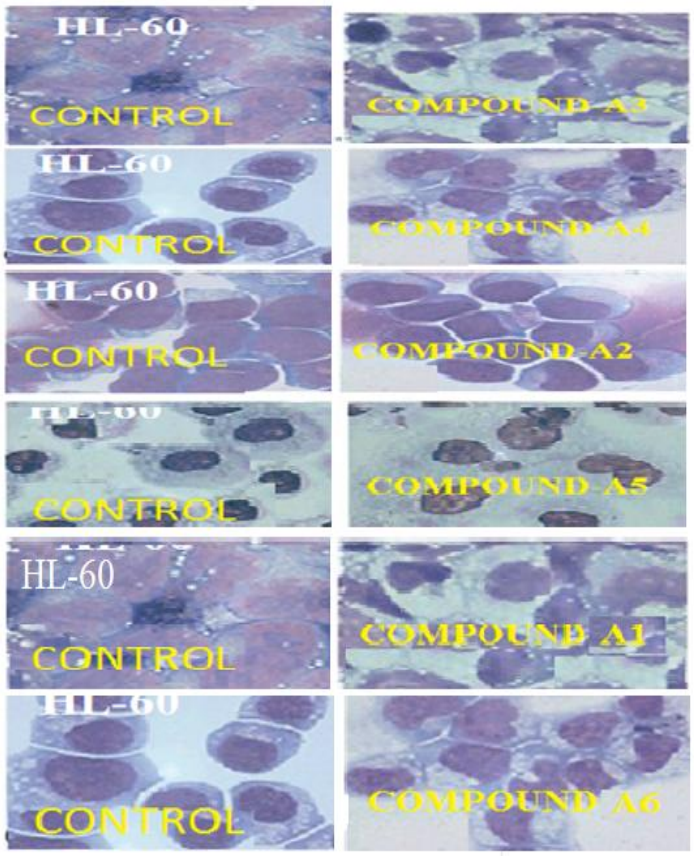


Fig. 1. Inhibition of HL-60 cancer cell by A3, A4, A2, A5, A1 and A6 Compounds

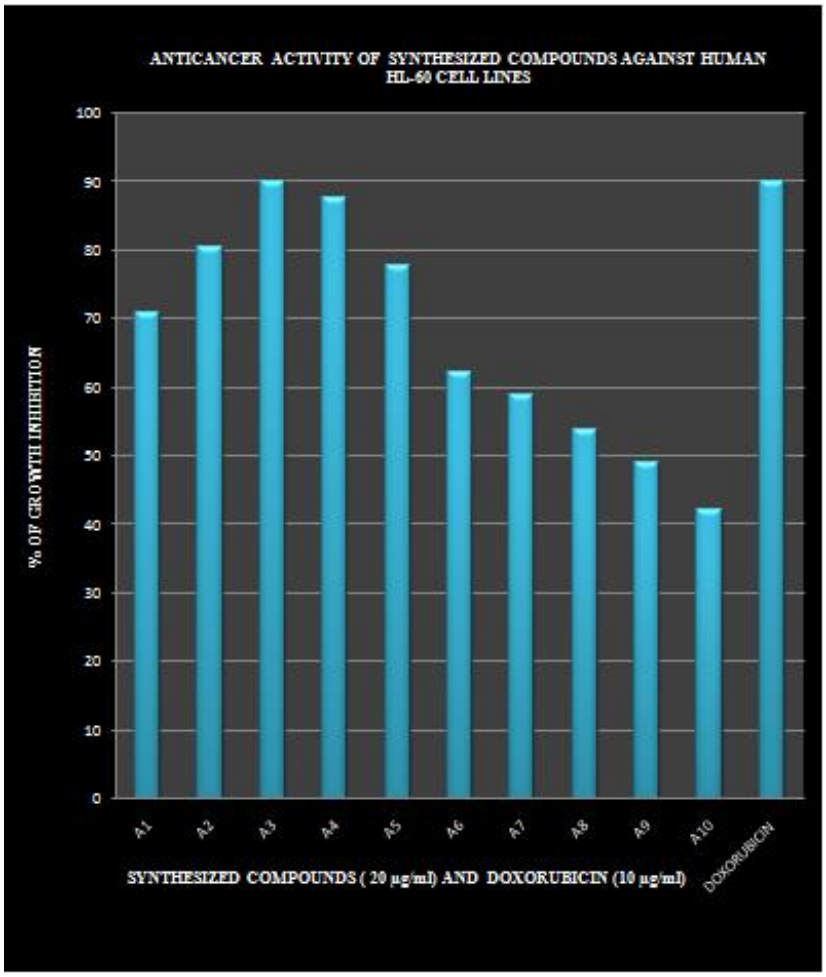


Fig 1. Inhibitory percentage (%) of the synthesized compounds at 20µg/ml and standard drug doxorubicin(at 10µg/ml) on leukemia HL-60 cancer cell line

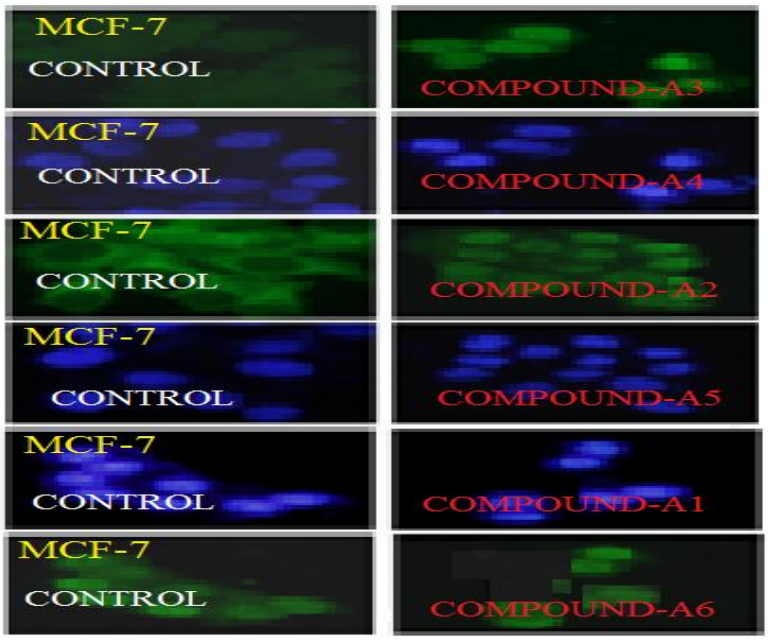


Fig. 2. Inhibition of MCF-7 cancer cell by A3, A4, A2, A5, A1 and A6 Compounds

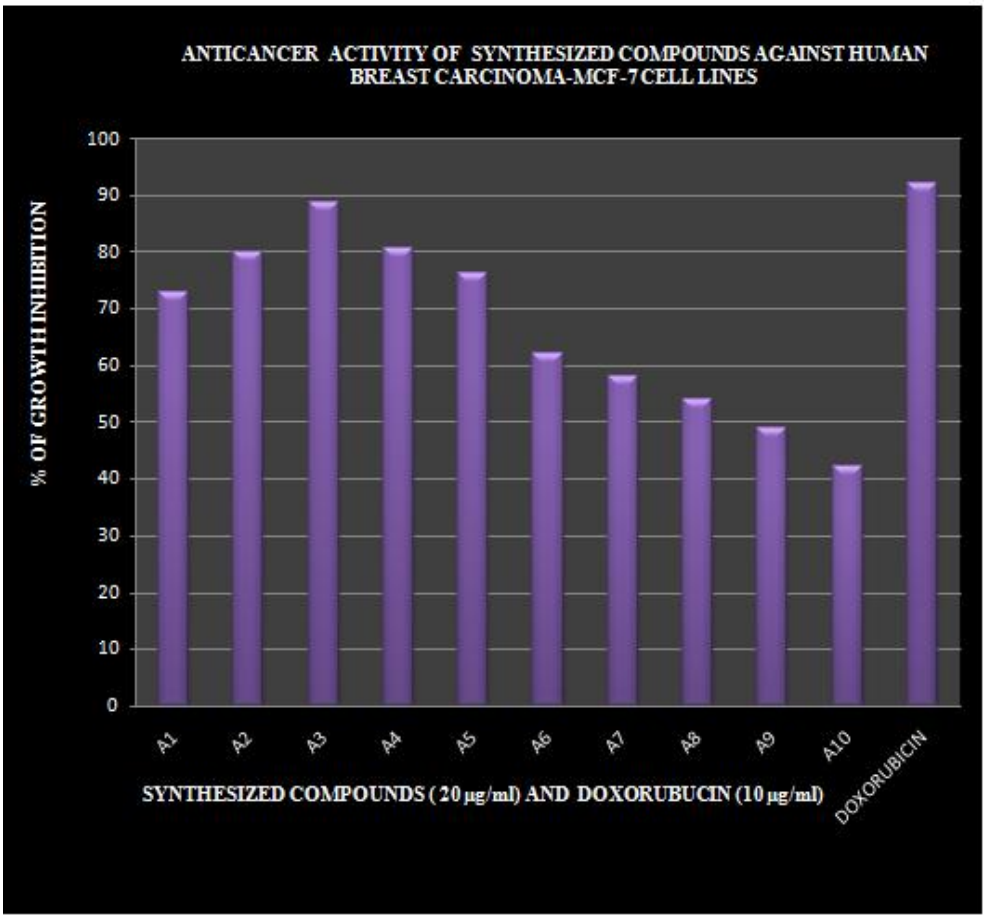


Fig. 2. Inhibitory percentage (%) of the synthesized compounds at 20µg/ml and standard drug doxorubicin (at 10µg/ml) on MCF-7 cancer cell line

Table 1. For percentage (%) of cell growth inhibition of synthesized compounds on human hl - 60 cell lines by mtt assay

Name of the synthesized compounds	Concentration of the drugs	Absorbance of drug samples	Inhibition of cell growth (%)
A1	20 µg/ml	1.520	70.9
A2	20 µg/ml	1.511	80.3
A3	20 µg/ml	1.502	89.9
A4	20 µg/ml	1.506	87.5
A5	20 µg/ml	1.518	77.6
A6	20 µg/ml	1.540	62.2
A7	20 µg/ml	1.556	58.8
A8	20 µg/ml	1.565	53.9
A9	20 µg/ml	1.599	48.9
A10	20 µg/ml	1.60	42.1
Doxorubicin	10 µg/ml	1.501	90
control		2.510	0

Table 2. For percentage (%) of cell growth inhibition of synthesized compounds on human breast carcinoma mcf-7 cell lines by mtt assay

Name of the synthesized compounds	Concentration of the drugs	Absorbance of drug samples	Inhibition of cell growth (%)
A1	20 µg/ml	1.520	72.9
A2	20 µg/ml	1.509	79.9
A3	20 µg/ml	1.47	89.9
A4	20 µg/ml	1.501	80.5
A5	20 µg/ml	1.519	76.3
A6	20 µg/ml	1.541	62.1
A7	20 µg/ml	1.555	57.9
A8	20 µg/ml	1.565	53.9
A9	20 µg/ml	1.599	48.9
A10	20 µg/ml	1.61	42.1
Doxorubucin	10 µg/ml	1.45	92
control		2.51	0

In the present study IC_{50} values below 4 µg/ml were displayed compound A3 (IC_{50} of 2.4µg/ml), A4 (IC_{50} of 2.6µg/ml), A2 (IC_{50} of 2.9µg/ml), A5 (IC_{50} of 3.4µg/ml), A1(IC_{50} of 3.9µg/ml) and A6 (IC_{50} of 4.5µg/ml) against Human Acute Monocytic Leukemia - HL- 60 and A3 (IC_{50} of 2.3µg/ml), A4 (IC_{50} of 2.6µg/ml), A2 (IC_{50} of 2.7µg/ml), A5 (IC_{50} of 3.3µg/ml), A1(IC_{50} of 3.1µg/ml) and A6 (IC_{50} of 4.5µg/ml) against Human Breast Carcinoma- MCF-7.Moreover IC_{50} values obtained with standard drug doxorubicin were below 4 µg/ml against these two cancer cell lines.

Conclusion

In conclusion, we report here a series of novel 4-thiazolidinone derivatives prepared by the reaction between β-napthol, ethylchloroacetate, hydrazinemonohydrate, ethylalcohol and various aromatic aldehydes in the presence of anhydrous potassium carbonate and their ability to kill tumour cells in vitro. The cytotoxic activities of the compounds A3, A4, A2, A5, A1 and A6 against both Human Acute Monocytic Leukemia - HL- 60 cell lines and Human Breast Carcinoma- MCF-7 cell lines can be considered very good with regards to the USNCI standard.

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