RESEARCH INVENTY: International Journal of Engineering and Science
ISBN: 2319-6483, ISSN: 2278-4721, Vol. 1, Issue 10
(December 2012), PP 68-74
www.researchinventy.com

Synthesis and characterization of 1, 8-dioxo-1, 2, 3, 4, 5, 6, 7, 8-octahydroxanthenes derivatives with evaluation of biological activity

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Abstract: *A large number of organic compounds are synthesized using 1, 3 dicarbonyls. Active methylene group at C_2 position in the 1, 3 dicarbonyl compounds plays an important role in the synthesis of a variety of compounds. Synthesis of condensed (3, 6 and 9) and cyclised (4, 7and10) compounds using dimedone and different aldehydes. Synthesized condensed compounds 3, 6 and 9 having fused ring systems are further cyclized to yield compounds 4, 7and10 respectively. Synthesis of dioximes ligands (11, 12 and 13) from condensed (3, 6 and 9) respectively. Xanthenes widely used as dyes fluorescent materials for visualization of bio-molecules and laser technologies due to their useful spectroscopic properties1 all these compounds have been characterized by modern spectral techniques such as IR, ^{1}HNMR, CMR, Mass etc. Evaluation of synthesized compounds (3,6,9), (4,7,10) and ((11, 12 and 13) for antimicrobial activity against specific bacterial strains like 1)Escherichia coli 2) Salmonella abony 3) Staphylococcus aureus and. Ligands 7,12,13 is found to be active in sterile water and in DMSO towards against Escherichia coli. Salmonella abony, and for Staphylococcus aureus.*

Key word*: Dimedone, Xanthenes, antibacterial activity*

I. Introduction

Dimedone is a 1, 3 dicarbonyl compound. are used in the synthesis of different branches of organic chemistry like dyes, rubber pharmaceutical pesticide etc. Cycloadditon reaction [1-2] with 1, 3 dicarbonyls have been reported Ceric ammonium nitrate (CAN) is used for oxidative cycloadditon of 1, 3 dicarbonyls to vinyl sulphides [3]. Xanthenes derivatives are very important heterocyclic compounds and have been widely used as dyes fluorescent materials for visualization of bio-molecules and laser technologies due to their useful spectroscopic properties [4]. They have been reported for their agricultural bactericide activity [5], photodynamic therapy, antiflammatory effect [6] and antiviral activity [7]. Fused ring systems are frequently present in terpenoids [8] alkaloids [9], steroids [10] etc.inplantsandmarineorganisms.Literature survey revealsnumberofcondensation reactions in presence of acidic [11], and alkaline [12] medium. The reports reveal that, different types of condensations like Knoevenagel, Claisen [13], they can conveniently be handled and removed from the reaction mixture, thus making the experimental procedure simple and eco-friendly. As part of our continued interest in the development of highly expedient methods for the synthesis of heterocyclic compounds of biological importance14, we would like to report a simple and efficient method to produce 1,8-Dioxo-octahydroxanthenes in very good yields Stobbe[14], Dickmann[15], Claisen –Schmidt[16], benzoin[17], Michael[18], Darzen[19],aldol condensation etc. occur at active position. Many important reactions of carbanion ion have been described in literature; few of them are Mannich, Wittig, Perkin, Cannizaro etc. These are the reactions of active methylene compounds with different carbonyl compounds in presence of acid or alkali. 5-5'- dimethyl -1, 3 –cyclohexane dione (dimedone) with different substituted aldehydes yield condensation products in presence of pyridine or piperidine catalyst. Presence of an aliphatic or aromatic aldehydes or ketones can be confirmed by above test. Cyclization is generally the last step of organic synthesis. Cyclization is a key step that involves formation of carbon–carbon and carbon- hetero bond with atoms like oxygen, nitrogen and sulphur.

1.1 Experimental

1.1.1 Synthesis of 3-Hydroxy-2-[(2-hydroxy-4,4-dimethyl- 6-oxocyclohex- 1-enyl)-phenyl-methyl]-5,5-dimethyl-cyclohex-2-enone----(3).

In a 50 ml round bottomed flask a solution of Dimedone (**1**, 0.01 moles, 1.4 g) in 20 ml distilled ethanol was taken. To this solution, distilled benzaldehyde (2, 0.005mole, 0.56 ml) was added with constant stirring. To the reaction mixture a drop of piperidine was added. The reaction mixture was refluxed on water bath for 15 minutes. After 15 minutes the refluxing was stopped, water was added drop wise through the condenser till turbidity persists. The crude product was crystallized using ethanol as solvent.

1.1.2 Cyclization of 3-Hydroxy-2-[(2-hydroxy-4,4-dimethyl-6-oxocyclohex- 1-enyl)-phenyl-methyl]-5,5-dimethyl-cyclohex-2-enone---3to3,4,6,7-tetrahydro-3,3,6,6,tetramethyl-9-phenyl-2H-xanthene-1,8---dione---- (6).

The condensed product (**3**, 0.27 m moles 0.10g) was suspended in 25 ml ethanol in round bottomed flask. To this were added 4/5 drops of A.R. grade hydrochloric acid as a cyclizing agent. The reaction mixture was refluxed for 10 minutes. On cooling, the reaction yielded white shining crystals of the cyclized product **4**.

1.1.2 Synthesis of 3-Hydroxy-2-[(2-hydroxy-4, 4-dimethyl-6-oxocyclohex-1-enyl)-(3-nitro-phenyl)-methyl]-5, 5-dimethyl-cyclohex-2-enone (6)

In a 50 ml round bottomed flask a solution of Dimedone (**1**, 0.01 moles, 1.4 g) in 20 ml distilled ethanol was taken. To this solution, m- nitro benzaldehyde (5, 0.005mole, 0.755 g) was added with constant stirring. To the reaction mixture a drop of piperidine was added. The reaction mixture was refluxed on water bath for 15 minutes. After 15 minutes the refluxing was stopped and water was added drop wise through the condenser till turbidity persists. The crude product was crystallized using ethanol as solvent.

1.1.3 Cyclization of 3-Hydroxy-2-[(2-hydroxy-4,4-dimethyl-6-oxocyclohex-1-enyl)-(3-nitro-phenyl)-methyl]-5,5-dimethyl-cyclohex-2-enone (6), to 3,3,6,6-tetramethyl-9-(3-nitro-phenyl)-3,4,5,6,7,9-hexahydro-2H-xanthene-1,8-dione,(7)

The condensed product (**6**, 0.10g, 0.24 m moles) was suspended in 25 ml ethanol in round bottomed flask. To this were added 4/5 drops of A.R. grade hydrochloric acid as a cyclizing agent. The reaction mixture was refluxed for 10 minutes. On cooling the reaction yielded white shining crystals of the cyclized product **7**.

1.1.4 Synthesis of 2-[(2-Chloro-phenyl)-(2-hdroxy-4, 4-dimethyl-cyclohex-1-enyl)-methyl]-3-hydroxy-5, 5-dimethyl-cyclohex-2-enone (9).

In a 50 ml round bottomed flask a solution of Dimedone (**1**, 0.01 moles, 1.4 g) in 20 ml distilled ethanol was taken. To this solution, o-chloro benzaldehyde (8, 0.005mole, 0.707ml) was added with constant stirring. To the reaction mixture a drop of piperidine was added. The reaction mixture was refluxed on water bath for 15 minutes. After 15 minutes the refluxing was stopped and water was added dropwise through the condenser till turbidity persists. The crude product was crystallized using ethanol as solvent.

1.1.5 Cyclization of 2-[(2-Chloro-phenyl)-(2-hdroxy-4, 4-dimethyl-cyclohex-1-enyl)-methyl]-3-hydroxy-5, 5-dimethyl-cyclohex-2-enone (9). to 9-(2-Chlorophenyl)-3,4,6,7- tetrahydro-3,3,6,6–tetramethyl -2H-xanthene -1,8 (5H,9H)- dione (10)

The condensed product (**9**, 0.10g, 0.248 m moles) was suspended in 25 ml ethanol in round bottomed flask. To this were added 4-5 drops of A.R. grade hydrochloric acid as a cyclizing agent. The reaction mixture was refluxed for 10 minutes. On cooling, the reaction yielded white shining crystals of the cyclized product **10**.

1.1.6 Compound 11

Synthesis of oxime derivatives of condensed product (3)

2-[2'-Hydroxy -4, 4'-dimethyl -6-oxo-cyclohex-1-enyl)-phenyl-methyl]-5, 5-dimethyl –cyclohexane -1, 3-dioxime, (**11)**

The compound 3-Hydroxy-2-[(2-hydroxy-4,4-dimethyl- 6-oxocyclohex-1-enyl)-phenyl-methyl]-5,5-dimethyl-cyclohex-2-enone (**3** , 0.2 g, 0.542 m mole) was taken in ethanol (10 ml) , to this hydroxyl amine hydrochloride (0.2 g,4.44 m moles ,) and sodium acetate (3.70 m moles ,0.3 g) in 10 ml of ethanol was added . The reaction mixture was refluxed for 25 hours by monitoring the progress of reaction using thin layer chromatography. The alcohol from the reaction mixture was removed under reduced pressure. The crude product was recrystallized from ethyl acetate.

1.1.7 Synthesis of oxime derivatives of condensed product (6)

3, 3, 6, 6-tetramethyl-9-(3-nitro-phenyl)-3, 4, 5, 6, 7, 9-hexahydro-2Hxanthene-1, 8-dione dioxime, (12)

The compound 3-Hydroxy-2-[(2-hydroxy-4,4-dimethyl-6-oxocyclohex-1-enyl)-(3-nitro-phenyl)-methyl]-5,5-dimethyl-cyclohex-2-enone (**6** , 0.48 m moles, 0.2 g)) was taken in ethanol (10 ml) , to this hydroxyl amine hydrochloride (4.4 m moles ,0.2 g)and sodium acetate (3.7 m moles 0.3 g) in 10 ml of ethanol was added . The reaction mixture was refluxed for 25 hours by monitoring the progress of reaction using thin layer chromatography. The alcohol from the reaction mixture was removed under reduced pressure. The crude product was recrystallizing from ethyl acetate the yield of oxime derivative (**12**).

1.1.8 Synthesis of oxime derivatives of condensed product (9)

9-(2-Chloro-phenyl)-3, 36, 6, 9-pentamethyl-3, 4, 5, 6, 7, 9-hexahydro-2H-xanthene-1, 8-dione dioxime (13)

The compound 2-[(2-Chloro-phenyl)-(2-hdroxy-4,4-dimethyl-cyclohex-1-enyl)-methyl]-3-hydroxy-5,5-dimethyl-cyclohex-2-enone- (**9** ,0.49 m moles ,0.2 g)) was taken in ethanol (10 ml) , to this hydroxyl amine hydrochloride (4.44 m moles 0.2 g) and sodium acetate (3.70 m moles 0.3 g) in 10 ml of ethanol were added . The reaction mixture was refluxed for 25 hours by monitoring the progress of reaction using thin layer chromatography. The alcohol from the reaction mixture was removed under reduced pressure. The crude product was recrystallizing from ethyl acetate.

1.1.9 **Antibacterial activity**

It includes three steps **a) Preparation of bacterial culture for antibacterial activity:** Bacterial cultural was procured from National collection of industrial microorganism NCL Pashan pune. Culture was incubated in different nutrient agar zones for three times and incubated at 39^0C for 48 hours respectively. Then these cultures are inoculated in solute nutrient of broth and incubated at 37^0C for 24 hours and bacterial suspensious count is adjusted to 10^6 cfu/ml.

b) Preparation of nutrient agar plates:

Four flasks of nutrients agar medium were prepared, each containing 100ml medium. In to sterilized nutrient agar medium 1 ml of each bacterial culture is added in respective flask asepectically. Then 25 ml medium is poured in Petri plate and keep aside for setting of medium. After medium is set in each plate five well are bored with cork borer and agar is removed

c) Preparation of sample solution

1) Above mentioned different synthesized products were dissolved separately in DMSO as well as sterile distilled water and final concentration is produced as 1mg/ml. Prepared solution are inoculated in to spherical well of respective cultural plate. Quantity of the inoculated into each well is 200 micro liters. Similarly these are also inoculated in 0.2 ml in each plate. These plates are then kept at 4^oC refrigerator for the diffusion of the solution for four hours. After difression all plates were incubated at 37^oC in incubator for 18 hours. Then zone of inhibition were checked noted down. Agar well diffusion method Perez C, Poul M, Bazerqure P Antibiotic assay by agar well diffusion method [20]

II. Results And Discussion

Present works deals with the synthesis of condensed and cyclised products using dimedone and different aldehydes. Claisen condensation reaction with different aldehydes such as benzaldehyde, m-nitrobenzaldehyde, and o-chlorobenzaldehyde has been carried out with dimedone. Further cyclization reactions have been carried out. The compounds obtained are purified and characterized by modern spectral techniques like IR, NMR, CMR, Mass spectrometry etc. Biological activities of these derivatives have been studied against certain bacterial strains. Antimicrobial activity of the compounds (3, 6, 9), (4, 7, 10) and ((11, 12 and 13) was tested against commonly used strains like *Salmonella abony, E.coli, Staphylococcus aureus*. It was found that compounds **7** had specific microbial activity against specific strain. Efforts are taken to show their structure activity relations.

2.1 2-[2'-Hydroxy -4, 4'-dimethyl -6-oxo-cyclohex-1-enyl)-phenyl-methyl]-5, 5-dimethyl –cyclohexane -1, 3-dione (3).

IR υ max: IR spectrum shows broad band at 3230 cm^{-1} enolic OH group, 1709 cm^{-1} for α, β unsaturated ketone, 1591 cm^{-1} and 1489 cm^{-1} for aromatic region ^{1}H NMR spectrum in **500 MHz, $CDCl_3$** shows *s* at 11.86 δ (*2H*) for enol hydroxyl protons conjugated with carbonyl groups, broad *s* at 5.51 δ (1H) for C-9 methyne proton attached to phenyl group, broad *s* at 2.39 δ (8H) for equivalent methylene protons.The *s* at 1.23 δ (6H) and 1.10 δ (6H) for the methyl protons

2.2 Compound (4*)*

3, 3, 6, 6-teteramethyl -9- phenyl-3, 4, 5, 6, 7, 9-hexahydro-2H-xanthene-1, 8--dione (4).

IR υ max: bands at 1668 cm^{-1}, (α, β unsaturated ketone), 1626cm^{-1} (double bond), 1528cm^{-1} (aromatic C-H stretching).; ^{1}H NMR spectrum in **500 MHz, $CDCl_3$** showed broad *s* at 4.73 δ (1H) for C-9 methyne proton, *s* at 2.46 δ (4H) for C-4 C-5 methylene protons and *s* at 1.09 δ (6H), 0.98 δ (6H) for the methyl protons at C-10, C-11 and C-12, C-13 respectively. The ^{13}C NMR spectrum of compound **4** showed 23 carbon atoms. Multiplicities of signals were determined by the DEPT pulse sequence. The downfield signal appeared at 196.15 δ (*s*) for (C-1, C-8) carbonyl carbons. The peak at 162.05 δ (*s*) was noticed for quaternary carbons C-4a and C-8b. The signal observed at 143.91 δ (*s*) for C-1" .The signals at 128.23 δ (d) and 127.9 δ (d) were assigned for C- 3", C-5" and C-2", 6" respectively. A doublet corresponding to C-4" was noticed at 126.22 δ. The peak at 115.52 δ (s) was assigned to quaternary carbons C 8a, 9a. The upfield signals at 50.7 δ (*t*) for C -7, C-2 and 40.87 δ (*t*) for C -4, C-5. An upfield doublet was noticed at 32.23 δ for C-9 methyne carbon. The quartets 29.31 δ and 27.36 δ were observed for methyl carbons at C-10, C-11 and C-12, C-13 respectively.

2.3 Compound (6)

3-Hydroxy-2-[(2-hydroxy-4, 4-dimethyl-6-oxocyclohex-1-enyl)-(3-nitro-phenyl)-methyl]-5, 5-dimethyl-cyclohex-2-enone (6).

IR υ max: bands at 3312 cm^{-1} (hydroxy stretching)1668 cm^{-1} (broad 1, 3 –dicarbonyl), 1626 cm^{-1} (double bond), 1553 cm^{-1}, 1364 cm^{-1} (nitro group), and 698, 743 cm^{1},monosusbstituted aromatic ring..^{1}H NMR spectrum in **500 MHz, $CDCl_3$** showed *s* at 11.84 δ (2H) for enol hydroxyl protons conjugated with carbonyl group. Aromatic protons due to electron withdrawing nitro group showed two multiplates at 7.97 δ and 7.41 δ for C4" and C2", C5", C6" respectively. A broad *s* appeared at 5.51 δ (1H) for C-9 methyne proton attached to phenyl group.`A multiplet appeared at 2.42 δ (8H) for C-4, C-6, C-3',C-5' methylene protons. *s* at 1.26 δ (6H) and 1.11 δ (6H) for C -8, C-8' and C-7, C-7' methyl groups respectively. The ^{13}C NMR spectrum of compound **6** showed 23 carbon atoms. Multiplicities of signals were determined by the DEPT pulse sequence. The downfield signals appeared at 190.78 δ (*s*) and 189.31(*s*) for (C-1, C-6') carbonyl carbons. The signals observed at 148.16 δ (*s*) and 140.44 δ (*s*) for C-3'' and C-1''respectively. A downfield signal at 189.31(*s*) for C-3 and C-2' was observed. The signals at 132.72 δ showed a doublet corresponding to C-6'' (*d*), 128.88 δ, and 122.02δ (*d*) were assigned for C-5", C-2" respectively. A doublet corresponding to C-4" was noticed at 126.22 δ. The upfield signals at 46.89 δ (*t*) for C-6, C-5' and 46.33 δ (*t*) for C-4, C-3'. An upfield doublet was noticed at 32.83 δ for C-9 methyne carbon. The peak observed at 31.41 δ (*s*) was assigned for C-5, C-4'. The quartets at 29.68 δ and 27.23 δ were observed for methyl carbons at C-8, C-8' and C-7, C-7' respectively.

2.4 Compound-(7)

3,3,6,6-tetramethyl-9-(3-nitro-phenyl)-3,4,5,6,7,9-hexahydro-2H-xanthene-1,8-dione (7).

IR υ max: bands at 1668 cm^{-1}(α, β unsaturated ketone in conjugation with ethereal oxygen), 1620 cm^{-1} (double bond), 1528 cm^{-1}1462 cm^{-1} (aromatic C-H stretching) and 1362 cm^{-1} (methyl groups). ^{1}H NMR spectrum in **500 MHz, $CDCl_3$** It showed a multiplet at 8.04 δ (1H) and 7.96 δ (1H) for C-4" and C-2" respectively, 7.77 δ (1H) for C-6" and 7.38 δ for C-5" .It showed broad *s* at 4.82 δ (1H) for methyne proton attached to C-9 and a phenyl ring, *s* at 2.22 δ (4H) for C-4and C-5 methylene protons. Peaks observed at 2.18 δ (4H) for C-2and C-7 methylene protons. Strong *s* appeared at 1.11 δ (6H) and 0.997 δ (6H) for C-10, C-11 and C-12, C-13 methyl groups respectively. The ^{13}C NMR spectrum of compound **7** showed 23 carbon atoms. The downfield singlet appeared at 196.10 δ(*s*) for C-1, C-8 carbonyl carbons, 162.82 (*s*) for C-4a and C-8b tetra substituted carbon atoms in conjugation with carbonyl group. The downfield signals at 148.00δ for C-3" and another signal at 146 δ for C-1" carbon atoms. The doublets were observed at 135.35 δ, 128.59 δ, 122.47 δ, and 121. 43 δ for C-6", C-5", C-4" and C-2" respectively. 114.30 δ (*s*) for C-8a and C-9a for tetra substituted olefin carbons respectively. The upfield signals at 50.53 δ (*t*) and 40.71 δ (*t*) were assigned for C-4,C-5 and C-2,C-7methylene carbon atom respectively .The signals at 32.20 δ (*s*) corresponds to C-3 and C-6 tetra substituted carbon atoms ,32.05 (*d*) for C-9 methyne carbon atom and the quartet observed at 29.17 δ , 27.24 δ for C-10,C-11 and C-12 ,C-13.

2.5 Compound (9)

2-[(2-Chloro-phenyl)-(2-hdroxy-4, 4-dimethyl-cyclohex-1-enyl)-methyl]-3-hydroxy-5, 5-dimethyl-cyclohex-2-enone-(9).

IR**:** bands at 3393 cm^{-1} (enolic hydroxyl groups), 1720 cm^{-1} (1,3–dicarbonyls) 1611cm^{-1} (double bond),1466 $cm^{-1,}$ (aromatic C-H stretching). A peak at 748 cm^{-1} is due to chlorine substituted to aromatic ring. hydroxyl protons conjugated with carbonyl groups. Aromatic protons showed a cluster at 7.22 δ for C-3", C-4", C-5", and C-6". A sharp *s* appeared at 5.58 δ (1H) for C-9 methyne proton attached to phenyl group. A multiplet was recorded at 2.39 δ (8H) for methylene protons at C-4, C-3', C-6 and C-5', and singlets at 1.16 δ (6H) and 1.14 δ (6H) for the methyl groups at C-8, C-8' and C-7, C-7' respectively.

2.6 Compound-(10)

9-(2-Chlorophenyl)-3,4,6,7- tetrahydro-3,3,6,6 –tetramethyl -2H-xanthene -1,8 (5H,9H)- dione (10)

IR: bands at 1678 cm^{-1}(α, β unsaturated ketone in conjugation with ethereal oxygen) 1632 cm^{-1} (double bond), 1526 cm^{-1} and 1468 cm^{-1} (aromatic C-H stretching) and 690 cm^{-1}(chlorine attached to phenyl ring). ^{1}H NMR spectrum in **500 MHz, $CDCl_3$** showed aromatic protons having different chemical shifts due to electronegative chlorine atom. It showed two multiplets at 7.43 δ (1H) for C-3" and a multiplet at 7.2 δ for C-4", C-5" and C-6" protons. It showed a sharp ***s*** at 4.98 δ (1H) for methyne proton attached to C-9 and a phenyl ring, *s* at 2.44 δ (4H) for C-4 and C-5 methylene protons. Peaks observed at 2.19 δ (4H) for C-2 and C-7 methylene protons. Strong *s* appeared at 1.092 δ (6H) and 1.006 δ (6H) for C-10, C-11 and C-12, C-13 methyl groups respectively.

2.7Compound-(11)

***2-[2'-Hydroxy -4, 4'-dimethyl -6-oxo-cyclohex-1-enyl)-phenyl-methyl]-5, 5-dimethyl –cyclohexane -1, 3-dioxime* (11)**

IR spectrum broad band at 3474 cm^{-1} and 3239 cm^{-1} due to hydroxyl (-OH) stretching frequency, 1707 cm^{-1}(C=N stretching), 1613 cm^{-1} (double bond), 1560 cm^{-1} and 1462 cm^{-1} (aromatic stretching) 741 cm^{-1} and 698 cm^{-1} for mono substituted aromatic ring. ^{1}H NMR spectrum showed a broad weak *s* at 11.2 δ for oxime hydroxyl protons. A sharp *s* was identified at 10.87 δ (2H) for enol hydroxyl protons conjugated with carbonyl groups. Two multiplets at 7.15 δ for C-3", C-4", C-5" protons, and at 7.04 δ for C-2", C-6" protons were assigned. A ***s*** at 4.95 δ (*1H*) was observed for C-9 methyne proton attached to phenyl group, a sharp *s* at 0.86 δ (*4H*) for equivalent methylene protons at C-5',C-6. Multiplet at 2.50 δ (4H) was appeared for C-3' and C-4 methylene protons. Strong *s* observed at 1.03 and 1.01 δ (*6H*) for the methyl groups at C-8, C-8' and C-7, C-7' respectively.

2.8 Compound-(12)

3, 3, 6, 6-tetramethyl-9-(3-nitro-phenyl)-3, 4, 5, 6, 7, 9-hexahydro-2Hxanthene-1, 8-dione dioxime, (12)

IR spectrum broad band at 3208 cm^{-1} due to hydroxyl (-OH) stretching frequency. Frequencies at 1707 cm^{-1} and 1665cm^{-1} were assigned to α-β conjugated C=N stretching, band at 1593cm^{-1} was due to aromatic stretching. A band at 1550 cm^{-1} and 1373 cm^{-1} was assigned to NO_2 group. Frequencies at 777 cm^{-1} and 696 cm^{-1} were identified for mono substituted aromatic ring. ^{1}H NMR spectrum showed singlet at 11.83 δ, for (*1H*) for enol hydroxyl protons conjugated with carbonyl groups. A singlet at 7.25 δ was due to oxime hydroxyl protons. Multiplets at 7.28 and 7.23 δ were assigned to C-4" and C-2". A multiplet at 7.10 δ was due to C -5" and C-6". Singlet at 5.54 δ (1H) for C-9 methyne proton attached to phenyl group. Broad singlet at 2.44 δ (*4H*) for equivalent methylene protons at C-4 and C-3', and 1.069 δ (4H) (*m*) for the syn shielded methyl protons. This shielding is due to syn orientation of oxime group. Singlet at 1.24 δ (6H) C (8, 8') and singlet at 1.11 δ (6H) is for C (7, 7').

2.9 Compound-(13)

9-(2-Chloro-phenyl)-3, 36, 6, 9-pentamethyl-3, 4, 5, 6, 7, 9-hexahydro-2H-xanthene-1, 8-dione dioxime (13)

IR spectrum shows characteristic bands at 3283 cm^{-1} (enolic hydroxyl group) Frequencies at1705 cm^{-1} and 1626 cm^{-1} were assigned for α-β conjugated C=N stretching , absorption peaks at 1466 cm^{-1} , 1368 cm^{-1} with aromatic C-H stretching.The characteristic broad absorption at 731 cm^{-1} was for Cl group , **^{1}H NMR** spectrum shows singlet at 8.99 δ (*2H*) for enol hydroxyl protons conjugated with carbonyl groups, a broad weak singlet at 11.2 δ, 8.94 δ for oxime hydroxyl protons. The aromatic proton shows H-3", H6" and H- 4", 5" peak at 7.354 δ (*m*), 7.193 δ, 7.074 δ (*m*) respectively. A broad , singlet at 5.848 δ (*1H*) for C-9 methyne proton attached to phenyl group, broad singlet at 2.33 δ (*8H*) for equivalent methylene protons at C-4 and C-3' , and singlet at 1.160δ (*6H*) and 1.108 δ (*6H*) for the methyl group C-8 and C-7 respectively.

4.0 Tables:

4.1 Table-I: Physical and Analytical Characteristics of Compounds 3-10

Compound	Molecular formula	Nature	Elemental analysis : Found, % / Calculated,%					mp, °C	Yield, %	LCMS [M+1] amu
			C	H	N	O	Cl			
3	$C_{23}H_{28}O_4$	white crystals	75.00 / 75.15	7.60 / 7.61	------	17.40 / 17.39	-----	195	77.49	368
4	$C_{23}H_{26}O_3$	white crystals	78.00 / 78.63	7.40 / 7.41	-----	13.67 / 13.60	----	202	88.42	351
6	$C_{23}H_{27}NO_6$	white crystals	66..80 / 66.82	6.50 / 6.53	3.55 / 3.54	23.25 / 23.4	------	202	80.45	413
7	$C_{23}H_{25}NO_5$	white crystals	69.70 / 69.69	6.30 / 6.31	3.65 / 3.62	20.10 / 20.15	-----	205	80.00	396
9	$C_{23}H_{27}ClO_4$	white crystals	68.55 / 68.56	6.72 / 6.75	------	15.85 / 15.88	8.82 / 8.80	198	88.00	403
10	$C_{23}H_{25}ClO_3$	white crystals	76.49 / 77.15	6.50 / 6.49	-----	12.45 / 12.47	9.10 / 9.09	182	80.10	385
11	$C_{23}H_{30}N_2O_4$	yellow solid	69.30 / 69.32	7.60 / 7.59	7.03 / 7.02	16.05 / 16.06	-----	188	65.23	398
12	$C_{23}H_{29}N_3O_6$	yellow powder	62.28 / 62.29	6.56 / 6.59	9.47 / 9.45	21.64 / 21.65	------	180	67.32	443
13	$C_{23}H_{29}ClNN_4$	Light yellow	63.80 / 63.81	6.74 / 6.75	6.47 / 6.46	14.77 / 14.78	8.17 / 8.19	172 ^{0}C	63.40	433

4.2 Antibacterial and Entomological Activities of Dimedone Derivatives.

A) Antibacterial activity study in sterile water and DMSO as solvent:-

Test : Antibacterial Activity
Method : Agar Well diffusion Method.
Solvent : Distilled water/DMSO
Concentration : 1mg/ml.
Medium Used : Nutrient Agar.
Name of organism: 1) *Escherichia coli* -------- NCIM—2065.
2) *Salmonella abony*------- NCIM—2257.
3) *Staphylococcus aureus*-NCIM—2079

B) Antibacterial activity study in sterile distilled water as solvent:-

Compound Nos	Antibacterial Activity in (A) Sterile water and in (B) DMSO					
	Salmonella abony		*E. coli*		*Staphylococcus aureus*	
	(A)	(B)	(A)	(B)	(A)	(B)
3	_	_	_	_	_	_
4	_	_	_	_	_	_
6	_	_	_	_	_	_
7	+	_	--	+	_	+
9	_	_	_	_	_	_
10	_	_	_	_	_	_
11	_	_	_	_	_	_
12	+	__	+	__	__	+
13	+	__	+	_	+	+

III. Conclusions:

The compounds obtained were tested against specific bacterial strains like 1) *Salmonella abony* 2) *Escherichia coli*, 3) *Staphylococcus aureus* and 4) *Pseudomonas aeruginosa*. In case of *Salmonella abony* compound -7 is active in sterile water. While *Escherichia coli* show positive activity in DMSO solvent. Activity of compound -7 is in sterile water is due to presence of $-NO_2$ (at meta position) group and cyclised ether. Compound 6 has meta nitro group, but presence of dihydroxy function. This dihydroxy function makes molecule more polar due to which it does not show any activity, probably site of penetration of the cell must be less polar than compound 6. Though compound 4 contains cyclic ether, but there is no $-NO_2$ group, which proves that presence of NO_2 group and cyclic ether is necessary for antimicrobial activity against the strains Salmonella abony and Staphylococcus aureus. For organic molecules of the above class to show activity against various bacterial strains the presence of one electron withdrawing group at meta position and cyclized ether are necessary. Compounds 3, 4, 9 and 10 which contain such groups but do not satisfy both conditions (Nitro group at Meta position and cyclized ether) are found to be inactive towards all bacterial strain. Ligand-7 show activity against various bacterial strains the presence of one electron withdrawing group at meta position and cyclized ether are necessary. Compounds 3, 4 9 and 10 which contain such groups but donot satisfy both conditions (Nitro group at meta position and cyclized ether) are found to be inactive towards all bacterial strains. The ligand (11) does not show any activity against the bacterial strains Salmonella *abony, E.coli, and Staphylococcus aureus* in both DMSO (polar aprotic) and distilled water (polar protic). The ligand (12) had a nitro substituted phenyl ring. As expected it shows activity, these results indicate that the electron withdrawing effect of NO_2 group on the phenyl ring and thereby polarization of the oxime group is reduced by coordination to the enolic –OH on the neighboring rings.

The ligand (13) shows bioactivity towards the three strains *Salmonella abony, E. coli, Staphylococcus aureus* in both water and DMSO. This can be attributed to the polarization caused by the chloro group binding to the metal through the oxime group results in the flow of electron density towards the metal , that structure of the complex indicate that electron withdrawing effect of the chloro group and the metal is the indifferent / opposite direction resulting in the total reductions of the bioactivity.

IV. Acknowledgement

I Dr. A. A. Kale sincerely thankful to Dr. R. V. Kashalkar Head, department of chemistry of S.P.College Pune for providing research facility and Principal, Dr.A.S. Burungale, Secretary, Rayat Shiksahn Sansth Satara, Principal, Dr. Mohan Rajmane S.G.M. Karad, Principal, Dr. N.L.Jadhav S.M.Joshi College , Hadapsar, Pune 28 for kind motivation for present research work.

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