ejpmr, 2022,9(3), 131-135

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Review Article

ISSN 2394-3211

EJPMR

BIOLOGICAL IMPORTANCE OF THIAZOLIDINONES

Indu Singh*

Assistant Professor, Department of Chemistry, Meerut College Meerut.

***Corresponding Author: Dr. Indu Singh**

Assistant Professor, Department of Chemistry, Meerut College Meerut.

Article Received on 09/01/2022 **Article Revised on 30/01/2022** **Article Accepted on 20/02/2022**

ABSTRACT

Thiazolidinone belongs to heterocyclic compounds having sulfur & nitrogen atom in a five member nucleus. Thiazolidinone is saturated structure of thiazole included carbonyl group on the fourth position of carbon. Different type of substituent of heterocyclic ring incorporating in thiazolidinone nucleus produces wide range of biological activities. Researchers and scientists have developed various new compounds having thiazolidinone and screened them for various pharmacological activities with least side effects. These thiazolidinone derivatives shows its significance such as antimicrobial, anti-inflammatory, antibacterial, anticonvulsant, analgesic activities etc. From the literature survey it has been found that thiazolidinone nucleus is biological active and easy to synthesized. This review article aims emphasize diverse biological activities of thiazolidinone.

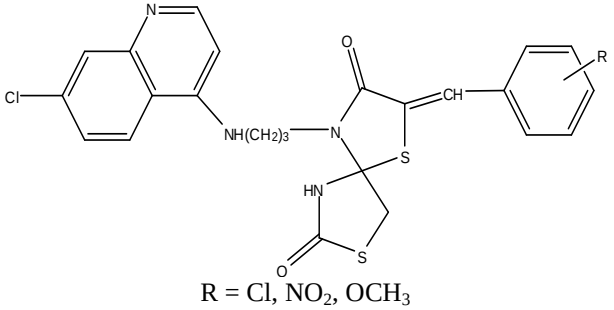
KEYWORDS: Thiazolidinone, biological activities, antimicrobial activity, anti-inflammatory activity.

INTRODUCTION

Thiazolidinone compounds possess different biological and pharmacological properties like anti-inflammatory[1,2], antimicrobial[3-5], antitubercular[6], anticancer[7,8], anticonvulsant[9], antibacterial[10] etc. Heterocyclic compounds consist of organic compounds which are extremely and necessary broad system of synthetic and therapeutic applications. There are many spectrums of bioactive compounds which showed various bioactivities in medicine sector. The curativity of this heterocyclic compounds have motivated chemistry to prepared new chemopreventive agents. Various scientists have reported that thiazolidinones have shown pharmacological activity. This article focused the work reported by many researchers in field of chemistry as well as explained biological activities of thiazolidinone in few past years.

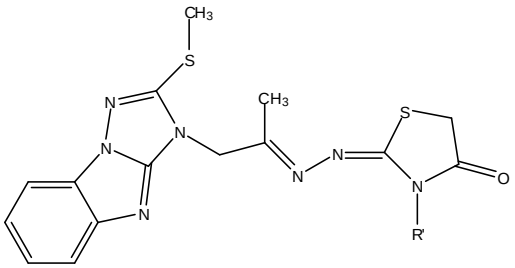
BIOLOGICAL ASPECTS OF THIAZOLIDINONE

Dwivedi et al[11] have synthesized new drugs and tested antiepileptic and antibacterial activity. In this study they found that compound 6a showed good lipophilicity.



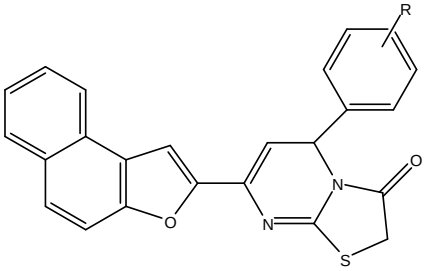
R = Cl, NO_2, OCH_3

Mohmoud et al[12] have prepared thiazoline derivatives incorporating triazole moiety. They selected different bacteria like S. aureus, B. cereus, M. luteus, P. aeruginosa, S. marcescens and compared with ampicillin and fungi such as C. albicans, S. brevicaulis, T. rubrum, A. flavus then compared by Fluconazole, Clotrimazole.



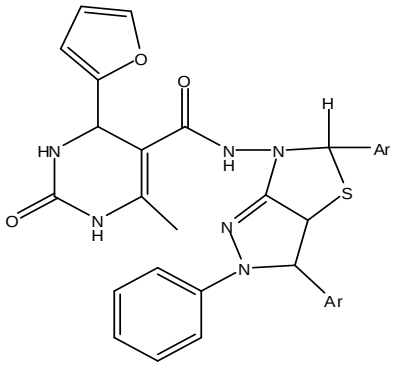
R' = C_6H_5, C_2H_5, C_3H_7, C_6H_{11}

Thiazolidinones containing naphthofuran moiety have been synthesized. Gaikwad et al[13] have tested and observed antimicrobial activity against different fungi as well as bacteria.



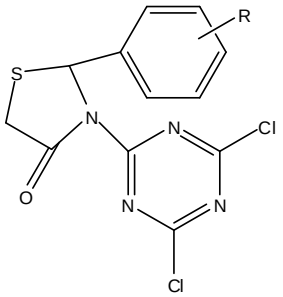
R = H, CH_3, OH, OCH_3, Cl

Jambu and Patel[14] have prepared drugs and have shown activity (Antibacterial as well as antifungal). They used agar diffusion method and potato dextrose agar method for this purpose.



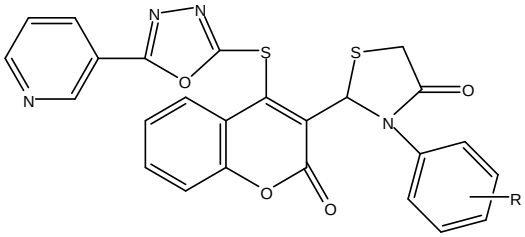
Ar = C_6H_5, 4-$OCH_3C_6H_4$, 4-OHC_6H_4, 2-OHC_6H_4, 4-$CH_3C_6H_4$, 3,4-methylene dioxy phenyl, 4-OH & 3-methoxyphenyl and 3,4-diethoxyphenyl

Shinde et al[15] have synthesized triazine with thiazolidinones then investigated anti-inflammatory activity.



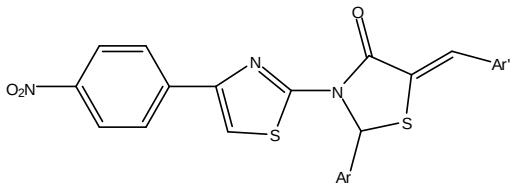
R = H, 4-OCH_3, 2-F, 2-F&4-Br, 2-Br, 2-F&5-Cl, 3-CH_3, 4-NO_2, 2-OH, 3-OCH_3,
2,5-difluro, 3-CN

R. Dani and Y. Patel[16] have reported antibacterial & antifungal activity by using broth dilution technique and they have used standard drugs like ciprofloxacin, chloramphenicol, nystatin and griseofulvin. Compounds 10h, 10j, 11h, and 11j showed good activity.



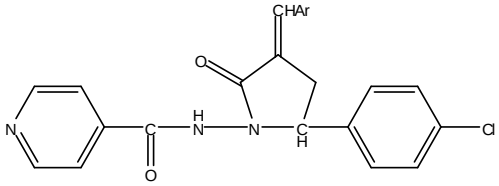
R = H, 2Cl,3Cl,4Cl,2CH_3,3CH_3,4CH_3,2NO_2,3NO_2,4NO_2

Thiazolidinone derivative with aryl and aryledine have been synthesized by Kumar & Patil[17] and explained antimicrobial activity.



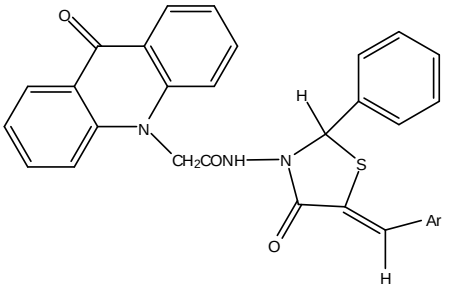
Ar = C_6H_5, 2-$NO_2C_6H_4$
Ar'=C_6H_5, 2-$NO_2C_6H_4$, 4ClC_6H_4,4-OHC_6H_4, 3-BrC_6H_4, 4-FC_6H_4, 3-$OCH_3C_6H_4$, 2-ClC_6H_4, 3-$NO_2C_6H_4$

Sharma and Vinay[18] have prepared heterocyclic compounds i.e. thiazolidinones. They had selected E.coli, S.aureus, B. subtitis, A.niger, C.albicans bacteria as well as fungi for biological screening.



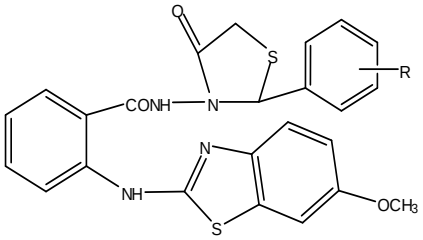
Ar = C_6H_5, C_4H_3O, C_6H_4Cl, $C_6H_4NH_2$, $C_6H_4NO_2$

New drugs have been reported by Baboo et. Al.[19] They used different types of bacteria as well as fungi and observed that 2b and 2d showed potent antimicrobial activity.



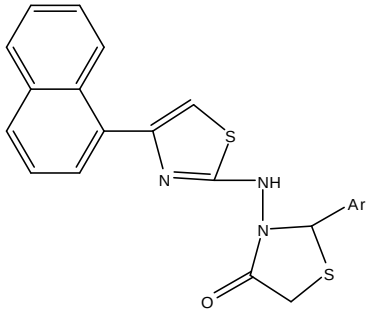
Ar = C_6H_4CHO, 2,4-dichloro, 4-Ndimethyamino, 3-methoxy-4-hydroxy, 3,4-dimethoxy

Patel and Shaikh[20] have prepared thiazolidinones having 2-amino-6-methoxybenzothiazole. Screening effect was check on E.coli, P.aeruginosa, S. aureus, S.pyogens, C.albicans, A.niger, A. clavalus.



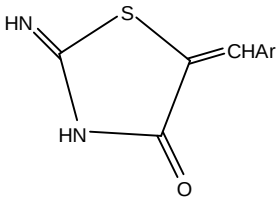
R = H, 2-Cl, 4-Cl, 2NO_2,4OH, 4OCH_3,3OCH_3&4OH, 3OCH_3, 4OH &5NO_2, furyl

Some drugs of thiazolidinone have prepared by Gangwar et al[21] and observed anti-inflammatory activity.



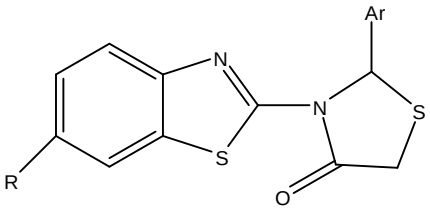
Ar = 2-NO_2, 4-NO_2

Screening of anticonvulsant activity and synthesis of thiazolidinone have been reported by Velmurugan et al.[22]



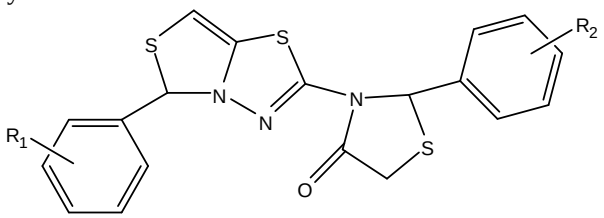
Ar = 2-$NO_2C_6H_4$, 4-BrC_6H_4, 2-OHC_6H_4, $OCH_3C_6H_4$, 4-ClC_6H_4, 5-Cinnamyl

Pareek et al[23] have reported drug containing benzothiazole moiety investigation of antibacterial, entomological, antifeedant and acaricidal activity.



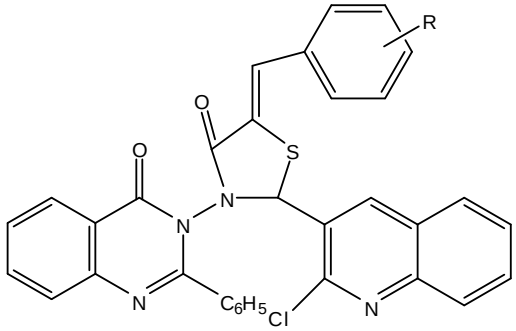
Ar - C_6H_5, $2C_6H_4OH$, $4C_6H_4OCH_3$, $4C_6H_4Cl$
R = Cl, o-C_2H_5, CH_3

Malipeddi et al[24] have prepared 2-(substitutedphenyl)-3-{5-[substitutedphenyl][1,3]thiazolo[4,3b][1,3,4]thiadiazole-2yl}1,3-thiazolodin-4one and tested antitubercular activity which compared with streptomycin, pyrazinamide



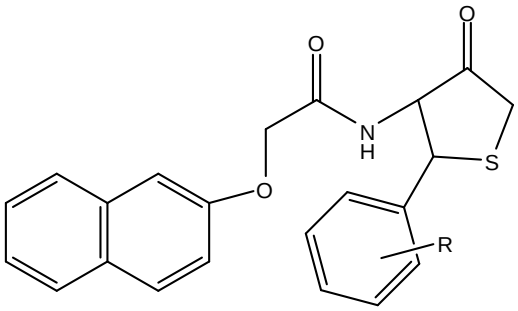
R_1 = H,$4CH_3$, 4-OH, $4N(CH_3)_2$
R_2 = H, 2Cl,4Cl, 2-CH_3,4-CH_3, 2-OH, 4-OH, 2-OCH_3, $4OCH_3$

Quinazolinones, thiazolidinones, azetidinones and oxadizoles have been synthesized by Desai et al[25] and showed antibacterial as well as antifungal activity against different bacteria like E.coli, P.aeruginosa, S.aureus, S.pyogen and fungi C.,albicans, A. niger, A.clavatus.

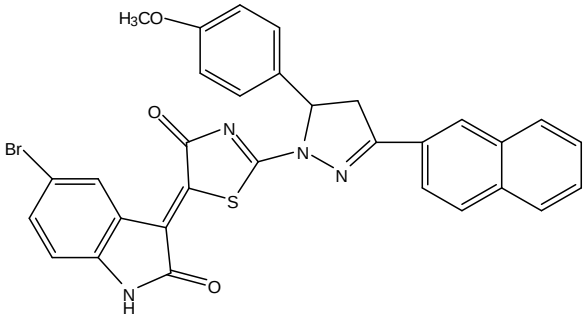


R = 2Cl,3Cl,4Cl,$2NO_2$,$3NO_2$,$4NO_2$, 2OH,3OH, 4OH, $4CH_3$, $4OCH_3$ 3, 4, $5(OCH_3)_3$

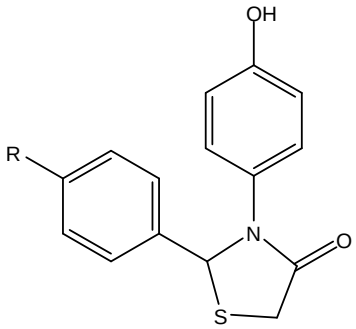
Bhaumik et al[26] have prepared N-[2-(4-substitutedphenyl)-4oxo1,3thiazolidine-3yl]2(naphthalene-2yloxy)acetamide. They had tested anticonvulsant activity from these drugs.



Kobylinska et.al[27] explained enhanced proapoptotic effects of 4-thiazolidinones based on chemotherapeutics.

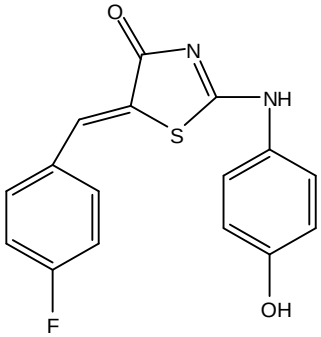


Al-Ebaisal et al[28] have reported antifungal activity of thiazolidinones. This activity was tested against different fungi like C. glabrata, C. albicans, C. krusei and compared by fluconazole, miconazole.

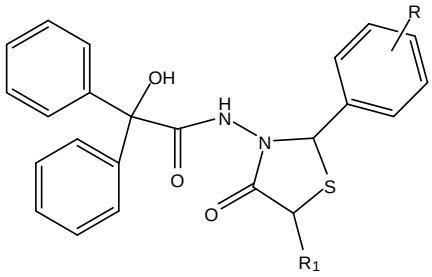


R = 4-OH, 4-Br, 4Cl, $4CH_3$, $4NO_2$, 4-OH, 4-C_2H_5

5-(4-fluorobenzylidine)-2-(4-hydroxyphenylamino)-thiazole-4-one have synthesized by Szychowski et al[29] and screened anticancer activity.

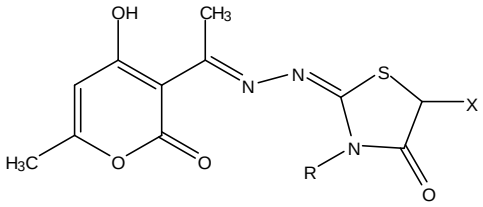


Guzel and Salman[30] have prepared 4-thiazolidinones and investigated antitumor as well as antimycobacterial activity.



R_1 = H, CH_3,
R = 2F,3F, 4F,2Cl,3Cl,4Cl, 2Br,3Br,4Br, 2,&4Cl, 3&4Cl

4-Thiazolidinone contaiing pyrone moiety have been prepared by Nechak et al[31] and showed antimicrobial activity against various bacteria such as E.coli ATCC25992, P.aeuginosa ATCC 27852, staphylococcus aureus ATCC43300, staphylococcus aureus ATCC43300, staphylococcus aureusATCC25923 and fungi like candida albicans.



X = CH_3, H

CONCLUSION

In this review many researchers and scientists gave their reports for preparation of drugs using Thiazolidinones. From this review it has been concluded that heterocyclic compounds specially thiazolidinone nucleus has biological property such as anti-inflammatory, anticancer, analgesic, antimicrobial activity. It can be provide a new idea for preparation of new drugs which may be beneficial for medicine chemistry.

REFERENCES

1. Deep, A; Jain, S; Sharma, PC; Phogat,P; Malhotra, M. Synthesis of 2-(aryl)-5-(arylidene)-4-thiazolidinone derivatives with potential analgesic and anti-inflammatory activity. Medicinal Chemistry. 2012; 21: 1652-1659.
2. Taranalli, AD; Bhat, AR; Srinivas, S; Saravaan, E. Anti-inflammatory, analgesic and antipyretic activity of certain thiazolidinone. Indian Journal of Pharmaceutical Sciences. 2008; 70(2): 159-164.
3. Sharma, R; Samadhiya, P; Srivastava, SD; Srivastava, SK. Synthesis and biological activity of 4-thiazolidinone derivatives of phenothiazine. Journal of the Serbian Chemical Society. 2012; 77(1): doi 10.2298.
4. Veerasamy, R; Rajak, H; Kumar, KS; Agrawal, RK. Synthesis and evaluation of antimicrobial activity of thiazolidinone derivatives. Letters in Drug Design & Discovery. 2011; 8(1): 82-86.
5. Salem, MA; Abbas, SY; El-Sharief, MAMS; Alzahrant, AY; Helal, MH; Thabet, HK. Synthesis and antimicrobial activity of 4-methylthiazole and 4-thiazolidinone derivatives derived from 5-(aryldiazo)salicylaldehyde thiosemicarbazones. An International Journal for Rapid Communication of Synthetic Organic Chemistry. 2021; 51(21): 3325-3331.
6. Samadhiya, P; Srivastava, SD. Synthesis and biological evaluation of 4-thiazolidione derivatives as antitubercular and antimicrobial agents. Arabian Journal of Chemistry. 2014; 7(5): 657-665.
7. Prabhu, A. Synthesis, in vitro anticancer, anti-inflammatory and DNA binding activity of thiazolidinone derivatives. Anti Cancer Agents in Medicinal Chemistry. 2020; 20(14): 1704-1713.
8. Skora, B; Lewinska, A; Dylevych, AK; Kaminskyy, D; Lesyk, R; Szychowski, KA. Evaluation of anticancer and antibacterial activity of four 4-thiazolidinone based derivatives. Molecule. 2022; 27(894): doi.org/10.3390.
9. Mishchenko, M; Shtrygol, S; Kaminskyy, D; Lesyk, R. Thiazole-bearing 4- thiazolidinones as new anticonvulsant sgents. 2020; 88(16): doi: 10.3390/scipharm88010016.
10. Sathyanarayana, R; Poojary, B; Kumar, BS; Kumar, V. Design, synthesis and biological evaluation of novel thiazolidinone derivatives. Asian Journal of Chemistry. 2021; 33(10): 2379-2385.
11. Dwivedi, J.; Devi, K,; Asmat, Y.; Jain, S; Sharma, S. Synthesis, characterization, antibacterial and antiepileptic studies of some novel thiazolidinone derivatives. Journal of Saudi Chemical Society. 2012; doi: org/10.1016.
12. Mohmoud, AM; Salem, OA; Moty, SGA; Alim, AMA Synthesis and antimicrobial evaluation of some new thiazoline and thiazolidine derivatives in corporating[1,2,4]triazolo[1,5-a]benzinidazole. Indian Journal of pharmaceutical Sciences. 2013; 75(5): 545-556.
13. Gaikwad, S; Suryawanshi, V; Viyapure, Y; Shende, V. Synthesis and biological study of some new thiazolidinone derivatives containing naphthofuran moiety. Journal of Chemical and Pharmaceutical Research. 2012; 4 (3): 1851-1855.
14. Jambu, SP ; Patel, YS. Synthesis, characterization and biological studies of novel fused thiazolidinone derivatives. Journal of Chemical and Pharmaceutical Research. 2016; 8 (1): 750-754.
15. Shinde, RS; Masand, VH; Patel, MK. Anti-inflammatory activity of triazine thiazolidinoe derivatives: molecular docking and oharmacophore modeling. Indian Journal of Phamaceutical Sciences. 2019; 81(5): 851-858.
16. Dani, R; Patel, Y. Novel coumarinyl-oxadiazolyl-azetidinone & thiazolidinone derivative: Design, synthesis and antimicrobial activity. Research Journal of Life Science, Bioinformatics, Pharmaceutical and Chemical Science. 2018; 4(5): 345-363.

17. Kumar, R; Patil, S. Synthesis, characterization and antimicrobial activity of 2-(aryl)-5-(arylidene)-4-thiazolidione derivatives. European Journal of Pharmaceutical and Medical Research. 2017; 4 (8): 464-469.
18. Sharma, R; Vinay, V. Synthesis & antimicrobial activity of thiazolidinone derivatives. International Journal of Scientific Research and Reviews. 2012; 1(1): 57-66.
19. Baboo, P; Gautam, G; Gupta, SK. Synthesis of a series of thiazolidinone derivatives and evaluation of their antimicrobial proper ties. International Research Journal of Pharmacy. 2017; 8 (4):121-125.
20. Patel, NB; Shaikh, FM. Synthesis and antimicrobial activity of new 4-thiazolidinone derivatives containing 2- amino-6-methoxybenzothiazole. Saudi Pharmaceutical Journal. 2010; 18(3): 129-136.
21. Gangwar, P; Sharma, P; Shrivastava, B; Sharma, J; Sharma, S. Synthesis and characterization of new thiazolidinone derivatives and screening for their anti-inflammatory activity. International Journal of Current Trends in Pharmaceutical Research. 2013; 1(3): 181-184.
22. Velmurugan, V; Leelavathi, N; Kalvikkarasi, S; Shanmugapriya, S; Anandhi, MV. Synthesis and anticonvulsant activity of thiazolidinone derivatives. International Journal of Chem Tech Research. 2012; 4(1): 01-04.
23. Pareek, D; Chaudhary, M; Pareek, PK; Kant, R; Ojha, KG; Pareek,R; Pareek, SIA. Synthesis of some bioactive-4-thiazolidinone derivatives incorporating benzothiazole moiety. Pelagia Research Library, Der Chemica Scinica. 2010; 1(3): 22-35.
24. Malipeddi, H; Karigar, AA; Malipeddi, VR; Sikarwar,MS. Synthesis and antitubercular activity of some novel thiazolidinone derivatives. Tropical Journal of Pharmaceutical Research. 2012; 11(4): 611-620.
25. Desai, NC; Dodiya, A.; Pandit, V. Antimicrobial screening of quinazolinones, thiazolidinones, azetidinones and oxadizoles bearing quinoline motifs. Journal of Pharmacology and Medicial Chemistry. 2017; 1(1): 6-9.
26. Bhaumik, A; Chandra, MA; Saha, S; Mastanaiah, J; Visalakshi, T. Synthesis, characterization and evaluation of aticonvulsant activity of some novel 4-thiazolidinone derivatives. Scholars Academic Journal of Pharmacy. 2014; 3(2): 128-132.
27. Kobylinska, L; Ivase, I; Skorokhyd, N; Pachuk, R; Riabtseva, A; Mitina, N; Zaicheko, A; Lesyk, R; Ziminkovsky, B; Stoika, R; Vari, SG. Enhanced proapoptotic effects of water dispersed complexes of 4-thiazolidinone based chemotherapeutics with a PEG containing polymeric nanocarrier. Nanoscale Research Letters. 2019; 14: doi. Org/10.1186.
28. Al-Ebaisal, HS; Ababneh, TS, Al-Shboul, TM; Jazzazi, TM. Synthesis characterization and antifungal activity of some substituted 4-thiazolidinone derivatives. Journal of Pure and Applied Chemistry Research. 2016; 5(3): 125-130.
29. Szychowski, K; Kamenskyy, DV; Leja, ML; Kryshchyshyh, AP; Lesyk, RB; Tobiasz, J; Wnuk, M; Pomianek, T; Gminski, J. Anticancer properties of 5z-(4-fluobezylidine)-2-(4-hydroxy phenylamino)-thiazol-4-one. Scientific Reports. 2019; doi.org /10.1038/541598-019-471776.
30. Guzel, O; Salman, A. Synthesis and biological evaluation of new 4-thiazolidinone derivatives. Journal of Enzyme Inhibition and Medicinal Chemistry. 2009; 24(4): 1015-1023.
31. Nechak, R; Bouzroura, SA; Benmalik, Y; Salhi, L; Martini, SP; Morizur, V; Dunach, S; Kolli, BN. Synthesis and antimicrobial activity evaluation of novel 4-thiazolidinones containing a pyrone moiety. 2015; 45(2): 262-272.