International Journal of Advanced Technology in Engineering and Science www.ijates.com

Volume No.03, Special Issue No. 02, February 2015 ISSN (online): 2348 – 7550

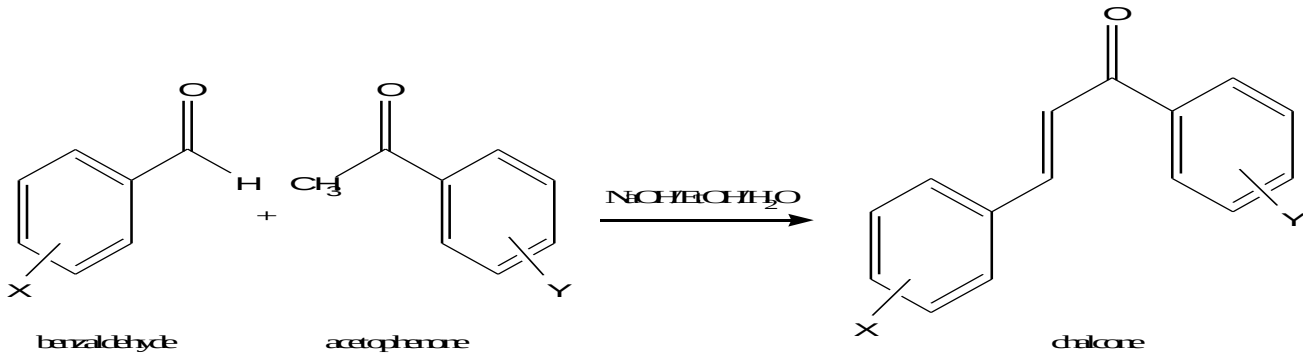
SYNTHESIS AND ANTIBACTERIAL ACTIVITY OF SOME SUBSTITUTED CHALCONE DERIVATIVES

S. D. Nimbalkar

Asst. Professor, St. Vincent Pallotti College of Engineering & Technology, Nagpur (India)

ABSTRACT

Chalcone derivatives were synthesized by the Claisen-Schmidt condensation of aromatic aldehydes with methyl ketones. Chalcone is unquie template that is associated with several biological activities. 2-hydroxy-2,5-dichloro acetophenon (1) were synthesized by Fries migration and condensed with aromatic aldehyde to produce the new chalcone derivatives (2a-e). The new 1-(2-hydroxy-3,5-dichlorophenyl)-aryl-prop-2-ene-1-ones (2a-e) (chalcones) were characterized using FT-IR and NMR The synthesized compounds were also screened against some bacterial species i;e, *S. aureus, K. pneumoniae, S. typhi, P. vulgaris, S. flexueri, E. coli & P. aeruginosa,* to evaluate their activity as promising antibacterial agents.



Keywords: Chalcone, Acetophenon, Aromatic aldehyde, Bacterial species

I INTRODUCTION

Chalcones or 1,3-diphenyl-2-propen-1-one derivatives are a class of open chain flavonoids in which two aromatic rings are linked by a three carbon α,β - unsaturated carbonyl skeleton. Chalcones and their derivatives have shown a wide variety of therapeutic activities such as anti-oncogenic [1], anti-inflammatory [2a,2b], anti-ulcerative [3], analgesic [4], anti-viral [5], anti-fungal [6], anti-malarial [7], anti-bacterial activities [8a,8b], anti-cancer activity[9], anti-invasive [10] and anti-tumour [11] . During the last decade, the antimicrobial resistant represent the major problem facing the world, so that several new antibiotics and antifungal agents are accepted each year to help treatment the infectious diseases. In order to

discovering new antimicrobial agents, this research illustrated the synthesis novel chalcone derivatives and screening their activities against some gram positive and game negative bacterial species.

II METHOD AND EXPERIMENTAL

The melting points are determined in open capillary tube & are uncorrected, purity of compounds was checked by TLC on silica gel-G plates .IR spectra was recorded on R Kin Elmer spectrophotometer. H^1NMR spectra were recorded in $CDCl_3$ on Bracker AC 300 F .Spectrophotometer at 300MHz using TMS as internal reference. Antimicrobial activity of the compounds was assayed by cup plate agar diffusion method [12]

The titled compounds were tasted against pathogenic bacteria for there antibacterial activity by paper disk method[13].The organism tasted were staphylococeus aureus., klebsiella pneumoniae , salmonella typhi, proteus vulgaris , shigella flexueri , Escherichia coli & pseudpmonas aerugivosa . The solution of these compounds was prepared in DMSO as a solvent at a concentration of 50µ /ml. The culture medium used was nutrient agar. After 24 hours of inhibition at 37 ^{0}C, the zones of inhibition were measured in millimeter.

2.1 Preparation of 1-(2-hydroxy-3,5-dichlorophenyl)-3-aryl-prop-2-ene-1-ones (2a-e) :

2-Hydroxy-3,5-dichloro acetophenone (1) (0.01 M) was dissolved in ethanol (15 ml). Then aromatic aldehyde (0.01 M) was added to it. The mixture was heated to boiling. Aqueous NaOH solution (40%, 8 ml) was added dropwise with constant stirring to the reaction mixture, orange cake was formed. The reaction mixture was kept overnight. Then it was decomposed by adding water containing a little conc. HCl. The crude product was crystallised from ethanol-acetic acid mixture to get 1-(2-hydroxy-3,5-dichlorophenyl)-3-aryl-prop-2-ene-1-ones (2a-e).

Table –1

Physical characterization data of 2-hydroxy-3-5-dichloro chalcones (2a-2e)

comp	R_1	R_2	Yields %	M.P.^{0}C	Molecular
2a	H	OCH_3	85	169	$C_{16}H_{12}O_3Cl_2$
2b	H	H	85	140	$C_{15}H_{10}O_2Cl_2$
2c	Cl	H	80	158	$C_{15}H_9O_2Cl_3$
2d	NO_2	H	90	220	$C_{15}H_9O_4Cl_2N$
2e	H	OH	75	168	$C_{15}H_{10}O_3Cl_2$

2.2 Spectral Interpretation of 2a

IR (max cm-1)- 3068.2 (Ar-H); 1599 (c=c); 702, 737,780 , (C-H); 824 (C-Cl); 1045 (C-O-C); 1637.3 (C=0)

HNMR: OH ($CDCL_3$, ppm); 3.87(S, 3H), 6.9-7(m 64), 3.53 (S_2lH)

Thus, the following Chalcones were prepared by this method.

1. (2a) 1-(2-hydroxy-3,5-dichlorophenyl)-3-phenyl-prop-2-ene-1-one
2. (2b) 1-(2-hydroxy-3,5-dichlorophenyl)-3-(4-methoxyphenyl)-prop-2-ene-1-one
3. (2c) 1-(2-hydroxy-3,5-dichlorophenyl)-3-(3-chlorophenyl)-prop-2-ene-1-one
4. (2d) 1-(2-hydroxy-3,5-dichlorophenyl)-3-(3-nitrophenyl)-prop-2-ene-1-one
5. (2e) 1-(2-hydroxy-3,5-dichlorophenyl)-3-(4-hydroxyphenyl)-prop-2-ene-1-one

2.3 Properties and Constitution of the Compound (2a-e) :

- The compound (2a-e) gave green colouration with neutral alcoholic $FeCl^3$solution indicating the presence of phenolic -OH group.
- The compound (2a-e) shows unsaturation test with bromine water and $KMnO_4$ solution.

Antimicrobial activities

TABLE - 2 :

Antimicrobial activity of 1-(2-hydroxy-3,5-dichlorophenyl)-3-aryl-prop-2-ene-1-ones (2a-e)

Microorganisms	2a	2b	2c	2d	2e
S. aureus	--	--	--	--	--
K. pneumoniae	14	14	11	15	18
S. typhi	--	12	12	13	11
P. vulgaris	15	17	16	15	16
S. flexueri	--	--	--	--	12
E. coli	12	12	12	--	18
P. aeruginosa	16	--	--	14	12

N.B. -- : Resistance (Inactive)
11-15 : Weakly active
15-20 : Moderately active
20-30 : Highly active

Results and Discussion :

From the Table-2, it is observed that *S. aureus* is inactive against all these compounds whereas *S. flexueri* is weakly active against 2e. *P. aeruginosa* are weakly active against 2d and 2e compounds. *P. vulgaris* is the organism which is moderately active against all compounds of this series and *K. pneumoniae* is moderately active against 2e and weakly active against 2a, 2b, 2c and 2d.

REFERENCES

[1] Kumar, S. K.; Hager, E.; Pettit, C.; Gurulingappa, H.; Davidson, N. E.; Khan, S. R. *J. Med. Chem.* **2003**, *46*, 2813 - 2815.

[2a] Hsieh, H. K.; Lee, T. H.; Wang, J. P.; Wang, J. J.; Lin, C. N. *Pharm. Res.***1998**, *15(1)*, 39 - 46.

[2b] Nowakowska, Z. A review of anti-infective and anti-inflammatory chalcones. *Eur. J. Med. Chem.***2007**, *42*, 125–137.

[3] Murakami, S.; Muramatsu, M.; Aihara, H.; Otomo, S. *Biochem.Pharmacol.* **1991**, *42(7)*,1447 - 1451.

[4] Viana, G. S.; Bandeira, M. A.; Matos, F. J. *Phytomedicine* **2003**, *10(2)*,189 - 195.

[5] Wu, J. H.; Wang, X. H.; Yi, Y. H.; Lee, K. H. *Bioorg. Med. Chem. Lett*. **2003**,*13(10)*, 1813 - 1815.

[6] Lopez, S. N.; Castelli, M. V.; Zacchino, S. A.; Dominguez, J. N.; Lobo, G.;Cortes, J. C.; Ribas, J. C.; Devia, C.; Rodriguez, A. M.; Enriz, R. D. *Bioorg.Med. Chem*. **2001**, *9(8)*, 1999 - 2004.

[7] Liu, M.; Go, P.; Wilairat, M. L. *J. Med. Chem*. **2001**, *44(25)*, 4443 - 4452.

[8a] Bekhit, A. A.; Habib, N. S.; Bekhit, A. *Boll. Chim. Farm*. **2001**, *140(5)*,297 - 301.

[8b] Sivakumar, P.M.; Ganesan, S.; Veluchamy, P.; Doble, M. Novel chalcones and 1, 3, 5-triphenyl-2-pyrazoline derivatives as antibacterial agents. *Chem. Biol. Drug. Des.* **2010**, *76*, 407–411.

[9] Suvitha Syam, Siddig Ibrahim Abdelwahab , Mohammed Ali Al-Mamary and Syam Mohan *Molecules* **2012**, *17*, 6179-6195; doi:10.3390/molecules17066179

[10] Go, M.L.; Wu, X.; Liu, X.L. Chalcones: An update on cytotoxic and chemoprotective properties.*Curr. Med. Chem.* **2005**, *12*, 483–499.

[11] Kumar, D.; Kumar, N.M.; Akamatsu, K.; Kusaka, E.; Harada, H.; Ito, T. Synthesis and biological evaluation of indolyl chalcones as antitumor agents. *Bioorg. Med. Chem. Lett.* **2011**, *20*, 3916–3919.

[12] A.L.Barry "The Antimicrobial suscebility Test: Principle 7 Practice *'Illuslea &* Febiger, *phiadelphia*

[13] C.H.Collins , (*Microbiological Methods , Butterworth ,London*)**1967**