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Crystal structure of 3-(difluoromethyl)-1-methyl-*N*-(4,11,11-trimethyl-1,2,3,4-tetrahydro-1,4-methanoacridin-9-yl)-1*H*-pyrazole-4-carboxamide monohydrate, C₂₃H₂₆F₂N₄O₃

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The molecular structure is shown in the figure. Table 1 contains crystallographic data and Table 2 contains the list of the atoms including atomic coordinates and displacement parameters.

Table 1: Data collection and handling.

Crystal:	Colorless block
Size:	0.20 × 0.18 × 0.12 mm
Wavelength:	Mo Kα radiation (0.71073 Å)
μ:	0.10 mm ⁻¹
Diffractometer, scan mode:	Bruker APEX-II, φ and ω
θ _{max} , completeness:	25.5°, >99%
<i>N</i> (<i>hkl</i>) _{measured} , <i>N</i> (<i>hkl</i>) _{unique} , <i>R</i> _{int} :	17,253, 4136, 0.022
Criterion for <i>I</i> _{obs} , <i>N</i> (<i>hkl</i>) _{gt} :	<i>I</i> _{obs} > 2 σ(<i>I</i> _{obs}), 3649
<i>N</i> (<i>param</i>) _{refined} :	293
Programs:	Bruker [1], SHELX [2, 3], Diamond [4]

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Abstract

C₂₃H₂₆F₂N₄O₃, orthorhombic, *P*2₁2₁2₁ (no. 19), *a* = 11.6524(10) Å, *b* = 11.9777(10) Å, *c* = 15.9058(13) Å, *V* = 2220.0(3) Å³, *Z* = 4, *R*_{gt}(*F*) = 0.0305, *wR*_{ref}(*F*²) = 0.0751, *T* = 296(2) K.

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Source of material

An amount of 10 mmol of 3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carboxylic acid and 30 mmol of thionyl chloride were mixed and one drop of *N,N*-dimethylformamide was added. The mixture was condensed and refluxed at 95 °C for 4 h, and 3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carbonyl chloride was obtained [5]. About 10 mmol of 4,11,11-trimethyl-1,2,3,4-tetrahydro-1,4-methanoacridin-9-amine was dissolved in 20 mL of dichloromethane. The prepared 3-(difluoromethyl)-1-methyl-1*H*-pyrazole-4-carbonyl chloride was added to the single-necked flask and dissolved in 30 mL of dichloromethane solution. Then cool to 0 °C. A mixed solution of 10 mmol of 4,11,11-trimethyl-1,2,3,4-tetrahydro-1,4-methacridin-9-amine and 20 mmol of triethylamine was slowly added dropwise with stirring. After the addition was completed, the reactor was placed at room temperature and stirred for 6 h, and the reaction was monitored by thin layer chromatography (TLC)

Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²).

Atom	<i>x</i>	<i>y</i>	<i>z</i>	<i>U</i> _{iso} */ <i>U</i> _{eq}
C1	0.22419 (18)	0.38793 (18)	0.21920 (13)	0.0440 (5)
C2	0.2957 (2)	0.3521 (2)	0.28537 (15)	0.0552 (6)
H2	0.2967	0.3914	0.3358	0.066*
C3	0.3634 (2)	0.2604 (2)	0.27604 (18)	0.0644 (7)
H3	0.4085	0.2365	0.3208	0.077*
C4	0.3661 (2)	0.2018 (2)	0.20050 (18)	0.0655 (7)
H4	0.4131	0.1395	0.1950	0.079*
C5	0.2996 (2)	0.23566 (19)	0.13449 (17)	0.0560 (6)
H5	0.3030	0.1969	0.0839	0.067*
C6	0.22602 (18)	0.32866 (17)	0.14203 (14)	0.0439 (5)
C7	0.15056 (19)	0.36415 (18)	0.07673 (12)	0.0431 (5)
C8	0.07984 (19)	0.45060 (18)	0.09209 (13)	0.0430 (5)
C9	0.08387 (18)	0.50458 (18)	0.17189 (13)	0.0426 (5)
C10	−0.0086 (2)	0.5927 (2)	0.17166 (14)	0.0546 (6)
C11	−0.1216 (2)	0.5219 (3)	0.17370 (18)	0.0747 (8)
H11A	−0.1188	0.4669	0.2184	0.090*
H11B	−0.1880	0.5695	0.1822	0.090*
C12	−0.1265 (2)	0.4648 (3)	0.08708 (19)	0.0722 (8)
H12A	−0.1941	0.4877	0.0559	0.087*
H12B	−0.1265	0.3841	0.0926	0.087*
C13	−0.0156 (2)	0.5065 (2)	0.04409 (14)	0.0533 (6)
H13	−0.0128	0.4978	−0.0171	0.064*
C14	−0.0054 (2)	0.6278 (2)	0.07687 (14)	0.0535 (6)
C15	−0.1052 (3)	0.7040 (3)	0.05150 (17)	0.0758 (8)
H15A	−0.1004	0.7729	0.0822	0.114*
H15B	−0.1766	0.6677	0.0641	0.114*
H15C	−0.1012	0.7191	−0.0077	0.114*
C16	0.1072 (2)	0.6833 (2)	0.05134 (17)	0.0660 (7)
H16A	0.1098	0.6909	−0.0087	0.099*
H16B	0.1704	0.6381	0.0698	0.099*
H16C	0.1122	0.7557	0.0769	0.099*
C17	−0.0003 (3)	0.6835 (3)	0.23707 (16)	0.0783 (9)
H17A	−0.0156	0.6525	0.2916	0.117*
H17B	−0.0555	0.7407	0.2249	0.117*
H17C	0.0755	0.7149	0.2363	0.117*
C18	0.0837 (2)	0.22076 (18)	−0.01835 (13)	0.0482 (5)
C19	0.09286 (19)	0.17012 (17)	−0.10278 (14)	0.0456 (5)
C20	0.1474 (2)	0.20916 (19)	−0.17316 (13)	0.0510 (5)
H20	0.1894	0.2750	−0.1773	0.061*
C21	0.04214 (19)	0.06952 (18)	−0.12960 (15)	0.0498 (6)
C22	−0.0257 (3)	−0.0110 (2)	−0.07928 (18)	0.0683 (7)
H22	−0.0809	0.0287	−0.0437	0.082*
C23	0.1679 (3)	0.1410 (3)	−0.32149 (15)	0.0814 (9)
H23A	0.1999	0.2133	−0.3325	0.122*
H23B	0.1040	0.1282	−0.3583	0.122*
H23C	0.2253	0.0848	−0.3310	0.122*
N1	0.15201 (16)	0.47758 (15)	0.23376 (10)	0.0457 (4)
N2	0.15123 (17)	0.30889 (15)	−0.00290 (11)	0.0485 (5)
H2A	0.1961	0.3328	−0.0419	0.058*
N3	0.12931 (18)	0.13556 (17)	−0.23450 (11)	0.0554 (5)
N4	0.06475 (19)	0.04849 (16)	−0.20956 (13)	0.0575 (5)
O1	0.01822 (19)	0.18373 (17)	0.03480 (11)	0.0791 (6)
O2	0.82110 (17)	0.08597 (18)	0.10387 (12)	0.0675 (5)
F1	−0.08090 (19)	−0.08452 (15)	−0.12961 (14)	0.1092 (7)
F2	0.0441 (2)	−0.07281 (19)	−0.03227 (17)	0.1337 (9)

Table 2: (continued)

Atom	<i>x</i>	<i>y</i>	<i>z</i>	<i>U</i> _{iso} */ <i>U</i> _{eq}
H1W	0.831 (2)	0.053 (2)	0.1491 (11)	0.078 (9)*
H2W	0.8819 (19)	0.117 (3)	0.0891 (18)	0.107 (13)*

until completion [6]. Silica gel was added to the reaction solution and mixed well, eluted by column chromatography, and the title compound was obtained.

Experimental details

All H atoms were included in calculated positions and refined as riding atoms, with C–H = 0.90–0.97 Å with $U_{\text{iso}}(\text{H}) = 1.5 U_{\text{eq}}(\text{C})$ for methyl H atoms and $1.2 U_{\text{eq}}(\text{C})$ for all other H atoms.

Comment

Nitrogen-containing heterocyclic compounds are an important class of organic compounds. They are the basic structural framework of many drug molecules [7, 8]. Among them, pyrazole amide, as an important branch in the nitrogen-containing heterocyclic compound system, exhibits a variety of excellent pharmacological effects, such as insecticide [9, 10], bactericidal [11], anti-plant virus [12], and anti-tumor [13], etc. occupy an extremely important position in the fields of pesticides and medicine [14]. In addition, pyrazole amides exist in several pesticides with high recognition in the market, such as Tolfenpyrad, Chlorantraniliprole, and Sedaxane. Amide compounds formed from a carboxylic acid with a basic pyrazole skeleton as a parent usually exhibit different pharmacological effects depending on the substituent groups. Therefore, in recent years, the synthesis of pyrazole amide compounds and the determination of their biological activity have gradually attracted the attention of the majority of scientific researchers.

The asymmetric unit of the title compound (see the Figure) consists of one water molecule and one 3-(difluoromethyl)-1-methyl-*N*-(4,11,11-trimethyl-1,2,3,4-tetrahydro-1,4-methanoacridin-9-yl)-1*H*-pyrazole-4-carboxamide molecule. Bond lengths and angles within the title structure are very similar to those given in the literature for (1*R*, 4*S*)-7,8-dichloro-1,2,3,4-tetrahydro-1,11,11-trimethyl-1,4-methanophenazine [15]. The atoms of pyrazole ring and quinoline ring are approximately co planar, and the dihedral angle

between the pyrazole ring and the quinoline ring is $76.76(7)^\circ$. The dihedral angle between the pyrazole ring and the plane carboxamide moiety(C18–O1–N2) is $9.76(13)^\circ$. The C8–C15 part adopts a bridge ring structure. The torsion angles of C7–C8–C13–C12, C7–C8–C13–C14, N1–C9–C10–C14, N1–C9–C10–C11, and N1–C9–C10–C17 are $104.2(3)^\circ$, $-149.6(3)^\circ$, $149.5(2)^\circ$, $107.0(3)^\circ$, and $20.7(3)^\circ$, respectively.

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