CHAPTER – II

SYNTHESIS OF NOVEL IMIDAZO[1,2-a]PYRIDINE DERIVATIVES AND STUDIES ON THEIR ANTITUBERCULAR ACTIVITY

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SYNTHESIS OF NOVEL IMIDAZO[1,2-a]PYRIDINE DERIVATIVES AND STUDIES ON THEIR ANTITUBERCULAR ACTIVITY

2.1 INTRODUCTION:-

In recent years heterocyclic compounds, analogues and derivatives have attracted wide attention due to their broad range of biological and pharmacological properties. The heterocycles are the versatile compounds existing in almost all natural products and synthetic organic compounds, usually associated with one or the other biological activity.

Heterocyclic compounds containing a bridge nitrogen atom represent important building blocks in both natural and synthetic bioactive compounds, which have been shown to possess various therapeutic activities.[1] Imidazo[1,2-a]pyridine has significant importance in the pharmaceutical industry owing to the interesting biological activities[2] displayed over a broad range of therapeutic classes , exhibiting anti-inflammatory[3], antiulcer[4], antibacterial[5], selective cyclin-dependant kinase inhibitors[6] , GABA and benzodiazepine receptor agonists[7], cardiotonic[8], gastric anti secretory[9], hypnotic[10], and anti anxiety agents[11]..

Among the heterocycles the thiazoles and benzothiazoles occupy a prominent position. They hold a broad range of biological activities and are found in many potent biologically active molecules and drugs

such as vitamin thiamine, sulfathiazol (antimicrobial drug), ritonavir (antiretroviral drug), abafungin (antifungal drug) and tiazofurin (antineoplastic drug). Benzothiazole is among the usually occurring heterocyclic nuclei in many marine as well as natural plant products. It is a privileged bicyclic ring system with multiple applications. It is known to exhibit a wide range of biological properties including anticancer,[12] antimicrobial,[13,14] antidiabetic,[15] anticonvulsant,[16] anti-inflammatory,[17] antiviral,[18] antitubercular[19] activities. A large number of therapeutic agents are synthesized with the help of benzothiazole nucleus. During recent years there have been some interesting developments in the biological activities of benzothiazole derivatives. These compounds have special significance in the field of medicinal chemistry due to their remarkable pharmacological potentialities.

Looking at the importance of these heterocyclic nuclei, it is thought of interest to accommodate Imidazo[1,2-a]pyridine and benzothiazole moieties in single molecular framework and screen them for their various biological activities. As a part of our current interest on the synthesis of novel imidazo[1,2-a]pyridine derivatives, we are presenting the synthesis of 2-benzothiazolyl-3-substituted acetamido imidazo[1,2-a]pyridine derivatives **(Fig: a)** and studied their antitubercular activity.

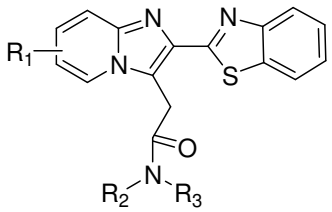
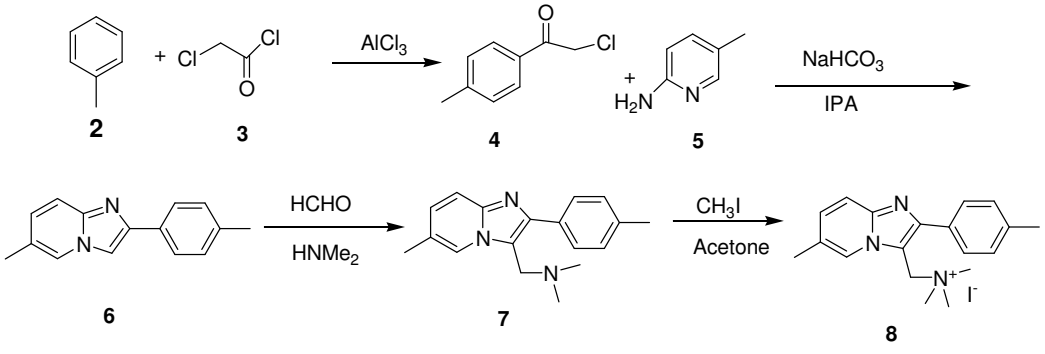


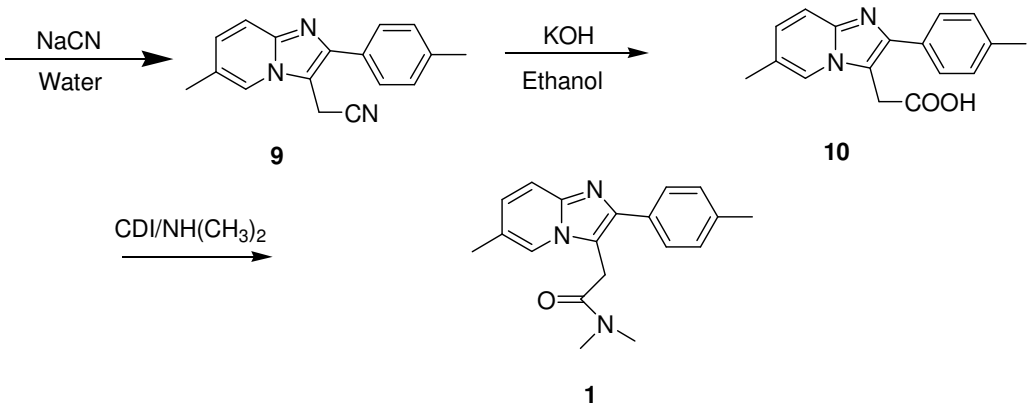
Fig: (a)

2.2 LITERATURE BACKGROUND

Kaplan[10] et al reported the synthesis of hypnotic drug Zolpidem **1** starting from the reaction of toluene **2** with chloroacetylchloride **3** to produce **4.** The compound **4,** on condensation with **5** in IPA, gave imidazo[1,2-a]pyridine derivative **6**. The compound **6** was further treated with dimethylamine and formaldehyde in the presence of acetic acid to give Mannich base **7**. The compound **7** was treated with methyliodide to produce quaternary salt **8,** which was treated with Sodium cyanide to yield the corresponding nitrile derivative **9**. The nitrile derivative was hydrolyzed with KOH in ethanol to give acid **10**. The compound **10** on treatment with dimethylamine in presence of carbonyl diimidazole (CDI) to yield the corresponding amide **1.**

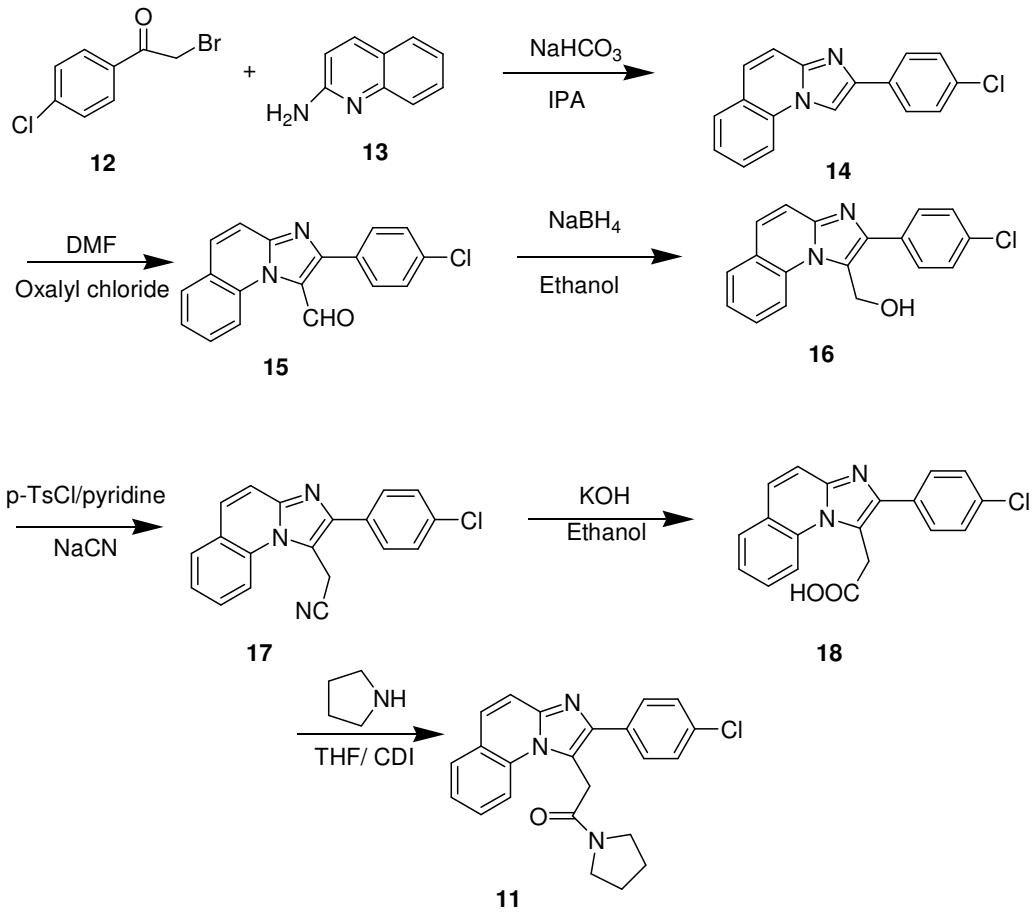
(Scheme-2.1)





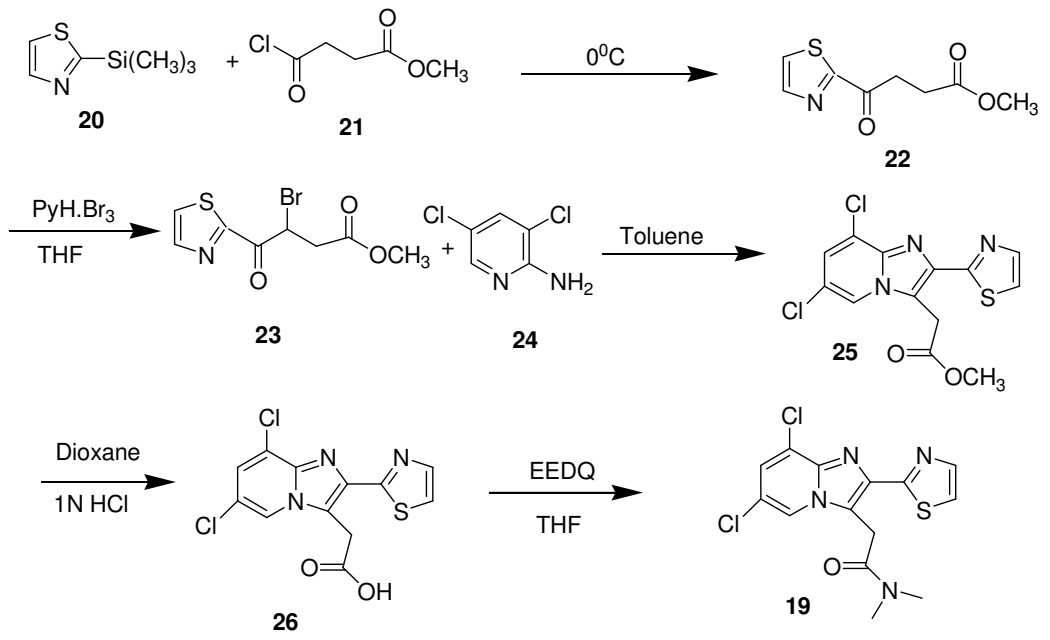
(Scheme-2.1)

Danielle[20] et al reported the synthesis of imidazo[1,2-a]quinoline derivatives **11** by the reaction 2-aminoquinoline **13** with 4-chloro phenacylbromide **12** in IPA to produce **14.** The compound **14** was treated with DMF and oxalylchloride in presence of MDC to produce **15,** which was reduced with sodium borohydride in ethanol to produce (2-(4-Chlorophenyl)imidazo[1,2-a]quinolin-1-yl)methanol **16.** It was treated with PTSCl in pyridine followed by NaCN to give the corresponding nitrile derivative **17.** The nitrile derivative was hydrolyzed using KOH in ethanol to give the acid derivative **18.** Compound **18** was treated with pyrrolidine to give the corresponding amide **11 (Scheme-2.2)**



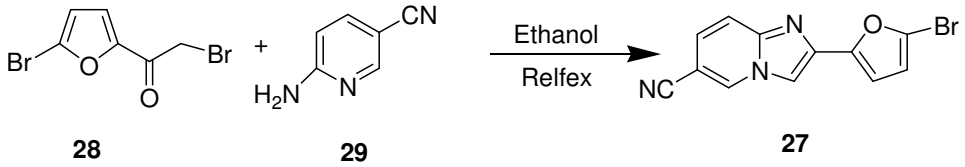
(Scheme-2.2)

Giuseppe[21] et al reported the synthesis of 2-(6,8-dichloro-2-(thiozol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,Ndimethylacetamide **19** by the reaction of 2-(trimethylsilyl)thiazole with methyl 4-chloro-4-oxobutanate to produce **22,** which was treated with pyridinium perbromide in THF to give the bromo derivative **23.** The bromo derivative **23,** on condensation with **24** in toluene gave **25,** which was treated with dioxane in 1N HCl to produce an acid derivative **26.** The acid derivative **26** was aminated with dimethylamine to give the corresponding amide **19 (Scheme-2.3).**



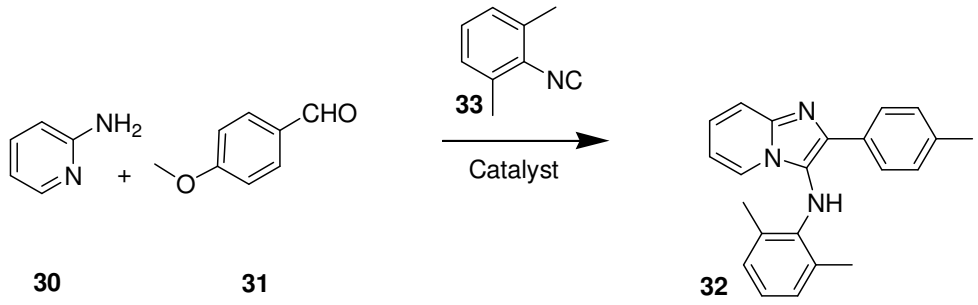
(Scheme-2.3)

Brun[22] et al reported the synthesis of 2-(5-bromofuran-2-yl)imidazo[1,2-a]pyridin-6-carbonitrile **27** by the reaction of 2-bromo-1-(5-bromofuran-2-yl)ethanone **28** with 6-aminonicotinonitrile **29** in ethanol **(Scheme-2.4).**



(Scheme-2.4)

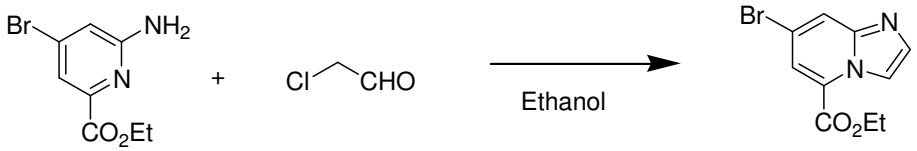
Rousseau[23] et al reported the synthesis of N-(2,6-dimethylphenyl)-2-*p*-tolylimidazo[1,2-a]pyridin-3-amine **32** by the reaction of 2-aminopyridine **30** with aldehyde **31** in presence of isocyanide **33** and catalyst to produce **32 (Scheme-2.5).**



30 **31** **32**

(Scheme-2.5)

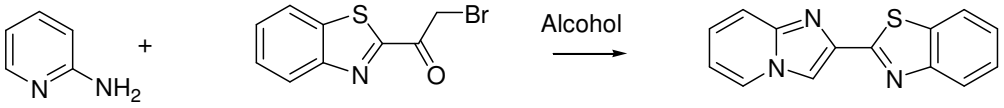
Jeremy[24] et al reported the synthesis of ethyl 7-bromoimidazo[1,2-a]pyridin-5-carboxylate **36** by the reaction ethyl 6-amino-4-bromopicolinate **34,** with chloroacetaldehyde **35** in ethanol to produce **36 (Scheme-2.6).**



34 **35** **36**

(Scheme-2.6)

J.V.Singh[25] et al reported the synthesis of 2-(benzothiazol-2-yl)imidazo[1,2-a]pyridine **38** by the reaction of 2-aminopyridine **30** with 1-(benzolthiazol-2-yl)-2-bromoethanone **37,** in IPA to produce **38 (Scheme-2.7).**



30 **37** **38**

(Scheme-2.7)

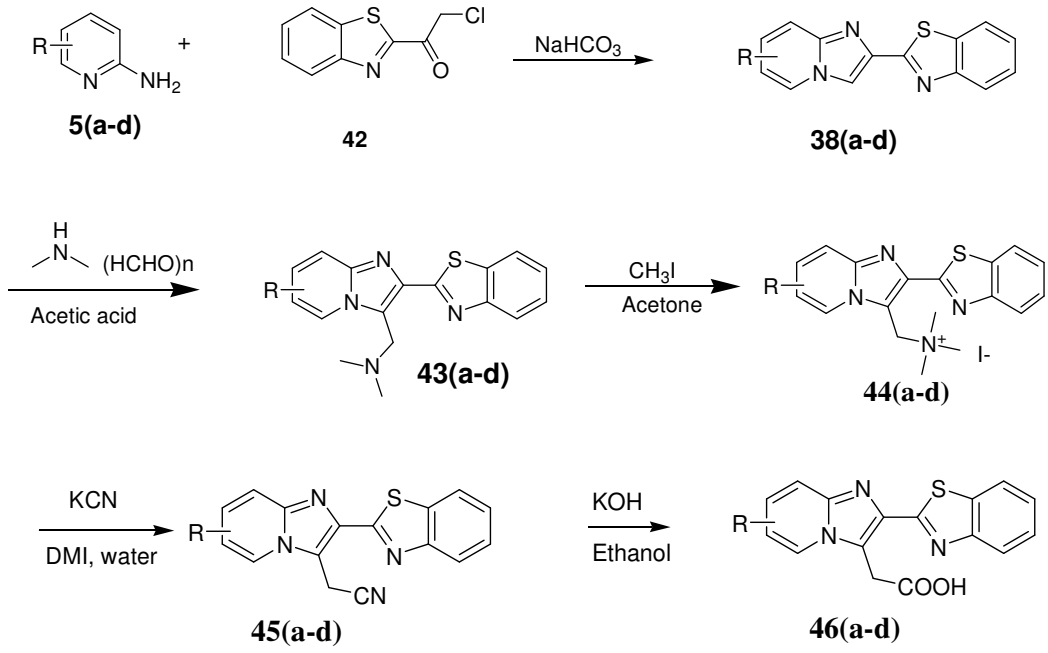
Shankarappa[26] et al reported the synthesis of 6-bromo-2-(3,4-

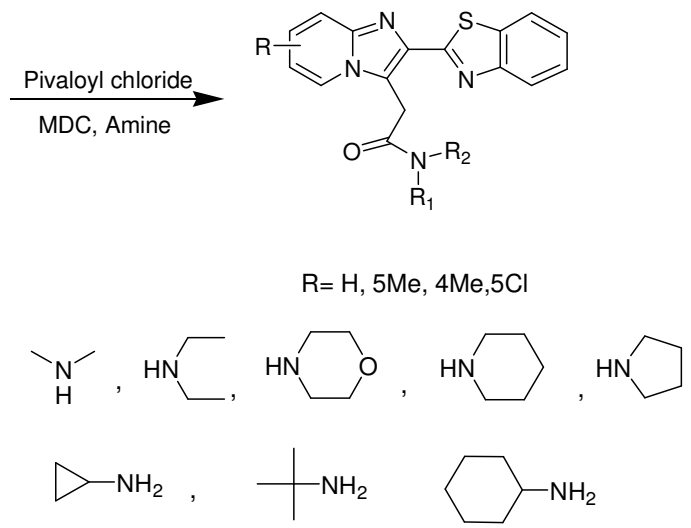
dichlorophenyl)imidazo[1,2-a]pyridine **41** by the reaction of 2-amino-5-bromopyridine **39** with 2-bromo-1-(3,4-dichlorophenyl) ethanone **40** in DMF to produce **41 (Scheme-2.8).**

(Scheme-2.8)

2.3 PRESENT WORK:

The present work involves the synthesis of Zolpidem analogues, containing benzothiazol-2-yl ring at second position, various acetamide derivatives at third position and different substituents in pyridine ring of imidazo[1,2-a]pyridine moiety and study of their anti tubercular activity.



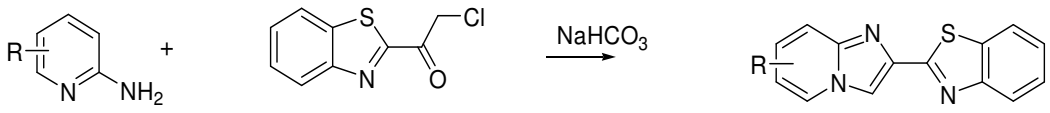


(Scheme-2.9)

2.4 RESULTS AND DISCUSSION

The reaction of 2-aminopyridine **5a** with (benzothiazo-2-yl)-2-chloroethanone **42** with sodiumbicarbonate in isopropanol solvent at 80-85°C for 6h, gave a product which is different from the starting materials and homogeneous on the TLC. The product was characterized as 2-(benzothiazol-2-yl)imidazo[1,2-a]pyridine **38a (Scheme-2.10)** on the basis of its analytical and spectral data. Its **^{1}H NMR** ($CDCl_3$/TMS) spectrum (**Fig-2.1**) showed signals as δ 6.99 (t, *J* = 6.7 Hz, 1H aromatic -C**H**), 7.34 (t, *J* = 8.5Hz, 1H aromatic -C**H**), 7.42 (d, *J* = 7.5Hz, 1H aromatic -C**H**), 7.52 (t, *J* = 7.8 Hz, 1H aromatic -C**H**), 7.65 (d, *J* = 9.0 Hz, 1H aromatic -C**H**), 8.00 (d, *J* = 8.0 Hz, 1H aromatic -C**H**), 8.01 (d, *J* = 7.8 Hz, 1H aromatic -C**H**), 8.59 (d, *J* =6.6 Hz, 1H aromatic -C**H**), 8.65 (s, 1H aromatic -C**H**). Its **^{13}C NMR** ($CDCl_3$/TMS): spectrum (**Fig-2.2**) showed signals at δ 112.25, 113.99, 117.54, 122.81, 123.00, 125.66, 126.92, 126.94, 128.02, 134.91, 139.16,

145.33, 154.24, 163.95 and its **ESI** mass spectrum (**Fig-2.3**) showed molecular ion peak at 252.9(M+1) corresponds to the molecular mass of 251.9 (M^+).



5(a-d) **42** **38(a-d)**

5a) R = H **38a) R = H**

5b) R = 4-Methyl **38b) R = 7-Methyl**

5c) R = 5-Chloro **38c) R = 6-Chloro**

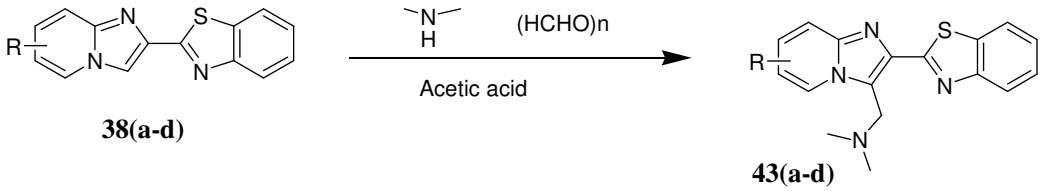
5d) R = 5-Methyl **38d) R = 6-Methyl**

(Scheme-2.10)

In similar manner, 2-amino-4-methylpyridine (**5b**), 2-amino-5-chloro pyridine (**5c**), 2-amino-5-methylpyridine (**5d**) on condensation with (benzothiozol-2-yl)-2-chloroethanone **42** produced **38b, 38c** and **38d** correspondingly. Structures confirmed on the basis of their analytical and spectral data. (for details, please see experimental section)

2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridine **38a** was treated with dimethylamine and paraformaldehyde in presence of aceticacid at 50-55^oC for 5h to give a product and the compound was identified as (2-(benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N-dimethyl methanamine **43a (Scheme-2.11)** on the basis of its analytical and spectral data. **^{1}H NMR** ($CDCl_3$/TMS) spectrum (**Fig-2.4**) showed signals at δ 2.37 (s, 6H, 2xCH_3 –N(C**H$_3$**)$_2$), 4.48 (s, 2H **–**C**H$_2$**-N), 6.91

(t, *J* = 6.7 Hz, 1H aromatic -C**H**), 7.31 (t, *J* = 8.9 Hz, 1H aromatic -C**H**), 7.43 (d, *J* = 7.5 Hz, 1H aromatic -C**H**), 7.53 (t, *J* = 7.7Hz, 1H aromatic -C**H**), 7.72 (d, *J* = 9.1 Hz, 1H aromatic -C**H**), 8.00 (d, *J* = 7.9Hz, 1H aromatic -C**H**), 8.12 (d, *J* = 8.1 Hz, 1H aromatic -C**H**), 8.46 (d, *J* = 6.8Hz, 1H aromatic -C**H**). Its **^{13}C NMR** ($CDCl_3$/TMS) spectrum (**Fig-2.5**) showed signals at δ 45.29, 52.07, 112.85, 117.71, 121.04, 121.69, 123.15, 124.89, 125.68, 125.83, 125.96, 135.17, 137.50, 145.21, 154.55, 164.34 and its **ESI** mass spectrum (**Fig-2.6**) showed molecular ion peak at 309.2(M+1) corresponds to the molecular mass of 308.2(M^+).



38(a-d) **43(a-d)**

38a) R = H **43a) R = H**

38b) R = 7-Methyl **43b) R = 7-Methyl**

38c) R = 6-Chloro **43c) R = 6-Chloro**

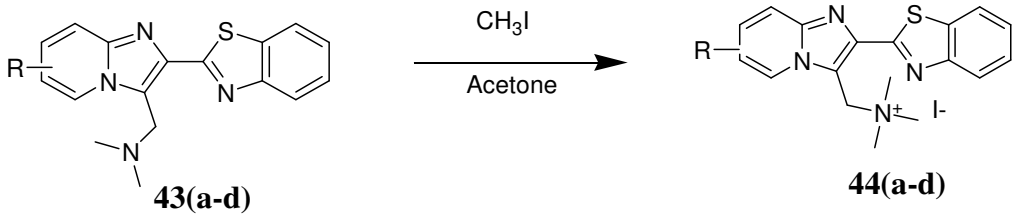
38d) R = 6-Methyl **43d) R = 6-Methyl**

(Scheme-2.11)

This general reaction was extended to other compounds such as 2-(benzothiazol-2-yl)-7methylimidazo[1,2-a]pyridine (**38b**), 2-(benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridine (**38c**) and 2-(benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridine (**38d**) and the

products were **43b, 43c** and **43d** on the basis of their analytical and spectral data. (for details, please see experimental section).

(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine **43a** was treated with methyliodide in acetone at 10-15°C for 15h to give a product, which was different from the starting materials and homogeneous on the TLC. The compound was characterized as (2-(benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide **44a (Scheme-2.12)** on the basis of its analytical and spectral data. Its **^{1}H NMR** (DMSO-d_6/TMS) spectrum (**Fig-2.7**) showed signals at δ 3.25 (s, 9H, 3xCH_3 –N^+(C**H$_3$**)$_3$), 5.51 (s, 2H **–**C**H$_2$-**N), 7.26 (d, *J* = 6.7 Hz, 1H aromatic **-**C**H**), 7.61 (m, 3H aromatic **-**C**H**), 7.87 (d, *J* = 9.0 Hz, 1H aromatic **-**C**H**), 8.22 (t, *J* = 8.8 Hz, 2H aromatic **-**C**H**), 9.01 (d, *J* = 6.8 Hz, 1H aromatic **-**C**H**). Its **^{13}C NMR** (DMSO-d_6/TMS) spectrum (**Fig-2.8**) showed signals at δ 52.83, 57.38, 112.31, 115.10, 118.21, 122.79, 123.76, 126.29, 126.36, 127.07, 128.45, 134.90, 140.98, 146.55, 153.98, 163.73 and its **ESI** mass spectrum (**Fig-2.9**.) showed base peak at 265.5 corresponds to its fragment ion peak.



43(a-d) **44(a-d)**

43a) R = H **44a) R = H**

43b) R = 7-Methyl **44b) R = 7-Methyl**

43c) R= 6-Chloro **44c) R= 6-Chloro**

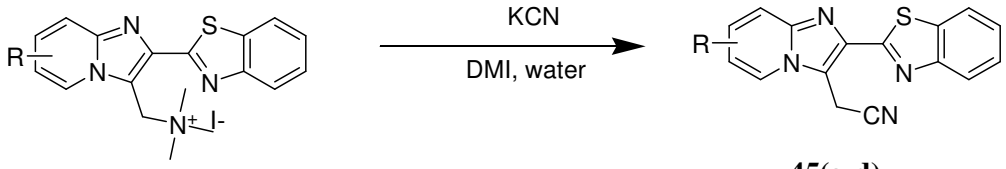
43d) R = 6-Methyl **44d) R = 6-Methyl**

(Scheme-2.12)

(2-(benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine (**43b**), (2-(benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridine-3-yl)-N,N-dimethylmethanamine (**43c**) and (2-(benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridine-3-yl)-N,N-dimethylmethanamine (**43d**) reacted alike with methyliodide to produce compounds **44b, 44c** and **44d** respectively. All the products were confirmed the assigned structures on the basis of their analytical and spectral data. (for details, please see experimental section)

(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethyl methanammonium iodide **44a** was treated with potassium cyanide in dimethylimidazolidine and water at 95-100^{o}C for 36h to yield 2-(2-(benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)acetonitrile (**45a**) **(Scheme-2.13)**. The compound was characterized as on the basis of its analytical and spectral data. Accordingly the product in its **IR** (In KBr) spectrum **(Fig-2.10**) showed a peak at **2244cm^{-1}** as strong band corresponding to cyano group. **^{1}H NMR** ($CDCl_3$/TMS) spectrum **(Fig-2.11)** showed signals at δ 5.00 (s, 2H **–CH_2-**CN), 7.07 (t, *J* = 6.7 Hz, 1H aromatic **-C**H), 7.35-7.41 (m, 2H aromatic **-C**H), 7.51 (t, *J* = 7.6 Hz, 1H aromatic **-C**H), 7.77 (d, *J* = 9.1 Hz, 1H aromatic **-C**H), 7.98 (d, *J* = 7.9 Hz, 1H aromatic **-C**H), 8.08 (d, *J* = 7.8 Hz, 1H aromatic **-C**H), 8.17 (d, *J* = 6.8 Hz, 1H aromatic **-C**H). Its **^{13}C NMR** ($CDCl_3$/TMS):

spectrum (**Fig-2.12**) showed signals as δ 32.65, 113.80, 114.07, 117.99, 118.20, 122.65, 124.50, 125.35, 126.04, 126.42, 134.91, 136.26, 139.29, 145.19, 153.76 and 165.02. Its **ESI** mass spectrum **(Fig-2.13)** showed molecular ion peak at 291.1(M+1) related to the molecular mass of product 290.1(M^+).



44(a-d) **45(a-d)**

44a) R = H **45a) R =H**

44b) R = 7-Methyl **45b) R = 7-Methyl**

44c) R = 6-Chloro **45c) R = 6-Chloro**

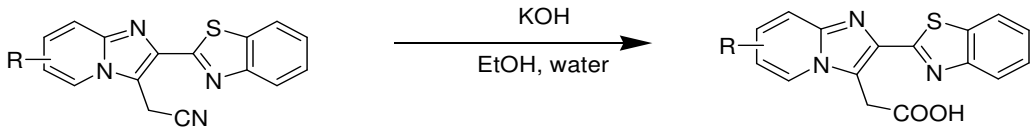
44d) R = 6-Methyl **45d) R = 6-Methyl**

(Scheme-2.13)

Similar procedure extended to other derivatives. (2-(benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethyl methan ammonium iodide (**44b**), (2-(benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide (**44c**) and (2-(benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide (**44d**) reacted with KCN and DMI to produce **45b, 45c** and **45d**. The products obtained were confirmed the assigned structure on the basis of their analytical and spectral data. (for details, please see experimental section).

2-(2-(Benzothiazol-2-yl)6-methylimidazo[1,2-a]pyridin-3-yl)acetonitrile **45a** was hydrolyzed using potassium hydroxide in aqueous ethanol

at 80-85°C for 24h to give a product, which was different from the starting materials. Obtained product confirmed as 2-(2-(benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)aceticacid **46a (Scheme-2.14)** on the basis of its analytical and spectral data. The product in its **IR** (In KBr) spectrum **(Fig-2.14)** showed a peak at **1707cm^{-1}** a strong band for carboxylic acid functional group. **^{1}H NMR** (DMSO-d_6/TMS) spectrum **(Fig-2.15)** showed signals at 4.66 (s, 2H –C**H$_2$**-CO), 7.02 (t, *J* = 6.6 Hz, 1H aromatic -C**H**), 7.41 (m, 2H aromatic -C**H**), 7.50 (t, *J* = 7.6 Hz, 1H aromatic -C**H**), 7.67 (d, *J* = 9.0 Hz, 1H aromatic -C**H**), 8.00 (d, *J* = 8.0 Hz, 1H aromatic -C**H**), 8.11 (d, *J* = 7.8 Hz, 1H aromatic -C**H**), 8.45 (d, *J* = 6.8 Hz, 1H aromatic -C**H**), 12.75 (s, 1H -COO**H**). Its **^{13}C NMR** (DMSO-d_6/TMS) spectrum **(Fig-2.16)** showed signals at δ 29.87, 113.61, 117.53, 118.85, 122.63, 123.11, 125.65, 126.06, 126.57, 126.89, 134.58, 135.97, 144.72, 154.36, 164.85, 170.98 and its **ESI** mass spectrum **(Fig-2.17)** showed molecular ion peak at 310.0(M+1) corresponding to its molecular mass of 309.0(M^+).



45(a-d) **46(a-d)**

45a) R = H **46a) R = H**

45b) R = 7-Methyl **46b) R = 7-Methyl**

45c) R = 6-Chloro **46c) R = 6-Chloro**

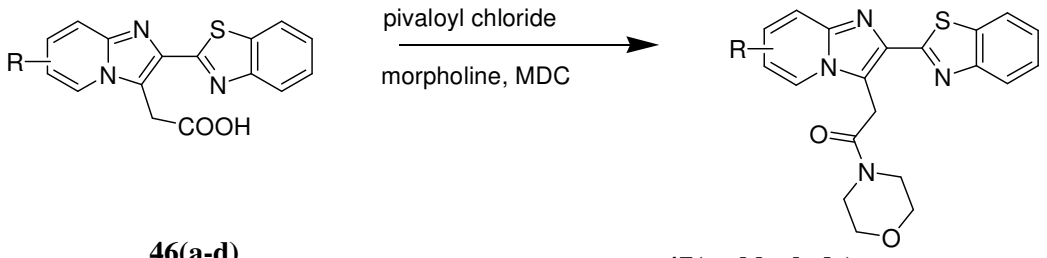
45d) R = 6-Methyl **46d) R = 6-Methyl**

(Scheme- 2.14)

This general procedure **45a** hydrolysis with KOH in ethanol to produce **46a** applied to preparation of other derivatives. 2-(2-(benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)acetonitrile (**45b**), 2-(2-(benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)acetonitrile (**45c**) and 2-(2-(benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)acetonitrile (**45d**) produced **46b, 46c** and **46d** respectively. Obtained products structures established on the basis of their analytical and spectral data. Details presented in experimental section.

2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)aceticacid **46a** was treated with pivaloyl chloride in dichloromethane solvent followed by morpholine at 0-5^{o}C for 1h to give the corresponding product, 2-(2-(benzothiazol-2-yl)imidazo[1,2-a]pyridin-3yl)-1-(morpholin-4-yl)ethanone (**47aa**) **(Scheme-2.15)**. Compound structure confirmed on the basis of its analytical and spectral data. Its **^{1}H NMR** ($CDCl_3$/TMS) spectrum **(Fig-2.18)** showed signals at δ 3.54 (t, *J* = 4.4 Hz, 2H morpholine-C**H$_2$**), 3.61 (s, 4H morpholine 2x-C**H$_2$**), 3.97 (t, *J* = 4.4 Hz, 2H morpholine-C**H$_2$**), 4.81 (s, 2H **-**C**H$_2$-**CO), 6.92 (t, *J* = 8.0 Hz, 1H aromatic **-**C**H**), 7.29 (t, *J* = 7.2 Hz, 1H aromatic **-**C**H**), 7.41 (t, *J* = 7.6 Hz, 1H aromatic **-**C**H**), 7.50 (t, *J* = 7.2 Hz, 1H aromatic **-**C**H**), 7.60 (d, *J* = 8.8 Hz, 1H aromatic **-**C**H**), 7.97 (t, *J* = 8.8 Hz, 2H aromatic **-**C**H**), 8.62 (d, *J* = 6.8 Hz, 1H aromatic **-**C**H**). Its **^{13}C NMR** ($CDCl_3$/TMS) spectrum **(Fig-2.19)** showed signals at δ 30.5, 42.71, 46.90, 66.84, 66.94, 113.38, 117.30, 117.79, 121.96, 122.52, 125.14, 125.78,

125.99, 126.25, 134.97, 135.76, 145.40, 154.22, 164.71, 167.29 and its **ESI** mass spectrum **(Fig-2.20)** showed molecular ion peak at 379.3(M+1) related to the molar mass product 378.3(M^+).



46(a-d) **47(aa,bb,cb,dc)**

46a) R =H **47aa) R = H**

46b) R = 7-Methyl **47bb) R = 7-Methyl**

46c) R = 6-Chloro **47cb) R = 6-Chloro**

46d) R = 6-Methyl **47dc) R = 6-Methyl**

(Scheme- 2.15)

The reaction of 2-(2-(benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)aceticacid (**46b**), 2-(2-(benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)aceticacid (**46c**) and 2-(2-(benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)aceticacid (**46d**) with pivaloyl chloride and morpholine to produce the corresponding morpholinyl amides **47b, 47c** and **47d** respectively. Analytical and spectral data confirmed the structures.

In similar methods, we have prepared a series of compounds with various amines such as dimethylamine, diethylamine, tert butylamine, cyclo propylamine, cyclo hexylamine, piperidine and pyrrolidine and

different substituents at imidazo[1,2-a]pyridine ring such as 7-methyl, 6-methyl and 6-chloro. All the compounds are presented in **Table 2.1**. Analytical and spectral data presented in experimental section.

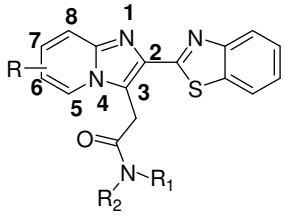
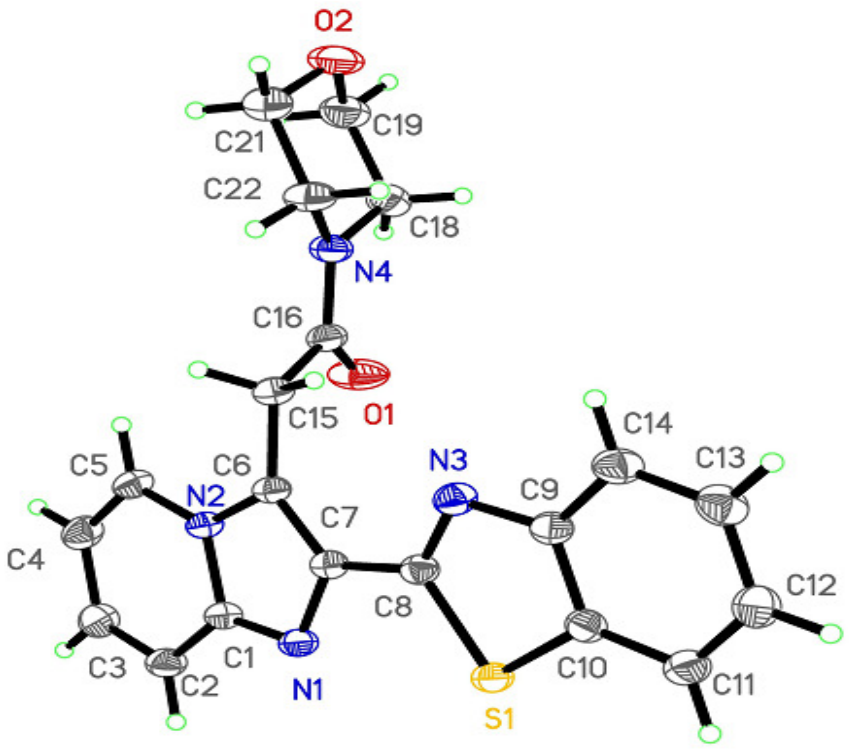


Table 2.1: Various 2-(benzothiazol-2yl)-3-acedamideimidazo[1,2-a]pyridines derivatives.

Entry	Product	R	R_1	R_2	Yield
1	47aa	H	morpholinyl		75%
2	47ab		$-C_2H_5$	$-C_2H_5$	73%
3	47ac		Piperdinyl		78%
4	47ad		pyrrolidinyl		72%
5	47ae		H	Tert-butyl	69%
6	47af		H	Cyclohexyl	71%
7	47ag		H	Cyclopropyl	75%
8	47ba	7-methyl	$-C_2H_5$	$-C_2H_5$	64%
9	47bb		Morpholinyl		66%
10	47bc		Piperdinyl		68%
11	47bd		Pyrrolidinyl		72%
12	47be		H	Tert-butyl	71%
13	47bf		H	Cyclohexyl	70%
14	47ca	6-chloro	$-C_2H_5$	$-C_2H_5$	69%
15	47cb		Morpholinyl		72%
16	47cc		Piperdinyl		71%
17	47cd		Pyrrolidinyl		70%
18	47da	6-Methyl	$-CH_3$	$-CH_3$	75%
19	47db		$-C_2H_5$	$-C_2H_5$	74%

20	47dc		Morpholinyl		78%
21	47dd		Piperdinyl		82%
22	47de		pyrrolidinyl		68%
23	47df		H	Tert-butyl	69%
24	47dg		H	Cyclohexyl	70%
25	47dh		H	Cyclopropyl	81%

For further conformation of the structure of these compounds, we analyzed a typical compound of **47aa** by single crystal X-Ray analysis. The structure of the compound confirmed unambiguously as depicted below.



X-Ray crystal structure of compound 47aa - 2-(-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-1-(morpholin-4-yl)ethanone.

Biological evaluation of prepared compounds

A total of 25 new compounds were screened for in vitro activity against M.tuberculosis H37Rv (ATCC 27294 strain) using the agar dilution method. The MIC (minimum inhibitory concentration) is defined as the minimum concentration of the compound required to completely inhibit bacterial growth. The MIC values (μg/mL) of all the synthesized compounds and three standard antitubercular drugs determined in triplicate at pH 7.40 are presented in **Table 2.2**. Several derivatives displayed MIC value of 6.25 μg/mL, a value postulated by the global program as an upper threshold for the evaluation of M. tuberculosis therapy and for the discovery of new antituberculosis drugs.

In-vitro MTB screening

Two-fold serial dilutions of each test compound/drug were prepared and incorporated into Middle- brook 7H11 agar medium with oleic acid, albumin, dextrose, and catalase (OADC) growth supplement to get final concentrations of 50, 25, 12.5, 6.25, 3.13, 1.56, and 0.78 μg/mL. Inoculum of *M. tuberculosis* H37Rv ATCC 27294 was prepared from fresh Middlebrook 7H11 agar slants with OADC (Difco) growth supplement adjusted to 1 mg/ mL (wet weight) in Tween 80 (0.05%) saline diluted to 10^{-2} to give a concentration of ~10^{7} cfu/mL. Five microliters of this bacterial suspension was spotted onto 7H11 agar tubes containing different concentrations of the drug as discussed above. The tubes were incubated at 37 °C, and final readings (as MIC in μg/mL) were determined after 28 days. This

method is similar to that recommended by the National Committee for Clinical Laboratory Standards for the determination of MIC in triplicate.

Table 2.2: Antitubercular activity of the compounds.

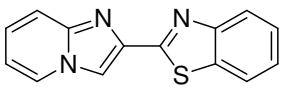
S. No.	Compound	MIC in ug/ml
1	47aa	12.5
2	47ab	3.13
3	47ac	1.56
4	47ad	25
5	47ae	6.25
6	47af	25
7	47ag	6.25
8	47ba	12.5
9	47bb	6.25
10	47bc	1.56
11	47bd	3.13
12	47be	12.5
13	47bf	1.56
14	47ca	3.13
15	47cb	25
16	47cc	1.56
17	47cd	25
18	47da	6.25
19	47db	3.13
20	47dc	50
21	47dd	12.5
22	47de	6.25
23	47df	1.56
24	47dg	1.56
25	47dh	3.13
26	Isoniazid	0.05
27	Ethambutol	1.56
28	Pyrazinamide	6.25

2.5 EXPERIMENTAL SECTION:

General procedure for the preparation of 2-(Benzothiazo-2-yl)imidazo[1,2-a]pyridine derivatives (38a-d)

A mixture of 2-aminopyridine **5a** (8.9g, 94.7 mmol), 1-(benzothiazol-2-yl)-2-chloroethanone **42** (12.0g, 94.7 mmol) and sodium bicarbonate (12g, 14.3 mmol) in isopropanol was magnetically stirred in a RB flask fitted a condenser initially at room temperature and later at reflux temperature for 6h. The progress of the reaction was monitored by Thin layer chromotography. On completion, the reaction mixture was diluted with water (120 ml) and extracted with MDC (2 X 60 ml). The organic extract was washed with water (50 ml) dried over anhydrous sodium sulphate. The solution was filtered and concentrated to get brown colour solid **38a**. Analytical and spectral data are given below.

38a: 2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridine.



38a

Description : Brown colour solid.

Melting point: Up to 260.0°C (Not clear)

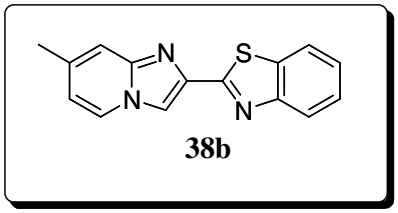
IR (In KBr) : 3412, 3118, 3046, 1502, 1450, 1433, 1361, 1314, 1183, 911, 756, 737, 725, 699 cm^{-1}

^{1}H NMR (DMSO-d_6/TMS): δ 6.99 (t, *J* = 6.7 Hz, 1H), 7.34 (t, *J* = 8.5Hz,

1H), 7.42 (d, *J* = 7.5Hz, 1H), 7.52 (t, *J* = 7.8 Hz, 1H), 7.65 (d, *J* = 9.0 Hz, 1H), 8.00 (d, *J* = 8.0 Hz, 1H), 8.01 (d, *J* = 7.8 Hz, 1H), 8.59 (d, *J* = 6.6 Hz, 1H), 8.65 (s, 1H).

^{13}C NMR (DMSO-d_6/TMS):δ 112.25, 113.99, 117.54, 122.81, 123.00, 125.66, 126.92, 126.94, 128.02, 134.91, 139.16, 145.33, 154.24, 163.95; **ESI-MS:(m/z):** 252.95(M+1).

38b: 2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridine.



38b

Description : Brown colour solid.

Melting point: Up to 260.0^{o}C (Not clear).

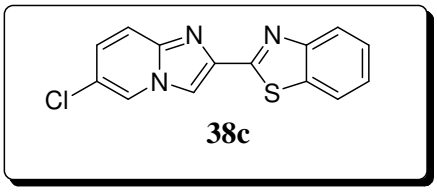
IR (In KBr) : 3433, 3129, 3038, 1646, 1569, 1432, 1364, 1316, 1185, 1165, 1015, 917, 798, 756, 725, 694 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.41 (s, 3H), 6.70 (d, *J* = 8.0 Hz, 1H), 7.40 (t, *J* = 8.0 Hz, 1H), 7.43 (s, 1H), 7.50 (d, *J* = 7.6 Hz, 1H), 7.96 (d, *J* = 9.2 Hz, 1H), 8.05 (d, *J* = 7.2 Hz, 2H), 8.25 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.49, 110.44, 116.28, 116.39, 121.85, 122.86, 124.94, 125.23, 126.20, 135.18, 136.87, 139.97, 146.11, 154.20, 163.77.

ESI-MS:(m/z): 266.2 (M+1).

38c: 2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridine.



38c

Description : Brown colour solid.

Melting point: Up to 260.0°C (Not clear).

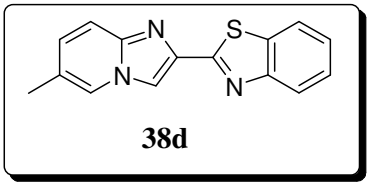
IR (In KBr) : 3421, 3125, 3035, 1183, 1073, 919, 796, 758, 726, 709 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 7.23 (d, *J* = 9.6 Hz,1H), 7.42 (t, *J* = 8.0 Hz, 1H), 7.52 (t, *J* = 7.6 Hz,1H), 7.65 (d, *J* = 9.6 Hz, 1H), 7.97 (d, *J* = 7.9 Hz, 1H), 8.06 (d, *J* = 8.1 Hz, 1H), 8.22 (s, 1H), 8.29 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 112.35, 113.25, 117.54, 122.71, 123.00, 125.56, 126.82, 126.74, 128.12, 134.81, 139.36, 144.33, 153.24, 162.95.

ESI-MS:(m/z): 286.0(M+1).

38d: 2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridine.



38d

Description : Brown colour solid.

Melting point: 245.1-247.2°C.

IR (In KBr) : 3434, 3126, 2924, 1569, 1349, 1312, 1184, 1159, 920, 784, 759, 728 $cm^{-1.}$

^{1}H NMR ($CDCl_3$/TMS): δ 2.32 (s, 3H), 7.09 (dd, *J* =1.0Hz, *J* = 9.2Hz, 1H), 7.40 (t, *J* = 7.6 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.59 (d, *J* = 6.8 Hz, 1H), 7.95 (m, 2 H), 8.05 (d, *J* = 8.70 Hz, 1H), 8.23, (S, 1H).

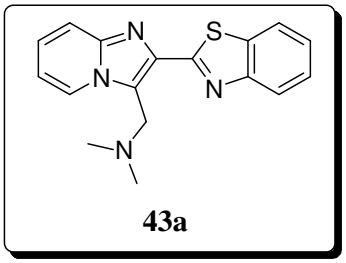
^{13}C NMR ($CDCl_3$/TMS): δ 18.04, 110.53, 117.25, 121.74, 122.70, 123.23, 123.55, 124.83, 126.09, 128.95, 135.07, 139.75, 144.56, 154.05, 163.67.

ESI-MS:(m/z): : 266.1(M+1).

General procedure for the preparation of 2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine derivatives (43a-d).

A mixture of 2-(benzothiazol-2-yl)imidazo[1,2-a]pyridine **38a** (1.9g, 7.54mmol), dimethylamine (40% in water) (1.27g, 11.3 mmol) and paraformaldehyde (0.29g, 9.81mmole) in aceticacid (40.0 ml) was stirred at 50-55^{0}C for 4h and the progress of the reaction was monitored by TLC. After completion, aceticacid was distilled at reduced pressure and the residue diluted with water (25 ml). The solution was basified with sodium bicarbonate. Product was extracted with ethylacetate (2 x 25 ml) and the organic layer was washed with water 20 ml, dried over anhydrous sodium sulphate, filtered and concentrated. The residue was stirred in 10 ml of n-Hexane to give the product **43a**. Analytical and spectral data are given below.

43a: (2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine.



43a

Description : Pale brown colour solid.

Melting point: 173.5 -174.9^{o}C

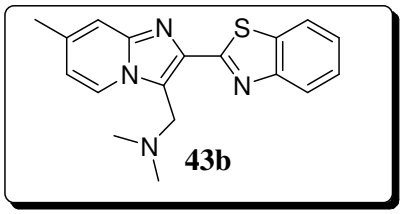
IR (In KBr) : 3435, 3036, 2935, 2822, 2775, 1374, 1346, 1253, 1235, 1044, 1014, 761, 751, 739, 691 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.37 (s, 6H, 2xCH_3), 4.48 (s, 2H), 6.91 (t, *J* = 6.7 Hz, 1H), 7.31 (t, *J* = 8.9 Hz, 1H), 7.43 (d, *J* = 7.5 Hz, 1H), 7.53 (t, *J* = 7.7Hz, 1H), 7.72 (d, *J* = 9.1 Hz, 1H), 8.00 (d, *J* = 7.9Hz, 1H), 8.12 (d, *J* = 8.1 Hz, 1H), 8.46 (d, *J* = 6.8Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 45.29, 52.07, 112.85, 117.71, 121.04, 121.69, 123.15, 124.89, 125.68, 125.83, 125.96, 135.17, 137.50, 145.21, 154.55, 164.34.

ESI-MS: (m/z): 309.2(M+1).

43b: (2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine.



43b

Description : Pale brown colour solid.

Melting point: 163.4-164.8°C.

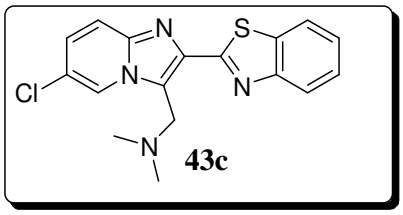
IR (In KBr) : 3430, 3055, 2942, 2812, 2756, 1644, 1575, 1453, 1374, 1238, 1011, 963, 780, 757, 726, 609 cm^{-1} .

^{1}H NMR ($CDCl_3$/TMS): δ 2.32 (s, 6H, 2xCH_3), 2.41 (s, 3H), 4.41 (s, 2H), 6.69 (t, *J* = 2.4 Hz, 1H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.41 (s, 1H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.95 (d, *J* = 8.0 Hz, 1H), 8.07 (d, *J* = 8.4 Hz, 1H), 8.29 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.51, 45.26, 52.07, 115.56, 115.96, 120.57, 121.66, 123.07, 124.77, 124.93, 125.90, 135.15, 136.70, 137.22, 145.67, 154.56, 164.56.

ESI-MS: (m/z): 323.3(M+1).

43c: (2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine.



43c

Description : Pale brown colour solid.

Melting point: 193.5 – 196.8°C

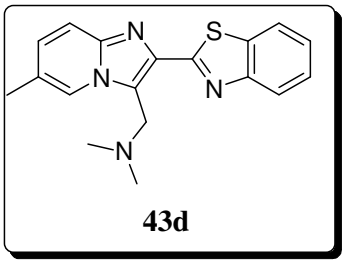
IR (In KBr) : 3429, 3097, 2821, 2778, 1373, 1088, 965, 794, 758, 733, 682 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.37 (s, 6H, 2xCH_3), 4.43 (s, 2H), 7.25 (m, 1H), 7.41 (t, *J* = 7.6 Hz, 1H), 7.51 (t, *J* = 7.6 Hz, 1H), 7.62 (d, *J* = 9.5 Hz, 1H), 7.96 (d, *J* = 7.8 Hz, 1H), 8.08 (d, *J* = 8.1 Hz,, 1H), 8.51 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 45.27, 52.13, 118.02, 121.01, 121.62, 121.70, 123.25, 123.89, 125.07, 126.06, 127.16, 135.16, 138.32, 143.53, 154.49, 163.77.

ESI-MS:(m/z): 343.0(M+1).

43d: (2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N,N-dimethylmethanamine.



43d

Description : Pale brown colour solid.

Melting point: 188.7 –190.0°C.

IR (In KBr) : 3400, 3081, 2977, 2943, 2818, 2773, 1571, 1540, 1455, 1370, 1344, 1237, 1160, 1041, 1018, 965, 934, 793, 763, 728 cm^{-1} .

^{1}H NMR ($CDCl_3$/TMS): δ 2.35 (s, 6H, 2xCH_3), 2.37 (s, 3H), 4.42 (s, 2H), 7.12 (dd, *J* = 1.1Hz, *J* = 9.3 Hz, 1H), 7.39 (t, *J* = 7.2 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.59 (d, *J* = 12 Hz, 1H), 7.96 (d, *J* = 8.0 Hz, 1H), 8.07 (d, *J* = 8.0 Hz, 1H), 8.13 (s, 1H).

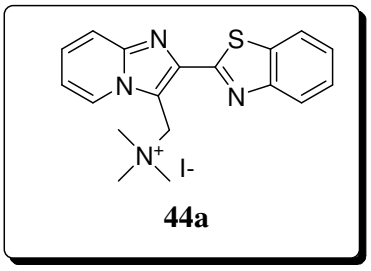
^{13}C NMR ($CDCl_3$/TMS): δ 18.46, 45.21, 51.85, 116.90, 120.59, 121.52, 122.51, 122.94, 124.66, 125.77, 128.82, 135.00, 137.26, 144.18, 154.43, 164.40.

ESI-MS: (m/z): 323.2(M+1).

General procedure for the preparation of (2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethyl methanammonium iodide derivatives (44a-d).

A solution of Mannich base **43a** (1.4g,0.465 mmol) in 140 ml of acetone was stirred at 10-15^{0}C for about 10-15 minutes and to this solution methyliodide (1.98g 1.397mmol) was added. The reaction mixture was stirred for 16h at RT and the solid was filtered, washed with acetone (10 ml) to give the product **44a**. Analytical and spectral data are given below.

44a: (2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide.



44a

Description : Pale brown colour solid.

Melting point: Up to 260.0^{o}C (Not clear).

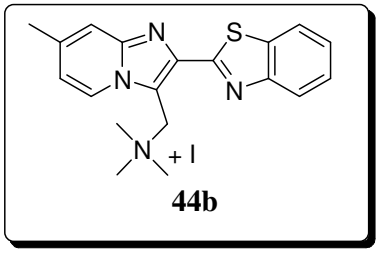
IR (In KBr) : 3428, 3067, 3033, 3007, 1488, 1359, 1192, 1148, 974, 926, 868, 752, 737, 727, 695 cm^{-1}.

^{1}H NMR (DMSO-d$_6$/TMS): δ 3.25 (s, 9H, 3xCH_3), 5.51 (s, 2H), 7.26 (d, *J* = 6.7 Hz, 1H), 7.61 (m, 3H), 7.87 (d, *J* = 9.0 Hz, 1H), 8.22 (t, *J* = 8.8 Hz, 2H), 9.01 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR (DMSO-d$_6$/TMS): δ 52.83, 57.38, 112.31, 115.10, 118.21,

122.79, 123.76, 126.29, 126.36, 127.07, 128.45, 134.90, 140.98, 146.55, 153.98, 163.73.

44b: (2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide.



44b

Description : Pale brown colour solid.

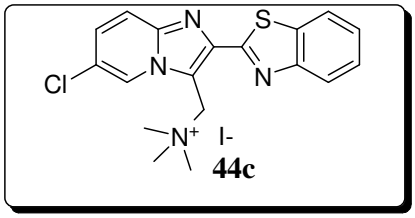
Melting point: Up to 260.0°C (Not clear).

IR (In KBr) : 3436, 3045, 2996, 2917, 1714, 1647, 1488, 1358, 925, 872, 780, 770, 735, 607 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 2.42 (s, 3H), 3.22 (s, 9H, 3xCH_3), 5.45 (s, 2H), 7.10 (d, *J* = 6.8 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.60 (t, *J* = 7.6 Hz, 2H), 8.19 (t, *J* = 7.6 Hz, 2H), 8.88 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 21.22, 52.79, 57.48, 111.64, 116.24, 117.53, 122.72, 123.70, 125.40, 126.22, 126.97, 134.83, 139.24, 140.84, 146.87, 153.96, 163.77.

44c: (2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide.



44c

Description : Pale brown colour solid.

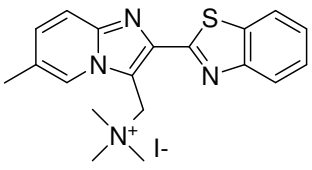
Melting point : Up to 260.0°C(Not clear).

IR (In KBr) : 3438, 3006, 1707, 1488, 1362, 1088, 877, 794, 765, 732 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 3.20 (s, 9H, 3xCH_3), 5.43 (s, 2H) 7.49 (t, *J* = 7.6 Hz, 1H), 7.60 (m, 2H), 7.89 (d, *J* = 9.5 Hz, 1H), 8.19 (t, *J* = 7.8 Hz, 2H), 9.24 (s, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 52.83, 57.15, 113.05, 119.08, 122.33, 122.81, 123.83, 124.29, 126.45, 127.12, 129.34, 134.96, 141.90, 145.09, 153.92, 163.22.

44d: (2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N,N,N-trimethylmethanammonium iodide.



44d

Description : Pale brown colour solid.

Melting point: Up to 260.0°C (Not clear).

IR (In KBr) : 3437, 3030, 3005, 1485, 1380, 1361, 1317, 1157, 973, 943, 875, 802, 758, 728 cm^{-1} .

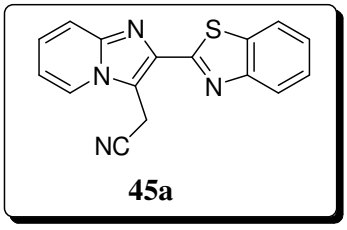
^{1}H NMR (DMSO-d_6/TMS): δ 2.38 (s, 3H), 3.25 (s, 9H, 3xCH_3), 5.46 (s, 2H) 7.40 (d, *J* = 9.1 Hz, 1H), 7.49 (t, *J* = 7.5 Hz, 1H), 7.59 (t, *J* = 7.5 Hz, 1H), 7.74 (d, *J* = 9.1 Hz, 1H), 8.14-8.19 (m, 2H), 8.84 (s, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 18.20, 52.75, 57.37, 111.10, 117.37, 122.62, 123.41, 123.57, 124.71, 126.14, 126.89, 131.20, 134.74, 140.70, 145.45, 153.85, 163.71.

General procedure for the preparation of 2-(2-(Benzothiazol-2-yl)imdazo [1,2-a] pyridin-3-yl)acetonitrile derivatives (45a-d).

A mixture of the quaternary salt **44a** (1.5g, 3.3 mmol) and potassium cyanide (1.08g, 16.7mol) in 15 ml of water and 7.5ml of DMI was stirred at reflux temperature for 30-36h. The progress of the reaction was monitored by TLC and on completion, cooled to room temperature and stirred for 30 minutes. Formed solid was filtered, washed with water, dried in the oven. Obtained solid further purified by silica gel column chromatography using MDC as eluent to give the product **45a**. Analytical and spectral data are given below.

45a: 2-(2-(Benzothiazol-2-yl)imdazo[1,2-a]pyridin-3-yl)acetonitrile.



45a

Description : Off-white solid

Melting point: 238.0 - 240.0^{o}C

IR (In KBr) : 3434, 2944, 2924, 2244, 1364, 1317, 1240, 1143, 925, 759, 747, 736 cm^{-1}.

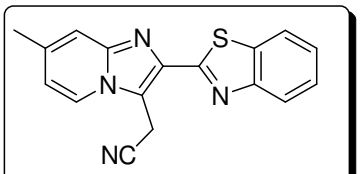
^{1}H NMR (CDCl$_3$/TMS): δ 5.00 (s, 2H), 7.07 (t, *J* = 6.7 Hz, 1H), 7.35-7.41 (m, 2H), 7.51 (t, *J* = 7.6 Hz, 1H), 7.77 (d, *J* = 9.1 Hz, 1H), 7.98 (d,

J = 7.9 Hz, 1H), 8.08 (d, *J* = 7.8 Hz, 1H), 8.17 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 32.65, 113.80, 114.07, 117.99, 118.20, 122.65, 124.50, 125.35, 126.04, 126.42, 134.91, 136.26, 139.29, 145.19, 153.76, 165.02,

ESI-MS: (m/z): 291.1(M+1).

45b: 2-(2-(Benzothiazol-2-yl)-7-methylimdazo[1,2-a]pyridin-3-yl)acetonitrile.



45b

Description : Off-white solid

Melting point: Up to 260.0°C (Not clear).

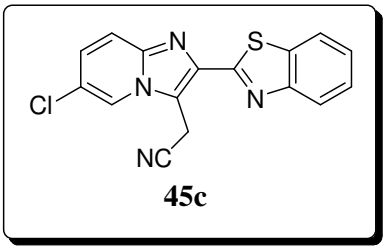
IR (In KBr) : 3436, 3053, 2921, 2245, 1645, 1361, 1316, 1262, 1243, 1166, 919, 755, 728, 706, 511 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.46 (s, 3H), 4.96 (s, 2H), 6.87 (t, *J* = 6.0 Hz, 1H), 7.42 (t, *J* = 7.2 Hz, 1H), 7.52 (t, *J* = 6.4 Hz, 2H), 7.97 (d, *J* = 8.0 Hz, 1H), 8.05 (t, *J* = 8.0 Hz, 2H).

^{13}C NMR ($CDCl_3$/TMS): δ 13.31, 21.51, 110.42, 115.04, 116.77, 117.04, 121.85, 122.41, 123.14, 125.29, 126.31, 134.90, 137.02, 137.51, 146.04, 154.18, 163.46.

ESI-MS:(m/z): 305.4(M+1).

45c: 2-(2-(Benzothiazol-2-yl)-6-chloroimdazo[1,2-a]pyridin-3-yl)acetonitrile.



45c

Description : Off-white solid

Melting point: Up to 260.0°C (Not clear).

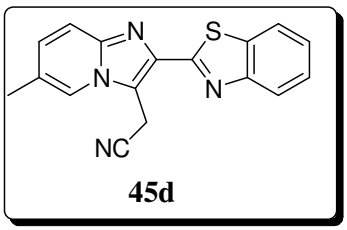
IR (In KBr) : 3422, 3060, 2920, 2245, 1680, 1375, 1144, 944, 796, 759, 729, 706 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 5.41 (s, 2H), 7.47 (t, *J* = 8.4 Hz, 2H), 7.55 (t, *J* = 7.6 Hz, 1H), 7.77 (d, *J* = 9.6 Hz, 1H), 8.06 (d, *J* = 8.0 Hz, 1H), 8.14 (d, *J* = 7.8 Hz, 1H), 8.17 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 30.83, 118.40, 120.40, 120.92, 122.67, 123.17, 124.19, 125.75, 126.92, 127.30, 134.62, 136.75, 140.90, 154.35, 164.47, 170.07.

ESI-MS:(m/z): 326.0(M+1).

45d: 2-(2-(Benzothiazol-2-yl)-6-methylimdazo[1,2-a]pyridin-3-yl)acetonitrile.



45d

Description : Off-white solid

Melting point: Up to 260.0°C (Not clear).

IR (In KBr) : 3424, 3060, 2921, 2246, 1684, 1375, 1144, 944, 796, 759, 729, 706 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.44 (s, 3H), 4.98 (s, 2H), 7.24 (m, 1H), 7.43 (d, *J* = 7.6 Hz, 1H), 7.52 (d, *J* = 7.2 Hz, 1H), 7.67 (d, *J* = 9.2 Hz, 1H), 7.91 (s, 1H), 7.98 (d, *J* = 8.0 Hz, 1H), 8.07 (d, *J* = 8.0 Hz, 1H).

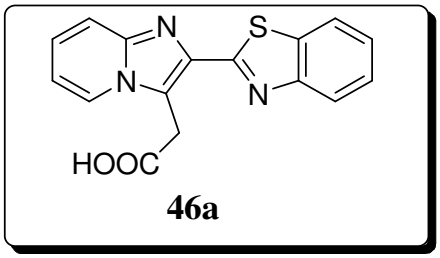
^{13}C NMR ($CDCl_3$/TMS): δ 13.19, 18.41, 110.50, 114.88, 117.64, 120.66, 121.70, 123.01, 124.30, 125.16, 126.18, 129.38, 134.76, 136.94, 144.54, 154.06, 163.34.

ESI-MS:(m/z): 305.3(M+1).

General procedure for the preparation of 2-(2-(Benzothiazol-2-yl)imdazo[1,2-a]pyridin-3-yl)aceticacid derivatives (46a-d).

The acetonitrile derivative **45a** (1.22g, 4.22 mmol) was dissolved in aqueous ethanol (50 ml), containing potassium hydroxide 1.4g and the reaction mixture was stirred under reflux for 24h. The progress of the reaction was monitored by TLC and on completion; the reaction mixture was filtered and acidified with aceticacid. Solid formed was filtered and recrystallized from water to give the product **46a.** Analytical and spectral data are given below.

46a: 2-(2-(Benzothiazol-2-yl)imdazo[1,2-a]pyridin-3-yl)acetic acid.



46a

Description : Pale brown colour solid.

Melting point: Up to 260.0^{o}C (Not clear).

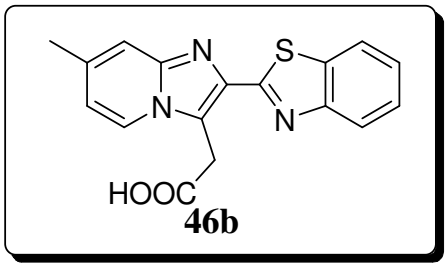
IR (In KBr) : 3423, 3055, 2861, 2776, 1707, 1372, 1315, 1236, 1196, 938, 763, 747, 739, 698 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 4.66 (s, 2H), 7.02 (t, *J* = 6.6 Hz, 1H), 7.41 (m, 2H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.67 (d, *J* = 9.0 Hz, 1H), 8.00 (d, *J* = 8.0 Hz, 1H), 8.11 (d, *J* = 7.8 Hz, 1H), 8.45 (d, *J* = 6.8 Hz, 1H), 12.75 (s, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 29.87, 113.61, 117.53, 118.85, 122.63, 123.11, 125.65, 126.06, 126.57, 126.89, 134.58, 135.97, 144.72, 154.36, 164.85, 170.98.

ESI-MS:(m/z): 310.0(M+1).

46b: 2-(2-(Benzothiazol-2-yl)-7-methylimdazo[1,2-a]pyridin-3-yl)aceticacid.



46b

Description : Pale brown colour solid.

Melting point: 182.2 - 183.5°C.

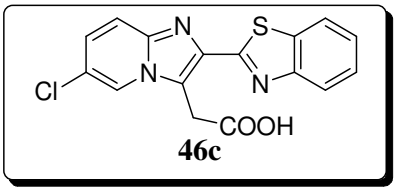
IR (In KBr) : 3430, 3063, 2910, 2459, 1905, 1710, 1646, 1257, 936, 885, 783, 755, 726, 670 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 2.38 (s, 3H), 4.67 (s, 2H), 6.89 (d, *J* = 7.2 Hz, 1H), 7.45 (t, *J* = 7.6 Hz, 2H), 7.53 (t, *J* = 7.2 Hz, 1H), 8.01 (d, *J* = 8.4 Hz, 1H), 8.12 (d, *J* = 8.0 Hz, 1H), 8.35 (d, *J* = 7.2 Hz, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 21.29, 29.84, 115.56, 116.14, 118.33, 122.58, 123.03, 125.19, 125.55, 126.84, 134.54, 135.68, 137.20, 145.12, 154.37, 165.01, 171.03.

ESI-MS:(m/z): 324.1(M+1).

46c: 2-(2-(Benzothiazol-2-yl)-6-chloroimdazo[1,2-a]pyridin-3-yl)aceticacid.



46c

Description : Pale brown colour solid.

Melting point: 231.0 - 234.2 °C (Decomposed).

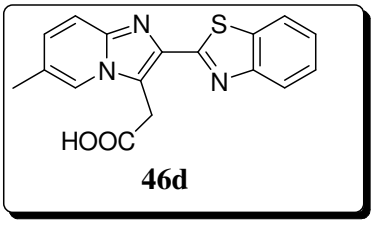
IR (In KBr) : 3434, 3052, 2920, 1708, 1315, 1245, 1187, 946, 802, 762, 730, 723, 666 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 4.71 (s, 2H), 7.46 (d, *J* = 7.5 Hz, 2H), 7.55 (t, *J* = 7.6 Hz, 1H), 7.76 (d, *J* = 9.5 Hz, 1H), 8.03 (d, *J* = 7.9 Hz, 1H), 8.14 (d, *J* = 7.76 Hz, 1H), 8.84 (s, 1H).

^{13}C NMR (DMSO-d_6/TMS): δ 29.98, 118.41, 119.86, 120.69, 122.68, 123.21, 124.26, 125.81, 126.97, 127.47, 134.58, 136.85, 143.13, 154.31, 164.31, 170.82.

ESI-MS:(m/z): 344.1(M+1).

46d: 2-(2-(Benzothiazol-2-yl)-6-methylimdazo[1,2-a]pyridin-3-yl)acetic acid.



46d

Description : Pale brown colour solid.

Melting point: 221.0 - 222.0°C (Decomposed).

IR (In KBr) : 3429, 3061, 2922, 1710, 1315, 1239, 1187, 946, 802, 762, 734, 723, 662 cm^{-1}.

^{1}H NMR (DMSO-d_6/TMS): δ 2.34 (s, 3H), 4.63 (s, 2H), 7.22 (d, *J*= 8.0 Hz, 1H), 7.42 (t, *J*= 7.6 Hz, 1H), 7.51 (t, *J*= 7.2 Hz, 1H), 7.58 (d, *J*= 9.2 Hz, 1H), 7.99 (d, *J*= 8.0 Hz, 1H), 8.10 (d, *J*= 8.0 Hz, 1H), 8.23 (s, 1H).

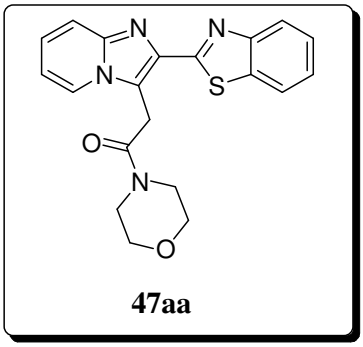
^{13}C NMR (DMSO-d_6/TMS): δ 18.08, 30.11, 116.74, 118.88, 122.44, 122.80, 122.90, 123.07, 125.42, 126.70, 129.36, 134.40, 135.63, 143.60, 154.27, 164.94, 170.93.

ESI-MS:(m/z): 324.1(M+1).

Typical procedure for the preparation of 2-(2-(Benzothiozol-2-yl)imidazo[1-2-a]pyridin-3-yl)acetamide derivatives.

In a RB flask was charged acid derivative **(46a)**, dichloromethane and triethylamine. It was cooled to 0-5^{o}C and pivaloyl chloride was added under stirring. After the addition, the reaction mixture was stirred at 0-5^{o}C for about 30 min. Reaction progress was monitored by TLC and after mixed anhydride formation was completed, amine base was added at 0-5^{o}C. The reaction mixture was stirred at 0-5^{o}C for 1h and monitored the reaction by TLC for completion of reaction. The reaction mixture quenched in water and extracted with MDC. The MDC layer was distilled under reduced pressure and further purified by the silica gel column chromatography. All the obtained compounds analysed by their spectral data and given below.

47aa: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-(1-(morpholin-4-yl)ethanone.



47aa

Description : Off-white solid

Melting point: 253.0 -256.5^{o}C.

IR (In KBr) : 3326, 3037, 2894, 2851, 1650, 1599, 1571, 1451,

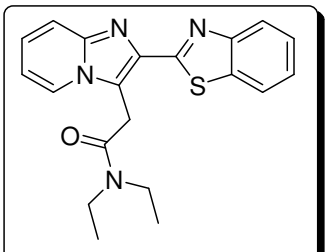
1434, 1358, 1232, 1216, 1114, 928, 772, 747, 737, 429 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 3.54 (t, *J* = 4.4 Hz, 2H), 3.61 (s, 4H), 3.97 (t, *J* = 4.4 Hz, 2H), 4.81 (s, 2H), 6.92 (t, *J* = 8.0 Hz, 1H), 7.29 (t, *J* = 7.2 Hz, 1H), 7.41 (t, *J* = 7.6 Hz, 1H), 7.50 (t, *J* = 7.2 Hz, 1H), 7.60 (d, *J* = 8.8 Hz, 1H), 7.97 (t, *J* = 8.8 Hz, 2H), 8.62 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 30.05, 42.71, 46.90, 66.84, 66.94, 113.38, 117.30, 117.79, 121.96, 122.52, 125.14, 125.78, 125.99, 126.25, 134.97, 135.76, 145.40, 154.22, 164.71, 167.29.

ESI-MS:(m/z): 379.3(M+1).

47ab: 2-(2-(Benzothiazol-2-yl)imidazo[1-2-a]pyridin-3-yl)-N,N-diethylacetamide.



47ab

Description : Off-white solid

Melting point: 182.2 - 184.5°C.

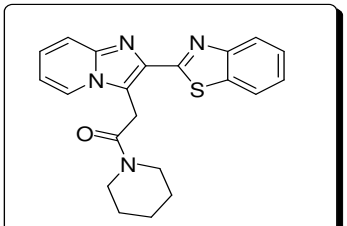
IR (In KBr): 3324, 2971, 2930, 1633, 1573, 1450, 1435, 1362, 935, 754, 735, 430 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.11 (t, *J* = 7.2 Hz, 3H), 1.21 (t, *J* = 7.2 Hz, 3H), 3.40 (m, 2H), 3.64 (m, 2H), 4.48 (s, 2H), 6.90 (t, *J* = 6.4 Hz, 1H), 7.28 (s, 1H), 7.41 (t, *J* = 7.6 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.67 (d, *J* = 8.8 Hz, 1H), 7.99 (t, *J* = 7.2 Hz, 2H), 8.64 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 13.09, 14.48, 30.66, 40.84, 42.62, 113.17, 117.62, 118.10, 121.86, 122.68, 124.97, 125.84, 126.00, 126.09, 135.04, 135.78, 145.39, 154.37, 164.70, 167.68.

ESI-MS:(m/z): 365.3 (M+1).

47ac: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-1-(piperidin-1-yl)ethanone.



47ac

Description : Off-white solid

Melting point: up to 260.0^{o}C (Not clear).

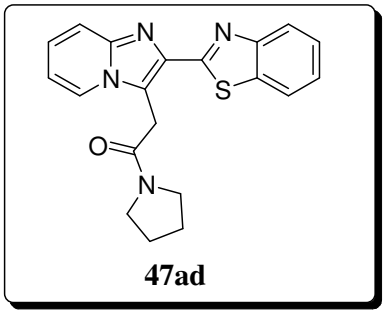
IR (In KBr): 3060, 3037, 2938, 2917, 1644, 1599, 1572, 1437, 1353, 1252, 1238, 1226, 1123, 1011, 930, 769, 747, 736, 429 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.37 (m, 2H), 1.47 (m, 2H), 1.55 (m, 2H), 3.54 (t, *J* = 5.2 Hz, 2H), 3.78 (t, *J* = 5.1 Hz, 2H), 4.82 (s, 2H), 6.89 (t *J* = 6.7 Hz, 1H), 7.27 (t, *J* = 9.1 Hz, 1H), 7.4 (t, *J* = 7.2 Hz, 1H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.66 (d, *J* = 9.0 Hz, 1H), 7.99 (t, *J* = 8.6 Hz, 2H), 8.62 (d, *J* = 6.7 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 24.45, 25.75, 26.56, 30.52, 43.54, 47.56, 113.23, 117.68, 118.01, 121.86, 122.71, 124.98, 125.81, 125.94, 126.10, 135.01, 135.67, 145.35, 154.37, 134.68, 166.74.

ESI-MS:(m/z): 377.3(M+1).

47ad: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-1-(pyrrolidin-1-yl)ethanone.



47ad

Description : Off-white solid

Melting point: 244.0 - 249.0°C.

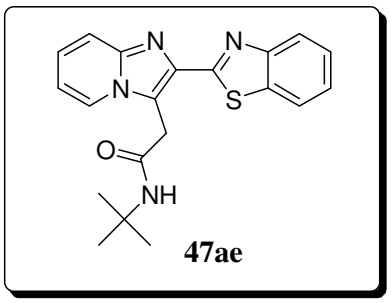
IR (In KBr) : 3431, 3052, 2970, 2871, 1655, 1634, 1439, 1391, 1363, 1259, 1242, 934, 746, 732, 726, 432 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.87 (m, 2H), 1.95 (m, 2H), 3.48 (t, *J* = 6.7 Hz, 2H), 3.79 (t, *J* = 6.7 Hz, 2H), 4.80 (s, 2H), 6.90 (t, *J* = 6.7 Hz, 1H), 7.28 (t, *J* = 9.1 Hz, 1H), 7.41 (t, *J* = 7.3 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.67 (d, *J* = 9.0 Hz, 1H), 7.99 (t, *J* = 8.1 Hz, 2H), 8.60 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 24.37, 26.26, 31.45, 46.19, 47.20, 113.13, 117.68, 121.87, 122.68, 124.93, 125.79, 125.87, 126.04, 135.08, 145.37,154.42, 167.03.

ESI-MS:(m/z): 363.1(M+1).

47ae: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N-tert-butylacetamide.



47ae

Description : Off-white solid

Melting point: 179.0 - 181.2°C.

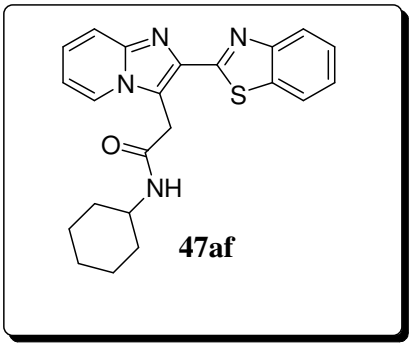
IR (In KBr) : 3277, 3222, 3068, 3046, 2959, 2929, 1675, 1360, 1313, 1254, 1240, 1227, 1032, 754, 733, 728, 430 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.26 (s, 9, 3xCH_3), 4.19 (s, 2H), 6.95 (t, *J* = 6.5 Hz, 1H), 7.30 (t, *J* = 8.6 Hz, 1H), 7.44 (t, *J* = 7.6 Hz, 1H), 7.54 (t, *J* = 7.4 Hz, 1H), 7.67 (d, *J* = 9.0 Hz, 1H), 8.01 (t, *J* = 7.5 Hz, 2H), 8.20 (s, 1H), 8.49 (d, *J* = 6.6 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 28.71, 34.10, 51.12, 113.73, 117.85, 119.35, 122.13, 122.38, 124.73, 125.24, 126.01, 126.46, 134.95, 135.89, 145.09, 153.68, 165.07, 167.85.

ESI-MS:(m/z): 365.3(M+1).

47af: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N-cyclohexylacetamide.



47af

Description : Off-white solid.

Melting point: up to 260.0°C (Not clear).

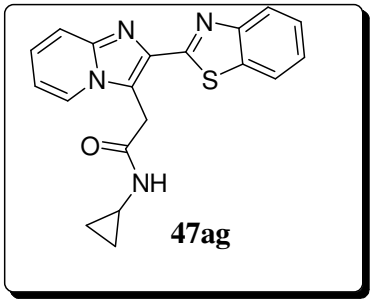
IR (In KBr) : 3311, 2930, 2853, 1633, 1539, 1364, 1344, 1139, 1124, 929, 756, 745, 729, 431 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.13 (m, 2H), 1.29 (m, 2H), 1.66 (m, 4H), 1.81 (m, 2H), 3.70 (m, 1H), 4.26 (s, 2H), 6.96 (t, *J* = 6.7 Hz, 1H), 7.30 (t, *J* = 7.2 Hz, 1H), 7.46 (t, *J* = 7.6 Hz, 1H), 7.56 (t, *J* = 7.7 Hz, 1H), 7.67 (d, *J* = 9.0 Hz, 1H), 8.03 (t, *J* = 7.9 Hz, 2H), 8.27 (d, *J* = 7.3 Hz, 1H), 8.50 (d, *J* = 6.8 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 24.50, 25.48, 32.82, 33.12, 48.27, 113.70, 117.89, 119.15, 122.13, 122.37, 124.71, 125.26, 125.66, 126.49, 135.00, 136.03, 145.10, 153.71, 165.07, 167.75.

ESI-MS:(m/z): 391.4(M+1).

47ag: 2-(2-(Benzothiazol-2-yl)imidazo[1,2-a]pyridin-3-yl)-N-cyclopropylacetamide.



47ag

Description : Off-white solid.

Melting point: up to 260.0°C (Not clear).

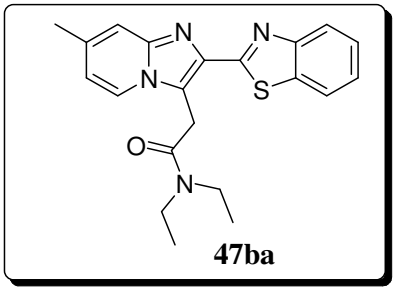
IR (In KBr) : 3277, 3053, 2925, 1644, 1537, 1364, 1256, 1238, 1033, 927, 757, 747, 731, 432 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 0.458 (m, 2H), 0.718 (m, 2H), 2.71 (m, 1H), 4.24 (s, 2H), 6.96 (t, *J* = 6.7 Hz, 1H), 7.30 (t, *J* = 7.3 Hz, 1H), 7.46 (t, *J* = 7.3 Hz, 1H), 7.56 (t, *J* = 7.8 Hz, 1H), 7.67 (d, *J* = 9.0 Hz, 1H), 8.00 (d, *J* = 8.0 Hz, 2H), 8.48 (d, *J* = 6.3 Hz, 2H).

^{13}C NMR ($CDCl_3$/TMS): δ 6.18, 22.49, 33.85, 113.63, 117.78, 118.57, 122.00, 122.17, 124.52, 125.21, 125.92, 126.40, 134.80, 135.94, 145.00, 153.47, 164.97, 169.81.

ESI-MS: (m/z): 349.3(M+1).

47ba: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N,N-diethylacetamide.



47ba

Description : Off-white solid.

Melting point: 212.0 - 214.5°C.

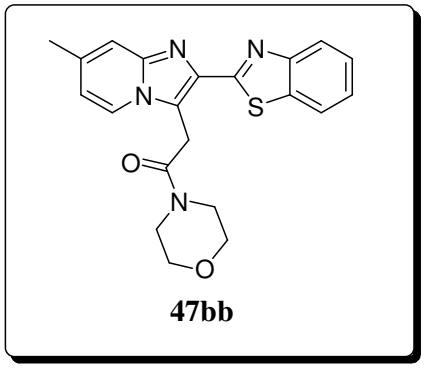
IR (In KBr): 3436, 3070, 2974, 1638, 1454, 1434, 1260, 1034, 935, 753. cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.09 (t, *J* = 7.0 Hz, 3H), 1.15 (t, *J* = 7.0 Hz, 3H), 2.40 (s, 3H), 3.38 (m, 2H), 3.61 (m, 2H), 4.79 (s, 2H), 6.70 (d, *J* = 6.4 Hz, 1H), 7.39 (t, *J*= 8.0 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.97 (t, *J* = 7.3 Hz, 2H), 8.52 (d, *J* = 7.0 Hz, 1H).

^{13}C ($CDCl_3$/TMS): δ 13.09, 14.47, 21.49, 30.83, 40.79, 42.58, 115.86, 115.88, 117.54, 121.85, 122.61, 124.85, 125.19, 126.04, 135.04, 135.46, 136.87, 145.85, 154.40, 164.94, 167.79.

ESI-MS:(m/z): 379.2(M+1).

47bb: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-1-(morpholin-4-yl)ethanone.



47bb

Description : Off-white solid.

Melting point: Up to 260.0^{o}C(Not Clear).

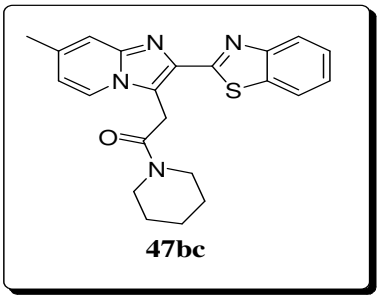
IR (In KBr): 3436, 3052, 2982, 2856, 1648, 1434, 1359, 1235, 1120, 1028, 933, 756 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.41 (s, 3H), 3.51 (t, *J* = 4.6 Hz, 2H), 3.6 (s, 4H), 3.95 (t, *J* = 4.7 Hz, 2H), 4.77 (s, 2H), 6.73 (d, *J* = 7.1 Hz, 1H), 7.40 (t, *J* = 7.4 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.96 (t, *J* = 10.2 Hz, 2H), 8.49 (d, *J* = 7.0 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.49, 30.15, 42.70, 46.38, 115.99, 116.09, 116.75, 121.92, 122.45, 124.90, 125.02, 126.18, 134.93, 135.41, 137.07, 145.91, 154.22, 164.88, 167.39.

ESI-MS:(m/z): 393.2(M+1).

47bc: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-1-(piperidin-1-yl)ethanone.



47bc

Description : Off-white solid

Melting point: 172.3 - 174.2°C.

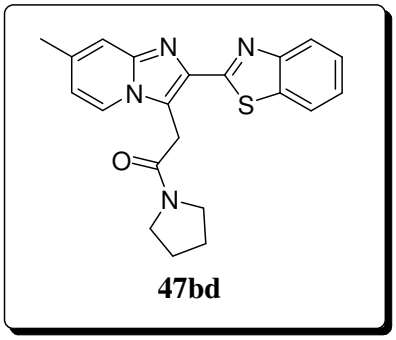
IR (In KBr): 3327, 2928, 2851, 1622, 1571, 1454, 1437, 1360, 1242, 1088, 930, 725 cm^{-1}.

^{1}H ($CDCl_3$/TMS): δ 1.34 (m, 2H), 1.53 (m, 4H), 2.42 (s, 3H), 3.54 (t, *J* = 5.5 Hz, 2H), 3.77 (t, *J* = 5.3 Hz, 2H), 4.79 (s, 2H), 6.71 (d, *J* = 6.4 Hz, 1H), 7.39 (t, *J* = 7.4 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.98 (t, *J* = 8.2 Hz, 2H), 8.51 (d, *J* = 7.0 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.48, 24.45, 25.77, 26.54, 30.66, 43.53, 47.54, 115.90, 115.95, 117.45, 121.83, 122.63, 124.86, 125.08, 126.04, 134.98, 135.33, 136.87, 145.81, 154.39, 164.87, 166.85.

ESI-MS: (m/z): 391.3(M+1).

47bd: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-1-(pyrrolidin-1-yl)ethanone.



47bd

Description : Off-white solid

Melting point: Up to 260.0^{o}C (Not clear).

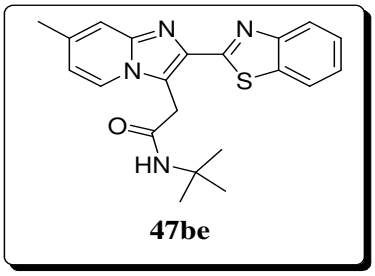
IR (In KBr): 3435, 2970, 2870, 1655, 1646, 1437, 1394, 1359, 1164, 1033, 934, 754 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.84 (m, 2H), 1.95 (m, 2H), 2.39 (s, 3H), 3.46 (t, *J* = 6.9 Hz, 2H), 3.75 (t, *J* = 6.8 Hz, 2H), 4.74 (s, 2H), 6.70 (d, *J* = 6.8Hz, 1H), 7.38 (t, *J* = 8.5Hz, 2H), 7.48 (t, *J* = 7.7 Hz, 1H), 7.97 (t, *J* = 7.6 Hz, 2H), 8.45 (d, *J* = 7.0 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.48, 24.35, 26.25, 31.52, 46.18, 47.15, 115.86, 117.15, 121.84, 122.61, 124.82, 124.99, 125.99, 135.03, 135.79, 136.87, 145.80, 154.42, 164.89, 167.15.

ESI-MS:(m/z): 377.2(M+1).

47be: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N-tert-butylacetamide.



47be

Description : Off-white solid.

Melting point: 230.5 - 233.8°C.

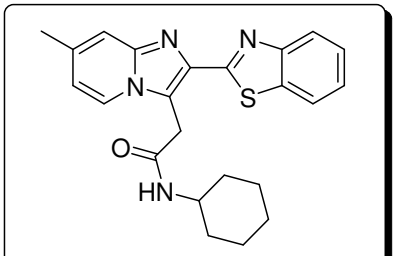
IR (In KBr): 3434, 3294, 2962, 1680, 1566, 1359, 1314, 1243, 1032, 941, 754 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.26 (s, 9H, 3xCH_3), 2.42 (s, 3H), 4.15 (s, 2H), 6.77 (d, *J* = 6.4 Hz, 1H), 7.43 (d, *J* = 7.8 Hz, 2H), 7.53 (t, *J* = 7.6 Hz, 1H), 8.00 (m, 2H), 8.20 (s, 1H), 8.36 (d, *J* = 7.0 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.49, 28.70, 34.10, 51.07, 116.05, 116.42, 118.88, 122.08, 122.19, 123.83, 125.09, 126.37, 134.94, 135.61, 137.09, 145.55, 153.70, 165.26, 167.97.

ESI-MS: (m/z): 379.2(M+1).

47bf: 2-(2-(Benzothiazol-2-yl)-7-methylimidazo[1,2-a]pyridin-3-yl)-N-cyclohexylacetamide.



47bf

Description : Off-white solid.

Melting point: 236.8 - 237.9°C.

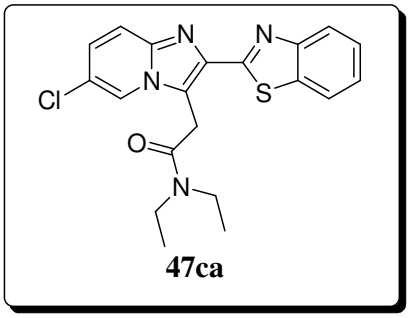
IR (In KBr): 3326, 2928, 2851, 1657, 1575, 1541, 1312, 1244, 1069, 928, 753 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.12 (m, 2H), 1.28 (m, 2H), 1.60 (m, 4H), 1.80 (m, 2H), 2.48 (s, 3H), 3.69 (m, 1H), 4.22 (s, 2H), 6.78 (d, *J* = 6.8 Hz, 1H), 7.44 (m, 2H), 7.55 (t, *J* = 7.6 Hz, 1H), 8.01 (t, *J* = 6.8 Hz, 2H), 8.26 (d, *J* = 7.4 Hz, 1H), 8.36 (d, *J* = 7.0 Hz, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 21.54, 24.52, 25.48, 32.82, 33.10, 48.24, 116.04, 116.46, 118.70, 122.13, 122.30, 123.80, 125.17, 126.46, 134.95, 145.52, 153.68, 167.91.

ESI-MS:(m/z): 405.3(M+1).

47ca: 2-(2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-N-N-diethylacetamide.



47ca

Description : Off-white solid.

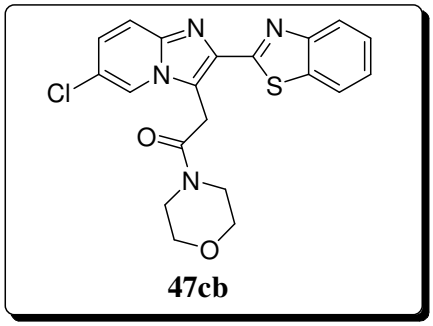
Melting point: 182.2 - 186.5°C.

^{1}H NMR ($CDCl_3$/TMS): δ 1.13 (t, *J* = 7.0 Hz, 3H), 1.28 (t, *J* = 7.0 Hz, 3H), 3.42 (m, 2H), 3.67 (m, 2H), 4.79 (s, 2H), 7.22 (d, *J* = 9.5 Hz, 1H), 7.41 (t, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 9.5 Hz, 1H), 7.97 (d, *J* = 7.8 Hz, 2H), 8.68 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 13.10, 14.57, 31.93, 40.93, 42.71, 117.97, 118.75, 121.43, 121.87, 122.73, 123.89, 125.10, 126.15, 127.28, 135.07, 136.79, 141.73, 154.32, 164.28, 167.37.

ESI-MS:(m/z): 399.3(M+1).

47cb: 2-(2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-1-(morpholin-4-yl)ethanone.



47cb

Description : Off-white solid.

Melting point: Up to 260.0°C (Not Clear).

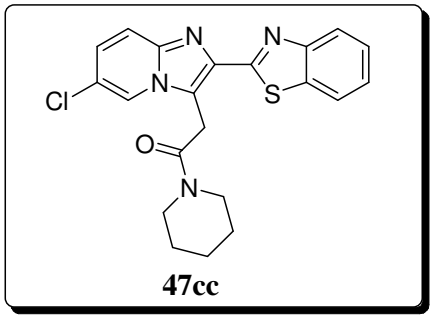
IR (In KBr): 3437, 3052, 2906, 2861, 1651, 1434, 1238, 1117, 945, 755, 563 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 3.62 (t, *J* = 4.6 Hz, 2H), 3.69 (s, 4H), 4.01 (t, *J* = 4.6 Hz, 2H), 4.79 (s, 2H), 7.24 (m, 1H), 7.43 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.62 (d, *J* = 9.5 Hz, 1H), 7.98 (m, 2H), 8.69 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 29.48, 42.70, 46.96, 66.81, 66.96, 117.97, 118.08, 121.68, 121.98, 122.55, 123.65, 125.30, 126.34, 127.51, 134.95, 136.71, 143.78, 154.15, 164.20, 166.98.

ESI-MS:(m/z): 413.2(M+1).

47cc: 2-(2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-1-(piperidin-1-yl)ethanone.



47cc

Description : Off-white solid.

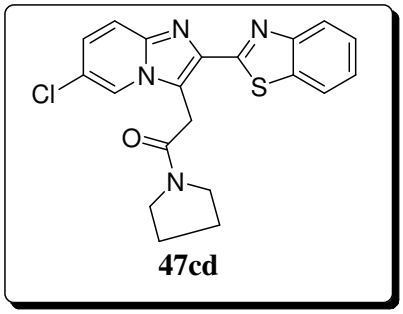
Melting point: 182.2 - 186.5°C.

^{1}H NMR ($CDCl_3$/TMS): δ 1.51 (m, 4H), 1.60 (t, *J* = 5.4 Hz, 2H), 3.57 (t, *J* = 5.4 Hz, 2H), 3.83 (t, *J* = 5.2 Hz, 2H), 4.79 (s, 2H), 7.23 (m, 1H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 9.5 Hz, 1H), 7.98 (m, 2H), 8.68 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 24.45, 25.68, 26.67, 29.88, 43.54, 47.64, 117.99, 118.70, 121.51, 121.89, 122.75, 123.79, 125.14, 126.18, 127.34, 134.99, 136.65, 143.69, 154.30, 164.18, 166.43.

ESI-MS:(*m/z*): 411.3(M+1).

47cd: 2-(2-(Benzothiazol-2-yl)-6-chloroimidazo[1,2-a]pyridin-3-yl)-1-(pyrrolidin-1-yl)ethanone.



47cd

Description : Off-white solid.

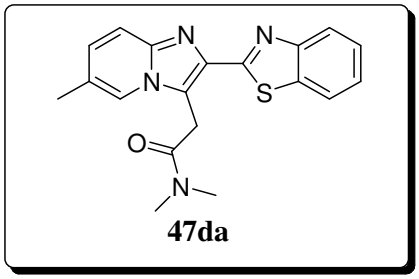
Melting point: 182.2 -186.5°C.

^{1}H NMR ($CDCl_3$/TMS): δ 1.90 (m, 2H), 2.01 (m, 2H), 3.49 (t, *J* = 6.8 Hz, 2H), 3.85 (t, *J* = 6.8 Hz, 2H), 4.73 (s, 2H), 7.21 (d, *J* = 9.4 Hz, 1H), 7.40 (t, *J* = 7.4 Hz, 1H), 7.49 (t, *J* = 7.4 Hz, 1H), 7.59 (d, *J* = 9.5 Hz, 1H), 7.97 (t, *J* = 4.7 Hz, 2H), 8.62 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 24.42, 26.24, 31.00, 46.18, 47.32, 117.97, 118.47, 121.41, 121.88, 122.72, 123.74, 125.09, 126.09, 127.29, 135.06, 137.00, 143.69, 154.33, 164.22, 166.68.

ESI-MS:(m/z): 397.3(M+1).

47da: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N-N-dimethylacetamide.



47da

Description : Off-white solid.

Melting point: Up to 260.0°C (Not Clear).

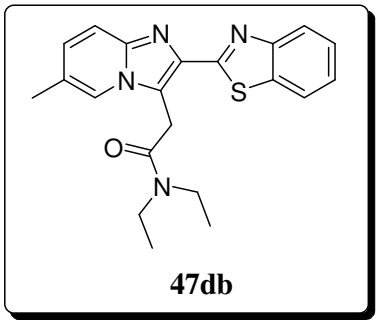
IR (In KBr): 3436, 3070, 2923, 1645, 1634, 1391, 1265, 1142, 941, 773 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.36 (s, 3H), 2.96 (s, 3H), 3.27 (s, 3H), 4.80 (s, 2H), 7.11 (d, *J* = 8.7 Hz, 1H), 7.39 (t, *J* = 7.2 Hz, 1H), 7.49 (t, *J* = 7.2 Hz, 1H), 7.57 (d, *J*= 8.8 Hz, 1H), 7.99 (m, 2H), 8.30 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.43, 30.21, 35.86, 37.84, 116.86, 117.33, 121.69, 122.53, 122.84, 123.02, 124.74, 125.87, 128.93, 134.85, 135.63, 144.35, 154.24, 164.77, 168.59.

ESI-MS:(m/z): 351.2(M+1).

47db: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N-N-diethylacetamide.



47db

Description : Off-white solid.

Melting point: 211.0 - 213.8°C.

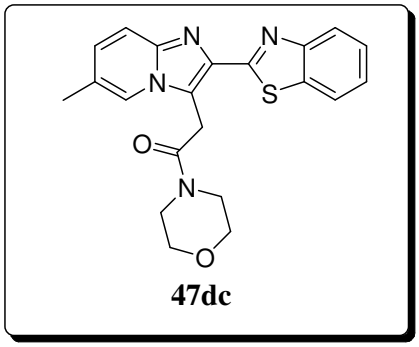
IR (In KBr): 3436, 3055, 2976, 2926, 1656, 1452, 1434, 1260, 1143, 948, 793, 755 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.12 (t, *J* = 6.9 Hz, 3H), 1.20 (t, *J* = 6.8 Hz, 3H), 2.37 (s, 3H), 3.40 (m, 2H), 3.65 (m, 2H), 4.80 (s, 2H), 7.12 (d, *J* = 9.1 Hz, 1H), 7.40 (t, *J* = 7.4 Hz, 1H), 7.49 (t, *J* = 7.4 Hz, 1H), 7.57 (d, *J* = 9.1 Hz, 1H), 7.98 (m, 2H), 8.39 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 13.01, 14.39, 18.47, 30.52, 40.73, 42.51, 116.82, 117.73, 121.73, 122.49, 122.81, 123.22, 124.74, 125.92, 128.96, 134.88, 135.53, 144.36, 154.28, 164.82, 167.66.

ESI-MS:(m/z): 379.3(M+1).

47dc: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-1-(morpholin-4-yl)ethanone.



47dc

Description : Off-white solid.

Melting point: Up to 260.0°C (Not Clear).

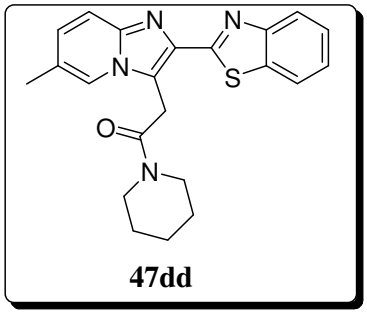
IR (In KBr): 3437, 3052, 2906, 2861, 1651, 1434, 1356, 1238, 1117, 1033, 945, 755 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 2.73 (s, 3H), 3.56 (t, *J* = 4.6 Hz, 2H), 3.62 (s, 4H), 3.98 (t, *J* = 4.6 Hz, 2H), 4.77 (s, 2H), 6.13 (d, *J* = 9.2 Hz, 1H), 7.40 (t, *J* = 7.5 Hz, 1H), 7.50 (t, *J* = 7.4 Hz, 1H), 7.58 (d, *J* = 9.2 Hz, 1H), 8.49 (m, 2H), 8.36 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.57, 29.98, 42.73, 46.90, 66.84, 66.95, 117.04, 117.08, 121.91, 122.42, 123.11, 123.16, 125.01, 126.16, 129.21, 134.95, 135.63, 144.57, 154.25, 164.92, 167.39.

ESI-MS:(m/z): 393.2(M+1).

47dd: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-1-(piperidin-1-yl)ethanone.



47dd

Description : Off-white solid.

Melting point: 227.1 - 229.6°C.

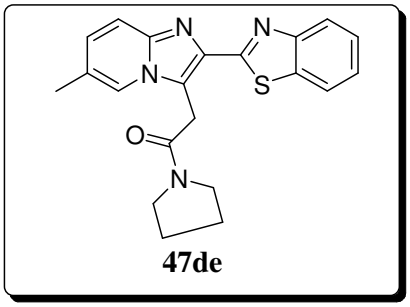
IR (In KBr): 3436, 2927, 2855, 1635, 1452, 1439, 1355, 1227, 1136, 943, 766 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.45 (d, *J* = 3.8 Hz, 2H), 1.54 (t, *J* = 6.1 Hz, 2H), 1.60 (d, *J* = 5.0 Hz, 2H), 2.42 (s, 3H), 3.59 (t, *J*= 5.4 Hz, 2H), 3.84 (t, *J* = 5.4 Hz, 2H), 4.83 (s, 2H), 7.15 (d, *J* = 9.3 Hz, 1H), 7.43 (t, *J* = 7.5 Hz, 1H), 7.53 (t, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 9.2 Hz, 1H), 8.01 (t, *J* = 7.0 Hz, 2H), 8.41 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.60, 24.47, 25.75, 26.59, 30.40, 43.55, 47.56, 116.98, 117.76, 121.83, 122.62, 122.98, 123.26, 124.87, 126.03, 129.08, 134.96, 135.54, 144.45, 154.39, 164.89, 166.85.

ESI-MS:(m/z): 391.4(M+1).

47de: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-1-(pyrrolidin-1-yl)ethanone.



47de

Description : Off-white solid.

Melting point: 248.0 - 249.2°C.

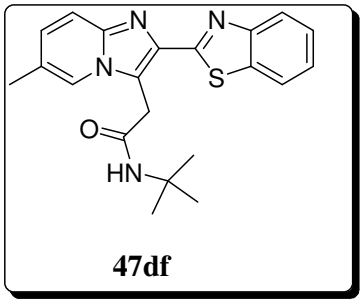
IR (In KBr): 3435, 3053, 2974, 1654, 1633, 1439, 1396, 1242, 1143, 947, 793, 754 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.87 (m, 2H), 1.97 (m, 2H), 2.36 (s, 3H), 3.49 (t, *J* = 6.8 Hz, 2H), 3.80 (t, *J* = 6.8 Hz, 2H), 4.76 (s, 2H), 7.12 (d, *J* = 9.2 Hz, 1H), 7.39 (t, *J* = 7.6 Hz, 1H), 7.49 (t, *J* = 7.4 Hz, 1H), 7.57 (d, *J* = 9.2 Hz, 1H), 7.98 (t, *J* = 6.6 Hz, 2H), 8.34 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.54, 24.37, 26.26, 31.42, 46.18, 47.18, 116.99, 117.43, 121.83, 122.58, 122.87, 123.22, 124.82, 125.97, 129.04, 135.05, 136.01, 144.48, 154.44, 164.97, 167.15.

ESI-MS:(m/z): 377.3(M+1).

47df: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N-tert-butylacetamide.



47df

Description : Off-white solid.

Melting point: 223.2 - 226.1°C.

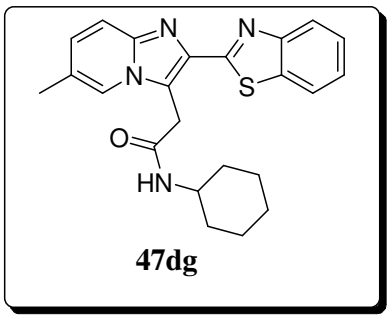
IR (In KBr): 3435, 3296, 2969, 2925, 1672, 1548, 1458, 1313, 1244, 1225, 1123, 947, 764 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.31 (s, 9H, 3xCH_3), 2.42 (s, 3H), 4.20 (s, 2H), 7.18 (d, *J* = 9.0 Hz, 1H), 7.47 (t, *J* = 7.6 Hz, 1H), 7.57 (t, *J* = 7.6 Hz, 1H), 7.61 (d, *J* = 9.2 Hz, 1H), 8.04 (m, 2H), 8.29 (s, 2H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.55, 28.72, 34.06, 51.08, 117.12, 119.03, 122.09, 122.27, 123.57, 125.13, 126.40, 129.33, 134.86, 135.69, 144.19, 153.65, 165.27, 168.01.

ESI-MS:(m/z): 379.2(M+1).

47dg: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N-cyclohexylacetamide.



47dg

Description : Off-white solid.

Melting point: Up to 260.0°C (Not Clear).

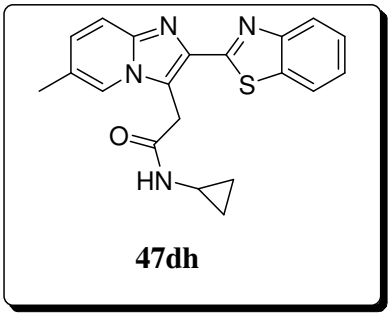
IR (In KBr) : 3434, 3288, 2928, 2853, 1631, 1543, 1352, 1129, 943, 755 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 1.17 (m, 2H), 1.32 (m, 2H), 1.55 (m, 2H), 1.64 (m, 2H), 1.85 (m, 2H), 2.42 (s, 3H), 3.71 (m, 1H), 4.27 (s, 2H), 7.18 (d, *J* = 9.2 Hz, 1H), 7.30 (s, 1H), 7.49 (t, *J* = 7.6 Hz, 1H), 7.61 (m, 2H), 8.05 (t, *J* = 7.4 Hz, 2H), 8.29 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 18.48, 24.53, 25.48, 32.83, 33.10, 48.29, 117.15, 118.84, 122.11, 122.29, 123.63, 125.18, 126.47, 129.33, 134.93, 135.83, 144.20, 153.67, 165.25, 167.93.

ESI-MS:(m/z): 405.2(M+01).

47dh: 2-(2-(Benzothiazol-2-yl)-6-methylimidazo[1,2-a]pyridin-3-yl)-N-cyclopropylacetamide.



47dh

Description : Off-white solid.

Melting point: 255.8 - 257.0°C.

IR (In KBr): 3301, 3052, 2923, 1639, 1538, 1337, 1127, 1002, 941, 796, 754 cm^{-1}.

^{1}H NMR ($CDCl_3$/TMS): δ 0.45 (m, 2H), 0.71 (m, 2H), 2.39 (s, 3H), 2.71 (m, 1H), 4.22 (s, 2H), 7.15 (m, 1H), 7.45 (t, *J*= 7.2 Hz, 1H), 7.58 (m, 2H), 8.00 (m, 2H), 8.25 (s, 1H), 8.53 (s, 1H).

^{13}C NMR ($CDCl_3$/TMS): δ 6.26, 6.29, 18.45, 22.60, 32.78, 117.18, 118.37, 122.06, 122.10, 122.21, 123.67, 125.23, 126.48, 129.35, 134.88, 135.90, 144.24, 153.59, 165.31, 170.16.

ESI-MS:(m/z): 363.2(M+1).

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