International Journal of Pharmacy and Biological Sciences
ISSN: 2321-3272 (Print), ISSN: 2230-7605 (Online)
IJPBS | Volume 9 | Special Issue 2 | 2019 | 34-37
| Research Article | Biological Sciences |Open Access |MCI Approved|
|UGC Approved Journal|

Synthesis, Characterization and Antimicrobial Activities of N-(4-Chlorophenyl)-4-Oxo-2,6-Diphenylpiperidine-3-Carboxamide

S. Mohamed Rabeek and M. Seeni Mubarak*
PG and Research Department of Chemistry, Jamal Mohamed College (Autonomous), Affiliated to Bharathidasan University, Tiruchirappalli – 620 020, Tamil Nadu, India.

Received: 30 Jan 2019 / Accepted: 20 Feb 2019 / Published online: 01 Apr 2019
Corresponding Author Email: rafeeqchem@yahoo.com

Abstract
Mannich bases of piperidinone have been synthesized by using 4-chloroacetoacetanilide and benzaldehyde with ammonium formate. Structures of the compounds were confirmed by IR, ^{1}H,^{13}C-NMR, mass spectra and elemental analysis. They were also screened for antimicrobial activity of gram positive (*Staphylococcus aureus*) Gram negative (*Escherichia coli* and *Pseudomonas aereuginosa*) and Fungus (*Aspergillus niger* and *Mucor)* against various bacterial and fungal strains employing Ciprofloxacin as standard drug for antibacterial and Nystatin as standard drug for anti-fungal.

Keywords
4-chloroacetoacetanilide, benzaldehyde, Spectral studies and Antimicrobial activities.

*****

INTRODUCTION
Mannich bases form by far the largest of classical divisions of organic chemistry and are of immense importance biologically and industrially. Heterocyclic compounds containing piperidine rings are associated with diverse pharmacological properties such as biological like antimicrobial [1], anticancer [2], anti-convulsant [3] as part of our studies in this area, for more than a century, heterocycles have constituted one the largest areas of research in organic chemistry. They have contributed to the development of society from a biological and industrial point of view as well as to the understanding of life processes and to the efforts to improve the quality of life. Among the approximately 20 million chemical compounds identified by the end of the second millennium, more than two-thirds are fully or partially aromatic and approximately half are heterocyclic.

Heterocyclic compound with a piperidone skeleton are attractive target for organic synthesis and there is found to be significant in compound possessing aromatic substitution in 2^{nd} and 6^{th} position in the piperidone rings [4]. Piperidin-4-one was prepared in the laboratory based on the literature method [4-10]. These aspects prompted us to take a study on the heterals, particularly on piperidinone chemistry. Literature report shows that a wide range of 2,6-substituted piperidinone-4-ones have been prepared, the substituents being alkyl, aryl and chloro groups [10-16].

The compound has been analyzed for its structural features and biological activity. The present study

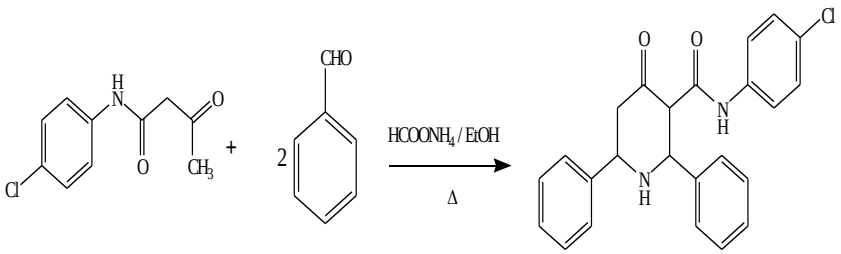
deals with synthesis of N-(4-chlorophenyl)-4-oxo-2,6-diphenylpiperidine-3-carboxamide. It was characterized by IR, ^{1}H NMR, ^{13}C NMR and biological studies.

MATERIALS AND METHODS

All the reagents and solvents used were of laboratory grade. The melting points of the compounds were determined by open capillaries on a Thomas Hoover apparatus and are uncorrected. The purity and homogeneity of compounds were checked using TLC technique. IR spectra were recorded using KBr pellets on Perkin Elmer 337 spectrophotometer, ^{1}H NMR were recorded on Bruker WH 500 spectrophotometer using $CHCl_3$ and DMSO as solvent.

EXPERIMENTAL METHODS

4-chloroacetoacetanilide (1.6g; 0.1mol), ammonium formate (4g; 0.1mol) and benzaldehyde (3.02.gm; 0.03mol) were taken in a RB flask containing ethanol (10ml). The mixture was refluxed in a water bath with occasional shaking until the colour changed into red orange. The solution was cooled, and then ether (50ml) was added. The filtered solution was transferred into conical flask and Con.HCl (5ml) was added. A white precipitate was formed. The precipitate was washed with 5:1 ethanol: ether mixture and dried. Acetone (10ml), liquid ammonia (5ml), and excess of coldwater were added. The precipitate was formed, filtered and dried. Then the product was recrystallised with ethanol. The product was dried, m.p 220-222^{0}C.



SCHEME – I : N-(4-CHLOROPHENYL)-4-OXO-2,6-DIPHENYLPIPERIDINE-3-CARBOXAMIDE

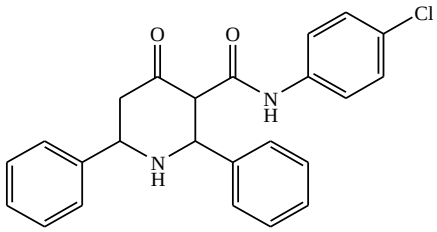
RESULTS AND DISCUSSION

Spectral characterization

N-(4-chlorophenyl)-4-oxo-2,6-diphenylpiperidine-carboxamide Yield: 86-92%; mp: 220-222^{0}C. FT-IR (KBr): 3406 (υN-H), 3064 (υaromatic-CH), 3030 (υaliphatic-CH), 1714 (υC=O), 704 (υC-Cl), 1347 (υC-N)cm^{-1}, ^{1}H NMR (500MHz, DMSO-d6, δ in ppm); 7.97 (s, N-H, 2º amide H); 7.09-7.55 (m, aromatic-H); 4.175 – 4.669 (d, benzylic-**H** at C_2); 3.363 – 3.892 (d, Methine **H** at C_3); 2.071(s, **NH** proton at ring). ^{13}CNMR (500MHz, DMSO-d6, δ in ppm): 201 (>C=O), 161,157,149,120

N-(4-CHLOROPHENYL)-4-OXO-2,6-DIPHENYLPIPERIDINE-3-CARBOXAMIDE

Based on the above spectral data the compound is identified as and the given structure



BIOLOGICAL ACTIVITY

The obtained results are tabulated as following

Table I

S.No	Name of the Micro Organisms	30 µg/ml	35 µg/ml	Standard (Amoxycillin)
1	*Klebsillapneumonia*	16	18	11
2	*Staphylococcus aureus*	18	17	10
3	*Shigelladysenteriae*	17	19	11
4	*Escherichia coli*	19	20	12
5	*Pseudomonas Aeruginosa*	16	20	10

6	*Streptococcus pneumonia*	18	16	10
7	*Proteus vulgaris*	18	19	9

Standard – Amoxylillin 10µg/disc for bacteria, Solvent DMSO

Followed by incubation at 37^0C for 24 Hrs and 25^0C for two days for bacteria and fungi were observed for zone of inhibition. The zone of inhibition was measured by using a standard scale. The diameter of the zone of inhibition directly proportional to the amount of active constituent present in the sample. The synthesized compound has high degree of inhibition towards *Klebsiellapneumonia, Staphylococcus aureus, Shigelladysenteriae, Escherichia coli, Pseudomonas Aeruginosa, Streptococcus pneumonia* and *Proteus vulgaris.*

DISCUSSION

- The microorganism of *Klebsiellapneumonia* in microbial activity 30= 16 mm, 35=18 mm then standard 11 mm.
- The microorganism of *Staphylococcus aureus* in microbial activity 30= 18 mm, 35=17 mm then standard 10 mm.
- The microorganism of *Shigelladysenteriae* in microbial activity 30= 17 mm, 35=19 mm then standard 11 mm.
- The microorganism of *Escherichia coli* in microbial activity 30= 19 mm, 35=20 mm then standard 12mm.
- The microorganism of *Pseudomonas aeruginosa* in microbial activity 30= 16 mm, 35=20 mm then standard 10 mm.
- The microorganism of *Streptococcus pneumonia* in microbial activity 30=18 mm, 35=16 mm then standard 10 mm.
- The microorganism of *Proteus vulgaris* in microbial activity 30= 18 mm, 35=19 mm then standard 9 mm.

CONCLUSION

A simple and elegant method for the synthesis of the compound described in this work. Nitrogen containing piperdine-4-ones are obtained, when more convenient ammonium formate is employed instead of the deliquescent ammonium acetate. The synthesized compound was characterized by FT-IR, ^{1}H-NMR, ^{13}C-NMR and biological activity.

ACKNOWLEDGEMENT

The Authors thanks the Principal and Management committee members, Jamal Mohamed College, Trichy-620 020 for providing necessary facilities. We are very thankful to the Sastra University, Thanjavur collected for NMR studies and also Periyar Maniyammai Pharmaceuticals College and Research Institute, Trichy for their help in antimicrobial susceptibility testing.

REFERENCES

1. Patel, N. B., Agravat, S. N. & Shaikh, F. M. Med. Chem. Res.20, 1033–1041 (2011)
2. Srivastava, A. & Pandeya, S. N. Int. J. Curr. Pharm. Rev. Res.4, 5–8, (2011)
3. Paronikyan, E. G., Noravyan, A. S., Dzhagatspanyan, I. A., Nazaryan,I. M. & Paronikyan, R. G. Pharm. Chem. J. 36, 465–467, (2002)
4. Baliah. V, Ekambaram A, Govindarajan T.S, Curr. Sci,;23:264,(1954)
5. Baliah. V, Jeyaraman R, Chandrasekaran L. J. Am. Chem. Soc, Rev., Vol.83, 379-423, (1983)
6. Baliah. V and Chandrasekaran.J, Indian Journal of Chemistry, 15B, 55S, (1977)
7. Baliah. V, Gopalakrishnan V, Jeyaraman R,Indian.J.Chem,Soc., Sec.B, 6B: 1065 (1978)
8. Baliah. V, Gopalakrishnan V, Jeyaraman R, Indian Journal of Chemical Society, Sec.B, 16B.1065, (1978)
9. Fazal Mohamed M.I and Krishnapillay M, Indian.Chem.Soc., 70: 258, (1993)
10. Fazal Mohamed M.I and Krishnapillay M, Indian. J. Chem., 36B: 50 (1997)
11. Jeyaraman R and Avila S, Chem. Rev., 81, 1499 (1981)
12. Baliah. V and T.S. Govindarajan, Curr. Sce., 23, 91 (1954)
13. Baliah. V and A. Ekambaram, J. Indian. Chem. Soc., 33,274, (1955)
14. Silverstein, Bassler and Morrill, Spectrometric Identification of Organic Compounds. 4th Edn. John Wiley and Sons.
15. Seeni Mubarak M, et al., Oriental J. Chem., 27(1) 333, (2011)

16. Ramani Devi R, Kathirvel R, Seeni Mubarak M, Mohamed Rabeek S, Fazal Mohamed M.I; International J.ITEE., Vol 3:1-4 (2014)