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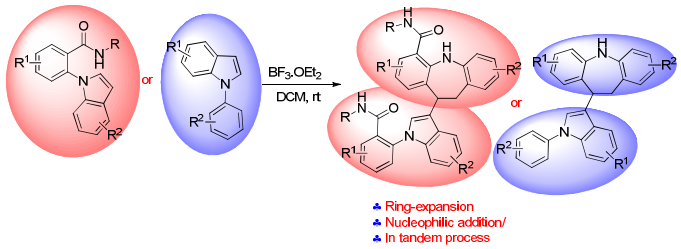
Graphical Abstract



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ARTICLE TYPE

BF_3•OEt_2-mediated one pot synthesis of 10-indolyldibenzo[*b,f*]azepine derivatives via tandem ring expansion and C-C bond formation

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A simple and efficient one pot protocol was developed for the synthesis of new structurally diverse 10-indolyldibenzo[*b,f*]azepine derivatives. The reaction involves Lewis-acid mediated ring exapansion followed by *C-C* bond formation through nucleophillic addition of indole moiety.

Nitrogen containing heterocyclic [6,7,6] ring system such as dibenzo[b,f]azepines, and dihydro dibenzo[b,f]azepines are attractive synthetic targets for the chemists due to its immense biological activities including, anticonvulsant, antidepressant, and antiepileptic activities.[1,2] Some of the drugs having dibenzo[b,f]azepines or dihydro dibenzo[b,f]azepines are depicted in Figure 1.

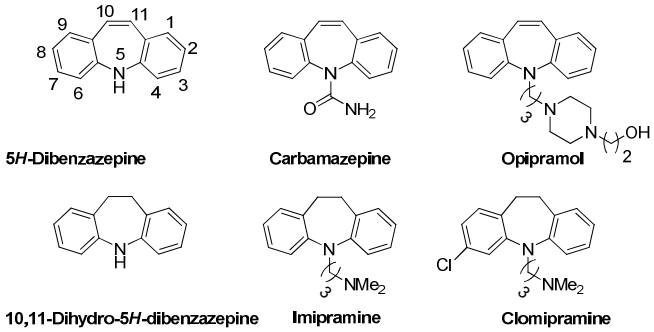
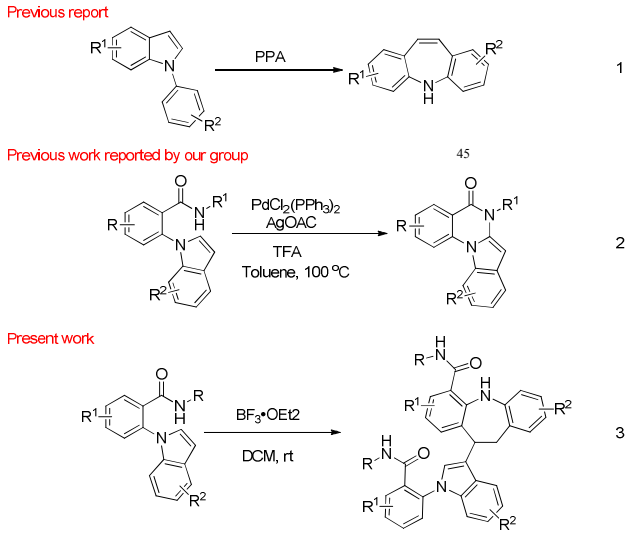


Figure 1. CNS-active drugs containing [6,7,6] ring system.

A plethora methods have been developed for the construction of dibenzo[*b,f*]azepine derivatives.[3] The most common method for accessing these derivatives involves the dehydrogenation of iminobibenzyls[3a,c,e,f] or rearrangement of isatins and arylindoles (Eqaution 1, Scheme1).[4] For instance, recently, Stachulski et al. have reported a convenient method for the synthesis of halo-dibenzo[*b,f*]azepines by using isatins and *N*-arylindoles in the presence of protic acid.[4a] On the other hand, few examples have been reported for the synthesis of dibenzoazepine derivatives through transition-metal-catalyzed reactions.[5] Buchwald et al. reported a method for the construction of dibenzoazepine derivatives through a Pd-catalyzed coupling reaction of *o*-bromostyrene and *o*-chloroaniline.[5b,5d] Very recently, Liang et al. developed a palladium-catalyzed double amination coupling reaction of (Z)-1,2-bis(2-bromophenyl)ethene with amines for *N*-substituted dibenzoazepine.[5e] Some of these methods were effective for the synthesis of dibenzoazepine derivatives. However, most of the reported procedures were associated one or more complications such as requirement of high temperature, functional group-intolerance and low yields of products.



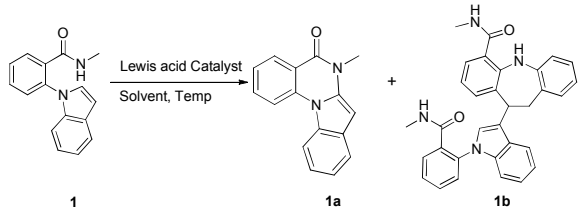
Scheme1. Previous and present reports on *N*-phenylindole reactions

In our recent research, we focused our attention on exploring the synthetic utilities of 2-iodobenzamide substrates for the construction of various heterocycles, including 2-aminophenylbenzoxazoles, isocoumarin derivatives, indolo[1,2-a]-quinazolinone derivatives, fused isoquinolinone derivatives and dibenzodiazepine derivatives (Eqaution 2, Scheme1).[6] In a continuation to our interest on this topic, we recently, investigated the reaction of 2-(1*H*-indol-1-yl)-*N*-substituted benzamide-1-phenyl-1*H*-indoles with palladium catalyst in the presence of acidic additive.[6c] While, screening with various catalysts, we utilized Iron (III) chloride as catalyst in the reaction.We found a trace of different product along with indolo[1,2-a]-quinazolinone (**1a**). The ^{1}H, ^{13}C NMR and mass spectral data revealed the minor product obtained in this reaction was *N*-methyl-11-(1-(2-(methyl-carbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b,f*]azepine-4-carboxamide (**1b**). Here, the formation of product involves two reaction in tandem fashion i.e. the ring expansion and the *C-C* bond formation in one-pot. On the other hand, the compound obtained here consists

of two bioactive moieties such as indole and dibenzoazepine. Moreover, the ring expansion of *N*-aryl indole to dibenzoazepine derivatives has been well documented in the literature.[3,4] However, to our knowledge, the synthesis of *N*-substituted-11-(1-(2-(substituted-carbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamides and 10-(1-phenyl-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[b,f]azepine analogues has not been reported in the literature. Hence, we wish to investigate the synthesis of indolyldibenzoazepine derivatives from *N*-aryl indole derivatives ((Eqaution 3, Scheme1)..

To pursue our goal, we first synthesized the starting materials by *N*-arylation of indoles with 2-iodobenzamide derivatives through a straightforward literature method reported by our group.[6c] Since, we observed the desired compound in the presence of $FeCl_3$, we carried out a reaction of 2-(1*H*-indol-1-yl)-*N*-methylbenzamide and $FeCl_3$ (20 mol%) in DCM at room tempearture for 24 h. Under these conditions, the desired product (**1b**)was obtained in low yield(Table 1 entry 1).

Table 1. Optimization of the reaction conditions with various solvents and Lewis acid .

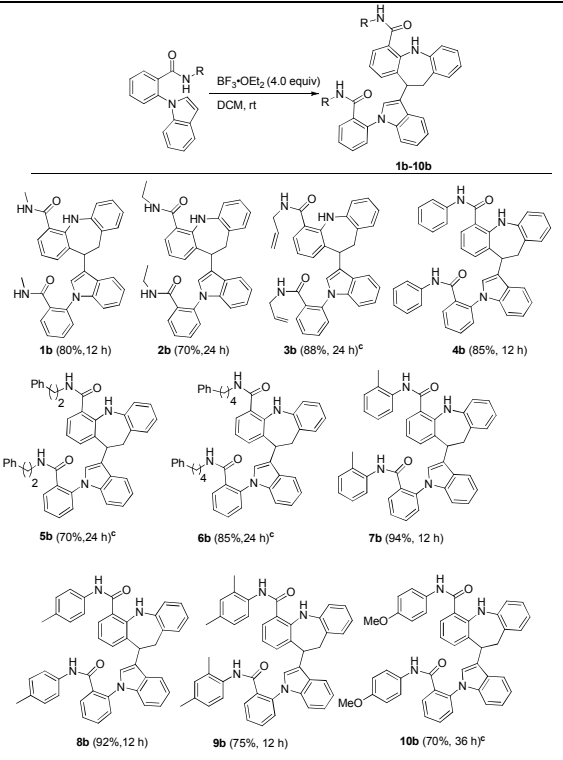


Entry[a]	Lewis-acid-Catalyst (equiv.)	Solvent	Temp (°C)	Time (h)	Yield (s) (%)[b] 1a	1b
1[c]	$FeCl_3$ (0.2)	DCM	rt	24	20	10
2[c]	$InCl_3$ (0.2)	DCM	rt	24	7	10
3[c]	$AlCl_3$ (0.2)	DCM	rt	24	8	8
4[c]	$TiCl_4$ (0.2)	DCM	rt	24		trace
5[c]	$SnCl_2$ (0.2)	DCM	rt	24		trace
6[d]	$ZnCl_2$ (0.2)	DCM	rt	24		-
7	BF_3•OEt_2 (0.2)	DCM	rt	24		12
8	BF_3•OEt_2 (0.5)	DCM	rt	24		18
9	BF_3•OEt_2 (1.0)	DCM	rt	24		25
10	BF_3•OEt_2 (2.0)	DCM	rt	24		37
11	BF_3•OEt_2 (3.0)	DCM	rt	12		55
12	**BF_3•OEt_2 (4.0)**	**DCM**	**rt**	**12**		**80**
13	BF_3•OEt_2 (5.0)	DCM	rt	12		65
14	BF_3•OEt_2 (4.0)	$CHCl_3$	rt	12		70
15	BF_3•OEt_2 (4.0)	CH_3CN	rt	24		42
16	BF_3•OEt_2 (4.0)	THF	rt	24		45
17	BF_3•OEt_2 (4.0)	DMSO	rt	24		-
18[d]	BF_3•OEt_2 (4.0)	toulene	100	24		-
19	BF_3•OEt_2 (4.0)	DCE	rt	24		42
20[e]	PPA	-	120	24	trace	-

[a] All the reactions were carried out on 0.5 mmol scale. [b] Yields determined by ^{1}H NMR (CH_2Br_2 as internal standard). [c] Unidentified compounds were observed. [d] Starting material 1 was recovered. [e] 3 mL of PPA was used and unidentified compounds were observed.

It is evident from the literature that the ring expansion occurs in the presence of a strong acid. Hence, we screened this reaction with different Lewis acids including $InCl_3$, $AlCl_3$, , $TiCl_4$, $SnCl_2$, $ZnCl_2$ and BF_3•OEt_2. Among these Lewis acids, $InCl_3$, $AlCl_3$, $TiCl_4$ provided the desired product along with trace amount of indolo[1,2-a]-quinazolinone derivative and also few unidentified products(entries 2-4). Where as in the presence of $SnCl_2$ and $ZnCl_2$, the reaction produced trace amount of the desired product(entries 5,6). Moreover, the reaction in the presence of BF_3•OEt_2 also furnished the desired product in low yield but the reaction was clean. Further to improve the yield of the desired product, we increased the amount of BF_3•OEt_2 to 0.5 equiv. Slight improvement in the yield of the product was observed. However, it still not satisfactory. Hence, we conducted the reactions with 1.0, 2.0, 3.0, 4.0 and 5.0 equiv. of BF_3•OEt_2 It was observed that the yield of the product was increased with increasing the amount of the reagent (BF_3•OEt_2). The optimum amount for the reaction to obtain the better yield of the desired product was found to be 4 equiv. of BF_3•OEt_2. Further, to know the effect of solvent, we conducted the reaction in different solvents such as $CHCl_3$, CH_3CN, THF, DMSO, DCE and Toluene. When chloroform used as solvent, the reaction produced desired product in 70% yield. With CH_3CN, THF, DCE as solvents, the reaction times were longer, and obtained the lower yields of expected compound. Moreover, No trace amount of desired compound (**1b)** was observed in DMSO and toluene (entries 17 and 18). Thus, we selected dichloromethane (DCM) as suitable solvent for this reaction.

Table 2. Scope of the reaction with respect to various *N*-substituted indolylbenzamide substrates. [a,b,,d]

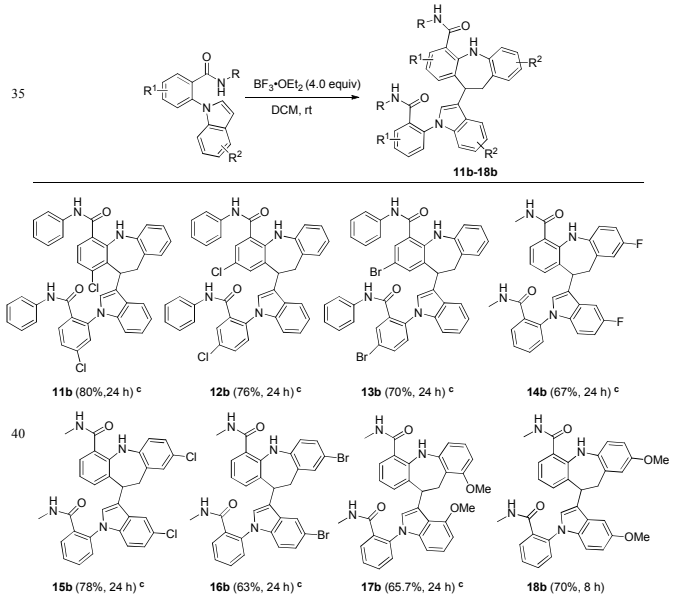


[a] All reactions were performed on a 0.5-mmol scale. [b] Isolated yields with respect to starting materials and purified compounds. [c] about 5%-10 % starting material recovered ^{1}H NMR. [d] Trace of unidentified product observed in all the reactions.

With the optimized reaction conditions in hand, we next aimed to explore the scope of the methodology using different substitution on benzene ring, and indole moiety of 2-(*1H*-indol-1-yl)-*N*-substituted benzamides (Tables 2 and 3). Under the optimized reaction conditions, the reaction of *N*-methyl, ethyl, allyl, phenyl, *N*-phenylethyl, and *N*-butylphenyl-indolylbenzamide substrates furnished corresponding *N*-substituted-11-(1-(2-carbamoyl)phenyl-1H-indol-3-yl)-10,11-dihydro-5H-dibenzo[*b*,*f*]azepine-4-carboxamide derivatives in good yields (Table 2 **1b-6b**). It is important to note that the yields of the corresponding desired product were high when *N*-allyl and phenyl- indolylbenzamide were employed as substrates (**3b** and **4b**). On the other hand, the reaction of *N*-phenyl-indolylbenzamide containing moderate electron donating groups provided the desired products in good to excellent yields (**7b-10b**).

Once we examined the efficacy of our procedure for the different class of *N*-substituted-indolylbenzamide, we decided to extend the scope of this methodology using different substituent pattern on the benzene ring and indole moiety of *N*-substituted-indolylbenzamide (Table 3). As illustrated in Table 3, substrates that contain electron-withdrawing groups on the benzene ring of the 2-(1*H*-indol-1-yl)-*N*-phenylbenzamide reacted smoothly under present reaction conditions produced their corresponding desired products in good-to-moderate yield (Table 3, **11b-13b**). Moreover, when the reaction of 2-(*1H*-indol-1-yl)-*N*-methylbenzamides that contain electron-withdrawing groups, such as F, Cl, Br as well as electron-donating group, like OMe in the indole moiety equipped the expected products in good-to-moderate yields (**14b-18b**)

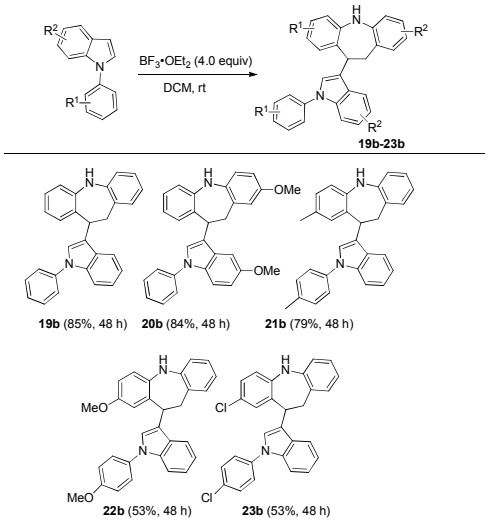
Table 3. Scope of the reaction with various substitution pattern on benzene ring and in indole moiety of *N*-substituted-indolylbenzamide substrates. [a,b,,d]



[a] All reactions were performed on a 0.5-mmol scale. [b] Isolated yields with respect to starting materials and purified compounds. [c] about 5%-10 % starting material recovered ^{1}H NMR. [d] Trace of unidentified product observed in all the reactions.

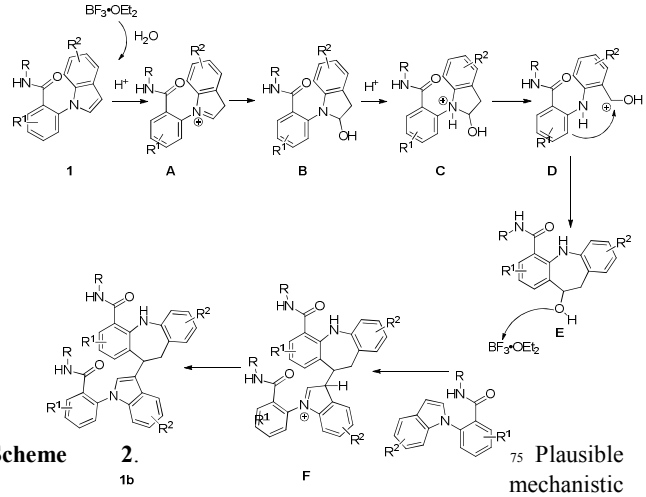
To diversify the present methodology, we examined the reaction with various 1-phenyl-*1H*-indole substrates (Table 4). As could be seen from Table 4, the substrates containing electron-deficient and electron-rich groups on 1-phenyl-*1H*-indole substrates reacted with equally ease and resulted the corresponding 10-(1-phenyl-*1H*-indol-3-yl)-10,11-dihydro-5H-dibenzo[*b*,*f*]azepine derivatives in good-to-moderate yields (**19b-23b**).

Table 4. Scope of the reaction with various 1-phenyl-*1H*-indole substrates. [a,b,,c]



[a] All reactions were performed on a 0.5-mmol scale. [b] Isolated yields with respect to starting materials and purified compounds [c] Trace of unidentified product observed in all the reactions.

The plausible mechanism for the formation of *N*-substituted-11-(1-(2-carbamoyl)phenyl-*1H*-indol-3-yl)-10,11-dihydro-5H-dibenzo[b,f]azepine-4-carboxamides is outlined in Scheme 2.



Scheme 2. Plausible mechanistic pathway for the formation of *N*-substituted-11-(1-(2-carbamoyl)phenyl-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamides.

The proposed mechanism is very similar to the mechanism proposed by Tokmakov and co-workers.[3e] We assume that

BF_3•OEt_2 reacts with moisture to produce a proton which reacts with **1** to provide **A**, which produces indoline intermediate **B** by the addition of hydroxide ion. Next, the indoline intermediate on protonation to form the intermediate **C**. Further, the intermediate **C** undergoes ring cleavage to generate carbocation intermediate **D**, which further undergoes intramolecular electrophillic cyclization to obtain the intermediate **E**. This intermediate **E** reacts with another molecule of compound **1** *via* Nucleophilic addition in the presence of BF_3•OEt_2 furnishes intermediate **F**. The intermediate **F** upon losing proton to provide the desired product **1b**

In conclusion, we have demonstrated an efficient method for synthesis of novel *N*-substituted-11-(1-(2-substituted-carbamoyl)phenyl-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b,f*]azepine-4-carboxamides and 10-(1-phenyl-1*H*-indol-3-yl)-10,11-dihydro-5H-dibenzo[*b,f*]azepine derivatives from readily accessible 2-(*1H*-indol-1-yl)-*N*-substituted benzamides and various 1-phenyl-1*H*-indoles. Mild reaction conditions, high yields of the products and the use of readily available starting materials are the important features of this methodlogy. Moreover, most of the reported procedures described the reaction of *N*-arylindole in the presence of acid provides dibenzodiazepine derivatives only. However, in our protocol, we observed only indolyldibenzoazepine derivatives.

Experimental Section

General Remarks: Reagents and solvents were purchased from commercial suppliers and were used directly without any further purification unless otherwise stated. Column chromatography was performed on 63–200 mesh silica gel. ^{1}H and ^{13}C NMR spectra were recorded at 400 and 100 MHz, respectively. Chemical shifts are reported in parts per million (ppm) on the δ scale by using $CDCl_3$ as an internal standard, and coupling constants are expressed in Hertz (Hz). IR spectra were recorded with an FTIR spectrometer, and data are reported in cm^{-1}. Melting points were recorded by using an Electro Thermal capillary melting point apparatus.

General procedure

Boron trifluoride etherate ($BF_3.OEt_2$, 4.0 equiv.(2 mmol)) was added to a stirred solution of the 2-(1*H*-indol-1-yl)-*N*-substituted benzamides (0.5 mmol) or 1-phenyl-*1H*-indole (0.5 mmol) in dichloromethane (5.0 mL) at room temperature. Upon completion of the reaction (TLC), the reaction mixture was quenched with aqueous sodium bicarbonate solution (aq. $NaHCO_3$ solution), then the solution was extracted with ethyl acetate and washed with brine, then purified by flash column chromatography on silica gel to afford the desired product.

Spectral Data

***N*-Methyl-11-(1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b,f*]azepine-4-carboxamide (1b)**

Yield: (100 mg) 80%; Yellow green solid; m.p: 198-200 ^{o}C. FT-IR (KBr) (ν/cm^{-1}): 3421 (-NH-), 3312 (-NH-), 1642 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.6 (bs, 1H), 7.92 (dd, *J* = 7.4, 1.9 Hz, 1H), 7.67-7.65 (m, 1H), 7.48-7.40 (m, 2H), 7.33-7.31 (m, 1H), 7.21-7.14 (m, 3H), 7.10-7.06 (m, 2H), 7.00-6.96 (m, 1H), 6.86 (d, *J* = 7.9 Hz, 1H), 6.77 (d, *J* = 7.1 Hz, 1H), 6.67 (t, *J* = 7.6 Hz, 1H), 6.59-6.56 (m, 2H), 6.26 (d, *J* = 4.2 Hz, 1H), 4.95 (d, *J* = 6.6 Hz, 1H), 4.79 (bs, 1H), 3.61-3.56 (m, 1H), 3.50-3.47 (m, 1H), 3.00 (d, *J* = 4.8 Hz, 3H), 2.24 (d, *J* = 3.8 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C (ppm): 171.3, 167.0, 143.7, 141.7, 137.4, 136.2, 134.1, 132.4, 131.8, 131.1, 131.0, 128.1, 127.9, 127.3, 127.0, 126.9, 126.4, 126.3, 123.2 121.0, 120.6, 119.7, 119.6, 119.5, 119.2, 117.7 110.6, 42.7, 39.9, 27.0, 26.9. **LRMS** (EI) (m/z) (relative intensity): 500.6 (M^+, 51), 436.9 (100), 408.5 (74), 305.2 (61), 247.9 (50), 220.2 (45); **HRMS** calcd for $C_{32}H_{28}O_2N_4$ $(M+Na)^+$: 523.2110, found 523.2108.

***N*-Ethyl-11-(1-(2-(ethylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b,f*]azepine-4-carboxamide (2b)**

Yield: (93 mg) 70%; Yellow green solid; m.p: 178-180 ^{o}C. FT-IR (KBr) (ν/cm^{-1}): 3412 (-NH-), 3310 (-NH-), 1644 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.6 (bs, 1H), 7.92 (dd, *J* = 7.3, 1.8 Hz, 1H), 7.65 (dd, *J* = 6.0, 2.8 Hz, 1H), 7.48-7.41 (m, 2H), 7.33 (d, *J* = 7.7 Hz, 1H), 7.21-7.13 (m, 3H), 7.07-7.05 (m, 2H), 6.99 (t, *J* = 7.5 Hz, 1H), 6.87 (d, *J* = 7.9 Hz, 1H), 6.79 (d, *J* = 7.3 Hz, 1H), 6.67 (t, *J* = 7.6 Hz, 1H), 6.63 (s, 1H), 6.58 (t, *J* = 7.3 Hz, 1H), 6.24 (s, 1H), 4.95 (d, *J* = 6.3 Hz, 1H), 4.85 (bs, 1H), 3.61-3.55 (m, 1H), 3.52 - 3.51 (m, 1H), 3.49 - 3.46 (m, 2H), 2.93 - 2.87 (m, 1H), 2.66 (bs, 1H), 1.27 (t, *J* = 7.3 Hz, 3H), 0.27 (t, *J* = 6.6 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C (ppm): 170.5, 166.0, 143.7, 141.7, 137.5, 136.1, 133.9, 132.8, 132.6, 131.7, 131.1, 131.1, 128.2, 128.1, 127.3, 127.0, 126.6, 126.3, 123.2, 120.8, 120.6, 119.7, 119.6, 119.5, 119.1, 117.7, 110.7, 42.7, 39.9, 35.1, 34.6, 14.9, 13.7. **LRMS** (EI) (m/z) (relative intensity): 528.3 (M^+, 59), 436.6 (100), 409.6 (59), 263.1 (39), 220.1 (61); **HRMS** calcd for $C_{34}H_{32}O_2N_4$ $(M+Na)^+$: 551.2423, found 551.2414.

***N*-Allyl-11-(1-(2-(allylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b,f*]azepine-4-carboxamide (3b)**

Yield: (121 mg) 88.4%; Yellow green solid; m.p: 187-189 ^{o}C. FT-IR (KBr) (ν/cm^{-1}): 3412 (-NH-), 3306 (-NH-), 1645 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.5 (bs, 1H), 7.94 (dd, *J* = 7.5, 1.8 Hz, 1H), 7.65-7.62 (m, 1H), 7.50-7.42 (m, 2H), 7.36 (dd, *J* = 7.6, 1.0 Hz, 1H), 7.19-7.14 (m, 3H), 7.09-7.07 (m, 2H), 7.00 (t, *J* = 7.2 Hz, 1H), 6.88 (d, *J* = 7.9 Hz, 1H), 6.78 (d, *J* = 7.3 Hz, 1H), 6.68-6.58 (m, 3H), 6.29 (t, *J* = 5.3 Hz, 1H), 6.00-5.91 (m, 1H), 5.29 (dd, *J* = 17.2, 1.2 Hz, 1H), 5.21 (dd, *J* = 10.2, 1.1 Hz, 1H), 5.08 – 4.98 (m, 2H), 4.94 (d, *J* = 5.8 Hz, 1H), 4.76 (dd, *J* = 10.2, 1.2 Hz, 1H), 4.65 (dd, *J* = 17.6, 1.2 Hz, 1H), 4.09 (t, *J* = 5.6 Hz, 2H), 3.58-3.53 (m, 1H), 3.51-3.47 (m, 1H), 3.41 (s, 2H) . **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 170.4, 166.2, 143.9, 141.7, 137.5, 136.2, 134.0, 134.0, 133.4, 132.8, 132.5, 131.9, 131.2, 131.1, 128.3, 128.2, 127.5, 127.0, 126.7, 126.6, 126.2, 123.3, 121.1, 120.7, 119.8, 119.7, 119.3, 119.3 117.7, 117.1, 116.1, 110.7, 42.5, 42.4, 42.3, 40.0. **LRMS** (EI) (m/z) (relative intensity): 552.6 (M^+, 29), 437.2 (100), 409.2 (39), 275.0 (50),

220.1 (61); **HRMS** calcd for $C_{36}H_{32}O_2N_4$ $(M+Na)^+$: 575.2423, found 575.2421 .

***N*-Phenyl-11-(1-(2-(phenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (4b)** **Yield**: (132 mg) 85%; Yellow green solid; m.p: 139-141 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3393 (-NH-), 3287 (-NH-), 1660 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.2 (bs, 1H), 8.05 (d, J = 7.4 Hz, 1H), 7.86 (s, 1H), 7.64 (d, J = 8.2 Hz, 1H), 7.58 - 7.50 (m, 4H), 7.42 – 7.37 (m, 3H), 7.24-7.12 (m, 7H), 7.03-6.93 (m, 3H), 6.84 (t, J = 8.9 Hz, 2H), 6.76 -6.74 (m, 3H), 6.67 (d, J = 7.4 Hz, 1H), 6.51-6.46 (m, 2H), 4.89 (d, J = 7. 1 Hz, 1H), 3.54-3.48 (m, 1H), 3.44-3.40 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 169.0, 164.3, 144.1, 141.6, 137.8, 137.4, 137.2, 136.1, 134.0, 133.0, 132.2, 131.4, 131.0, 129.2, 128.8, 128.6, 128.5 127.7, 127.1, 127.0, 126.7, 126.3, 125.0, 124.7, 123.6, 121.6, 121.0, 120.6, 120.4, 120.0, 119.7, 119.4, 118.0, 110.4, 41.9, 40.1. **LRMS** (EI) (m/z) (relative intensity): 624.3 (M^+, 34), 436.9 (100), 409.1 (40), 353.0 (44), 309.8 (39), 220.2 (39); **HRMS** calcd for $C_{42}H_{32}O_2N_4$ $(M+Na)^+$: 647.2423, found 647.2414 .

***N*-Phenethyl-11-(1-(2-(phenethylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (5b) Yield**: (119 mg) 70%; Yellow green solid; m.p: 99-101 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3418 (-NH-), 3314 (-NH-), 1646 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.56 (bs, 1H), 7.90-7.89 (m, 1H), 7.68-7.66 (m, 1H), 7.49-7.41 (m, 2H), 7.35-7.31(m, 2H), 7.27-7.25 (m, 3H), 7.19-7.16 (m, 4H), 7.14-7.07 (m, 5H), 6.98 (t, J = 7.6 Hz, 1H), 6.88 (d, J = 7.9 Hz, 1H), 6.82-6.77 (m, 3H), 6.66 (s, 1H), 6.60 (t, J = 7.6 Hz, 1H), 6.54 (t, J = 7.2 Hz, 1H), 6.16 (t, J = 5.3 Hz, 1H), 5.03 (bs, 1H), 4.95 (d, J = 6.0 Hz, 1H), 3.7 (q, J = 12.8, 6.5 Hz, 2H), 3.60-3.54 (m, 1H), 3.51-3.48 (m, 1H), 3.14-3.10 (m, 1H), 2.96 (t, J = 6.7 Hz, 3H), 2.08-2.01 (m, 1H), 1.86 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 170.5, 166.4, 143.7, 141.6, 138.9, 138.7, 137.4, 136.1, 133.8, 132.6, 132.6, 131.7, 131.1, 130.9, 128.9, 128.8, 128.5, 128.5, 128.1, 127.9, 127.5, 127.0, 126.8, 126.3, 126.2, 123.2, 120.8, 120.7, 119.6, 119.5, 119.2, 117.7, 110.7, 42.5, 41.3, 41.0, 40.0, 35.7, 34.6. **LRMS** (EI) (m/z) (relative intensity): 680.7 (M^+, 51), 575.7 (100), 558.2 (78), 556.3 (34); **HRMS** calcd for $C_{46}H_{40}O_2N_4$ $(M+Na)^+$: 703.3049, found 703.3041 .

***N*-(4-Phenylbutyl)-11-(1-(2-(4-phenylbutylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (6b) Yield**: (157 mg) 85%; Yellow green solid; m.p: 135-137 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3412 (-NH-), 3314 (-NH-), 1645 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.57 (bs, 1H), 7.95-7.93 (m, 1H), 7.65-7.62 (m, 1H), 7.49-7.41 (m, 2H), 7.30-7.25 (m, 6H), 7.20-7.13 (m, 7H), 7.08-7.04 (m, 4H), 6.97 (t, J = 7.3 Hz, 1H), 6.86 (d, J = 7.8 Hz, 1H), 6.71-6.63 (m, 3H), 6.54 (t, J = 7.3 Hz, 1H), 6.18 (s, 1H), 4.95 (s, 1H), 4.91 (d, J = 4.4 Hz, 1H), 3.56-3.45 (m, 4H), 2.86 (s, 1H), 2.68 (t, J = 7.3 Hz, 2H), 2.35-2.31 (m, 2H), 1.77-1.64 (m, 5H), 1.18-1.11 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 170.5, 166.1, 143.7, 142.2, 142.1, 141.6, 137.4, 136.0, 133.8, 132.6, 132.6, 131.7, 131.1, 131.0, 128.5, 128.5, 128.3, 128.2, 128.1, 127.3, 126.9, 126.6, 126.3, 126.1, 125.9, 125.8, 123.1, 120.8, 120.6, 119.6, 119.5, 119.5, 119.1, 117.6, 110.6, 42.5, 39.9, 39.9, 39.7, 35.6, 35.5, 29.8, 29.2, 28.8, 28.3. **LRMS** (EI) (m/z) (relative intensity): 736.9 (M^+, 43), 602.9 (61), 586.7 (74), 586.4 (100) 436.9 (100); **HRMS** calcd for $C_{50}H_{48}O_2N_4$ $(M+Na)^+$: 759.3675, found 759.3682.

***N*-o-Tolyl-11-(1-(2-(o-tolylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (7b) Yield**: (154 mg) 94%; Yellow green solid; m.p: 121-123 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3387 (-NH-), 3291 (-NH-), 1657 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.43 (bs, 1H), 8.09-8.07 (m, 1H), 7.76 (d, J = 7.7 Hz, 1H), 7.65-7.62 (m, 2H), 7.57-7.50 (m, 2H), 7.47 (d, J = 7.4 Hz, 1H), 7.30 – 7.22 (m, 5H), 7.18 – 7.15 (m, 3H), 7.07-6.98 (m, 5H), 6.83-6.78 (m, 4H), 6.62 (d, J = 6.5 Hz, 1H), 6.49 (s, 1H), 4.91 (d, J = 7.0 Hz, 1H), 3.54-3.48 (m, 1H), 3.44-3.41 (m, 1H), 2.34 (s, 3H), 1.39 (s, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 169.1, 164.5, 144.4, 141.5, 137.8, 136.1, 135.5, 135.5, 134.2, 132.9, 132.8, 132.2, 131.6, 130.9, 130.9, 130.3, 128.5, 128.4, 127.8, 127.1, 127.0, 126.9, 126.7, 126.3, 126.2, 125.4, 124.2, 123.6, 121.8, 121.0, 120.0, 119.9, 119.3, 117.8, 110.7, 42.1, 40.0, 18.2, 16.8 . **LRMS** (EI) (m/z) (relative intensity): 652.6 (M^+, 56), 543.6 (100), 436.5 (100), 409.1 (33); **HRMS** calcd for $C_{44}H_{36}N_4O_2$ $(M+Na)^+$: 675.2736, found 675.2738 .

***N*-p-Tolyl-11-(1-(2-(p-tolylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (8b) Yield**: (151 mg) 92; Yellow green solid; m.p: 153-155 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3387 (-NH-), 3303 (-NH-), 1654 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.2 (bs, 1H), 8.05 (dd, J = 7.5, 1.4 Hz, 1H), 7.80 (s, 1H), 7.64-7.62 (m, 1H), 7.57-7.49 (m, 2H), 7.46-7.40 (m, 3H), 7.24-7.18 (m, 6H), 7.00-6.93 (m, 4H), 6.85 (d, J = 7.9 Hz, 1H), 6.77-6.73 (m, 2H), 6.64 (t, J = 8.1 Hz, 3H), 6.50 (t, J = 7.3 Hz, 2H), 4.89 (d, J = 7.2 Hz, 1H), 3.53-3.47 (m, 1H), 3.42-3.38 (m, 1H), 2.35 (s, 3H), 2.24 (s, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 164.1, 144.1, 141.6, 137.5, 136.1, 135.1, 134.8, 134.7, 134.4, 133.9, 133.2, 133.1, 132.1, 131.6, 131.0, 129.8, 129.4, 128.6, 128.5, 127.7, 127.1, 127.0, 126.8, 126.2, 123.6, 121.6, 121.1, 121.0, 120.8, 120.0, 119.9, 119.5, 118.0, 110.5, 41.9, 40.2, 21.1, 21.0. **LRMS** (EI) (m/z) (relative intensity): 652.7 (M^+, 45), 543.9 (100), 541.8 (34), 436.8 (100); **HRMS** calcd for $C_{44}H_{36}O_2N_4$ $(M+Na)^+$: 675.2736, found 675.2748 .

***N*-(2,4-Dimethylphenyl)-11-(1-(2-(2,4-dimethylphenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (9b) Yield**: (128 mg) 75%; Yellow green solid; m.p: 242-244 ^oC. FT-IR (KBr) (ν/cm^{-1}): 3338 (-NH-), 3253 (-NH-), 1641 (-CONH-); **^1H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.4 (bs, 1H), 8.07 (dd, J = 7.4, 1.7 Hz, 1H), 7.64-7.62 (m, 1H), 7.59-7.46 (m, 5H), 7.21-7.18 (m, 3H), 7.09-7.04 (m, 5H), 6.87-6.77 (m, 6H), 6.59 (d, J = 7.0 Hz, 1H), 6.54-6.53 (m, 1H), 6.37 (bs, 1H), 4.91 (d, J = 6.8 Hz, 1H), 3.53-3.47 (m, 1H), 3.43-3.39 (m, 1H), 2.33 (s, 3H), 2.30 (s, 3H), 2.23 (s, 3H), 1.39 (s, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 169.2, 164.6, 144.3, 141.5, 137.7, 136.1, 135.1, 134.1, 132.8, 132.0, 131.5, 131.5, 130.9, 130.9, 128.4, 128.3, 127.7, 127.5, 127.1, 127.0, 126.8, 126.7, 126.4, 124.7, 123.5, 121.7, 120.9, 119.9, 119.3, 117.7, 110.7, 42.1, 40.0, 21.1, 20.9, 18.1,

16.8. **LRMS** (EI) (m/z) (relative intensity): 680.7 (M^+, 100), 558.2 (50), 436.5 (100), 408.2 (35), **HRMS** calcd for $C_{46}H_{40}N_4O_2$ $(M+Na)^+$: 703.3049, found 703.3038

***N*-(4-Methoxyphenyl)-11-(1-(2-(4-methoxyphenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (10b) Yield**: (120 mg) 70%; Yellow green solid; m.p: 182-184 °C. FT-IR (KBr) (ν/cm^{-1}): 3387 (-NH-), 3285 (-NH-), 1649 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.3 (bs, 1H), 8.04 (d, *J* = 7.3 Hz, 1H), 7.78 (s, 1H), 7.65-7.64 (m, 1H), 7.57-7.51 (m, 2H), 7.47-7.41 (m, 3H), 7.20 (d, *J* = 2.4 Hz, 4H), 7.03 (d, *J* = 7.0 Hz, 1H), 6.92 (d, *J* = 8.8 Hz, 3H), 6.83 (d, *J* = 7.8 Hz, 1H), 6.76 (s, 1H), 6.67-6.60 (m, 6H), 6.52 (t, *J* = 7.5 Hz, 1H), 6.45 (bs, 1H), 4.91 (d, *J* = 6.8 Hz, 1H), 3.82 (s, 3H), 3.72 (s, 3H), 3.53-3.48 (m, 1H), 3.44-3.41 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 157.1, 156.8, 144.1, 141.6, 137.4, 136.1, 133.9, 133.0, 132.9, 132.1, 131.5 131.0, 130.7, 130.2, 128.6, 128.4, 127.7, 127.0, 127.0, 126.7 126.3, 123.6, 123.0, 123.0, 122.8, 121.5, 121.0, 120.0, 119.8, 119.4, 117.9, 114.4, 114.0, 110.6, 55.7, 55.5, 42.0, 40.1. **LRMS** (EI) (m/z) (relative intensity): 684.4 (M^+, 100), 559.9 (51), 436.5 (100), 410.3 (55), 341.1 (40); **HRMS** calcd for $C_{44}H_{36}O_4N_4$ $(M+Na)^+$: 707.2634, found 707.2628 .

1-Chloro-11-(1-(5-chloro-2-(phenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-phenyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (11b) Yield: (139 mg) 80%; Yellow green solid; m.p: 168-170 °C. FT-IR (KBr) (ν/cm^{-1}): 3387 (-NH-), 3295 (-NH-), 1657 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.6 (bs, 1H), 8.05 (d, *J* = 8.5 Hz, 1H), 7.84 (d, *J* = 7.9 Hz, 2H), 7.57 (d, *J* = 7.9 Hz, 2H), 7.44-7.38 (m, 4H), 7.25-7.21 (m, 2H), 7.19-7.15 (m, 2H), 7.10 (t, *J* = 7.6 Hz, 2H), 7.04-6.96 (m, 3H), 6.89-6.83 (m, 3H), 6.73-6.66 (m, 3H), 6.49 (d, *J* = 6.2 Hz, 1H), 6.34 (s, 1H), 5.66 (d, *J* = 5.4 Hz, 1H), 3.52-3.48 (m, 1H), 3.38-3.33 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 168.7, 162.9, 145.9, 140.9, 140.0, 138.0, 137.5, 137.2, 136.8, 132.9, 130.5, 130.1, 129.3, 128.7, 128.2, 128.0, 127.8, 127.5, 127.2, 127.1, 126.5, 125.2, 124.9, 123.9, 122.3, 121.4, 121.1, 119.6, 119.5, 118.5, 118.2, 117.5, 110.5, 39.1, 38.0. **LRMS** (EI) (m/z) (relative intensity): 692.2 (M^+, 90), 598.8 (39), 505.1 (100), 469.7 (90), 468.0 (80), 442.6 (75); **HRMS** calcd for $C_{42}H_{30}Cl_2N_4O_2$ $(M+Na)^+$: 715.1644, found 715.1648.

2-Chloro-11-(1-(4-chloro-2-(phenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-phenyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (12b) Yield: (132 mg) 76%; Yellow green solid; m.p: 126-128 °C. FT-IR (KBr) (ν/cm^{-1}): 3395 (-NH-), 3289 (-NH-), 1655 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.63 (bs, 1H), 8.05 (d, *J* = 8.4 Hz, 1H), 7.85 (d, *J* = 7.0 Hz, 2H), 7.57 (d, *J* = 7.9 Hz, 2H), 7.44-7.38 (m, 4H), 7.26-7.21 (m, 2H),7.20-7.15 (m, 2H), 7.10 (t, *J* = 7.5 Hz, 2H), 7.04-6.97 (m, 3H), 6.89-6.83 (m, 3H), 6.65 (m, 3H), 6.49 (d, *J* = 5.6 Hz, 1H), 6.34 (s, 1H), 5.66 (d, *J* = 5.4 Hz, 1H), 3.52-3.48 (m, 1H), 3.38-3.33 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 168.7, 167.3, 162.9, 146.0, 140.9, 140.1, 139.4, 138.1, 137.7, 137.5, 137.3, 136.8, 136.3, 134.6, 132.9, 130.5, 130.1, 129.5, 129.3, 129.1, 128.9, 128.7, 128.3, 127.8, 127.5, 127.1, 127.1, 126.5, 125.3, 125.0, 124.0, 121.6, 121.4, 121.2, 120.3, 119.6, 119.5, 118.5, 117.5, 110.6, 39.1, 38.0. **LRMS** (EI) (m/z) (relative intensity): 692.3 (M^+, 5), 597.7 (35), 505.4 (100), 254.0 (100), 225.9 (73), 190.8 (67), 93.0 (96); **HRMS** calcd for $C_{42}H_{30}Cl_2N_4O_2$ $(M+Na)^+$: 715.1644, found 715.1652.

2-Bromo-11-(1-(4-bromo-2-(phenylcarbamoyl)phenyl)-1*H*-indol-3-yl)-N-phenyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (13b) Yield: (137 mg) 70%; Yellow green solid; m.p: 177-179 °C. FT-IR (KBr) (ν/cm^{-1}): 3389 (-NH-), 3291 (-NH-), 1657 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.23 (bs, 1H), 8.20 (s, 1H), 7.77 (bs, 1H), 7.68-7.65 (m, 2H), 7.58-7.56 (m, 3H), 7.40 (t, *J* = 7.8 Hz, 2H), 7.28 (s, 1H), 7.24-7.20 (m, 3H), 7.17-7.13 (m, 3H), 7.02 (t, *J* = 7.0 Hz, 2H), 6.91 (t, *J* = 7.0 Hz, 1H), 6.80 (d, *J* = 7.9 Hz, 1H), 6.70 (t, *J* = 7.9 Hz, 3H), 6.59 (s, 1H), 6.56 (d, *J* = 7.6 Hz, 1H), 6.44 (bs, 1H), 4.87 (d, *J* = 5.7 Hz, 1H), 3.47–3.41 (m, 1H), 3.39–3.36 (m, 1H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 167, 162.6, 143.1, 140.9, 137.4, 137.3, 136.8, 136.6, 135.2, 135.1, 134.5, 13.4, 134.1, 131.1, 130.0, 129.3, 129.1, 128.9, 127.5, 127.2, 126.9, 126.5, 125.4, 125.1, 124.0, 122.4, 121.4, 121.4, 121.1, 120.9, 120.6, 119.7, 119.5, 110.5, 109.4, 42.4, 39.6. **LRMS** (EI) (m/z) (relative intensity): 805.4 (M+Na, 100), 804.3 (48).

8-Fluoro-11-(5-fluoro-1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-methyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (14b) Yield: (90 mg) 67%; Yellow green solid; m.p: 250-252 °C. FT-IR (KBr) (ν/cm^{-1}): 3442 (-NH-), 3309 (-NH-), 1645 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.59 (bs, 1H), 7.89 (dd, *J* = 7.4, 1.7 Hz, 1H), 7.49–7.41 (m, 2H), 7.34 (d, *J* = 7.4 Hz, 1H), 7.28-7.25 (m, 1H), 7.20 (d, *J* = 7.4 Hz, 1H), 7.06 (d, *J* = 7.4 Hz, 1H), 7.02-6.99 (m, 1H), 6.94-6.89 (m, 1H), 6.83-6.79 (m, 1H), 6.72-6.67 (m, 2H), 6.59 (s, 1H), 6.51-6.48 (m, 1H), 6.20 (d, *J* = 3.4 Hz, 1H), 4.88 (t, *J* = 4.2 Hz, 1H), 4.77 (bs, 1H), 3.47-3.46 (m, 2H), 3.02 (d, *J* = 4.4 Hz, 3H), 2.31 (d, *J* = 3.5 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 171.2, 166.9, 161.4, 159.6, 143.8, 138.2, 136.0, 134.5, 133.9, 132.5, 131.8, 131.3, 131.1, 128.5, 128.4, 128.2, 128.2, 127.8, 127.6, 127.5, 126.5, 120.8, 120.3, 120.2, 119.3, 117.7, 117.0, 116.8, 113.8, 113.6, 111.8, 104.6, 104.4, 42.5, 39.2, 27.0, 26.8. **LRMS** (ESI) (m/z) (relative intensity): 559.6 (M+Na, 100), 558.0 (23), 557.1 (18).

8-Chloro-11-(5-chloro-1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-methyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (15b): Yield: (111 mg) 78%; Yellow green solid; m.p: 252-254 °C. FT-IR (KBr) (ν/cm^{-1}): 3421 (-NH-), 3306 (-NH-), 1641 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.7 (bs, 1H), 7.89-7.87 (m, 1H), 7.60 (s, 1H), 7.50-7.43 (m, 2H), 7.35-7.33 (m, 1H), 7.19 (d, *J* = 7.4 Hz, 1H), 7.14 – 7.08 (m, 2H), 7.01 (d, *J* = 8.7 Hz, 1H), 6.95 (dd, *J* = 8.5, 2.3 Hz, 1H), 6.79 (d, *J* = 8.8 Hz, 2H), 6.72 (t, *J* = 7.6 Hz, 1H), 6.63 (s, 1H), 6.22 (d, *J* = 4.6 Hz, 1H), 4.87 (t, *J* = 3.9 Hz, 1H), 4.75 (bs, 1H), 3.46 (s, 2H), 3.02 (d, *J* = 4.6 Hz, 3H), 2.31 (d, *J* = 3.4 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 171.1, 166.9, 143.2, 140.3, 135.8, 135.7, 134.2, 132.6, 131.8, 131.0, 130.5, 128.5, 128.2, 128.1, 127.8, 127.5, 127.0, 126.5, 124.2, 123.6, 120.4, 120.0, 119.5, 118.8, 118.2, 111.8, 42.4, 39.5, 27.1, 26.9. **LRMS** (EI) (m/z) (relative intensity): 568.1 (M^+, 59), 505.2 (100), 504.1 (80), 338.8 (90);

HRMS calcd for $C_{32}H_{26}Cl_2N_4O_2$ $(M+Na)^+$: 591.1331, found 591.1332 .

8-Bromo-11-(5-bromo-1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-methyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (16b) Yield: (100 mg) 63%; Yellow green solid; m.p: 258-260 °C. FT-IR (KBr) (ν/cm^{-1}): 3422 (-NH-), 3307 (-NH-), 1644 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.72 (bs, 1H), 7.88-7.86 (m, 1H), 7.75 (s, 1H), 7.50-7.43 (m, 2H), 7.34 (d, J = 7.6 Hz, 1H), 7.18 (d, J = 7.5 Hz, 1H), 7.10-7.07 (m, 2H), 6.98-6.93 (m, 2H), 6.75-6.70 (m, 2H), 6.62 (s, 1H), 6.23 (d, J = 4.1 Hz, 1H), 4.86 (d, J = 3.8 Hz, 1H), 4.77 (bs, 1H), 3.45 (d, J = 3.6 Hz, 2H), 3.01 (d, J = 4.8 Hz, 3H), 2.31 (d, J = 4.0 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 171.1, 166.8, 143.2, 140.8, 136.1 135.6, 134.1, 133.4, 132.7, 132.1, 131.8, 130.0, 128.8, 128.6, 128.0, 127.9, 126.5, 126.2, 121.9, 120.8, 119.8, 119.6, 118.3, 114.1, 112.3, 111.6, 42.4, 39.6, 27.1, 27.0. **LRMS** (EI) (m/z) (relative intensity): 658.3 (M^+, 100), 580.5 (74), 578.3 (62), 327.9 (100), 218.8 (84), 179.1 (79); **HRMS** calcd for $C_{32}H_{26}Br_2N_4O_2$ $(M+Na)^+$: 679.0320, found 679.0326 .

9-Methoxy-11-(4-methoxy-1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-methyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (17b) Yield: (92 mg) 65.7%; Yellow green solid; m.p: 167-169 °C. FT-IR (KBr) (ν/cm^{-1}): 3415 (-NH-), 3314 (-NH-), 1648 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.36 (bs, 1H), 7.94 (dd, J = 7.3, 2.0 Hz, 1H), 7.47-7.40 (m, 2H), 7.28-7.26 (m, 1H), 7.18 (d, J = 7.5 Hz, 1H), 7.06-7.01 (m, 2H), 6.91 (t, J = 8.1 Hz, 1H), 6.68-6.63 (m, 2H), 6.55-6.51 (m, 3H), 6.21-6.16 (m, 2H), 5.27 (d, J = 7.7 Hz, 1H), 5.0 (bs, 1H), 4.01-3.95 (m, 1H), 3.92 (s, 3H), 3.42 (s, 3H), 3.16-3.12 (m, 1H), 3.01 (d, J = 4.8 Hz, 3H), 2.37 (s, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 171.3, 166.9, 158.3, 155.0, 143.9, 143.6, 138.9, 136.5, 134.5, 133.6 132.2, 131.7, 131.0, 128.1, 128.1, 126.4, 125.8, 125.6, 123.9, 122.1, 119.5, 117.8, 117.6, 116.5, 112.5, 103.5, 102.4, 100.9, 55.8, 55.4, 42.6, 31.0, 26.9, 26.9. **LRMS** (EI) (m/z) (relative intensity): 560.4 (M^+, 78), 497.4 (82), 496.5 (100), 278.1 (100), 249.7 (78); **HRMS** calcd for $C_{34}H_{32}O_4N_4$ $(M+Na)^+$: 583.2321, found 583.2319.

8-Methoxy-11-(5-methoxy-1-(2-(methylcarbamoyl)phenyl)-1*H*-indol-3-yl)-*N*-methyl-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine-4-carboxamide (18b) Yield: (98 mg) 70%; Yellow green solid; m.p: 218-220 °C. FT-IR (KBr) (ν/cm^{-1}): 3412 (-NH-), 3315 (-NH-), 1642 (-CONH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 10.41 (bs, 1H), 7.91 (d, J = 7.3 Hz, 1H), 7.47-7.39 (m, 2H), 7.30 (d, J = 7.7 Hz, 1H), 7.17 (d, J = 7.2 Hz, 1H), 7.09-7.06 (m, 2H), 6.98 (d, J = 8.9 Hz, 1H), 6.82-6.80 (m, 2H), 6.63-6.57 (m, 3H), 6.36 (s, 1H), 6.24 (s, 1H), 4.88 (s, 2H), 3.85 (s, 3H), 3.58 (s, 3H), 3.49 (s, 2H), 3.01 (d, J = 4.5 Hz, 3H), 2.30 (d, J = 3.8 Hz, 3H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 171.3, 167.0, 154.8, 153.2, 144.3, 136.4, 135.7, 134.3, 132.6, 132.2, 131.8, 131.3, 131.2, 128.2, 128.0, 128.0, 127.8,127.6, 126.3, 121.0, 120.2, 119.0, 117.1, 116.1, 112.8, 112.5, 111.4, 101.9, 56.1, 55.5, 42.4, 39.6, 27.0, 26.8. **LRMS** (EI) (m/z) (relative intensity): 560.3 (M^+, 100), 497.2 (40), 496.5 (34), 279.1 (85), 250.1 (56); **HRMS** calcd for $C_{34}H_{32}N_4O_4$ $(M+Na)^+$: 583.2321, found 583.2324 .

10-(1-Phenyl-1H-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine (19b). Yield: (82 mg) 85%; white solid; m.p: 97-99 °C. FT-IR (KBr) (ν/cm^{-1}): 3389 (-NH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 7.70-7.68 (m, 1H), 7.50 (d, J = 7.4 Hz, 1H), 7.43-7.39 (m, 2H), 7.27-7.22 (m, 3H), 7.21-7.15 (m, 2H), 7.13-7.08 (m, 2H), 7.05-7.01 (m, 1H), 6.83-6.72 (m, 4H), 6.66-6.62 (m, 2H), 6.07 (bs, 1H), 4.92 (t, J = 4.5 Hz, 1H), 3.54-3.53 (m, 2H). **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 142.7, 142.3, 139.9, 136.1, 131.6, 131.5, 130.1, 129.5, 128.2, 127.6 127.2, 126.9 126.7, 126.1, 124.3, 122.4 121.1, 120.1,120.1, 119.7, 119.6, 118.6, 117.7, 110.6, 41.4, 40.0. **LRMS** (EI) (m/z) (relative intensity): 385.3 (M^+, 61), 306.4 (58), 206.0 (62), 193.0 (100); **HRMS** calcd for $C_{28}H_{23}N_2$ $(M+H)^+$: 387.1861, found 387.1856 .

2-Methoxy-10-(5-methoxy-1-phenyl-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine (20b) Yield: (94 mg) 84%; white solid; m.p: 78-80 °C. FT-IR (KBr) (ν/cm^{-1}): 3381 (-NH-); **^{1}HNMR**(400MHz, $CDCl_3$) δ_H (ppm): 7.41-7.38 (m, 3H), 7.26-7.22 (m, 3H), 7.13-7.06 (m, 3H), 6.86 (dd, J = 9.0, 1.8 Hz, 1H), 6.79-6.72 (m, 3H), 6.62- 6.59 (m, 2H), 6.36 (d, J = 2.0 Hz, 1H), 5.84 (bs, 1H), 4.87 (s, 1H), 3.87 (s, 3H), 3.57 (s, 3H), 3.50 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 154.4, 140.0, 136.9, 131.9, 131.3, 129.6, 129.5, 129.3, 129.2, 128.7, 127.2, 125.8, 123.9, 121.1, 119.2, 118.9, 118.4, 116.2, 112.6, 112.0, 111.4, 101.8, 56.1, 55.6, 41.2, 39.5. **LRMS** (ESI) (m/z) (relative intensity): 469.5 (M+Na), 446.4 (62).

2-Methyl-11-(1-p-tolyl-1H-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine (21b) Yield: (82 mg) 79%; white solid; m.p: 88-90 °C. FT-IR (KBr) (ν/cm^{-1}): 3389 (-NH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 7.72 (dd, J = 6.3, 2.3 Hz, 1H), 7.47 (dd, J = 6.6, 4.0 Hz, 1H), 7.22-7.18 (m, 4H), 7.16-7.12 (m, 2H), 7.04-7.02 (m, 1H), 7.00 (s, 1H), 6.97-6.91 (m, 1H), 6.76-6.72 (m, 3H), 6.62 (t, J = 7.3 Hz, 1H), 6.57 (s, 1H), 5.98 (bs, 1H), 4.92 (d, J = 4.3 Hz, 1H), 3.51 (d, J = 6.9 Hz, 2H), 2.38 (s, 3H), 2.19 (s, 3H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 143.0, 139.9, 137.4, 136.2, 135.8, 132.0, 131.5, 130.0, 128.7, 128.1, 127.8, 127.3, 126.8, 126.8, 124.2, 122.2, 120.7, 119.8, 119.5, 118.7, 117.5, 110.6, 41.3, 39.9, 21.1, 20.5. **LRMS** (-ESI) (m/z) (relative intensity): 413.4 (M-1, 100).

2-Methoxy-11-(1-(4-methoxyphenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine (22b) Yield: (59 mg) 53%; white solid; m.p: 82-84 °C. FT-IR (KBr) (ν/cm^{-1}): 3384 (-NH-); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 7.73 (d, J = 7.0 Hz, 1H), 7.46 (d, J = 7.6 Hz, 1H), 7.25-7.21 (m, 4H), 7.06 (t, J = 7.0 Hz, 1H), 6.99 (d, J = 8.0 Hz, 2H), 6.85 (d, J = 6.8 Hz, 1H), 6.76-6.68 (m, 6H), 5.90 (bs, 1H), 4.97 (s, 1H), 3.86 (s, 3H), 3.69 (s, 3H), 3.59 (s, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 158.0, 153.3, 143.3, 136.6, 136.4, 132.9, 132.3, 131.5, 127.8, 126.9, 126.8, 125.8, 122.2, 120.0, 119.8, 119.6, 119.6, 117.5, 116.2, 114.7, 112.9, 110.5, 55.6, 41.0, 40.0. **LRMS** (EI) (m/z) (relative intensity): 446.2 (M^+, 100), 336.8 (41), 236.0 (28), 223.1 (69); **HRMS** calcd for $C_{30}H_{27}N_2O_2$ $(M+H)^+$: 447.2073, found 447.2068

2-Chloro-11-(1-(4-chlorophenyl)-1*H*-indol-3-yl)-10,11-dihydro-5*H*-dibenzo[*b*,*f*]azepine (23b) Yield: (61. mg) 53%; white solid; m.p: 215-217 °C. FT-IR (KBr) (ν/cm^{-1}): 3396 (-NH-

); **^{1}H NMR** (400 MHz, $CDCl_3$) δ_H (ppm): 7.68-7.66 (m, 1H), 7.44-7.42 (m, 1H), 7.39-7.37(m, 2H), 7.24-7.17 (m, 4H), 7.09 (d, J = 2.2 Hz, 1H), 7.07-7.02 (m, 2H), 6.76-6.74 (m, 3H), 6.65 (t, J = 7.4 Hz, 1H), 6.53 (s, 1H), 6.04 (bs, 1H), 4.86 (t, J = 4.5 Hz, 1H), 3.49 (d, J = 4.5 Hz, 2H); **^{13}C NMR** (100 MHz, $CDCl_3$) δ_C(ppm): 142.2, 141.0, 138.3, 136.1, 131.7, 131.5, 131.4, 131.0, 129.7, 128.0, 127.4, 127.2, 127.0, 126.4, 125.4, 124.3, 122.8, 120.8, 120.5, 120.5, 120.0, 119.6, 117.9, 110.5, 41.3, 39.6 . **LRMS** (-ESI) (m/z) (relative intensity): 453.2 (M-1, 100).

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Notes and references

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Electronic Supplementary Information (ESI) available: CCDC numbers of compounds **18b**, and **23b** are 1003565 and 1003566

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