



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 5, 2021 – 06:04 PM EDT

PDB ID : 7JRX  
Title : Crystal structure of the R64F mutant of Bauhinia Bauhinioides complexed with Bovine Chymotrypsin  
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Deposited on : 2020-08-13  
Resolution : 1.77 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.23.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.23.1

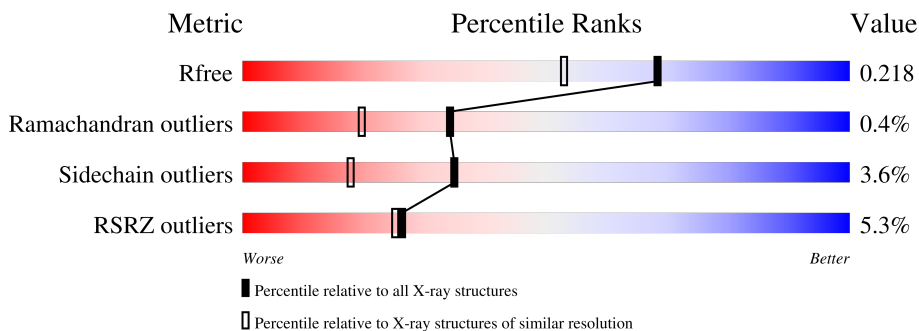
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.77 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



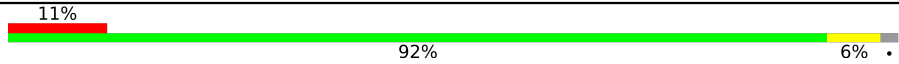
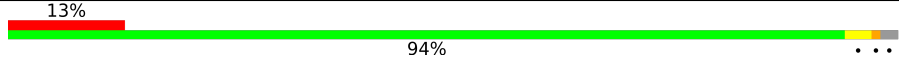
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	9185 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)
RSRZ outliers	127900	9032 (1.80-1.76)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	13	
1	a	13	
2	B	131	
2	b	131	
3	C	97	
3	c	97	

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Mol	Chain	Length	Quality of chain
4	I	166	 <p>11% 92% 6%</p>
4	i	166	 <p>13% 94%</p>

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 6902 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Chymotrypsin A chain A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	13	Total 86	C 56	N 14	O 15	S 1	0	0	0
1	a	12	Total 78	C 50	N 13	O 14	S 1	0	0	0

- Molecule 2 is a protein called Chymotrypsin A chain B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	131	Total 1004	C 635	N 166	O 199	S 4	0	3	0
2	b	131	Total 1002	C 633	N 165	O 200	S 4	0	4	0

- Molecule 3 is a protein called Chymotrypsin A chain C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	97	Total 710	C 441	N 124	O 138	S 7	0	2	0
3	c	97	Total 716	C 445	N 125	O 139	S 7	0	4	0

- Molecule 4 is a protein called Kunitz-type inhibitor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	I	163	Total 1264	C 813	N 212	O 238	S 1	0	3	0
4	i	163	Total 1269	C 817	N 214	O 237	S 1	0	2	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	0	GLY	-	expression tag	UNP Q6VEQ7
I	64	PHE	ARG	engineered mutation	UNP Q6VEQ7
i	0	GLY	-	expression tag	UNP Q6VEQ7
i	64	PHE	ARG	engineered mutation	UNP Q6VEQ7

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	21	Total O 21 21	0	0
5	B	173	Total O 173 173	0	0
5	C	88	Total O 88 88	0	0
5	I	99	Total O 99 99	0	0
5	a	21	Total O 21 21	0	0
5	b	184	Total O 184 184	0	0
5	c	90	Total O 90 90	0	0
5	i	97	Total O 97 97	0	0

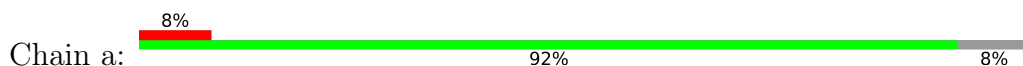
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: Chymotrypsin A chain A



- Molecule 1: Chymotrypsin A chain A



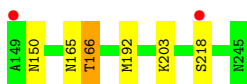
- Molecule 2: Chymotrypsin A chain B



- Molecule 2: Chymotrypsin A chain B



- Molecule 3: Chymotrypsin A chain C

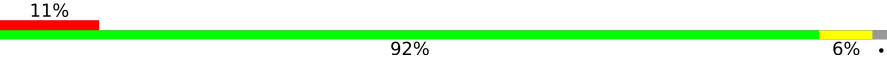


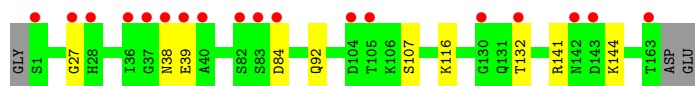
- Molecule 3: Chymotrypsin A chain C

Chain c:  97%

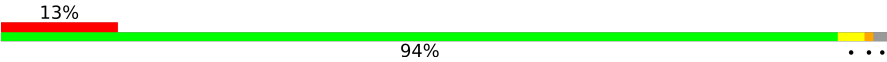


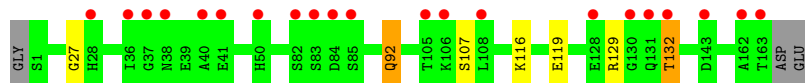
• Molecule 4: Kunitz-type inhibitor

Chain I:  11% 92% 6%



• Molecule 4: Kunitz-type inhibitor

Chain i:  13% 94%



## 4 Data and refinement statistics i

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	60.02Å 60.69Å 425.54Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	71.02 – 1.77 70.92 – 1.77	Depositor EDS
% Data completeness (in resolution range)	94.9 (71.02-1.77) 94.9 (70.92-1.77)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.10	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.58 (at 1.76Å)	Xtrriage
Refinement program	REFMAC 5.8.0258	Depositor
R, $R_{free}$	0.175 , 0.208 0.186 , 0.218	Depositor DCC
$R_{free}$ test set	1451 reflections (1.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.3	Xtrriage
Anisotropy	0.118	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 42.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.26$	Xtrriage
Estimated twinning fraction	0.076 for -k,-h,-l	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	6902	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.21% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.



## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.70	0/87	0.87	0/119
1	a	0.67	0/79	0.84	0/108
2	B	0.76	0/1028	0.81	0/1400
2	b	0.78	0/1031	0.84	0/1404
3	C	0.79	0/730	0.90	2/993 (0.2%)
3	c	0.76	0/745	0.81	0/1014
4	I	0.70	0/1308	0.91	2/1778 (0.1%)
4	i	0.69	0/1309	0.86	0/1779
All	All	0.74	0/6317	0.86	4/8595 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	107[A]	SER	CA-CB-OG	-7.93	89.78	111.20
4	I	107[B]	SER	CA-CB-OG	-7.93	89.78	111.20
3	C	166	THR	CB-CA-C	-7.45	91.48	111.60
3	C	166	THR	N-CA-CB	5.90	121.51	110.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	11/13 (85%)	11 (100%)	0	0	100	100
1	a	10/13 (77%)	10 (100%)	0	0	100	100
2	B	132/131 (101%)	129 (98%)	3 (2%)	0	100	100
2	b	133/131 (102%)	130 (98%)	3 (2%)	0	100	100
3	C	97/97 (100%)	96 (99%)	1 (1%)	0	100	100
3	c	99/97 (102%)	97 (98%)	2 (2%)	0	100	100
4	I	164/166 (99%)	157 (96%)	6 (4%)	1 (1%)	25	11
4	i	163/166 (98%)	157 (96%)	4 (2%)	2 (1%)	13	3
All	All	809/814 (99%)	787 (97%)	19 (2%)	3 (0%)	34	19

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	i	27	GLY
4	I	27	GLY
4	i	129	ARG

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	10/10 (100%)	9 (90%)	1 (10%)	7	1
1	a	9/10 (90%)	9 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	112/109 (103%)	111 (99%)	1 (1%)	78	72
2	b	113/109 (104%)	113 (100%)	0	100	100
3	C	79/77 (103%)	73 (92%)	6 (8%)	13	3
3	c	81/77 (105%)	77 (95%)	4 (5%)	25	9
4	I	139/139 (100%)	131 (94%)	8 (6%)	20	6
4	i	139/139 (100%)	134 (96%)	5 (4%)	35	18
All	All	682/670 (102%)	657 (96%)	25 (4%)	35	17

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LEU
2	B	79	LYS
3	C	150	ASN
3	C	165	ASN
3	C	166	THR
3	C	192	MET
3	C	203	LYS
3	C	218	SER
4	I	38	ASN
4	I	39	GLU
4	I	84	ASP
4	I	92	GLN
4	I	116	LYS
4	I	132	THR
4	I	141	ARG
4	I	144	LYS
3	c	165	ASN
3	c	192	MET
3	c	218[A]	SER
3	c	218[B]	SER
4	i	92	GLN
4	i	107	SER
4	i	116	LYS
4	i	119	GLU
4	i	132	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
3	C	165	ASN
3	C	167	ASN
3	C	204	ASN
4	I	51	HIS
4	I	93	GLN
4	I	142	ASN
2	b	50	ASN
3	c	165	ASN
3	c	204	ASN
4	i	10	GLN
4	i	92	GLN
4	i	142	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 5.7 Other polymers [i](#)

There are no such residues in this entry.

### 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	13/13 (100%)	0.17	1 (7%) 13 13	14, 16, 36, 54	0
1	a	12/13 (92%)	0.14	1 (8%) 11 11	14, 17, 38, 50	0
2	B	131/131 (100%)	-0.22	0 100 100	8, 13, 23, 41	0
2	b	131/131 (100%)	-0.24	0 100 100	8, 14, 23, 30	0
3	C	97/97 (100%)	-0.14	2 (2%) 63 63	8, 13, 28, 48	0
3	c	97/97 (100%)	-0.15	0 100 100	8, 14, 24, 38	0
4	I	163/166 (98%)	0.46	18 (11%) 5 5	11, 27, 64, 84	0
4	i	163/166 (98%)	0.47	21 (12%) 3 3	12, 26, 59, 76	0
All	All	807/814 (99%)	0.08	43 (5%) 26 25	8, 18, 54, 84	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	I	37	GLY	5.2
4	i	38	ASN	4.5
4	i	163	THR	4.4
4	I	38	ASN	4.4
4	I	84	ASP	4.3
4	I	143	ASP	4.2
4	i	28	HIS	4.1
4	i	108	LEU	4.0
4	i	132	THR	3.9
4	I	105	THR	3.7
1	A	13	LEU	3.6
4	I	104[A]	ASP	3.3
4	I	27	GLY	3.3
4	I	36	ILE	3.2
3	C	149	ALA	3.1
4	I	142	ASN	3.0

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Mol	Chain	Res	Type	RSRZ
4	I	83	SER	3.0
4	i	50	HIS	2.9
1	a	12	GLY	2.9
4	i	40	ALA	2.8
4	i	82	SER	2.7
4	I	39	GLU	2.6
4	i	130	GLY	2.6
4	i	37	GLY	2.6
4	i	128	GLU	2.5
4	i	36	ILE	2.5
4	I	40	ALA	2.5
3	C	218	SER	2.4
4	i	105	THR	2.4
4	I	132	THR	2.4
4	I	28	HIS	2.4
4	I	82	SER	2.3
4	i	85	SER	2.3
4	i	131	GLN	2.3
4	i	143	ASP	2.2
4	i	84	ASP	2.2
4	I	130	GLY	2.2
4	i	83	SER	2.2
4	I	1	SER	2.1
4	i	41	GLU	2.1
4	I	163	THR	2.0
4	i	162	ALA	2.0
4	i	106	LYS	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.