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RESEARCH ARTICLE

Synthesis of Novel Fluorine Containing Schiff Bases

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ABSTRACT

Synthesis of a series of (E)-N'-(4-substitutedbenzylidene)-2-(2,3,4-trifluorophenyl) acetohydrazide. ***(3a-j)*** was achieved from different aryl aldehyde and 2-(2,3,4-trifluorophenyl) acetohydrazide using few drops of acetic acid added and refluxed with fine yield. The structures of the products were supported by FTIR, PMR and mass spectral data.

KEYWORDS

2-(2,3,4-Trifluorophenyl) Acetohydrazide, Aryl Aldehyde, Acetic Acid, Only Refluxed

INTRODUCTION

The condensation of primary amines with aldehydes and ketones give imines. Imines that contain an aryl group bound to the nitrogen or to the carbon atom are called Schiff bases, since their synthesis was first reported by Schiff. Schiff bases are capable of forming coordinate bonds with many of metal ions through both azomethine group and phenolic group or via its azomethine or phenolic groups A large number of Schiff bases and their complexes are significant interest and attention because of their biological activity including anti-tumor, antibacterial, fungicidal and anti-carcinogenic properties and catalytic activity

A Schiff base is a nitrogen analog of an aldehyde or ketone in which the C=O group is replaced by C=N-R group. It is usually formed by condensation of an aldehyde or ketone with a primary amine.

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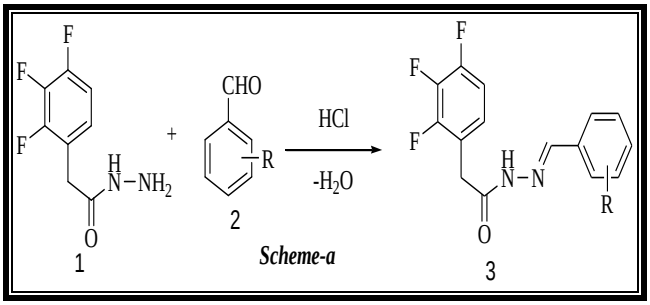
Schiff bases that contain aryl substituents are substantially more stable and more readily synthesized, while those which contain alkyl substituents are relatively unstable. Schiff bases of aliphatic aldehydes are relatively unstable and readily polymerizable.

The substituted benzothiazoles found to possess a broad spectrum of pharmacological and biological activity of clinical importance. These derivatives find a variety of applications ranging from Anti-inflammatory[1-2], Anti-microbial[3-5] , Anti-convulsant[6-7], Anti-diabetic[8], Anthelmintic[9], Anti-mycobacterial[10], Anti-oxidant[11-12], Anti-tubercular[13] activities.



Scheme - 1

To evade these problems, we have developed a new etiquette for the synthesis of (E)-N'-(4-substitutedbenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide ***(3a-j)*** with the advantage of fine yield and environmentally easiness (**Scheme-a**).

EXPERIMENTAL

Typical Experimental Procedure for the Synthesis of Fluoro Containing Schiff Bases

To the mixture of 2-(2,3,4-trifluorophenyl)acetohydrazide (1 mmol) and aryl aldehyde (1 mmol) in 20 mL ethanol was added three drops of acetic acid with stirring for 12 hrs. at ambient temperature. Insoluble solid was gradually generated, then filter and wash with ethanol. After drying pure target compound was afforded as crystalline solid.

(E)-N'-benzylidene-2-(2,3,4-trifluorophenyl)acetohydrazide 3a

Yield: 64%; MP 252-254 ºC; MS: m/z 292; IR (cm^{-1}): 3032 (C-H stretching of aromatic ring), 2965 (C-H asymmetrical stretching of alkane group), 1670, 1606 (C=O stretching), 1562 (C=C stretching of aromatic ring), 1394 and 1325 (C-H asymmetrical deformation of CH3 group), 1263 (C-N starching), 1143, 1062, 837 (C-O-C stretching); 1064 (C-F stretching); 1HNMR: 3.82 (s, 2H), 7.15-7.20 (d, 1H), 7.51 (d, 2H), 7.65 (d, 2H), 7.80 (d, 2H), 8.12 (s, 1H) 8.88 (s, 1H (NH)); Anal. Calcd. $C_{15}H_{11}F_3N_2O$; C, 61.64; H, 3.79; F, 19.50; N, 9.59; O, 5.47; Found: C, 61.44; H, 3.59; F, 19.40; N, 9.29; O, 5.22%.

(E)-N'-(2-bromobenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3b

Yield: 56%; MP 240-250 ºC; MS: m/z 371; IR (cm^{-1}): 3044 (C-H stretching of aromatic ring), 2965 (C-H asymmetrical stretching of alkane group), 1674, 1602 (C=O stretching), 1542 (C=C stretching of aromatic ring), 1384 and 1305 (C-H asymmetrical deformation of CH3 group), 1260 (C-N starching), 964 (C-Br starching), 1153, 1072, 831(C-O-C stretching); 1064 (C-F stretching); 777 (C-Br stretching); 1HNMR: 3.82 (s, 2H), 7.15 (s, 1H), 7.51 (d, 1H), 7.65 (d, 2H), 7.80 (s, 1H), 8.12 (d, 2H) 8.88 (s, 1H (NH)); Anal. Calcd. $C_{15}H_{10}BrF_3N_2O$, C, 48.54; H, 2.72; Br, 21.53; F, 15.36; N, 7.55; O, 4.31; Found: C, 48.34; H, 2.70; Br, 21.50; F, 15.30; N, 7.25; O, 4.21%.

(E)-N'-(4-bromobenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3c

Yield: 50%; MP 240-243 ºC; MS: m/z 371; IR (cm^{-1}): 3067 (C-H stretching of aromatic ring), 2961 (C-H asymmetrical stretching of alkane group), 1671, 1600 (C=O stretching), 1522 (C=C stretching of aromatic ring), 1354 and 1301 (C-H asymmetrical deformation of CH3 group), 1220 (C-N starching), 1067 (C-F starching), 1150, 1012, 866 (C-O-C stretching), 918 (C-Br starching); 1HNMR: 4.12 (s, 2H), 7.02 (s, 1H), 7.38 (d, 1H), 7.50 (d, 2H), 7.77 (s, 1H), 8.06 (d, 2H) 8.52 (s, 1H (NH)); Anal. Calcd. $C_{15}H_{10}BrF_3N_2O$, C, 48.54; H, 2.72; Br, 21.53; F, 15.36; N, 7.55; O, 4.31; Found: C, 48.14; H, 2.50; Br, 21.30; F, 15.10; N, 7.15; O, 4.23%.

(E)-N'-(2-chlorobenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3d

Yield: 52%; MP 235-240 ºC; MS: m/z 326; IR (cm^{-1}): 3060 (C-H stretching of aromatic ring), 2960 (C-H asymmetrical stretching of alkane group), 1671, 1608 (C=O stretching), 1528 (C=C stretching of aromatic ring), 1354 and 1301 (C-H asymmetrical deformation of CH3 group), 1224 (C-N starching), 1023 (C-F starching), 868 (C-Cl starching), 1152, 1014, 860 (C-O-C stretching); 1HNMR: 3.94 (s, 2H), 6.85 (s, 1H), 7.24 (d, 1H), 7.56 (d, 2H), 7.89 (s, 1H), 8.03 (d, 2H) 8.89 (s, 1H (NH)); Anal. Calcd. $C_{15}H_{10}ClF_3N_2O$; C, 55.15; H, 3.09; Cl, 10.85; F, 17.45; N, 8.57; O, 4.90; Found: C, 55.10; H, 3.00; Cl, 10.55; F, 17.15; N, 8.27; O, 4.24 %.

(E)-N'-(4-chlorobenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3e

Yield: 45%; MP 235-238 ºC; MS: m/z 398; IR (cm^{-1}): 3089 (C-H stretching of aromatic ring), 2987 (C-H asymmetrical stretching of alkane group), 1675, 1665 (C=O stretching), 1520 (C=C stretching of aromatic ring), 1376 and 1311 (C-H asymmetrical deformation of CH3

group), 1234 (C-N starching), 1067 (C-F starching), 1159, 1014, 843 (C-O-C stretching), 828 (C-Cl starching); 1HNMR: 4.03 (s, 2H), 6.95 (s, 1H), 7.15 (d, 1H), 7.45 (d, 2H), 7.69 (s, 1H), 7.87 (d, 2H) 9.02 (s, 1H (NH)); Anal. Calcd. $C_{15}H_{10}ClF_3N_2O$; C, 55.15; H, 3.09; Cl, 10.85; F, 17.45; N, 8.57; O, 4.90; Found: C, 55.02; H, 3.01; Cl, 10.35; F, 17.05; N, 8.17; O, 4.20 %.

(E)-N'-(2-methylbenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3f

Yield: 68%; MP 210-212 ºC; MS: m/z 306 and M-1 377; IR (cm^{-1}): 3058 (C-H stretching of aromatic ring), 2970 (C-H asymmetrical stretching of alkane group), 1683, 1648 (C=O stretching), 1467 and 1394 (C-H asymmetrical deformation of CH3 group), 1267 (C-N starching), 1147, 1026, 857 (C-O-C stretching); 1002 (C-F starching); 1HNMR: 2.35 (s, 3H), 3.25 (s, 2H), 7.10 (s, 1H), 7.11 (d, 1H), 7.30 (d, 2H), 7.70 (s, 1H), 7.97 (d, 2H) 9.32 (s, 1H (NH)); Anal. Calcd. $C_{16}H_{13}F_3N_2O$; C, 62.74; H, 4.28; F, 18.61; N, 9.15; O, 5.22; Found: C, 62.44; H, 4.20; F, 18.51; N, 9.05; O, 5.02%.

(E)-N'-(4-methylbenzylidene)-2-(2,3,4-trifluorophenyl)acetohydrazide 3g

Yield: 64%; MP 208-210 ºC; MS: m/z 306; IR (cm^{-1}): 3054 (C-H stretching of aromatic ring), 2974 (C-H asymmetrical stretching of alkane group), 1684, 1644 (C=O stretching), 1464 and 1395 (C-H asymmetrical deformation of CH3 group), 1267 (C-N starching), 1144, 1024, 854 (C-O-C stretching); 1002 (C-F starching); 1HNMR: 2.28 (s, 3H), 3.21 (s, 2H), 7.00 (s, 1H), 7.11 (d, 1H), 7.39 (d, 2H), 7.73 (s, 1H), 7.90 (d, 2H) 8.92 (s, 1H (NH)); Anal. Calcd. $C_{16}H_{13}F_3N_2O$; C, 62.74; H, 4.28; F, 18.61; N, 9.15; O, 5.22; Found: C, 62.34; H, 4.10; F, 18.21; N, 9.01; O, 5.00%.

(E)-N'-(2,4-dimethylbenzylidene)-2-(2,3,4-trifluorophenyl) acetohydrazide 3h

Yield: 62%; MP 200-205 ºC; MS: m/z 320; IR (cm^{-1}): 3054 (C-H stretching of aromatic ring), 2978 (C-H asymmetrical stretching of alkane group), 1688, 1647 (C=O stretching), 1464 and 1395 (C-H asymmetrical deformation of CH3 group), 1260 (C-N starching), 1140, 1024, 850 (C-O-C stretching), 1100 (C-F starching); 1HNMR: 2.01 (s, 3H), 2.34 (s, 3H), 4.21 (s, 2H), 6.74 -6.84 (dd, 2H), 7.23-7.27 (s, 1H), 7.56-7.65 (dd, 2H), 8.01 (s, 1H), 8.18 (s, 1H (NH)); Anal. Calcd. $C_{17}H_{15}F_3N_2O$; C, 63.75; H, 4.72; F, 17.79; N, 8.75; O, 4.99; Found: C, 63.75; H, 4.72; F, 17.79; N, 8.75; O, 4.99%.

(E)-N'-(2,3-dimethylbenzylidene)-2-(2,3,4-trifluorophenyl) acetohydrazide 3i

Yield: 55%; MP 199-200 ºC; MS: m/z 320; IR (cm^{-1}): 3050 (C-H stretching of aromatic ring), 2970 (C-H asymmetrical stretching of alkane group), 1670, 1653 (C=O stretching), 1460 and 1390 (C-H asymmetrical deformation of CH3 group), 1269 (C-N starching), 1149, 1029, 859 (C-O-C stretching), 1057 (C-F starching); 1HNMR: 2.01 (s, 3H), 2.34 (s, 3H), 4.21 (s, 2H), 6.74 -6.84 (dd, 2H), 7.23-7.27 (s, 1H), 7.56-7.65 (m, 3H), 8.18 (s, 1H (NH)); Anal. Calcd. $C_{17}H_{15}F_3N_2O$; C, 63.75; H, 4.72; F, 17.79; N, 8.75; O, 4.99; Found: C, 63.75; H, 4.72; F, 17.79; N, 8.75; O, 4.99%.

(E)-N'-(2,6-difluorobenzylidene)-2-(2,3,4-trifluorophenyl) acetohydrazide 3j

Yield: 51%; MP 232-234 ºC; MS: m/z 328; IR (cm^{-1}): 3042 (C-H stretching of aromatic ring), 2945, 2860 (C-H asymmetrical stretching of alkane group), 1647, 1587 (C=O stretching), 1467 and 1394 (C-H asymmetrical deformation of CH3 group), 1267 (C-N starching), 1147, 1026, 857 (C-O-C stretching) 1056 (C-F starching); 1HNMR: 3.38 (s, 2H), 6.70 -6.80 (dd, 2H), 7.15-7.24 (s, 1H), 7.50-7.60 (m, 3H), 9.10 (s, 1H (NH)); Anal. Calcd. $C_{15}H_9F_5N_2O$; C, 54.89; H, 2.76; F, 28.94; N, 8.53; O, 4.87; Found: C, 54.59; H, 2.56; F, 28.54; N, 8.43; O, 4.80 %.

CONCLUSION

In conclusion, we have synthesized of fluorine-based Schiff base using simple and convenient method. This method produces these products in good yields, with a short reaction time and easy workup. Product is isolated by simple vaccum filteration. The isolated products are very pure and do not need any column purification. This

study opens up a new area of cost-effective synthesis of potentially biologically active fluorine-based Schiff base compounds.

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