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Comparison of the efficiency of innovative formazan compound with innovative sulfazan against breast tumors

Zainab Mohamed Farhan[1], Nagham Mahmood Aljamali[2*]
[1] Department of Chemistry, College of Education for Girls, Iraq
[2] Professor, Department of Organic Chemistry, Synthetic Chemistry Field, Iraq

Abstract
Sulfazan derivatives are a modern type of organic chemistry compounds, which is considered a recent innovation by Professor. Dr. Nagham Aljamali, who set the conditions for its preparation and properties and studied its stability and color fastness, also we investigated these compounds in the previous research via spectral techniques and we improved their structures, but here in this research, the work on studying its effectiveness and efficiency against breast tumors was completed, and we took two types of cells, one of them healthy and the other infected, for the purpose of comparing the efficiency of both derivatives (Invented Sulfazan and Formazan).

Keywords: sulfazan, formazan, anticancer, breast cancer, trimethoprim, drugs, tumor

Introduction

Formazan: derivatives have had a significant impact on the advancement of organic chemistry and its applications, as it had and still has many biomedical and industrial applications, and it outperformed other compounds in terms of its many applications in most of the biochemistry fields, the chemistry of ligands.

Sulfazans: are described as a novel organic compounds, as they were initiated and settled by academic Professor Dr. Nagham Aljamali in April year 2019 for the first time, and were measured as creative compounds that were added to the essential organic chemistry, also Dr. Nagham initiated and intended various methods [1, 2] of its preparation and reactions, conditions and catalysts for its synthesis and their physical and chemical belongings. Structure of Sulfazan: It has structure of (-N=N- Sulfur Compound) or according to type of reactant amine) and sulfur derivatives in reaction in reformed basic medium like (Buto-oxide,Pi.pridine,…)

Devices and Investigational Part

In our previous research, we prepared innovative derivatives of formazan and sulfazan derived from the drug trimethoprim, and we diagnosed them by several spectroscopic methods mentioned in the previous research. In the current research, we studied the effectiveness of these innovative derivatives against some breast tumors.

Procedures

Designation of Normal Formazan-Trimethoprim Derivative

Trimethoprim Drug (0.001 mol) refluxed with (0.002 mol) of p-formal phenol for (2 hrs) with (3 drops) of glacial acetic acid and total ethanol (40 ml), the product filtered,dried,recrystallized to yield Trimethoprim-Aldamine Derivative according to procedures [38-41], that (0.01 mole) reacted with (0.02 mole) from diazo salt of 2-amino pyridine in (5 % NaOH) through five stages in basic medium to formation Formazan after (24 hrs), the product filtered,dried,washed by condensed water, recrystallized to yield Normal Formazan Compound by following procedures in literatures [2-4, 24].

Designation of Invented Sulfazan -Trimethoprim Derivative

Trimethoprim drug (0.001 mole) dissolved in (3 ml) of hydrochloric acid (concentrated) with cold solution of sodium nitrite, then reacted with 4-hydroxy-2-mercapto thiazole in (tri. ethyl amine) through many stages in basic medium to formation Invented Sulfazan after (2 days), the product filtered,dried,washed by condensed water, recrystallized to yield Invented Sulfazan Compound by following Originated procedures in literature [2-4, 24].

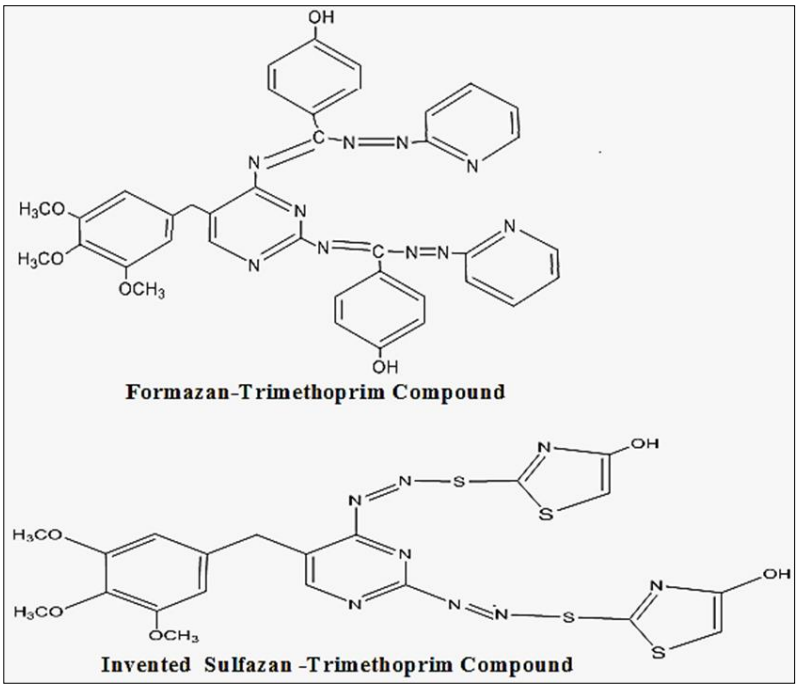

Fig 1: Designation of Invented Sulfazan and Formazan-Drugs

Results and Discussion

In our previous research, we prepared innovative derivatives of formazan and sulfazan derived from the drug trimethoprim, and we diagnosed them by several spectroscopic methods mentioned in the previous research [24]. In the current research, we studied the effectiveness of these innovative derivatives against some breast tumors.

Spectral Signals

FT.IR- Spectral Bands of Trimethoprim Derivatives of Normal Formazan and Patented Sulfazan

Appearance band in Normal Formazan we noted shifting of frequencies in initiated compound-Imine band (CH=N) in starting compound from (1620) Cm^{-1} which shifted to (1635) Cm^{-1} respectively for (-C=N-) due to production of Formazan in compound., Besides to appearance three new band in Formazan compound due to Azo group of Formazan at (1413, 1445, 1500)., while in other compound: Sulfazan compound we noted disappearance: band of thiol group (SH) in starting materials and appearance new bands in Invented Sulfazan compound at (1284) cm^{-1} due to sulfide in Sulfazan group (-S-N=N-) and presence three bands in each Sulfazan compound due to (-N=N- in Sulfazan) group at (1389,1427,1475) in Sulfazan compound, all frequencies clarified according to reference [34] (Nagham Aljamali 2022) as Identification reference of all Spectra., and other functional groups in figures (1, 2):

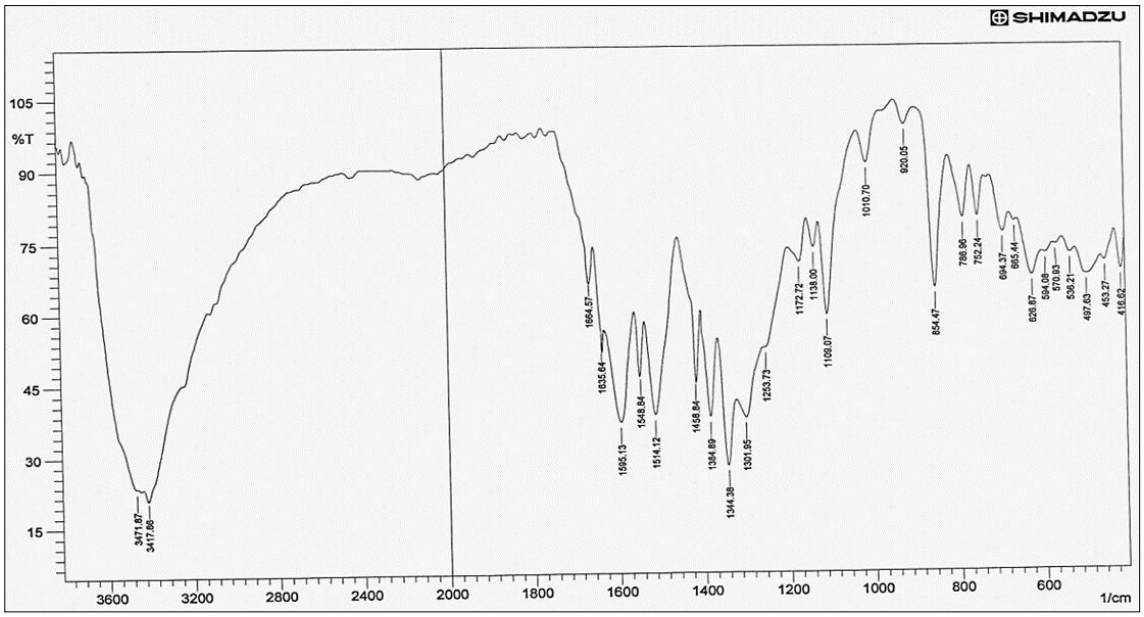

Fig 1: FT.IR of Formazan-Trimethoprim Derivative

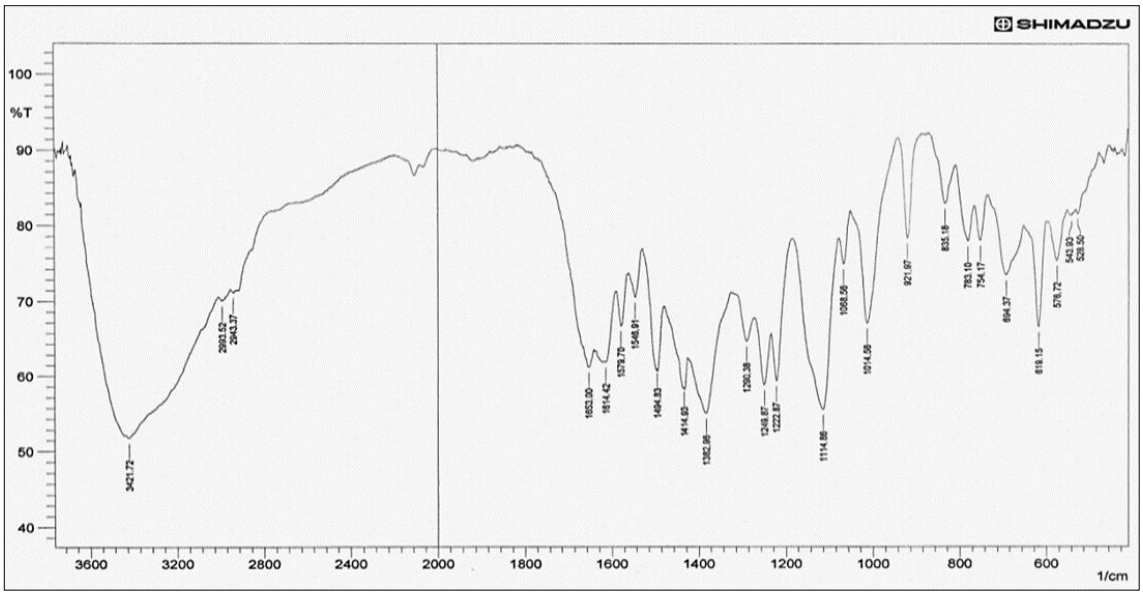

Fig 2: FT.IR of Sulfazan-Trimethoprim Derivative

[1]H.NMR- Spectral Signals of Trimethoprim Derivatives of Normal Formazan and Patented Sulfazan: In initiated compound: anil group (CH=N) that were at δ (8.43) but this signal disappeared when the formazan formed due to formation of (N=C-N=N) Formazan group Formazan compound and all peaks explained according to reference [35] (Nagham Aljamali 2022) as Identification reference of all Spectra,figures (3, 4).

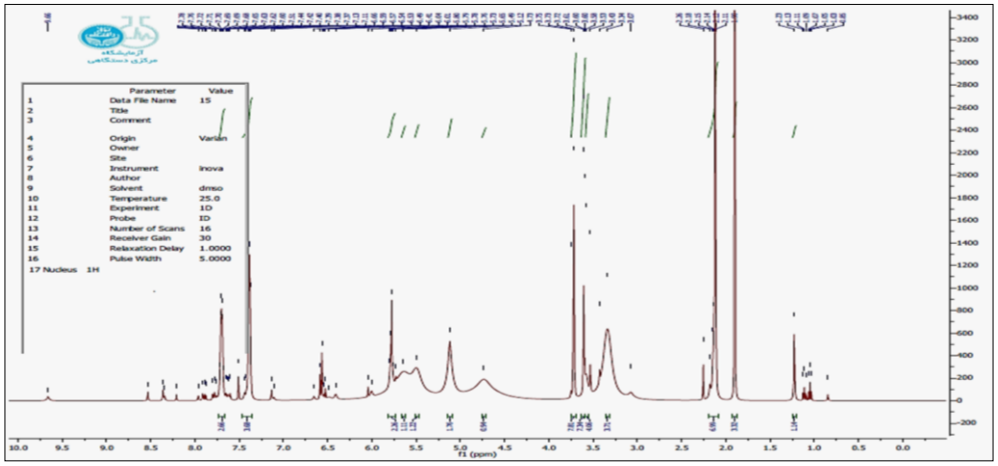

Fig 3: H.NMR- of Formazan-Trimethoprim Derivative

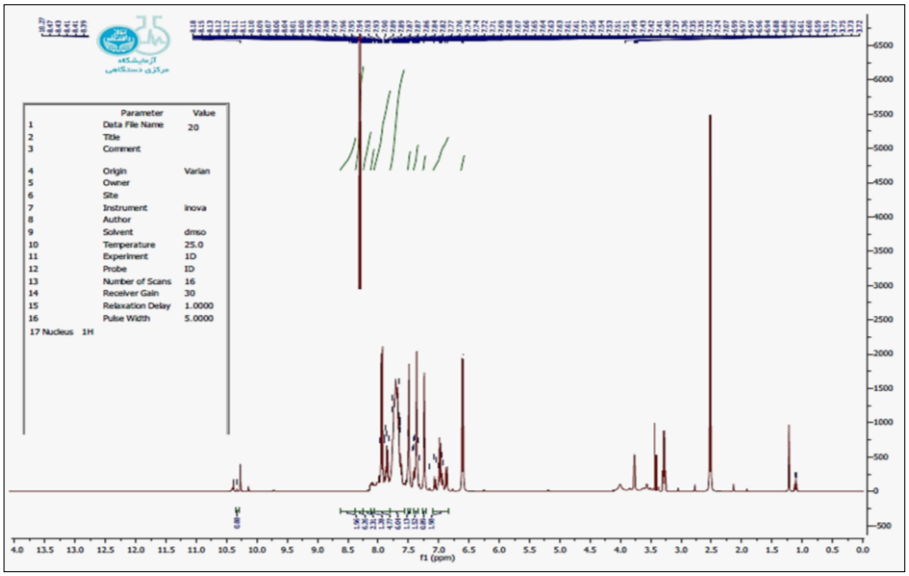

Fig 4: H.NMR- of Sulfazan-Trimethoprim Derivative

^{13}C.NMR- Spectral Signals of Trimethoprim Derivatives of Normal Formazan and Patented Sulfazan: We noted the peak of carbon atom for aldamine group (CH=N) in initiated compound (Anil compound) was at δ (154. 56) which shifted to δ (99. 51)] due to formation (N=C-N=N) Formazan group in Patented Formazan compound according to reference(34) (Nagham Aljamali 2022) as Identification reference of all Spectra.

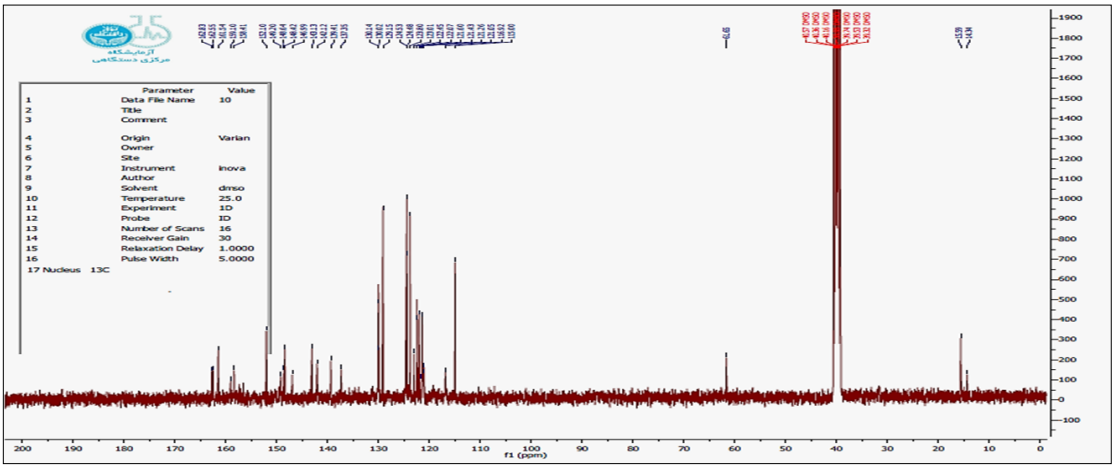

Fig 5: C.NMR- Spectrum of Formazan-Trimethoprim Derivative

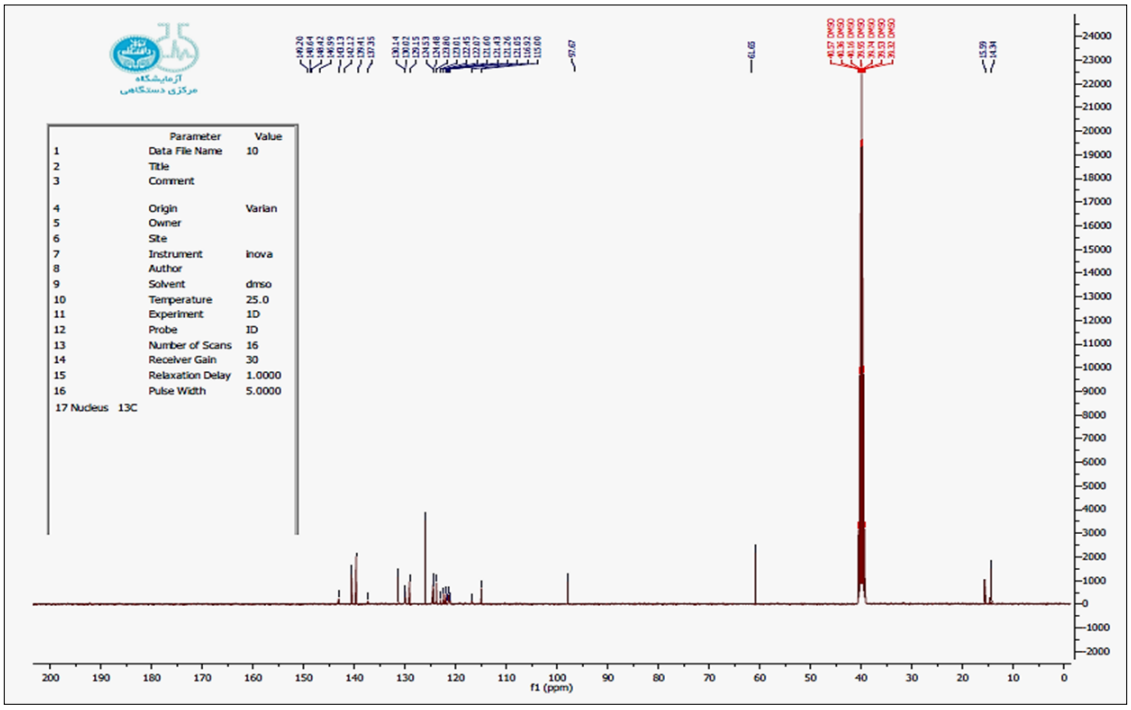

Fig 6: C.NMR- Spectrum of Sulfazan-Trimethoprim Derivative

Influence of Sulfazan and Formazan Against Breast Tumors [24, 30]:
(MTT)-Method was used to determine cell viability by two (MCF-7 and MCF- 10 A cell lines) according to studies [24, 30], all data in Figures (7-10).

MTT was rummage to limit cell viability by chromatic investigation flowed with mentioned methods [24, 30] of two types from cells (MCF-7 and MCF-10 A) for Formazan compound and Patented Sulfazan compound figures (7-10):

1. Cell interruption (100 µL) was further to the wells of a small flat plate bottom.
2. The solution was equipped through dissolving the crystals of 5 mg MTT in 1 ml of PBS solution (phosphate buffer solution).
3. The concentrations of all new derivative of the equipped derivatives were castoff in this study (6. 15, 12.5, 25, 50, 100, 200, 400*)* µg/ml of methanol, which were added to each well (three replicates per concentration).
4. A 10 ml MTT solution was added to each well of a plate containing 96 wells and then incubated for 4 hours with a test sample at 37 °C (the solution converted to yellow),according to literatures [24,30].

Cell Vitality% = [(Absorption from the treated sample /Absorption from the untreated sample) X 100

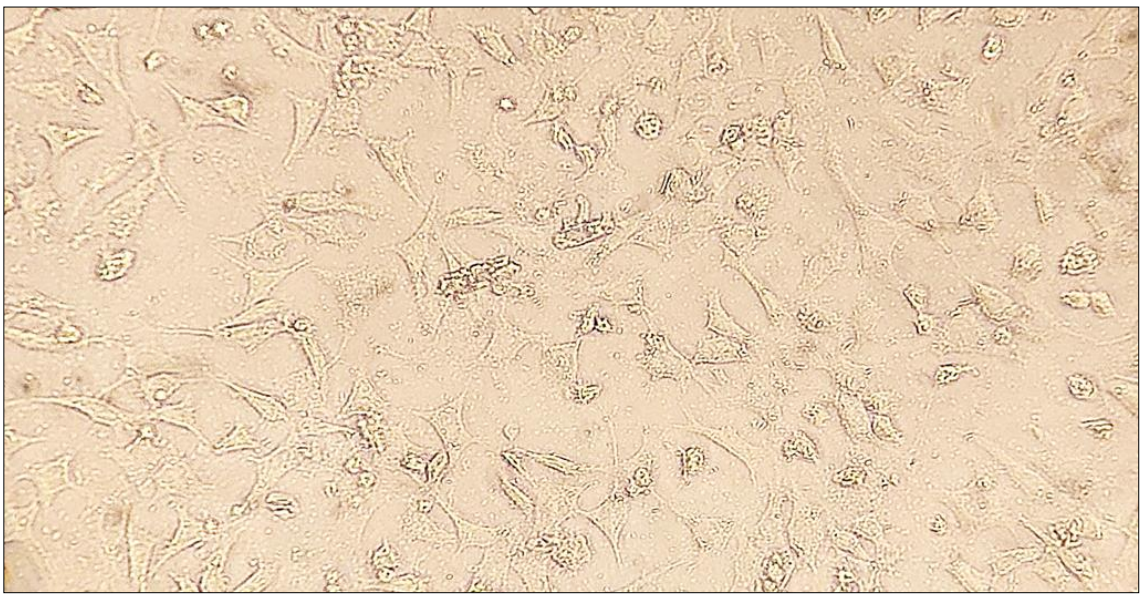

Fig 7: Anti-cancer activity of Formazan Compound on (MCF-7) at 25µg/ml

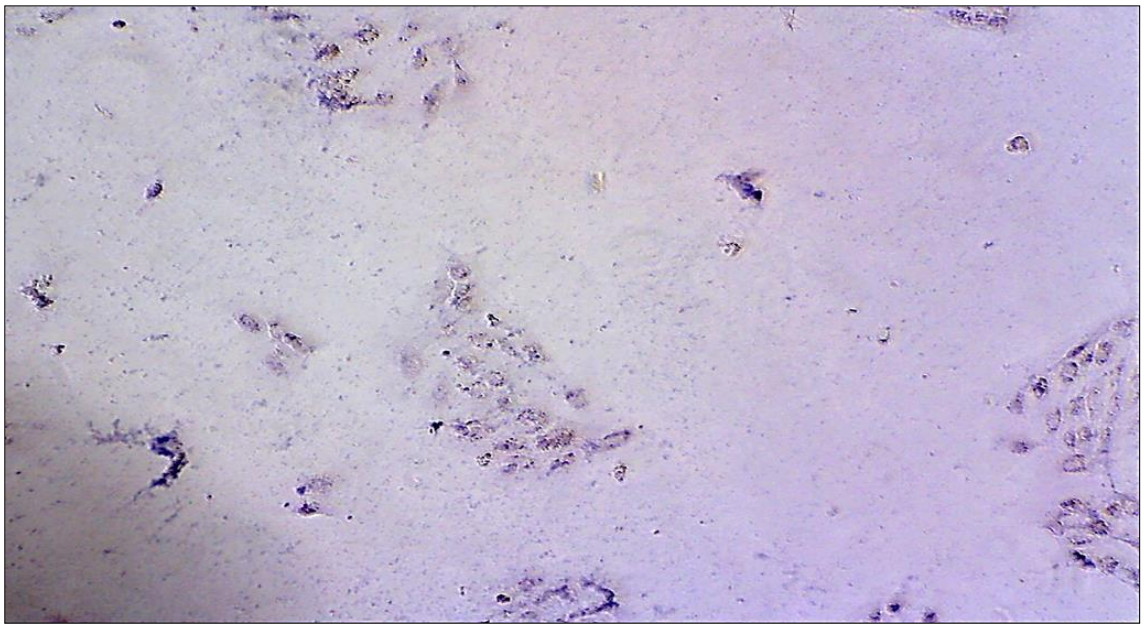

Fig 8: Anti-cancer activity of Formazan Compound on (MCF- A 10) at 25µg/ml

Fig 9: Anti-cancer activity of Sulfzan Compound on (MCF-7) at 25µg/ml

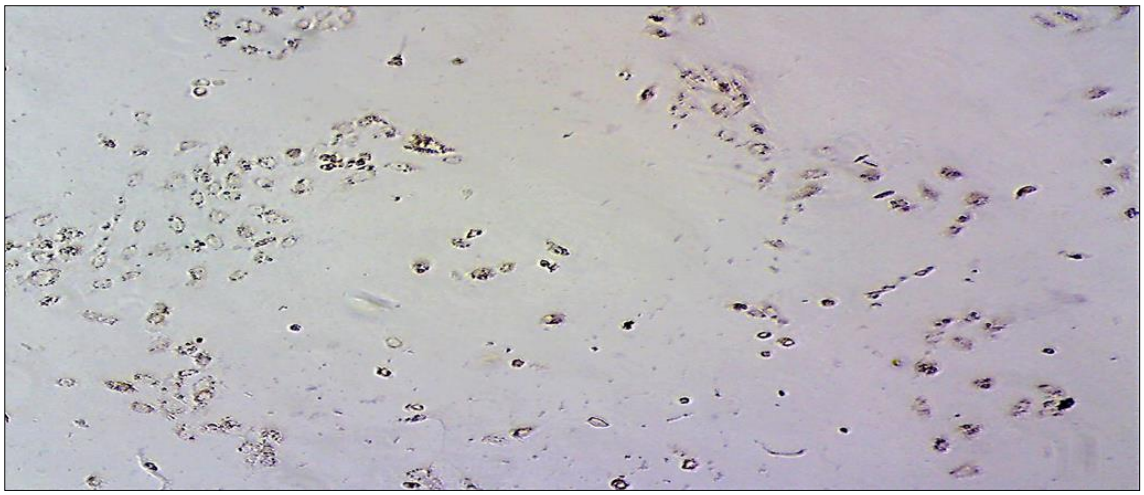

Fig 10: Anti-cancer activity of Sulfazan Compound on (MCF-A 10) at 25µg/ml

From the results,we noted that (Innovative Sulfazan Compound is more activity in inhibition of Cancer cells than Formazan Compound which due to Sulfide group in Sulfazan compound (S-N=N- Ar) is more active than Azo-Group in Formazan compound (-N=N-C=N- Ar).

Ethical clearance: Ethics committee refer that there is no plagiarism and there is no mistakes or wrong results in this work.

Conflict of interest: The authors declare that there is no conflict of interest.

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