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Evaluation of antimicrobial activities of synthesized pyridinium derivatives

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ABSTRACT

*Antimicrobial activities of novel synthesized pyridinium derivatives showed prospective broad spectrum antimicrobial effect. The synthetic compounds were examined using agar well and dilution method. The antimicrobial effect was measured and represented as minimum inhibitory concentration (MIC). Halogentated pyridinium derivatives showed significant antimicrobial effect with MIC values ranged from 7.5 µg/ml to 180 µg/ml aganist ATCC strains and clinically isolated gram positive and gram negative microbes. P-flouro-derivative (**79**) was the broadest antimicrobial agent with MIC value = 7.5 µg/ml against Strep. B. Although, S.aureus, B.subtilis and C.albican are the most sensitive microbes , P.auregenosa , P.mirabilis and K.pneumoniae are the most challenging one.*

Keywords: pyridinium derivatives, gram positive, antimicrobial activity, gram negative, cationic compounds.

INTRODUCTION

Importance of hetero cyclic compounds has long been recognized in the field of synthetic organic chemistry. It is well known that heterocyclic compounds containing nitrogen and sulphur exhibit a wide variety of biological activities [1]. A series of pyridine derivatives were evaluated for antitumor activities [2]. Nicotinamide has been shown to be useful in treatment of papular, pustular acne and skin cancer [3]. Nicotinamide or nicotinic acid has been used to treat diseases such as hyper-cholesterolemia and schizophrenia [4-7]. Nicotinamide and its derivatives are also used to prevent type-1 diabetes in animal models [8,9]. Moreover, 6–chloro–3-substituted pyridine are significant class of heterocycles which mainly applied in pharmaceutical and agrochemical industry [10-12]. The increasing interest in the chemistry of nicotinamide and its substituted derivatives result from the wide possibilities and their practical application for obtaining biologically active agents. Derivatives of S-protected triazole and diazole exhibit high anti-inflammatory activity [13]. Previously synthesized pyridinium derivatives showed Hsp90 inhibitory effect with potential antitumor effect [14]. Our interest is to look for antibacterial and antifungal activities of new halogenated alkylamide derivatives of nicotinamide. An attempt has been made to understand the structural activity relationship of antimicrobial effect of pyridinium derivatives [15,16] .

MATERIALS AND METHODS

2. *In vitro* Experimental Studies

2.1.Reagents and Reference Samples

Pharmaceutical grade nicotinic acid 95%(Sigma-Aldrich, Germany), p-chloroaniline (98%), m-chloroaniline (98%), o-chloroaniline (98%), p-chloroaniline (98%), p-bromoaniline (98%), p-flouroaniline (98%), p-Iodoaniline (98%), p-methylthioaniline (98%), 2,4-dichloroaniline (98%), 3,5-dichloroaniline (98%), oxalyl chloride (99.0%), triethylamine (99%) , and monochloroacetyl chloride (99%) (Sigma-Aldrich, Germany). Bi-distilled water was produced in-house (BOECO Water Still, WS3500, Germany). Isolated pathogenic microbes were supplied from Supporting Medical Sciences Faculty at Zarqa University, ATCC bacterial strains , ATCC C.albicans was purchased from Al-Sami company.

2.2 Preparation of hit compounds for *In vitro* assay

The synthesized compounds were kept as dry powders in variable quantities (5.0 mg). They were initially dissolved in 1.0 ml (water: ethanol 1:1) to give stock solutions of 5.0 mg/ml. Subsequently, they were diluted to the required concentrations with deionized water for antimicrobial testing.

2.3 Microbiology

Antibacterial activities of the compounds were determined using agar well method and tube dilution technique for active compounds [18,19]. The minimum inhibitory concentration (MIC) values are given in µg/mL. The standard bacteria strains used, zone of inhibition and MIC values are shown in table 4 and table 5. Samples were prepared as follows; 5.0 mg was dissolved in 1.0 ml of (water: ethanol 1:1), 25 µl was added in each well using agar well method. 25 µl of (water: ethanol 1:1) was used as blank. Diameter of the inhibition zone was measured. Serial dilution method was used for MIC value determination as follows; 96 µl of the tested compound (5.0 mg/ml) was transferred to 2 ml of nutrient broth, vortexing, then 1 ml of liquid broth was transfered to the next tube, followed by addition of 1 ml broth, vortexing, then transfering 1 ml of mixed broth to the third test tube, the serial concentrations are; 240, 120, 60, 30 and 15 µg/ml. The fifth test tube was used as blank (negtive control) [17].

3. Chemistry-Experimental Section

3.1 Synthetic Procedures

Melting points were measured using Gallenkampf melting point apparatus and are uncorrected. ^{1}H NMR and ^{13}C NMR spectrums were collected on a Varian Oxford NMR-300 spectrometer. Electron Impact mass spectrometry was performed using **ISQ** Thermo Scientific mass spectrometer utilizing electron ionization. Infrared spectra were recorded using Shimadzu IR Affinity-1 spectrophotometer. The samples were analyzed as thin solid films using KBr pellets. Analytical thin layer chromatography (TLC) was carried out using pre-coated aluminium plates and visualized by UV light (at 254 and/or 360 nm). Chemicals and solvents were used without further purification.

3.1.1 Synthesis of the mono-chloromethyl-acetamido derivatives (1-9) (**Scheme 1**)

To a magnetically-stirred, ice-bathed, solution or suspension of the particular aromatic amine (**1-9**, 1.0 equivalent) and triethylamine (2.0 equivalents) in dry acetone (25 mL), chloroacetylchloride (1.0 equivalent) in dry acetone (25 mL) was gradually added over 30 min. The reaction mixture was stirred at room temperature until TLC revealed complete consumption of the starting amine. Subsequently, the reaction mixture was poured slowly onto 100ml of 5% aqueous sodium bicarbonate to neutralize the generated acid. The precipitated crude products were purified by recrystalyzation from acetone/water

3.1.1.1. 2-Chloro-N-(4-chloro-phenyl)-acetamide (1)

This compound was prepared from 4-chloro-aniline (3.0 gm, 23.5 mmol) to yield **1** as pale grayish solid (4.2 gm, 87%); mp 136-138 ^{o}C, IR (KBr): ν_{max} = 3361, 3101, 1670, 1612, 1492cm^{-1} [14] .

3.1.1.2 2-Chloro-N-(3-chloro-phenyl)-acetamide (2)

This compound was prepared from m-chloro-aniline (3.0 gm, 23.5 mmol) to yield **2** as white powder (3.9 gm, 81 %); mp 91-93 ^{o}C, IR (KBr): ν_{max} = 3351, 3105, 1678, 1597 cm^{-1}

3.1.1.3 2-Chloro-N-(2-chloro-phenyl)-acetamide (3)

This compound was prepared from o-chloro-aniline (3.0 gm, 23.5 mmol) to yield **3** as white powder (4.7 gm, 98%); mp: 69-71 ^{o}C, IR (KBr): ν_{max} = 3271, 1674, 1593, 1535 cm-1

3.1.1.4 2-Chloro-*N*-(4-bromo-phenyl)-acetamide (4)

This compound was prepared from 4-bromo-aniline (3.0 gm, 17.5 mmol) to yield **4** as pale grayish solid (3.7 gm, 85.4%); mp 174-176 ^{o}C, IR (KBr): ν_{max} = 3263, 3101, 1670, 1608, 1551cm^{-1}

3.1.1.5 2-Chloro-*N*-(4-Iodo-phenyl)-acetamide (5)

This compound was prepared from *p*-iodo-aniline (3.0 gm, 13.7 mmol) to yield **5** as gray crystaline solid (3.5 gm, 86.5%); mp 121-122 ^{o}C, IR (KBr): ν_{max} = 3301, 1660 , 1552, 1502 cm^{-1}

3.1.1.6 2-Chloro-*N*-(4-methylsulfanyl-phenyl)-acetamide (6)

This compound was prepared from 4-methylthio-aniline (3.0 gm, 21.6 mmol) to yield **6** as a pale gray powder (4.1 gm, 88%); mp 125-127 ^{o}C, IR (KBr): ν_{max} = 3333, 3186, 1658, 1589 cm^{-1} [14] .

3.1.1.7 2-Chloro-*N*-(4-Flouro-phenyl)-acetamide (7)

This compound was prepared from *p*-flouro-aniline (3.0 gm, 27 mmol) to yield **7** as yellow crystalline solid (3.65 gm, 72 %); mp 126-128^{o}C, IR (KBr): ν_{max} = 3280, 3110, 1670, 1627, 1570, 1508 cm^{-1},

3.1.1.8 2-Chloro-*N*-(2,4-dichloro-phenyl)-acetamide (8)
This compound was prepared from 2,4-dichloroaniline (3.0 gm, 18.5 mmol) to yield **8** as gray crystaline solid (3.8 gm, 86.0%); mp 92-94 ^{o}C, IR (KBr): ν_{max} = 3248, 1670 , 1585, 1531 cm^{-1};

3.1.1.9 2-Chloro-*N*-(3,5-dichloro -phenyl)-acetamide (9)
This compound was prepared from 3,5-dichloroaniline (3.0 gm, 18.5 mmol) to yield **9** as a pale gray powder (4.1 gm, 93%); mp 133-135 ^{o}C, IR (KBr): ν_{max} = 3353, 3186, 1685, 1608, 1589 cm^{-1},

3.1.2 Synthesis of *N*-substituted-nicotinamide derivatives (10-18) (scheme 2)
To stirred ice-bathed neat oxalyl chloride (5 mL, 58 mmol) nicotinic acid (5g, 40 mmol) was added to form thick slurry. The reaction mixture was left at room temperature for one hour during which excess oxalyl chloride was allowed to evaporate in fume hood to yield whitish powder. Subsequently, the particular amine (1.0 equivalent, neat) was added under vigorous stirring to the resulting powder under ice bath conditions. The reaction was subsequently warmed to room temperature and stirred for 15 minutes. The reaction was terminated by quenching with 5% aqueous $NaHCO_3$ solution (100 ml). The resulting crude precipitate was filtered and recrystallized from acetone/water to yield compounds (**10-18**).

3.1.2.1 *N*-(4-Chloro-phenyl)-nicotinamide (10)
This compound was prepared from 4-chloro-aniline/acetone solution (3.0 gm/25 ml , 23.5 mmol) to yield **10** as pale white crystalline solid (3.1 gm, 56.6%); mp 129-131 ^{o}C, IR (KBr): ν_{max} = 3340, 3178, 1682, 1550, 1508 cm^{-1}[14].

3.1.2.2 *N*-(3-Chloro-phenyl)-nicotinamide (11)
This compound was prepared from *m*-chloro-aniline (3.0 gm, 23.5 mmol) to yield **11** as pale white powder (3.2 gm, 58%) ; mp 132-134 ^{o}C, IR (KBr): ν_{max} = 3401, 1670, 1593, 1527 cm^{-1},

3.1.2.3 *N*-(2-Chloro-phenyl)-nicotinamide (12)
This compound was prepared from o-chloro-aniline (3.0 gm, 23.5 mmol) to yield **12** (3.5 gm, 64%) mp 72-75 ^{o}C, IR (KBr): ν_{max} = 3290, 1654, 1589, 1531 cm^{-1},

3.1.2.4 *N*-(4-Bromo-phenyl)-nicotinamide (13)
This compound was prepared from *p*-bromo-aniline/acetone (3.0 gm/20 ml, 17.5 mmol) to yield **13** as grey crystalline solid (2.7 gm, 56%); mp 171-173 ^{o}C, IR (KBr): ν_{max} = 3294, 3024, 1662, 1589 ,1516 cm^{-1}.

3.1.2.5 *N*-(4-Iodo-phenyl)-nicotinamide (14)
This compound was prepared from p-iodo-aniline/acetone (3.0 gm/25 ml, 13.7 mmol) to yield **14** as yellow crystalline solid (3.5 gm, 85.7 %) ; mp 186-188 ^{o}C, IR (KBr): ν_{max} = 3344, 1654, 1593, 1519 cm^{-1}.

3.1.2.6 *N*-(4-Methyl-sulfanyl-phenyl)-nicotinamide (15)
This compound was prepared from 4-methyl thio-aniline/acetone (3.0 gm/25 ml , 21.5 mmol) to yield **15** as pale white crystalline solid (3.4 gm, 64.5%); mp 144-146 ^{o}C, IR (KBr): ν_{max} = 3305, 3071, 1654, 1585 cm^{-1} [14].

4.1.2.7 *N*-(4-Flouro-phenyl)-nicotinamide (16)
This compound was prepared from 4-flouro-aniline/acetone solution (3.0 gm/25 ml , 27 mmol) to yield **16** as pale white crystalline solid (3.24 gm, 56%); mp 78-80 ^{o}C, IR (KBr): ν_{max} = 3440, 3278, 1689, 1597, 1492 cm^{-1}.

3.1.2.8 *N*-(2,4-dichloro-phenyl)-nicotinamide (17)
This compound was prepared from 2,4-dichloro-aniline/acetone solution (3.0 gm/25 ml , 18.5 mmol) to yield **17** as pale white crystalline solid (3.4 gm, 64.5%); mp 54-56 ^{o}C, IR (KBr): ν_{max} = 3325, 3071, 1577, 1516 cm^{-1}.

3.1.2.9 *N*-(3,5-dichloro-phenyl)-nicotinamide (18)
This compound was prepared from 3,5-dichloro-aniline/acetone solution (3.0 gm/25 ml , 27 mmol) to yield **18** as pale white crystalline solid (3.24 gm, 56%); mp 220-222 ^{o}C, IR (KBr): ν_{max} = 3271, 3078, 1674, 1585, 1512 cm^{-1}.

3.1.3 Synthesis of the pyridinium cationic derivatives (19-99) (schemes 3)
To magnetically-stirred neat *N*-substituted nicotinamide (**10-18**) (0.5 gm) heated to 190-200^{o}C, the particular *mono*-chloromethyl-acetamide derivative (**1-9**) was added neat (0.5 gm). The reaction mixture was stirred at 190-200^{o}C for 10-15 mins then cooled to room temperature. The resulting solid mass was suspended in dry acetone (20 mL) and stirred at room temperature for 15 min then filtered. The residues were further washed with acetone (2 x 20 mL) to yield pyridinum derivatives **(19-99).**

3.1.3.1 3-(4-Chloro-phenylcarbamoyl)-1-[(4-chloro-phenylcarbamoyl)-methyl]-pyridinium chloride (19)
This compound was prepared [14] from **1** (0.5 gm, 2.45 mmol) and **10** (0.5 gm, 2.3 mmol) to yield **19** as yellowish powder (0.298 gm, 34.5%) ; mp 162-164^{o}C, IR (KBr): ν_{max} = 3110, 1670, 1608, 1540 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.80 (s, 2H, CH_2), 7.40 (d, 2H, phenyl, J = 8.6 Hz), 7.65 (d, 2H, phenyl, J = 8.4 Hz), 7.80 (d, 2H, phenyl, J = 8.6 Hz), 7.95 (d, 2H, phenyl, J = 8.6 Hz), 8.40 (d, 1H, pyridinium, J = 6.0 Hz), 8.80 (d, 1H, pyridinium , J = 3.0 Hz), 9.17 (s, 1H, pyridinium), 9.75 (s, 1H, pyridinium), 10.70 (s, 1H, CONH), 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.31 (CH_2), 120.81 (CH), 122.25 (CH), 127.63 (CH), 128.56 (C), 128.85 (CH), 129.02 (CH), 133.75 (C), 136.48 (C), 137.76 (C), 139.11 (CH), 144.76 (C), 147.88 (CH), 151.21 (CH), 162.41 (C=O), 163.77 (C=O) ppm; EI-MS *m/z* : 203.22, 215.28, 232.27 (100%), 234.30, 236.20, 273.29, 283.31, 310.34, 338.34, 359.27, 398.19, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06 Found 400.22.

3.1.3.2 3-(3-Chloro-phenylcarbamoyl)-1-[(4-chloro-phenylcarbamoyl)-methyl]-pyridinium chloride (20)
This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **11** (0.5 gm, 2.3 mmol) to yield **20** as yellowish powder (0.32 gm , 37%); mp 200-201 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3100, 1682, 1609, 1454 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.84 (s, CH_2), 7.25 (d, 2H, phenyl, J = 7.4 Hz), 7.4 (d, 2H, phenyl, J = 7.4 Hz), 7.7 (m, 3H, phenyl), 7.85 (d, 1H, phenyl, J = 7.6 Hz), 9.30 (d, 2H, pyridinium, J = 5.6 Hz), 9.75 (s, 1H, pyridinium) , 10.85 (s, 1H, $CONH_2$), 11.50 (br s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=62.37 (CH_2), 119.03 (CH), 120.04 (CH), 120.83 (CH), 122.09 (CH), 122.42 (CH), 124.15 (CH), 127.5 (CH), 128.56 (CH), 128.78 (C), 130.41 (C), 133.75 (CH), 139.77 (C), 144.76 (C), 147.37 (CH), 148.52 (C), 163.40 (C=O), 164.78 (C=O) ppm.; EI-MS *m/z* : 191.91, 202.89 (100%), 204.89, 206.80, 208.03, 231.93, 232.96, 272.81, 296.17, 309.83, 323.64, 338.56 368.75, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found 400.02.

3.1.3.3 3-(2-Chloro-phenylcarbamoyl)-1-[(4-chloro-phenylcarbamoyl)-methyl]-pyridinium chloride (21)
This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **21** as yellow powder (0.33 gm, 38%); mp 198-200 ^{o}C, IR (KBr): ν_{max} = 3304, 1678, 1519, 1438 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.72 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, J = 6.9 Hz), 7.43 (d, 2H, phenyl, J = 6.9 Hz), 7.59 (d, 1H, phenyl, J = 7.1 Hz), 7.91 (d, 2H, phenyl, J = 7.1 Hz), 8.01 (s, 1H, phenyl), 8.12 (dd, 1H, pyridinium , J = 6.6 Hz), 8.47 (s, 1H, pyridinium), 8.97 (d, 1H, pyridinium, J = 5.7 Hz), 10.45 (d, 1H, pyridinium, J = 5.7 Hz), 11.15 (s, 1H, CO-NH), 11.59 (s, 1H, CONH) ppm ; ^{13}C NMR (75 MHz, DMSO-d_6): δ=62.38 (CH_2), 119.85 (CH), 121.01 (CH), 126.62 (CH), 126.67 (CH), 126.93 (CH), 132.75 (CH), 133.70 (CH), 134.92 (C), 135.42 (C), 135.56 (CH), 135.65 (C), 144.63 (C), 146.69 (C), 148.08 (CH), 152.04 (CH), 158.61 (C), 160.09 (C=O) 162.79 (C=O) ppm. EI-MS *m/z*: 185.1, 213.12, 232.00, 255.03, 272.95, 284.19, 307.91 (100%), 309.94, 311.96, 312.96, 353.19, 368.26, 382.12, 395.19 $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06 , found 400.25.

3.1.3.4 3-(4-Bromo-phenylcarbamoyl)-1-[(4-chloro-phenylcarbamoyl)-methyl]-pyridinium chloride (22)
This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **22** as yellowish white solid (0.4 gm, 44.5%); m.p 230-231 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3230, 1666, 1489, 1454 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.81 (s, CH_2), 7.4 (br s, 2H, phenyl), 7.6 (d, 2H, phenyl, J = 7.2 Hz), 7.78 (d, 2H, phenyl, J = 7.2 Hz), 7.87 (d, 2H, phenyl, J = 5.5 Hz), 8.36 (s, 1H, pyridinium), 9.2 (br s, 1H, pyridinium), 9.3 (br s, 1H, pyridinium), 9.77 (br s, 1H, pyridinium), 11.0 (s, 1H, CO-NH), 11.45 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=62.3 (CH_2), 116.6 (CH), 120.8 (C), 122.4 (CH), 126.98 (C), 127.52 (C), 128.84 (CH), 130.97 (C), 131.58 (CH), 137.26 (CH), 137.44 (C), 137.86 (CH), 144.8 (CH), 146.8 (CH), 158.5 (C), 160.42 (C=O), 163.17 (C=O), EI-MS *m/z* : 185.03, 198.97, 200.98, 203.00, 232.01, 275.98, 395.90,397.94 (100%), 399.94, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 444.01, found : 444.12.

3.1.3.5 1-[(4-Chloro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium chloride (23)
This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **14** (0.5 gm ,1.5 mmol) to yield **23** as yellow-white solid (0.54 gm, 65%); mp 218-220 ^{o}C, IR (KBr): ν_{max} = 3300, 3010, 1678, 1609, 1492 cm^{-1}, ^{1}H NMR (300MHz, DMSO-d_6): δ5.82 (s, 2H, CH_2), 7.40 (d, 2H, phenyl, J = 8.3 Hz), 7.54 (d, 2H, phenyl, J = 8.6 Hz), 7.67-7.74 (m, 4H, phenyl), 8.35 (dd, 1H, pyridinium, J = 6.3 Hz), 9.25 (dd, 2H, pyridinium, J = 7.2, 5.4 Hz), 9.80 (s, 1H, pyridinium), 11.11 (s, 1H, CO-NH) , 11.60 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ= 62.96 (CH_2), 87.98 (C), 114.71 (CH), 120.84 (CH), 121.44 CH), 122.71 (CH), 127.89 (CH), 128.80 (C), 132.13 (C), 133.91 (C), 137.44 (C), 144.80 (CH), 147.26 (CH), 148.68 (CH), 163.088 (C=O), 163.432 (C=O); EI-MS *m/z* : 187.11, 197.21 (100%), 215.18, 219.04, 233.14, 245.03, 261.13, 276.13, 295.09, 297.10, 323.07, 324.15, 336.17, 367.16, 387.14, 413.33, 427.31, 449.17, 476.21, $[M]^+$ calcd for $C_{20}H_{16}Cl_1I_1N_3O_2^+$: 492.00, found 491.94.

3.1.3.6 1-[(4-Chloro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium chloride (24)
This compound was prepared [14] from **1** (0.5 gm, 2.45 mmol) and **15** (0.5 gm, 2.1 mmol) to yield **24** as pale white solid (0.24 gm, 27%): mp 182-183 ^{o}C (decomp.), IR (KBr): ν_{max} = 3332, 3011, 1674, 1604, 1493 cm^{-1}, ^{1}H NMR

(300 MHz, DMSO-d_6): δ = 2.45 (s, 3H, CH_3), 5.85 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, *J* = 8.5 Hz), 7.40 (d, 2H, phenyl, *J* = 8.5 Hz), 7.70 (d, 2H, phenyl, *J* = 8.7 Hz), 7.85 (d, 2H, phenyl, *J* = 8.7 Hz), 8.35 (dd, 1H, pyridinium, *J* = 6.1 Hz), 9.20 (d, 1H, pyridinium, *J* = 5.3 Hz), 9.25 (d, 1H, pyridinium, *J* = 5.3 Hz), 9.80 (s, 1H, pyridinium), 10.80 (s, 1H, CONH), 11.60 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 15.22 (CH_3), 63.04 (CH_2), 120.84 (CH), 121.15 (CH), 126.75 (CH), 126.86 (CH), 128.79 (C), 128.27 (C), 129.6 (CH), 134.48 (C), 136.19 (C), 137.92 (C), 145.31 (CH), 147.42 (CH), 148.83 (CH), 160.81 (C=O), 163.89 (C=O) ppm; EI-MS *m/z* : 186.82, 202.83 , 218.86, 243.89 (100%), 245.78, 277.88, 294.81, 308.07, 333.89, 348.25, 377.78, 395.26, 406.14, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found 412.24.

3.1.3.7 1-[(4-Chloro-phenylcarbamoyl)-methyl]-3-(4-fluoro-phenylcarbamoyl)-pyridinium Chloride (25)

This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **25** as white solid (0.35 gm, 42%); mp > 200 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3301, 1658, 1620, 1454 cm^{-1}, ^{1}H-NMR (300 MHz, DMSO-d_6): δ = 5.83 (s, 2H, CH_2) , 6.88 (d, 2H, *J* = 7.5 Hz, phenyl), 7.17 (dd, 2H, phenyl, *J* = 7.8 Hz), 7.40 (d, 2H, phenyl, *J* = 8.4 Hz), 7.47 (d, 2H, phenyl, *J* = 8.4 Hz), 8.31 (dd, 1H, pyridinium, *J* = 6.3 Hz), 9.24 (d, 1H, pyridinium, *J* = 6 Hz), 9.18 (d, 1H, pyridinium, *J* = 6.9 Hz) , 9.63 (s, 1H, pyridinium), 11.10 (s , 1H, CO-NH), 11.33 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 63.06 (CH_2) , 117.05 (CH), 120.36 (CH), 125.26 (CH), 127.87 (CH), 129.40 (CH), 132.23 (C), 133.78 (C), 138.77, (C), 138.99 (C) , 144.82 (CH), 147.35 (CH), 148.69 (CH) , 156.325 (C), 163.43 (C=O), 163.66 (C=O) ppm; EI-MS *m/z* : 184.06, 197.05, 215.11, 219.03, 245.02, 247.03, 249.04, 276.03, 294.14, 324.09 (100%), 325.03, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 348.01.

3.1.3.8 1-[(4-Chloro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (26)

This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **17** (0.5 gm, 1.9 mmol) to yield **26** as white solid (0.65 gm, 71%); mp 246-247 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3325, 1705, 1577, 1512 cm^{-1}, ^{1}H-NMR (300 MHz, DMSO-d_6): δ = 5.87 (s, 2H, CH_2) , 7.10 (d, 2H, *J* = 7.5 Hz, phenyl), 7.17 (dd, 1H, phenyl, *J* = 7.8 Hz), 7.40 (d, 1H, phenyl, *J* = 8.4 Hz), 7.47 (s, 1H, phenyl), 7.56 (d, 2H, *J* = 7.5 Hz, phenyl), 8.36 (dd, 1H, pyridinium, *J* = 6.0 Hz), 9.28 (d, 1H, pyridinium, *J* = 6.1 Hz), 9.28 (d, 1H, pyridinium, *J* = 6.2 Hz) , 9.60 (s, 1H, pyridinium), 10.98 (s , 1H, CO-NH), 11.33 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 61.86 (CH_2) , 117.05 (CH), 118.24 (CH), 119.54 (CH), 120.36 (CH), 125.26 (CH), 127.87 (CH), 129.40 (C), 130.8 (C), 133.78 (C), 138.77, (C), 138.99 (C) , 144.52 (CH), 147.65 (CH), 148.69 (CH), 156.01 (C), 161.13 (C=O), 163.66 (C=O) ppm; EI-MS *m/z* : 184.06, 197.05, 215.11, 219.03, 245.02, 247.03, 249.04, 251.01, 276.03, 294.14, 324.09 (100%), 325.03, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 434.02, found : 434.57.

3.1.3.9 1-[(4-Chloro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (27)

This compound was prepared from **1** (0.5 gm, 2.45 mmol) and **18** (0.5 gm, 1.9 mmol) to yield **27** as white solid (0.25 gm, 27%); mp 256-257 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3301, 1701, 1590, 1544 cm^{-1}, ^{1}H-NMR (300 MHz, DMSO-d_6): δ = 5.85 (s, 2H, CH_2), 7.25 (dd, 2H, phenyl, *J* = 8.7 Hz), 7.45 (dd, 2H, phenyl, *J* = 8.7, 5.2 Hz), 7.75 (s, 1H, phenyl), 7.91 (dd, 2H, phenyl, *J* = 8.8, 5.0 Hz), 8.38 (d, 1H, pyridinium, *J* = 7.8 Hz), 9.25 (d, 1H, pyridinium, *J* = 5.9 Hz), 9.35 (d, 1H, pyridinium, *J* = 7.9 Hz), 9.80 (s, 1H, pyridinium), 11.7 (s, 1H, CONH), 12.10 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.40 (CH_2), 115.24 (CH), 117.45 (CH), 121.96 (CH), 122.08 (CH), 122.39 (CH), 123.10 (CH), 126.99 (CH), 128.7 (CH), 133.50 (C), 134.17 (C), 140.71 (C), 144.9 (C), 146.87 (C), 148.19 (C), 160.35 (C=O), 163.88 (C=O) ppm; EI-MS *m/z* : 188.02 (100%), 191.025, 201.96, 205.98, 232.04, 234.09, 236.99, 265.99, 278.04, 311.04, 322.98 , 342.99,356.00 375.95, 377.98, 382.00, 398.96, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.00.

3.1.3.10 3-(4-Chloro-phenylcarbamoyl)-1-[(3-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (28)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **28** as pale white solid (0.31 gm, 36%); mp 182-185 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3298, 3020, 1670,1604, 1523 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 5.80 (s, 2H, CH_2) , 7.15 (d, 2H, phenyl, *J* = 7.9 Hz), 7.41 (d, 1H, phenyl, *J* = 7.8 Hz), 7.46 (d, 2H, phenyl, *J* = 7.9 Hz), 7.81 (dd, 3H, phenyl, *J* = 9.5, 7.8 Hz), 8.85 (dd, 1H, pyridinium, *J* = 4.5 Hz), 9.24 (d, 1H, pyridinium, *J* = 4.5 Hz), 9.6 (d, 1H, pyridinium, *J* = 4.5 Hz) , 10.7 (s, 1H, pyridinium), 11.01 (s, 1H, CONH), 11.31 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.87 (CH_2), 119.1 (CH), 121.92 (CH), 122.08 (CH), 123.59 (CH), 124.19 (CH), 128.59 (CH), 128.79 (CH), 131.14 (CH), 132.53 (C), 133.88 (C), 136.04 (C) 144.84 (CH), 145.43 (CH), 148.18 (C), 156.1 (C), 163.44 (C=O), 164.02 (C=O); EI-MS *m/z* : 191.91, 202.89, 204.89, 206.80, 208.03, 231.93, 232.96, 272.85, 296.17, 309.83, 323.64 , 338.66, 368.75, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found : 400.02.

3.1.3.11 3-(3-Chloro-phenylcarbamoyl)-1-[(3-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (29)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **29** as pale white powder (0.43 gm, 50%); mp 240-241 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3352, 3074, 1693, 1597, 1554 cm^{-1}, ^{1}H NMR

(300 MHz, DMSO-d_6): δ5.83 (s, 2H, CH_2), 7.2 (dd, 1H, phenyl, J = 7.8, 15.2 Hz), 7.40-7.60 (m, 2H, phenyl), 7.80 (d, 2H, phenyl, J = 4.8), 8.0 (s, 1H, phenyl), 8.38 (dd, 1H, pyridinium, J = 6.8, 1.4 Hz), 9.24 (dd, 2H, pyridinium, J = 8.0, 13.6 Hz), 9.80 (s, 1H, pyridinium), 11.55 (s, 1H, CONH), 11.65 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 62.38 (CH_2), 117.69 (CH), 118.79 (CH), 118.92 (CH), 119.81 (CH), 119.98 (CH), 123.45 (CH), 124.34 (CH), 127.03 (CH), 130.32 (CH), 130.64 (C), 133.03 (C), 133.17 (C), 133.44 (C), 139.74 (C), 144.85 (CH), 146.83 (CH), 148.29 (CH), 160.57 (C=O), 163.41 (C=O) ppm; EI-MS *m/z* : 185.09, 199.11, 202.89, 213.08, 227.09, 231.93 (100%), 241.10,256.12, 272.95, 284.16, 307.88, 311.04, 382.09, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found : 399.98 .

3.1.3.12 3-(2-Chloro-phenylcarbamoyl)-1-[(3-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (30)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **30** as white solid (0.53 gm, 61%); mp 194-196 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3313, 1678, 1523, 1438 cm^{-1}, ^{1}H-NMR (300 MHz, DMSO-d_6) : δ 5.87 (s, 2H, CH_2), 7.20 (d, 1H, phenyl, J = 7.0 Hz), 7.42 (ddd, 3H, phenyl, J = 8.0, 12.2, 20.4 Hz), 7.55 (d, 1H, phenyl, J = 7.8 Hz), 7.80 (dd, 2H, phenyl, J = 8.8, 17.3 Hz), 8.06 (br s, 1H, phenyl), 8.38 (d, 1H, pyridinium, J = 7.4 Hz), 9.32 (dd, 2H, pyridinium, J = 8.0, 11.8 Hz), 9.85 (s, 1H, pyridinium), 10.55 (s, 1H, CONH), 11.77 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.23 (CH_2) , 118.91 (CH), 119.95 (CH), 120.7 (CH), 124.28 (CH), 125.97 (CH), 126.28 (CH), 126.88 (CH), 127.51 (C), 129.69 (CH), 130.50 (CH), 132.98 (C), 133.39 (C), 134.01 (C), 139.89 (CH), 144.88 (C), 146.87 (CH), 148.22 (CH), 160.62 (C=O), 163.84 (C=O) ppm; EI-MS *m/z* : 184.98 , 198.86, 212.96, 213.94, 231.87, 233.86, 236.00, 247.85, 256.79, 284.02, 293.86, 307.78, 311.85, 336.99, 368.07, 377.66, 397.48, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found : 400.04.

3.1.3.13 3-(4-Bromo-phenylcarbamoyl)-1-[(3-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (31)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **31** as white solid (0.61 gm, 68%); mp 243-244 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3294, 3019, 1666, 1593 1547 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.81 (s, 2H, CH_2), 7.18 (d, 1H, phenyl, J = 8.8 Hz), 7.4 (d, 1H, phenyl, J = 1.7 Hz), 7.65 (dd, 2H, phenyl, J = 5.0, 4.0 Hz), 8.0 (dd, 4H, phenyl, J = 4.2, 1.7 Hz), 8.40 (d, 1H, pyridinium, J = 6.4 Hz), 9.25 (dd, 2H, pyridinium, J = 8.0, 24.0 Hz), 9.8 (s, 1H, pyridinium), 11.24 (s, 1H, CONH), 11.9 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.27 (CH_2), 115.40 (CH), 115.69 (CH), 118.59 (CH), 118.73 (CH), 120.95 (CH), 121.06 (CH), 123.8 (CH), 123.97 (CH), 127.01 (CH), 133.02 (C) , 134.03 (CH), 134.68 (C), 140.72 (CH), 144.92 (C), 146.90 (CH), 148.46 (CH), 156.71 (C), 158.41 (CH), 159.89 (C), 160.88 (C=O), 162.83 (C=O) ppm, EI-MS *m/z* : 185.03 , 198.97, 200.98, 203.00, 205.00, 213.15, 232.01, 234.06, 250.08, 275.98, 278.93, 294.03, 316.98, 326.93, 355.91, 368.30 395.90, 397.94 (100%), 399.94, 400.87, 402.97, 423.19, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 446.01, found : 446.10.

3.1.3.14 1-[(3-Chloro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (32)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **14** (0.5 gm ,1.54 mmol) to yield **32** as white solid (0.68 gm, 81.5%); mp 236-238 ^{o}C, IR (KBr): ν_{max} = 3270, 1681, 1597, 1538 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.84 (s, 2H, CH_2), 7.15 (d, 1H, phenyl, J = 6.8 Hz), 7.38 (d, 1H, phenyl, J = 7.3 Hz), 7.55 (d, 1H, phenyl, J = 6.8 Hz), 7.65-7.85 (m, 5H, phenyl), 8.33 (br s, 1H, pyridinium), 9.22 (br s, 1H, pyridinium), 9.30 (br s, 1H, pyridinium), 9.80 (s, 1H, pyridinium) , 11.55 (s, 2H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.35 (CH_2), 87.89 (C), 117.69 (CH), 118.78 (CH), 120.99 (CH), 122.66 (CH), 123.62 (CH), 126.93 (CH), 130.61 (CH), 133.13 (C), 133.55 (C), 137.43 (C), 138.33 (C), 144.81 (CH), 146.77 (CH), 148.07 (CH), 160.38 (C=O), 163.43 (C=O) ppm; EI-MS *m/z* : 191.19, 203.20, 219.17, 220.16, 246.16, 246.21, 277.37, 295.25, 320.36, 324.33 (100%), 325.24, 338.37, 368.76, 387.27, 402.39, 414.37, 449.37, $[M]^+$ calcd for $C_{20}H_{16}Cl_2\ I_1N_3O_2^+$: 492.00, found : 492.37.

3.1.3.15 1-[(3-Chloro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (33)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **15** (0.5 gm, 2.0 mmol) to yield **33** as pale white solid (0.34 gm, 38%); mp 200-202 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3286, 3102, 1682, 1597,1535 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 2.50 (s, 3H, CH_3) , 5.82 (s, 2H, CH_2), 7.18-7.82 (m, 8H, phenyl), 8.38 (br s, 1H, pyridinium), 9.23 (m, 2H, pyridinium), 9.75 (br s, 1H, pyridinium), 11.30 (s, 1H, CONH) , 11.50 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=15.20 (CH_3), 62.31 (CH_2), 117.69 (CH), 118.80 (CH), 121.30 (CH), 123.68 (CH), 126.76 (CH), 127.01 (CH), 130.67 (C), 133.17 (C), 133.74 (C), 135.56 (CH), 139.70 (C), 144.67 (CH), 146.72 (CH), 148.08 (C), 148.61 (CH), 160.09 (C=O), 163.40 (C=O); EI-MS *m/z* : 182.10 , 197.13, 204.14, 216.20, 233.26 (100%), 245.41, 247.31, 261.46, 293.51, 309.65, 324.70 , 337.85, 371.03, 399.21, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found : 412.10.

3.1.3.16 1-[(3-Chloro-phenylcarbamoyl)-methyl]-3-(4-fluoro-phenylcarbamoyl)-pyridinium Chloride (34)

This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **34** as pale white solid (0.65 gm, 79%); mp 246-247 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3198, 3043, 1692, 1597, 1547 cm^{-1}, ^{1}H NMR (300

MHz, DMSO-d_6): δ = 5.79 (s, 2H, CH_2) , 7.20 (dd, 2H, phenyl, *J* = 8.1 Hz, 16.0 Hz), 7.45 (dd, 2H , phenyl, *J* = 8.30, 15.4 Hz), 7.75 (dd, 3H , phenyl, *J* = 9.2, 21.3 Hz), 8.0 (br s, 1H, phenyl) , 8.5 (d, 1H, pyridinium, *J* = 7.7 Hz), 8.85 (d, 1H , pyridinium, *J* = 4.1 Hz), 9.2 (s, 1H, pyridinium), 9.70 (s, 1H, pyridinium), 10.90 (s, 1H, CONH), 11.35 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 61.05 (CH_2), 118.71 (CH), 118.88 (CH), 119.78 (CH), 119.92 (CH), 121.36 (CH), 123.77 (CH), 124.31 (CH), 127.03 (CH), 130.59 (CH), 130.71 (CH), 133.49 (C), 137.63 (C), 138.05 (C), 140.20 (C), 144.73 (CH), 147.10 (CH), 156.37 (C), 160.8 (C=O), 163.16 (C=O) ppm; EI-MS *m/z* : 188.00 (100%), 188.99, 203.01, 217.98, 232.08, 234.07, 247.06, 266.04, 268.04, 269.07, 307.08, 324.07, 325.07, 341.08, 365.10, 378.03, 380.02, 382.05, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 348.11.

3.1.3.17 1-[(3-Chloro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (35)
This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **17** (0.5 gm, 2.0 mmol) to yield **35** as pale white solid (0.55 gm, 60%); mp > 250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3286, 3043, 1695, 1597, 1546 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 5.81 (s, 2H, CH_2) , 7.10 (d, 2H, *J* = 7.2 Hz, phenyl), 7.20 (dd, 1H, phenyl, *J* = 7.8 Hz), 7.40 (d, 1H, phenyl, *J* = 8.4 Hz), 7.45 (s, 1H, phenyl), 7.56 (d, 2H, *J* = 7.5 Hz, phenyl), 8.35 (dd, 1H, pyridinium, *J* = 6.1 Hz), 9.28 (d, 2H, pyridinium, *J* = 6.1 Hz), 9.65 (s, 1H, pyridinium), 10.98 (s , 1H, CONH), 11.33 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 61.86 (CH_2) , 117.05 (CH), 118.24 (CH), 119.54 (CH), 120.36 (CH), 123.2 (CH), 125.26 (CH), 127.87 (CH), 129.40 (C), 130.8 (C), 133.78 (C), 138.77, (C), 138.99 (C) 142.14 (C), 142.5 (CH), 144.52 (CH), 147.65 (CH), 148.69 (CH), 161.13 (C=O), 163.66 (C=O) ppm; EI-MS *m/z* : 188.11, 190.17, 278.21, 343.22 (100%), 345.23, 375.15, 378.20, 380.21, 400.18, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.06.

3.1.3.18 1-[(3-Chloro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (36)
This compound was prepared from **2** (0.5 gm, 2.45 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **36** as pale white solid (0.37 gm, 40.5%); mp > 250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3271, 3010, 1675, 1585 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = = 5.80 (s, 2H, CH_2) , 7.2 (d, 1H, *J* = 4.8 Hz, phenyl), 7.40 (d, 2H, phenyl, *J* = 4.7 Hz), 7.5-7.8 (m, 4H, phenyl), 8.40 (d, 1H, pyridinium, 6.4 Hz), 9.24 (d, 1H, pyridinium, *J* = 5.9 Hz), 9.35 (d, 1H, pyridinium, *J* = 8.0 Hz) , 9.80 (s, 1H, pyridinium), 11.25 (s , 1H, CO-NH), 11.90 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 62.08 (CH_2) , 115.20 (CH), 118.73 (CH), 120.95 (CH), 121.06 (CH), 123.8 (CH), 123.97 (CH), 127.02 (CH), 133.02 (C), 133.61 (C), 134.03 (C), 134.65 (C), 139.92 (C), 140.72 (C) , 144.92 (CH), 146.90 (CH), 148.46 (CH), 160.90 (C=O), 162.83 (C=O) ppm; EI-MS m/z : 188.07 (100%), 190.03, 192.03, 193.09, 376.17,378.2, 380.21, 382.21, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02 , found : 434.07.

3.1.3.19 3-(4-Chloro-phenylcarbamoyl)-1-[(2-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (37)
This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **37** as white powder (0.44 gm, 51%); mp 218-220 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3200, 1692, 1604, 1554 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = = 5.89 (s, 2H, CH_2) , 7.22-7.55 (m, 5H, phenyl), 7.70-7.95 (m, 3H, phenyl), 8.35 (d, 1H, pyridinium, *J* = 7.4 Hz) , 9.25 (d, 1H, pyridinium, *J* = 5.8 Hz), 9.35 (d, 1H , pyridinium, *J* = 8.1 Hz), 9.90 (s, 1H, pyridinium, *J* = 8.1 Hz), 10.63 (s , 1H, CO-NH), 11.80 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.22 (CH_2), 120.92 (CH), 122.10 (CH), 126.9 (CH), 127.47 (CH), 128.23 (CH), 128.36 (CH), 128.65 (CH), 129.66 (C), 133.43 (C), 136.57 (C), 137.41 (C), 139.6 (C), 144.91 (CH), 146.84 (CH), 148.11 (CH), 160.39 (C=O), 163.81 (C=O) ppm ; EI-MS *m/z* : 51.11, 78.09, 90.07, 99.01, 106.03, 111.01, 127.02 (100%), 129.01, 134.03, 152.91, 231.93, 307.87, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found : 400.05.

3.1.3.20 3-(3-Chloro-phenylcarbamoyl)-1-[(2-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (38)
This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **38** as white solid (0.64 gm, 74%); mp 234-235 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3250, 3011, 1665, 1612, 1539 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = = 5.87 (s, 2H, CH_2), 7.22-7.48 (m, 5H), 7.78 (dd, 2H, *J* = 8.0 Hz, *J* = 25.0 Hz), 8.06 (s, 1H), 8.38 (dd, 1H, *J* = 6.5 Hz), 9.28 (dd, 2H, *J* = 6.0 Hz, *J* = 20.0 Hz), 9.85 (s, 1H, pyridinium), 10.6 (s, 1H, CONH), 11.79 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=62.23 (CH_2), 118.91 (CH), 119.94 (CH), 124.28 (CH), 125.97 (C), 126.28 (CH), 126.88 (CH), 127.51 (CH), 129.68 (C), 130.50 (CH), 132.98 (CH),133.39 (C), 134.00(C), 139.89 (C), 144.88 (CH), 146.87 (CH), 148.22 (CH),160.62 (C=O),163.84 (C=O) ppm; EI-MS *m/z* : 184.98, 198.86, 212.96, 213.94, 231.87 (100%), 233.86, 236.00, 247.86, 256.01, 265.79, 284.02, 307.78, $[M]^+$ calcd for $C_{20}H_{16}Cl_2N_3O_2^+$: 400.06, found : 400.04.

3.1.3.21 3-(2-Chloro-phenylcarbamoyl)-1-[(2-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (39)
This compound was prepared from compound **3** (0.5 gm, 2.45 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **39** as pale gray solid (0.40 gm, 46%); mp 210-211 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3313, 1678, 1523 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.75 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, *J* = 7.0 Hz), 7.45 (d, 2H, phenyl, *J* = 7.7 Hz), 7.60 (d, 2H, phenyl, *J* = 7.8 Hz), 7.90 (d, 2H, phenyl, *J* = 7.8 Hz), 8.10 (d, 1H, pyridinium, *J* = 7.6 Hz), 8.45 (d, 1H,

pyridinium, *J* = 4.6 Hz), 8.85 (d, 1H, pyridinium, *J* = 8.0 Hz), 9.0 (d, 1H, pyridinium, *J* = 5.0 Hz), 10.6 (s, 2H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ52.51 (CH_2), 122.46 (CH), 124.22 (CH), 124.38 (CH), 124.64 (CH), 126.23 (CH), 126.41 (CH), 126.87 (CH), 127.0 (CH), 127.49 (CH), 127.80 (CH), 129.44 (C), 129.54 (C), 133.97 (C), 136.06 (C), 145.01 (CH), 146.82 (CH), 149.14 (C), 150.53 (C=O), 158.15 (C=O) ppm; EI-MS *m/z* : 63.06, 73.02, 98.95, 126.93 (100%), 128.95, 167.85,169.92, 202.82, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 400.06, found : 400.09.

3.1.3.22 3-(4-Bromo-phenylcarbamoyl)-1-[(2-chloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (40)

This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **40** as yellowish solid (0.47 gm, 52%); mp 222-223 ^{o}C, IR (KBr): ν_{max} = 3392, 1667, 1512, 1485 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.89 (s, 2H, CH_2) , 7.22 (d, 2H, phenyl, *J* = 7.8 Hz), 7.55 (m, 3H, phenyl), 7.70 (d, 2H, phenyl, *J* = 7.8 Hz), 7.95 (d, 1H, phenyl, *J* = 6.8 Hz), 8.35 (d, 1H, pyridinium, *J* = 7.4 Hz) , 9.24 (d, 1H, pyridinium, *J* = 5.8 Hz), 9.34 (d, 1H , pyridinium, *J* = 8.0 Hz), 9.90 (s, 1H, pyridinium, *J* = 8.0 Hz), 10.60 (s , 1H, CO-NH), 11.70 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.0 (CH_2), 120.52 (CH), 122.30 (CH), 126.3 (CH), 127.37 (CH), 128.13 (CH), 128.36 (CH), 128.75 (CH), 129.62 (CH), 133.33 (C), 136.57 (C), 137.41 (C), 144.91 (CH), 146.24 (CH), 148.16 (C), 152.14 (C), 160.1 (C=O), 163.31 (C=O) ppm, EI-MS *m/z* : 182.91, 198.91, 200.89, 209.97, 243.95, 260.86, 275.85, 307.84, 323.83, 340.79, 355.75 , 377.74, 395.74, 397.75, 399.77, 400.74, 401.75, 427.76, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 446.01, found : 446.10.

3.1.3.23 1-[(2-Chloro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (41)

This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **14** (0.5 gm, 1.54 mmol) to yield **41** as pale white solid (0.48 gm, 57.5%); mp 190-191 ^{o}C, IR (KBr): ν_{max} = 3251, 1667, 1616, 1481 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.80 (s, 2H, CH_2), 7.2 (d, 2H, phenyl, *J* = 7.2 Hz), 7.35 (d, 1H, *J* = 7.3 Hz), 7.6 (dd, 2H, phenyl, *J* = 7.2 Hz), 7.7-7.9 (m, 3H, phenyl), 8.30 (d, 1H, pyridinium), 8.66 (d, 1H, pyridinium), 9.20 (d, 2H, pyridinium), 9.8 (s, 1H, CONH), 10.64 (s, 1H, CONH) ppm; ^{13}C-NMR (75 MHz, DMSO-d_6): δ61.3 (CH_2), 88.4 (C), 119.52 (CH), 121.30 (CH), 125.3 (CH), 126.37 (CH), 127.13 (CH), 127.36 (CH), 128.75 (CH), 129.72 (CH), 133.33 (C), 136.37 (C), 137.21 (C), 144.81 (CH), 146.14 (CH), 148.06 (C), 160.8 (C=O), 164.31 (C=O) ppm EI-MS *m/z* : 190.92, 202.92, 218.90, 231.93, 244.84, 245.85, 265.95, 274.96, 298.98, 323.91 (100%), 324.93, 339.94, 364.91, 377.85, 387.87, 413.91, 432.89, 448.86, $[M]^+$ calcd for $C_{20}H_{16}I_1Cl_1N_3O_2^+$: 492.00, found : 491.83.

3.1.3.24 1-[(2-Chloro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (42)

This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **15** (0.5 gm ,2.0 mmol) to yield **42** as white solid (0.67 gm, 30%); mp 230-232 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3250, 1658, 1612, 1531 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = = 2.51 (s, 3H, CH_3), 5.87 (s, 2H, CH_2), 7.3 (ddd, 3H, *J* = 9.8, 18.8, 28.6 Hz, phenyl), 7.55 (dd, 1H, *J* = 4.87, 7.7 Hz, phenyl), 7.7-7.9 (m, 4H, phenyl), 8.34 (dd, 1H, pyridinium, *J* = 1.7, 7.7 Hz), 9.23 (dd, 2H, pyridinium, *J* = 8.1, 17.4 Hz), 9.8 (s, 1H, pyridinium), 10.75 (s, 1H, CONH), 11.4 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.36 (CH_3), 62.21 (CH_2), 121.1 (CH), 123.4 (CH), 126.66 (CH), 126.77 (CH), 127.49 (CH), 129.67 (CH), 130.4 (C), 134.11 (C), 135.44 (C), 136.29 (C), 144.7 (CH), 146.76 (C), 148.7 (CH), 152.04 (CH), 158.38 (CH), 160.11 (C=O), 163.68 (C=O) ppm, EI-MS *m/z* : 182.10 , 196.99, 218.92, 230.96, 244.01, 244.96, 260.03, 275.93, 278.90, 323.92, 331.98 (100%), 332.92, 234.02 , 334.99, 352.91, 386.90, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found : 412.10.

3.1.3.25 1-[(2-Chloro-phenylcarbamoyl)-methyl]-3-(4-fluoro-phenylcarbamoyl)-pyridinium Chloride (43)

This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **43** as white solid (0.34 gm, 41%); mp > 250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3002, 1791, 1681, 1631, 1452 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.81 (s, 2H, CH_2) , 7.10 (d, 2H, phenyl, *J* = 7.2 Hz), 7.65 (m, 3H, phenyl), 7.78 (d, 2H, phenyl, *J* = 7.2 Hz), 7.96 (d, 1H, phenyl, *J* = 6.3 Hz), 8.32 (d, 1H, pyridinium, *J* = 7.7 Hz) , 9.23 (d, 1H, pyridinium, *J* = 5.5 Hz), 9.38 (d, 1H , pyridinium, *J* = 7.9 Hz), 9.89 (s, 1H, pyridinium, *J* = 7.9 Hz), 10.83 (s , 1H, CO-NH), 11.60 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ63.22 (CH_2), 119.92 (CH), 121.10 (CH), 126.96 (CH), 127.41 (CH), 128.13 (CH), 128.36 (CH), 128.75 (CH), 129.64 (CH), 133.41 (C), 136.17 (C), 137.31 (C), 144.71 (CH), 146.34 (CH), 148.8 (C), 152.4 (C), 160.9 (C=O), 164.8 (C=O) ppm; EI-MS *m/z*: 63.07, 75.02, 89,97, 110.96, 119.96, 126.95 (100%), 128.99, 163.94, 272.87, 274.93, 307.83, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 384.08.

3.1.3.26 1-[(2-Chloro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (44)

This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **17** (0.5 gm, 2.3 mmol) to yield **44** as white solid (0.22 gm, 25%); mp > 250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3400, 3048, 1705, 1577, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.88 (s, 2H, CH_2) , 7.14 (ddd, 3H, *J* = 9.8, 18.8, 28.6 Hz, phenyl), 7.33 (dd, 1H, *J* = 4.87, 7.7 Hz, phenyl), 7.47 (d, 1H, phenyl, *J* = 7.8 Hz), 7.72 (d, 2H, *J* = 7.8 Hz, phenyl), 8.35 (dd, 1H, pyridinium, *J* = 6.1 Hz),

9.28 (d, 2H, pyridinium, *J* = 6.1 Hz), 9.65 (s, 1H, pyridinium), 10.68 (s , 1H, CONH), 11.53 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ= 61.86 (CH_2) , 117.05 (CH), 118.24 (CH), 119.54 (CH), 120.36 (CH), 123.2 (CH), 125.26 (CH), 127.87 (CH), 129.40 (C), 130.8 (C), 133.78 (C), 138.77, (C), 138.99 (C) 142.5 (CH), 144.52 (CH), 147.65 (CH), 148.69 (CH), 156.01 (C), 162.13 (C=O), 165.07 (C=O) ppm ; EI-MS *m/z* : 182.10 , 197.13, 204.14, 216.20, 233.26 (100%), 245.41, 247.31, 261.46, 293.51, 309.65, 324.70 , 337.85, 371.03, 399.21, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 412.09, found : 412.10.

3.1.3.27 1-[(2-Chloro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (45)
This compound was prepared from **3** (0.5 gm, 2.45 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **45** as white solid (0.29 gm, 32%); mp 210-211 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3271, 1674, 1581, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = = 5.80 (s, 2H, CH_2) , 7.21 (d, 1H, *J* = 4.8 Hz, phenyl), 7.35 (d, 2H, phenyl, *J* = 4.7 Hz), 7.45-7.75 (m, 4H, phenyl), 8.40 (d, 1H, pyridinium, 6.4 Hz), 9.24 (d, 1H, pyridinium, *J* = 5.9 Hz), 9.35 (d, 1H, pyridinium, *J* = 8.0 Hz) , 9.80 (s, 1H, pyridinium), 11.25 (s , 1H, CO-NH), 11.90 (s, 1H, CO-NH) ppm; ^{13}C-NMR (75 MHz, DMSO-d_6): δ = 62.8 (CH_2) , 115.10 (CH), 118.3 (CH), 120.85 (CH), 121.16 (CH), 123.18 (CH), 123.92 (CH), 127.2 (CH), 133.02 (CH), 133.6 (C), 134.0 (CH), 134.65 (CH), 139.92 (C), 140.70 (C) , 144.91 (C), 146.92 (CH), 148.42 (C), 158.49 (C), 160.60 (C=O), 162.43 (C=O) ppm; EI-MS *m/z* : 188.12 (100%), 190.03, 192.02, 193.07, 215.09, 235.17, 266.12, 278.18, 294.17, 323.14 , 343.19, 395.10, 376.14, 378.17, 380.17, 382.17, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.10.

3.1.3.28 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(4-chloro-phenylcarbamoyl)-pyridinium Chloride (46)
This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **46** as pale white solid (0.33 gm, 38%); mp 246-247 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3240, 3016, 1674, 1546, 1512 cm^{-1}, ^{1}H NMR (300 MHz, MeOH-d_3): δ 5.81 (s, 2H, CH_2), 7.22 (d, 2H , phenyl , *J* = 8.5 Hz), 7.55 (dd, 4H, phenyl, *J* = 8.5, 17.6 Hz), 7.85 (dd, 2H, phenyl, *J* = 2.8, 5.3 Hz), 8.38 (dd, 2H, pyridinium, *J* = 7.2 Hz) , 9.23 (d, 1H, pyridinium, *J* = 5.6 Hz), 9.30 (d, 1H, pyridinium, *J* = 7.8 Hz), 9.77 (s, 1H, pyridinium), 11.45 (d , 2H, CO-NH, *J* = 1.5 Hz) ppm; ^{13}C NMR (75 MHz, MeOH-d_3): δ 62.59 (CH_2), 121.35 (CH), 122.59 (CH), 126.94 (CH), 133.46 (C), 137.42 (CH), 137.53 (C), 138.19 (CH), 138.76 (C), 144.83 (CH), 146.82 (CH), 148.17 (CH), 148.79 (C), 152.16 (C), 160.38 (C=O), 163.17 (C=O) ppm; EI-MS *m/z* : 191.08 , 203.06, 216.14, 219.11, 220.03, 232.17 , 245.02, 261.10, 252.98, 295.03, 297.09, 321.19, 324.14 (100%), 325.12, 338.17, 376.12, 402.17, 429.21, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 446.01, found : 446.08.

3.1.3.29 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(3-chloro-phenylcarbamoyl)-pyridinium Chloride (47)
This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **47** as white solid (0.28 gm, 32%); mp 252-253 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3361, 3012, 1708, 1682, 1597, 1546 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.83 (s, 2H, CH_2), 7.24 (d , 1H , phenyl, *J* = 7.8 Hz), 7.45 (d, 1H, phenyl, *J* = 8.0 Hz), 7.65 (dd, 4H, phenyl, *J* = 8.6, 21.2 Hz), 7.85 (d, 1H, phenyl, *J* = 7.8 Hz), 8.06 (s, 1H, phenyl), 8.38 (d, 1H, pyridinium, *J* = 7.5 Hz), 9.28 (d, 1H, pyridinium, *J* = 5.8 Hz), 9.34 (d, 1H, pyridinium, *J* = 8.0 Hz), 9.8 (s, 1H, CONH) , 11.49 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.21 (CH_2), 115.60 (CH), 118.92 (CH), 119.98 (CH), 121.17 (CH), 124.1 (CH), 127.0 (CH), 130.49 (CH), 131.74 (CH), 133.0 (C), 133.2 (CH), 137.8 (CH), 139.94 (C), 144.91 (C), 146.98 (C), 148.15 (C), 160.5 (C=O), 163.0 (C=O) ppm; EI-MS *m/z* : 182.99, 198.98 , 201.01, 210.10, 211.06, 244.09, 245.00 , 275.00, 290.99, 317.01, 332.07, 334.10, 335.06, 355.94, 395.93, 397.98 (100%), 399.97, 400.92, 415.04, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 446.01, found : 446.18.

3.1.3.30 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(2-chloro-phenylcarbamoyl)-pyridinium Chloride (48)
This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **48** as white solid (0.21 gm, 24%); mp 282-284 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3344, 3008, 1705, 1685, 1581 cm^{-1}, 1H NMR (300 MHz, DMSO-d_6): δ 5.76 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, *J* = 7.2 Hz), 7.45 (d, 2H, phenyl, *J* = 7.2Hz), 7.55-7.70 (m , 3H, phenyl), 7.85 (d, 1H, phenyl, *J* = 7.9 Hz), 8.16 (d, 1H, pyridinium, *J* = 6.7 Hz), 8.90 (d, 1H, pyridinium, *J* = 7.8 Hz), 9.27 (d, 1H, pyridinium, *J* = 6.9 Hz), 9.75 (s, 1H, pyridinium), 10.71 (s, 1H, CONH) , 11.30 (s, 1H, CONH); ^{13}C NMR (75 MHz, DMSO-d_6): δ61.99 (CH_2), 121.17 (CH), 123.73 (CH), 124.85 (CH), 126.64 (CH), 127.38 (CH), 127.88 (CH), 129.61 (CH), 131.71 (CH), 133.37 (CH), 136.86 (C), 137.76 (C), 145.22 (C), 147.02 (C), 153.19 (C), 157.83 (CH), 162.35 (C=O), 163.60 (C=O) ppm; EI-MS *m/z* : 196.98 , 210.04, 237.00, 246.94, 272.98 (100%), 275.02, 276.96, 307.93, 311.91, 335.94 , 370.90, 383.86, 397.85, 417.95, 435.95, $[M]^+$ calcd for $C_{20}H_{16}Br_1Cl_1N_3O_2^+$: 446.01, found : 446.09.

3.1.3.31 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(4-Bromo-phenylcarbamoyl)-pyridinium Chloride (49)
This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **49** as yellowish solid (0.45 gm, 51%); mp 240-241 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3294, 3001, 1666, 1547, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.80 (s, 2H, CH_2), 7.60 (dd, 4H , phenyl , *J* = 7.4, 12.1 Hz), 7.80 (d, 4H, phenyl, *J* = 8.8 Hz), 8.36 (d, 1H, pyridinium, *J* = 7.2 Hz) , 9.23 (dd, 2H, pyridinium, *J* = 5.3, 8.3 Hz), 9.75 (s, 1H, pyridinium), 10.95 (s ,

1H, CO-NH) , 11.45 (s , 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.53 (CH_2), 121.34 (CH), 122.54 (CH), 126.84 (CH), 133.36 (C), 137.32 (CH), 137.56 (C), 138.10 (CH), 138.86 (C), 140.01 (C), 144.13 (CH), 146.32 (CH), 148.27 (CH), 148.70 (C), 161.38 (C=O), 164.17 (C=O) ppm; EI-MS *m/z* : 184.04, 199.04 , 199.99, 210.14, 244.13, 249.00, 276.04, 279.00 , 319.06, 332.12, 396.00, 398.04, 400.04, 400.99, 429.21, $[M]^+$ calcd for $C_{20}H_{16}Br_2N_3O_2^+$: 489.96, found : 489.97.

3.1.3.32 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (50)

This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **14** (0.5 gm, 1.5 mmol) to yield **50** as pale solid (0.79 gm, 81%); mp 242-243 ^{o}C, IR (KBr): ν_{max} = 3245, 3053, 1685, 1492 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.84 (s, 2H, CH_2) 7.52-7.75 (m, 8H, phenyl), 8.36 (d, 1H, pyridinium, *J* = 6.1 Hz), 9.24 (d, 1H, pyridinium, *J* = 5.4 Hz), 9.32 (d, 1H, pyridinium, *J* = 7.3 Hz), 9.80 (s, 1H, pyridinium), 11.53 (s, 1H, CONH), 11.57 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=62.36 (CH_2), 88.63 (C), 115.55 (CH), 121.19, (CH), 122.63 (CH), 126.96 (CH), 131.71 (CH), 133.5 (C), 137.44 (C), 137.73 (CH), 144.73 (CH), 146.79 (C), 148.16 (CH), 160.37 (C=O), 163.15 (C=O) ppm; EI-MS *m/z*: 186.99, 196.99, 215.01, 218.91, 230.00, 244.89, 246.94, 248.95, 275.97,294.93, 323.96 (100%), 324.99 $[M]^+$ calcd for $C_{20}H_{16}Br_1I_1N_3O_2^+$: 535.95, found : 535.92.

3.1.3.33 1-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (51)

This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **51** as pale solid (0.71 gm, 83%); mp 240-241 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3448, 3302, 1658, 1585, 1520 cm^{-1}; ^{1}H NMR (300 MHz, DMSO-d_6): δ = 2.48 (s, 3H, CH_3), 5.79 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, *J* = 9.8 Hz), 7.6 (dd, 4H, phenyl, *J* = 7.8, 13.2 Hz), 7.8 (d, 2H, phenyl, *J* = 8.2 Hz), 8.35 (d, 1H, pyridinium, *J* = 6.4 Hz), 9.25 (d, 2H, pyridinium, *J* = 8.8 Hz), 9.72 (s, 1H, pyridinium), 11.37 (s, 1H, CONH) , 11.43 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): □□ 15.2 (s, CH_3), 62.34 (CH_2), 115.64 (CH), 121.03 (CH), 121.12 (CH), 126.69 (CH), 127.02 (CH), 131.79 (CH), 133.79 (C), 135.49 (C), 137.61 (C), 144.61 (C), 146.69 (CH), 148.10 (CH), 158.39 (C), 160.09 (C=O), 163.17 (C=O) ppm; EI-MS *m/z* : 183.98 , 198.97, 211.08, 244.00, 248.92, 258.05 , 290.00, 317.00, 332.04 (100%), 334.08, 335.02, 365.97, 383.90, 412.98, 437.03, $[M]^+$ calcd for $C_{21}H_{19}Br_1N_3O_2S_1^+$: 458.04, found : 458.09.

3.1.3.34 3-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(4-fluoro-phenylcarbamoyl)-pyridinium Chloride (52)

This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **16** (0.5 gm , 2.3 mmol) to yield **52** as white solid (0.42 gm, 54%); mp 233-235 ^{o}C , IR (KBr): ν_{max} = 3278, 3039, 1678, 1608, 1546 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.80 (s, 2H, CH_2), 7.4-7.9 (m, 8H, phenyl), 8.39 (d, 1H, pyridinium, *J* = 6.0 Hz), 9.25 (d, 2H, pyridinium, *J* = 7.7 Hz), 9.7 (s, 1H, pyridinium), 11.32 (s, 1H, CONH) , 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.35 (CH_2), 115.62 (CH), 121.12 (CH), 122.03 (CH), 127.00 (CH), 128.57 (CH), 128.77 (CH), 131.8 (CH), 133.63 (C), 137.24 (C), 137.64 (C), 144.73 (C), 146.78 (CH), 148.24 (C), 160.42 (C=O), 163.19 (C=O), EI-MS *m/z* : 184.07, 197.03 , 231.01, 232.11 (100%) , 234.13, 251.02, 277.03, 292.02, 321.10, 332.10, 358.13, 386.05, 403.09, 415.10, $[M]^+$ calcd for $C_{20}H_{16}Br_1F_1N_3O_2^+$: 428.04, found : 428.05.

3.1.3.35 3-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (53)

This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **17** (0.5 gm , 2.3 mmol) to yield **53** as white solid (0.62 gm, 59%); mp 230-231 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3325, 1705, 1577, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.80 (s, 2H, CH_2), 7.55 (d, 4H, phenyl, *J* = 7.8 Hz), 7.7-7.9 (m, 3H, phenyl), 8.35 (br s, 1H, pyridinium), 9.22 (br s, 1H, pyridinium), 9.31 (d, 1H, pyridinium, *J* = 7.8 Hz), 9.79 (s, 1H, pyridinium), 11.15 (s, 1H, CONH) , 11.47 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ66.21 (CH_2), 119.844 (CH), 121.21 (CH), 125.33 (CH), 127.68 (CH), 129.51 (CH), 130.014 (CH), 133.59 (C), 134.40 (C), 136.55 (C), 139.0 (C), 145.40 (CH), 147.45 (CH), 148.82 (CH), 152.3 (C), 162.15 (C=O), 163.39 (C=O); EI-MS *m/z* : 188.01, 190.08 192.02, 231.11, 249.04, 273.11, 306.06, 323.03, 341.04, 345.08, 346.01, 376.00, 378.05, 380.06, 382.06, 398.03, 416.04, 441.00, 450.26, 476.84, $[M]^+$ calcd for $C_{20}H_{15}Br_1Cl_2N_3O_2^+$: 479.97, found : 479.74

3.1.3.36 3-[(4-Bromo-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (54)

This compound was prepared from **4** (0.5 gm, 2.0 mmol) and **18** (0.5 gm , 2.3 mmol) to yield **54** as white solid (0.42 gm, 40%); mp 248-250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3271, 3012, 1678, 1585, 1511 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.81 (s, 2H, CH_2), 7.42 (s, 1H, phenyl), 7.58 (dd, 2H, phenyl, *J* = 7.5Hz), 8.0 (d, 4H, phenyl, *J* = 10.4 Hz), 8.39 (d, 1H, pyridinium, *J* = 5.6 Hz), 9.24 (dd, 2H, pyridinium, *J* = 5.0, 28.6 Hz), 9.81 (s, 1H, pyridinium), 11.25 (s, 1H, CONH) , 11.9 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.38 (CH_2), 118.7 (CH), 121.11 (CH), 123.8 (CH), 127.0 (CH), 127.34 (C), 131.78 (CH), 133.04 (C), 134.45 (C), 137.7 (C), 139.9 (C), 140.7 (CH), 144.9 (C), 146.9 (CH), 148.5 (CH), 160.9 (C=O), 163.14 (C=O); EI-MS *m/z*: 188.05 (100%), 190.12, 192.00, 193.03, 266.13, 376.12, 378.16, 380.17, $[M]^+$ calcd for $C_{20}H_{15}Br_1Cl_2N_3O_2^+$: 477.97, found : 478.00.

3.1.3.37 3-(4-Chloro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (55)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **55** as gray solid (0.38 gm, 46%); mp 183-185 ^{o}C, IR (KBr): ν_{max} = 3402, 3078, 1671, 1604, 1493 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.82 (s, 2H, CH_2), 7.46 (d, 2H, phenyl, J = 9.6 Hz), 7.74 (d, 2H, phenyl, J = 7.3 Hz), 7.89 (d, 2H, phenyl, J = 7.0 Hz), 8.38 (dd, 1H, pyridinium, J = 6.4, 8.8 Hz), 8.70 (m, 1H, pyridinium, J = 7.6 Hz) , 8.93 (d, 1H, pyridinium, J = 5.0 Hz), 9.34 (s, 1H, pyridinium) , 11.0 (s, 1H, CONH) , 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.39 (CH_2), 87.90 (C), 121.35 (CH), 122.05 (CH), 125.05 (CH), 126.99 (CH), 127.80 (CH), 128.66 (CH), 131.60 (C), 133.52 (C), 136.57 (C), 145.52 (CH), 146.80 (C), 148.30 (CH), 160.39 (C=O), 162.64 (C=O) ppm; EI-MS *m/z* : 187.11, 197.21 (100%), 215.16, 219.04, 233.14, 245.03, 261.13, 276.13, 295.09,297.10, 324.15, $[M]^+$ calcd for $C_{20}H_{16}Cl_1I_1N_3O_2^+$: 535.95, found : 536.01.

3.1.3.38 3-(3-Chloro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (56)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **56** as pale solid (0.510 gm, 61%); mp 200-202 ^{o}C, IR (KBr): ν_{max} = 3355, 3009, 1678, 1597, 1539 cm^{-1} , ^{1}H NMR (300 MHz, DMSO-d_6): δ5.79 (s, 2H, CH_2), 7.19 (dd, 1H, phenyl, J = 8.1, 16.0 Hz), 7.44 (dd, 2H, phenyl, J = 8.3, 3.5, Hz), 7.73 (dd, 3H, phenyl, J = 8.3, 13.30 Hz), 7.99 (s, 1H, phenyl) , 8.36 (d, 1H, pyridinium, J = 7.25 Hz), 8.52 (d, 1H, pyridinium, J = 7.75 Hz), 8.85 (d, 1H, pyridinium, J = 4.1 Hz), 9.27 (s, 1H, pyridinium), 10.80 (s, 1H, CONH), 11.30 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=63.7 (CH_2), 88.01 (C), 118.71 (CH), 119.78 (CH), 121.36 (CH), 123.77 (CH), 124.31 (CH), 127.03 (CH), 130.41 (C), 130.71 (CH), 133.49 (C), 137.63 (C), 138.06 (CH), 140.2 (CH), 144.73 (C), 147.10 (CH), 160.90 (C=O), 163.16 (C=O) ppm; EI-MS *m/z* : 197.32, 215.29, 232.32 (100%), 234.31, 235.23, 273.30, 283.34, 310.36, 338.38, 376.23, 386.33, 400.32, 416.30, 430.51, 464.44, 478.30, $[M]^+$ calcd for $C_{20}H_{16}Cl_1I_1N_3O_2^+$: 492.00, found : 492.09.

3.1.3.39 3-(2-Chloro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (57)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **57** as white solid (0.49 gm, 59%); mp 227-230 ^{o}C, IR (KBr): ν_{max} = 3344, 3032, 1693, 1550, 1539 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.71 (s, 2H, CH_2) , 7.23 (d, 2H, phenyl, J = 7.3 Hz), 7.38 (d, 2H, phenyl, J = 7.3 Hz), 7.5-7.8 (m, 4H, phenyl), 8.35 (d, 1H, pyridinium, J = 7.8 Hz) , 9.29 (d, 2H, pyridinium, J = 5.3 Hz), 9.81 (s, 1H, pyridinium), 11.08 (s , 1H, CO-NH), 11.54 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.22 (CH_2), 89.01 (C), 118.92 (CH), 121.14 (CH), 126.86 (CH), 127.21 (CH), 128.03 (CH), 128.33 (CH), 128.77 (CH), 129.68 (CH), 133.42 (C), 136.27 (CH), 137.32 (C), 144.72 (C), 146.33 (CH), 148.6 (C), 160.8 (C=O), 164.5 (C=O) ppm; EI-MS *m/z* : 190.92, 202.92, 218.90, 231.93, 244.84, 245.84, 265.95, 274.96, 298.98, 323.91 (100%), 324.93, 339.94, 364.91, 377.85, 387.87, 413.91, 432.89, 448.91, 448.85, 478.87, $[M]^+$ calcd for $C_{20}H_{16}Cl_1I_1N_3O_2^+$: 492.00, found : 492.03.

3.1.3.40 3-(4-Bromo-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (58)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **58** as pale solid (0.32 gm, 37%); mp > 250 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3294, 3025. 1666, 1546, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.77 (s, 2H, CH_2), 7.47 (d, 2H, phenyl, J = 6.9 Hz), 7.54 (d, 2H, phenyl , J = 10.5 Hz), 7.67 (d, 2H, phenyl, J = 8.0 Hz), 7.90 (d, 2H, phenyl, J = 6.2 Hz), 8.34 (d, 1H, pyridinium, J = 6.4 Hz), 9.27 (d, 2H, pyridinium, J = 4.8 Hz), 9.73 (s, 1H, pyridinium), 11.0 (s, 1H, CONH), 11.35 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.42 (CH_2), 87.5 (C), 116.57 (CH), 121.41 (CH), 122.4 (CH), 122.44 (CH), 127.01 (C), 131.68 (CH), 133.63 (C), 136.98 (CH), 137.61 (C) , 144.7 (C), 146.74 (CH), 148.69 (CH), 160.39 (C=O), 163.13 (C=O) ppm; EI-MS *m/z* : 183.04, 199.04, 199.98, 210.15, 219.03, 276.04, 294.99, 317.08, 396.00, 398.03 (100%), 400.02, 400.96, $[M]^+$ calcd for $C_{20}H_{16}Br_1I_1N_3O_2^+$: 535.95, found : 536.01.

3.1.3.41 3-(4-iodo-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (59)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **14** (0.5 gm, 1.54 mmol) to yield **59** as greyish pale solid (0.49 gm, 49%); mp 244-245 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3217, 3078, 1678, 1605, 1543 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): □□5.83 (s, 2H, CH_2), 7.49 (d, 4H, phenyl, J = 8.1 Hz), 7.73 (d, 4H, phenyl, J = 10.0 Hz), 8.35 (d, 1H, pyridinium, J = 6.1 Hz), 9.21 (d, 1H, pyridinium, J = 5.2 Hz), 9.33 (d, 1H, pyridinium, J = 7.1 Hz), 9.81 (s, 1H, pyridinium), 11.7 (s, 1H, CONH) , 11.8 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.38 (CH_2), 87.67 (C), 88.72 (C), 121.35 (CH), 122.59 (CH), 126.5 (CH), 133.46 (C), 137.43 (CH), 137.79 (C), 138.19 (CH), 140.9 (C), 144.83 (CH), 146.82 (CH), 148.17 (CH), 160.38 (C=O), 163.17 (C=O) ppm; EI-MS *m/z* : 191.06, 202.98, 219.00, 220.02, 244.98, 246.02, 277.06, 295.01, 297.04, 299.07, 324.13, 325.09, 352.11, 376.09, 387.03, 402.16, 415.11, 446.11, 478.12, 492.12, 504.12, 541.10, 553.11, $[M]^+$ calcd for $C_{20}H_{16}I_2N_3O_2^+$: 583.93, found : 583.90.

3.1.3.421-[(4-Iodo-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (60)
This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **60** as yellowish pale solid (0.52 gm, 67%); mp 206-208 ^{o}C , IR (KBr): ν_{max} = 3401, 1674, 1604, 1539 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-

d_6): δ 2.47 (s, 3H, CH_3), 5.81 (s, 2H, CH_2), 7.30 (d, 2H, phenyl, J = 9.9 Hz), 7.48 (d, 2H, phenyl, J = 9.6 Hz), 7.67 (d, 2H, phenyl, J = 8.6 Hz), 7.80 (d, 2H, phenyl, J = 8.6 Hz), 8.31 (d, 1H, pyridinium, J = 7.8 Hz), 9.21 (d, 1H, pyridinium, J = 6.0 Hz), 9.28 (d, 1H, pyridinium, J = 8.1 Hz), 9.76 (s, 1H, pyridinium), 11.28 (s, 1H, CONH) , 11.42 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.23 (CH_3), 62.4 (CH_2), 86.99 (C), 121.04 (CH), 121.41 (CH), 126.7 (CH), 126.88 (CH), 126.99 (CH), 133.71 (C), 135.58 (C), 137.57 (CH), 138.13 (C), 144.66 (C), 146.7 (CH), 148.07 (CH), 160.07 (C=O), 163.15 (C=O) ppm; EI-MS *m/z* : 191.13, 211.29, 219.10, 220.07, 232.24, 244.25 (100%), 246.12, 261.19, 290.28, 295.11, 297.16, 299.17, 324.23, 332.31, 333.26, 367.21, 382.23, 398.28, 412.21, 436.23, 458.17, 478.18, $[M]^+$ calcd for $C_{21}H_{19}I_1N_3O_2S_1^+$: 504.02, found : 504.03.

3.1.3.43 3-(4-Fluoro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (61)

This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **61** as white solid (0.32 gm, 40%); mp 234-236^{o}C , IR (KBr): ν_{max} = 3240, 3039, 1678, 1604, 1543 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.80 (s, 2H, CH_2,), 7.5 (dd, 4H, J = 8.6, 20.3 Hz), 7.70 (d, 2H, phenyl, J = 8.5 Hz), 7.9 (d, 2H, phenyl, J = 8.7 Hz), 8.38 (d, 1H, pyridinium, J = 7.1 Hz), 9.20 (d, 1H, pyridinium, J = 5.6Hz), 9.28 (d, 1H, pyridinium, J = 8.0 Hz), 9.72 (s, 1H, pyridinium), 11.2 (s, 1H, CONH) ,11.30 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.37 (CH_2), 87.7 (C), 115.12 (CH), 121.36 (CH), 121.87 (CH), 122.05 (CH), 126.97 (CH), 128.7 (C), 133.6 (C), 137.3, (C), 137.6 (CH), 144.71 (C), 146.75 (CH), 148.21 (CH), 160.41 (C=O), 163.18 (C=O) ppm; EI-MS *m/z* : 187.23, 197.20, 215.28, 219.17, 232.26 (100%), 234.28, 246.19, 261.19, 276.22, 295.14, 297.18, 298.11, 332.34, 341.35, 358.31, 387.28, 409.33, 424.25, 449.31, 461.29, $[M]^+$ calcd for $C_{20}H_{16}F_1I_1N_3O_2^+$: 476.30, found : 476.29.

3.1.3.44 3-(2,4-dichloro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (62)

This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **17** (0.5 gm, 2.3 mmol) to yield **62** as white solid (0.52 gm, 53%); mp 235-236 ^{o}C (Decomp.), IR (KBr): ν_{max} = 3325, 3078, 1705, 1577, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 5.81 (s, 2H, CH_2) , 7.12 (d, 1H, J = 7.4 Hz, phenyl), 7.28 (s, 1H, phenyl), 7.42 (d, 2H, phenyl, J = 8.3 Hz), 7.57 (d, 1H, J = 7.4 Hz, phenyl), 7.66 (d, 2H, phenyl, J = 8.1 Hz), 8.34 (dd, 1H, pyridinium, J = 6.0 Hz), 9.28 (d, 1H, pyridinium, J = 6.1 Hz), 9.38 (d, 1H, pyridinium, J = 6.2 Hz) , 9.60 (s, 1H, pyridinium), 11.01 (s , 1H, CO-NH), 11.35 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 61.6 (CH_2) , 88.23 (C), 117.0 (CH), 118.14 (CH), 119.4 (CH), 120.16 (CH), 123.2 (CH), 125.46 (CH), 127.67 (CH), 129.40 (C), 130.9 (C), 133.8 (C), 138.67, (C), 144.62 (C), 147.75 (CH), 148.61 (CH), 161.23 (C=O), 163.76 (C=O) ppm; EI-MS *m/z* : 188.24, 190.26, 191.18, 202.28, 219.22, 232.34, 245.27, 261.31, 295.26, 308.38, 324.34, 343.39 (100%), 345.40, 346.31, 376.33, 378.38, 380.38, 382.37, 403.38, 428.41, 449.40, 478.37, $[M]^+$ calcd for $C_{20}H_{15}Cl_2I_1N_3O_2^+$: 525.96, found : 526.01.

3.1.3.45 3-(3,5-dichloro-phenylcarbamoyl)-1-[(4-iodo-phenylcarbamoyl)-methyl]-pyridinium Chloride (63)

This compound was prepared from **5** (0.5 gm, 1.7 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **63** as white solid (0.32 gm, 68%); mp 228-230 ^{o}C, IR (KBr): ν_{max} = 3271, 3078, 1674, 1581, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 5.75 (d, 2H, J = 5.0 Hz, CH_2), 7.3-7.5 (m, 3H, phenyl), 7.7 (d, 2H, phenyl, J = 8.0 Hz), 8.0 (dd, 4H, phenyl, J = 5.1, 10.8 Hz), 8.40 (d, 1H, Pyridinium, J = 7.7 Hz), 9.2-9.35 (m, 2H, pyridinium), 9.80 (d, 1H, J = 14.0 Hz, pyridinium), 11.25 (s, 1H, CO-NH) , 11.8 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.42 (CH_2), 87.8 (C), 118.7 (CH), 121.36 (CH), 123.9 (CH), 127.01 (CH), 133.05 (C), 134.04 (C), 137.6 (CH), 138.09 (C), 139.9 (C), 140.7 (C), 144.9 (CH), 146.9 (CH), 148.48 (CH), 160.87 (C=O), 163.12 (C=O) ppm; EI-MS *m/z* : 187.98, 189.99, 191.88, 192.98, 218.94, 234.96, 244.87, 265.94, 294.86, 322.88, 342.91, 358.83, 375.86, 377.89, 379.89, 381.89, 411.79, 433.81, 445.81, 482.81, $[M]^+$ calcd for $C_{20}H_{15}Cl_2I_1N_3O_2^+$: 525.96, found : 525.99.

3.1.3.46 3-(4-Chloro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (64)

This compound was prepared [14] from **6** (0.5 gm, 2.3 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **64** as grayish white solid (0.28 gm, 31%); mp 180-183 ^{o}C , IR (KBr): ν_{max} = 3402, 3309, 3109, 1670, 1604, 1539 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.44 (s, 3H, CH_3), 5.77 (s, 2H, CH_2), 7.4-7.5 (m, 4H, phenyl), 7.7-7.9 (m, 4H, phenyl), 8.5 (d, 1H, pyridinium, J = 7.9 Hz), 8.85 (d, 1H, pyridinium, J = 4.9 Hz), 9.20 (s, 1H, pyridinium), 9.70 (s, 1H, pyridinium), 10.80 (s, 1H, CONH), 11.00 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ15.26 (CH_3), 62.4 (CH_2), 121.93 (CH), 122.08 (CH), 124.31 (CH), 127.7 (C), 128.59 (CH), 128.78 (CH), 131.05 (C), 136.57 (C), 137.69 (C), 146.98 (CH), 148.21 (CH), 150.15 (CH), 158.5 (C), 162.56 (C=O), 163.33 (C=O); EI-MS *m/z* : 197.22, 215.28, 232.20 (100%), 234.21, 235.22, 273.25, 294.48, 308.27, 324.28, 351.73, 376.22, 400.16, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found : 412.29.

3.1.3.47 3-(3-Chloro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (65)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **65** as yellowish pale solid (0.38 gm, 43%) ; mp 217-220 ^{o}C , IR (KBr): ν_{max} = 3271, 3063, 1678, 1597, 1543 cm^{-1}, ^{1}H NMR (300 MHz,

DMSO-d_6) : δ=2.44 (s, 3H, CH_3), 5.92 (s ,2H , CH_2), 7.25 (d, 3H, phenyl, *J* = 7.8 Hz), 7.45 (d, 1H, phenyl, *J* = 8.1 Hz), 7.60 (d, 2H, phenyl, *J* = 8.0 Hz), 7.85 (d, 1H, phenyl, *J* = 6.5 Hz), 8.05 (s, 1H, phenyl), 8.38 (dd, 1H, pyridinium, *J* = 7.2 Hz), 9.22 (d, 1H, pyridinium, *J* = 5.0 Hz), 9.30 (d, 1H, pyridinium, *J* = 7.1 Hz), 9.80 (s, 1H, pyridinium), 11.20 (s, 1H, CONH), 11.75 (s, 1H, CONH) ppm ; ^{13}C NMR (75 MHz, DMSO-d_6) : δ 15.28 (s, CH_3), 62.34 (CH_2), 118.92 (CH), 119.91 (CH), 119.98 (CH), 122.27 (CH), 124.33 (CH), 127.01 (CH), 130.50 (C), 132.79 (C), 133.01 (C), 133.41 (CH), 135.66 (C), 139.77 (C), 144.81 (CH), 146.78 (CH), 148.27 (CH), 160.59 (C=O), 162.74 (C=O); EI-MS *m/z* : 182.10, 197.13, 204.14, 215.20, 233.28 (100%), 244.41, 247.31, 261.46, 293.61, 309.65, 324.70, 337.85, 371.03, 399.21, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found : 412.21.

3.1.3.48 3-(2-Chloro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (66)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **66** as greyish pale solid (0.54 gm, 61%) ; mp 193-196 ^{o}C , IR (KBr): ν_{max} = 3502, 3313, 3006, 1678, 1593, 1527 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6) : δ 2.45 (s, 3H, CH_3), 5.82 (s, 2H, CH_2), 7.2-7.45 (m, 3H, phenyl), 7.60 (d, 4H, phenyl, *J* = 8.1 Hz), 7.90 (d, 1H, phenyl, *J* = 7.8 Hz), 8.40 (dd, 1H, pyridinium, *J* = 6.6 Hz), 9.26 (d, 2H, pyridinium, *J* = 4.3 Hz), 9.71 (s, 1H, pyridinium), 10.40 (s, 1H, CONH), 11.21 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): □□ 15.29 (CH_3), 62.41 (CH_2), 119.91 (CH), 124.84 (CH), 127.02 (CH), 127.23 (CH), 127.37 (CH), 127.70 (CH), 127.88 (CH), 128.23 (CH), 128.35 (CH), 129.60 (CH), 133.03 (C), 135.67 (C), 144.49 (C), 146.77 (C), 148.41 (C), 160.66 (C=O), 162.82 (C=O) ppm; EI-MS *m/z* : 196.97, 210.08, 244.99, 272.99 (100%), 274.99, 276.95, 307.99, 311.97, 337.96, 367.03, 377.89, 388.85, $[M]^+$ calcd for $C_{21}H_{19}Cl_1N_3O_2S_1^+$: 412.09, found : 412.13..

3.1.3.49 3-(4-Bromo-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (67)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **13** (0.5 gm, 1.8 mmol) to yield **67** as pale white solid (0.37 gm, 40%) ; mp 228-230 ^{o}C , IR (KBr): ν_{max} = 3340, 3030, 1666, 1543 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.45 (s, 3H, CH_3), 5.78 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, *J* = 8.4 Hz), 7.45 (d, 2H, phenyl, *J* = 6.8 Hz), 7.65 (d, 2H, phenyl, *J* = 8.0 Hz), 7.78 (dd, 2H, phenyl, *J* = 3.4, 8.3 Hz), 8.36 (dd, 1H, pyridinium, *J* = 7.6 Hz), 8.44 (dd, 1H, pyridinium, *J* = 8.1 Hz), 9.24 (dd, 2H, pyridinium, *J* = 4.4, 12.7 Hz), 9.72 (s, 1H, pyridinium), 11.10 (s, 1H, CONH), 11.50 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.28 (CH_3), 62.33 (CH_2), 116.45 (C), 119.91 (CH), 122.43 (CH), 127.0 (CH), 131.27 (C), 131.57 (CH), 133.54 (C), 135.65 (CH), 136.98 (C), 137.68 (C), 144.75 (CH), 146.74 (CH), 148.19 (CH), 160.41 (C=O), 162.75 (C=O) ppm ; EI-MS *m/z* 186.83 (100%), 188.85, 196.85, 214.85, 216.83, 275.77, 312.80, $[M]^+$ calcd for $C_{21}H_{19}Br_1N_3O_2S_1^+$: 456.038, found : 455.85.

3.1.3.50 3-(4-Iodo-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (68)

This compound is pepared from **6** (0.5 gm, 2.3 mmol) and **14** (0.5 gm, 1.54 mmol) to yield **68** as pale white solid (0.39 gm, 47%) ; mp 190-192 ^{o}C (decomp.), IR (KBr): ν_{max} = 3317, 3032, 1678, 1604, 1539, 1493 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.51 (s, 3H, CH_3) , 5.77 (s, 2H, CH_2), 7.45 (d, 2H, phenyl, *J* = 7.0 Hz), 7.72 (d, 2H, phenyl, *J* = 8.0 Hz), 7.8-7.92 (m, 4H, phenyl), 8.5 (d , 2H, Pyridinium, *J* = 7.9 Hz), 8.85 (d , 1H, pyridinium, *J* = 3.7 Hz), 9.2 (s, 1H, pyridinium), 10.80 (s, 1H, CONH), 11.0 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ=15.29 (CH_3), 62.29 (CH_2), 119.93 (CH), 122.03 (CH), 122.68 (CH), 126.78 (CH), 127.01 (CH), 127.10 (CH), 132.71 (C), 136.84 (C), 137.27 (C), 137.43 (C), 140.39 (C), 146.74 (CH), 148.08 (CH), 160.39 (C=O), 162.76 (C=O) ppm; EI-MS *m/z* : 181.00, 196.00, 196.95, 214.94, 218.89, 219.85, 244.81, 246.81, 272.94, 293.96, 308.83, 323.89, 339.89, 355.88, 377.79, 397.80, 423.80, 435.73, 460.83, 491.81, $[M]^+$ calcd for $C_{21}H_{19}I_1N_3O_2S_1^+$: 504.02 found : 504.07.

3.1.3.51 3-(4-Methylsulfanyl-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (69)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **69** as yellowish pale solid (0.48 gm, 55%) ; mp 218-220 ^{o}C , IR (KBr): ν_{max} = 3330, 3039, 1678, 1601, 1539 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=2.45 (s, 3H, CH_3) , 2.50 (s, 3H, CH_3), 5.80 (s, 2H, CH_2), 7.28 (dd, 4H, phenyl, *J* = 8.7, 18.3 Hz), 7.60 (d, 2H, phenyl, *J* = 8.5 Hz), 7.8 (d, 2H, phenyl, *J* = 8.5 Hz), 8.37 (d, 1H, pyridinium, *J* = 7.2 Hz), 9.24 (dd, 2H, pyridinium, *J* = 6.0, 15.0 Hz), 9.76 (s, 1H, pyridinium), 11.25 (s, 1H, CONH), 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6) : δ15.16 (CH_3), 15.35 (CH_3), 62.30 (CH_2), 119.85 (CH), 121.01 (CH), 126.62 (CH), 126.93 (CH), 132.75 (C), 133.68 (C), 135.56 (CH), 135.65 (CH), 144.63 (C), 146.68 (C), 148.08 (CH), 148.68 (CH), 158.38 (C), 160.09 (C=O), 162.79 (C=O), ppm; EI-MS *m/z* : 181.17, 211.19, 215.06, 217.14, 232.16, 244.13 (100%), 245.12, 246.11, 260.22, 278.11, 304.19, 318.20, 332.16, 333.13, 346.22, 358.17, 381.22, 412.16, $[M]^+$ calcd for $C_{22}H_{22}N_3O_2S_2^+$: 424.12, found : 424.22.

3.1.3.52 3-(4-Fluoro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (70)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **70** as yellowish pale solid (0.27 gm, 33%) ; mp 192-193 ^{o}C (decomp.), IR (KBr): ν_{max} = 3245, 3171, 1678, 1604, 1543 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ2.45 (s, 3H, CH3), 5.78 (s, 2H, CH_2), 7.26 (d, 2H, phenyl, *J* = 7.7 Hz), 7.47 (d, 2H, phenyl, *J* = 7.7 Hz), 7.59 (d, 2H, phenyl, *J* = 6.8 Hz), 7.89 (d, 2H, phenyl, *J* = 7.4 Hz), 8.38 (br s, 1H, pyridinium), 9.27 (dd, 2H, pyridinium, *J* = 6.6, 10.5 Hz), 9.74 (s, 1H, pyridinium), 11.1 (s, 1H, CONH), 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.2 (CH_3), 62.38 (CH_2), 119.87 (CH), 121.0 (CH), 121.32 (CH), 121.84 (CH), 122.12 (CH), 126.7 (CH), 126.92 (C), 128.13 (C), 128.55 (C), 143.73 (C), 145.18 (C), 145.71 (CH) , 149.2 (CH), 160.43 (C=O), 163.3 (C=O) ppm; EI-MS *m/z* : 181.27, 187.19, 203.17, 215.24, 232.24, 234.16, 246.16, 26.19, 276.16, 295.15, 324.25, $[M]^+$ calcd for $C_{21}H_{16}F_1N_3O_2S_1^+$: 396.12, found : 396.15.

3.1.3.53 3-(2,4-dichloro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (71)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **17** (0.5 gm, 2.05 mmol) to yield **71** as yellowish pale solid (0.83 gm, 90%) ; mp 235-236 ^{o}C (decomp.), IR (KBr): ν_{max} = 3325, 3039, 1705, 1577, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.47 (s, 3H, CH_3), 5.79 (s, 2H, CH_2), 7.25 (dd, 3H, phenyl, *J* = 8.1 Hz), 7.47 (dd, 1H, phenyl, *J* = 1.3, 8.9 Hz), 7.68 (d, 3H, phenyl, *J* = 8.1 Hz), 8.35 (d, 1H, pyridinium, *J* = 6.8 Hz), 9.32 (dd, 2H, pyridinium, *J* = 5.8, 9.0 Hz), 9.76 (s, 1H, pyridinium), 11.10 (s, 1H, CONH), 11.50 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ15.23 (CH3), 62.23 (CH_2), 119.25 (CH), 120.52 (CH), 122.28 (CH), 122.46 (CH), 126.98 (CH), 127.12 (CH), 127.69 (CH), 129.92 (C), 133.12 (C), 133.59 (C), 134.64 (C), 137.22 (C), 144.77 (C), 146.81 (CH) , 148.27 (CH), 160.16 (C=O), 163.8 (C=O) ppm; EI-MS *m/z* : 187.87, 189.87, 190.82, 230.81, 249.79, 277.77, 305.77, 322.71, 342.75 (100%), 344.75, 345.72, 376.67, 377.68, 379.68, 381.68, 397.61, 415.72, $[M]^+$ calcd for $C_{21}H_{18}Cl_2N_3O_2S_1^+$: 446.05 , found : 446.07.

3.1.3.54 3-(3,5-dichloro-phenylcarbamoyl)-1-[(4-methylsulfanyl-phenylcarbamoyl)-methyl]-pyridinium Chloride (72)

This compound was prepared from **6** (0.5 gm, 2.3 mmol) and **18** (0.5 gm, 2.05 mmol) to yield **72** as yellowish pale solid (0.76 gm, 73%) ; mp 228-230 ^{o}C (decomp.), IR (KBr): ν_{max} = 3271, 3039, 1674, 1581, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=2.44 (s, 3H, CH_3) , 5.82 (s, 2H, CH_2), 7.25 (d, 2H, phenyl, *J* = 4.3 Hz), 7.40 (br s, 2H, phenyl), 7.60 (br s, 2H, phenyl), 7.95 (br s, 1H, phenyl), 8.37 (dd, 1H, phenyl), 9.25 (br s, 1H, phenyl), 9.38 (br s, 1H, phenyl), 9.77 (br s, 1H, phenyl), 11.20 (s, 1H, CONH), 11.95 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6) : δ 15.30 (CH3), 62.35 (CH_2), 118.32 (CH), 119.92 (CH), 123.51 (CH), 127.0 (CH), 130.05 (C), 132.78 (C), 133.0 (C), 134.03 (CH), 135.7 (C), 139.92 (C), 140.57 (C), 144.94 (CH), 146.87 (CH), 148.41 (CH), 160.86 (C=O), 162.70 (C=O), ppm; EI-MS *m/z* : 186.99, 188.99, 196.95, 218.90, 231.97, 244.87, 280.89, 275.92(100%), 294.84, 323.91, $[M]^+$ calcd for $C_{21}H_{18}Cl_2N_3O_2S_1^+$: 446.05 , found : 446.10.

3.1.3.55 3-(4-Chloro-phenylcarbamoyl)-1-[(4-fluoro-phenylcarbamoyl)-methyl]-pyridinium Chloride (73)

This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **73** as yellow pale solid (0.47 gm, 57%) ; mp 244-246 ^{o}C, IR (KBr): ν_{max} = 3255, 1670, 1608, 1543 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 5.77 (s, 2H, CH_2) , 6.86 (d, 2H, *J* = 7.8 Hz, phenyl), 7.27 (dd, 2H, phenyl, *J* = 7.8 Hz), 7.32 (d, 2H, phenyl, *J* = 8.1 Hz), 7.47 (d, 2H, phenyl, *J* = 8.1 Hz), 8.35 (dd, 1H, pyridinium, *J* = 6.2 Hz), 9.24 (d, 1H, pyridinium, *J* = 6.0 Hz), 9.38 (d, 1H, pyridinium, *J* = 6.0 Hz) , 9.63 (s, 1H, pyridinium), 11.20 (s , 1H, CO-NH), 11.43 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 62.06 (CH_2) , 118.05 (CH), 120.26 (CH), 125.16 (CH), 127.82 (CH), 129.50 (CH), 132.43 (C), 133.68 (C), 138.57, (C), 139.09 (C) , 144.81 (CH), 147.31 (CH), 148.79 (CH) , 156.31 (C), 161.43 (C=O), 163.66 (C=O) ppm; EI-MS *m/z*: 187.16 , 189.20, 215.22, 232.21 (100%), 234.23, 235.18, 259.28, 273.25, 304.28, 308.20, 312.26, 332.30, 358.28, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 384.10.

3.1.3.56 3-(3-Chloro-phenylcarbamoyl)-1-[(4-fluoro-phenylcarbamoyl)-methyl]-pyridinium Chloride (74)

This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **74** as pale white solid (0.37 gm, 45%) ; mp 242-243 ^{o}C (decomp.), IR (KBr): ν_{max} = 3255, 3066, 1681, 1597, 1562 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.83 (s, 2H, CH_2), 7.19 (d, 3H, phenyl, *J* = 8.8 Hz) , 7.47 (d, 1H, phenyl, *J* = 8.7 Hz), 7.68 (d, 2H, phenyl, *J* = 4.5 Hz), 7.86 (d, 1H, phenyl, *J* = 7.3 Hz), 8.08 (br s, 1H, phenyl), 8.38 (s, 1H, pyridinium), 9.25 (br s, 1H, pyridinium), 9.35 (d, 1H, pyridinium, *J* = 7.2 Hz), 9.84 (s, 1H, pyridinium), 11.50 (s, 1H, CONH), 11.80 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.26 (CH_2), 115.34 (CH) , 115.64 (CH), 118.94 (CH), 120.00 (CH) , 121.12 (CH), 124.30 (CH), 126.99 (C) , 130.47 (CH), 132.99 (C), 133.36 (C), 139.80 (C), 144.86, (CH), 146.8 (CH), 148.24 (CH) , 156.72 (C), 160.57 (C=O), 162.84 (C=O) ppm; EI-MS *m/z*: 187.23 (100%), 198.21, 197.22, 215.28, 276.23, 290.27,322.29, 341.25, 376.23, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 384.12.

3.1.3.57 3-(2-Chloro-phenylcarbamoyl)-1-[(4-fluoro-phenylcarbamoyl)-methyl]-pyridinium Chloride (75)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **75** as yellowish pale solid (0.31 gm, 37%); mp 198-200 ^{o}C , IR (KBr): ν_{max} = 3313, 3094, 1678, 1593, 1519 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.72 (s, 2H, CH_2), 7.30 (ddd, 2H, phenyl, J = 1.5, 6.4, 17.5 Hz), 7.43 (dd, 2H, phenyl, J = 1.3, 6.4, 17.2 Hz), 7.60 (dd, 2H, phenyl, J = 1.2, 6.7 Hz), 7.9 (d, 2H, phenyl, J = 7.8 Hz), 8.1 (d, 2H, pyridinium, J = 7.7 Hz), 8.45 (d, 1H, pyridinium, J = 3.2 Hz), 8.9 (s, 1H, pyridinium), 10.50 (s, 2H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.48 (CH_2), 115.67 (CH), 122.48 (CH), 124.80 (CH), 126.61 (CH), 127.28 (CH), 127.86 (CH), 128.36 (CH), 129.60 (CH), 133.52 (C), 136.08 (C), 149.21 (C), 150.53 (C), 157.91 (C), 164.60 (C=O), 167.6 (C=O) ppm; EI-MS *m/z*: 197.20, 210.24, 245.22, 255.22, 273.21 (100%), 275.26, 276.20, 277.19, 308.19, 312.22, 337.28, 351.38, 378.13, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 384.09, found : 384.22.

3.1.3.58 3-(4-Bromo-phenylcarbamoyl)-1-[(4-fluoro-phenylcarbamoyl)-methyl]-pyridinium Chloride (76)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **13** (0.5 gm, 1.8 mmol) to yield compound **76** as pale white solid (0.20 gm, 23%); mp 244-246 ^{o}C , IR (KBr): ν_{max} = 3232, 3043, 1666, 1543, 1508 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.8 (s, 2H, CH_2), 7.2 (d, 2H, phenyl, J = 8.2 Hz) , 7.63 (m, 4H, phenyl), 7.83 (d, 2H, phenyl, J = 8.3 Hz), 8.38 (d, 1H, pyridinium, J = 7.3 Hz), 9.25 (dd, 2H, pyridinium, J = 3.3, 7.9 Hz), 9.76 (s, 1H, pyridinium), 11.2 (s, 1H, CONH), 11.5 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.25 (CH_2), 120.96 (CH), 121.06 (CH), 122.42 (CH), 127.01 (CH), 131.68 (CH), 133.57 (C), 134.64 (C), 136.99 (C), 137.64 (C), 144.73 (CH), 146.76 (CH), 148.23 (CH), 156.71 (C), 160.43 (C=O), 162.88 (C=O) ppm, EI-MS *m/z* : 186.98, 198.92, 200.90, 275.87, 278.85, 395.73, 397.76 (100%), 399.76, 400.71, $[M]^+$ calcd for $C_{20}H_{16}Cl_1F_1N_3O_2^+$: 428.04 Found 428.07.

3.1.3.59 1-[(4-Fluoro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (77)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **14** (0.5 gm, 1.5 mmol) to yield **77** as pale solid (0.38 gm, 38%); mp 234-237 ^{o}C , IR (KBr): ν_{max} = 3240, 3078, 1678, 1535, 1508 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.79 (s, 2H, CH_2) , 7.37 (d, 2H, phenyl, J = 9.0 Hz), 7.44 (d, 2H, phenyl, J = 9.0 Hz), 7.65 (d, 2H, phenyl, J = 8.7 Hz), 7.88 (d, 2H, phenyl, J = 8.7 Hz), 8.35 (dd, 1H, pyridinium, J = 1.5, 6.3 Hz), 9.22 (d, 2H, pyridinium, J = 6.0 Hz), 9.72 (s, 1H, pyridinium), 11.34 (s, 1H, CONH), 11.47 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 62.34 (CH2), 87.70 (C), 115.41 (CH), 121.03 (CH), 122.07 (CH), 122.48 (CH), 123.44 (CH), 130.32 (CH), 135.49 (C), 136.90 (C), 137.40 (C), 138.72 (CH), 148.70 (CH), 152.17 (C), 162.69 (C=O), 164.14 (C=O) ppm; EI-MS *m/z* : 186.87, 188.91, 218.83, 219.83, 244.74, 246.74, 272.84, 287.87, 307.82, 323.80 (100%), 326.83, 347.77, 369.77, 396.73, 420.62, 432.77, 444.74, $[M]^+$ calcd for $C_{20}H_{16}F_1I_1N_3O_2^+$: 476.03 Found 476.04.

3.1.3.60 1-[(4-Fluoro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (78)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **78** as white solid (0.26 gm, 32%); mp 174-176 ^{o}C , IR (KBr): ν_{max} = 3379, 3271, 3178, 1674, 1651, 1593 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.48 (s, 3H, CH3), 5.81 (s, 2H, CH_2), 7.15-7.40 (m, 4H, phenyl), 7.50-7.80 (m, 4H, phenyl), 8.32 (dd, 1H, pyridinium, J = 7.5 Hz), 8.75 (d, 1H, pyridinium, J = 3.3 Hz), 9.21 (d, 2H, pyridinium, J = 5.6 Hz), 9.80 (s, 1H, pyridinium), 10.81 (s, 1H, CONH), 11.32 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.42 (CH3), 62.26 (CH_2), 115.35 (CH), 121.04 (CH), 123.40 (CH), 126.69 (CH), 130.43 (C), 132.69 (C), 133.68 (C), 135.41 (CH), 136.32 (CH), 144.65 (C), 146.67 (CH), 148.05 (CH), 152.02 (C), 162.88 (C=O), 163.87 (C=O) ppm; EI-MS *m/z* : 181.27, 187.19, 203.17, 215.24, 232.24 (100%), 234.16, 246.16, 266.19, 276.16, 295.16, 324.25, $[M]^+$ calcd for $C_{21}H_{19}F_1N_3O_2S_1^+$: 376.12 Found 376.19.

3.1.3.61 1-[(4-Fluoro-phenylcarbamoyl)-methyl]-3-(4-Fluoro-phenylcarbamoyl)-pyridinium Chloride (79)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **79** as pale white solid (0.25 gm, 29%); mp 229-231 ^{o}C, IR (KBr): ν_{max} = 3432, 3071, 1671, 1546 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.79 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, J = 8.6 Hz), 7.45 (d, 2H, phenyl, J = 8.6 Hz), 7.65 (dd, 2H, phenyl, J = 4.9 , 8.4 Hz), 7.90 (d, 2H, phenyl, J = 8.4 Hz), 8.35 (br s, 1H, pyridinium), 9.25 (d, 2H, pyridinium, J = 7.0 Hz), 9.75 (s, 1H, pyridinium), 11.20 (s, 1H, CONH), 11.44 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.25 (CH_2), 121.02 (CH), 121.13 (CH), 122.09 (CH), 122.42 (CH) , 127.01 (C), 128.28 (C), 128.73 (CH), 133.67 (C), 134.65 (CH), 137.34 (C), 144.71 (C), 146.72 (CH), 148.20 (CH), 160.4 (C=O), 162.88 (C=O) ppm; EI-MS *m/z* : 187.19, 189.19, 197.16, 215.20, 232.22 (100%), 234.21, 244.26, 259.28, 261.27, 278.22, 304.28, 332.29 , 341.30, 358.29, $[M]^+$ calcd for $C_{20}H_{16}F_2N_3O_2^+$: 368.12, found 368.17.

3.1.3.62 1-[(4-Fluoro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (80)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **17** (0.5 gm, 2.3 mmol) to yield **80** as pale white solid (0.45 gm, 51%); mp 222-224 ^{o}C (decomp.) , IR (KBr): ν_{max} = 3325, 3071, 1705, 1578 cm^{-1}, ^{1}H NMR (300 MHz,

DMSO-d_6): δ = 5.80 (s, 2H, CH_2) , 7.01 (d, 2H, J = 7.3 Hz, phenyl), 7.17 (dd, 1H, phenyl, J = 7.7 Hz), 7.42 (d, 1H, phenyl, J = 8.0 Hz), 7.49 (s, 1H, phenyl), 7.59 (d, 2H, J = 7.3 Hz, phenyl), 8.33 (dd, 1H, pyridinium, J = 6.2 Hz), 9.28 (d, 1H, pyridinium, J = 6.2 Hz), 9.32 (d, 1H, pyridinium, J = 6.2 Hz) , 9.68 (s, 1H, pyridinium), 10.70 (s , 1H, CO-NH), 11.43 (s, 1H, CO-NH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 61.62 (CH_2) , 115.19 (CH), 115.49 (CH), 121.12 (CH), 121.22 (CH), 123.55 (CH), 127.36 (CH), 127.65 (C), 128.48 (C), 139.07 (C), 129.62, (C), 134.91 (C) , 135.49 (CH), 148.77 (CH), 152.43 (CH), 156.59 (C), 159.84 (C=O), 164.55 (C=O) ppm; EI-MS *m/z*: 187.83 (100%) , 189.64, 190.84, 191.73, 192.94, 214.97, 244.83, 265.86, 277.68, 296.52, 323.82, 341.86, 358.45, $[M]^+$ calcd for $C_{20}H_{15}Cl_2F_1N_3O_2^+$: 418.05, found : 418.03.

3.1.3.63 1-[(4-Fluoro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (81)
This compound was prepared from **7** (0.5 gm, 2.7 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **81** as pale white solid (0.21 gm, 24%); mp 245-247 ^{o}C (decomp.) , IR (KBr): ν_{max} = 3432, 3071, 1674, 1581, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.81 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, J = 8.8 Hz), 7.41 (d, 1H, phenyl, J = 4.4 Hz), 7.66 (dd, 2H, phenyl, J = 5.0, 9.0 Hz), 8.01 (dd, 2H, phenyl, J = 1.5, 16.0 Hz), 8.40 (d, 1H, pyridinium, J = 6.4 Hz), 9.26 (d, 1H, pyridinium, J = 6.0 Hz), 9.37 (d, 1H, pyridinium, J = 6.0 Hz), 9.80 (s, 1H, pyridinium), 11.25 (s, 1H, CONH), 11.90 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.08 (CH_2), 115.69 (CH), 118.73 (CH), 120.95 (CH), 121.06 (CH), 123.8 (CH), 127.02 (CH), 133.02 (C), 134.68 (C), 139.92 (C), 140.72 (C), 144.91 (CH), 148.46 (CH), 156.7 (C), 160.88 (C=O), 162.83 (C=O) ppm; EI-MS *m/z*: 187.93 (100%) , 189.84, 190.86, 191.83, 192.94, 214.97, 244.83, 265.88, 277.88, 296.82, 323.86, 342.86, 358.77, $[M]^+$ calcd for $C_{20}H_{15}Cl_2F_1N_3O_2^+$: 418.05, found : 418.08.

3.1.3.64 3-(4-Chloro-phenylcarbamoyl)-1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (82)
This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **82** as yellow pale solid (0.52 gm, 57%) ; mp 241-244 ^{o}C, IR (KBr): ν_{max} = 3405, 3039, 1685, 1662 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.76 (s, 2H, CH_2), 7.12 (d, 1H, phenyl, J = 7.9 Hz), 7.25 (m, 3H, phenyl), 7.54 (d, 1H, phenyl, J = 8.1 Hz), 7.70 (d, 2H, phenyl, J = 8.5 Hz), 8.38 (d, 1H, pyridinium, J = 7.4 Hz), 9.32 (dd, 2H, pyridinium, J = 5.0, 9.1 Hz), 9.8 (s, 1H, pyridinium), 10.8 (s, 1H, CONH), 11.45 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.26 (CH_2), 115.29 (CH), 122.29 (CH), 122.46 (CH), 126.99 (CH), 127.11 (CH), 127.68 (CH), 129.13 (CH), 129.93 (C), 133.22 (C), 133.56 (CH), 134.64 (C), 139.92 (C), 140.72 (C), 144.78 (C), 146.84 (CH) , 148.17 (CH), 160.31 (C=O), 163.5 (C=O) ppm; EI-MS *m/z* : 188.24, 210.35, 255.35, 289.33, 308.34 (100%), 310.37, 312.38, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.023, found : 434.21.

3.1.3.65 3-(3-Chloro-phenylcarbamoyl)-1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (83)
This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **83** as pale white solid (0.37 gm, 41%) ; mp 195-198 ^{o}C , IR (KBr): ν_{max} = 3309, 1671, 1593, 1527 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ=5.74 (s, 2H, CH_2), 6.92 (d, 1H, phenyl, J = 8.6 Hz) , 7.25 (d, 2H, phenyl, J = 7.8 Hz), 7.40 (d, 1H, phenyl, J = 8.1 Hz), 7.85 (d, 2H, phenyl, J = 8.1 Hz), 8.0 (s , 1H, phenyl), 8.34 (d, 1H, pyridinium, J = 6.6 Hz), 9.23 (d, 1H, pyridinium, J = 6.0 Hz), 9.32 (d, 1H, pyridinium, J = 8.1 Hz), 9.77 (s, 1H, pyridinium), 11.10 (s, 1H, CONH), 11.58 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.16 (CH_2), 118.96 (CH) , 120.03 (CH) , 121.29 (CH), 122.64 (CH), 124.40 (CH) , 127.66 (CH) , 128.99 (C) , 130.41 (CH), 131.28 (C), 133.02 (C), 137.17 (C), 139.04 (C), 144.62, (CH), 146.63 (CH), 148.12 (CH) , 158.51 (C), 160.34 (C=O), 162.25 (C=O) ppm; EI-MS *m/z* : 188.24, 210.35, 227.34, 256.36, 273.37, 289.33, 308.34 (100%), 310.37, 312.38, 314.30, 342.28, 368.68, 378.36, 416.43, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.01.

3.1.3.66 3-(2-Chloro-phenylcarbamoyl)-1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (84)
This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **84** as yellowish pale solid (0.6 gm, 66%); mp 195-198 ^{o}C , IR (KBr): ν_{max} = 3313, 1678, 1581, 1523 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.80 (s, 2H, CH_2), 7.35 (d, 1H, phenyl, J = 7.5 Hz), 7.45 (d, 1H, phenyl, J = 7.5 Hz), 7.6 (d, 2H, phenyl, J = 7.7 Hz), 7.9 (d, 2H, phenyl, J = 7.7 Hz), 8.1 (d, 1H, phenyl, J = 6.3 Hz), 8.20 (d, 1H, pyridinium, J = 8.0 Hz), 8.65 (s, 1H, pyridinium), 9.0 (d, 1H, pyridinium, J = 10.4 Hz), 9.3 (s, 1H, pyridinium), 9.78 (s, 1H, pyridinium), 10.5 (s, 2H, CONH), ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.48 (CH_2), 88.7 (CH),115.29 (CH), 115.59 (CH), 122.29 (CH), 122.46 (CH), 124.96 (CH), 126.73 (C), 127.42 (CH) ,127.89 (CH), 129.62 (C), 133.38 (C), 137.15 (C), 142.94 (C), 144.3 (C), 144.78 (CH), 146.82 (CH), 157.84 (CH), 160.32 (C=O), 162.19 (C=O) ppm; EI-MS *m/z* : 197.21, 210.22, 246.20, 256.19, 273.19 (100%),275.24, 276.18, 308.21, 312.20, 341.11, 361.61, 378.13, 398.09, 418.24, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.21.

3.1.3.67 3-(4-Bromo-phenylcarbamoyl)-1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (85)
This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **13** (0.5 gm, 1.8 mmol) to yield compound **85** as pale white solid (0.33 gm, 38%); mp 245-248 ^{o}C , IR (KBr): ν_{max} = 3294, 1666, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-

d_6): δ2.27 (s, 3H, CH_3) , 5.78 (s, 2H, CH_2), 7.15 (d, 2H, phenyl, *J* = 8.1 Hz), 7.37 (d, 2H, phenyl, *J* = 9.0 Hz), 7.51 (dd, 4H, phenyl, *J* = 2.7, 9.0 Hz), 7.89 (d, 2H, phenyl, *J* = 9.0 Hz), 8.39 (dd, 1H, pyridinium, *J* = 3.3, 5.4 Hz), 9.25 (dd, 2H, pyridinium, *J* = 3.3, 7.8 Hz), 9.76 (s, 1H, pyridinium), 11.36 (s, 1H, CONH), 11.41 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ20.35 (CH_3), 62.24 (CH_2), 119.11 (2 x CH), 121.99 (2 x CH), 126.94 (2 x CH), 128.27 (C), 128.71 (2 x CH), 129.25 (CH), 132.91 (C), 133.52 (C), 135.66 (C), 137.15 (C), 144.61 (CH), 146.66 (CH), 148.17 (CH), 160.36 (C=O) , 162.56 (C=O) ppm; EI-MS *m/z* : 188.08, 198.99 , 201.09, 210.21, 211.13, 237.11, 265.11, 276.13, 292.11, 317.15, 341.10, 366.09, 376.12, 396.09, 398.12 (100%), 400.12, 401.06, 402.04, 427.13, 447.10, 459.13, $[M]^+$ calcd for $C_{20}H_{15}Cl_2Br_1N_3O_2^+$: 479.97, found : 480.01.

3.1.3.68 1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (86)

This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **14** (0.5 gm, 1.5 mmol) to yield **86** as pale solid (0.58 gm, 73%); mp 230-232 ^{o}C (decomp.), IR (KBr): ν_{max} = 3267, 3051, 2891, 1671, 1531 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.88 (s, 2H, CH_2) , 7.46 (d, 2H, phenyl, *J* = 7.4 Hz), 7.45 (d, 2H, phenyl, *J* = 7.4 Hz), 7.65-7.90 (m, 6H, phenyl), 8.35 (d, 1H, pyridinium, *J* = 7.0 Hz), 9.3 (dd, 2H, pyridinium, *J* = 8.1, 28.0 Hz), 9.85 (s, 1H, pyridinium), 10.75 (br s, 1H, CONH), 11.65 (br s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 62.21 (CH_2), 88.68 (CH), 122.59 (CH), 126.96 (CH), 127.18 (C), 127.31 (C), 129.1 (C), 129.95 (CH), 133.25 (C), 133.45 (CH), 137.4 (CH), 137.42 (C), 138.24 (C), 144.94 (CH), 146.87 (CH), 148.18 (CH), 160.39 (C=O), 164.03 (C=O) ppm; EI-MS *m/z* : 187.20, 189.22, 219.17, 220.16, 246.26, 261.30, 276.25, 295.29, 297.29, 298.21, 324.35 (100%), 325.27, 340.41, 353.34, 387.32, 402.38, 421.31,449.40, 478.38, 492.44, $[M]^+$ calcd for $C_{20}H_{15}Cl_2I_1N_3O_2^+$: 525.96, found : 525.48.

3.1.3.69 1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (87)

This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **87** as white solid (0.36 gm, 39%); mp 235-238 ^{o}C , IR (KBr): ν_{max} = 3379, 3051, 2978, 1658, 1527 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.86 (s, 2H, CH_2), 7.31 (s, 2H, NH_2), 7.48 (d, 2H, phenyl, *J* = 8.7 Hz), 7.81 (s, 4H, phenyl), 7.92 (d, 2H, phenyl, *J* = 8.7Hz), 8.39 (dd, 1H, pyridinium, *J* = 7.8 Hz), 9.25 (d, 1H, pyridinium, *J* = 6.3 Hz), 9.31 (d, 1H, pyridinium, *J* = 7.2 Hz), 9.79 (s, 1H, pyridinium), 11.47 (s, 1H, CONH), 11.58 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 63.16 (CH_2), 119.6 (2 x CH), 122.79 (2 x CH), 127.58 (2 x CH), 127.75 (2 x CH), 129.05 (C), 129.49 (CH), 134.3 (C), 137.98, (C), 139.82 (C), 141.85 (C), 145.53 (CH), 147.58 (CH), 148.97 (CH), 161.14 (C=O), 164.39 (C=O) ppm; EI-MS *m/z* : 63.07, 75.02, 89.97, 110.96, 119.96, 126.95 (100%), 128.99, 136.92, 163.64, 155.94, 167.92, 196.91, 209.96, 236.94, 254.89, 272.67, 274.93, 276.90, 307.83, 310.84, 341.94, 356.99, 370.96, 400.98, 416.97, 433.78, $[M]^+$ calcd for $C_{21}H_{18}Cl_2N_3O_2S_1^+$: 446.05, found : 446.35.

3.1.3.70 1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-3-(4-Fluoro-phenylcarbamoyl)-pyridinium Chloride (88)

This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **88** as pale white solid (0.28 gm, 32%); mp 244-246 ^{o}C , IR (KBr): ν_{max} = 3332, 3035, 2981, 1666, 1531 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.88 (s, 2H, CH_2), 7.47 (br d, 4H, phenyl, *J* = 7.3 Hz), 7.8 (d, 1H, phenyl, *J* = 8.2 Hz), 7.94 (d, 2H, phenyl, *J* = 8.4 Hz), 8.36 (d, 1H, pyridinium, *J* = 5.9 Hz), 9.26 (dd, 2H, pyridinium, *J* = 7.2, 14.4 Hz), 9.86 (s, 1H, pyridinium), 10.7 (s, 1H, CONH), 11.7 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.2 (CH_2), 122.2 (CH), 126.9 (CH), 127.35 (CH), 127.66 (CH), 128.25 (C), 128.7 (C), 129.11 (CH), 129.95 (CH), 130.29 (C), 133.24 (C), 133.44 (C), 137.34 (C), 144.92 (CH), 146.88 (CH), 148.62 (CH), 160.4 (C=O), 164.15 (C=O) ppm; EI-MS *m/z* : 186.92, 188.97, 201.95, 203.98, 205.98, 231.99 (100%), 232.95, 233.93, 235.03, 250.03, 274.97, 293.87, 308.98, 323.92, 335.97, 355.92, 367.91, 398.92, $[M]^+$ calcd for $C_{21}H_{18}F_1Cl_2N_3O_2^+$: 418.05, found : 418.76.

3.1.3.71 1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (89)

This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **17** (0.5 gm, 2.3 mmol) to yield **89** as pale white solid (0.4 gm, 45%); mp 235-237 ^{o}C (decomp.) , IR (KBr): ν_{max} = 3325, 1705, 1577 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.39 (s, 3H, CH_3), 5.73 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, *J* = 8.4 Hz), 7.43 (d, 2H, phenyl, *J* = 8.4 Hz), 7.54 (d, 2H, phenyl, *J* = 8.1 Hz), 7.84 (d, 2H, phenyl, *J* = 8.4 Hz), 8.33 (dd, 1H, pyridinium, *J* = 5.7 Hz), 9.20 (dd, 2H, pyridinium, *J* = 7.5 Hz), 9.70 (s, 1H, pyridinium), 11.05 (s, 1H, CONH), 11.37 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.89 (CH_3), 63.0 (CH_2), 120.56 (2 x CH), 122.74 (2 x CH), 127.63 (2 x CH), 127.71 (C), 129.02 (C), 129.46 (CH), 133.50 (C), 134.26 (2 x CH), 136.28 (C), 137.9 (C), 145.39 (CH), 147.42 (CH), 148.92 (CH), 161.11 (C=O), 163.45 (C=O) ppm; EI-MS *m/z* : 188.23, 190.22, 191.18, 202.27, 215.30, 231.33, 233.36, 255.38, 276.34, 306.33, 323.33, 343.40, 345.39, 346.31, 376.36, 380.39, 382.37, 403.40, 441.41, 459.42, $[M]^+$ calcd for $C_{20}H_{14}Cl_4N_3O_2^+$: 469.98, found : 470.05.

3.1.3.72 1-[(2,4-dichloro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (90)

This compound was prepared from **8** (0.5 gm, 2.7 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **90** as pale white solid (0.5 gm, 57%); mp 210-211 ^{o}C, IR (KBr): ν_{max} = 3275, 3071, 1671, 1581 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.87 (s, 2H, CH_2), 7.41 (d, 2H, phenyl, J = 3.7 Hz), 7.69-7.76 (m, 2H, phenyl), 7.89 (s, 1H, phenyl), 8.06 (s, 1H, phenyl), 8.38 (t, 1H, pyridinium, J = 7.7 Hz), 9.30 (dd, 2H, pyridinium, J = 6.0, 28.5 Hz), 9.88 (s, 1H, pyridinium), 10.66 (s, 1H, pyridinium), 11.30 (s, 1H, CONH), 12.05 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 62.28 (CH_2), 118.58 (CH), 118.74 (CH), 123.78 (CH), 123.97 (CH), 127.1 (CH), 127.67 (C), 129.06 (CH), 129.12 (CH), 129.93 (C), 132.98 (CH), 133.22 (C), 134.03 (CH), 139.93 (C), 140.77 (C), 145.06 (C), 147.00 (C), 148.47 (C), 158.4 (CH), 160.89 (C=O), 164.0 (C=O) ppm; EI-MS *m/z* : 188.06 (100%), 189.97, 190.99, 191.97, 193.08, 232.13, 249.06, 266.06, 278.13, 308.11, 325.09, 341.09, 362.05, 376.07, 378.10, 380.10, 382.10, 398.06, 421.91, 433.06, $[M]^+$ calcd for $C_{20}H_{14}Cl_4N_3O_2^+$: 469.98, found : 470.05.

3.1.3.73 3-(4-Chloro-phenylcarbamoyl)-1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (91)

This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **10** (0.5 gm, 2.35 mmol) to yield **91** as yellow pale solid (0.39 gm, 43%) ; mp 151-154 ^{o}C, IR (KBr): ν_{max} = 3255, 3055, 1674, 1593 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.87 (s, 2H, CH_2), 7.26 (d, 2H, phenyl, J = 6.7 Hz), 7.78 (s, 1H, phenyl), 7.9 (m, 4H, phenyl), 8.36 (d, 1H, pyridinium, J = 6.0 Hz), 9.25 (d, 1H, pyridinium, J = 4.8 Hz), 9.35 (d, 1H, pyridinium, J = 7.3 Hz), 9.78 (s, 1H, pyridinium), 11.7 (s, 1H, CONH), 12.10 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.38 (CH_2), 122.1 (CH), 122.5 (CH), 123.45 (CH), 127.5 (CH), 128.7 (CH), 133.57 (C), 134.2 (C), 140.7 (C), 144.8 (C), 146.9 (C), 148.2 (CH), 147.73 (CH) , 158.5 (C), 160.4 (C=O), 164.1 (C=O) ppm, EI-MS *m/z* : 188.03, 190.06, 203.07, 216.10, 232.10 (100%), 237.01, 241.04, 276.04, 398.04, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.023, found : 434.23.

3.1.3.74 3-(3-Chloro-phenylcarbamoyl)-1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (92)

This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **11** (0.5 gm, 2.35 mmol) to yield **92** as pale white solid (0.29 gm, 32%) ; mp 193-195 ^{o}C , IR (KBr): ν_{max} = 3310, 1671, 1593, 1572 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ3.73 (s, 3H, CH_3) , 5.78 (s, 2H, CH_2), 6.92 (d, 2H, phenyl, J = 9.0 Hz) , 7.48 (d, 2H, phenyl, J = 8.7 Hz), 7.55 (d, 2H, phenyl, J = 9.3 Hz), 7.90 (d, 2H, phenyl, J = 9.0 Hz), 8.37 (dd, 1H, pyridinium, J = 1.8 , 6.6 Hz), 9.23 (d, 1H, pyridinium, J = 6.0 Hz), 9.29 (d, 1H, pyridinium, J = 8.1 Hz), 9.78 (s, 1H, pyridinium), 10.97 (s, 1H, CONH), 11.48 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ55.08 (CH_3, OCH_3), 62.16 (CH_2), 113.96 (2 x CH) , 120.65 (2 x CH) , 121.99 (2 x CH) , 126.92 (C) , 128.24 (2 x CH) , 128.67 (CH), 131.28 (C), 133.46 (C), 137.17 (C), 144.62, (CH), 146.63 (CH), 148.12 (CH) , 155.57 (C), 160.34 (C=O), 162.25 (C=O) ppm; EI-MS *m/z* : 188.07 (100%), 190.03, 192.03, 193.09, 219.13, 235.19 , 266.16, 278.20, 295.12, 324.14, 341.20, 376.23, 376.17, 378.20, 380.21, 382.21, 400.18, 422.11, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.18.

3.1.3.75 3-(2-Chloro-phenylcarbamoyl)-1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (93)

This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **12** (0.5 gm, 2.35 mmol) to yield **93** as yellowish pale solid (0.26 gm, 30%); mp > 250 ^{o}C (decomp.), IR (KBr): ν_{max} = 3425, 3329, 3278, 1601, 1450 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ5.90 (s, 2H, CH_2), 7.48 (d, 2H, phenyl, J = 8.7 Hz), 7.89 (d, 2H, phenyl, J = 3.6 Hz), 7.92 (d, 2H, phenyl, J = 3.9 Hz), 8.27 (d, 2H, phenyl, J = 9.3 Hz), 8.40 (dd, 1H, pyridinium, J = 6.6 Hz), 9.25 (d, 1H, pyridinium, J = 6.3 Hz), 9.31 (d, 1H, pyridinium, J = 8.1 Hz), 9.78 (s, 1H, pyridinium), 11.45 (s, 1H, CONH), 11.92 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ62.48 (CH_2), 119.03 (2 x CH), 121.99 (2 x CH), 125.03 (2 x CH), 127.0 (C), 128.27 (2 x CH), 128.7 (CH), 133.53 (C), 137.15 (C), 142.67 (C), 144.3 (C), 144.78 (CH), 146.82 (CH), 148.2 (CH), 160.32 (C=O), 164.12 (C=O) ppm; EI-MS *m/z* : 187.06, 202.07, 204.09, 206.07, 215.10, 232.09 (100%), 234.13, 237.04, 241.03, 265.07, 297.08, 311.09, 336.12, 336.12, 356.06, 378.03, 391.06, 422.08, $[M]^+$ calcd for $C_{20}H_{15}Cl_3N_3O_2^+$: 434.02, found : 434.09.

3.1.3.76 3-(4-Bromo-phenylcarbamoyl)-1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-pyridinium Chloride (94)

This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **13** (0.5 gm, 1.8 mmol) to yield compound **94** as pale white solid (0.34 gm, 39%); mp 191-193 ^{o}C , IR (KBr): ν_{max} = 3332, 3078, 1671, 1589, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ = 2.27 (s, 3H, CH_3) , 5.78 (s, 2H, CH_2), 7.15 (d, 2H, phenyl, J = 8.1 Hz), 7.37 (d, 2H, phenyl, J = 9.0 Hz), 7.51 (dd, 4H, phenyl, J = 2.7, 9.0 Hz), 7.89 (d, 2H, phenyl, J = 9.0 Hz), 8.39 (dd, 1H, pyridinium, J = 3.3, 5.4 Hz), 9.25 (dd, 2H, pyridinium, J = 3.3, 7.8 Hz), 9.76 (s, 1H, pyridinium), 11.36 (s, 1H, CONH), 11.41 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ20.35 (CH_3), 62.24 (CH_2), 119.11 (2 x CH), 121.99 (2 x CH), 126.94 (2 x CH), 128.27 (C), 128.71 (2 x CH), 129.25 (CH), 132.91 (C), 133.52 (C), 135.66 (C), 137.15 (C), 144.61 (CH), 146.66 (CH), 148.17 (CH), 160.36 (C=O) , 162.56 (C=O) ppm; EI-MS *m/z* : 187.88, 198.91, 200.93, 202.94, 218.87, 220.92, 238.85, 240.85, 265.88, 275.88, 278.88, 294.80, 316.85, 340.81, 355.80, 377.79, 396.77, 397.78 (100%), 399.79, 400.79, 401.83, 433.75, 445.75, 462.75, $[M]^+$ calcd for $C_{20}H_{15}Br_1Cl_2N_3O_2^+$: 479.97, found : 480.01.

3.1.3.77 1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-3-(4-iodo-phenylcarbamoyl)-pyridinium Chloride (95)
This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **14** (0.5 gm, 1.5 mmol) to yield **95** as pale solid (0.7 gm, 86%); mp 220-222 ^{o}C , IR (KBr): ν_{max} = 3440, 3078, 1674, 1589 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.79 (s, 2H, CH_2) , 7.37 (d, 2H, phenyl, J = 9.0 Hz), 7.44 (d, 2H, phenyl, J = 9.0 Hz), 7.65 (d, 2H, phenyl, J = 8.7 Hz), 7.88 (d, 2H, phenyl, J = 8.7 Hz), 8.35 (dd, 1H, pyridinium, J = 1.5, 6.3 Hz), 9.21 (d, 1H, pyridinium, J = 6.0 Hz), 9.75 (s, 1H, pyridinium), 11.36 (s, 1H, CONH), 11.46 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ = 63.05 (CH_2), 121.49 (2 x CH), 122.77 (2 x CH), 127.72 (2 x CH), 128.25 (C), 129.02 (C), 129.44 (2 x CH), 129.56 (CH), 134.24 (C), 137.90 (C), 137.96 (C), 145.48 (CH), 147.5 (CH), 148.93 (CH), 161.1 (C=O), 163.86 (C=O) ppm; EI-MS *m/z* : 187.18, 189.18, 197.16, 215.20, 219.13, 220.05, 246.11, 261.15, 276.11 (100%), 295.12, 324.19, $[M]^+$ calcd for $C_{20}H_{15}Cl_2I_1N_3O_2^+$: 525.96, found : 526.02.

3.1.3.78 1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-3-(4-methylsulfanyl-phenylcarbamoyl)-pyridinium Chloride (96)
This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **15** (0.5 gm, 2.05 mmol) to yield **96** as white solid (0.29 gm, 32%); mp 229-231 ^{o}C (decomp.), IR (KBr): ν_{max} = 3305, 1658, 1585, 1523 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 5.86 (s, 2H, CH_2), 7.31 (s, 2H, NH_2), 7.48 (d, 2H, phenyl, J = 8.7 Hz), 7.81 (s, 4H, phenyl), 7.92 (d, 2H, phenyl, J = 8.7Hz), 8.39 (dd, 1H, pyridinium, J = 7.8 Hz), 9.25 (d, 1H, pyridinium, J = 6.3 Hz), 9.31 (d, 1H, pyridinium, J = 7.2 Hz), 9.79 (s, 1H, pyridinium), 11.47 (s, 1H, CONH), 11.58 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 63.16 (CH_2), 119.6 (2 x CH), 122.79 (2 x CH), 127.58 (2 x CH), 127.75 (2 x CH), 129.05 (C), 129.49 (CH), 134.3 (C), 137.98, (C), 139.82 (C), 141.85 (C), 145.53 (CH), 147.58 (CH), 148.97 (CH), 161.14 (C=O), 164.39 (C=O) ppm; EI-MS *m/z* : 187.25, 202.29, 211.38, 232.33, 244.39, 246.27, 273.35, 285.35, 317.36, 332.43 (100%), 334.35, 335.35, 355.32, 378.32, 398.31, 419.44, $[M]^+$ calcd for $C_{21}H_{18}Cl_2N_3O_2S_1^+$: 446.05, found : 446.42.

3.1.3.79 1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-3-(4-Fluoro-phenylcarbamoyl)-pyridinium Chloride (97)
This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **16** (0.5 gm, 2.3 mmol) to yield **97** as pale white solid (0.21 gm, 24%); mp 218-219 ^{o}C (decomp.) , IR (KBr): ν_{max} = 3462, 3171, 1674, 1604 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.39 (s, 3H, CH_3), 5.73 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, J = 8.4 Hz), 7.43 (d, 2H, phenyl, J = 8.4 Hz), 7.54 (d, 2H, phenyl, J = 8.1 Hz), 7.84 (d, 2H, phenyl, J = 8.4 Hz), 8.33 (dd, 1H, pyridinium, J = 5.7 Hz), 9.20 (dd, 2H, pyridinium, J = 7.5 Hz), 9.70 (s, 1H, pyridinium), 11.05 (s, 1H, CONH), 11.37 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.89 (CH_3), 63.0 (CH_2), 120.56 (2 x CH), 122.74 (2 x CH), 127.63 (2 x CH), 127.71 (C), 129.02 (C), 129.46 (CH), 133.50 (C), 134.26 (2 x CH), 136.28 (C), 137.9 (C), 145.39 (CH), 147.42 (CH), 148.92 (CH), 161.11 (C=O), 163.45 (C=O) ppm; EI-MS *m/z* : 187.16 (100%), 189.10, 202.15, 218.24, 232.23, 234.19, 237.14, 248.21, 273.23, 309.22, 324.19, 341.20, 366.21, 378.19, $[M]^+$ calcd for $C_{20}H_{15}Cl_2F_1N_3O_2^+$: 418.04, found : 434.23.

3.1.3.80 1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-3-(2,4-dichloro-phenylcarbamoyl)-pyridinium Chloride (98)
This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **17** (0.5 gm, 2.3 mmol) to yield **98** as pale white solid (0.62 gm, 70%); mp 221-222 ^{o}C (decomp.) , IR (KBr): ν_{max} = 3325, 1705, 1577, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.39 (s, 3H, CH_3), 5.73 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, J = 8.4 Hz), 7.43 (d, 2H, phenyl, J = 8.4 Hz), 7.54 (d, 2H, phenyl, J = 8.1 Hz), 7.84 (d, 2H, phenyl, J = 8.4 Hz), 8.33 (dd, 1H, pyridinium, J = 5.7 Hz), 9.20 (dd, 2H, pyridinium, J = 7.5 Hz), 9.70 (s, 1H, pyridinium), 11.05 (s, 1H, CONH), 11.37 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ 15.89 (CH_3), 63.0 (CH_2), 120.56 (2 x CH), 122.74 (2 x CH), 127.63 (2 x CH), 127.71 (C), 129.02 (C), 129.46 (CH), 133.50 (C), 134.26 (2 x CH), 136.28 (C), 137.9 (C), 145.39 (CH), 147.42 (CH), 148.92 (CH), 161.11 (C=O), 163.45 (C=O) ppm; EI-MS *m/z* : 188.10 ,190.13, 191.06, 197.16, 231.17, 249.10, 266.15, 278.17, 306.10, 323.15, 343.18 (100%), 345.18, 346.10, 376.11, 378.16, 380.17, 382.15, 400.08, 416.14, 441.13, 451.11 $[M]^+$ calcd for $C_{20}H_{14}Cl_4N_3O_2^+$: 469.98, found : 469.87.

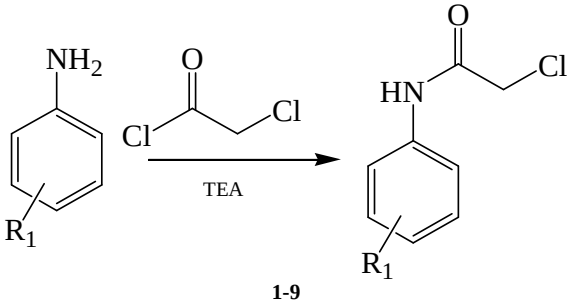
3.1.3.81 1-[(3,5-dichloro-phenylcarbamoyl)-methyl]-3-(3,5-dichloro-phenylcarbamoyl)-pyridinium Chloride (99)
This compound was prepared from **9** (0.5 gm, 2.7 mmol) and **18** (0.5 gm, 2.3 mmol) to yield **99** as pale white solid (0.42 gm, 48%); mp 230-231 ^{o}C, IR (KBr): ν_{max} = 3271, 1674, 1581, 1512 cm^{-1}, ^{1}H NMR (300 MHz, DMSO-d_6): δ 2.39 (s, 3H, CH_3), 5.73 (s, 2H, CH_2), 7.20 (d, 2H, phenyl, J = 8.4 Hz), 7.43 (d, 2H, phenyl, J = 8.4 Hz), 7.54 (d, 2H, phenyl, J = 8.1 Hz), 7.84 (d, 2H, phenyl, J = 8.4 Hz), 8.33 (dd, 1H, pyridinium, J = 5.7 Hz), 9.20 (dd, 2H, pyridinium, J = 7.5 Hz), 9.70 (s, 1H, pyridinium), 11.05 (s, 1H, CONH), 11.37 (s, 1H, CONH) ppm; ^{13}C NMR (75 MHz, DMSO-d_6): δ15.89 (CH_3), 63.0 (CH_2), 120.56 (2 x CH), 122.74 (2 x CH), 127.63 (2 x CH), 127.71 (C), 129.02 (C), 129.46 (CH), 133.50 (C), 134.26 (2 x CH), 136.28 (C), 137.9 (C), 145.39 (CH), 147.42 (CH), 148.92 (CH), 161.11 (C=O), 163.45 (C=O) ppm; EI-MS *m/z* : 188.05 (100%), 189.98, 191.07, 193.08, 197.06, 235.09,

266.10, 278.11, 297.08, 323.07, 341.10, 359.03, 376.07, 378.10, 380.11, 382.10, 398.08, 422.01, 447.07, $[M]^+$ calcd for $C_{20}H_{14}Cl_4N_3O_2^+$: 469.98, found : 470.12.

RESULTS AND DISCUSSION

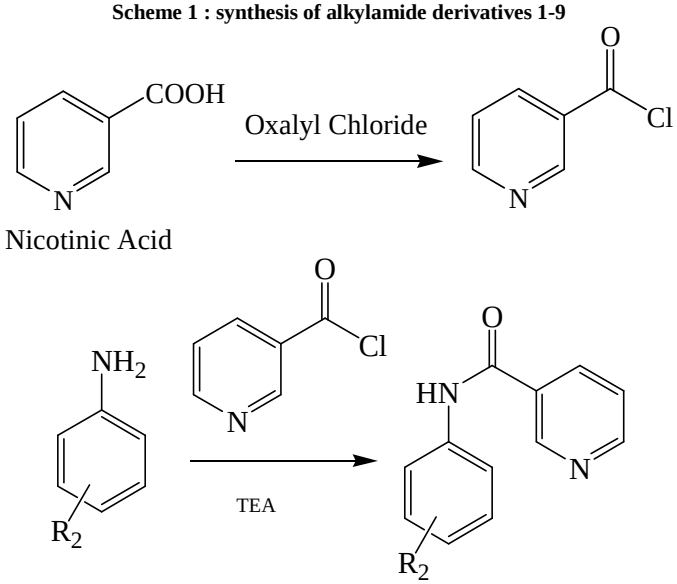
4.1. Chemistry

Table 1 shows the prepared target compounds (**19-99**), while figure 1 shows schemes 1-3; the synthetic steps implemented towards their prepration. The synthesis commenced by preparing the chloroacetylated derivatives (**1-9**) offered by the reaction of the corresponding aryl amines with *mono*-chloroacetyl chloride (Scheme 1, figure 1). The resulting mono-chloroacetamides were fused neat with *N*-substituted nicotinamide derivatives (**10-18)** (Scheme 2, figure 1) at 190-200 ^oC to yield the final products (**19-99**) (Scheme 3, figure 1). Several *N*-substituted nicotinamide starting materials (**10-18**) were prepared via reaction of nicotinic acid with oxalyl chloride to form nicotinyl chloride followed by coupling with the particular amines, as in Scheme 2, figure 1 [14].



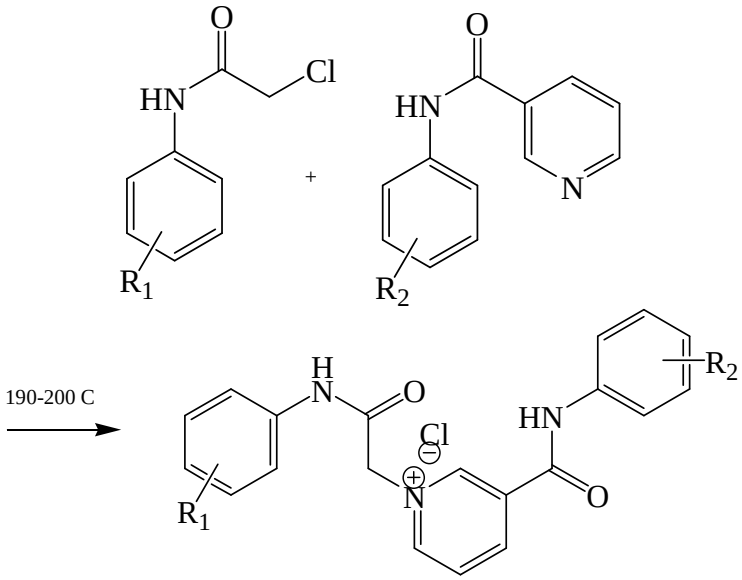
1-9

Scheme 1 : synthesis of alkylamide derivatives 1-9



10-18

Scheme 2: synthesis of N-substituted nicotinamide derivatives 10-18

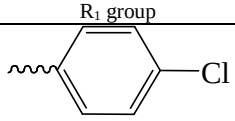
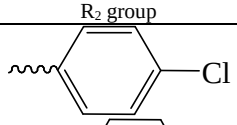
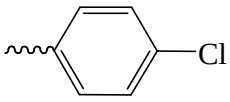
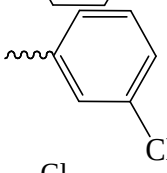
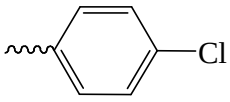
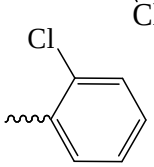
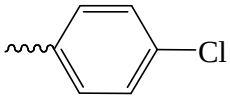
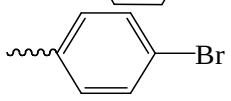
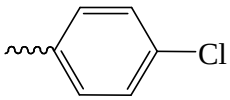
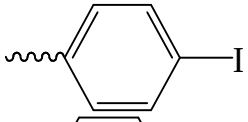
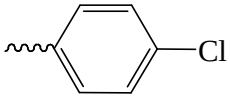
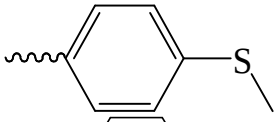
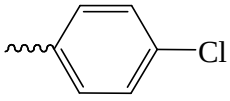
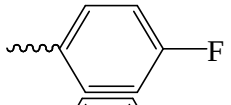
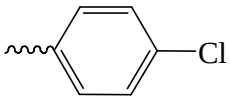
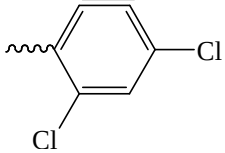


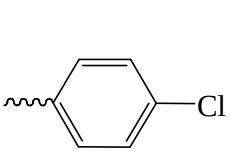
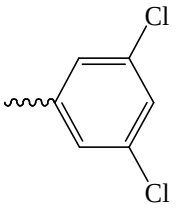
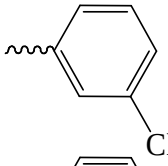
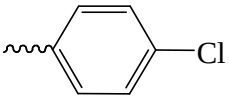
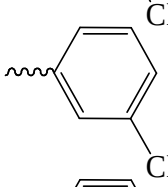
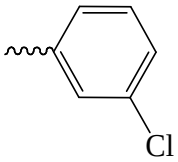
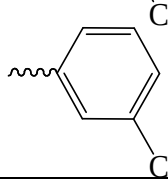
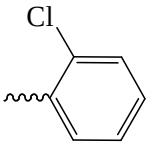
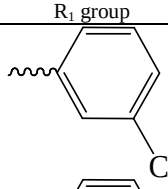
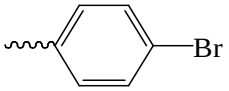
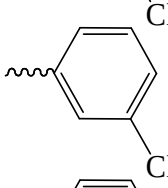
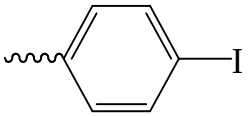
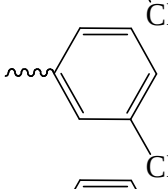
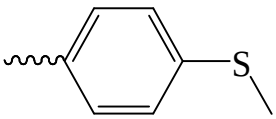
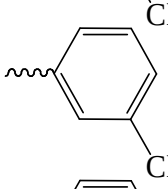
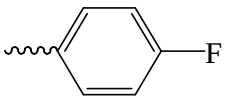
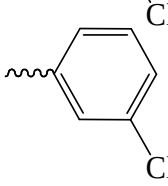
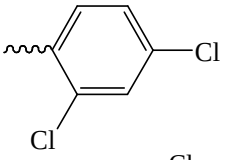
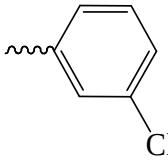
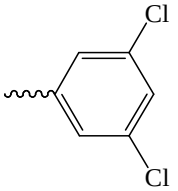
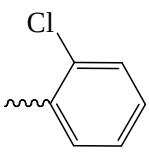
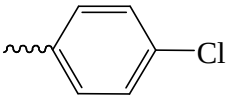
1-9 **10-18** **19-99**

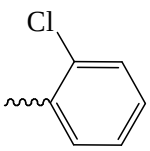
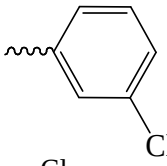
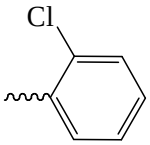
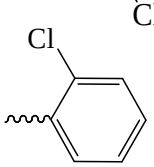
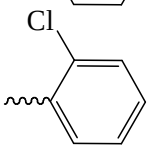
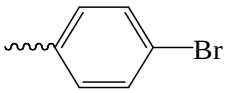
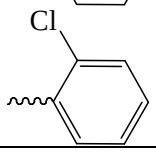
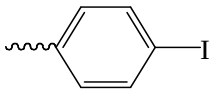
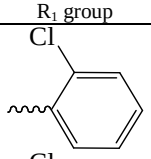
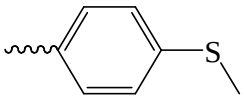
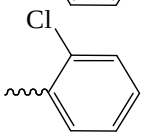
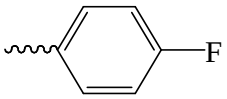
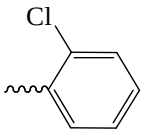
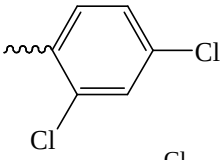
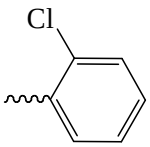
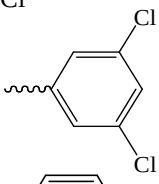
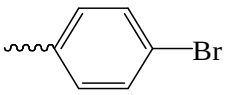
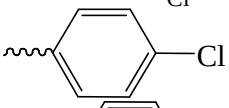
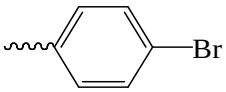
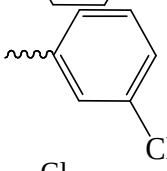
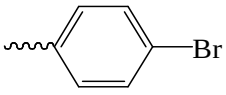
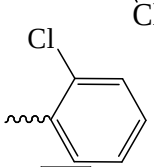
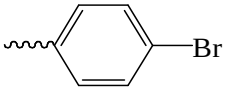
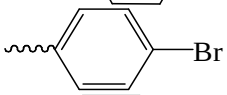
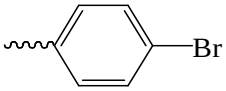
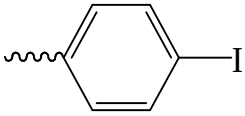
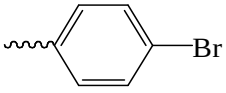
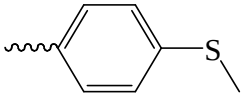
Scheme 3: synthesis of alkylamide nicotinamide derivatives 19-99

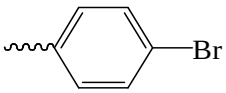
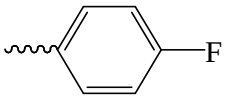
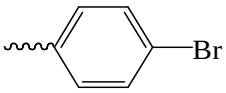
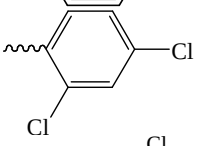
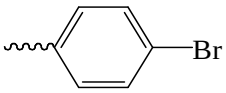
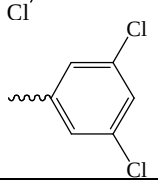
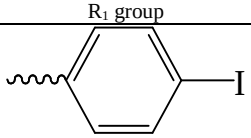
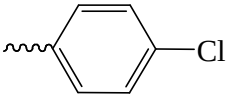
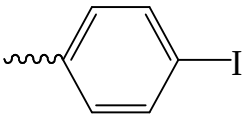
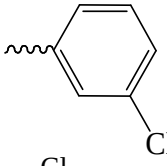
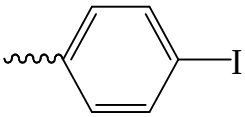
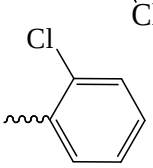
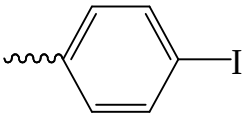
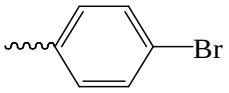
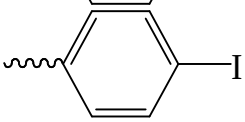
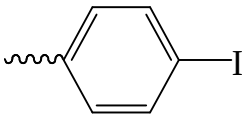
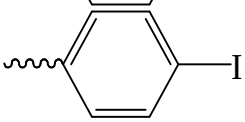
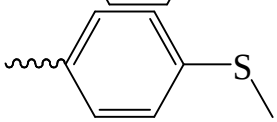
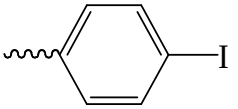
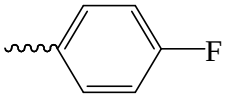
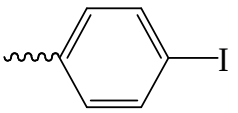
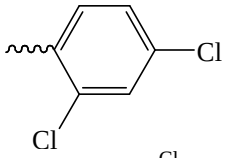
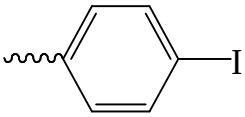
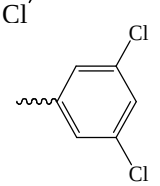
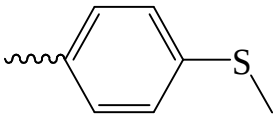
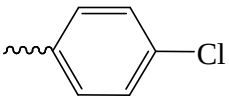
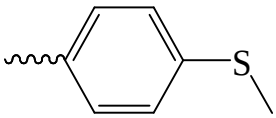
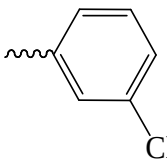
Figure 1: Synthesis of pyridinium derivatives

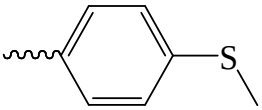
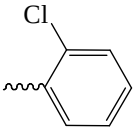
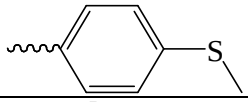
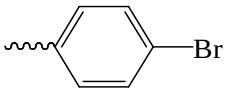
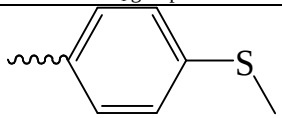
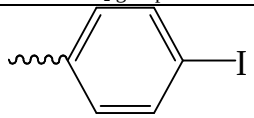
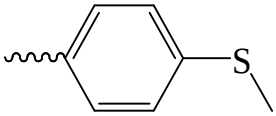
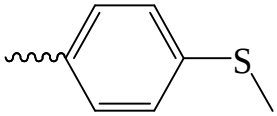
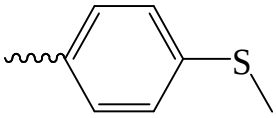
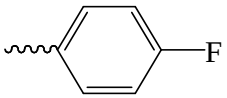
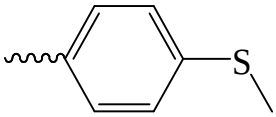
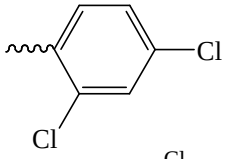
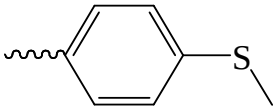
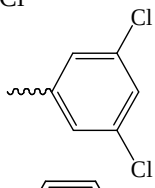
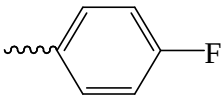
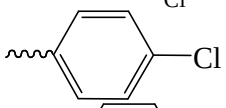
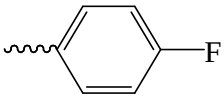
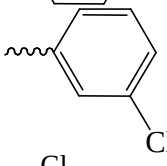
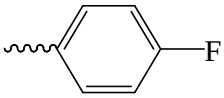
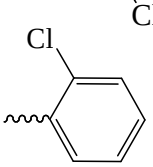
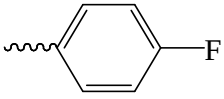
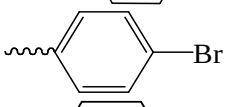
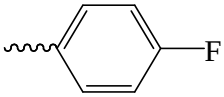
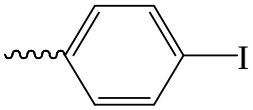
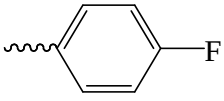
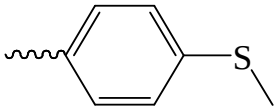
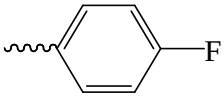
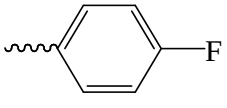
Table 1: Synthetic Pyridinium Compounds

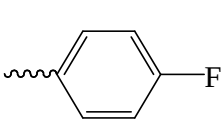
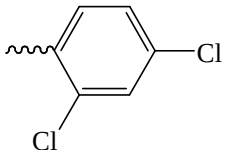
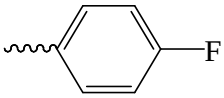
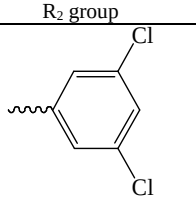
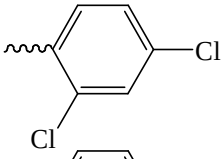
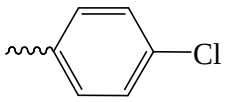
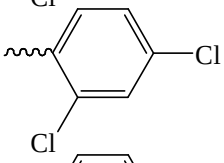
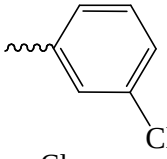
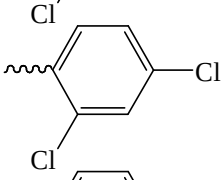
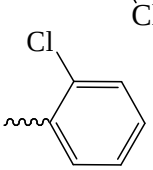
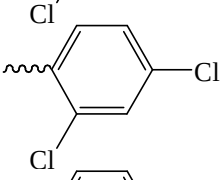
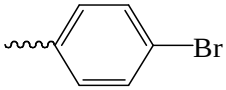
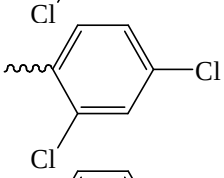
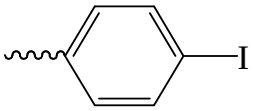
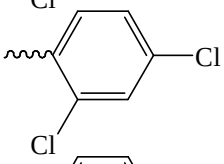
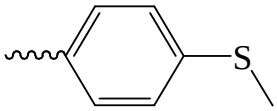
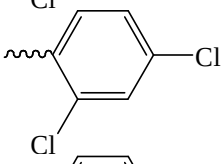
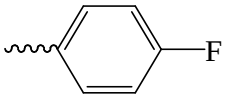
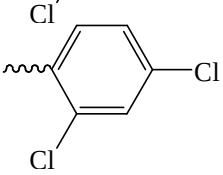
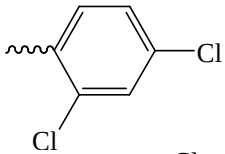
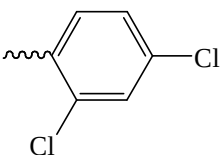
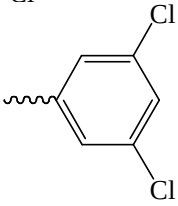
Compound Number	R_1 group	R_2 group
19		
20		
21		
22		
23		
24		
25		
26		

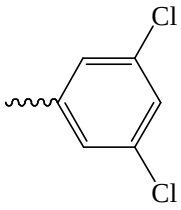
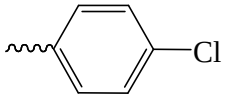
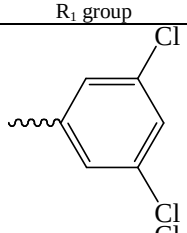
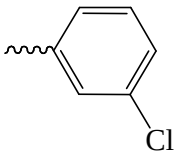
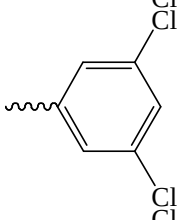
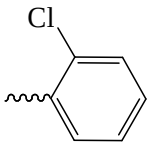
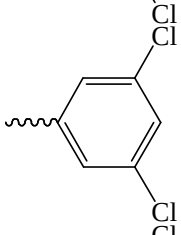
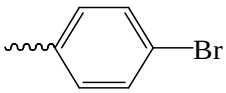
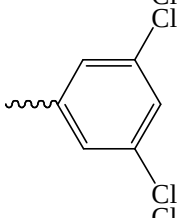
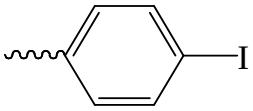
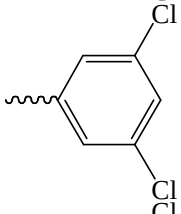
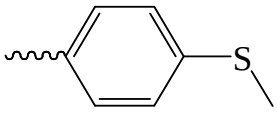
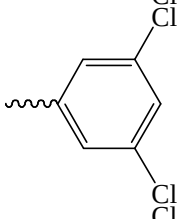
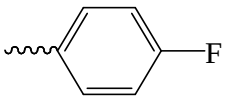
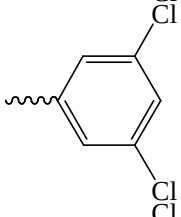
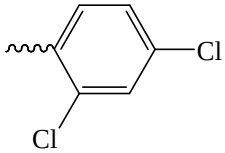
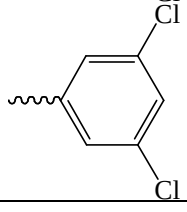
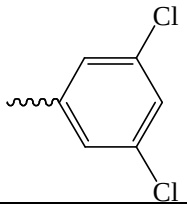
Compound Number	R_1 group	R_2 group
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		

Compound Number	R_1 group	R_2 group
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		

Compound Number	R_1 group	R_2 group
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		

Compound Number	R_1 group	R_2 group
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		

Compound Number	R_1 group	R_2 group
80		
81		
82		
83		
84		
85		
86		
87		
88		
89		
90		

Compound Number	R_1 group	R_2 group
91		
92		
93		
94		
95		
96		
97		
98		
99		

4.2 Antimicrobial activities

The *in-vitro* antibacterial activity of the halogen substituted alkylamide nicotinamide derivatives has been investigated against several representative pathogenic bacteria both ATCC and clinically isolated pathogens as shown in table 4 and 5. Nutrient agar media was employed for bacterial growth. Inocula containing approximately 10^7CFUs/mLof bacteria were prepared from broth culture in log phase. Bacterial plate was incubated at 37^0C for 24 h. Ten microbial strains i.e., *S. aureus, B. subtillis ,E. coli ,P.aeroginosa, K.pneumoniae, C. albicans, E. faecium, Strep. B , P.mirabilis* were used in antimicrobial assay. Standard antibiotic and antimicrobials were also screened under similar conditions as reference antimicrobial drugs [18,19]. It have been found to delineate profound antimicrobial potency as compared to reference drug within MIC range of 7.5-180 µg/mL (table 5). The screening results depicted in table 2 and table 3, ampicillin (10µg/disc), amoxicillin (25µg/disc), cefepime (30µg/disc), nitrofurantion (300µg/disc), penicillin G (10µg/disc), gentamycin (10µg/disc), amikacin (30µg/disc), augmentin (30µg/disc), tetracyclin (30µg/disc), Erythromycin (15µg/disc), Cefixime (5µg/disc) and Ceftriaxone (30µg/disc) were used as standard for antibacterial and antifungal activity respectively [17] .

Table 2. Standard Antimicrobial agents with zone of inhibition (diameter measured in mm)

Antimicrobial	Code	*S.aureus*	*S. epidermidis*	*K.pneumoniae*	*P. aeruginosa*	*C. albicans*	*E. faecium*	*Strep. B*	*p. mirabilis*	*B.subtilis*	*E.coli*
Ampicillin	AM10	45	10	0	0	0	0	20	0	30	12
Amoxicillin	AX25	44	13	0	0	0	0	28	0	31	23
Tetracycline	TE30	22	25	0	0	0	0	25	15	26	8
Nitrofurantion	F300	20	22	17	0	0	0	32	24	24	20
Cefepime	FEP30	30	28	25	20	0	20	32	0	27	25
Penicillin G	P10	50	11	0	0	0	0	32	0	32	9
Augmentin	AMC30	44	15	15	15	0	0	35	12	33	15
Gentamycin	CN10	30	0	10	0	0	0	30	23	35	22
Ceftriaxone	CRO30	30	11	0	0	0	0	30	0	25	30
Amikacin	AK30	28	0	25	0	0	0	30	29	28	22
Erythromycin	E15	30	0	0	0	0	0	0	0	26	11
Cefixime	CFM5	10	11	0	8	0	0	0	0	0	25

Table 3. Standard Antimicrobial agents with zone of inhibition (diameter measured in mm)

Antimicrobial	Code	*S.aureus*	*S. epidermidis*	*K.pneumoniae*	*P. aeruginosa*	*C. albicans*	*E. faecium*	*Strep. B*	*p. mirabilis*	*B.subtilis*	*E.coli*
Ampicillin	AM10	S	R	R	R	R	R	S	R	S	I
Amoxicillin	AX25	S	R	R	R	R	R	S	R	S	S
Tetracycline	TE30	S	S	R	R	R	R	S	I	S	R
Nitrofurantion	F300	S	S	S	R	R	R	S	S	S	S
Cefepime	FEP30	S	S	S	S	R	S	S	R	S	S
Penicillin G	P10	S	R	R	R	R	R	S	R	S	R
Augmentin	AMC30	S	I	S	R	R	R	S	I	S	I
Gentamycin	CN10	S	R	R	R	R	R	S	S	S	S
Ceftriaxone	CRO30	S	R	R	R	R	R	S	R	S	S
Amikacin	AK30	S	R	S	R	R	R	S	S	S	S
Erythromycin	E15	S	R	R	R	R	R	R	R	S	I
Cefixime	CFM5	R	I	R	I	R	R	R	R	R	S

Diameter <10 , Resistant (R) ; 11-15 mm, Intermediate (I) ,; > 15 mm, Sensitive (S)

Table 4. Pyridinium derivatives with zone of inhibition (diameter measured in mm)

No.	*S.aureus*	*S. epidermidis*	*K.pneumoniae*	*P. aeruginosa*	*C. albicans*	*E. faecium*	*Strep. B*	*p. mirabilis*	*B.subtilis*	*E.coli*
19	20	0	0	0	0	0	12	0	10	15
20	18	0	5	0	0	0	10	0	14	12
21	16	0	0	0	0	0	0	0	0	10
22	0	0	0	0	11	0	8	0	0	0
23	25	0	5	0	0	0	12	14	19	15
24	25	0	0	0	0	0	15	12	19	18
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	8	0	0	21	20	11	8	20	0
28	25	0	10	0	0	0	20	0	17	22
29	16	0	0	0	0	0	11	0	8	20
30	0	0	0	0	0	0	10	0	5	0
31	0	0	5	0	22	0	20	0	20	0
32	22	0	0	0	0	0	10	0	18	0
33	30	0	12	0	10	0	0	0	0	35
34	30	0	11	0	14	0	15	0	0	26
35	0	0	0	0	5	0	0	0	0	0
36	0	0	0	0	14	0	8	0	14	0
37	12	0	0	0	15	0	15	0	0	0
38	0	10	8	0	11	0	10	0	0	0
39	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	10	0	0	0	0	0
42	10	0	0	0	0	0	10	0	0	0
43	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	18	0	13	0	15	0
46	0	0	0	0	22	0	27	0	20	0
47	0	0	0	0	15	0	10	0	12	0
48	0	0	0	0	5	0	10	0	0	0
49	0	13	0	0	25	0	20	16	25	0
50	10	10	11	0	20	0	16	0	23	0
51	0	0	13	0	25	0	25	0	21	0
52	0	11	12	0	26	0	20	15	25	0
53	0	0	0	0	13	0	0	0	0	10
54	0	0	0	0	15	0	8	0	10	0
55	30	0	0	0	0	0	0	0	18	20
56	24	0	0	0	0	0	10	0	35	8
57	35	0	15	0	10	0	25	0	20	15
58	0	0	10	0	14	0	10	0	0	0
59	25	0	0	0	0	0	0	0	30	10
60	25	0	0	0	0	0	15	7	20	13
61	29	15	16	0	8	0	0	13	0	24
62	10	0	0	0	0	0	0	0	0	0
63	0	0	0	0	12	0	8	0	10	0
64	15	0	0	0	20	0	10	0	0	0
65	25	0	15	0	0	0	20	0	22	20
66	19	0	0	0	0	0	10	0	10	0
67	0	0	0	0	25	0	18	0	0	0
68	15	0	0	0	0	0	0	0	12	0
69	20	0	10	0	0	0	15	0	20	12
70	20	0	10	0	10	12	20	0	16	12
71	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	16	0	12	0	13	0
73	25	5	12	0	0	0	25	0	25	20
74	18	0	10	0	0	0	15	0	20	10
75	0	0	0	0	0	0	0	0	5	0
76	0	0	13	0	21	0	20	0	0	0
77	25	0	10	0	14	0	20	5	25	14
78	17	0	6	0	0	0	12	0	15	15
79	27	10	16	0	11	14	25	15	21	22
80	0	0	0	0	10	0	0	0	0	0
81	0	0	0	0	20	0	15	0	16	0
82	20	0	0	0	0	0	20	0	0	10
83	0	0	0	0	0	0	0	0	0	0
84	10	0	0	0	0	0	8	0	0	0
85	25	0	0	15	14	0	18	0	0	10
86	0	0	0	0	14	0	10	0	0	0
87	15	0	0	0	10	0	10	0	0	0
88	25	0	0	0	22	0	15	20	0	10
89	10	0	0	0	0	0	8	0	0	0
90	25	10	0	0	10	0	15	0	0	10
91	35	0	16	0	0	0	18	0	40	10
92	10	0	0	0	0	0	0	0	12	0
93	15	0	0	0	0	0	0	0	15	0
94	25	0	0	0	0	0	12	0	25	10
95	15	0	0	0	0	0	0	0	18	5
96	18	0	0	0	0	0	10	0	30	14
97	25	0	0	0	0	0	15	0	25	10
98	11	0	0	0	0	0	0	0	0	0
99	15	0	0	0	0	0	8	0	12	0

Diameter <10 , Resistant (R) ; 10-15 mm, Intermediate (I) ,; > 15 mm, Sensitive (S) [18]

Table 5. Classification of sensitivity spectrum for pyridinium derivatives with MIC (µg/ml) for most sensitive compounds

No.	*S.aureus*	*S. epidermidis*	*K.pneumoniae*	*P. aeruginosa*	*C. albicans*	*E. faecium*	*Strep. B*	*p. mirabilis*	*B.subtilis*	*E.coli*
19	> 180	R	R	R	R	R	I	R	I	I
20	> 180	R	R	R	R	R	I	R	I	I
21	> 180	R	R	R	R	R	R	R	R	I
22	R	R	R	R	I	R	R	R	R	R
23	22.5	R	R	R	R	R	I	I	S	I
24	45	R	R	R	R	R	I	I	S	> 180
25	R	R	R	R	R	R	R	R	R	R
26	R	R	R	R	R	R	R	R	R	R
27	R	8	R	R	> 180	S	I	R	S	R
28	22.5	R	I	R	R	R	> 180	R	S	7.5
29	> 180	R	R	R	R	R	I	R	R	> 180
30	R	R	R	R	R	R	I	R	R	R
31	R	R	R	R	> 180	R	> 180	R	S	R
32	S	R	R	R	R	R	I	R	S	R
33	22.5	R	I	R	I	R	R	R	R	7.5
34	7.5	R	I	R	I	R	I	R	R	7.5
35	R	R	R	R	R	R	R	R	R	R
36	R	R	R	R	I	R	R	R	I	R
37	I	R	R	R	I	R	I	R	R	R
38	R	I	R	R	I	R	I	R	R	R
39	R	R	R	R	R	R	R	R	R	R
40	R	R	R	R	R	R	R	R	R	R
41	R	R	R	R	I	R	R	R	R	R
42	I	R	R	R	R	R	I	R	R	R
43	R	R	R	R	R	R	R	R	R	R
44	R	R	R	R	R	R	R	R	R	R
45	R	R	R	R	> 180	R	I	R	I	R
46	R	R	R	R	> 180	R	22.5	R	S	R
47	R	R	R	R	I	R	I	R	I	R
48	R	R	R	R	R	R	I	R	R	R
49	R	I	R	R	22.5	R	> 180	S	22.5	R
50	I	I	I	R	> 180	R	> 180	R	S	R
51	R	R	I	R	> 180	R	22.5	R	S	R
52	R	I	I	R	22.5	R	> 180	I	7.5	R
53	R	R	R	R	I	R	R	R	R	I
54	R	R	R	R	I	R	R	R	I	R
55	22.5	R	R	R	R	R	R	R	S	> 180
56	> 180	R	R	R	R	R	I	R	90	R
57	45	R	I	R	I	R	7.5	R	S	I
58	R	R	I	R	I	R	I	R	R	R
59	45	R	R	R	R	R	R	R	90	I
60	22.5	R	R	R	R	R	I	R	S	I
61	45	R	S	R	R	R	R	I	R	45
62	I	R	R	R	R	R	R	R	R	R
63	R	R	R	R	I	R	R	R	I	R
64	I	R	R	R	> 180	R	I	R	R	R
65	22.5	R	I	R	R	R	> 180	R	S	> 180
66	> 180	R	R	R	R	R	I	R	I	R
67	R	R	R	R	22.5	R	> 180	R	R	R
68	I	R	R	R	R	R	R	R	I	R
69	> 180	R	I	R	R	R	I	R	S	I
70	> 180	R	I	R	I	I	7.5	R	S	I
71	R	R	R	R	R	R	R	R	R	R
72	R	R	R	R	> 180	R	I	R	I	R
73	45	R	I	R	R	R	> 180	R	45	> 180
74	> 180	R	I	R	R	R	I	R	S	I
75	R	R	R	R	R	R	R	R	R	R
76	R	R	I	R	> 180	R	> 180	R	R	R
77	22.5	R	I	R	I	R	> 180	R	7.5	I
78	> 180	R	R	R	R	R	I	R	I	I
79	22.5	I	S	R	I	I	7.5	I	S	22.5
80	R	R	R	R	I	R	R	R	R	R
81	R	R	R	R	> 180	R	I	R	S	R
82	> 180	R	R	R	R	R	> 180	R	R	I
83	R	R	R	R	R	R	R	R	R	R
84	I	R	R	R	R	R	R	R	R	R
85	45	R	R	I	I	R	> 180	R	R	I
86	R	R	R	R	I	R	I	R	R	R
87	I	R	R	R	I	R	I	R	R	R
88	22.5	R	R	R	> 180	R	I	S	R	I
89	I	R	R	R	R	R	R	R	R	R
90	90	I	R	R	I	R	I	R	R	I
91	22.5	R	S	R	R	R	> 180	R	7.5	I
92	I	R	R	R	R	R	R	R	I	R
93	I	R	R	R	R	R	R	R	I	R
94	90	R	R	R	R	R	I	R	7.5	I
95	I	R	R	R	R	R	R	R	S	R
96	> 180	R	R	R	R	R	I	R	> 180	I
97	22.5	R	R	R	R	R	I	R	22.5	I
98	I	R	R	R	R	R	R	R	R	R
99	I	R	R	R	R	R	R	R	I	R

Diameter <I , Resistant (R) ; I-15 mm, Intermediate (I) ; > 15 mm, Sensitive (S)

CONCLUSION

This study reports the successful synthesis of some new halogenated alkylamide pyridinium derivatives. The antimicrobial screening studies were also performed in this study. The flouro- substituted, bromo- and methylthio-substituted nicotinic acid show significant antimicrobial effect. The antimicrobial screening suggests that among the newly synthesized compounds, **50**, **52**, **70**, **73**, **77**, and **79** exhibited good activities against most of the tested microorganisms and the antifungal screening against *C.albicans* suggest that **46**, **49**, **51**, **52** and **67** exhibited good antifungal activities against tested microorganism.

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REFERENCES

[1] PC Sharma, A Sinhmar, A Sharma, H Rajak, DP Pathak, *J Enzyme Inhib Med Chem*, **2013**, 28, 240-266.
[2] AS Girgis, HM Hosni, FF Barsoum, *Bioorg Med Chem* , **2006** , 14 , 4466-4476.
[3] OM Memar, SK Tyring, *Int J Dermatal* , **1995**, 34 , 597-606.
[4] KL Keller, NA Fenske , *J American Acad Dermatal*, **1998**, 38 , 611-625.
[5] A Hoffer, J Prousky. *Altern Med Rev*. **2008** , 13, 287-291.
[6] X Wang, A Pinto-Duarte, TJ Sejnowski, MM Behrens. *Antioxid Redox Signal*, **2013** , 18, 1444-1462.
[7] N Zöllner, *Int J Vitam Nutr Res Suppl*, **1989**, 30, 114-119.
[8] E Cabrera-Rode, G Molina, C Arranz, M Vera, P González, R Suárez, M Prieto, S Padrón, R León, J Tillan, I García, C Tiberti, OM Rodríguez, A Gutiérrez, T Fernández, A Govea, J Hernández, D Chiong, E Domínguez, U Di Mario, O Díaz-Díaz, O Díaz-Horta, *Autoimmunity*, **2006**, 39, 333-340.
[9] P Franchetti, R Pasquelini, R Petrelli, M Ricciutelli, P Vita, L Cappellacci, *Biorg Med Chem*, **2004**, 14, 4655-4658.
[10] W Shi, X Qian, R Zhang, G Song, *J Agric Food Chem*, **2001**, 49, 124-130.
[11] A Elbert, H Overbeck, K Iwaya, S Tsuboi , *Proc Br Crop Conf Pests Dis* , **1990**, 1, 21-22.
[12] H Li, XM Wang, J Wang, T Shao, YP Li, QB Mei, SM Lu, SQ Zhang. *Bioorg Med Chem*, **2014** , 22 , 3739-3748
[13] L Labanauskas, E Udrenait, P Gaidelis, A Brukstus, *Farmaco*, **2004**, 59, 255-259.
[14] MA Al-Sha'er, MO Taha, *Med Chem Research* , **2011**, 21, 487-510.
[15] PV Maske, SJ Makhija, *Der Pharmacia Lettre*, **2011**, 3 , 110-114.
[16] LA, AL-Shabana , *Int J Med Res*, **2012**, 1, 292-296.
[17] MA Al-Sha'er, I Mansi, N Hakooz , *Der Pharma Chemica*, **2013**, 5, 156-162.
[18] MR McGinnis, MG Rinaldi, In: Lorian V. (Ed.), *Antibiotics in Laboratory Medicine*, 3rd ed., Williams andWilkins, London, **1991**, 198-199.
[19] M Rodetsky, RC Wheeler, MH Roe, JK Todd , *J Clin Microbiol*, **1986**, 24: 600-606.