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Diazabutadienes in Heterocyclic Syntheses. Preparation of Pyrimidin-6-ones by Reaction of 4-Dialkylamino-1,3-diaza-1,3-butadienes with 2-Oxazolin-5-ones

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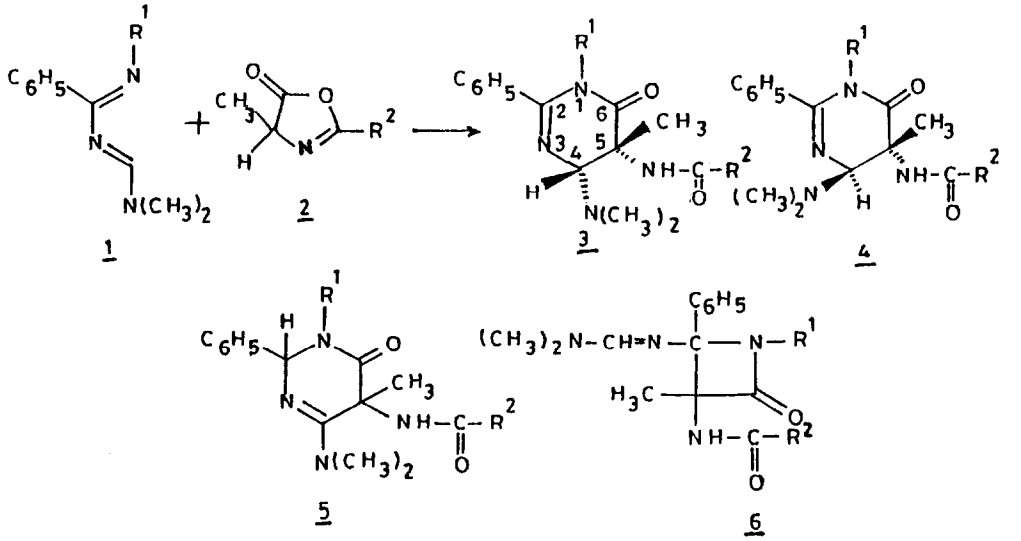
Key Words: 1,3-Diaza-1,3-butadienes; 2-oxazolin-5-ones; pyrimidin-6-ones.

Abstract: 1-Aryl-4-dimethylamino-2-phenyl-1,3-diaza-1,3-butadienes (1) and 1-aryl-4-dimethylamino-2-methylthio-1,3-diaza-1,3-butadienes (7) reacted with 2-oxazolin-5-ones (2) to yield pyrimidin-6-ones (3) and (8) respectively as single diastereoisomers with reverse stereochemistry. Reaction of 1,2-diphenyl-4-methylthio-4-amino-1,3-diaza-1,3-butadienes (12) with (2) also yielded pyrimidin-6-ones (13).

In the recent years azadienes have become useful key intermediates in organic synthesis for the construction of both heterocyclic systems and open chain polyfunctionalized molecules[1,2]. Particularly significant is the ability of certain types of azadienes to participate in 1,4-cycloaddition reactions. This synthetic strategy comes within the scope of what Boger and Weinreb[1b] have called Hetero Diels-Alder methodology. In this context 1,2- and 1,4-diaza-1,3-butadienes have been extensively studied, in comparison 1,3-diaza-1,3-butadienes have received less attention[3]. Also, there are conflicting reports concerning (4+2)/(2+2) cycloadditions in the case of the reaction of ketenes with 1,3-diaza-1,3-butadienes[3c]. 2-Oxazolin-5-ones undergo cycloaddition reactions with a variety of multiple bonds to provide novel heterocycles[4]. As a part of our continued interest in cycloaddition reactions of azadienes[1c,5], we herein report that 1,3-diaza-1,3-butadienes (1) and (7) reacted with 2-oxazolin-5-ones (2) to yield pyrimidin-6-ones (3) and (8) respectively as single diastereoisomers with reverse stereochemistry. The 1,3-diazabutadienes (12) also reacted with (2) to yield pyrimidinones (13) in excellent yields.

In our preliminary communications[6], we reported that 1-aryl-4-dimethylamino-2-phenyl-1,3-diaza-1,3-butadienes (1) react with 2-oxazolin-5-ones (2) to yield pyrimidin-6-ones (3) in excellent yields (82-90%)(Scheme-1). Thus equimolar quantities of 4-dimethylamino-1,2-diphenyl-1,3-diaza-1,3-

butadiene (1)[7] (R^1=C_6H_5) and 2-(4-chlorophenyl)-4-methyl-2-oxazolin-5-one (2)[8] (R^2=p-ClC_6H_4) when reacted in dry benzene at room temperature for 12h, yielded 5-(4-chlorobenzoylamino)-4-dimethylamino-1,2-diphenyl-5-methyl-1,4,5,6-tetrahydropyrimidin-6-one (3a) as white crystalline solid, mp. 150-51°C in 90% yield. The structural assignment (3a) rests on elemental as well as spectral analyses. The 400 MHz ^1H NMR spectra of (3a) taken in $CDCl_3$ showed signals at δ : 1.72 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 5.42 (s, 1H, H-4), 6.44 (broad s, 1H, NH), 7.20-7.46 (m, 12H, aromatic H), 7.80 (m, 2H, aromatic H ortho to CO). The ^{13}C NMR (100MHz, $CDCl_3$) of (3a) δ : 17.18 (q, CH_3), 42.96 (q, $N(CH_3)_2$), 59.88 (s, C-5), 77.46 (d, C-4), 127.14-129.22 (aromatic C), 132.50, 134.76, 137.50, 153.29 (s, C-2), 166.05 (s, CO), 171.04 (s, CO, C-6). The IR spectrum (KBr) showed bands at 3250, 1725 and 1645 indicating the presence of NH and two amido carbonyl groups respectively. The electron impact mass spectrum showed molecular ion peak at m/z (rel. int.) 460(5) with other major fragments at m/z 305(31), 252(40), 251(27), 209(7), 180(100), 139(60), 111(24), 77(67).



3	R^1	R^2	3	R^1	R^2
a	C_6H_5	p-ClC_6H_4	f	p-$CH_3C_6H_4$	$CH_2C_6H_5$
b	p-$CH_3C_6H_4$	p-ClC_6H_4	g	C_6H_5	p-$CH_3OC_6H_4$
c	C_6H_5	C_6H_5	h	p-$CH_3C_6H_4$	p-$CH_3OC_6H_4$
d	p-$CH_3C_6H_4$	C_6H_5	i	C_6H_5	p-$NO_2C_6H_4$
e	C_6H_5	$CH_2C_6H_5$	j	p-$CH_3C_6H_4$	p-$NO_2C_6H_4$

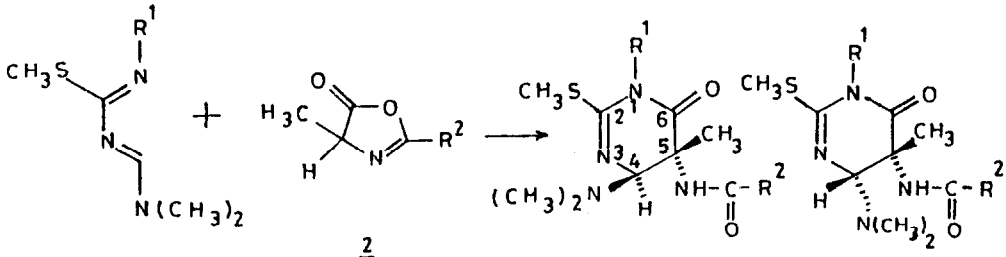
Scheme - 1

The possible formation of pyrimidinone (5a) was eliminated on the basis of difference nuclear overhauser enhancement (NOE) experiments. Irradiation of $-N(CH_3)_2$ signal δ 2.56 gives strong NOE at H-4 signal δ 5.42 which is geminal to it. The β-lactam structure (6a) was ruled out on the basis of absence of doublet carbon signal (CH=N) in the region δ 140-170ppm in ^{13}C NMR. This was further confirmed by recording fully decoupled distortionless enhancement by polarization transfer (DEPT) spectra $\ominus = 3\pi/4$ which did not show any peak for CH=N in the region δ 140-170ppm. The relative stereochemistry of pyrimidinone (3a) was established by recording difference NOE spectra. Irradiation of the proton H-4 δ 5.42 gave strong NOE at the $N(CH_3)_2$ signal δ 2.56 which is geminal to it and at CH_3 signal δ 1.72 which is in cis position. Similarly irradiation at CH_3 signal δ 1.72 showed NOE at H-4 δ 5.42 due to cis relationship. The reaction was found to be highly stereoselective and there was no evidence for the formation of other diastereoisomer (4a). The reaction was extended by varying the substituents in 1,3-diazabutadiene and 2-oxazolin-5-one partners and it afforded exclusively single diastereoisomers (3a-j).

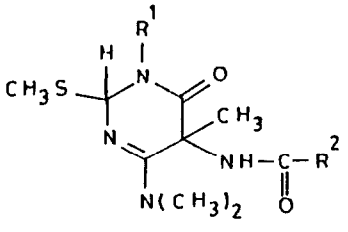
Further we investigated the reactions of 2-oxazolin-5-ones with 1,3-diaza-1,3-butadienes having another polarising function at position 2,with a view to examine the nature of cycloaddition pathway and stereoselectivity. Thus equimolar quantities of 4-dimethylamino-2-methylthio-1-phenyl-1,3-diaza-1,3-butadiene (7)[9] ($R^1=C_6H_5$) when reacted with 2-(4-chlorophenyl)-4-methyl-2-oxazolin-5-one (2)[8] ($R^2=p\text{-}ClC_6H_4$) in dry benzene at room temperature for 12h, yielded 5-(4-chlorobenzoylamino)-4-dimethylamino-5-methyl-2-methylthio-1-phenyl-1,4,5,6-tetrahydropyrimidin-6-one (8a) (Scheme-2) as single diastereoisomer mp. 161-62°C yield 94%. The structural assignment (8a) rests on elemental as well as spectral data. The ^1H NMR of (8a)(400MHz, $CDCl_3$) δ : 1.55 (s, 3H, CH_3), 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.31 (s, 1H, H-4), 6.41(broad s, 1H, NH), 7.24-7.43 (m, 7H, aromatic H), 7.72 (m, 2H, aromatic H ortho to CO). The ^{13}C NMR (100MHz, $CDCl_3$) δ : 14.81 (q, SCH_3), 17.57 (q, CH_3), 43.86 (q, $N(CH_3)_2$), 60.46 (s, C-5), 76.99 (d, C-4), 127.14-129.22 (aromatic c), 132.36, 135.42, 137.83, 151.91 (s, C-2), 165.97 (s, CO), 170.29 (s, CO, C-6). The IR spectrum (KBr) showed bands at 3275, 1715, 1625 indicating the presence of NH and two amido carbonyl groups respectively. The mass spectrum showed molecular ion peak at m/z (rel. int.) 430(2), with other major fragments at m/z 275(21), 222(41), 221(39), 209(7), 180(100), 139(51), 111(27), 77(57).

The possible formation of pyrimidinone (10a) was eliminated on the basis of difference NOE spectra. Irradiation of proton H-4 δ 5.31 gives strong NOE at the $N(CH_3)_2$ signal δ 2.48 which is geminal to it. The β-lactam structure (11a) was again ruled out on the basis of ^{13}C NMR and

recording fully decoupled DEPT spectra which showed the absence of CH=N signal in the region δ 140-170ppm. The relative stereochemistry of pyrimidinone (8a) was established by recording difference NOE spectra. Irradiation of the $N(CH_3)_2$ signal δ 2.48 gave strong NOE at H-4 δ 5.31 which is geminal to it and at CH_3 signal δ 1.55 which is in cis position. Similar irradiation of CH_3 signal δ 1.55 resulted NOE at $N(CH_3)_2$ signal δ 2.48 due to cis relationship. Again the reaction was found to be highly stereoselective and there was no evidence for the formation of other diastereoisomer (9a). Variation of the substituents in 1,3-diazabutadienes (7) and 2-oxazolin-5-one (2) partners afforded only single diastereoisomers (8a-h). It is worth mentioning that when the substituent in position 2 of 1,3-diazabutadiene (1) is changed from C_6H_5 to SCH_3 (diazabutadiene 7), it resulted in the reversal of stereochemistry of the pyrimidinone (3 and 8).



7 2 8 9



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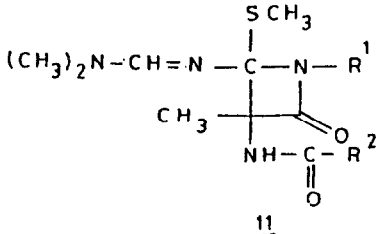


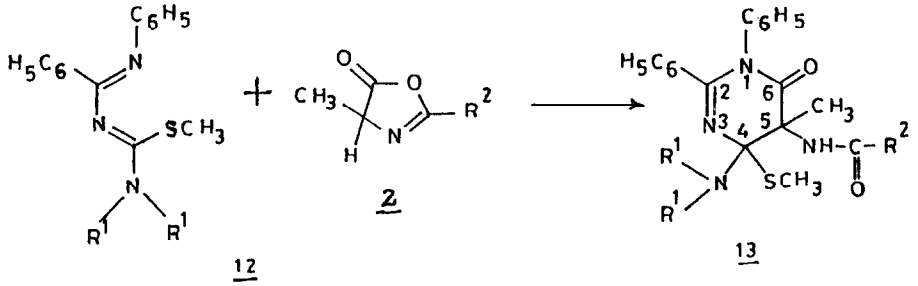
11

8	R^1	R^2
a	C_6H_5	p-ClC_6H_4
b	C_6H_5	p-$CH_3OC_6H_4$
c	C_6H_5	C_6H_5
d	C_6H_5	p-$O_2NC_6H_4$

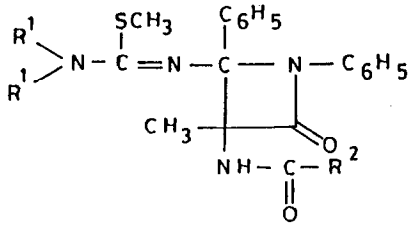
8	R^1	R^2
e	p-$CH_3C_6H_4$	p-ClC_6H_4
f	p-$CH_3C_6H_4$	C_6H_5
g	p-ClC_6H_4	C_6H_5
h	p-$CH_3OC_6H_4$	p-$O_2NC_6H_4$

Scheme - 2

In order to investigate the steric as well as electronic effect of the two polarising functions at position 4 of 1,3-diaza-1,3-butadienes, we studied the reactions of 1,2-diphenyl-4-methylthio-4-amino-1,3-diaza-1,3-butadienes (12) with 2-oxazolin-5-ones (2)(Scheme-3). The 1,3-diazabutadienes (12) were obtained by the methylation of 4-[(α-phenylimino)benzylidenethiocarbamoyl] sec. amines[10] following the reported procedure[9]. Treatment of equimolar quantities of 1,2-diphenyl-4-methylthio-4-morpholino-1,3-diaza-1,3-butadiene (12)(R^1R^1=$(CH_2)_2O(CH_2)_2$ and 2-(4-chlorophenyl)-4-methyl-2-oxazolin-5-one (2)(R^2=p-ClC_6H_4), stirring at room temperature in dry benzene for 12h followed by removal of the solvent under reduced pressure gave a pasty material which was purified by column chromatography



12 2 13



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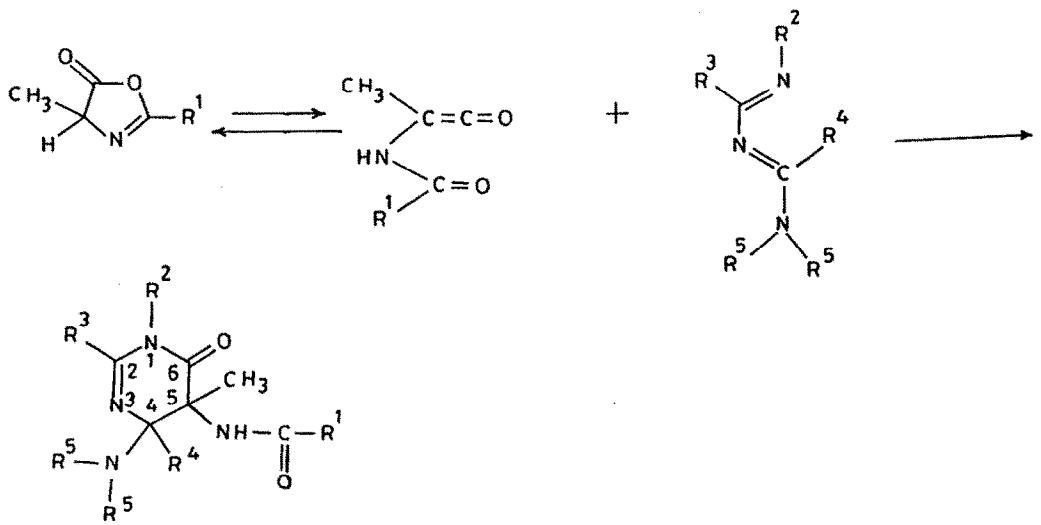
13	R^1R^1	R^2	13	R^1R^1	R^2
a	$(CH_2)_2O(CH_2)_2$	p-ClC_6H_4	e	$(CH_2)_5$	p-$CH_3OC_6H_4$
b	$(CH_2)_2O(CH_2)_2$	p-$CH_3OC_6H_4$	f	$(CH_2)_5$	C_6H_5
c	$(CH_2)_2O(CH_2)_2$	C_6H_5	g	CH_3, CH_3	p-ClC_6H_4
d	$(CH_2)_5$	p-ClC_6H_4			

Scheme - 3

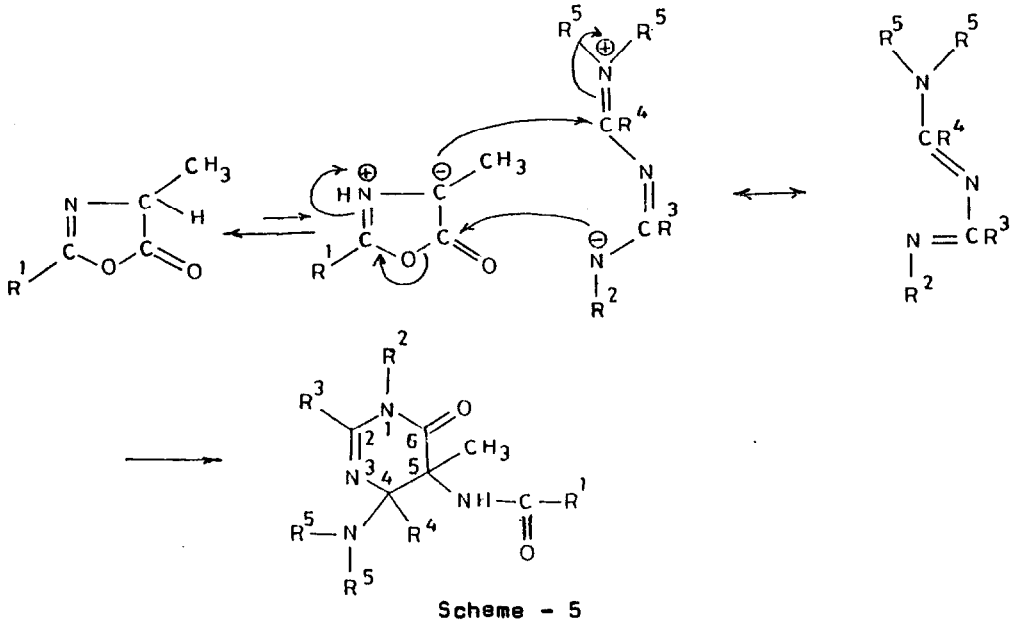
(silica gel, benzene-ethylacetate 1:1) to give thick viscous oil in 80% yield. The structural assignment (13a) to this product rests on elemental as well as spectral data. The IR spectrum (neat) showed bands at 3275, 1710 and 1640 indicating the presence of NH and two amido carbonyl groups respectively. The ^1H NMR ($CDCl_3$) showed signals at δ 1.62 (s, 3H, CH_3), 2.34 (s, 3H, SCH_3), 3.35 (m, 4H, CH_2-N-CH_2), 3.61 (m, 4H, CH_2-O-CH_2), 6.42 (broad s, 1H, NH), 7.20-7.45 (m, 12H, aromatic H), 7.75 (m, 2H, aromatic H ortho to CO). The mass spectrum showed molecular ion peak at m/z (rel. int.) 548(2), with other major fragments at m/z 393(27), 340(46), 209(7), 180(100), 139(75), 77(64). The possible formation of β-lactam (14) was eliminated on the basis of IR spectra as they show strong absorption band[11] at 1750 cm^{-1}. The relative stereochemistry of pyrimidinones (13) could not be clearly established by difference NOE experiments. The reaction was extended by employing different secondary amines in the 1,3-diazabutadiene and reacting them with differently substituted 2-oxazolin-5-ones. The pyrimidinone (13a-g) remained the only isolable product and there was no evidence for the formation of β-lactam (14).

There could be two plausible mechanistic pathways for the formation of pyrimidin-6-ones (3, 8, 13) from 1,3-diaza-1,3-butadienes (1, 7, 12) and 2-oxazolin-5-ones (2). Firstly, the 2-oxazolin-5-ones are known to undergo (4+2) cycloadditions involving the valence tautomeric ketene intermediate[12] and pyrimidin-6-ones may be formed analogously by a ketene 1,3-diazabutadiene reaction (Scheme 4). The oxazolone, ketene equilibrium is established at high temperatures which is not the case here. As all the reactions reported here were carried out at room temperature, hence this



Scheme - 4

mechanistic pathway is not operative in the present case. Secondly, the reaction may be initiated by the attack of 2-oxazolin-5-one in its carbanion form at C-4 of the zwitterionic form of the 1,3-diaza-1,3-butadiene and subsequent cyclization may yield pyrimidin-6-one (Scheme 5). The attack by N-1 is preffered over that of N-3, as the latter is placed in an unfavourable site of the butadiene system[13]. Such zwitterionic form of the 1,3-diaza-1,3-butadiene has already been presumed in explaining the 1,4-addition reaction mechanism[14].



Scheme - 5

Further investigations concerning the reaction of various 1,3-diaza-1,3-butadienes with 2-oxazolin-5-ones are underway and the results will be reported shortly.

EXPERIMENTAL

Melting points were determined in open capillary tubes on a Büchi apparatus and are uncorrected. The ^{1}H NMR spectra were recorded on Bruker 400MHz and 60MHz spectrometers and chemical shift values are recorded in δ units (parts per million) relative to Me_4Si as internal standard. The ^{13}C NMR spectra were obtained with proton noise decoupling and proton coupling at 100MHz with a Bruker 400MHz instrument and chemical shifts are expressed relative to internal standard Me_4Si. IR spectra were recorded on a Perkin Elmer 2378 IR spectrometer in potassium bromide discs or neat thin film. Mass spectra were recorded on AEIMS 30 instrument by the electron impact method. 2-Oxazolin-5-ones were prepared by cyclodehydration of n-acyl-α-amino acids with acetic anhydride[8].

Preparation of 1,3-diaza-1,3-butadienes: 1-Aryl-4-dimethylamino-2-phenyl-1,3-diaza-1,3-butadienes (1) were prepared by reported procedure[7]. 1-Aryl-4-dimethylamino-2-methylthio-1,3-diaza-1,3-butadienes (7) and 1,2-diphenyl-4-methylthio-4-sec. amino-1,3-diaza-1,3-butadienes (12) were prepared by thiomethylation of N,N-dimethylamino-N'-(N-arylthiocarbamoyl) formamidines and 4-[(α-phenylimino)benzylidenethiocarbamoyl] secondary amines[10] with methyl iodide following the reported procedure[9].

Reaction of 1,3-diaza-1,3-butadienes (1,7,12) with 2-oxazolin-5-ones (2) : General Procedure: To the stirred solution of 1,3-diaza-1,3-butadiene (1,7,12; 2.0 mmol) in dry benzene (5ml) was added the solution of 2-oxazolin-5-one (2, 2.0 mmol) in dry benzene (5ml) and the mixture was stirred at room temperature for 12h. The pyrimidinones (3a-i) were obtained by removing the solvent from the reaction mixture under reduced pressure and purifying the residue left by column chromatography over silica gel using ethylacetate/benzene (1:1) as eluent. The pyrimidinones (8a-h) separated out from the reaction mixture as white crystalline solid and were recrystallized from benzene. The pyrimidinones (13a-g) were obtained as thick viscous oil by purifying the residue left after removal of benzene under reduced pressure, by column chromatography on silica gel using ethylacetate/benzene (1:1) as eluent.

5-p-Chlorobenzoylamino-4-dimethylamino-1,2-diphenyl-5-methyl-1,4,5,6-tetrahydropyrimidin-6-one (3a): white crystalline solid; 90%; mp. 150-51°C; IR (KBr) 3250, 1725, 1645 cm^{-1}; δH ($CDCl_3$) 1.72 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 5.42 (s, 1H, H-4), 6.44 (brs, 1H, NH), 7.20-7.46 (m, 12H, ArH), 7.80 (m, 2H, ArH); m/z 460 (M^+); (Anal. Calcd. for $C_{26}H_{25}N_4O_2Cl$: C,67.75; H,5.47; N,12.15. Found: C,67.83; H,5.58; N,12.20).

5-p-Chlorobenzoylamino-4-dimethylamino-5-methyl-2-phenyl-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (3b): white crystalline solid; 85%; mp.194-95°C; IR (KBr) 3250, 1727, 1645 cm^{-1}; δH ($CDCl_3$) 1.72 (s, 3H, CH_3), 2.36 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 5.42 (s, 1H, H-4), 6.45 (brs, 1H, NH), 7.11-7.45 (m, 11H, ArH), 7.81 (m, 2H, ArH); m/z 474 (M^+); (Anal. Calcd. for $C_{27}H_{27}N_4O_2Cl$: C,68.27; H,5.73; N,11.79. Found: C,68.32; H,5.78; N,11.69).

5-Benzoylamino-4-dimethylamino-1,2-diphenyl-5-methyl-1,4,5,6-tetrahydropyrimidin-6-one (3c): white crystalline solid; 82%; mp. 171-72°C; IR (KBr) 3250, 1725, 1648 cm^{-1}; δH ($CDCl_3$) 1.70 (s, 3H, CH_3), 2.55 (s, 6H, $N(CH_3)_2$), 5.44 (s, 1H, H-4), 6.43 (brs, 1H, NH), 7.21-7.45 (m, 13H, ArH), 7.78 (m, 2H, ArH); m/z 426 (M^+); (Anal. Calcd. for $C_{26}H_{26}N_4O_2$: C,73.22; H,6.14; N,13.14. Found: C,73.37; H,6.08; N,13.20).

5-Benzoylamino-4-dimethylamino-5-methyl-2-phenyl-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (3d): white crystalline solid; 88%; mp. 178-79°C; IR (KBr) 3250, 1728, 1645 cm^{-1}; δH ($CDCl_3$) 1.70 (s, 3H, CH_3), 2.36 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 5.42 (s, 1H, H-4), 6.44 (brs, 1H, NH), 7.10-7.45 (m, 12H, ArH), 7.79 (m, 2H, ArH); m/z 440 (M^+); (Anal. Calcd. for $C_{27}H_{28}N_4O_2$: C,73.61; H,6.41; N,12.72. Found: C,73.52; H,6.47; N,12.64).

4-Dimethylamino-1,2-diphenyl-5-methyl-5-phenylacetylamino-1,4,5,6-tetrahydropyrimidin-6-one (3e): white crystalline solid; 87%; mp. 180-81°C ; IR (KBr) 3250, 1728, 1645 cm^{-1}; δH ($CDCl_3$) 1.68 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 3.61 (m, 2H, CH_2), 5.47 (s, 1H, H-4), 6.51 (brs, 1H, NH), 7.20-7.47 (m, 15H, ArH); m/z 440 (M^+); (Anal. Calcd. for $C_{27}H_{28}N_4O_2$: C,73.61; H,6.41; N,12.72. Found: C,73.76; H,6.49; N,12.77).

4-Dimethylamino-5-methyl-2-phenyl-5-phenylacetylamino-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (3f): white crystalline solid; 85%; mp. 198-99°C; IR (KBr) 3260, 1728, 1645 cm^{-1}; δH ($CDCl_3$) 1.68 (s, 3H, CH_3), 2.36 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 3.60 (m, 2H, CH_2), 5.47 (s, 1H, H-4), 6.51

(brs, 1H, NH), 7.20-7.48 (m, 14H, ArH); m/z 454 (M^+); (Anal. Calcd. for $C_{28}H_{30}N_4O_2$: C,73.98; H,6.65; N,12.33; Found: C,73.81; H,6.70; N,12.45).

4-Dimethylamino-1,2-diphenyl-5-methyl-5-p-methoxybenzoylamino-1,4,5,6-tetrahydropyrimidin-6-one (3g): white crystalline solid; 86%; mp. 162-63°C; IR (KBr) 3250, 1727, 1645 cm^{-1}; δH ($CDCl_3$) 1.72 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 3.88 (s, 3H, OCH_3), 5.42 (s, 1H, H-4), 6.44 (brs, 1H, NH), 6.86-7.65 (m, 12H, ArH), 7.82 (m, 2H, ArH); m/z 456 (M^+); (Anal. Calcd. for $C_{27}H_{28}N_4O_3$: C,71.03; H,6.18; N,12.27; Found: C,71.17; H,6.22; N,12.18).

4-Dimethylamino-5-methyl-5-p-methoxybenzoylamino-2-phenyl-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (3h): white crystalline solid; 85%; mp. 158-59°C; IR (KBr) 3255, 1725, 1647 cm^{-1}; δH ($CDCl_3$) 1.70 (s, 3H, CH_3), 2.35 (s, 3H, CH_3), 2.56 (s, 6H, $N(CH_3)_2$), 3.87 (s, 3H, OCH_3), 5.44 (s, 1H, H-4), 6.45 (brs, 1H, NH), 6.85-7.65 (m, 11H, ArH), 7.83 (m, 2H, ArH); m/z 470 (M^+); (Anal. Calcd. for $C_{28}H_{30}N_4O_3$: C,71.47; H,6.43; N,11.91; Found: C,71.58; H,6.39; N,11.84).

4-Dimethylamino-1,2-diphenyl-5-methyl-5-p-nitrobenzoylamino-1,4,5,6-tetrahydropyrimidin-6-one (3i): white crystalline solid; 87% ; mp. 197-98°C ; IR (KBr) 3255, 1725, 1645, 1525 cm^{-1}; δH ($CDCl_3$) 1.72 (s, 3H, CH_3), 2.57 (s, 6H, $N(CH_3)_2$), 5.44 (s, 1H, H-4), 6.45 (brs, 1H, NH), 7.21-7.75 (m, 12H, ArH), 7.98 (m, 2H, ArH); m/z 471 (M^+); (Anal. Calcd. for $C_{26}H_{25}N_5O_4$: C,66.23; H,5.34; N,14.85; Found: C,66.18; H,5.26; N,14.90).

4-Dimethylamino-5-methyl-5-p-nitrobenzoylamino-2-phenyl-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (3j): white crystalline solid; 84%; mp.187-88°C; IR (KBr) 3255, 1725, 1645, 1525 cm^{-1}; δH ($CDCl_3$) 1.72 (s, 3H, CH_3), 2.36 (s, 3H, CH_3), 2.57 (s, 6H, $N(CH_3)_2$), 5.44 (s, 1H, H-4), 6.45 (brs, 1H, NH), 7.12-7.75 (m, 11H, ArH), 7.98 (m, 2H, ArH); m/z 485 (M^+);(Anal. Calcd. for $C_{27}H_{27}N_5O_4$: C,66.79; H,5.61; N,14.42; Found: C,66.88; H,5.67; N,14.36).

5-p-Chlorobenzoylamino-4-dimethylamino-5-methyl-2-methylthio-1-phenyl-1,4,5,6-tetrahydropyrimidin-6-one (8a): white crystalline solid; 94%; mp. 161-62°C; IR (KBr) 3275, 1715, 1625 cm^{-1}; δH ($CDCl_3$) 1.55 (s, 3H, CH_3); 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.31 (s, 1H, H-4), 6.41 (brs, 1H, NH), 7.24-7.43 (m, 7H, ArH), 7.72 (m, 2H, ArH); m/z 430 (M^+); (Anal. Calcd. for $C_{21}H_{23}N_4O_2SCl$: C,58.53; H,5.38; N,13.00 ; Found : C,58.48; H,5.49; N,13.08).

4-Dimethylamino-5-methyl-2-methylthio-5-p-methoxybenzoylamino-1-phenyl-1,4,5,6-tetrahydropyrimidin-6-one (8b): white crystalline solid; 90%; mp. 149-50°C; IR (KBr) 3275, 1715, 1625 cm^{-1}; δH ($CDCl_3$) 1.55 (s, 3H, CH_3); 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 3.88 (s, 3H, OCH_3), 5.31 (s, 1H, H-4), 6.41 (brs, 1H, NH), 6.88-7.64 (m, 7H, ArH), 7.80 (m, 2H, ArH); m/z 426 (M^+); (Anal. Calcd. for $C_{22}H_{26}N_4O_3S$: C,61.95; H,6.14; N,13.14; Found: C,61.82; H,6.21; N,13.09).

5-Benzoylamino-4-dimethylamino-5-methyl-2-methylthio-1-phenyl-1,4,5,6-tetrahydropyrimidin-6-one (8c): white crystalline solid; 91%; mp. 162-63°C; IR (KBr) 3280, 1715, 1628 cm^{-1}; δH ($CDCl_3$) 1.55 (s, 3H, CH_3), 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.31 (s, 1H, H-4), 6.41 (brs, 1H, NH), 7.24-7.45 (m, 8H, ArH), 7.71 (m, 2H, ArH); m/z 396 (M^+); (Anal. Calcd. for $C_{21}H_{24}N_4O_2S$: C,63.61; H,6.10; N,14.13; Found: C,63.77; H,5.99; N,14.17).

4-Dimethylamino-5-methyl-2-methylthio-5-p-nitrobenzoylamino-1-phenyl-1,4,5,6-tetrahydropyrimidin-6-one (8d): white crystalline solid; 85%; mp. 166-68°C; IR (KBr) 3275, 1715, 1628, 1525 cm^{-1}; δH ($CDCl_3$) 1.55 (s, 3H, CH_3), 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.30 (s, 1H, H-4), 6.40 (brs, 1H, NH), 7.21-7.75 (m, 7H, ArH), 7.98 (m, 2H, ArH); m/z 441 (M^+) ;

(Anal. Calcd. for $C_{21}H_{23}N_5O_4S$: C,57.13; H,5.25; N,15.86; Found: C,57.25; H,5.18; N,15.78).

5-p-Chlorobenzoylamino-4-dimethylamino-5-methyl-2-methylthio-1-p-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (8e): white crystalline solid; 92%; mp. 163-64°C; IR (KBr) 3275, 1715, 1625 cm^{-1}; δ H ($CDCl_3$) 1.55 (s, 3H, CH_3), 2.30 (s, 3H, SCH_3), 2.37 (s, 3H, CH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.31 (s, 1H, H-4), 6.42 (brs, 1H, NH), 7.05-7.47 (m, 6H, ArH), 7.74 (m, 12H, ArH); m/z 444 (M^+); (Anal. Calcd. for $C_{22}H_{25}N_4O_2SCl$: C,59.38; H,5.66; N,12.59 ; Found: C,59.50; H,5.57; N,12.64).

5-Benzoylamino-4-dimethylamino-5-methyl-2-methylthio-1-tolyl-1,4,5,6-tetrahydropyrimidin-6-one (8f): white crystalline solid; 86%; mp. 166-67°C ; IR (KBr) 3280, 1715, 1628 cm^{-1}; δ H ($CDCl_3$) 1.56 (s, 3H, CH_3), 2.31 (s, 3H, SCH_3), 2.37 (s, 3H, CH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.33 (s, 1H, H-4), 6.44 (brs, 1H, NH), 7.10-7.50 (m, 7H, ArH), 7.73 (m, 2H, ArH); m/z 410 (M^+); (Anal. Calcd. for $C_{22}H_{26}N_4O_2S$: C,64.36; H,6.38; N,13.65; Found: C,64.53; H,6.29; N,13.71).

5-Benzoylamino-1-p-chlorophenyl-4-dimethylamino-5-methyl-2-methylthio-1,4,5,6-tetrahydropyrimidin-6-one (8g): white crystalline solid ; 83% ; mp. 159-60°C; IR (KBr) 3274, 1715, 1625 cm^{-1}; δ H ($CDCl_3$) 1.55 (s, 3H, CH_3), 2.30 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 5.31 (s, 1H, H-4), 6.41 (brs, 1H, NH), 7.22-7.45 (m, 7H, ArH), 7.74 (m, 2H, ArH); m/z 430 (M^+); (Anal. Calcd. for $C_{21}H_{23}N_4O_2SCl$: C,58.53; H,7.43; N,13.00 ; Found : C,58.68; H,7.36; N,13.11).

4-Dimethylamino-5-methyl-2-methylthio-1-p-methoxyphenyl-5-p-nitrobenzoylamino-1,4,5,6-tetrahydropyrimidin-6-one (8h): white crystalline solid; 80%; mp. 174-75°C; IR (KBr) 3280, 1715, 1628, 1524 cm^{-1}; δ H ($CDCl_3$) 1.54 (s, 3H, CH_3), 2.31 (s, 3H, SCH_3), 2.48 (s, 6H, $N(CH_3)_2$), 3.83 (s, 3H, OCH_3), 5.34 (s, 1H, H-4), 6.44 (brs, 1H, NH), 6.90-7.70 (m, 6H, ArH), 7.88 (m, 2H, ArH); m/z 471 (M^+); (Anal. Calcd. for $C_{22}H_{25}N_5O_5S$: C,56.04; H,5.34; N,14.85; Found: C,56.16; H,5.26; N,14.76).

5-p-Chlorobenzoylamino-1,2-diphenyl-5-methyl-4-methylthio-4-morpholino-1,4,5,6-tetrahydropyrimidin-6-one (13a): viscous liquid; 80%; IR (neat) 3275, 1710, 1640 cm^{-1}; δ H ($CDCl_3$) 1.62 (s, 3H, CH_3), 2.34 (s, 3H, SCH_3), 3.35 (m, 4H, CH_2-N-CH_2), 3.61 (m, 4H, CH_2-O-CH_2), 6.42 (brs, 1H, NH), 7.20-7.45 (m, 12H, ArH), 7.75 (m, 2H, ArH); m/z 548 (M^+); (Anal. Calcd. for $C_{29}H_{29}N_4O_3SCl$: C,63.44; H,5.32; N,10.20; Found: C,63.55; H,5.25; N,10.31).

1,2-Diphenyl-5-methyl-4-methylthio-5-p-methoxybenzoylamino-4-morpholino-1,4,5,6-tetrahydropyrimidin-6-one (13b): viscous liquid; 75%; IR (neat) 3280, 1710, 1645 cm^{-1}; δ H ($CDCl_3$) 1.62 (s, 3H, CH_3), 2.34 (s, 3H, SCH_3), 3.34 (m, 4H, CH_2-N-CH_2), 3.62 (m, 4H, CH_2-O-CH_2), 3.88 (s, 3H, OCH_3), 6.43 (brs, 1H, NH), 6.90-7.61 (m, 12H, ArH), 7.78 (m, 2H, ArH); m/z 544 (M^+); (Anal. Calcd. for $C_{30}H_{32}N_4O_4S$: C,66.16; H,5.92; N,10.29; Found: C,66.24; H,5.84; N,10.37).

5-Benzoylamino-1,2-diphenyl-5-methyl-4-methylthio-4-morpholino-1,4,5,6-tetrahydropyrimidin-6-one (13c): viscous liquid; 74% ; IR (neat) 3275, 1712, 1640 cm^{-1}; δ H ($CDCl_3$) 1.61 (s, 3H, CH_3), 2.34 (s, 3H, SCH_3), 3.35 (m, 4H, CH_2-N-CH_2), 3.62 (m, 4H, CH_2-O-CH_2), 6.42 (brs, 1H, NH), 7.21-7.46 (m, 13H, ArH), 7.77 (m, 2H, ArH); m/z 514 (M^+); (Anal. Calcd. for $C_{29}H_{30}N_4O_3S$: C,67.68; H,5.87; N,10.89; Found: C,67.59; H,5.82; N,10.93).

5-p-Chlorobenzoylamino-1,2-diphenyl-5-methyl-4-methylthio-4-piperidino-1,4,5,6-tetrahydropyrimidin-6-one (13d): viscous liquid; 90% ; IR (neat) 3280, 1710, 1640 cm^{-1}; δ H ($CDCl_3$) 1.41-1.61 (m, 9H, CH_3 and $-CH_2-CH_2-CH_2-$),

2.35 (s, 3H, SCH_3), 3.37 (m, 4H, CH_2-N-CH_2), 6.40 (brs, 1H, NH), 7.21-7.50 (m, 12H, ArH), 7.78 (m, 2H, ArH); m/z 546 (M^+) ; (Anal. Calcd. for $C_{30}H_{31}N_4O_2S$: C,65.86; H,5.71; N,10.24; Found: C,65.94; H,5.65; N,10.18).

1,2-Diphenyl-5-methyl-4-methylthio-5-p-methoxybenzoylamino-4-piperidino-1,4,5,6-tetrahydropyrimidin-6-one (13e): viscous liquid; 69% ; IR (neat) 3275, 1712, 1645 cm^{-1}; δ H ($CDCl_3$) 1.41-1.62 (m, 9H, CH_3 and -CH_2-CH_2-CH_2-), 2.34 (s, 3H, SCH_3), 3.36 (m, 4H, -CH_2-N-CH_2-), 3.87 (s, 3H, OCH_3), 6.41 (brs, 1H, NH), 6.88-7.60 (m, 12H, ArH), 7.80 (m, 2H, ArH); m/z 542 (M^+) ; (Anal. Calcd. for $C_{31}H_{34}N_4O_3S$: C,68.61; H,6.32; N,10.32; Found: C,68.56; H,6.30; N,10.41).

5-Benzoylamino-1,2-diphenyl-5-methyl-4-methylthio-4-piperidino-1,4,5,6-tetrahydropyrimidin-6-one (13f): viscous liquid; 72% ; IR (neat) 3280, 1710, 1640 cm^{-1}; δ H ($CDCl_3$) 1.40-1.61 (m, 9H, CH_3 and -CH_2-CH_2-CH_2-),2.35 (s, 3H, SCH_3), 3.37 (m, 4H, -CH_2-N-CH_2-), 6.41 (brs, 1H, NH), 7.20-7.47 (m, 13H, ArH), 7.78 (m, 2H, ArH); m/z 512 (M^+) ; (Anal. Calcd. for $C_{30}H_{32}N_4O_2S$: C,70.28; H,6.29; N,10.93; Found: C,70.35; H,6.31; N,10.86).

5-p-Chlorobenzoylamino-4-dimethylamino-1,2-diphenyl-5-methyl-4-methylthio-1,4,5,6-tetrahydropyrimidin-6-one (13g): viscous liquid ; 68% ; IR (neat) 3275, 1710, 1645 cm^{-1}; δ H ($CDCl_3$) 1.61 (s, 3H, CH_3), 2.35 (s, 3H, SCH_3), 2.87 (s, 6H, $N(CH_3)_2$), 6.41 (brs, 1H, NH), 7.21-7.50 (m, 12H, ArH), 7.78 (m, 2H, ArH); m/z 506 (M^+); (Anal. Calcd. for $C_{27}H_{27}N_4O_2SCl$: C,63.96 ; H,5.37; N,11.05; Found: C,64.04; H,5.29; N,11.15).

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