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Synthesis and Antimicrobial Activity of Some Diketones

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Substituted acetophenone was reacted with substituted benzoic acid in pyridine medium in presence of phosphoryl chloride for 5 h and the thick mass was decomposed by 1 : 1 HCl to get substituted benzoyloxy substituted acetophenone. This product was further subjected to BVT reaction to get substituted dibenzoyl methane or diketones. All these substituted benzoyl acetophenones and substituted dibenzoyl methanes were tested against the following organisms *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Proteus vulgaris and Enterobacter aerogenes.*

INTRODUCTION

β-Diketones are useful starting compounds for synthesis of various important compounds, *viz.*, chromones[1] oxygen and nitrogen heterocycles, pyrazoles[2,3], isomeric pyrazoles[4], isoxazoles[5], 3-chloroflavones[6], 3-bromoflavones[7], flavanones[8], 3-aroylflavanones[9], 3-aroylflavones[10] and acetophenones[11]. Hence it was thought to prepare new diketones and to test them against test organisms. *E. coli, P. aeruginosa, S. aureus, P. vulgaris and E. aerogenes.*

EXPERIMENTAL

Preparation of 2-(4′-nitro)-benzoyloxy-3-bromo-5-chloro-acetophenone

2-Hydroxy-3-bromo-5-chloro-acetophenone (0.04 mole) together with *p*-chlorobenzoic acid (0.05 mole) were dissolved in 40 mL of pyridine. To this ice-cold mixture 3 mL of $POCl_3$ was dropwise added, with constant stirring. The temperature was maintained below 40°C, allowed to stand for 4 to 5 h. The thick mass was decomposed with 1 : 1 HCl. The product was washed with 10% Na_2CO_3 solution, finally with 1% NaOH solution, then with water. It was then crystallised from ethanol to get 2-(4′-nitro) benzoyloxy-3-bromo-5-chloro-acetophenone **(Ia)**. m.f. = $C_{15}H_{19}NO_5Cl{\cdot}Br$; m.w. = 398.5. This is off white coloured crystalline compound, m.p. 154°C. It shows negative ferric chloride, showing absence of phenolic —OH group.

IR spectrum was recorded in nujol: 2943.5 (C—H, Stretching in CH_3); 1747 (C=O, Stretching); 1554 (C—NO_2, asymmetricstretching); 1607, 1507, 1460 (—C=C-Aromatic); 1320 (C—NO_2, Symmetric stretch); 733 (C—Cl,

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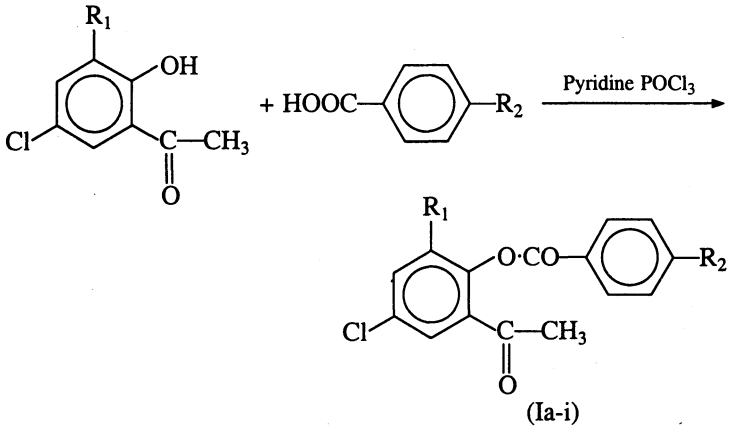
stretching) and 711 cm^{-1} (C—Br, stretching). ^{1}HNMR in $CDCl_3$ with TMS as internal standard: 2.3 δ (S, 3H, =C—CH_3); 7.6–8.2 (m, 6H, Ar—H).

Similarly other compounds were prepared by above method and they are reported in Table-1.



(Ia-i)

TABLE-1
SYNTHESISED COMPOUNDS, M.P. (s), YIELD AND COLOUR

S.No.	R_1	R_2	m.p. (°C)	Yield (%)	Colour
Ia	Br	NO_2	154	80	Off white
Ib	Br	Cl	110	76	Sandal wood
Ic	Br	NH_2	98	72	Rosy silk
Id	NO_2	NO_2	178	78	Raw silk
Ie	NO_2	Cl	126	68	Sandal wood
If	NO_2	NH_2	180	75	Pink
Ig	H	NO_2	92	70	White
Ih	H	Cl	106	72	Raw silk
Ii	H	NH_2	179	75	Pink

All these compounds **(Ia–i)** were tested against test organisms *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Proteus vulgaris, Enterobacter aerogenes.* The minimum inhibitory concentration (MIC) μg/mL values were determined. These values are given in Table-2.

TABLE-2
ANTIMICROBIAL ACTIVITY OF SUBSTITUTED BENZOYLOXY SUBSTITUTED ACETOPHENONE

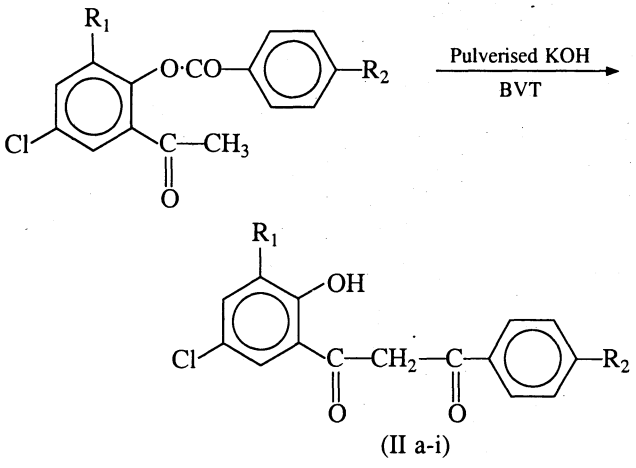
Compound	*E. coli*	*P. aeruginosa*	*S. aureus*	*P. vulgaris*	*E. aerogenes*
Ia	25.00	12.50	12.50	25.00	25.00
Ib	12.50	12.50	25.00	> 3	25.00
Ic	25.00	12.50	12.50	50.00	6.20
Id	6.20	12.50	50.00	50.00	25.00
Ie	25.00	12.50	50.00	100.00	50.00
If	> 3	3.10	12.50	06.20	> 3
Ig	12.50	50.00	50.00	100.00	25.00
Ih	12.50	50.00	200.00	6.20	25.00
Ii	200.00	50.00	12.50	25.00	12.00
Chloramphenicol	> 3	3.10	12.50	6.20	> 3

Compounds **Ib, Id, If, Ig, Ih** are strongly active compounds. **Ia, Ic, Ie,** are moderately active and compound **Ih** is poorly active.

Preparation of 2-hydroxy-3-bromo-5-chloro-4′-nitro dibenzoyl methane

2-(4′-Nitro) benzoyl oxy-3-bromo-5-chloro acetophenone (0.01 mole) was dissolved in 40 mL of pyridine. It is then treated with pulverised KOH (0.03 mole). The mixture was kept as such for 5–6 h. It was then decomposed with ice-cold acetic acid. The crude mass was washed with 10% Na_2CO_3 solution and then with water. It was then crystallised with mixture of 1 : 1 ethanol and acetic acid to get 2-hydroxy-3-bromo-5-chloro-4′-nitro dibenzoyl methane, **IIa**, m.p. 140°C yield 70%. m.f. $C_{15}H_9NO_5ClBr$. It is pale yellow coloured crystalline solid, Alcoholic solution **IIa** gives red colouration with neutral ferric chloride solution, indicating that **IIa** contains phenolic OH group. IR spectrum was recorded in nujol 2930–2850 (C—H, stretching in CH_2), 1648 (C=O, stretching, 1,3-diketone), 827–762 (1,3-disubstituted benzene) and 600–500 cm^{-1} (C—Br-bending). The PMR was recorded in $CDCl_3$ with TMS as internal standard 4.4 δ (S, 2H, —CH_2—); 7.26 δ (m, 6H—Ar) and 12.84 δ (s, 1H, —OH).

Similarly other compounds were prepared by above method and they are reported in Table-3.



(II a-i)

TABLE-3
SYNTHESISED DIKETONES, m.p., YIELD AND COLOUR

S.No.	R_1	R_2	m.p. (°C)	yield (%)	Colour
IIa	Br	NO_2	140	70	Pale yellow
IIb	Br	Cl	176	65	Canary yellow
IIc	Br	NH_2	108	65	Buff
IId	NO_2	NO_2	128	72	Yellow
IIe	NO_2	Cl	118	67	Yellow
IIf	NO_2	NH_2	120	62	Golden brown
IIg	H	NO_2	204	70	Canary yellow
IIh	H	Cl	114	68	Cream
IIi	H	NH_2	180	65	Yellow

All these diketones **(IIa–i)** were tested against the test organisms *Eschericha coli, Pseudomonas aeruginosa, Staphylococcus aureus, Proteus vulgaris, Enterobacter aerogenes.* The minimum inhibitory concentration (MIC) μg/mL values were determined. These values are given in Table-4.

Compounds **IId** and **IIe** are strongly active, compounds **IIg, IIh** and **IIc** are moderately active while compounds, **IIa, IIb, IIf** and **IIc** are poorly active against test organisms.

TABLE-4
ANTIMICROBIAL ACTIVITY OF NEW DIKETONES

Compound	*E. coli*	*P. aeruginosa*	*S. aureus*	*P. vulgaris*	*E. aerogenes*
IIa	25.00	50.00	25.00	25.00	3.00
IIb	25.00	50.00	25.00	3.00	25.00
IIc	50.00	12.50	3.00	25.00	25.00
IId	> 3	12.50	50.00	6.20	50.00
IIe	03.10	> 3	50.00	50.00	25.00
IIf	25.00	25.00	100.00	100.00	100.00
IIg	12.50	50.00	50.00	6.20	25.00
IIh	12.50	50.00	100.00	100.00	12.50
IIi	12.50	25.00	12.50	25.00	12.50
Chloramphenicol	> 3	3.10	12.50	6.20	> 3

REFERENCES

1. W.D. Ollis and D. Weight, *J. Chem. Soc.*, 3826 (1952).
2. L. Knorr, *Bes. dt. Chem. Ges.*, **16**, 2597 (1883).
3. H.G.Garg and S.S. Joshi, *J. Org. Chem.*, **26**, 946 (1961).
4. K. Von Avwers and H. Stublmann, *Bes. dt. Chem.*, **59,** 1043 (1926).
5. K.A. Shakar and R.P. Muley, *Indian J. Chem.*, **14B**, 224 (1976).
6. H.Z. Goggad and K.N.Wadodkar, *Indian J. Chem.*, **17B**, 641 (1979).
7. K.N. Wadodkar and K.B. Doifode, *Indian J. Chem.*, **18B**, 458 (1979).
8. H.S. Mahal and K.Venkatraman, *Curr. Sci.* (India), **2**, 214 (1933).
9. A.G. Doshi, Ph.D. Thesis, Amravati University (1986).
10. W. Baker and F. Glockling, *J. Chem. Soc.*, 2759 (1950).
11. A.G. Doshi and B. Ghiya, *Curr. Sci.* (India), **55**, 502 (1986).

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