Crystal structure of (1,8-diethyl-1,3,4,9-tetrahydro-pyrano[3,4-*b*]indol-1-yl)acetic acid (2-hydroxy-benzylidene)hydrazide, C₂₄H₂₇N₃O₃

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Abstract

C₂₄H₂₇N₃O₃, monoclinic, *P*12₁/*c*1 (no. 14), *a* = 11.376(1) Å, *b* = 15.955(2) Å, *c* = 12.254(1) Å, β = 97.352(2)°, *V* = 2205.8 Å³, *Z* = 4, *R*_{gt}(*F*) = 0.051, *wR*_{ref}(*F*²) = 0.152, *T* = 293 K.

Source of material

The compound, (1,8-diethyl-1,3,4,9-tetrahydro-pyrano[3,4-*b*]indol-1-yl)acetic acid (2-hydroxy-benzylidene)hydrazide, is obtained from the condensation reaction of (1,8-diethyl-1,3,4,9-tetrahydro-pyrano[3,4-*b*]indol-1-yl)-acetic acid hydrazide with salicylaldehyde [1,2]. A mixture of 1 g (3.3 mmol) of (1,8-diethyl-1,3,4,9-tetrahydro-pyrano[3,4-*b*]indol-1-yl)-acetic acid hydrazide, 0.41 g (3.32 mmol) of salicylaldehyde, 50 mL of anhydrous ethanol was vigorously stirred at reflux for 1.5 hours. Then the reaction mixture was filtrated and washed with 30 ml ethanol to give 1.21 g of the title compound (yield 89.9 %). The crystals were obtained from a solution of the compound in anhydrous ethanol after two days at room temperature (m.p. 462–463 K).

Experimental details

The positions of H1 (at N1), H2 (at N3) and H3 (at O3) were found from Fourier difference maps and refined freely. The other H atoms were placed in calculated positions and allowed to ride on their parent atoms at distances of 0.93 Å – 0.97 Å for C—H. Isotropic displacement parameters were set at 1.2 to 1.5 times *U*_{eq} of the parent atom.

One ethyl group was found to be disordered over two positions caused by rotation around the C3—C16 single bond with approximately equal occupancies. The C17 atom was split into two positions and refined anisotropically. The corresponding H atoms at C16 and C17 were added geometrically in accord with the C16—C17A and C16—C17B bonds.

Discussion

The title compound is a derivative of the non-steroidal anti-inflammatory drugs (NSAIDs) etodolac [3]. Etodolac is an indoleacetic acid derivative with analgesic and limited anti-inflammatory properties. Etodolac is rapidly absorbed from the gastrointestinal tract, with a bioavailability of approximately 80 %. Like other NSAIDs, etodolac is highly (more than 99 %) bound to plasma proteins and extensively metabolized in the liver, with a half-life of approximately six to seven hours [4]. Also, gastrointestinal effect is the most common adverse reactions associated with etodolac [5].

In the title crystal structure, the molecules are interlinked by intermolecular hydrogen bonds N3—H A···O1 and O1—H A···N3 bonds into centrosymmetric dimers. There are two intramolecular hydrogen bonds O3—H A···N2, O2—H A···N1 forming two closed six-membered loops in each molecule. The phenyl ring and the pyrrole ring are nearly coplanar. In phenyl ring part, the maximum C—C bond length is 1.406(3) Å, the minimum is 1.363(3) Å, and the average C—C bond length for the phenyl ring is 1.389(3) Å. In the pyrrole ring part, the longer C—C bond is 1.406(3) Å and the other is 1.356(3) Å. The pyran ring has a chair form configuration. Other bond lengths and angles are in normal range.

Table 1. Data collection and handling.

Crystal:	colorless, prismatic, size 0.234 × 0.417 × 0.498 mm
Wavelength:	Mo <i>K</i> _α radiation (0.71073 Å)
μ:	0.81 cm ^{−1}
Diffractionmeter, scan mode:	Bruker SMART CCD, φ/ω
2θ _{max} :	54°
<i>N</i> (<i>hkl</i>) _{measured} , <i>N</i> (<i>hkl</i>) _{unique} :	12839, 4815
Criterion for <i>I</i> _{obs} , <i>N</i> (<i>hkl</i>) _{gt} :	<i>I</i> _{obs} > 2 σ(<i>I</i> _{obs}), 2251
<i>N</i> (<i>param</i>) _{refined} :	294
Programs:	SHELXS-97 [6], SHELXL-97 [7]

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Table 2. Atomic coordinates and displacement parameters (in Å²).

Atom	Site	Occ.	x	y	z	U _{iso}
H(1)	4e		0.327(2)	0.187(1)	0.145(2)	0.083(8)
H(2)	4e		0.664(2)	0.072(1)	0.080(2)	0.065(7)
H(3)	4e		0.206(3)	0.184(2)	-0.154(3)	0.12(1)
H(2A)	4e		0.4760	-0.0043	0.1386	0.076
H(2B)	4e		0.3725	0.0174	0.2060	0.076
H(4A)	4e		0.5636	0.1991	0.4032	0.095
H(4B)	4e		0.4429	0.2477	0.3961	0.095
H(5A)	4e		0.4753	0.3124	0.2358	0.084
H(5B)	4e		0.5940	0.3223	0.3161	0.084
H(10)	4e		0.7198	0.3871	0.1402	0.081
H(11)	4e		0.8481	0.3938	0.0108	0.093
H(12)	4e		0.8966	0.2765	-0.0817	0.090
H(14A)	4e		0.8286	0.0686	-0.0164	0.105
H(14B)	4e		0.7704	0.1045	-0.1290	0.105
H(15A)	4e		0.9457	0.1531	-0.1651	0.133
H(15B)	4e		0.9552	0.0570	-0.1382	0.133

Table 2. Continued.

Atom	Site	Occ.	x	y	z	U _{iso}
H(15C)	4e		1.0058	0.1229	-0.0495	0.133
H(16A)	4e	0.5	0.6241	0.0762	0.3850	0.110
H(16B)	4e	0.5	0.5326	0.0043	0.3585	0.110
H(16C)	4e	0.5	0.6320	0.0011	0.2854	0.110
H(16D)	4e	0.5	0.6471	0.0754	0.3682	0.110
H(17A)	4e	0.5	0.6991	-0.0521	0.3587	0.125
H(17B)	4e	0.5	0.7468	0.0201	0.2895	0.125
H(17C)	4e	0.5	0.6516	-0.0427	0.2335	0.125
H(17D)	4e	0.5	0.4934	-0.0517	0.3655	0.130
H(17E)	4e	0.5	0.4879	0.0281	0.4393	0.130
H(17F)	4e	0.5	0.6002	-0.0297	0.4549	0.130
H(18)	4e		0.2336	0.2987	0.0764	0.074
H(20)	4e		0.1257	0.4226	0.0017	0.098
H(21)	4e		0.0116	0.4934	-0.1365	0.124
H(22)	4e		-0.0394	0.4270	-0.3052	0.133
H(23)	4e		0.0385	0.2995	-0.3386	0.116

Table 3. Atomic coordinates and displacement parameters (in Å²).

Atom	Site	Occ.	x	y	z	U ₁₁	U ₂₂	U ₃₃	U ₁₂	U ₁₃	U ₂₃
O(1)	4e		0.3528(1)	0.05026(9)	-0.0267(1)	0.095(1)	0.070(1)	0.061(1)	0.0046(8)	-0.0036(8)	-0.0128(8)
O(2)	4e		0.4382(1)	0.1511(1)	0.2945(1)	0.065(1)	0.095(1)	0.0571(9)	-0.0124(8)	0.0161(7)	-0.0125(8)
O(3)	4e		0.1751(2)	0.2085(1)	-0.2147(2)	0.112(2)	0.117(2)	0.055(1)	0.036(1)	0.005(1)	-0.014(1)
N(1)	4e		0.3179(2)	0.1590(1)	0.0807(2)	0.063(1)	0.077(1)	0.045(1)	0.005(1)	0.0020(9)	-0.009(1)
N(2)	4e		0.2583(2)	0.2007(1)	-0.0074(1)	0.054(1)	0.073(1)	0.052(1)	0.0008(9)	0.0076(9)	-0.0049(9)
N(3)	4e		0.6602(1)	0.1232(1)	0.1040(1)	0.053(1)	0.052(1)	0.057(1)	-0.0013(9)	0.0059(8)	-0.0065(9)
C(1)	4e		0.3647(2)	0.0833(1)	0.0641(2)	0.054(1)	0.062(2)	0.056(1)	-0.014(1)	0.006(1)	-0.004(1)
C(2)	4e		0.4305(2)	0.0416(1)	0.1636(2)	0.063(1)	0.067(1)	0.059(1)	-0.014(1)	0.007(1)	0.005(1)
C(3)	4e		0.5150(2)	0.0964(1)	0.2414(2)	0.063(1)	0.068(1)	0.049(1)	-0.008(1)	0.005(1)	0.002(1)
C(4)	4e		0.4973(2)	0.2200(2)	0.3530(2)	0.079(2)	0.101(2)	0.060(1)	-0.007(1)	0.015(1)	-0.023(1)
C(5)	4e		0.5415(2)	0.2821(1)	0.2753(2)	0.066(1)	0.074(2)	0.070(2)	0.003(1)	0.007(1)	-0.017(1)
C(6)	4e		0.6063(2)	0.2351(1)	0.1963(2)	0.054(1)	0.058(1)	0.054(1)	-0.002(1)	0.002(1)	-0.008(1)
C(7)	4e		0.5916(2)	0.1514(1)	0.1816(2)	0.050(1)	0.059(1)	0.047(1)	-0.003(1)	0.0012(9)	-0.003(1)
C(8)	4e		0.7203(2)	0.1909(1)	0.0680(2)	0.045(1)	0.053(1)	0.053(1)	-0.0056(9)	0.000(1)	0.001(1)
C(9)	4e		0.6882(2)	0.2620(1)	0.1251(2)	0.053(1)	0.054(1)	0.054(1)	-0.004(1)	-0.001(1)	-0.002(1)
C(10)	4e		0.7383(2)	0.3390(1)	0.1031(2)	0.072(2)	0.056(1)	0.072(2)	-0.008(1)	0.003(1)	-0.003(1)
C(11)	4e		0.8149(2)	0.3426(2)	0.0262(2)	0.077(2)	0.069(2)	0.086(2)	-0.019(1)	0.011(1)	0.005(1)
C(12)	4e		0.8442(2)	0.2713(2)	-0.0297(2)	0.066(2)	0.088(2)	0.074(2)	-0.017(1)	0.017(1)	0.002(1)
C(13)	4e		0.7990(2)	0.1932(1)	-0.0112(2)	0.051(1)	0.071(2)	0.062(1)	-0.008(1)	0.008(1)	-0.008(1)
C(14)	4e		0.8314(2)	0.1147(2)	-0.0676(2)	0.070(2)	0.101(2)	0.096(2)	-0.017(1)	0.033(1)	-0.029(2)
C(15)	4e		0.9438(4)	0.1117(3)	-0.1085(4)	0.114(3)	0.120(4)	0.148(6)	-0.017(3)	0.088(4)	-0.081(4)
C(16)	4e		0.5886(3)	0.0397(2)	0.3266(2)	0.109(2)	0.092(2)	0.065(2)	-0.017(2)	-0.020(2)	0.015(2)
C(17A)	4e	0.5	0.6785(5)	-0.0129(3)	0.3000(4)	0.080(3)	0.081(3)	0.085(3)	0.023(3)	-0.010(3)	0.025(3)
C(17B)	4e	0.5	0.5388(6)	-0.0069(4)	0.4022(5)	0.135(5)	0.137(5)	0.094(4)	-0.013(4)	0.032(4)	0.039(4)
C(18)	4e		0.2198(2)	0.2738(2)	0.0073(2)	0.056(1)	0.077(2)	0.054(1)	-0.005(1)	0.011(1)	-0.010(1)
C(19)	4e		0.1539(2)	0.3188(1)	-0.0843(2)	0.055(1)	0.071(2)	0.065(2)	-0.002(1)	0.014(1)	0.001(1)
C(20)	4e		0.1085(2)	0.3977(2)	-0.0671(2)	0.078(2)	0.077(2)	0.092(2)	0.001(1)	0.013(2)	-0.003(2)
C(21)	4e		0.0393(3)	0.4398(2)	-0.1486(3)	0.108(2)	0.077(2)	0.124(3)	0.014(2)	0.012(2)	0.018(2)
C(22)	4e		0.0113(3)	0.4006(2)	-0.2502(3)	0.104(2)	0.122(3)	0.104(3)	0.018(2)	0.011(2)	0.041(2)
C(23)	4e		0.0569(3)	0.3243(2)	-0.2698(2)	0.103(2)	0.124(3)	0.063(2)	0.023(2)	0.008(2)	0.013(2)
C(24)	4e		0.1303(2)	0.2834(2)	-0.1891(2)	0.072(2)	0.093(2)	0.057(1)	0.008(1)	0.017(1)	0.004(1)

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