Novel syntheses of pyrido[1,2-*a*]pyrimidin-2-ones, 2*H*-quinolizin-2-ones, pyrido[1,2-*a*]quinolin-3-ones, and thiazolo[3,2-*a*]pyrimidin-7-ones

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Dedicated to Professor Narasimhan on his 75th anniversary

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Abstract

As novel 1,3-bis-electrophilic synthons, 1-benzotriazolyl-2-propynones provide access to the fused ring systems of pyrido[1,2-*a*]pyrimidin-2-ones and 2*H*-quinolizin-2-ones, known for their diverse biological activities. Reactions of *N*-(phenylpropioyl)benzotriazole (**13a**) with substituted 2-aminopyridines **14** afforded pyrido[1,2-*a*]pyrimidin-2-ones **16a–c** in good yields (71–73%). Likewise, 2*H*-quinolizin-2-ones **18a–f** were obtained in moderate to good yields (39–81%) from reactions of benzotriazolyl-2-propynones **13a,b** with substituted 2-picolines **14**. Extension of this methodology to other fused ring systems has provided 1-alkyl- and 1-arylpyrido[1,2-*a*]quinolin-3-ones **20a,b** (40%) and 5-phenylthiazolo[3,2-*a*]pyrimidin-7-one (**22**) (54%) in moderate yields.

Keywords: 1,3-Bis-electrophilic synthons, pyrido[1,2-*a*]pyrimidin-2-ones, 2*H*-quinolizin-2-ones, pyrido[1,2-*a*]quinolin-3-ones, thiazolo[3,2-*a*]pyrimidin-7-ones

Introduction

Pyrido[1,2-*a*]pyrimidines. Pyrido[1,2-*a*]pyrimidines possess diverse biological activities.[1] This structural motif is present in the tranquilizer pirenperone,[2a] the antiallergic agent ramastine,[2b] an antiulcerative agent,[2c] and an antiasthmatic agent[2d] (Figure 1).

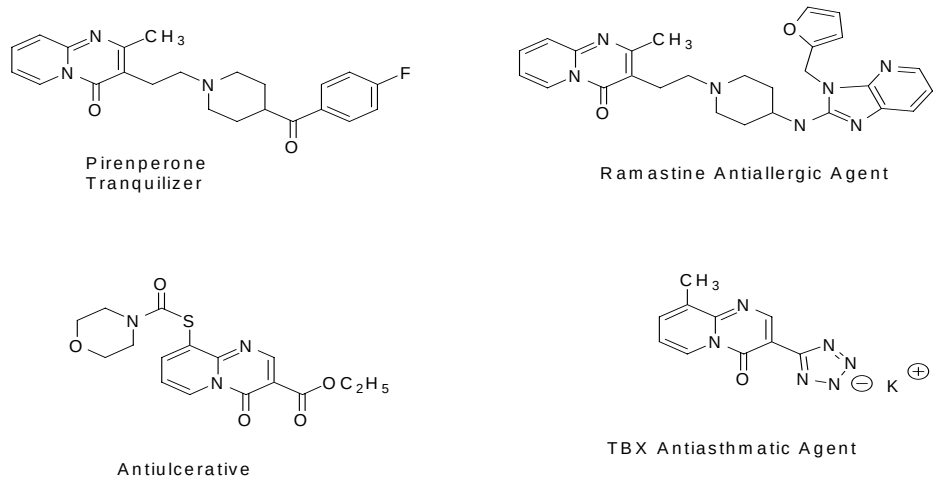
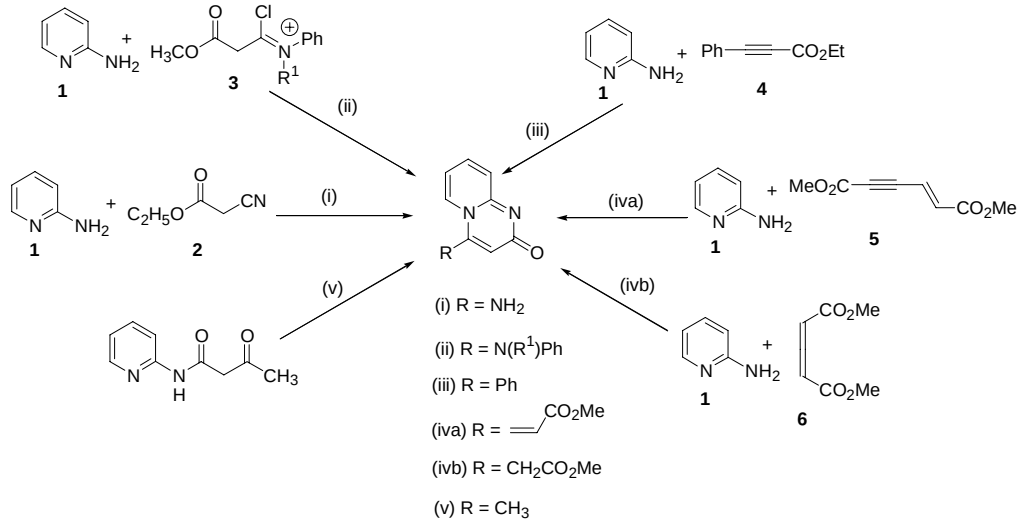


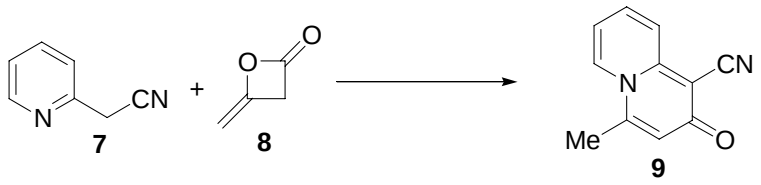
Figure 1. Pyrido[1,2-*a*]pyrimidines possessing diverse biological activities.

The pyrido[1,2-*a*]pyrimidin-4-ones (for examples see Figure 1) form the best-known class of pyrido[1,2-*a*]pyrimidines, to which numerous synthetic routes are available.[3] Literature methods (Scheme 1) to synthesize the less studied pyrido[1,2-*a*]pyrimidin-2-ones comprise: (i) cyclization of 2-aminopyridine **1** with ethyl cyanoacetate **2** at 80–100 °C and 14 kbar;[4] (ii) the cyclization of 2-aminopyridine with the Vilsmeier-Haack **3** reagent prepared in situ from *N*-alkyl-*N*-arylethoxycarbonylacetamide and phosphorus oxychloride, which always affords a mixture of the pyrido[1,2-*a*]pyrimidin-2-ones and pyrido[1,2-*a*]pyrimidin-4-ones;[5] (iii) reaction of phenylpropiolic ester **4** with 2-aminopyridine, which forms a significant amount of undesired side products;[6,1] (iv) reaction of dimethyl hex-2-en-4-yne-1,6-dioate (**5**)[7] or allene-1,3-dicarboxylic esters **6**[8] with 2-aminopyridines; (v) acid catalyzed cyclization of *N*-acetoacetylated 2-amino pyridines/picolines/quinolines under microwave assisted synthesis.[9]



Scheme 1. Literature methods for synthesis of pyrido[1,2-*a*]pyrimidin-2-ones.

Quinolizin-2-ones. Quinolizin-2-ones are a little studied class. The only reported synthesis is 4-methyl-2-oxo-2*H*-quinolizine-1-carbonitrile (**9**) by the reaction of 2-pyridylacetonitrile (**7**) with 4-methyleneoxetan-2-one (**8**) (Scheme 2).[10] In particular, no reported examples use picolines in the place of 2-aminopyridines in the reaction with acetylenic carboxylic acid derivatives.



Scheme 2. 2-Pyridylacetonitrile with 4-methyleneoxetan-2-one.

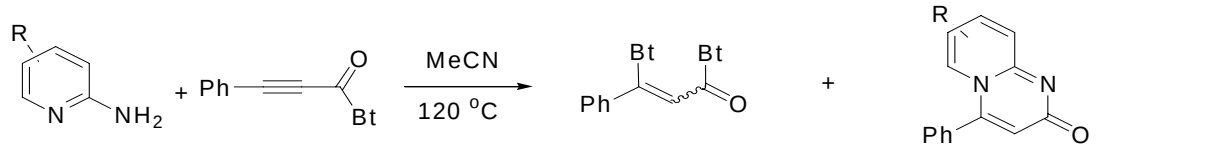
N-Acylbenzotriazoles are well known mild neutral *N*-acylating agents for the preparation of primary, secondary, and tertiary amides[11a] including formylation[11b] and trifluoroacylation.[11c] They are also used for the *O*-acylation of aldehydes[11d] and for regioselective C-acylation of ketone enolates into α-diketones.[11e] Recently, we developed an efficient method for the synthesis of *N*-acylbenzotriazoles from acetylenic-carboxylic acids.[12] *N*-Acylbenzotriazoles formed from acetylenic-carboxylic acids are 1,3-bis-electrophiles. We now demonstrate that their reaction with 2-aminopyridines leads to improved syntheses of pyrido[1,2-*a*]pyrimidin-2-ones (Scheme 1 method (iii)).

Results and Discussion

Preparation of substituted 1-benzotriazolyl-2-propynones. As representative examples of alkyl and aryl substituted 1-benzotriazolyl-2-propynones, 1-benzotriazol-1-yl-3-phenylpropynone and 1-benzotriazol-1-yl-oct-2-yn-1-one (**13a,b**) were prepared in 87% and 95% yields, respectively (Scheme 3). 1-Benzotriazol-1-yl-3-phenylpropynone (**13a**) was previously reported by our group;[12] 1-benzotriazol-1-yl-oct-2-yn-1-one (**13b**) is a novel compound.

Scheme 3. Synthesis of substituted 1-benzotriazolyl-2-propynones.

Synthesis of pyrido[1,2-*a*]pyrimidin-2-ones. In the first reaction to obtain pyrido[1,2-*a*]pyrimidine-2-one **16a** (conducted at 80–100 °C in acetonitrile for 2–4h), it was noted that a significant amount of byproduct **15** was obtained along with the desired product **16a**. Thus when 1-benzotriazol-1-yl-3-phenylpropynone (**13a**) was reacted with 2-aminopyridine in acetonitrile at 80 °C for 2h, **16a** was isolated in 27% yield along with the by-product **15** in 46% yield (Scheme 4). By-product **15** is apparently formed by the counter attack of benzotriazole to 1-benzotriazol-1-yl-3-phenylpropynone (**13a**). The isolated yield of **15** was decreased significantly by conducting the reaction in a sealed tube at 120 °C for 12h allowing conversion to the pyridopyrimidine **16a** (R = Ph) in 71 % yield. Use of 4- and 5-methyl substituted 2-aminopyridines also resulted in the formation of corresponding pyridopyrimidines **16b** and **16c** in yields of 73% and 71%.

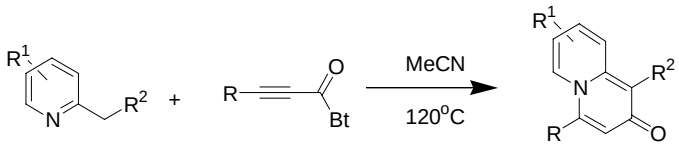


14 **13a** **15**

16a: R=H (71%)
16b: R=8-methyl (73%)
16c: R=7-methyl (71%)

Scheme 4. Reaction of 1-benzotriazol-1-yl-3-phenylpropynone and 2-aminopyridines.

Synthesis of 2*H*-quinolizin-2-ones. Reaction of 2-picoline with 1-benzotriazol-1-yl-3-phenylpropynone (**13a)** in a sealed tube at 120 °C in acetonitrile afforded the expected quinolizin-2-one **18a** in 61% yield (Scheme 5). Similarly, reactions of 1-benzotriazol-1-yl-3-phenylpropynone (**13a**) and 1-benzotriazol-1-yl-oct-2-yn-1-one (**13b**) with 2-picoline and derivatives also afforded the corresponding 2*H*-quinolizin-2-ones **18** in moderate to good yields.



17 **13a,b** **18**

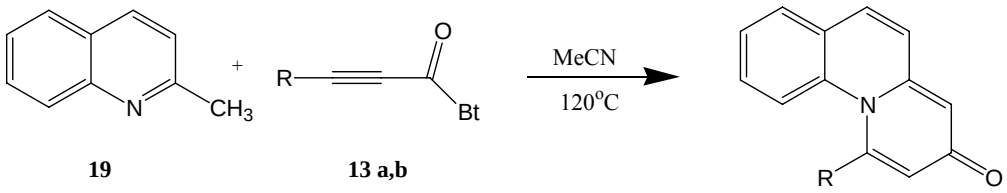
18	R	R^1	R^2	Yield (%)
a	Ph	H	H	61
b	Ph	H	CN	81
c	Ph	H	Ph	50
d	Ph	H	Me	51
e	C_5H_{11}	H	H	39
f	Ph	9-methyl	H	53

Scheme 5. Reaction of 2-picolines and 1-benzotriazolyl-2-propynones.

We were surprised to find that there were few reports in the literature on reactions of propionates and 2-picoline or its derivatives leading to the formation of fused ring systems. The

reaction of 2-methylpyridine-1-oxide with methyl-3-phenyl-2-propanoate to give methyl(2-(2-methyl-3-pyridyl)-3-oxo-3-phenyl)propanoate is the only known analogue.[13] 1-Benzotriazolyl-2-propynones **13a,b**, being very good acylating reagents, react easily as 1,3-bis-electrophilic synthons to give fused ring products.

Synthesis of pyrido[1,2-*a*]quinolin-3-ones and 5-phenylthiazolo[3,2-*a*]pyrimidin-7-one. Our *N*-acylbenzotriazole methodology, developed for the preparation of pyrido[1,2-*a*]pyrimidin-2-ones and 2*H*-quinolizin-2-ones, has also been extended to provide access to the fused ring systems of pyrido[1,2-*a*]quinolin-3-ones and thiazolo[3,2-*a*]pyrimidin-7-ones. Reactions of 2-methylquinoline (**19**) with 1-benzotriazol-1-yl-3-phenylpropynone (**13a**) or 1-benzotriazol-1-yl-oct-2-yn-1-one (**13b**) in a sealed tube at 120 °C in acetonitrile afforded the expected 1-phenyl- and 1-pentylpyrido[1,2-*a*]quinolin-3-ones (**20a,b**) in 40% yields (Scheme 6).

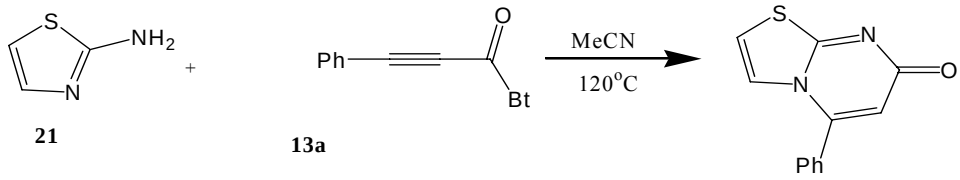


19 **13 a,b**

20a: R=Ph (40 %)
20b: R=C_5H_{11} (40 %)

Scheme 6. Reaction of 2-methylquinoline and 1-benzotriazolyl-2-propynones.

Reaction of 2-aminothiazole (**19**) with 1-benzotriazol-1-yl-3-phenylpropynone (**13a**) in a sealed tube at 120 °C in acetonitrile afforded the expected 5-phenylthiazolo[3,2-*a*]pyrimidin-7-one (**22**) in 54% yield (Scheme 7).



21 **13a**

22 **54 % yield**

Scheme 7. Reaction of 2-aminothiazole and *N*-(phenylpropioyl)benzotriazole.

Synthesis of analogous pyrimido[2,1-*b*]benzothiazoles from acetylenic acids and 2-aminobenzothiazoles has been reported.[14] In our hands, application of this procedure to the synthesis of pyrido[1,2-*a*]pyrimidin-2-ones, 2*H*-quinolizin-2-ones, and thiazolo[3,2-*a*]pyrimidin-7-ones did not provide the desired products in the cases of pyrido[1,2-*a*]pyrimidin-2-ones and thiazolo[3,2-*a*]pyrimidin-7-ones. For 2*H*-quinolizin-2-ones, only trace amounts of product were

isolated from a complex reaction mixture after 2 days. In comparison, our *N*-acylbenzotriazole methodology offers shorter reaction times, cleaner conversion to products, and higher yields.

Experimental Section

General Procedures. Melting points were determined using a Bristoline hot-stage microscope and are uncorrected. ^{1}H (300 MHz) and ^{13}C (75 MHz) NMR spectra were recorded on a 300 MHz NMR spectrometer in chloroform-*d* solution. Elemental and mass spectroscopy analyses were performed by Analytical Laboratories, Dept. of Chem., University of Florida. THF was distilled from sodium-benzophenone ketyl prior to use. All the reactions were performed under a nitrogen atmosphere and in flame dried glasswares. Column chromatography was performed on silica gel (200–425 mesh).

General procedure for the preparation of substituted 1-benzotriazolyl-2-propynones 13a,b
To a solution of benzotriazole (2.96 g, 24.8 mmol) and thionyl chloride (5.55 mL, 20.8 mmol) in methylene chloride (20 mL), the appropriate acid (8.3 mmol) was added. The reaction mixture was stirred at room temperature for 18h. Solvent was removed under vacuum and the resultant solid was re-dissolved in ethyl acetate. The organic layer was washed with water, 1N NaOH (200 mL × 2), and brine. Recrystallization from ethyl acetate afforded the desired 1-benzotriazolyl-2-propynones in 80–95% yields.
1-Benzotriazol-1-yl-3-phenylpropynone (13a). White powder (87%), mp 119–123 ^{o}C. ^{1}H NMR δ 7.31 – 7.63 (m, 4H), 7.73 – 7.78 (m, 1H), 7.84 – 7.87 (m, 2H), 8.22 (d, *J* = 8.1 Hz), 1H), 8.37 (d, *J* = 8.1 Hz, 1H). ^{13}C NMR δ 81.5, 94.8, 114.1, 118.2, 120.5, 127.2, 129.5, 130.6, 131.3, 132.4, 133.4, 145.9, 149.8. Anal. Calcd For $C_{15}H_9N_3O$: C, 72.86; H, 3.67; N, 16.99. Found: C, 72.55; H, 3.56; N, 16.98.
1-Benzotriazol-1-yl-oct-2-yn-1-one (13b). Yellow oil (95%). ^{1}H NMR δ 0.93 - 0.98 (m, 3H), 1.36 - 1.54 (m, 4H), 1.73 - 1.78 (m, 2H), 2.61(t, *J* = 7.2 Hz, 2H), 7.53 (t, *J* = 7.8 Hz, 1H), 7.68 (t, *J* = 7.8 Hz, 1H), 8.15 (d, *J* = 7.8 Hz, 1H), 8.27 (d, *J* = 8.1 Hz, 1H). ^{13}C NMR δ 13.9, 19.4, 22.1, 27.1,31.0, 100.4, 114.2, 120.3, 126.3, 126.5, 130.5, 130.9, 146.2, 150.2.

General procedure for the preparation of pyrido[1,2-*a*]pyrimidin-2-ones 16a–c
1-Benzotriazol-1-yl-3-phenylpropynone (200 mg, 0.90 mmol) and substituted 2-aminopyridine (0.90 mmol) were added to acetonitrile (3 mL) in a sealed tube and heated to 120 °C with stirring for 12 hours. Solvent was removed under vacuum and the crude mixture was separated by silica column chromatography (30% ethyl acetate/hexanes to remove benzotriazole, then 5% methanol/chloroform to elute product). Recrystallization from ethyl acetate afforded the desired pyrido[1,2-*a*]pyrimidin-2-ones in 71–88% yields.
4-Phenyl-2*H*-pyrido[1,2-*a*]pyrimidin-2-one (16a). Yellow flakes (71%), mp 226–228 °C (Lit. mp 227–228 °C).[6] ^{1}H NMR δ 6.51 (s, 1H), 6.69 – 6.74 (m, 1H), 7.32 – 7.39 (m, 1H), 7.45 – 7.47

(m, 2H), 7.52 – 7.55 (m, 1H), 7.58 – 7.61 (m, 3H), 7.72 (d, *J* = 7.2 Hz, 1H). ^{13}C NMR δ 112.6, 117.1, 125.3, 128.8, 129.6, 129.7, 130.8, 135.7, 148.6, 152.5, 168.1. Anal. Calcd For $C_{14}H_{10}N_2O$: C, 75.66; H, 4.54; N, 12.60. Found: C, 74.90; H, 4.39; N, 12.54.

8-Methyl-4-phenylpyrido[1,2-*a*]pyrimidin-2-one (16b). Orange flakes (73%), mp 210–211 °C. ^{1}H NMR δ 2.15 (s, 3H), 6.45 (s, 1H), 7.27 – 7.32 (m, 1H), 7.38 – 7.45 (m, 4H), 7.56 – 7.60 (m, 3H).^{13}C NMR δ 18.0, 117.1, 122.7, 124.9, 126.9, 128.9, 129.7, 130.8, 131.1, 138.9, 148.5, 151.6, 168.3. Anal. Calcd For $C_{15}H_{12}N_2O$: C, 76.25; H, 5.12; N, 11.86. Found: C, 75.20; H, 5.01; N, 12.08.

7-Methyl-4-phenylpyrido[1,2-*a*]pyrimidin-2-one (16c). Red flakes (71%), mp 160–162 °C. ^{1}H NMR δ 2.36 (s, 3H), 6.43 (s, 1H), 6.53 (d, 1H, *J* = 7.4 Hz), 7.13 (s, 1H), 7.40 – 7.43 (m, 2H), 7.56 – 7.61 (m, 4H). ^{13}C NMR δ 21.3, 115.5, 116.8, 123.1, 128.9, 129.0, 129.6, 130.8, 131.0, 147.9, 148.4, 152.6, 168.4. Anal. Calcd For $C_{15}H_{12}N_2O$: C, 76.25; H, 5.12; N, 11.86. Found: C, 75.77; H, 5.36; N, 11.40.

General procedure for the preparation of quinolizin-2-ones 18a–f

1-Benzotriazol-1-yl-3-phenylpropynone or 1-benzotriazol-1-yl-oct-2-yn-1-one (0.90 mmol) and the appropriate 2-picoline derivative (0.90 mmol) were added to acetonitrile (3 mL) in a sealed tube and heated to 120 °C with stirring for 12 hours. Solvent was removed under vacuum and the crude mixture was separated by silica column chromatography (30% ethyl acetate/hexanes to remove benzotriazole, then 5% methanol/chloroform to elute product). Recrystallization from ethyl acetate afforded the substituted quinolizin-2-ones in 50–81 % yields.

4-Phenylquinolizin-2-one (18a). Brown crystals (61%), mp 190 °C. ^{1}H NMR δ 6.49 – 6.54 (m, 1H), 6.74 (d, *J* = 2.7 Hz, 1H), 6.85 (d, *J* = 2.7 Hz, 1H), 7.11 – 7.16 (m, 1H), 7.26 – 7.34 (m, 1H), 7.37 – 7.54 (m, 3H), 7.59 – 7.61 (m, 2H), 7.71 (d, *J* = 7.5 Hz, 1H). ^{13}C NMR δ 111.5, 112.4, 124.4, 124.8, 128.4, 128.7, 129.1, 129.4, 129.6, 130.3, 132.9, 145.0, 146.0, 175.4. HRMS (EI) Found $[M]^+$ 221.0852; $C_{15}H_{11}NO$ requires 221.0841.

2-Oxo-4-phenyl-2*H*-quinolizin-1-carbonitrile (18b). Brown crystals (81%), mp 171 °C. ^{1}H NMR δ 6.76 – 6.82 (m, 2H), 7.30 (s, 1H), 7.46 – 7.49 (m, 2H), 7.55 – 7.58 (m, 1H), 7.62 – 7.65 (m, 3H), 7.82 – 7.91 (m, 2H). ^{13}C NMR δ 94.9, 113.8, 115.5, 122.5, 125.2, 129.0, 129.2, 129.9, 130.9, 131.3, 131.7, 133.5, 147.05, 148.4. Anal. Calcd For $C_{16}H_{10}N_2O$: N, 11.38. Found: N, 11.97.

1,4-Diphenylquinolizin-2-one (18c). Brown crystals (50%), mp 223–225 °C. ^{1}H NMR δ 6.43 (ddd, *J* = 7.2, 6.3, 1.2 Hz, 1H), 6.93 (s, 1H), 6.95 (ddd, *J* = 7.5, 6.3, 1.2 Hz, 1H), 7.22 (d, *J* = 9.3 Hz, 1H), 7.40 – 7.44 (m, 3H), 7.50 – 7.56 (m, 4H), 7.60 – 7.63 (m, 3H), 7.73 (d, *J* = 7.2 Hz, 1H). ^{13}C NMR δ 111.4, 123.3, 123.8, 124.4, 127.6, 127.9, 128.8, 129.2, 129.5, 129.7, 130.1, 131.0, 133.5, 134.8, 142.6, 145.1, 173.7. Anal. Calcd For $C_{21}H_{15}NO$: C, 84.82; H, 5.08; N, 4.71. Found: C, 84.29; H, 5.01; N, 4.66.

1-Methyl-4-phenylquinolizin-2-one (18d). Black oil (51%). ^{1}H NMR δ 2.36 (s, 3H), 6.41 (t, *J* = 6.3 Hz, 1H), 6.80 (s, 1H), 7.07 – 7.12 (m, 1H), 7.39 – 7.42 (m, 2H), 7.44 (d, *J* = 4.8 Hz, 1H), 7.48 – 7.55 (m, 3H), 7.68 (d, *J* = 7.5 Hz, 1H). ^{13}C NMR δ 10.3, 111.0, 118.1, 122.0, 122.4,

127.7, 129.1, 129.4, 129.9, 130.0, 133.5, 141.6, 144.3, 174.4. Anal. Calcd for $C_{16}H_{13}NO$: N, 5.95. Found: N, 5.48.

4-Pentylquinolizin-2-one (18e). Black oil (39%). ^{1}H NMR δ0.95 (m, 3H), 1.37 –1.46 (m, 4H), 1.73 (t, *J* = 7.5 Hz, 2H), 2.83 (t, *J* =7.9 Hz, 2H), 6.54 (d, *J* = 4.2 Hz, 1H), 6.63–6.68 (m, 1H), 6.75 (d, *J* = 2.7 Hz, 1H), 7.06 – 7.11 (m, 1H), 7.16 – 7.19 (m, 1H), 7.82 (d, *J* = 7.5 Hz, 1H). ^{13}C NMR δ 13.9, 22.3, 26.2, 31.3, 32.4, 111.2, 112.6, 122.7, 125.3, 127.2, 128.0, 145.0, 145.2, 175.8. HRMS (EI) Found $[M]^+$ 215.1300; $C_{14}H_{17}NO$ requires 215.1310.

9-Methyl-4-phenylquinolizin-2-one (18f). Red crystals (53%), mp 150 °C. ^{1}H NMR δ 2.40 (s, 3H), 6.42 (t, *J* = 7.2 Hz, 3H), 6.79 (s, 2H), 7.00 (d, *J* = 6.6 Hz, 1H), 7.42 – 7.45 (m, 2H), 7.57 – 7.62 (m, 4H). ^{13}C NMR δ 19.6, 109.0, 111.4, 124.1, 127.9, 128.0, 129.1, 129.5, 130.1, 131.0, 133.6, 145.3, 146.5, 175.8. Anal. Calcd for $C_{16}H_{13}NO$: N, 5.95. Found: N, 5.56.

General procedure for the preparation of pyrido[1,2-*a*] quinolin- 3-ones 20a,b and 5-phenylthiazolo[3,2-*a*]pyrimidin-7-one (22)

1-Benzotriazol-1-yl-3-phenylpropynone or 1-benzotriazol-1-yl-oct-2-yn-1-one (0.90 mmol) and the appropriate substituted 2-methylquinoline or 2-aminothiazole (0.90 mmol) were added to acetonitrile (3 mL) in a sealed tube and heated to 120 °C with stirring for 12 hours. Solvent was removed under vacuum and the crude mixture was separated by silica column chromatography (30% ethyl acetate/hexanes to remove benzotriazole, then 5% methanol/chloroform to elute product). Recrystallization from ethyl acetate afforded the pyrido[1,2-*a*]quinolin-3-ones in 40 % yield and 5-phenylthiazolo[3,2-*a*]pyrimidin-7-one in 54% yield.

1-Phenylpyrido[1,2-*a*]quinolin-3-one (20a). Black oil (40%). ^{1}H NMR δ 6.57 (d, *J* = 3 Hz, 1H), 6.79 (d, *J* = 3 Hz, 1H), 6.95 – 7.08 (m, 3H) 7.22 – 7.27 (m, 1H), 7.31 – 7.36 (m, 3H), 7.38 – 7.45 (m, 3H), 7.52 – 7.55 (m, 1H). ^{13}C NMR δ 114.3, 123.1, 124.0, 125.4, 125.6, 125.8, 127.4, 127.6, 128.2, 129.3, 129.4, 130.0, 135.3, 137.3, 145.7, 148.6, 177.7. Anal. Calcd For $C_{19}H_{13}NO$: N, 5.16. Found: N, 5.11.

1-Pentylpyrido[1,2-*a*]quinolin-3-one (20b). Black oil (40%). ^{1}H NMR δ 0.81 (t, *J* = 6.9 Hz, 3H), 1.17 – 1.22 (m, 4H), 1.61 (t, *J* = 7.2 Hz, 2H), 3.05 (t, *J* = 7.8 Hz, 2H), 6.47 (d, *J* = 2.4 Hz, 1H), 6.77 (d, *J* = 2.4 Hz, 1H), 6.95 (d, *J* = 9.0 Hz, 1H), 7.24 – 7.28 (m, 2H), 7.49 – 7.59 (m, 2H). ^{13}C NMR δ 13.8, 22.2, 29.9, 31.1, 34.9, 113.5, 121.4, 123.5, 124.4, 125.9, 126.0, 127.9, 128.3, 219.2, 134.8, 145.3, 151.2, 177.7. Anal. Calcd For $C_{18}H_{19}NO$: C, 81.45; H, 7.23; N, 5.28. Found: C, 80.47; H, 7.33; N, 5.25.

5-Phenylthiazolo[3,2-*a*]pyrimidin-7-one (22). Gray powder (54%), mp 162 °C (Lit. mp 191–194 °C).[15] ^{1}H NMR δ 6.15 (s, 1H), 7.22 (d, *J* = 4.2 Hz, 1H), 7.35 (d, *J* = 4.8 Hz, 1H), 7.59 – 7.65 (m, 5H). ^{13}C NMR δ 98.2, 109.8, 110.8, 123.3, 128.6, 129.2, 130.7, 131.2, 147.9, 166.5. Anal. Calcd For $C_{12}H_8N_2OS$: C, 63.14; H, 3.53; N, 12.27. Found: C, 60.14; H, 3.48; N, 12.07.

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