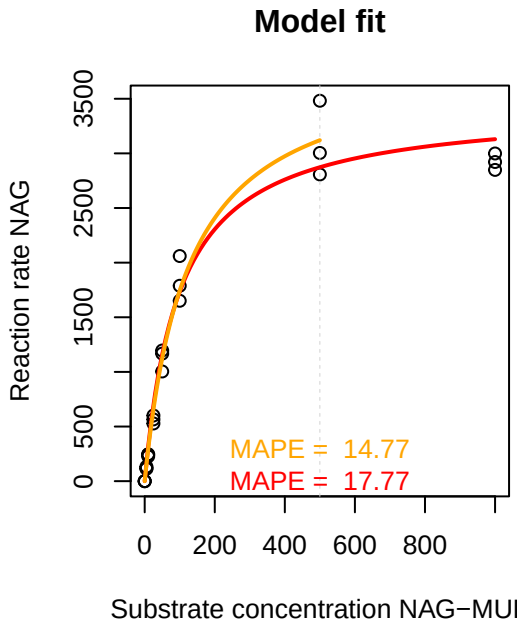
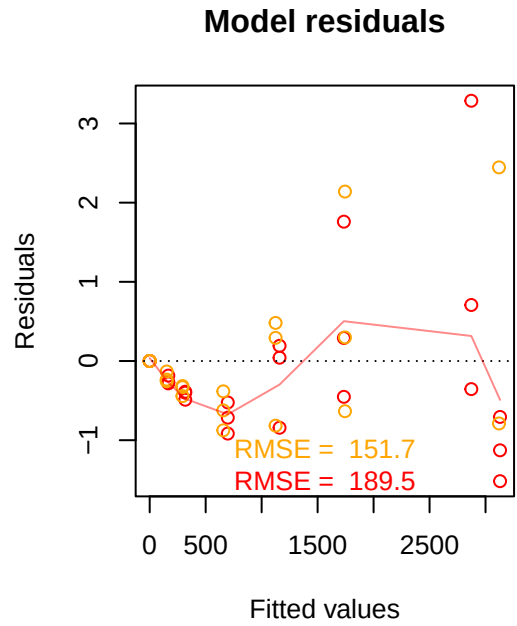
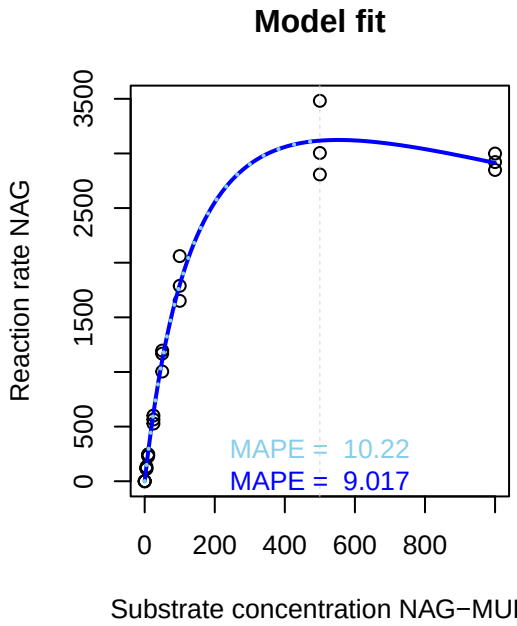
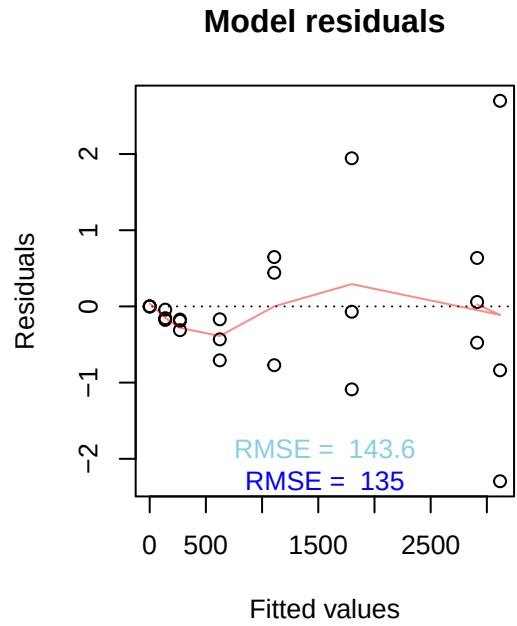
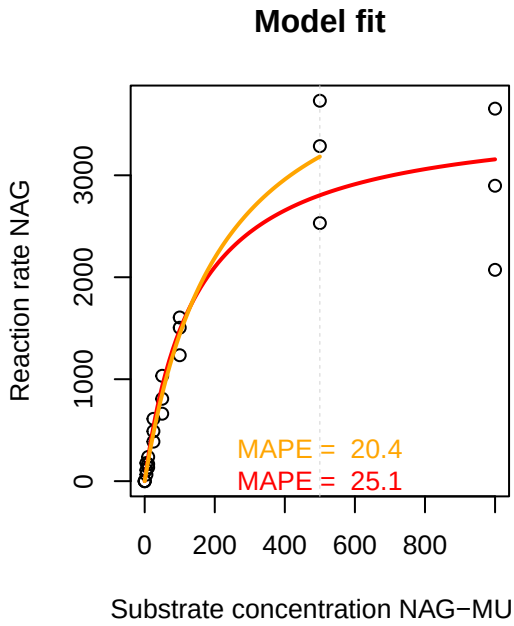
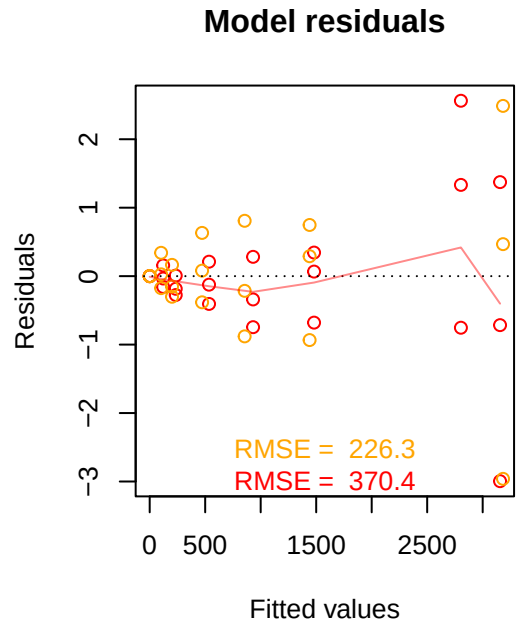

Model fit
Reaction rate NAG
0
500
1500
2500
3500
0
200
400
600
800
MAPE = 14.77
MAPE = 17.77
Substrate concentration NAG−MUF

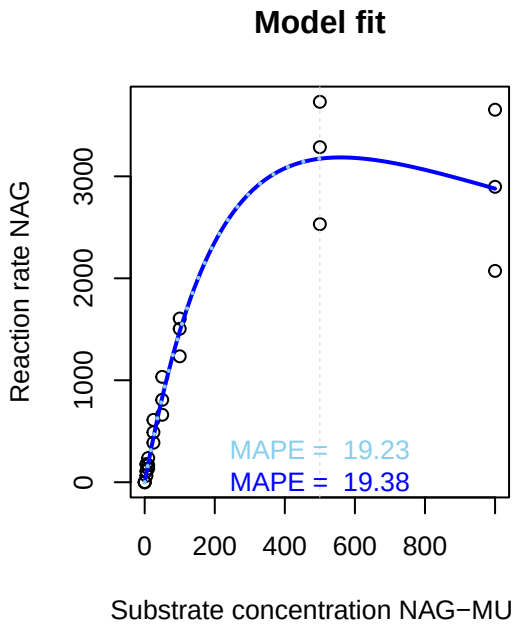

Model residuals
Residuals
−1
0
1
2
3
0
500
1500
2500
RMSE = 151.7
RMSE = 189.5
Fitted values

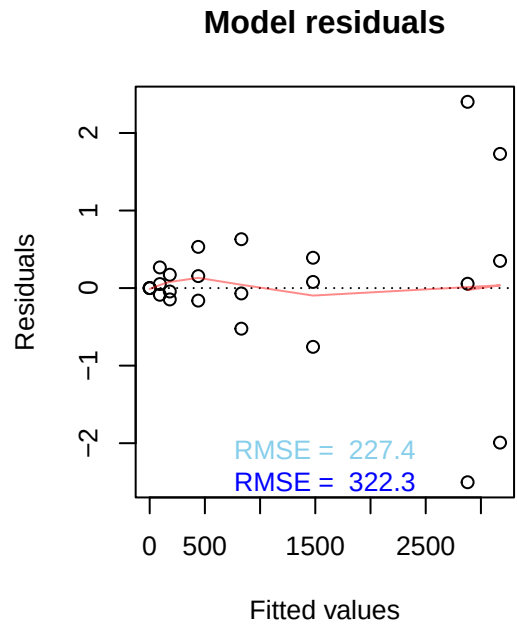

Model fit
Reaction rate NAG
0
500
1500
2500
3500
0
200
400
600
800
MAPE = 10.22
MAPE = 9.017
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
0
500
1500
2500
RMSE = 143.6
RMSE = 135
Fitted values

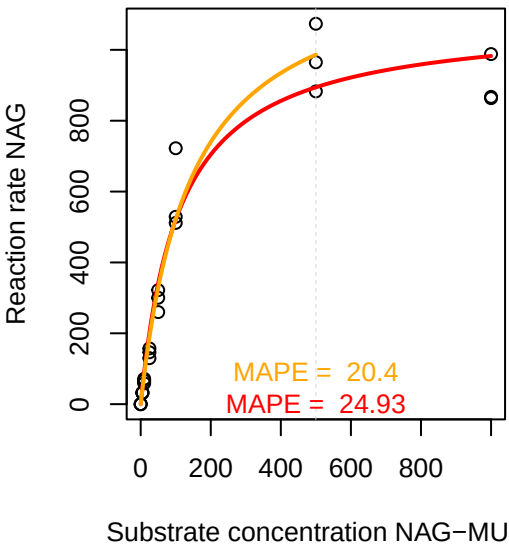

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 20.4
MAPE = 25.1
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−3
−2
−1
0
1
2
RMSE = 226.3
RMSE = 370.4
0
500
1500
2500
Fitted values

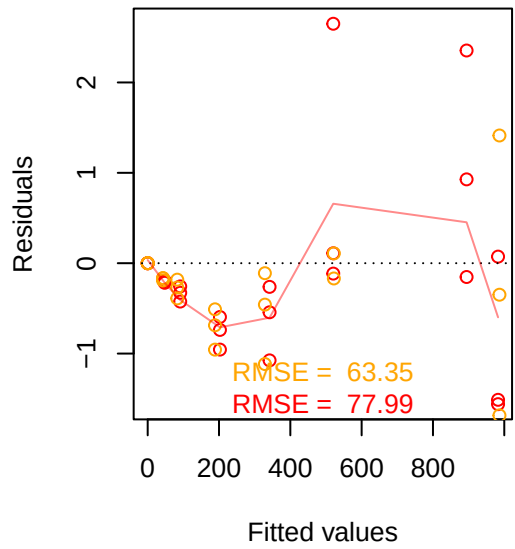

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 19.23
MAPE = 19.38
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 227.4
RMSE = 322.3
0
500
1500
2500
Fitted values

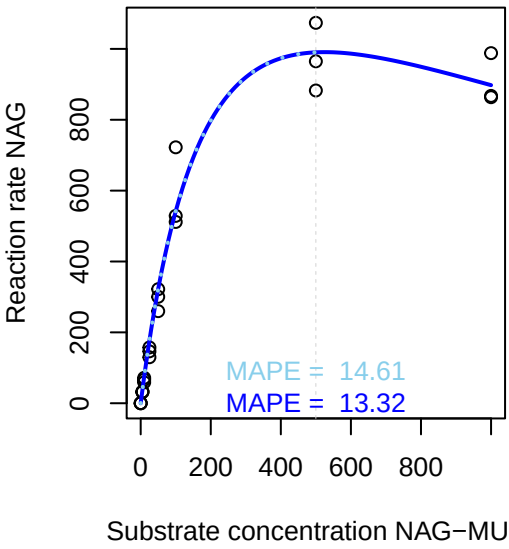
Model fit



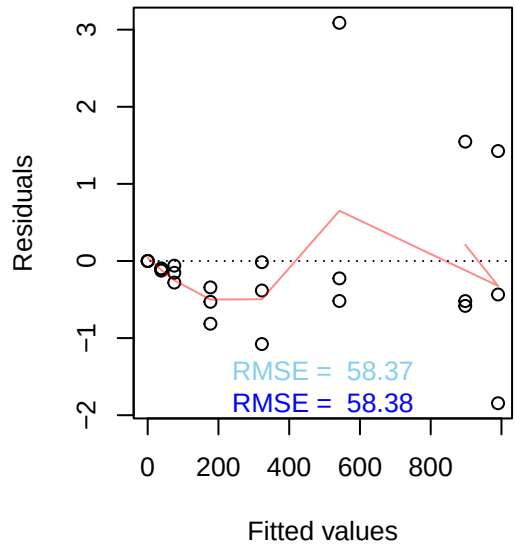
Model residuals



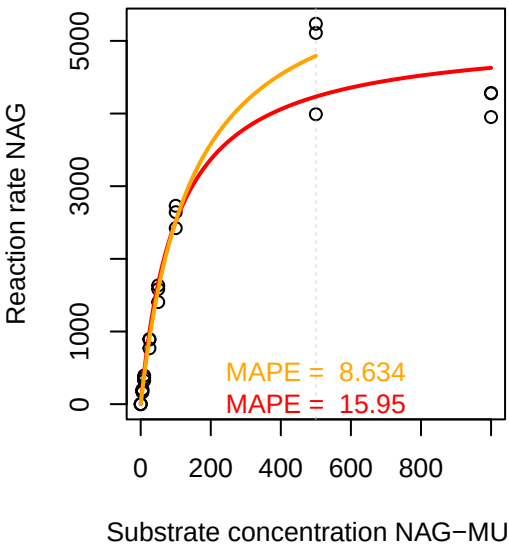
Model fit



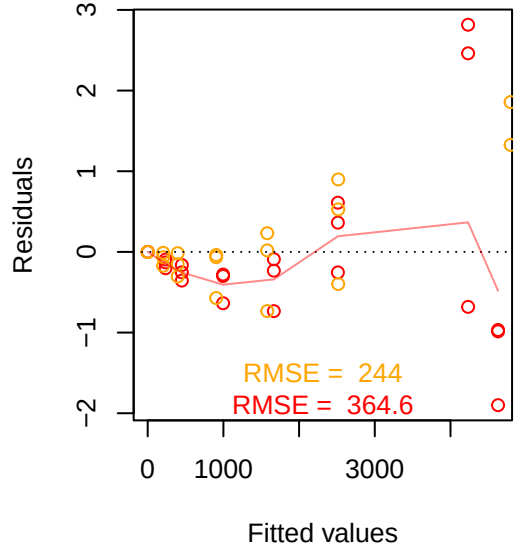
Model residuals



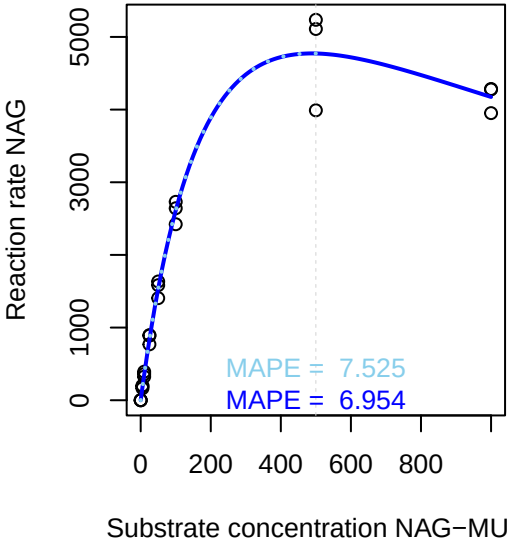
Model fit



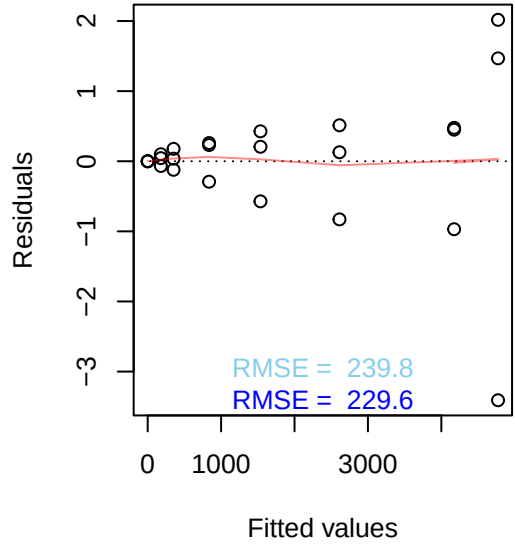
Model residuals

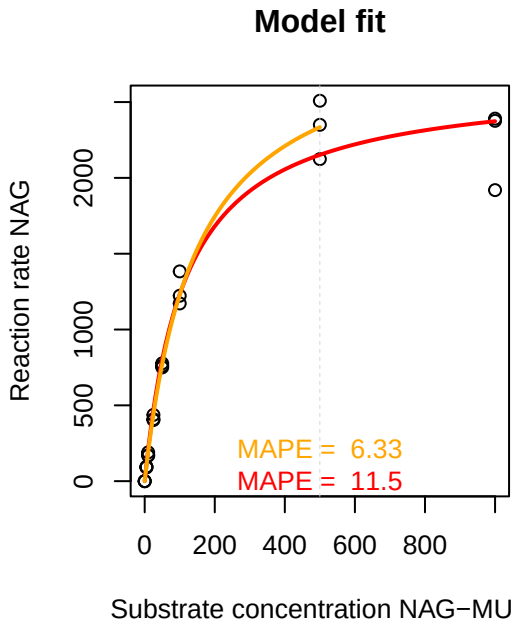


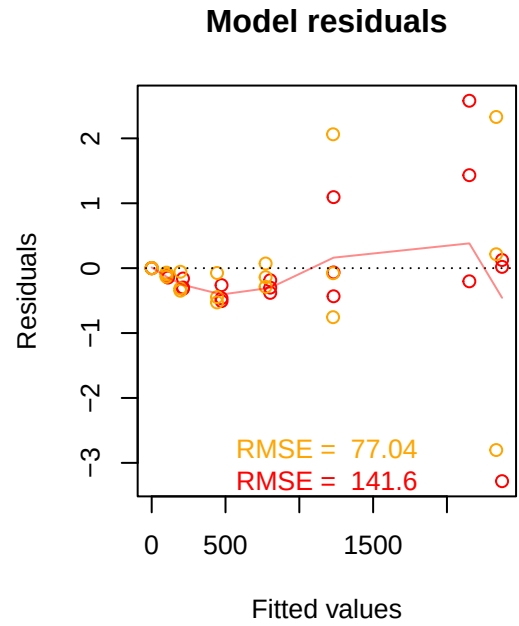
Model fit

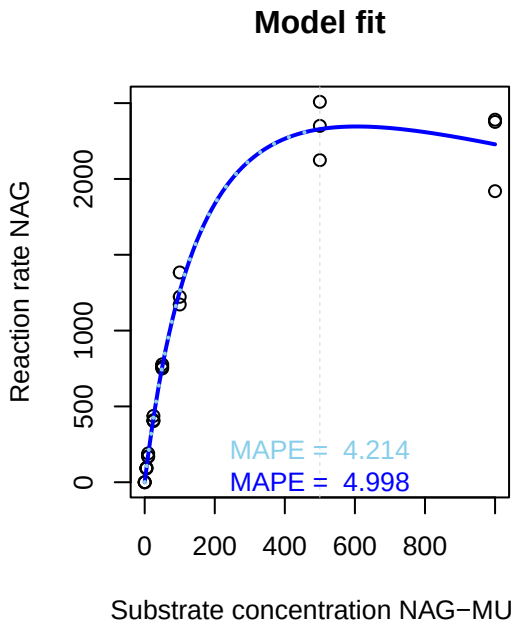


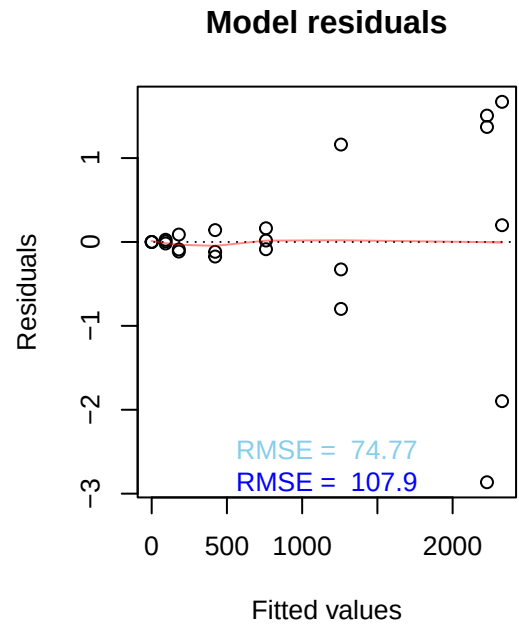
Model residuals

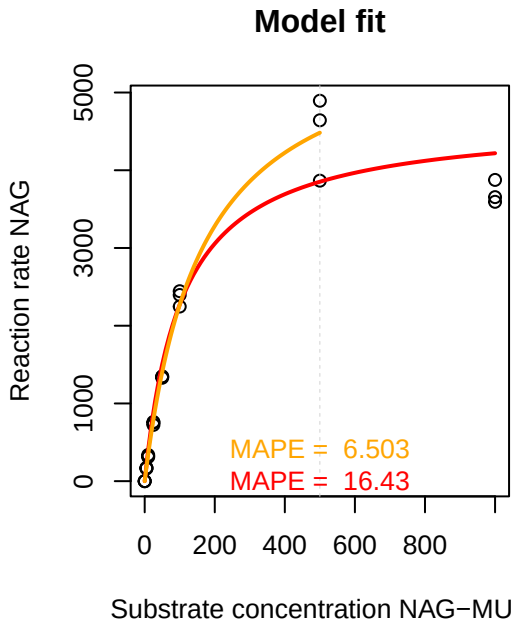


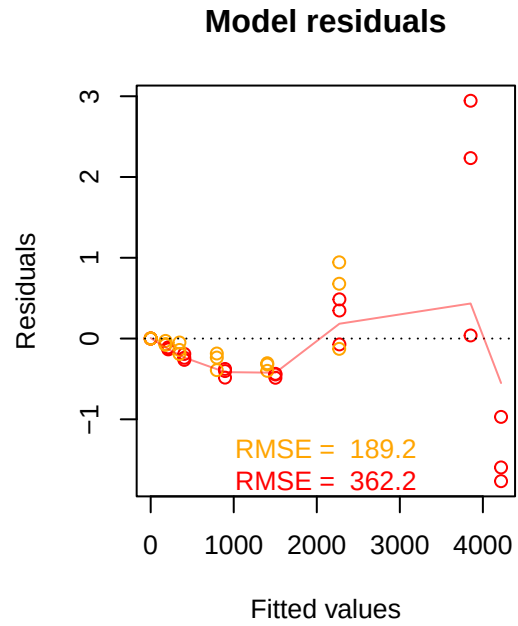

Model fit
Reaction rate NAG
0
500
1000
2000
MAPE = 6.33
MAPE = 11.5
0
200
400
600
800
Substrate concentration NAG−MUF

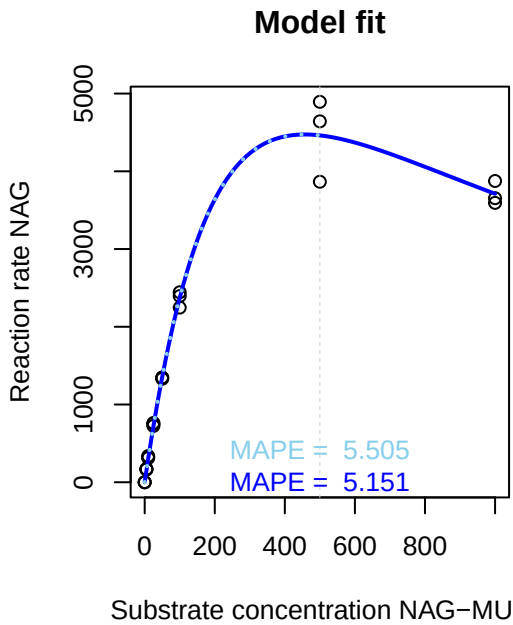

Model residuals
Residuals
−3
−2
−1
0
1
2
RMSE = 77.04
RMSE = 141.6
0
500
1500
Fitted values

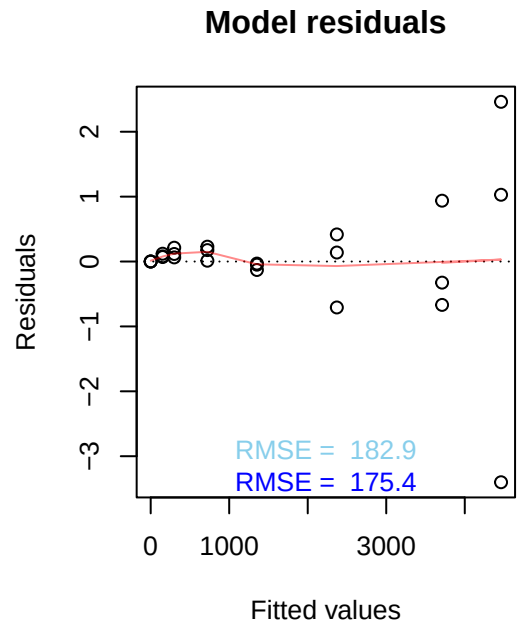

Model fit
Reaction rate NAG
0
500
1000
2000
MAPE = 4.214
MAPE = 4.998
0
200
400
600
800
Substrate concentration NAG−MUF

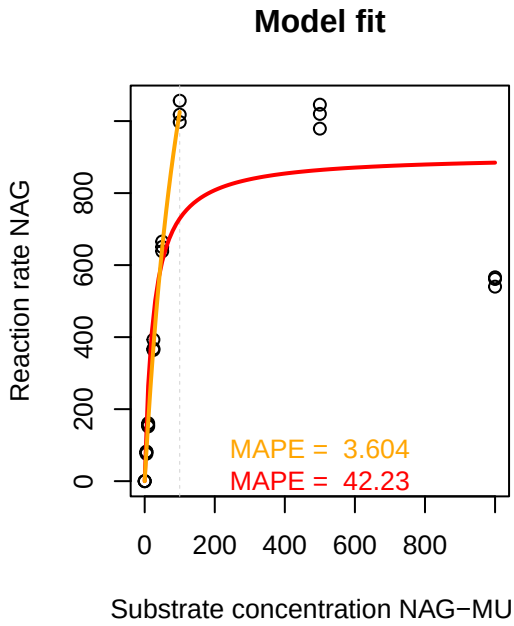

Model residuals
Residuals
−3
−2
−1
0
1
RMSE = 74.77
RMSE = 107.9
0
500
1000
2000
Fitted values

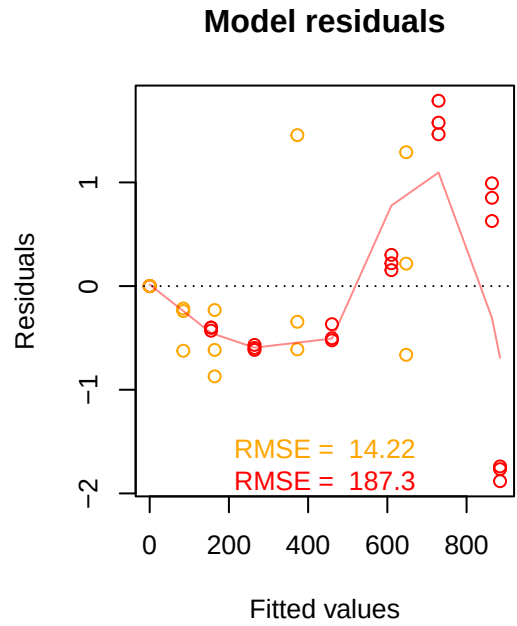

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 6.503
MAPE = 16.43
Substrate concentration NAG−MUF

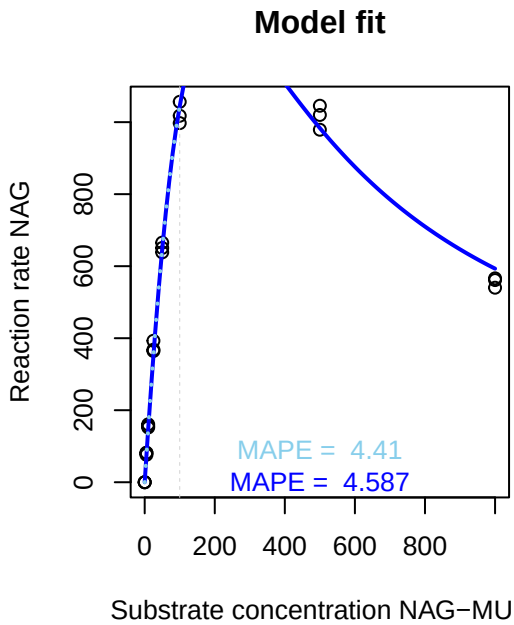

Model residuals
Residuals
−1
0
1
2
3
0
1000
2000
3000
4000
RMSE = 189.2
RMSE = 362.2
Fitted values

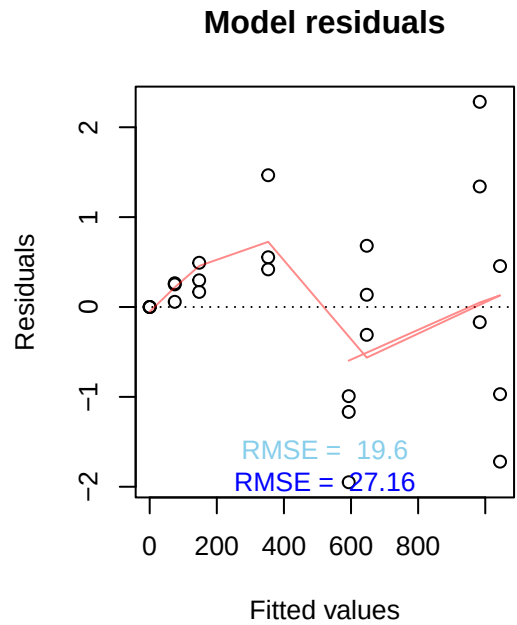

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 5.505
MAPE = 5.151
Substrate concentration NAG−MUF

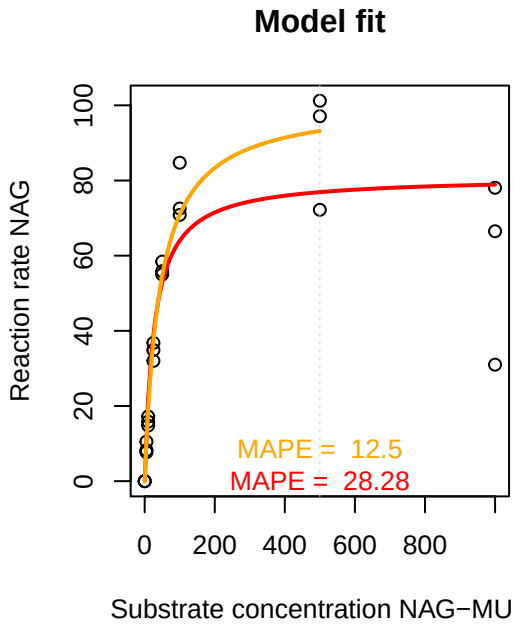

Model residuals
Residuals
−3
−2
−1
0
1
2
0
1000
3000
RMSE = 182.9
RMSE = 175.4
Fitted values

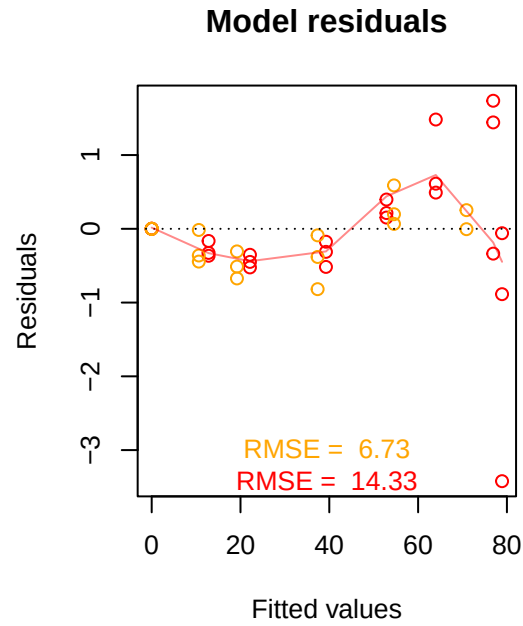

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 3.604
MAPE = 42.23
0
200
400
600
800
Substrate concentration NAG−MUF

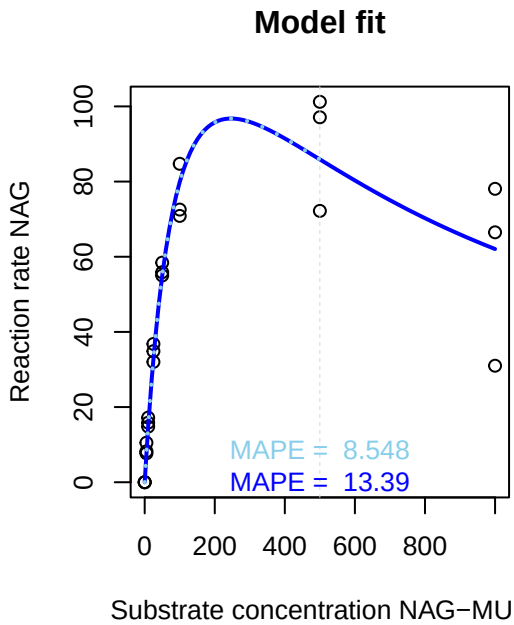

Model residuals
Residuals
−2
−1
0
1
RMSE = 14.22
RMSE = 187.3
0
200
400
600
800
Fitted values

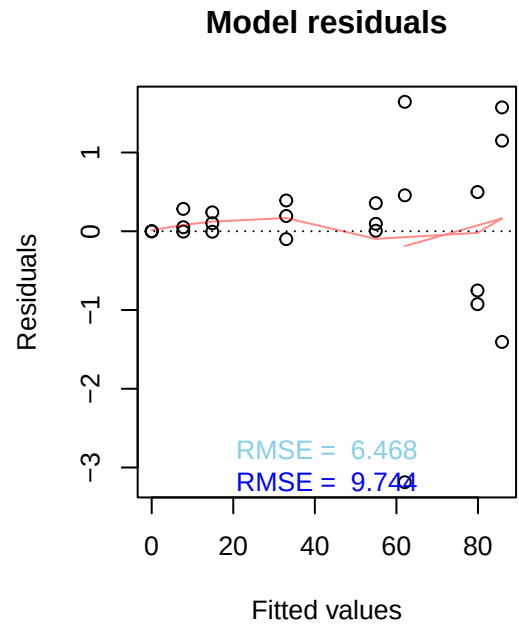

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 4.41
MAPE = 4.587
0
200
400
600
800
Substrate concentration NAG−MUF

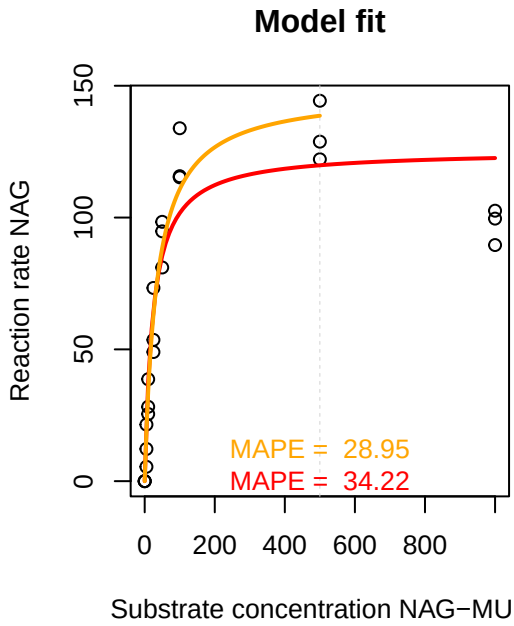

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 19.6
RMSE = 27.16
0
200
400
600
800
Fitted values

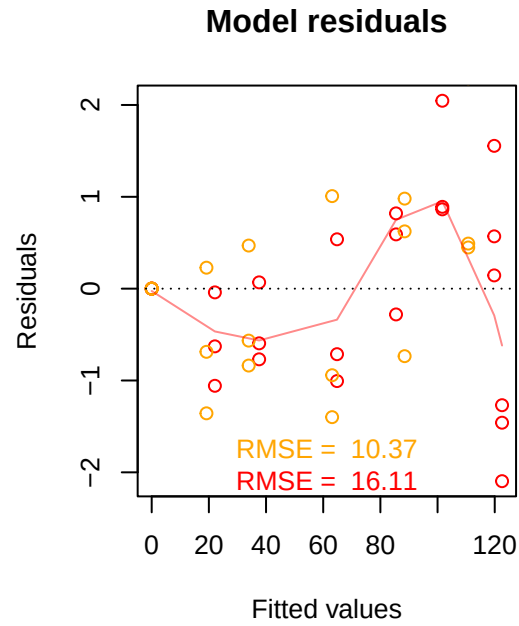

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 12.5
MAPE = 28.28
0
20
40
60
80
100
0
200
400
600
800

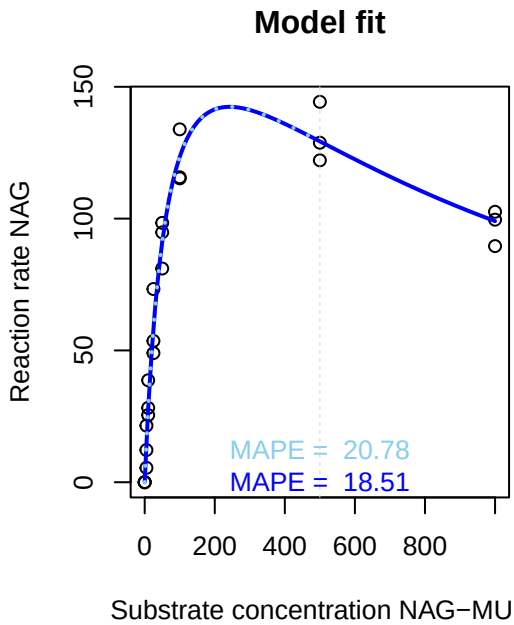

Model residuals
Residuals
Fitted values
RMSE = 6.73
RMSE = 14.33
−3
−2
−1
0
1
0
20
40
60
80

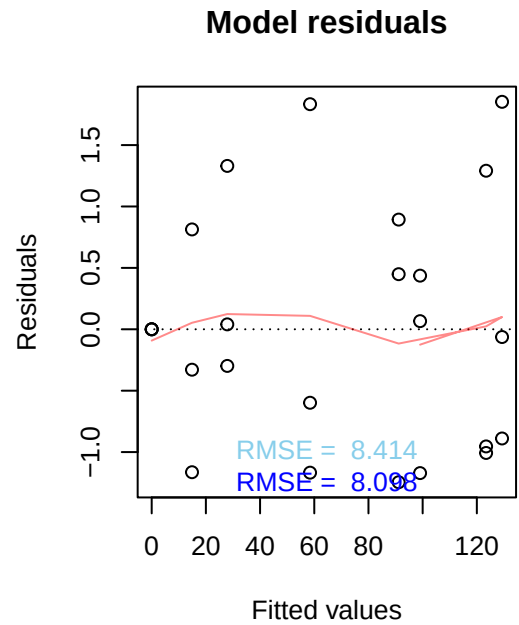

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 8.548
MAPE = 13.39
0
20
40
60
80
100
0
200
400
600
800

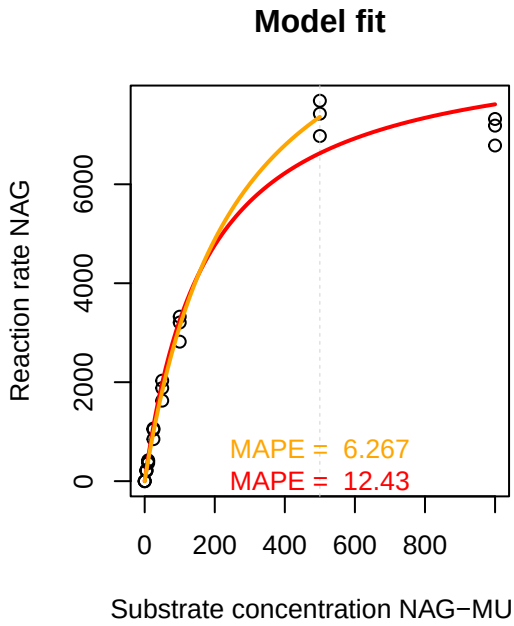

Model residuals
Residuals
Fitted values
RMSE = 6.468
RMSE = 9.744
−3
−2
−1
0
1
0
20
40
60
80

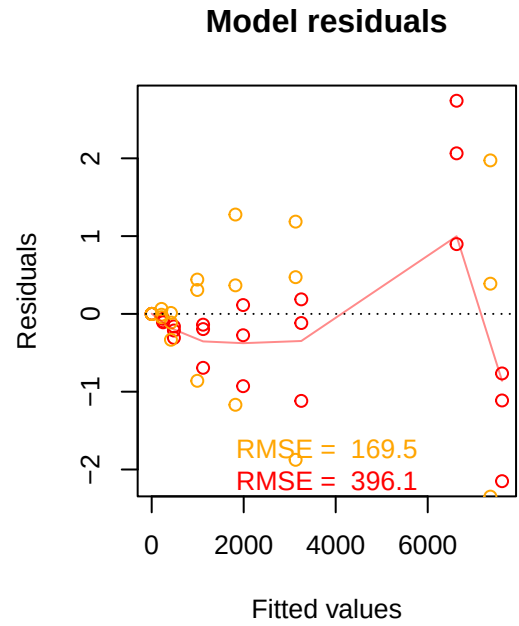

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 28.95
MAPE = 34.22
0
50
100
150
0
200
400
600
800

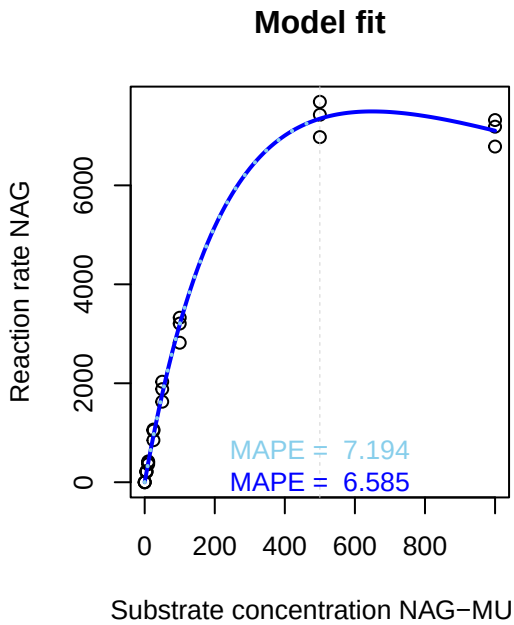

Model residuals
Residuals
Fitted values
RMSE = 10.37
RMSE = 16.11
−2
−1
0
1
2
0
20
40
60
80
120

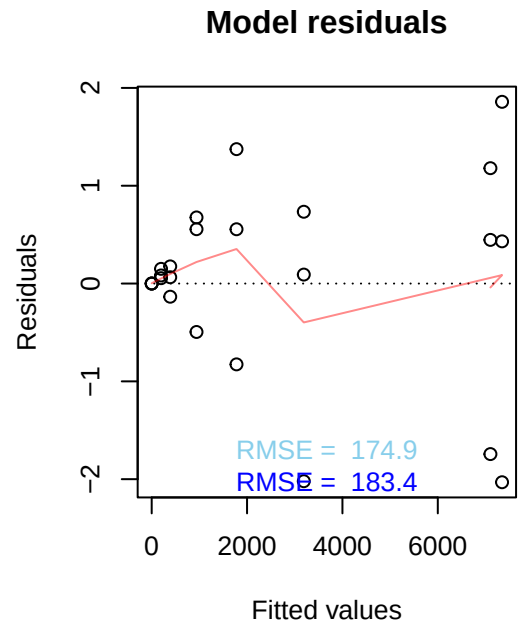

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 20.78
MAPE = 18.51
0
50
100
150
0
200
400
600
800

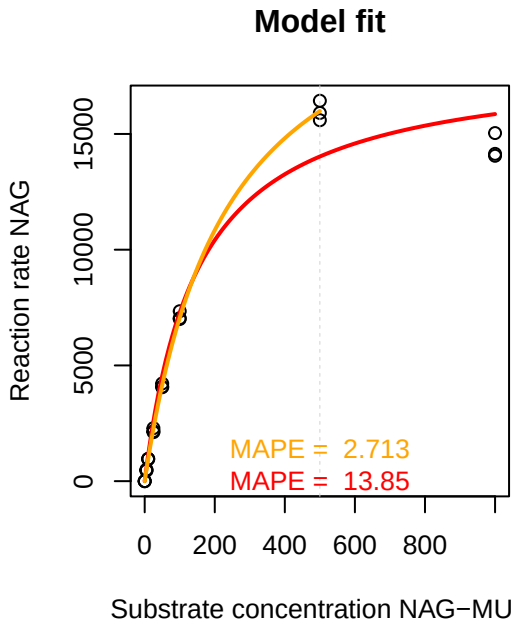

Model residuals
Residuals
Fitted values
RMSE = 8.414
RMSE = 8.098
−1.0
0.0
0.5
1.0
1.5
0
20
40
60
80
120

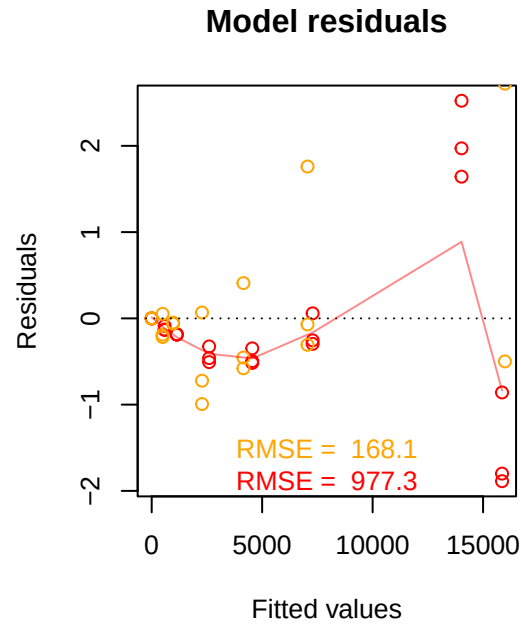

Model fit
Reaction rate NAG
0
2000
4000
6000
0
200
400
600
800
MAPE = 6.267
MAPE = 12.43
Substrate concentration NAG−MUF

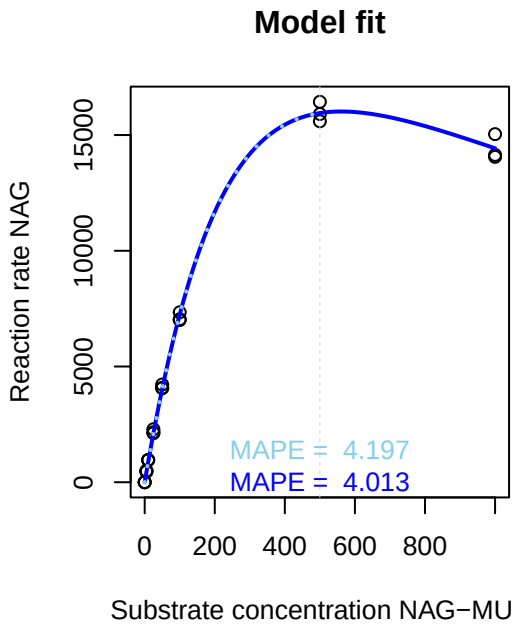

Model residuals
Residuals
−2
−1
0
1
2
0
2000
4000
6000
RMSE = 169.5
RMSE = 396.1
Fitted values

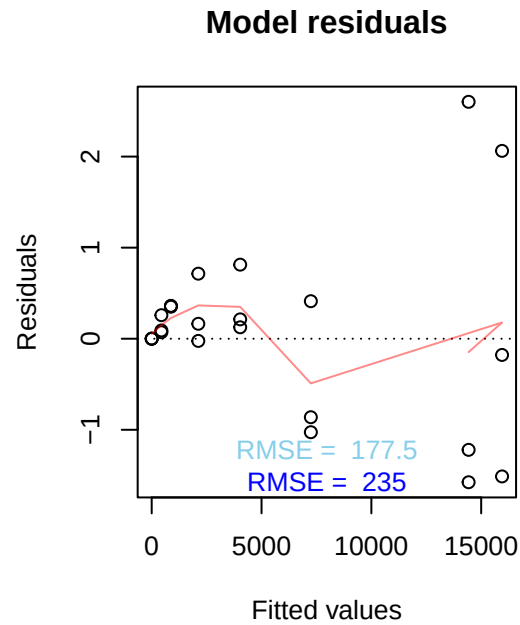

Model fit
Reaction rate NAG
0
2000
4000
6000
0
200
400
600
800
MAPE = 7.194
MAPE = 6.585
Substrate concentration NAG−MUF

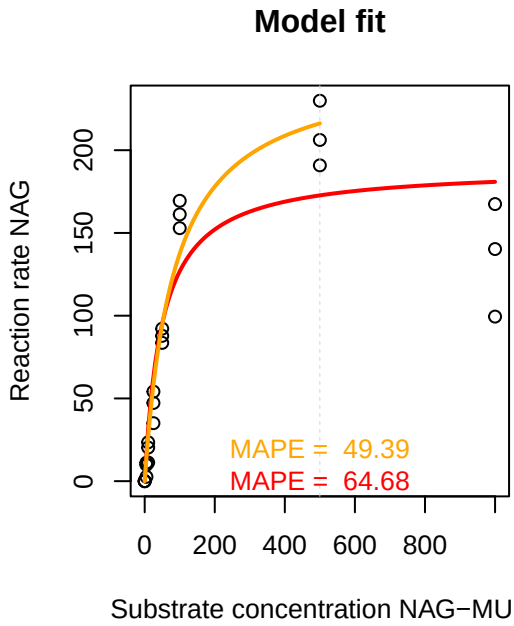

Model residuals
Residuals
−2
−1
0
1
2
0
2000
4000
6000
RMSE = 174.9
RMSE = 183.4
Fitted values

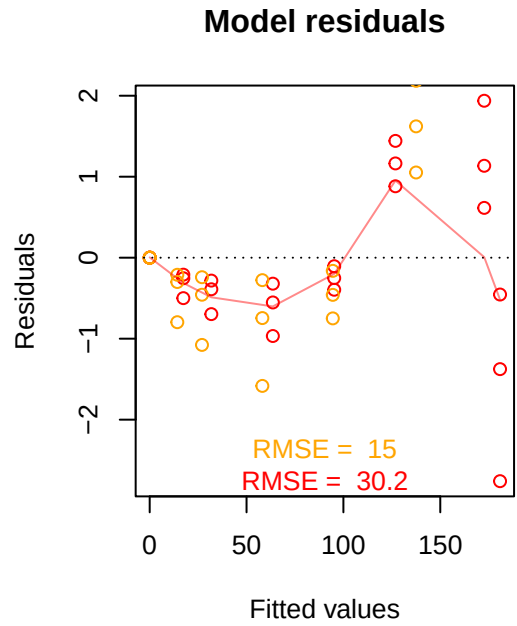

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 2.713
MAPE = 13.85
Substrate concentration NAG−MUF

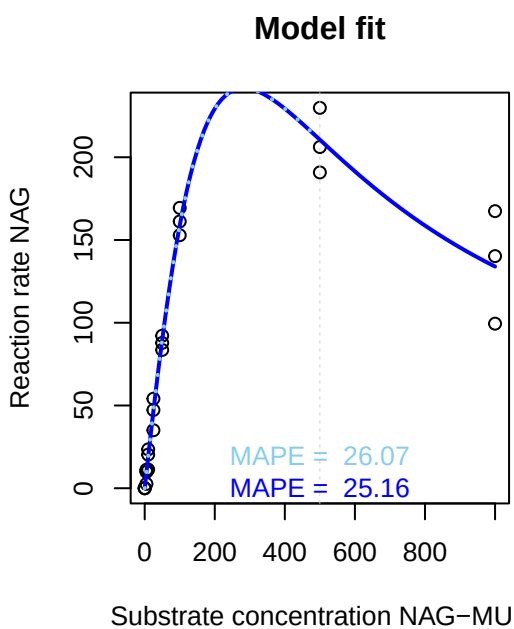

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
RMSE = 168.1
RMSE = 977.3
Fitted values

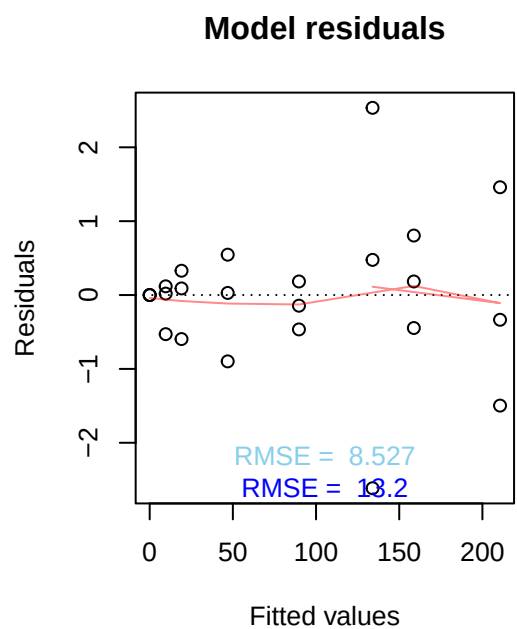

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 4.197
MAPE = 4.013
Substrate concentration NAG−MUF

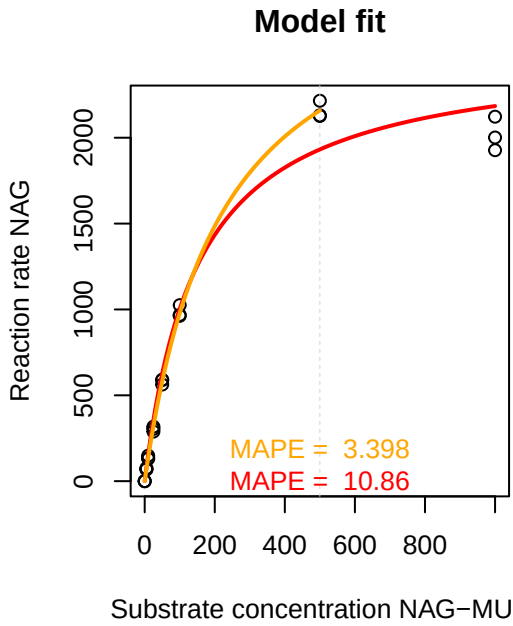

Model residuals
Residuals
−1
0
1
2
0
5000
10000
15000
RMSE = 177.5
RMSE = 235
Fitted values

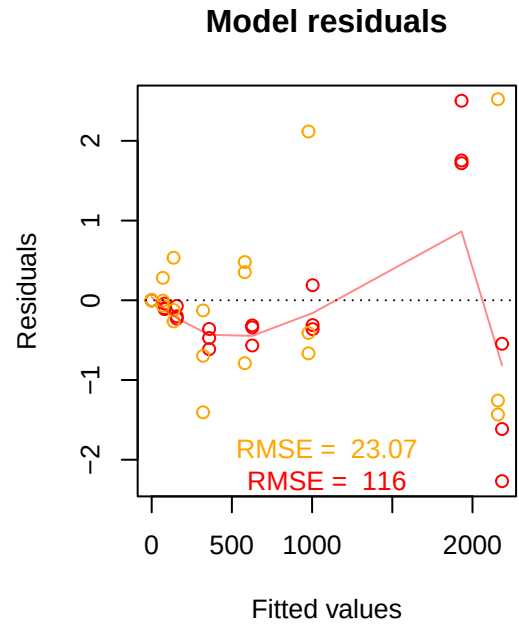

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 49.39
MAPE = 64.68
0
50
100
150
200
0
200
400
600
800

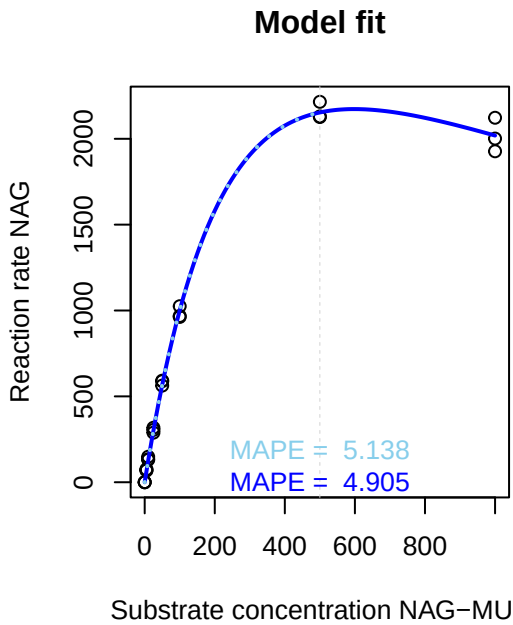

Model residuals
Residuals
Fitted values
RMSE = 15
RMSE = 30.2
−2
−1
0
1
2
0
50
100
150

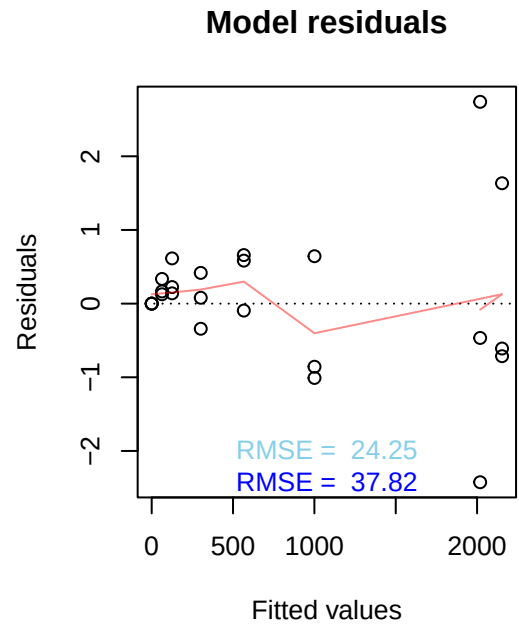

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 26.07
MAPE = 25.16
0
50
100
150
200
0
200
400
600
800

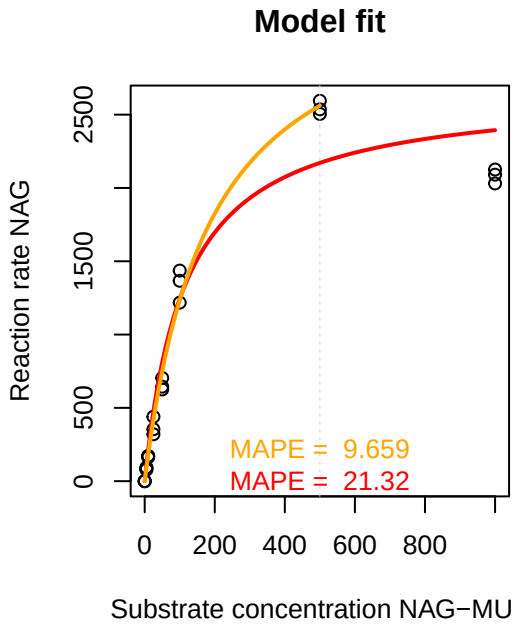

Model residuals
Residuals
Fitted values
RMSE = 8.527
RMSE = 18.2
−2
−1
0
1
2
0
50
100
150
200

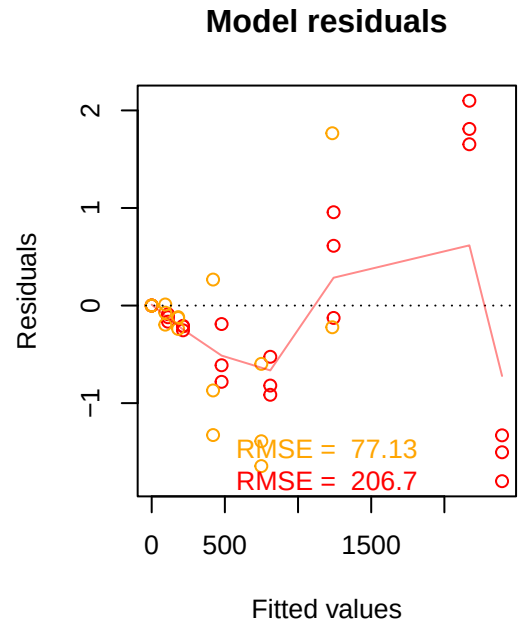

Model fit
Reaction rate NAG
0
500
1000
1500
2000
MAPE = 3.398
MAPE = 10.86
0
200
400
600
800
Substrate concentration NAG−MUF

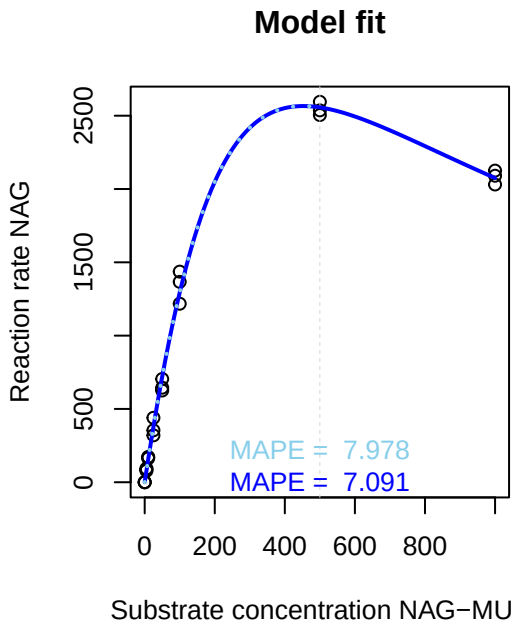

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 23.07
RMSE = 116
0
500
1000
2000
Fitted values

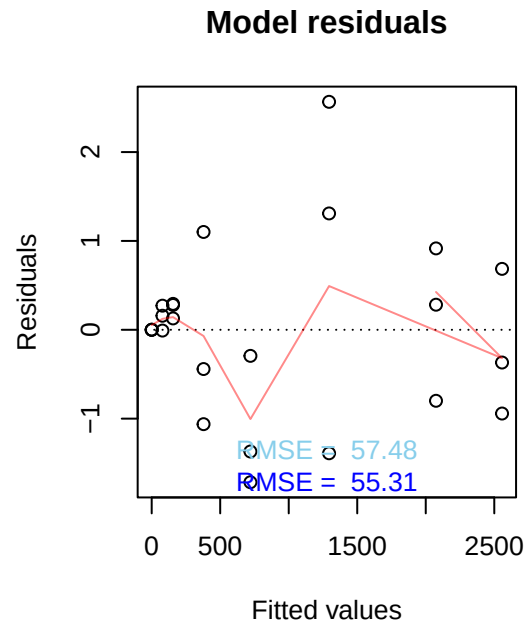

Model fit
Reaction rate NAG
0
500
1000
1500
2000
MAPE = 5.138
MAPE = 4.905
0
200
400
600
800
Substrate concentration NAG−MUF

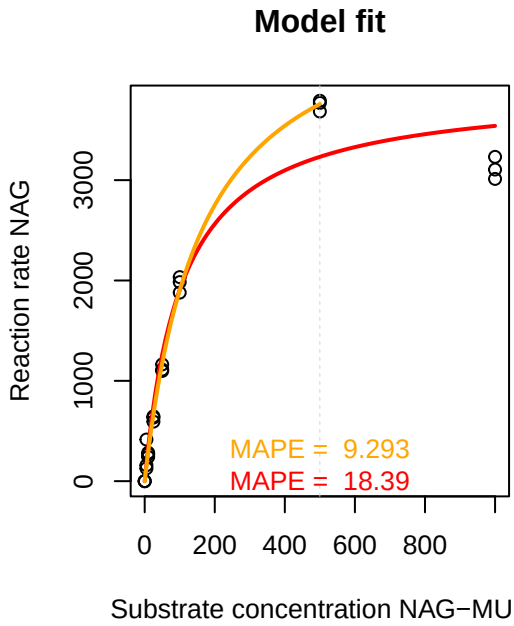

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 24.25
RMSE = 37.82
0
500
1000
2000
Fitted values

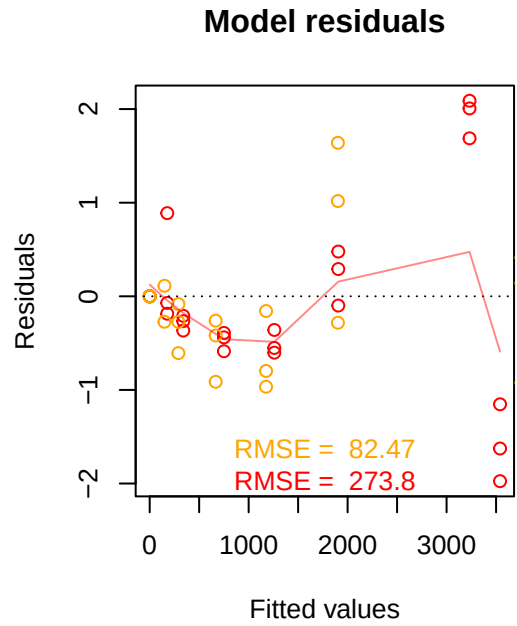

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 9.659
MAPE = 21.32
0
500
1500
2500
0
200
400
600
800

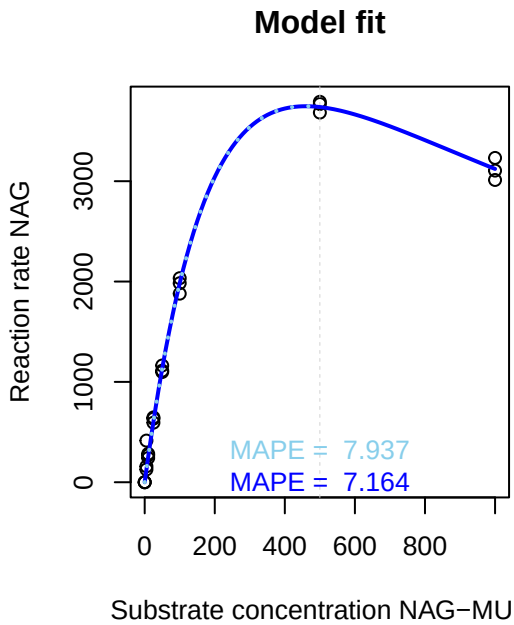

Model residuals
Residuals
Fitted values
RMSE = 77.13
RMSE = 206.7
−1
0
1
2
0
500
1500

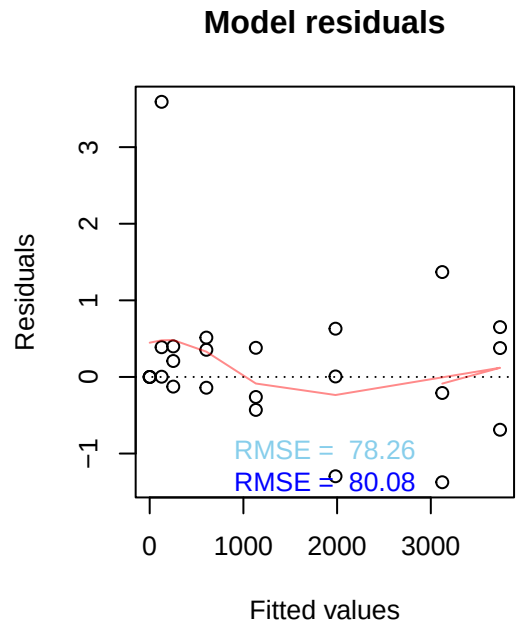

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 7.978
MAPE = 7.091
0
500
1500
2500
0
200
400
600
800

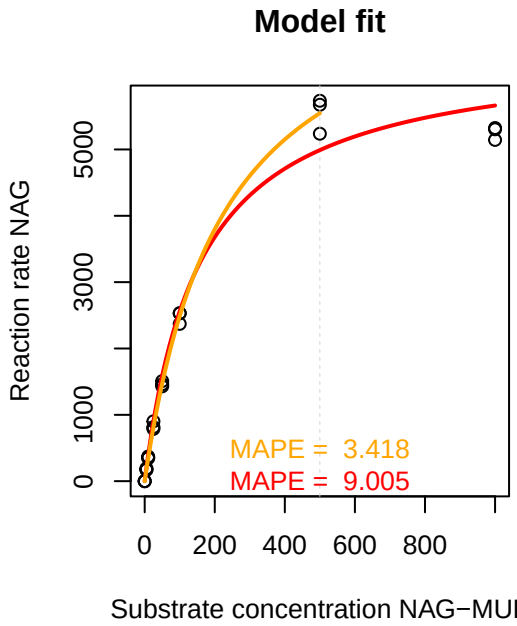

Model residuals
Residuals
Fitted values
RMSE = 57.48
RMSE = 55.31
−1
0
1
2
0
500
1500
2500

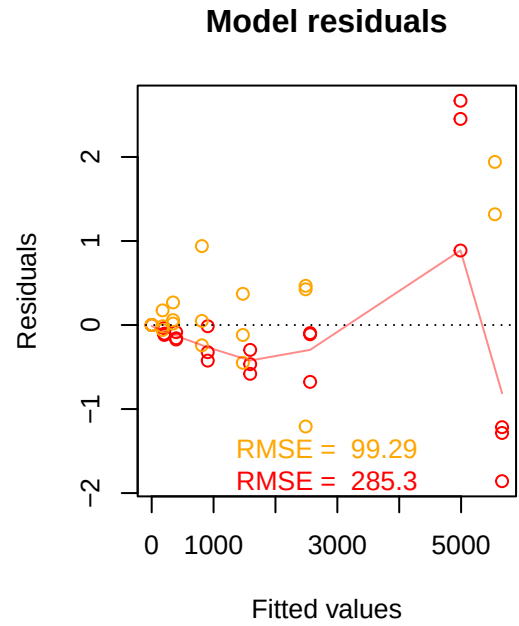

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 9.293
MAPE = 18.39
0
200
400
600
800
Substrate concentration NAG−MUF

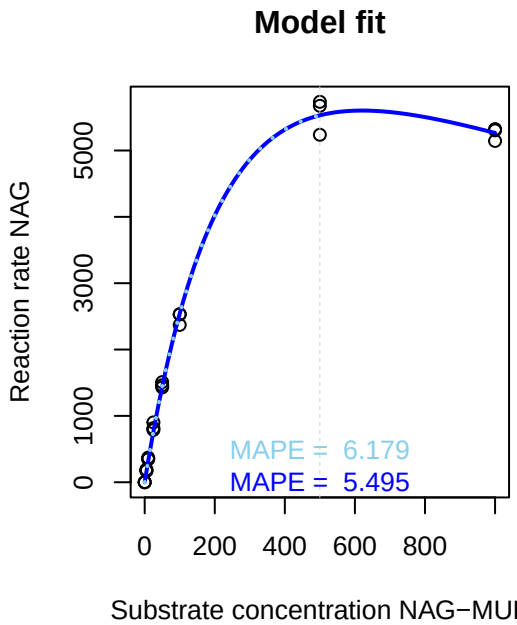

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 82.47
RMSE = 273.8
0
1000
2000
3000
Fitted values

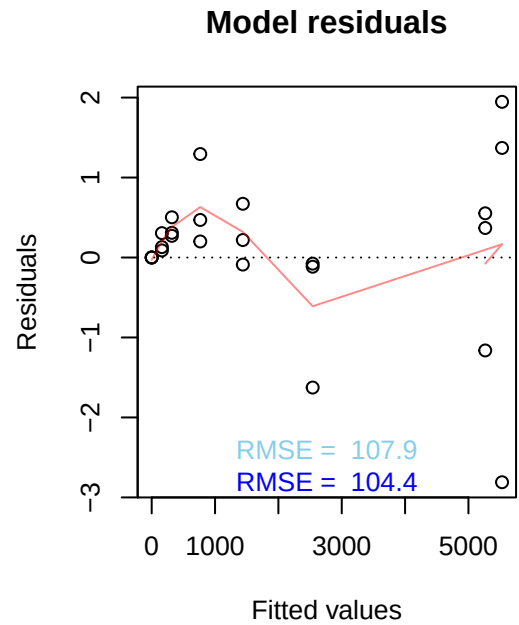

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 7.937
MAPE = 7.164
0
200
400
600
800
Substrate concentration NAG−MUF

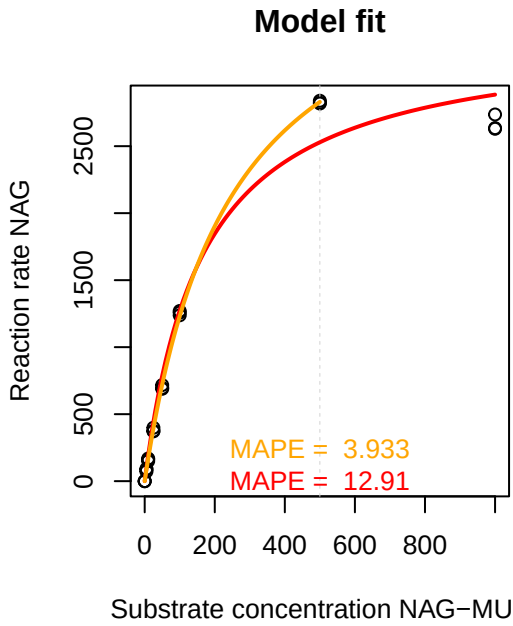

Model residuals
Residuals
−1
0
1
2
3
RMSE = 78.26
RMSE = 80.08
0
1000
2000
3000
Fitted values

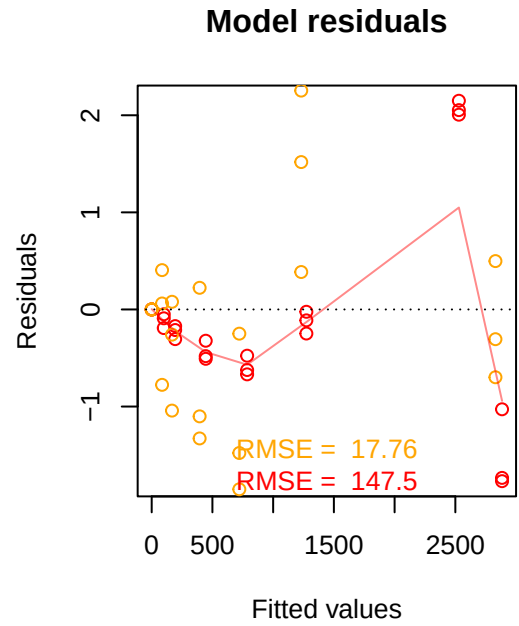

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 3.418
MAPE = 9.005
Substrate concentration NAG−MUF

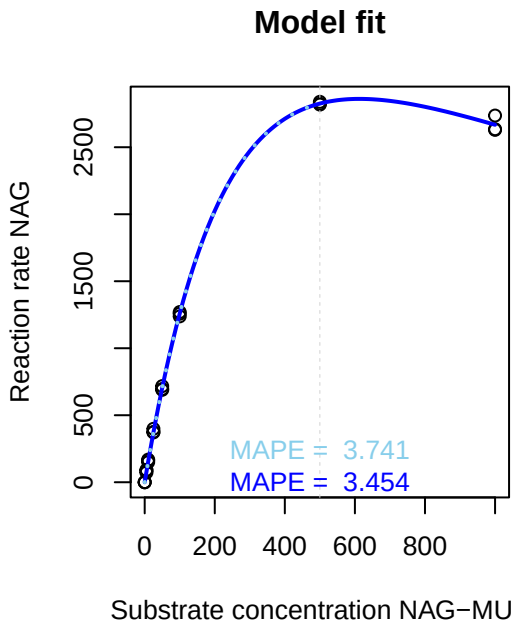

Model residuals
Residuals
−2
−1
0
1
2
0
1000
3000
5000
RMSE = 99.29
RMSE = 285.3
Fitted values

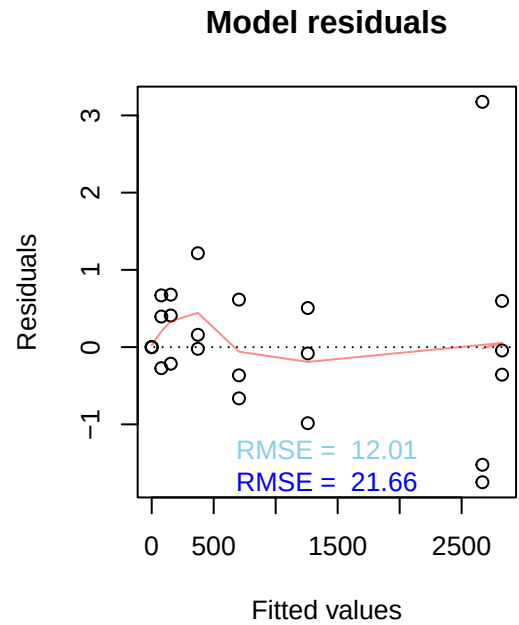

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 6.179
MAPE = 5.495
Substrate concentration NAG−MUF

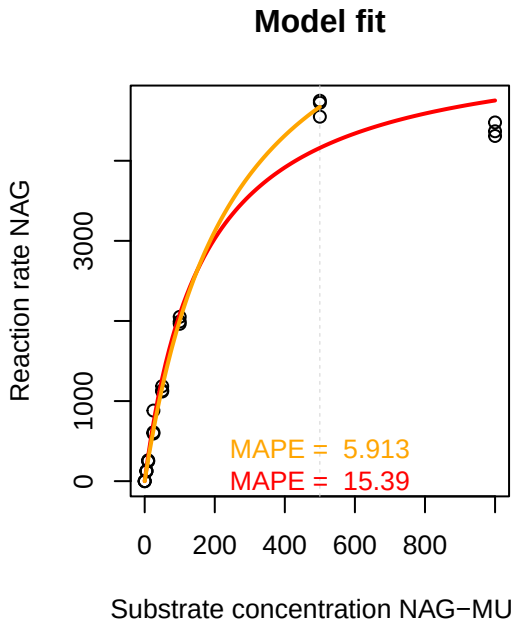

Model residuals
Residuals
−3
−2
−1
0
1
2
0
1000
3000
5000
RMSE = 107.9
RMSE = 104.4
Fitted values

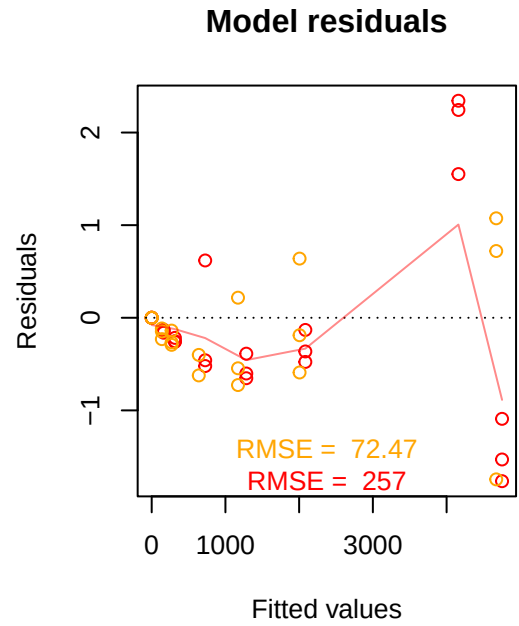

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 3.933
MAPE = 12.91
0
200
400
600
800
Substrate concentration NAG−MUF

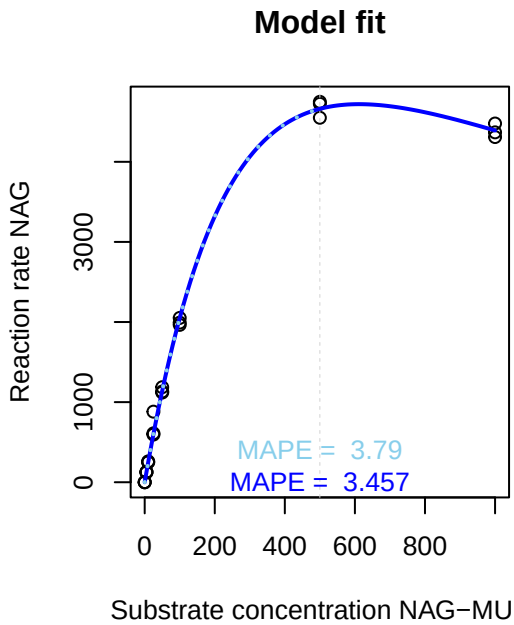

Model residuals
Residuals
−1
0
1
2
RMSE = 17.76
RMSE = 147.5
0
500
1500
2500
Fitted values

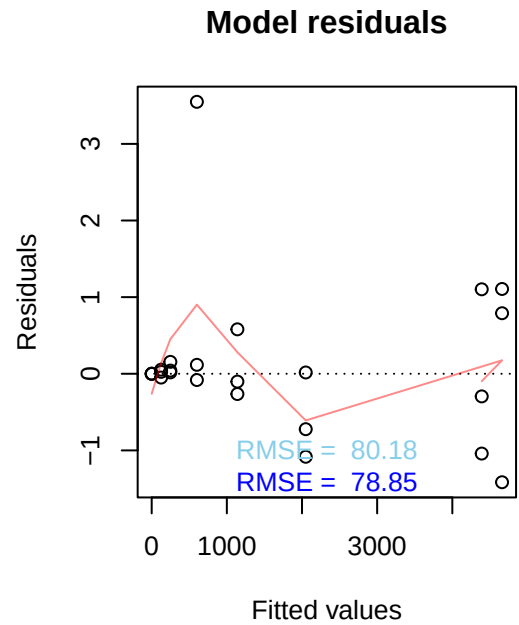

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 3.741
MAPE = 3.454
0
200
400
600
800
Substrate concentration NAG−MUF

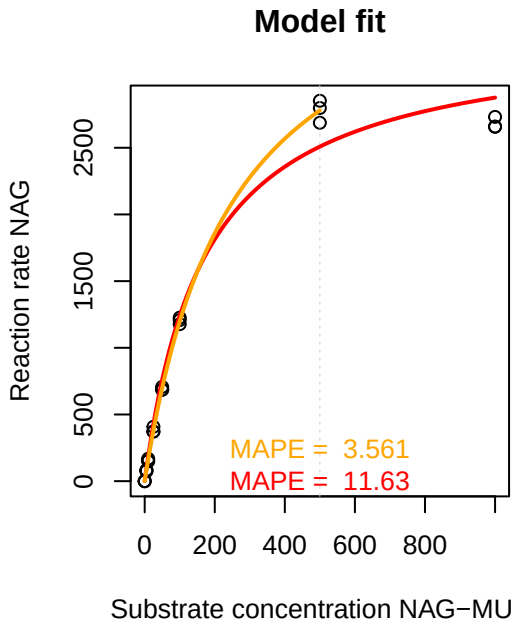

Model residuals
Residuals
−1
0
1
2
3
RMSE = 12.01
RMSE = 21.66
0
500
1500
2500
Fitted values

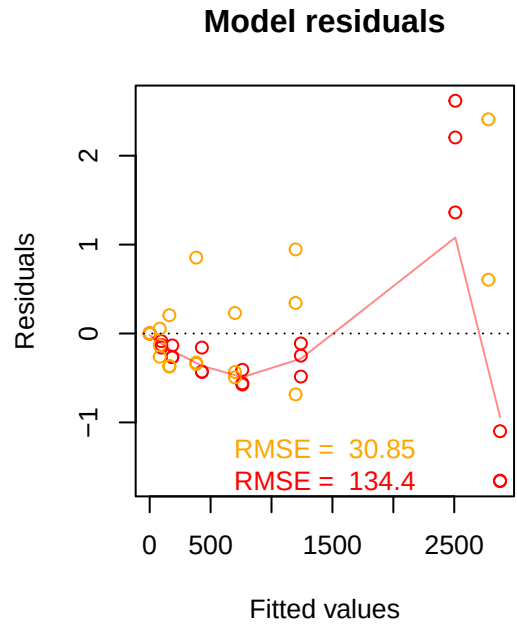

Model fit
Reaction rate NAG
0
1000
3000
0
200
400
600
800
MAPE = 5.913
MAPE = 15.39
Substrate concentration NAG−MUF

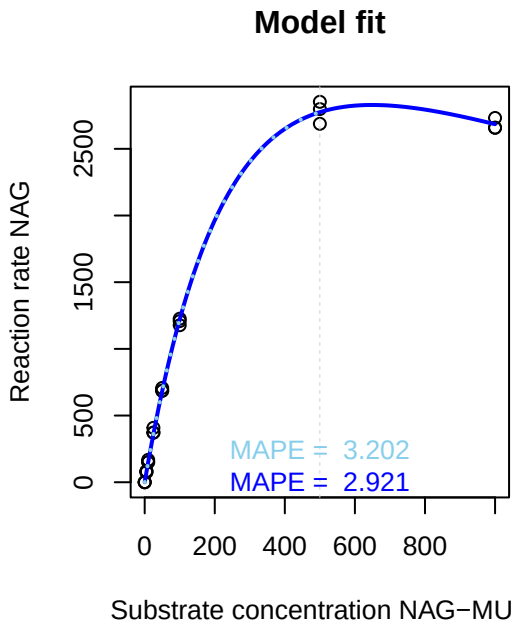

Model residuals
Residuals
−1
0
1
2
0
1000
3000
RMSE = 72.47
RMSE = 257
Fitted values

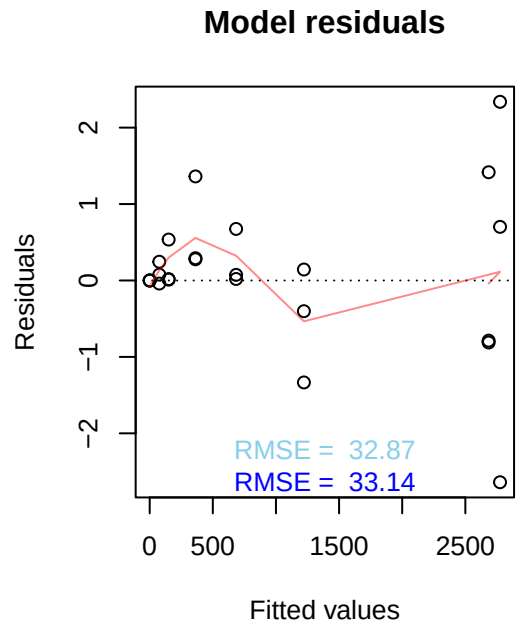

Model fit
Reaction rate NAG
0
1000
3000
0
200
400
600
800
MAPE = 3.79
MAPE = 3.457
Substrate concentration NAG−MUF

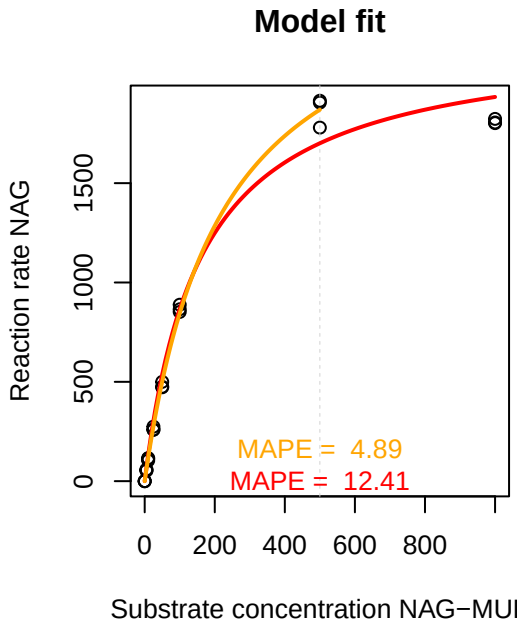

Model residuals
Residuals
−1
0
1
2
3
0
1000
3000
RMSE = 80.18
RMSE = 78.85
Fitted values

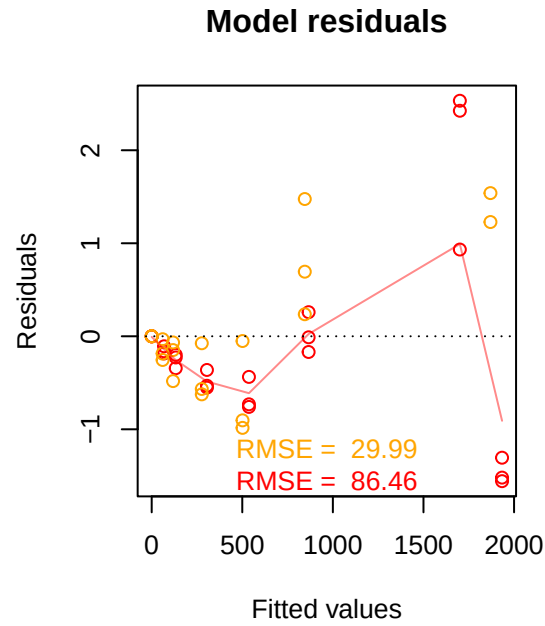

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 3.561
MAPE = 11.63
0
200
400
600
800
Substrate concentration NAG−MUF

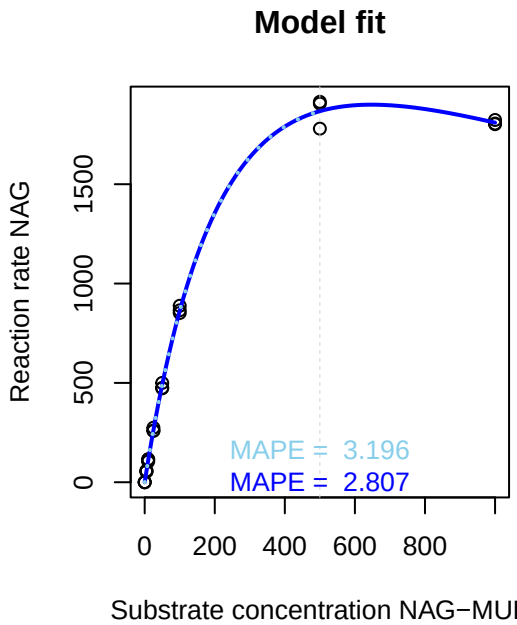

Model residuals
Residuals
−1
0
1
2
RMSE = 30.85
RMSE = 134.4
0
500
1500
2500
Fitted values

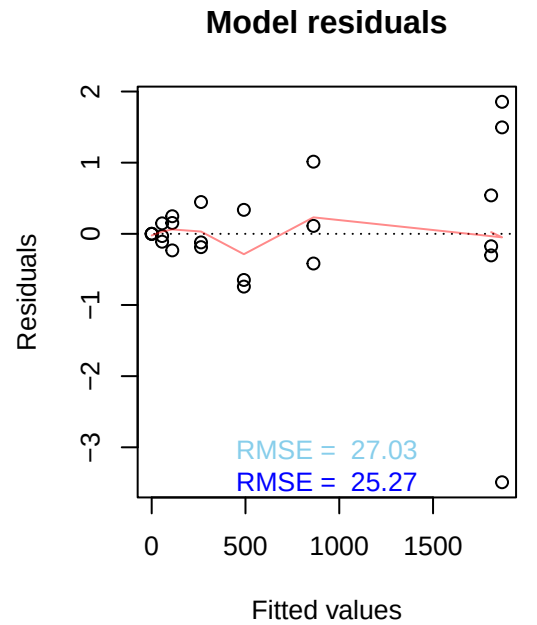

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 3.202
MAPE = 2.921
0
200
400
600
800
Substrate concentration NAG−MUF

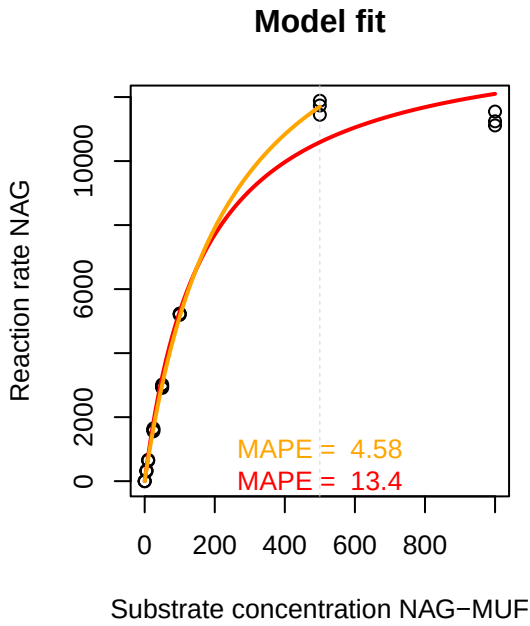

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 32.87
RMSE = 33.14
0
500
1500
2500
Fitted values

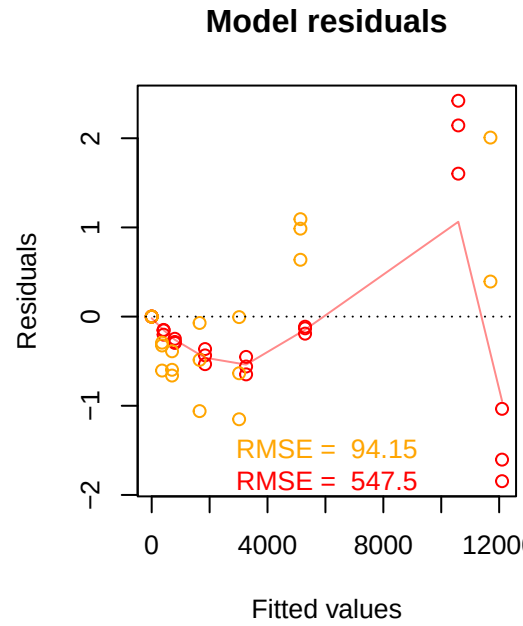

Model fit
Reaction rate NAG
0
500
1000
1500
0
200
400
600
800
MAPE = 4.89
MAPE = 12.41
Substrate concentration NAG−MUF

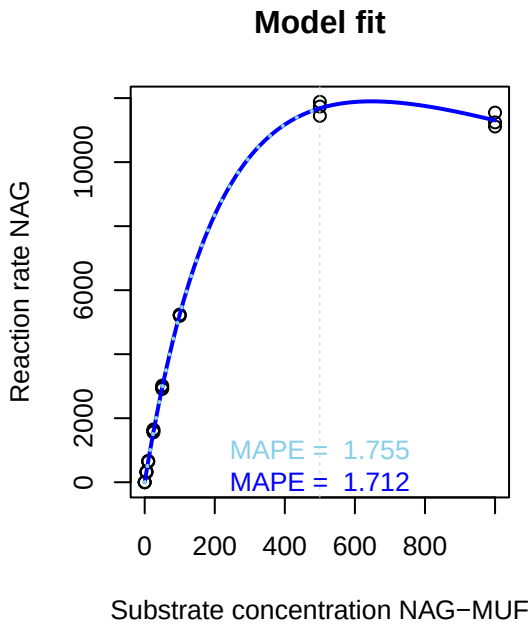

Model residuals
Residuals
−1
0
1
2
0
500
1000
1500
2000
RMSE = 29.99
RMSE = 86.46
Fitted values

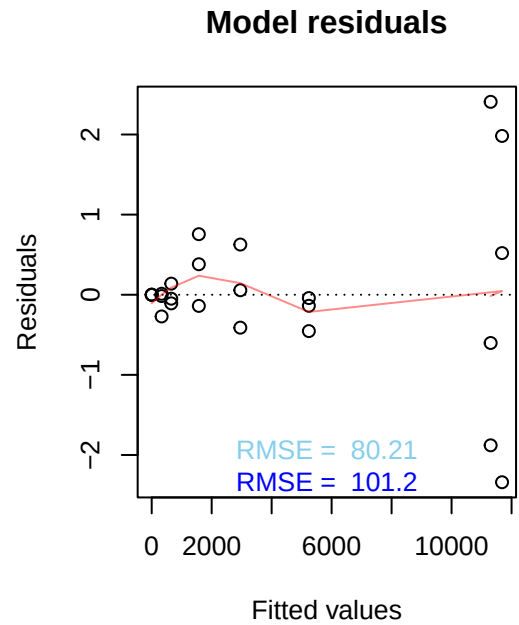

Model fit
Reaction rate NAG
0
500
1000
1500
0
200
400
600
800
MAPE = 3.196
MAPE = 2.807
Substrate concentration NAG−MUF

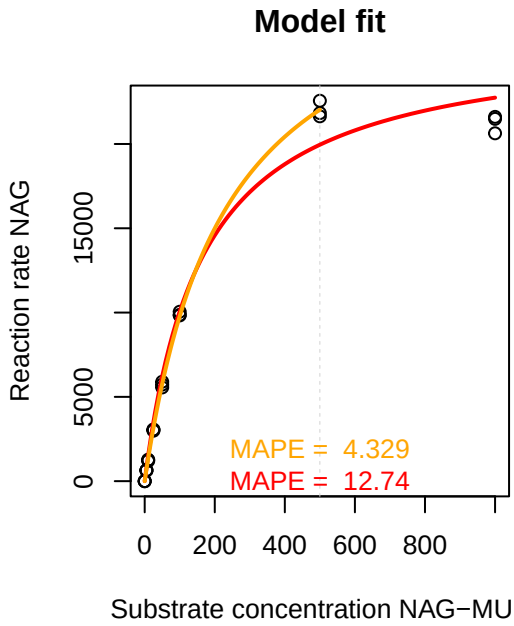

Model residuals
Residuals
−3
−2
−1
0
1
2
0
500
1000
1500
RMSE = 27.03
RMSE = 25.27
Fitted values

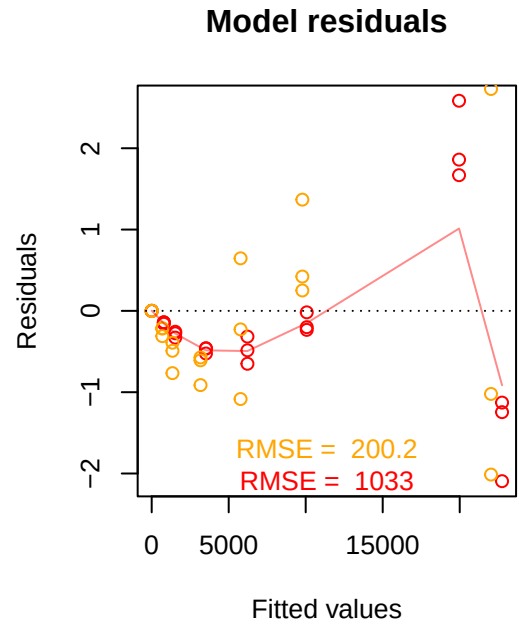

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 4.58
MAPE = 13.4
Substrate concentration NAG−MUF

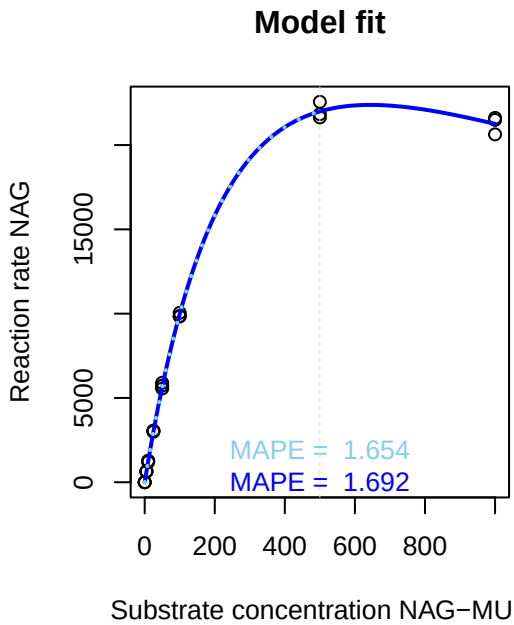

Model residuals
Residuals
−2
−1
0
1
2
0
4000
8000
12000
RMSE = 94.15
RMSE = 547.5
Fitted values

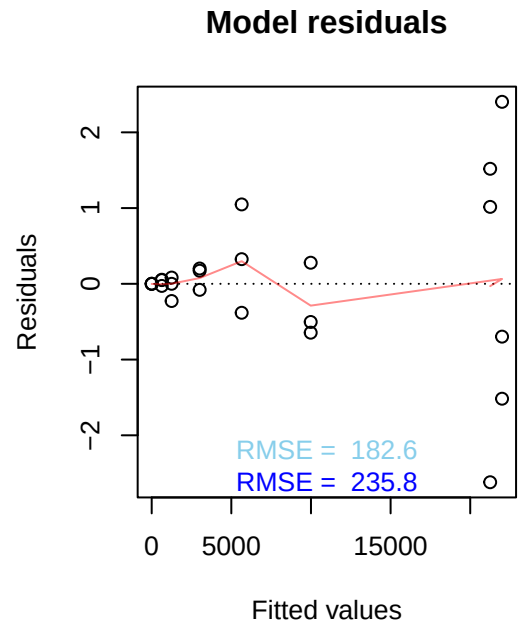

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 1.755
MAPE = 1.712
Substrate concentration NAG−MUF

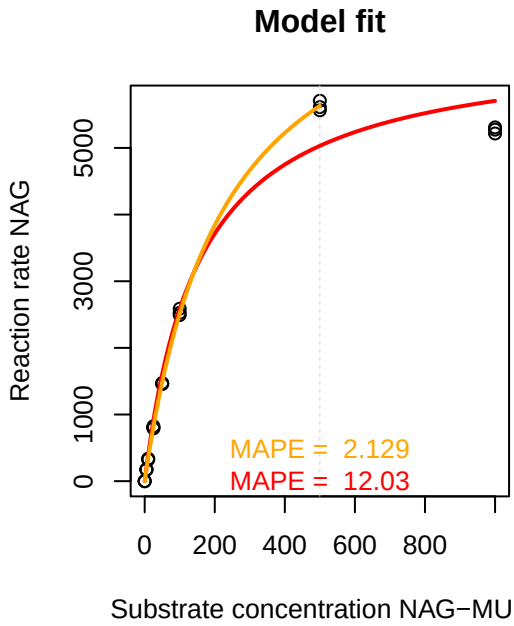

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 80.21
RMSE = 101.2
Fitted values

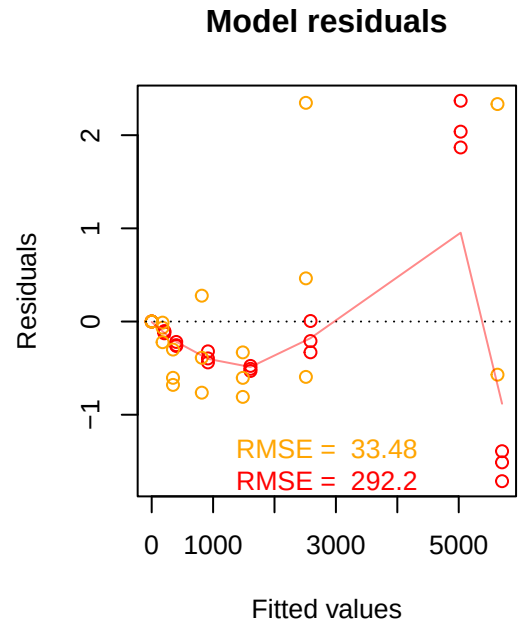

Model fit
Reaction rate NAG
0
5000
15000
0
200
400
600
800
MAPE = 4.329
MAPE = 12.74
Substrate concentration NAG−MUF

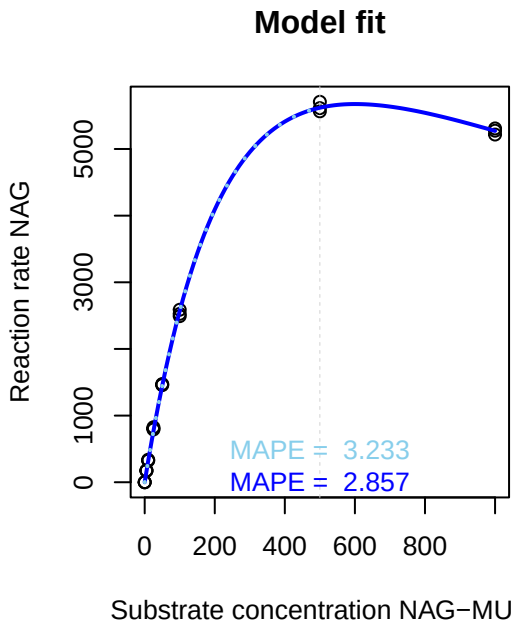

Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
RMSE = 200.2
RMSE = 1033
Fitted values

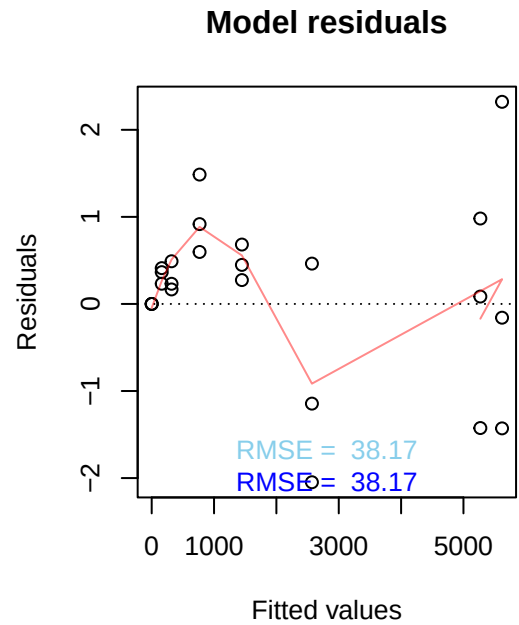

Model fit
Reaction rate NAG
0
5000
15000
0
200
400
600
800
MAPE = 1.654
MAPE = 1.692
Substrate concentration NAG−MUF

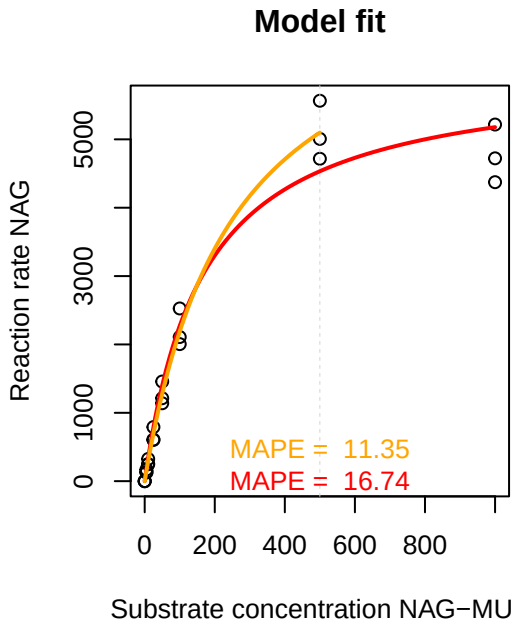

Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
RMSE = 182.6
RMSE = 235.8
Fitted values

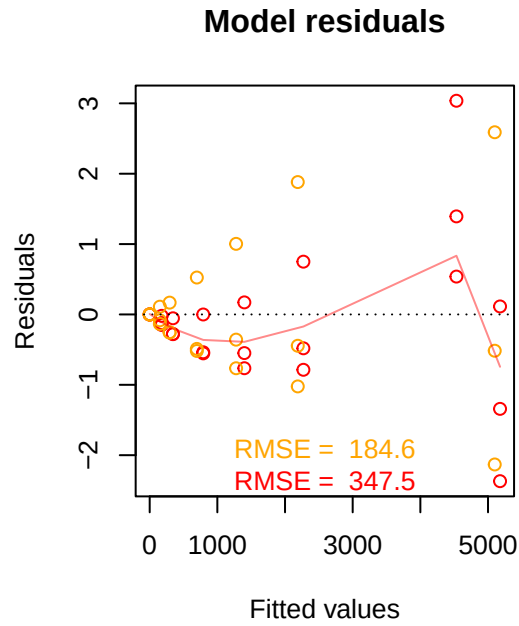

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 2.129
MAPE = 12.03
0
200
400
600
800
Substrate concentration NAG−MUF

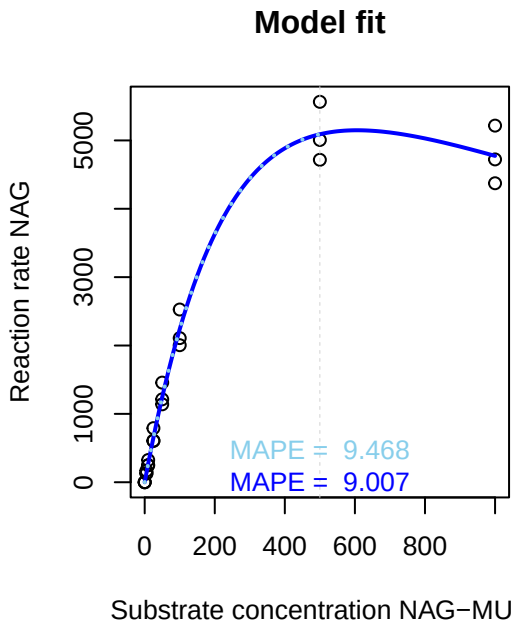

Model residuals
Residuals
−1
0
1
2
RMSE = 33.48
RMSE = 292.2
0
1000
3000
5000
Fitted values

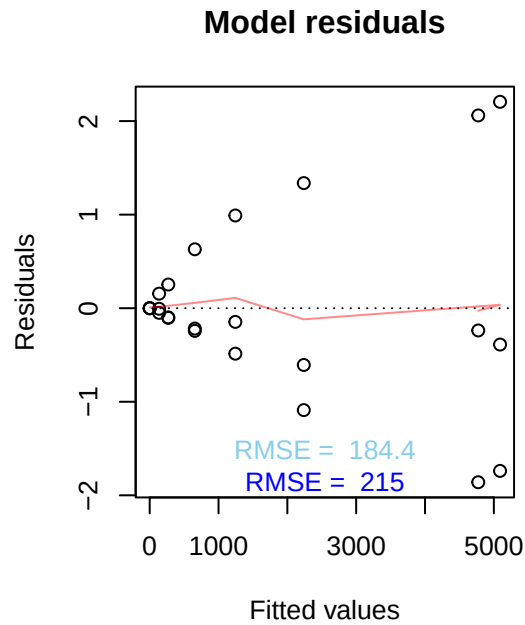

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 3.233
MAPE = 2.857
0
200
400
600
800
Substrate concentration NAG−MUF

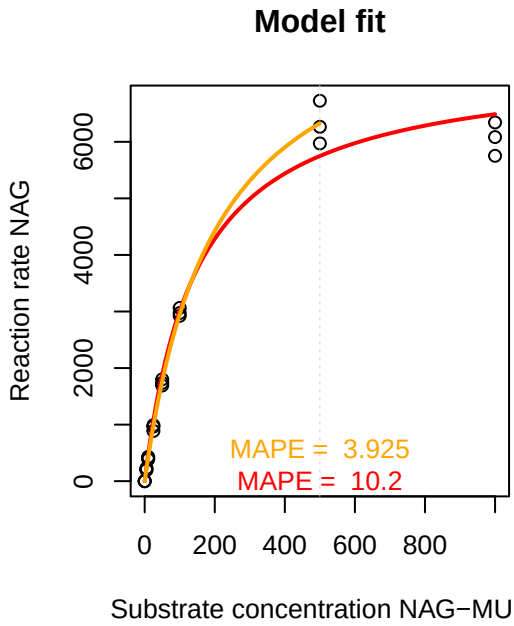

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 38.17
RMSE = 38.17
0
1000
3000
5000
Fitted values

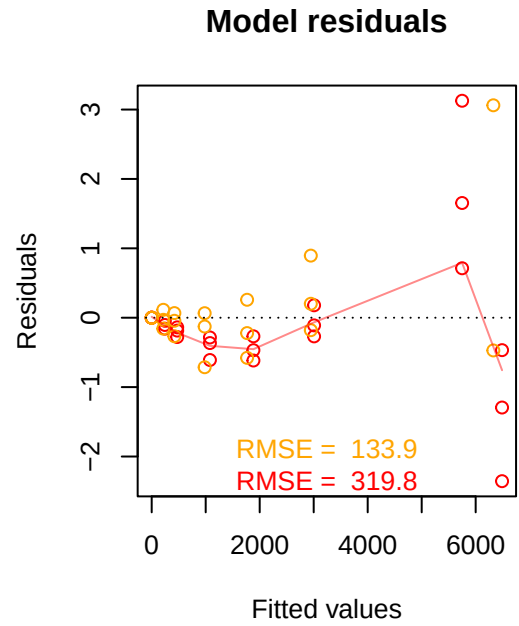

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 11.35
MAPE = 16.74
0
200
400
600
800
Substrate concentration NAG−MUF

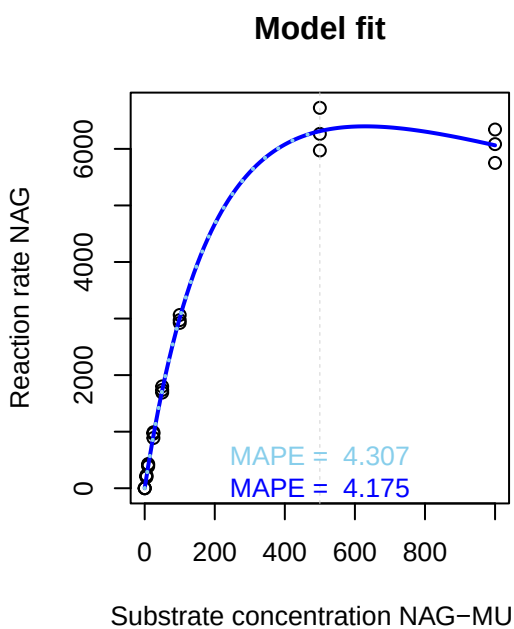

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 184.6
RMSE = 347.5
0
1000
3000
5000
Fitted values

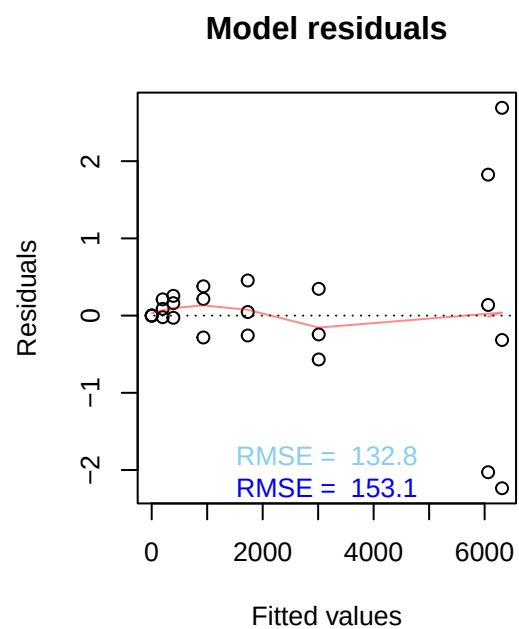

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 9.468
MAPE = 9.007
0
200
400
600
800
Substrate concentration NAG−MUF

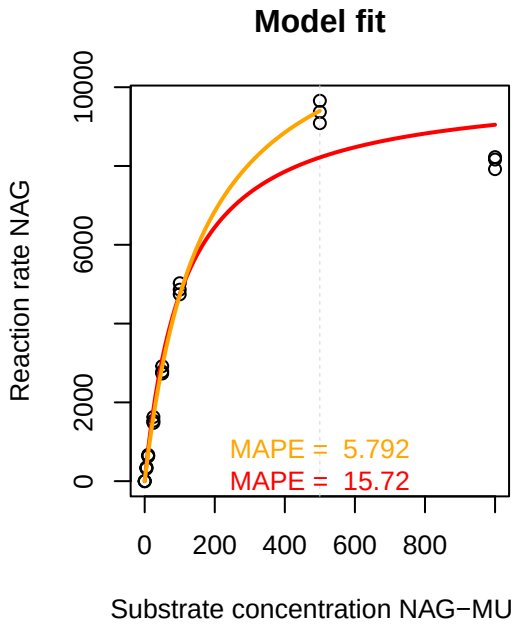

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 184.4
RMSE = 215
0
1000
3000
5000
Fitted values

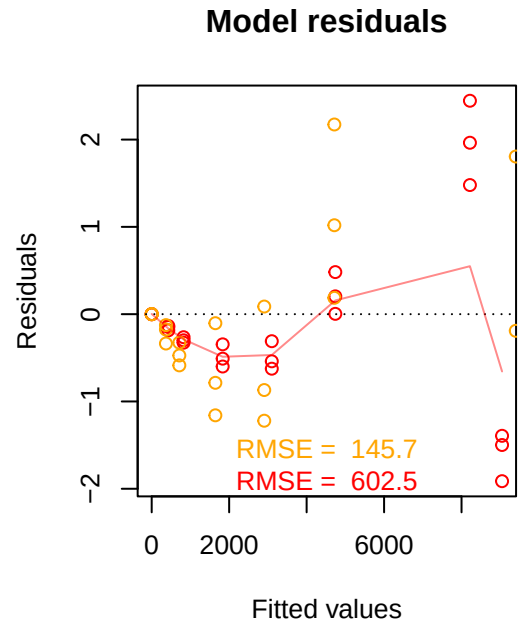

Model fit
Reaction rate NAG
0
2000
4000
6000
0
200
400
600
800
MAPE = 3.925
MAPE = 10.2
Substrate concentration NAG−MUF

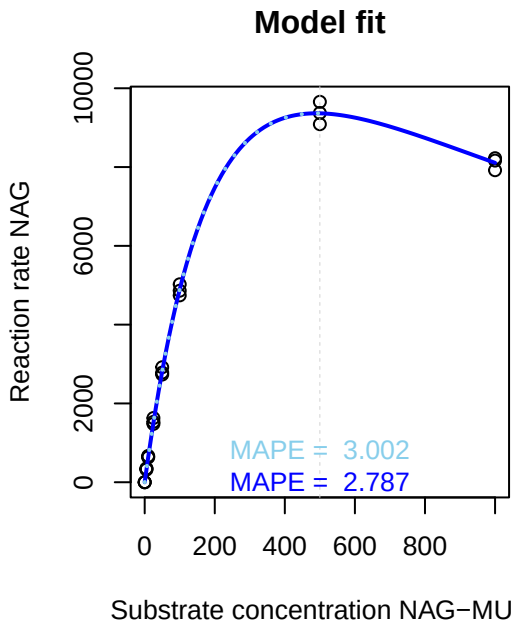

Model residuals
Residuals
−2
−1
0
1
2
3
0
2000
4000
6000
RMSE = 133.9
RMSE = 319.8
Fitted values

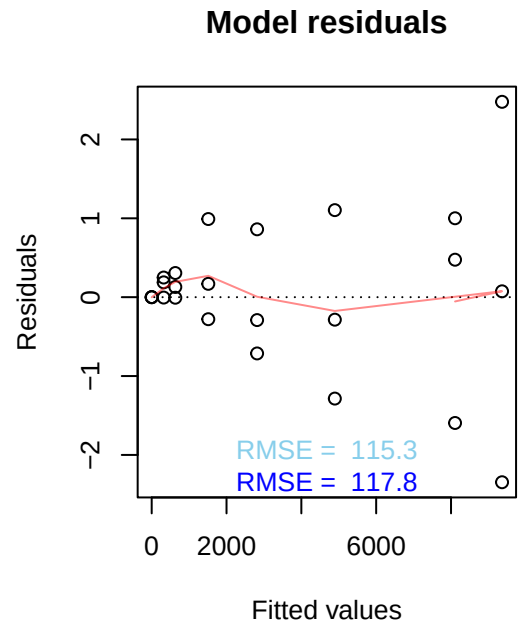

Model fit
Reaction rate NAG
0
2000
4000
6000
0
200
400
600
800
MAPE = 4.307
MAPE = 4.175
Substrate concentration NAG−MUF

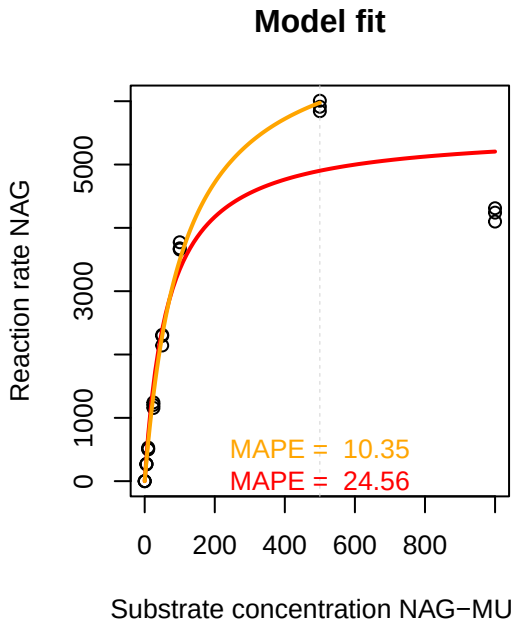

Model residuals
Residuals
−2
−1
0
1
2
0
2000
4000
6000
RMSE = 132.8
RMSE = 153.1
Fitted values

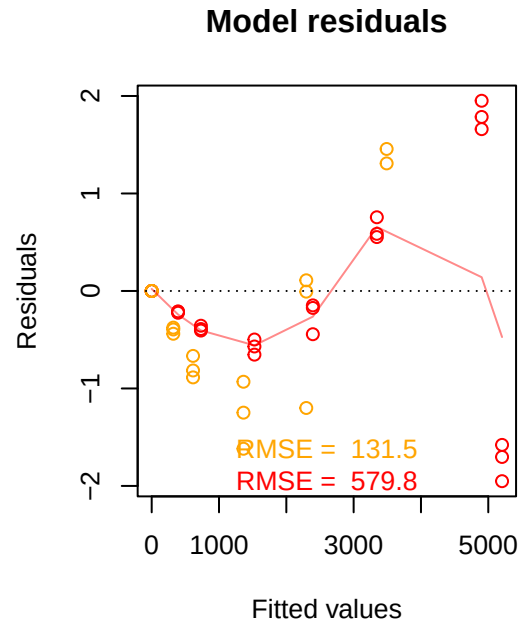

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 5.792
MAPE = 15.72
0
2000
6000
10000
0
200
400
600
800

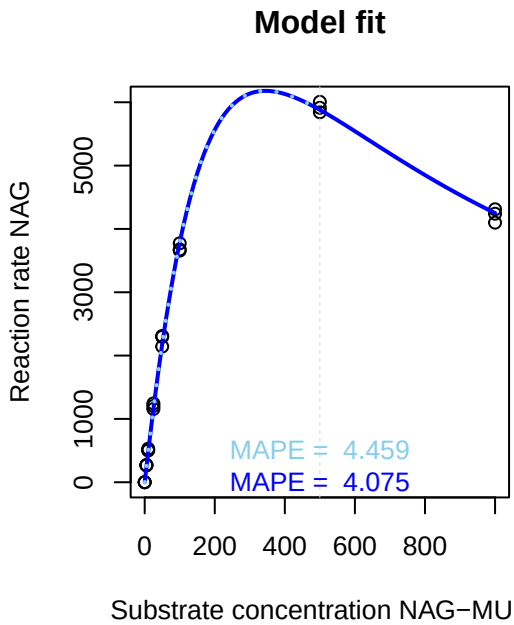

Model residuals
Residuals
Fitted values
RMSE = 145.7
RMSE = 602.5
−2
−1
0
1
2
0
2000
6000

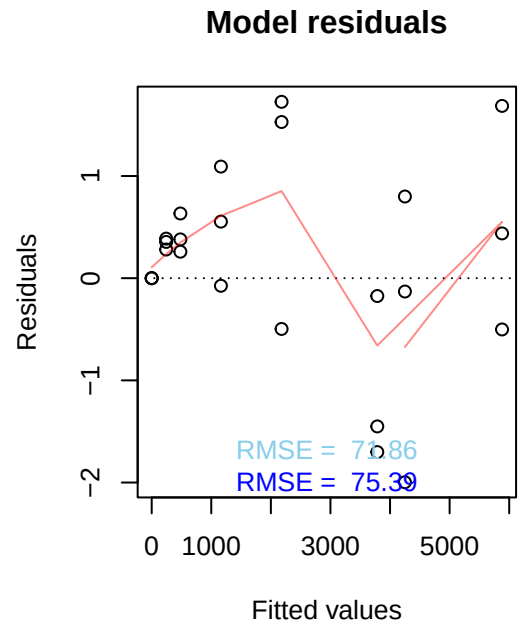

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 3.002
MAPE = 2.787
0
2000
6000
10000
0
200
400
600
800

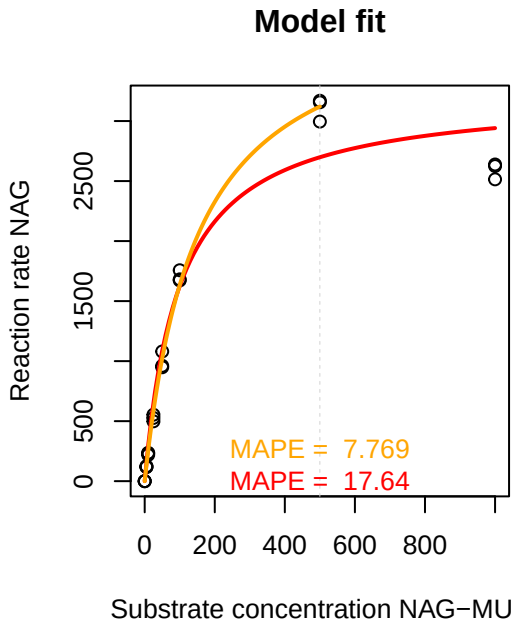

Model residuals
Residuals
Fitted values
RMSE = 115.3
RMSE = 117.8
−2
−1
0
1
2
0
2000
6000

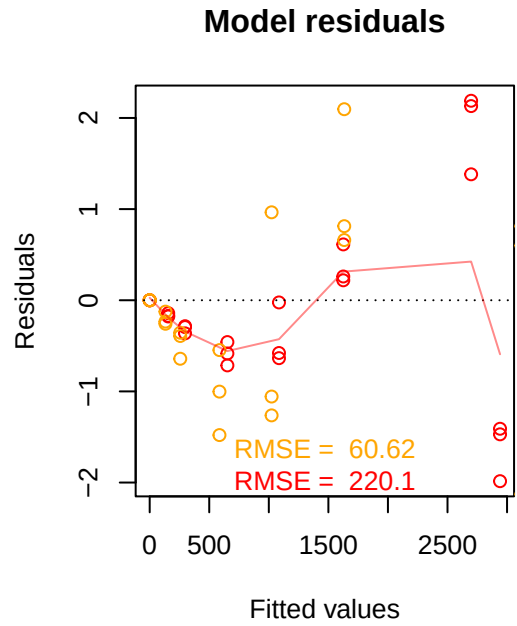

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 10.35
MAPE = 24.56
Substrate concentration NAG−MUF

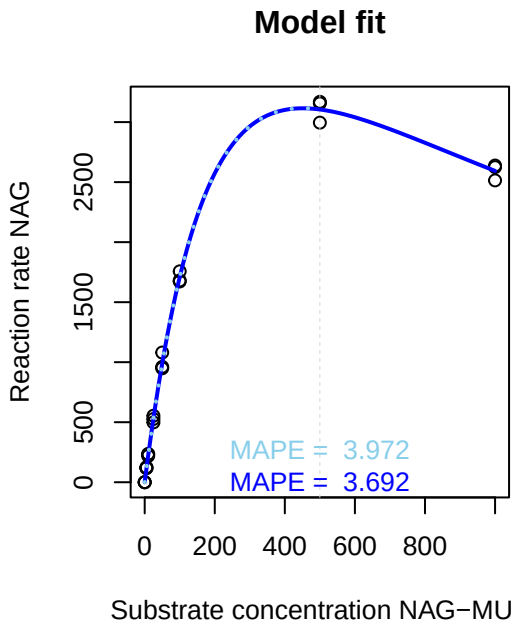

Model residuals
Residuals
−2
−1
0
1
2
0
1000
3000
5000
RMSE = 131.5
RMSE = 579.8
Fitted values

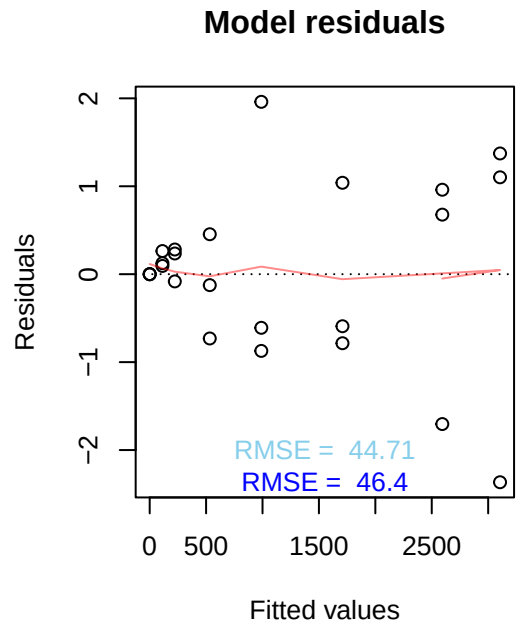

Model fit
Reaction rate NAG
0
1000
3000
5000
0
200
400
600
800
MAPE = 4.459
MAPE = 4.075
Substrate concentration NAG−MUF

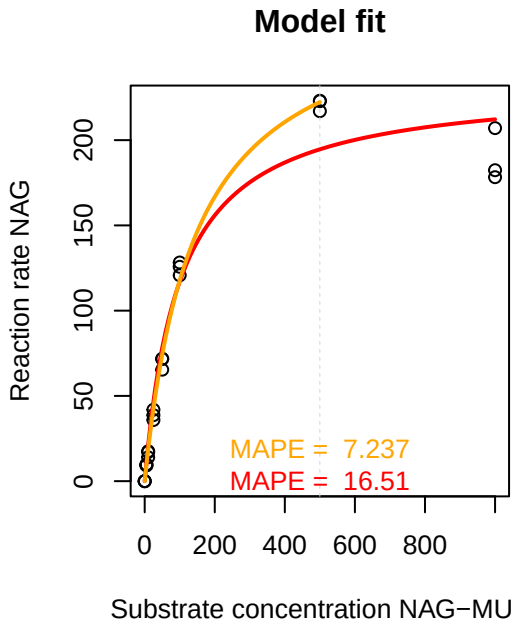

Model residuals
Residuals
−2
−1
0
1
0
1000
3000
5000
RMSE = 75.39
Fitted values

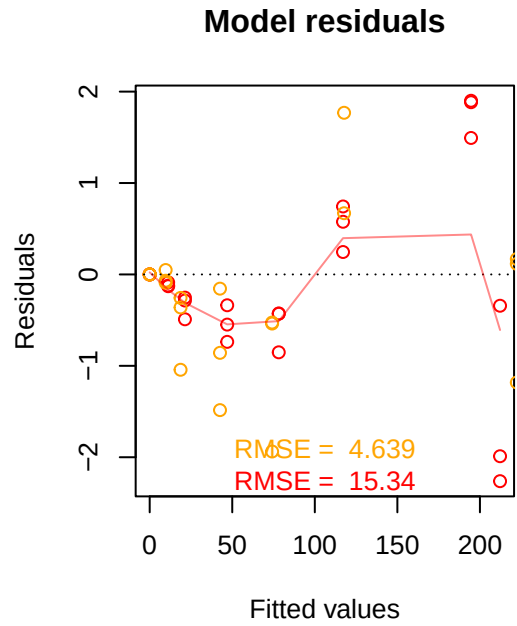

Model fit
Reaction rate NAG
0
500
1500
2500
0
200
400
600
800
MAPE = 7.769
MAPE = 17.64
Substrate concentration NAG−MUF

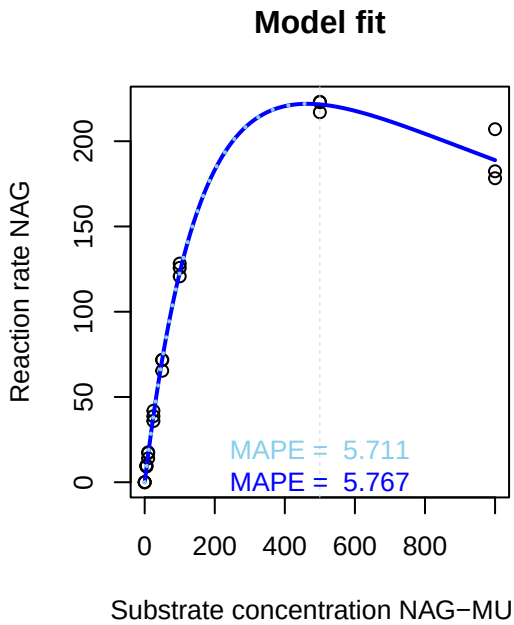

Model residuals
Residuals
−2
−1
0
1
2
0
500
1500
2500
RMSE = 60.62
RMSE = 220.1
Fitted values

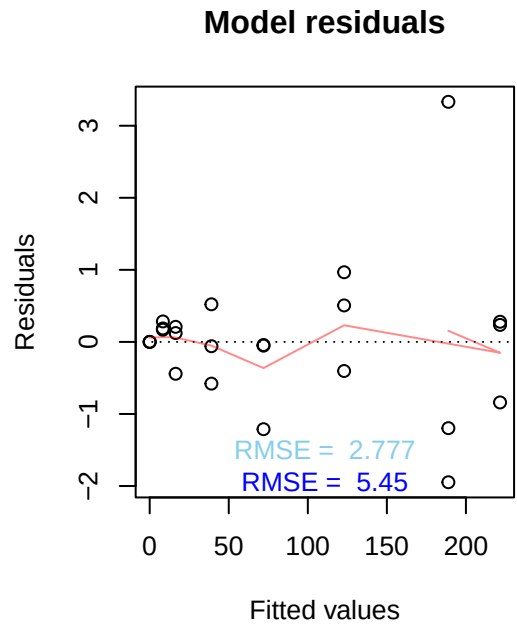

Model fit
Reaction rate NAG
0
500
1500
2500
0
200
400
600
800
MAPE = 3.972
MAPE = 3.692
Substrate concentration NAG−MUF

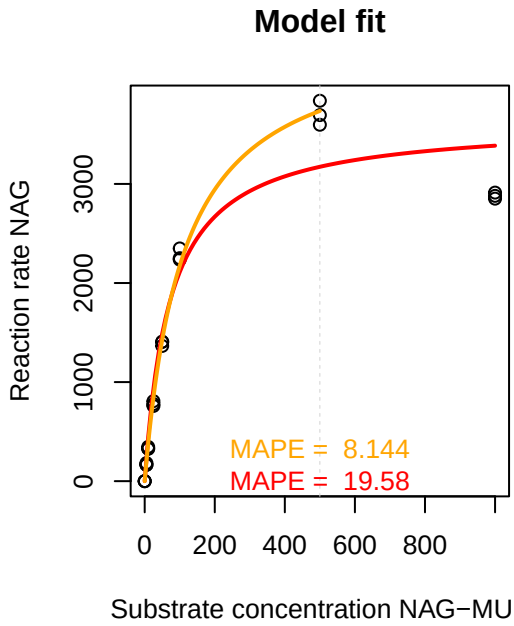

Model residuals
Residuals
−2
−1
0
1
2
0
500
1500
2500
RMSE = 44.71
RMSE = 46.4
Fitted values

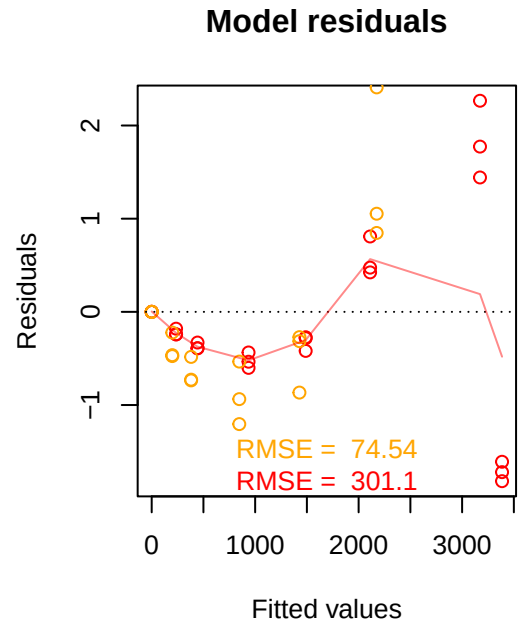

Model fit
Reaction rate NAG
0
50
100
150
200
0
200
400
600
800
MAPE = 7.237
MAPE = 16.51
Substrate concentration NAG−MUF

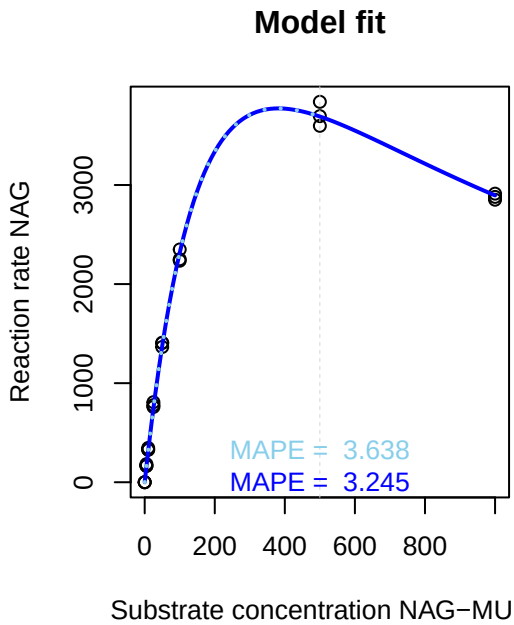

Model residuals
Residuals
−2
−1
0
1
2
0
50
100
150
200
RMSE = 4.639
RMSE = 15.34
Fitted values

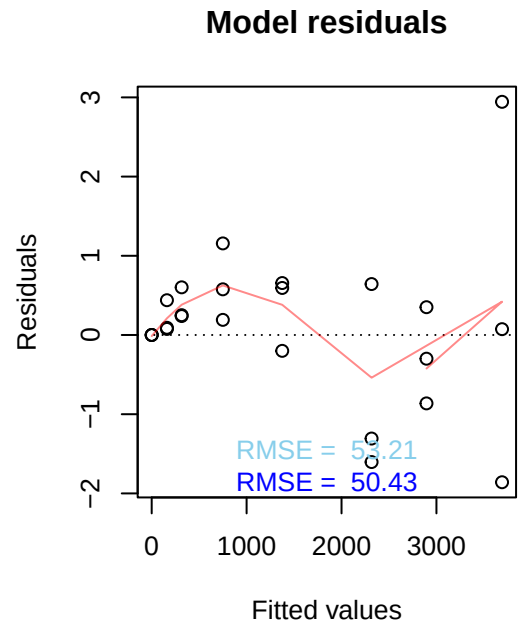

Model fit
Reaction rate NAG
0
50
100
150
200
0
200
400
600
800
MAPE = 5.711
MAPE = 5.767
Substrate concentration NAG−MUF

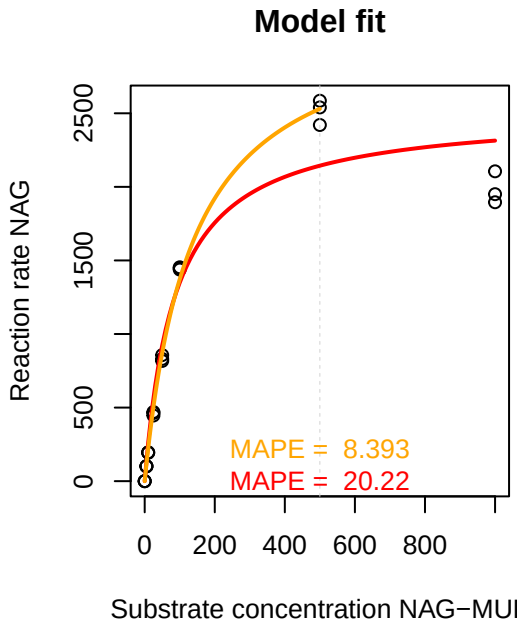

Model residuals
Residuals
−2
−1
0
1
2
3
0
50
100
150
200
RMSE = 2.777
RMSE = 5.45
Fitted values

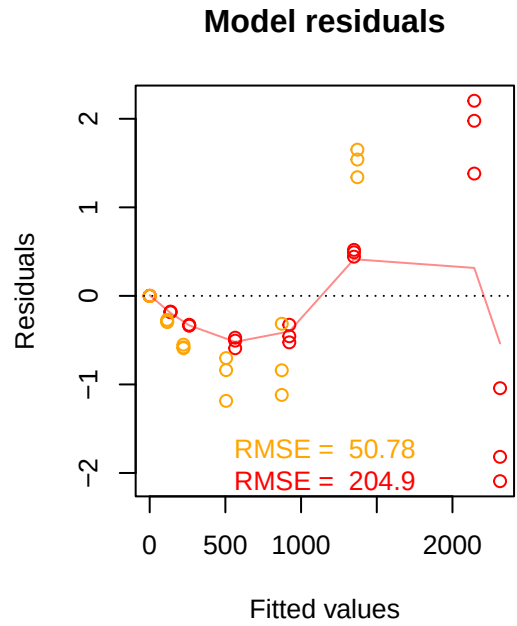

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 8.144
MAPE = 19.58
0
200
400
600
800
Substrate concentration NAG−MUF

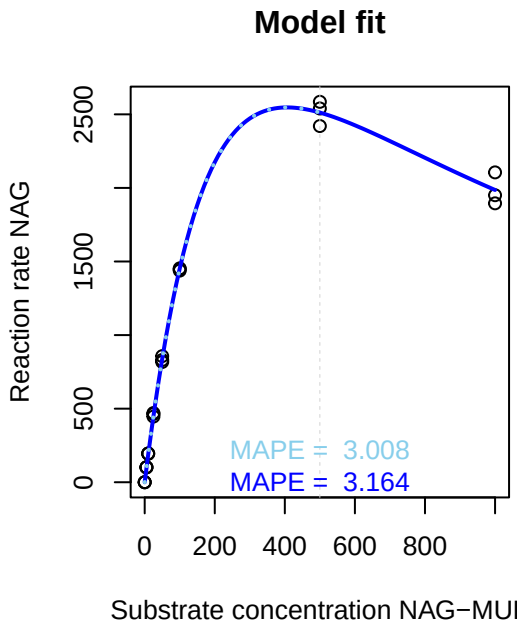

Model residuals
Residuals
−1
0
1
2
RMSE = 74.54
RMSE = 301.1
0
1000
2000
3000
Fitted values

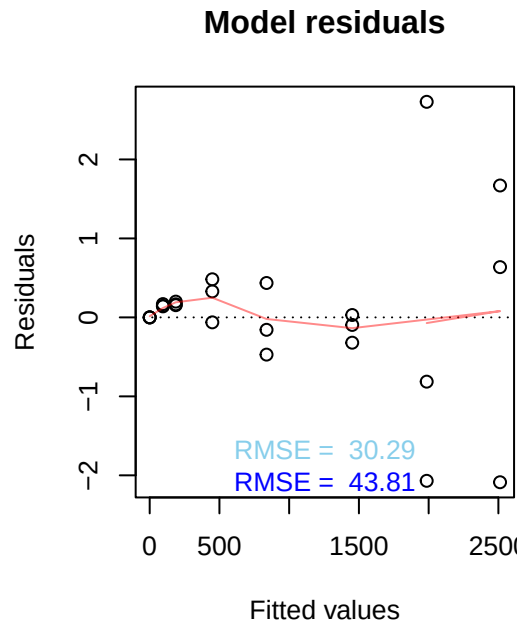

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 3.638
MAPE = 3.245
0
200
400
600
800
Substrate concentration NAG−MUF

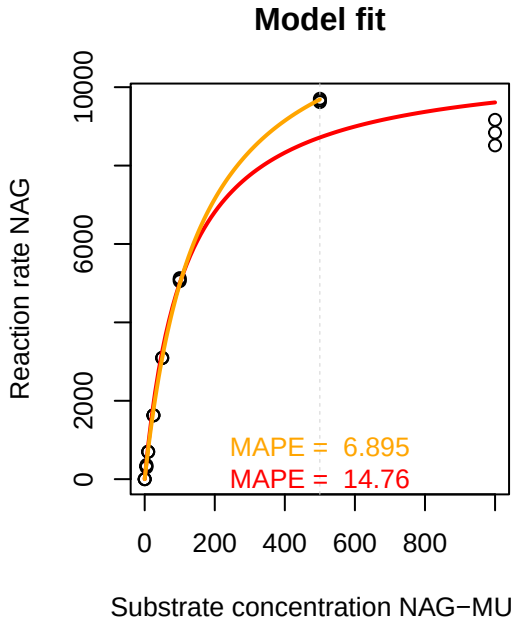

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 53.21
RMSE = 50.43
0
1000
2000
3000
Fitted values

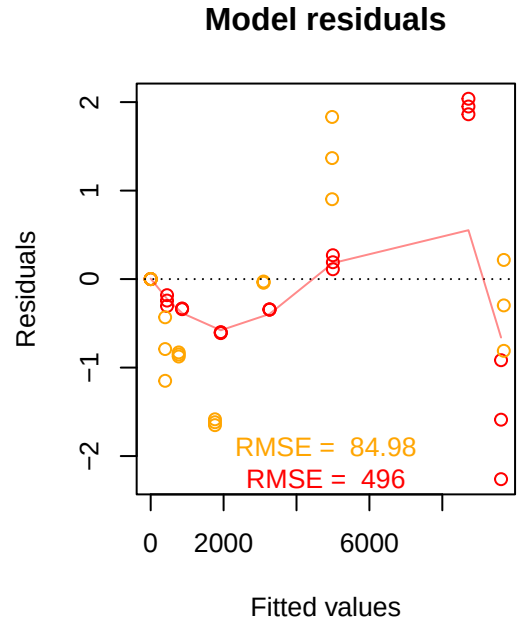

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 8.393
MAPE = 20.22
0
200
400
600
800
Substrate concentration NAG−MUF

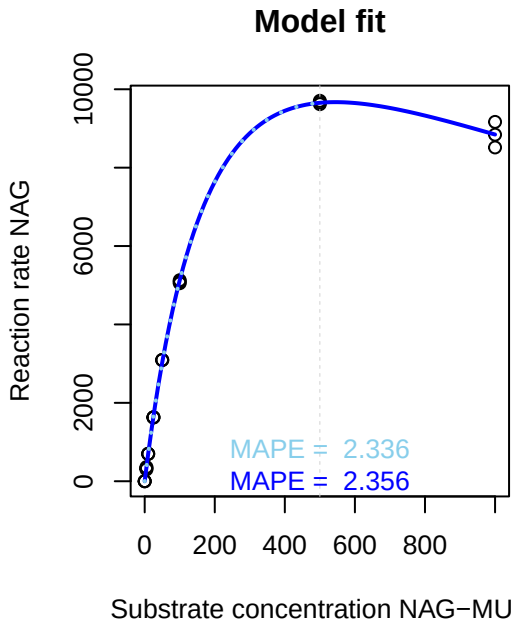

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 50.78
RMSE = 204.9
0
500
1000
2000
Fitted values

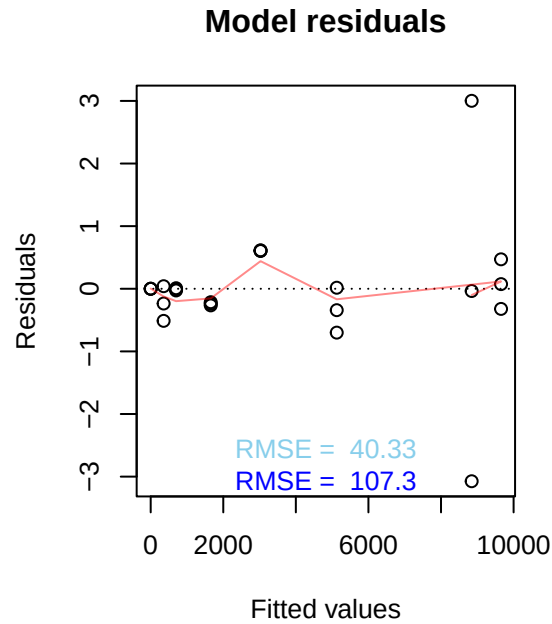

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 3.008
MAPE = 3.164
0
200
400
600
800
Substrate concentration NAG−MUF

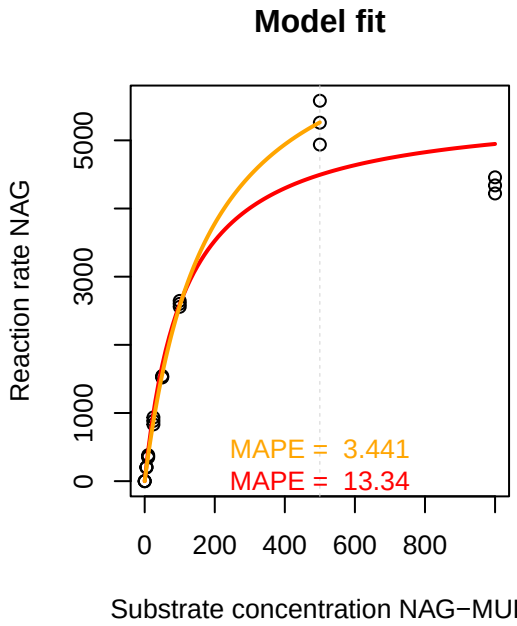

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 30.29
RMSE = 43.81
0
500
1500
2500
Fitted values

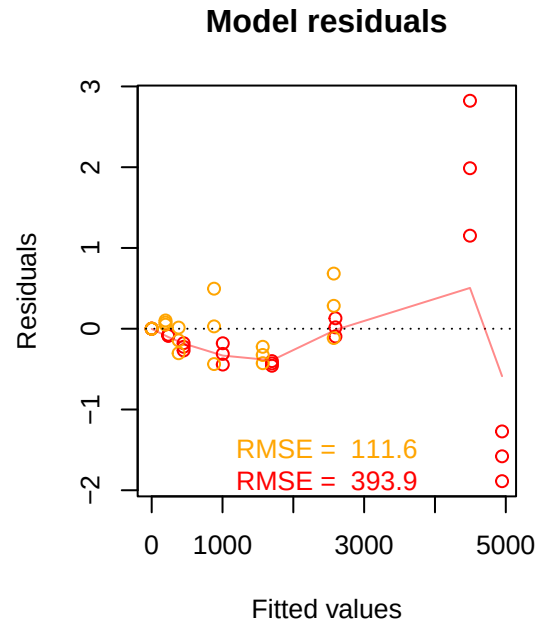

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 6.895
MAPE = 14.76
Substrate concentration NAG−MUF

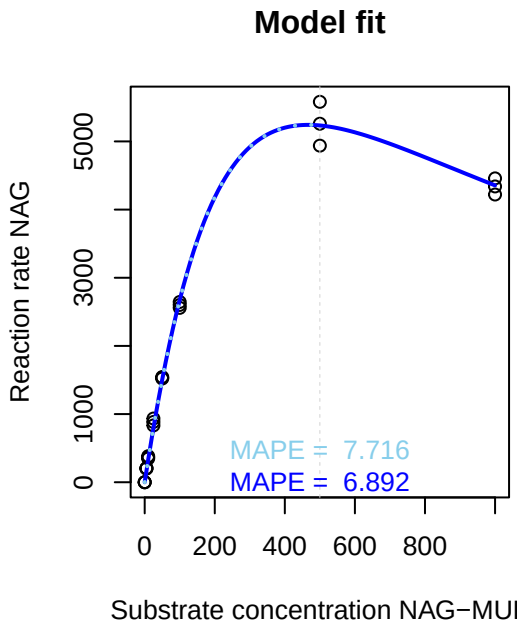

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
RMSE = 84.98
RMSE = 496
Fitted values

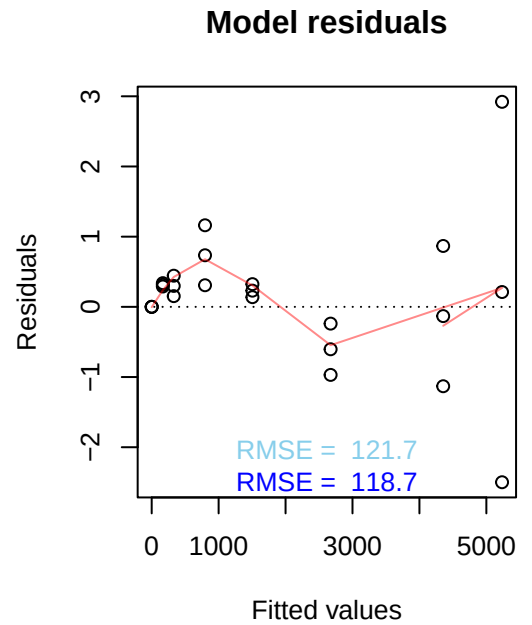

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 2.336
MAPE = 2.356
Substrate concentration NAG−MUF

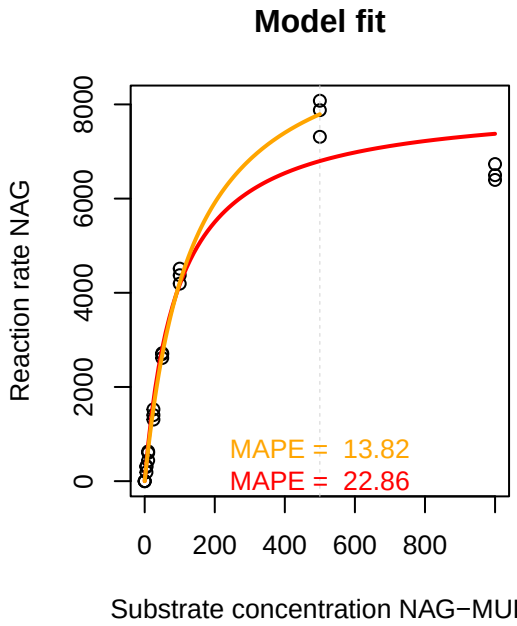

Model residuals
Residuals
−3
−2
−1
0
1
2
3
0
2000
6000
10000
RMSE = 40.33
RMSE = 107.3
Fitted values

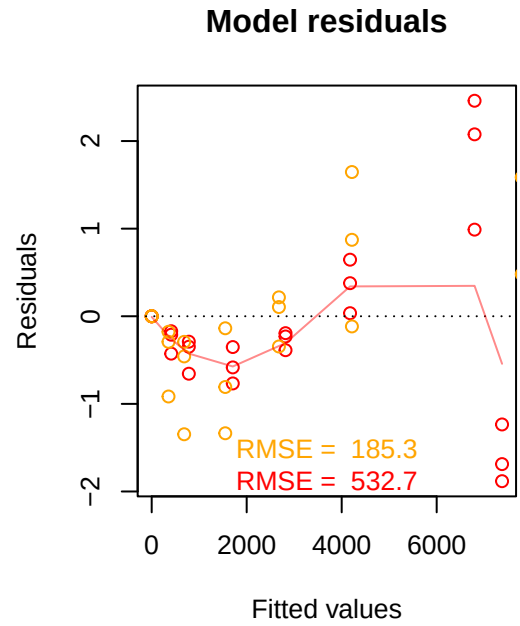

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 3.441
MAPE = 13.34
0
200
400
600
800
Substrate concentration NAG−MUF

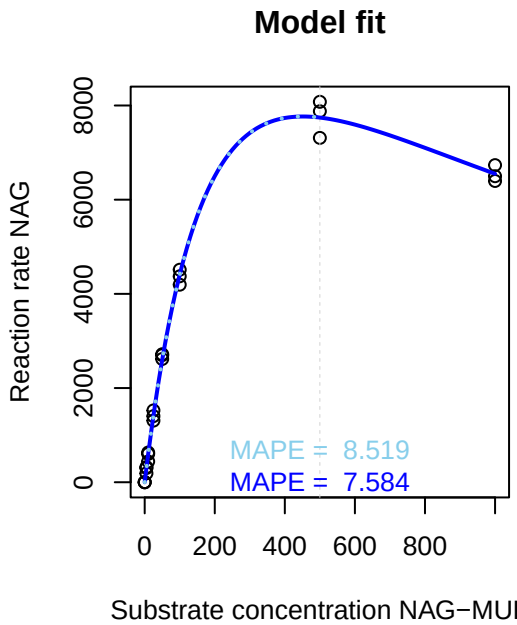

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 111.6
RMSE = 393.9
0
1000
3000
5000
Fitted values

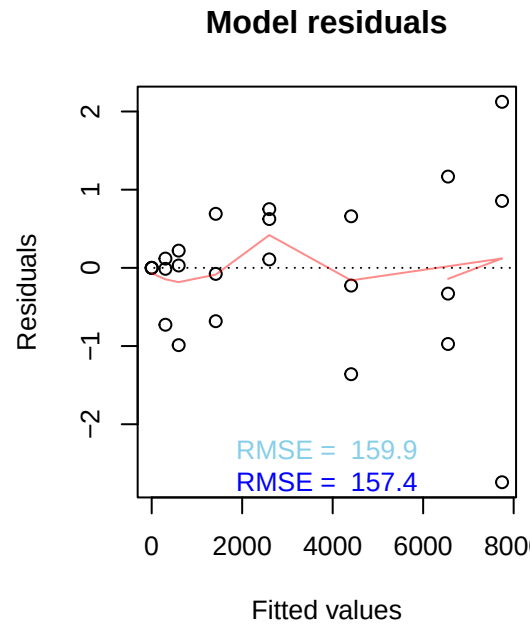

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 7.716
MAPE = 6.892
0
200
400
600
800
Substrate concentration NAG−MUF

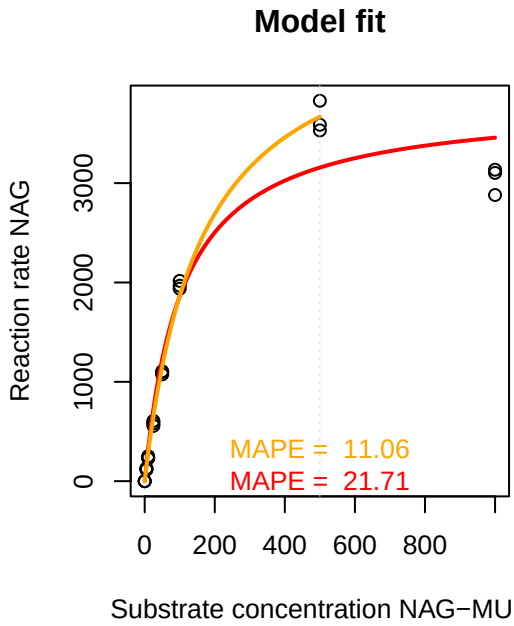

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 121.7
RMSE = 118.7
0
1000
3000
5000
Fitted values

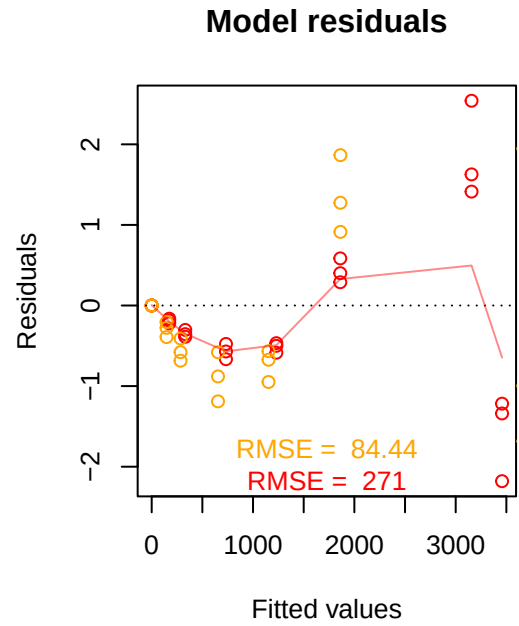

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
0
200
400
600
800
MAPE = 13.82
MAPE = 22.86
Substrate concentration NAG−MUF

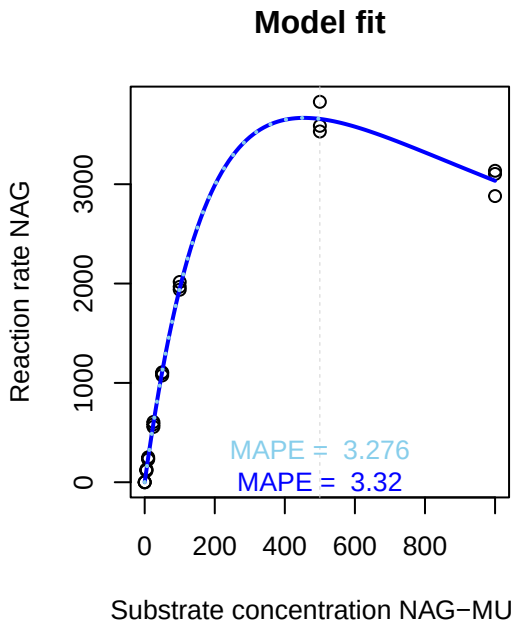

Model residuals
Residuals
−2
−1
0
1
2
0
2000
4000
6000
RMSE = 185.3
RMSE = 532.7
Fitted values

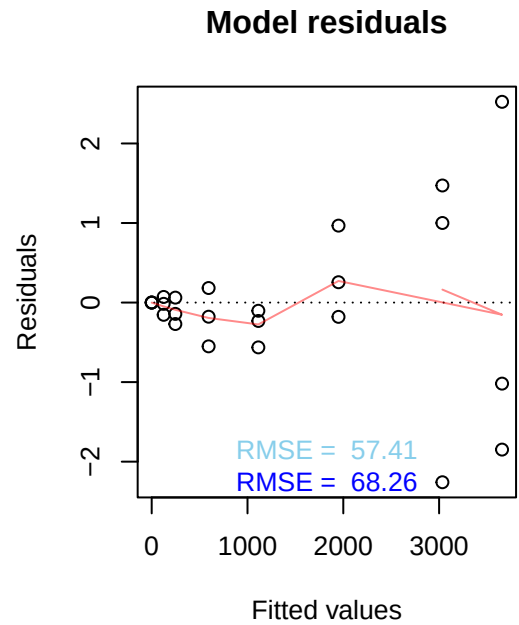

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
0
200
400
600
800
MAPE = 8.519
MAPE = 7.584
Substrate concentration NAG−MUF

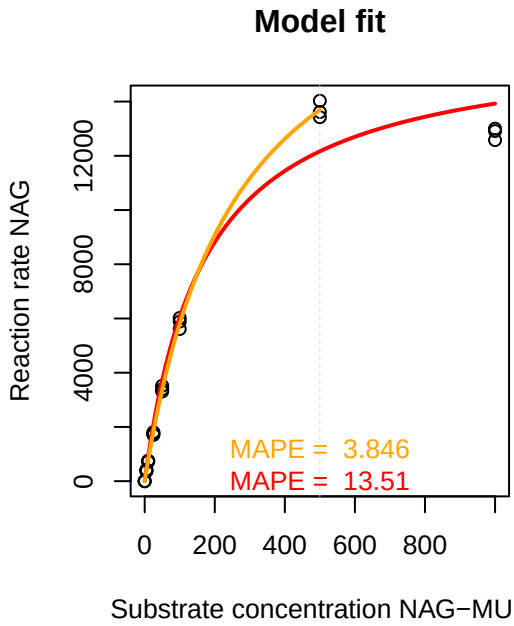

Model residuals
Residuals
−2
−1
0
1
2
0
2000
4000
6000
8000
RMSE = 159.9
RMSE = 157.4
Fitted values

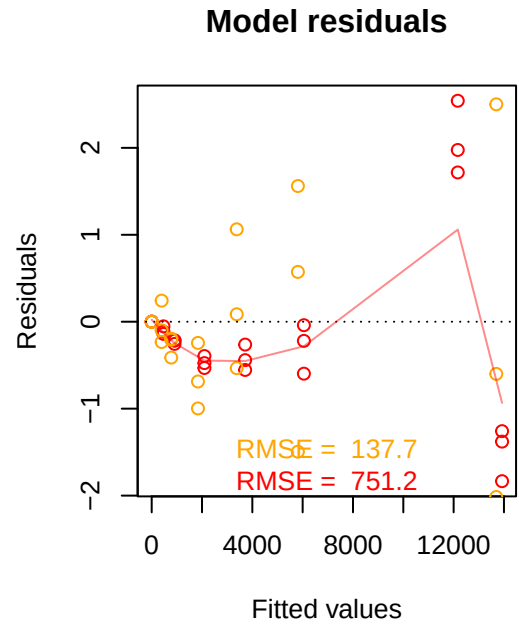

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 11.06
MAPE = 21.71
0
200
400
600
800
Substrate concentration NAG−MUF

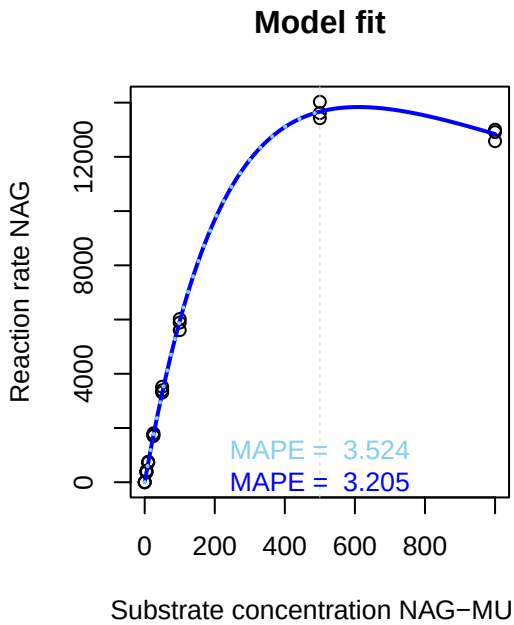

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 84.44
RMSE = 271
0
1000
2000
3000
Fitted values

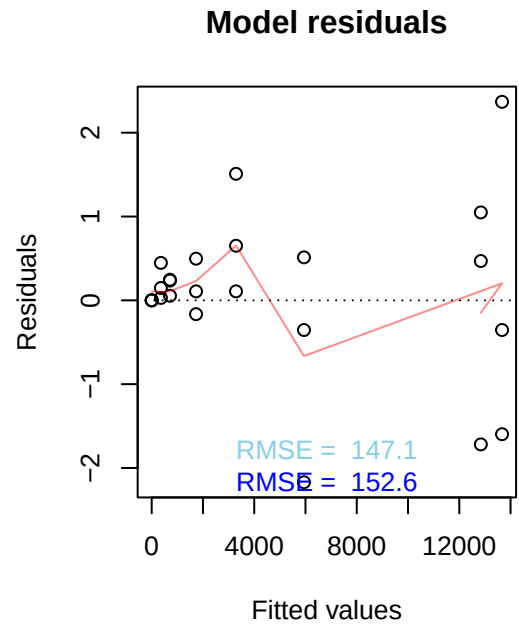

Model fit
Reaction rate NAG
0
1000
2000
3000
MAPE = 3.276
MAPE = 3.32
0
200
400
600
800
Substrate concentration NAG−MUF

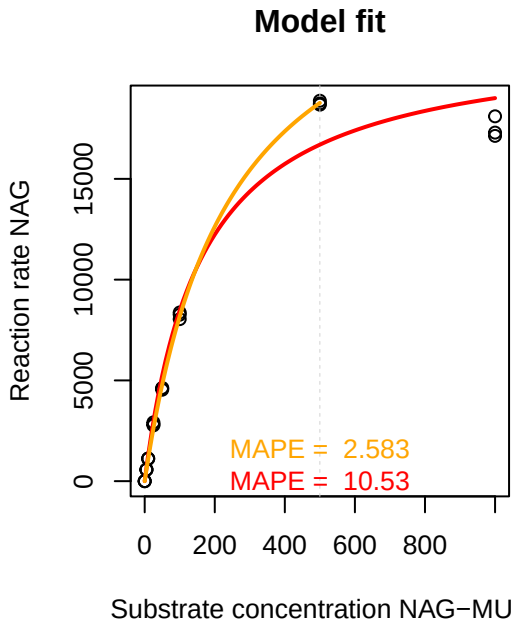

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 57.41
RMSE = 68.26
0
1000
2000
3000
Fitted values

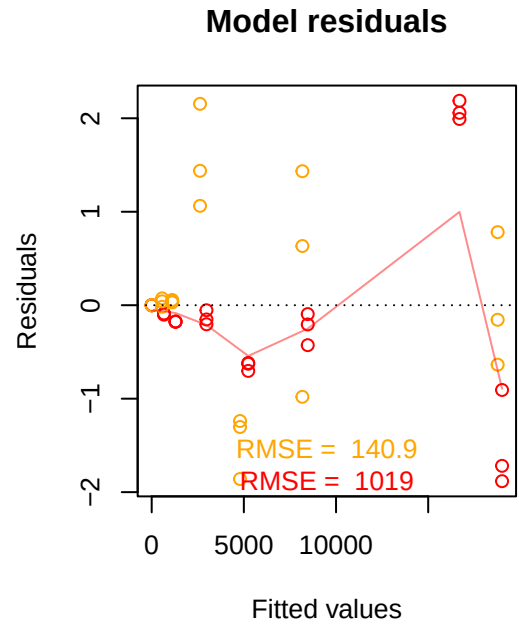

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
MAPE = 3.846
MAPE = 13.51
Substrate concentration NAG−MUF

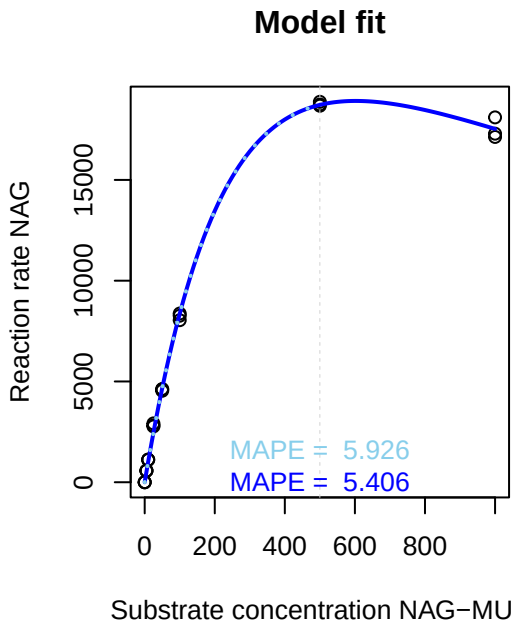

Model residuals
Residuals
−2
−1
0
1
2
0
4000
8000
12000
RMSE = 137.7
RMSE = 751.2
Fitted values

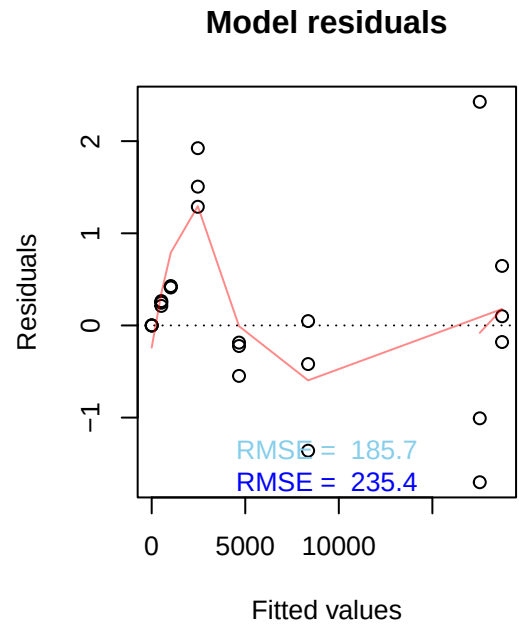

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
MAPE = 3.524
MAPE = 3.205
Substrate concentration NAG−MUF

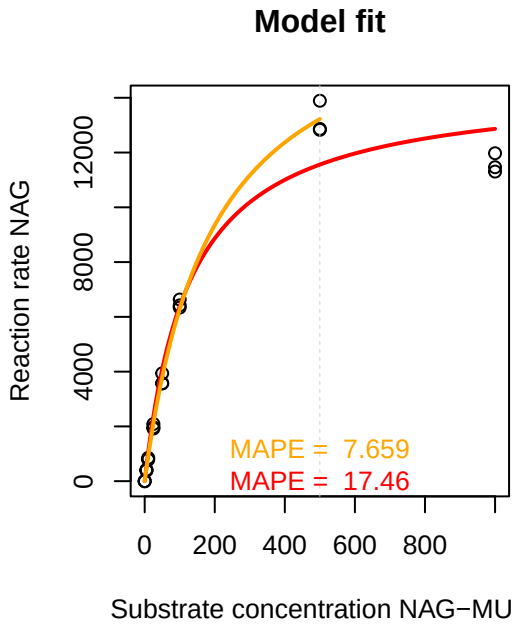

Model residuals
Residuals
−2
−1
0
1
2
0
4000
8000
12000
RMSE = 147.1
RMSE = 152.6
Fitted values

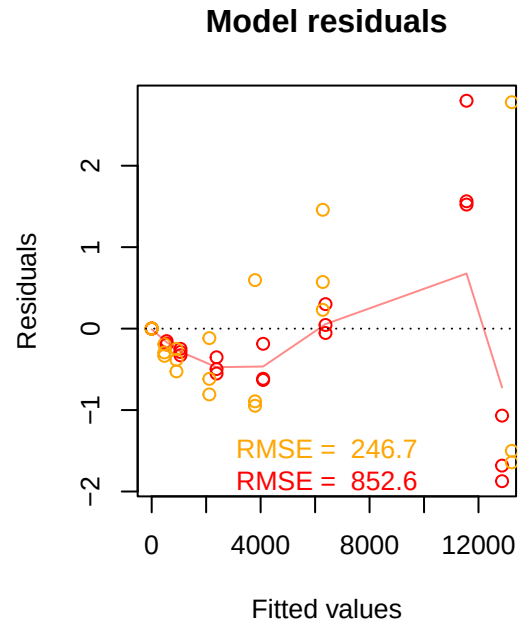

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 2.583
MAPE = 10.53
Substrate concentration NAG−MUF

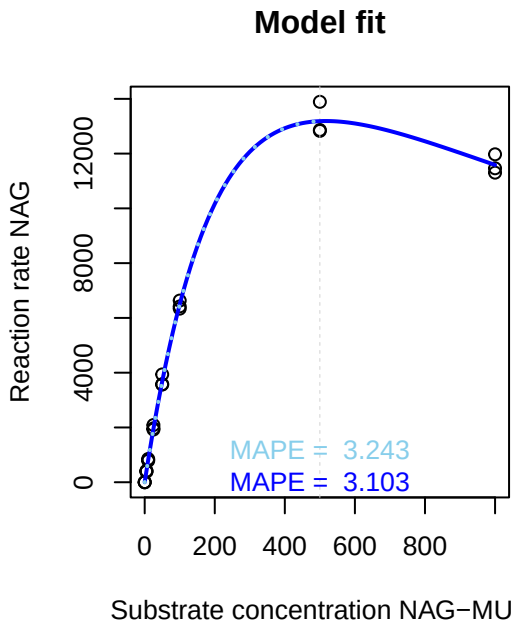

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
RMSE = 140.9
RMSE = 1019
Fitted values

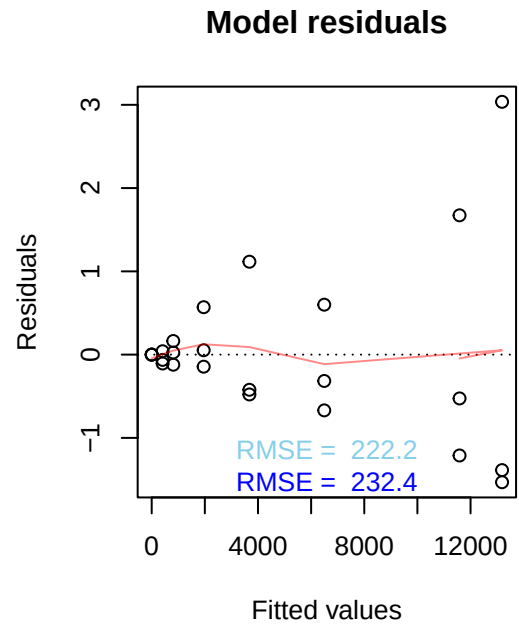

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 5.926
MAPE = 5.406
Substrate concentration NAG−MUF

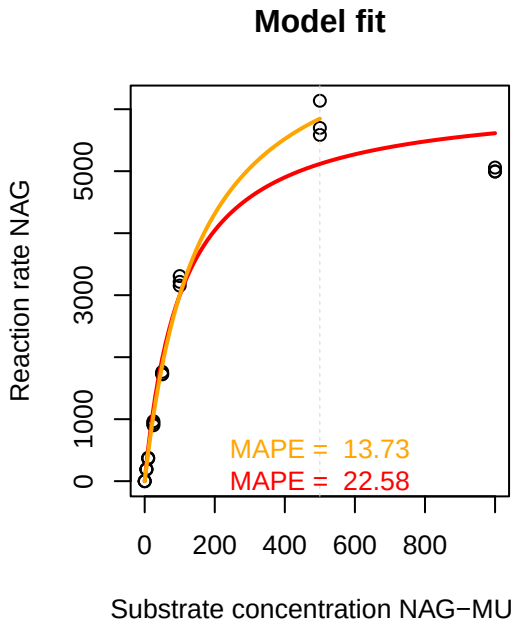

Model residuals
Residuals
−1
0
1
2
0
5000
10000
RMSE = 185.7
RMSE = 235.4
Fitted values

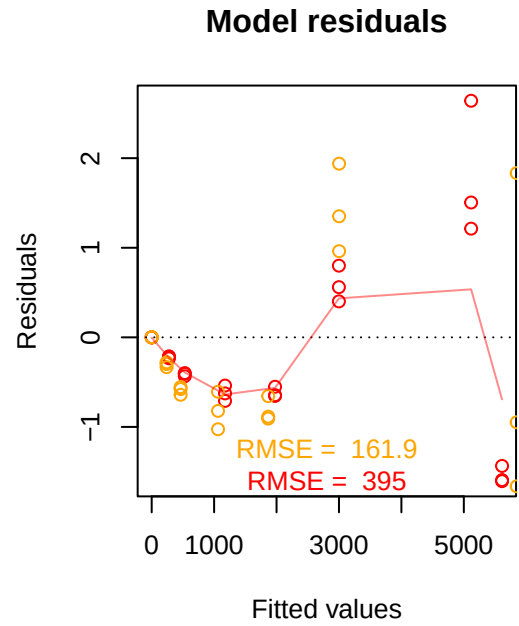

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
MAPE = 7.659
MAPE = 17.46
Substrate concentration NAG−MUF

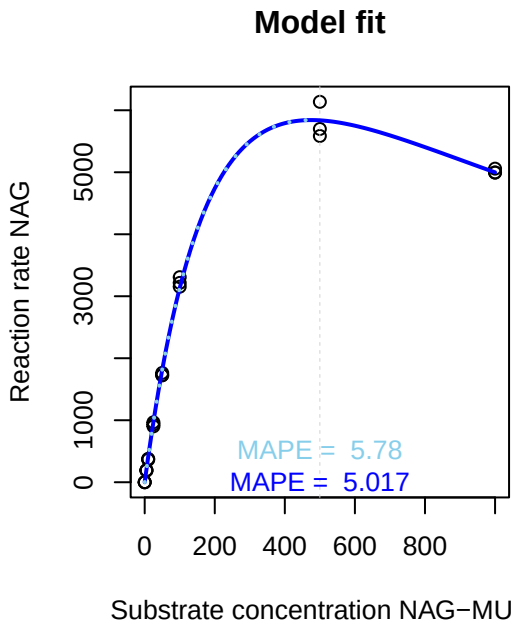

Model residuals
Residuals
−2
−1
0
1
2
0
4000
8000
12000
RMSE = 246.7
RMSE = 852.6
Fitted values

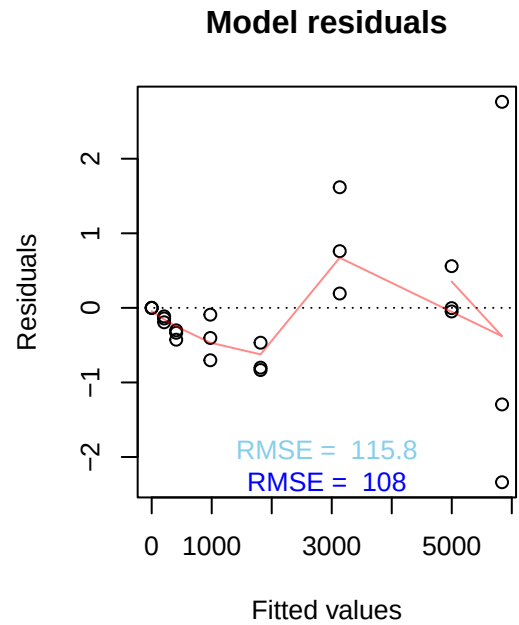

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
MAPE = 3.243
MAPE = 3.103
Substrate concentration NAG−MUF

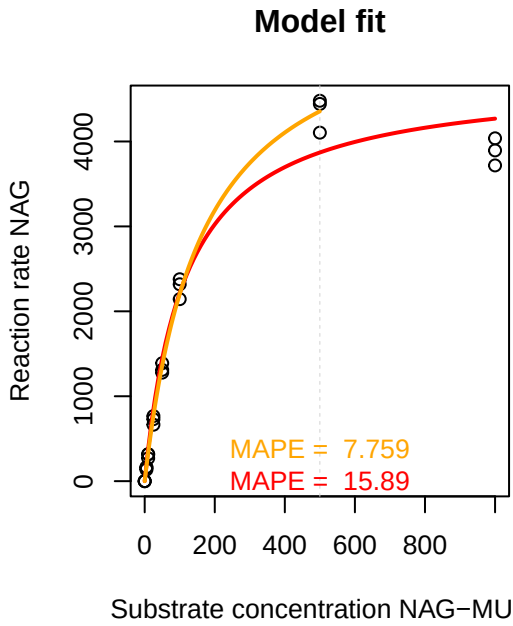

Model residuals
Residuals
−1
0
1
2
3
0
4000
8000
12000
RMSE = 222.2
RMSE = 232.4
Fitted values

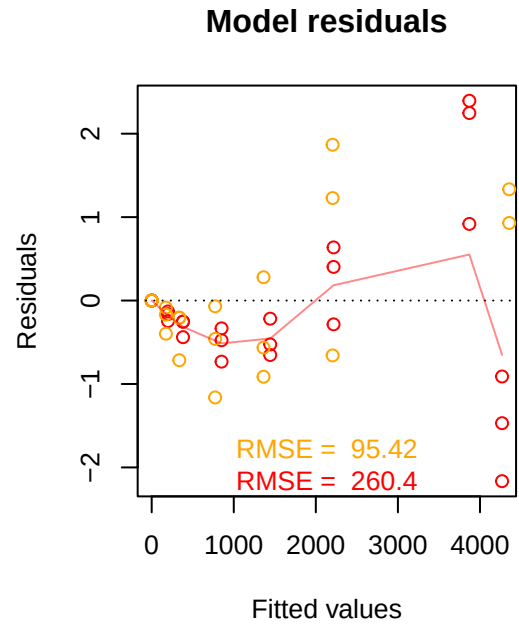

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 13.73
MAPE = 22.58
0
200
400
600
800
Substrate concentration NAG−MUF

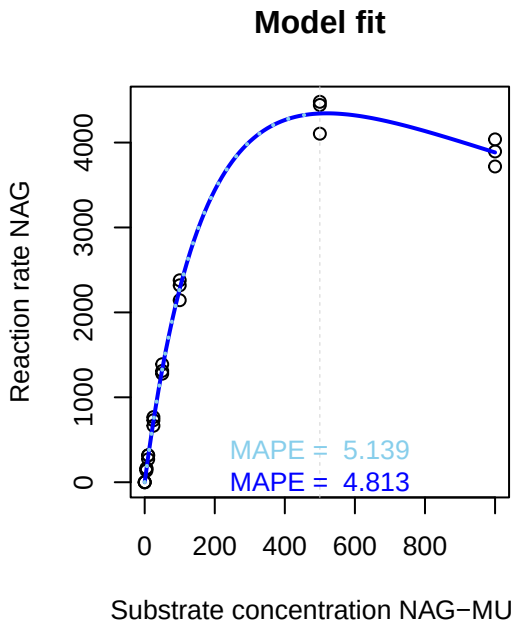

Model residuals
Residuals
−1
0
1
2
RMSE = 161.9
RMSE = 395
0
1000
3000
5000
Fitted values

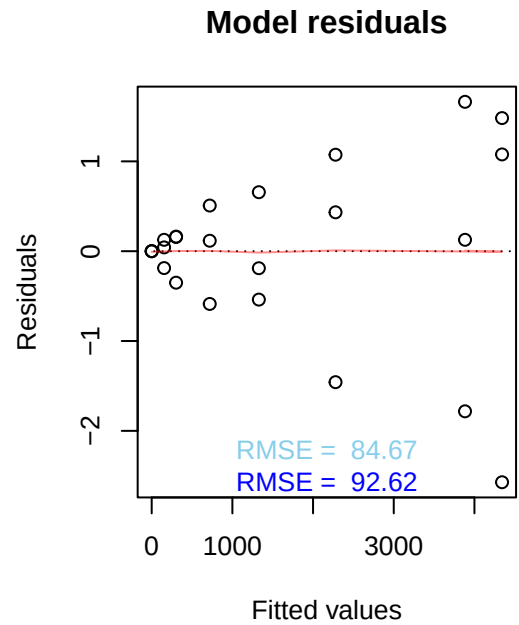

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 5.78
MAPE = 5.017
0
200
400
600
800
Substrate concentration NAG−MUF

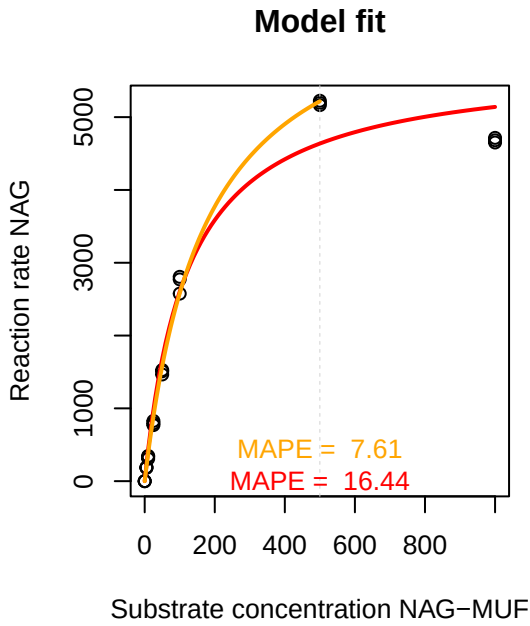

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 115.8
RMSE = 108
0
1000
3000
5000
Fitted values

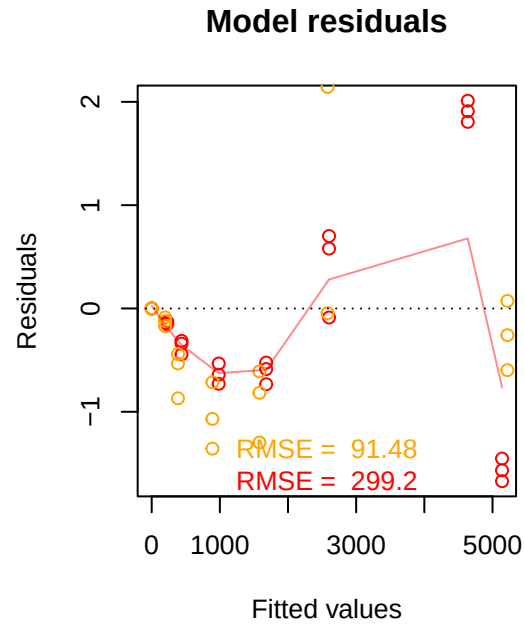

Model fit
Reaction rate NAG
0
1000
2000
3000
4000
MAPE = 7.759
MAPE = 15.89
0
200
400
600
800
Substrate concentration NAG−MUF

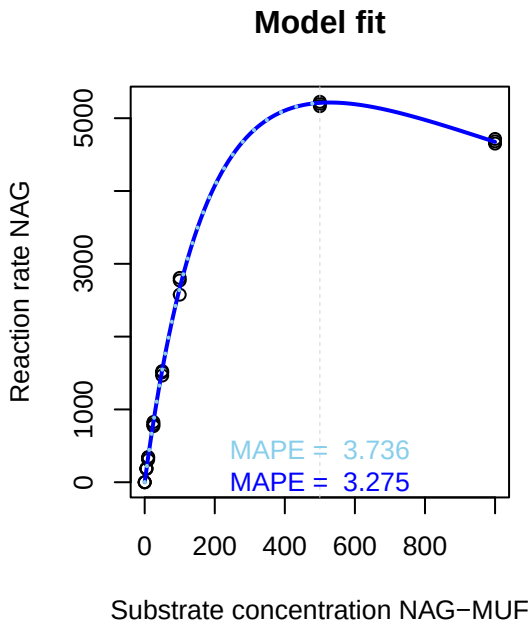

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 95.42
RMSE = 260.4
0
1000
2000
3000
4000
Fitted values

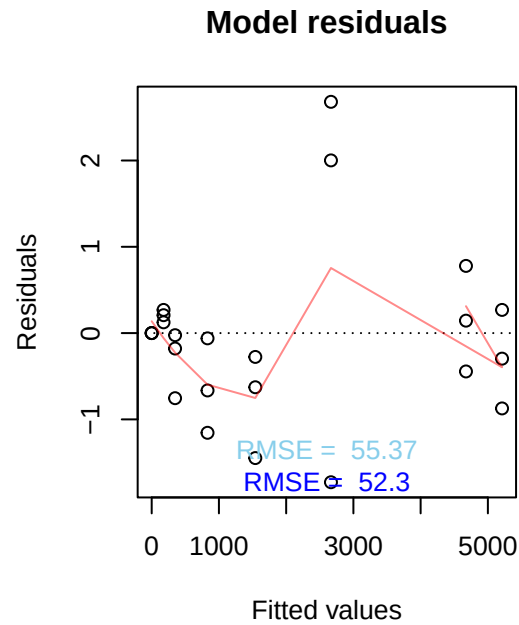

Model fit
Reaction rate NAG
0
1000
2000
3000
4000
MAPE = 5.139
MAPE = 4.813
0
200
400
600
800
Substrate concentration NAG−MUF

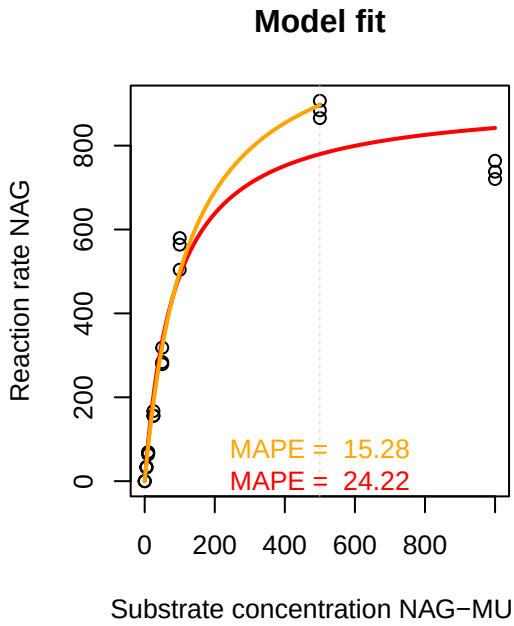

Model residuals
Residuals
−2
−1
0
1
RMSE = 84.67
RMSE = 92.62
0
1000
3000
Fitted values

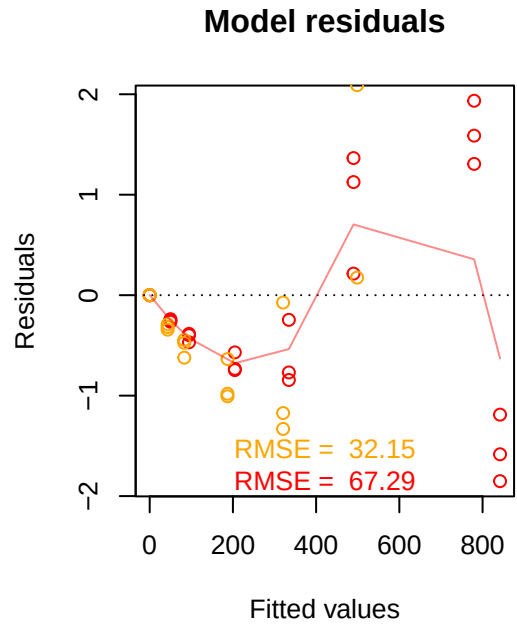

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 7.61
MAPE = 16.44
0
200
400
600
800
Substrate concentration NAG−MUF

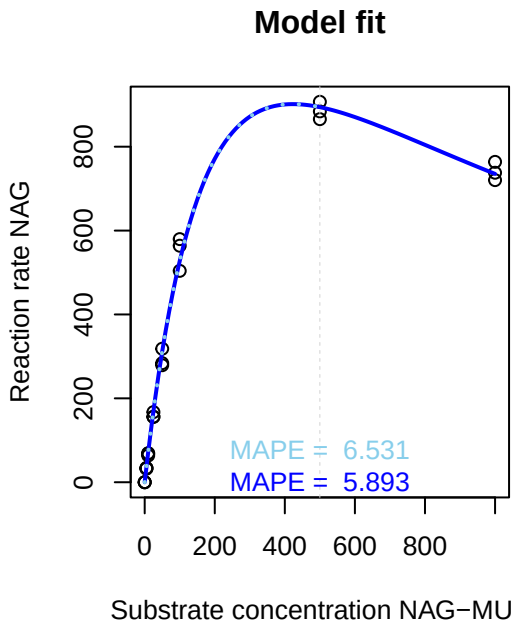

Model residuals
Residuals
−1
0
1
2
RMSE = 91.48
RMSE = 299.2
0
1000
3000
5000
Fitted values

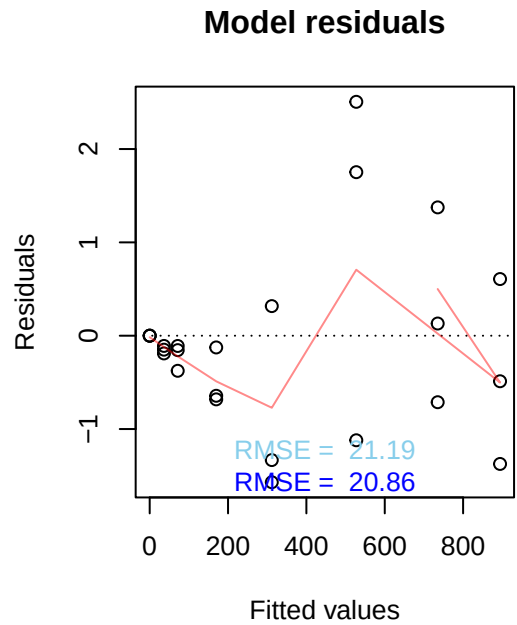

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 3.736
MAPE = 3.275
0
200
400
600
800
Substrate concentration NAG−MUF

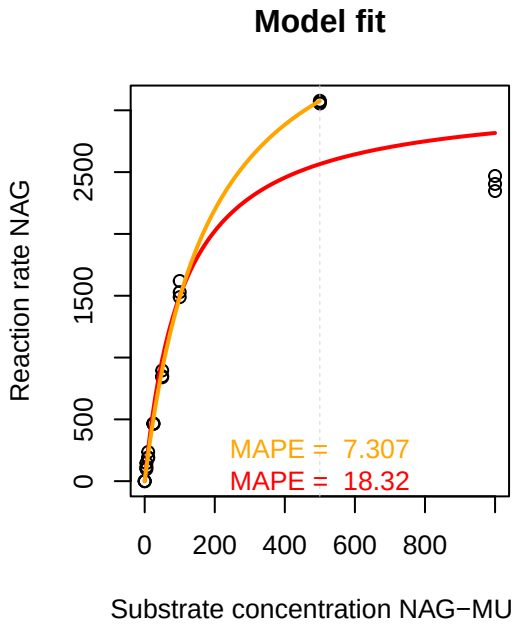

Model residuals
Residuals
−1
0
1
2
RMSE = 55.37
RMSE = 52.3
0
1000
3000
5000
Fitted values

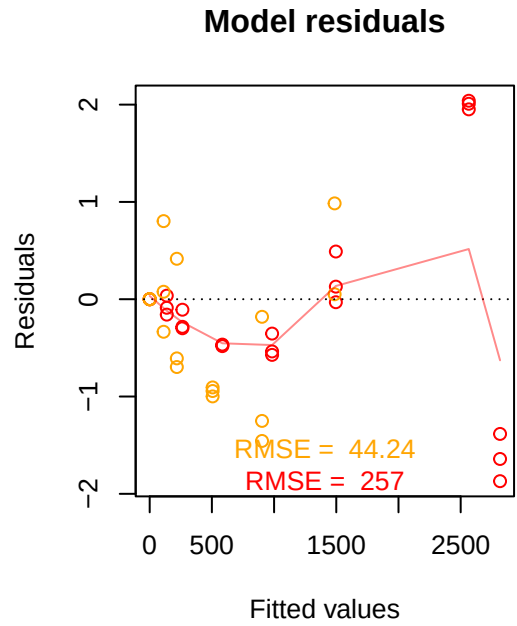

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 15.28
MAPE = 24.22
0
200
400
600
800
Substrate concentration NAG−MUF

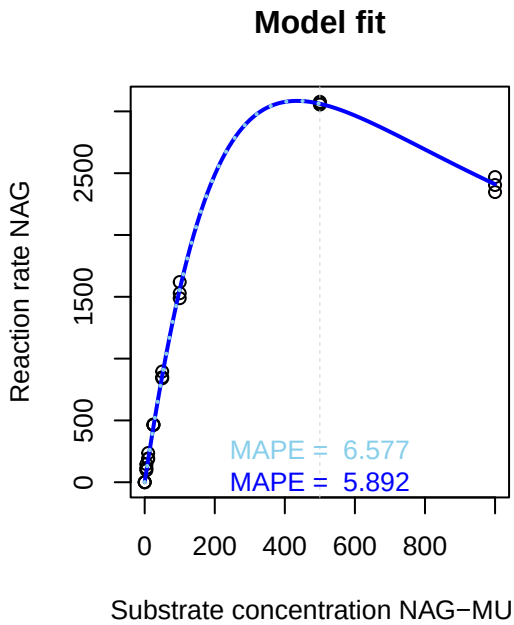

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 32.15
RMSE = 67.29
0
200
400
600
800
Fitted values

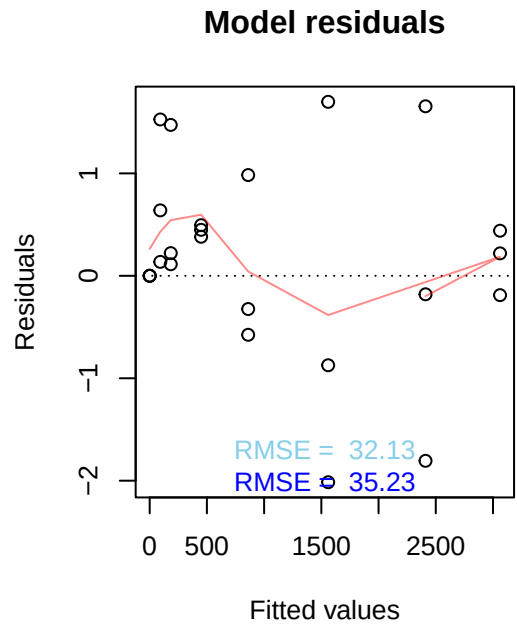

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 6.531
MAPE = 5.893
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−1
0
1
2
RMSE = 21.19
RMSE = 20.86
0
200
400
600
800
Fitted values

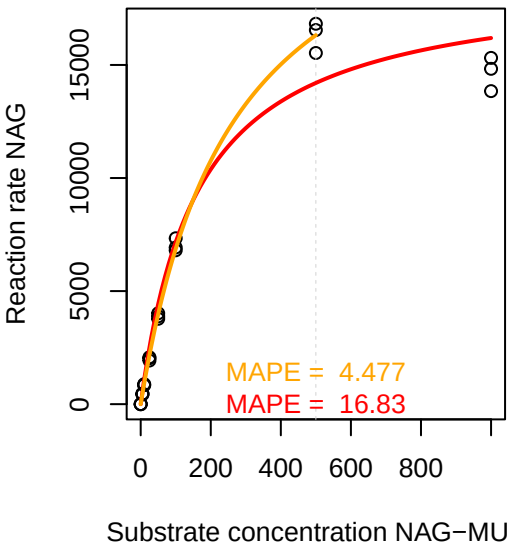

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 7.307
MAPE = 18.32
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 44.24
RMSE = 257
0
500
1500
2500
Fitted values

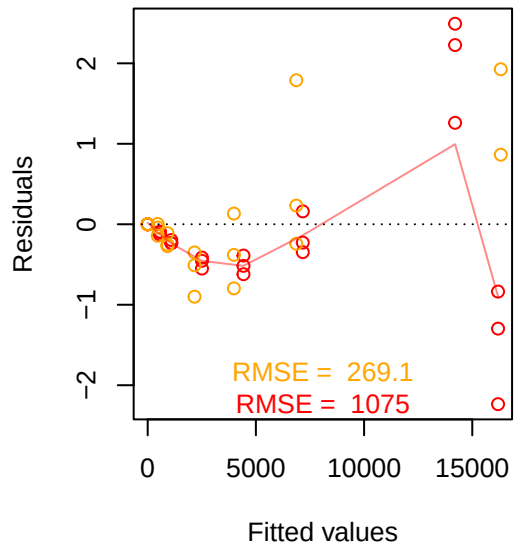

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 6.577
MAPE = 5.892
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
RMSE = 32.13
RMSE = 35.23
0
500
1500
2500
Fitted values

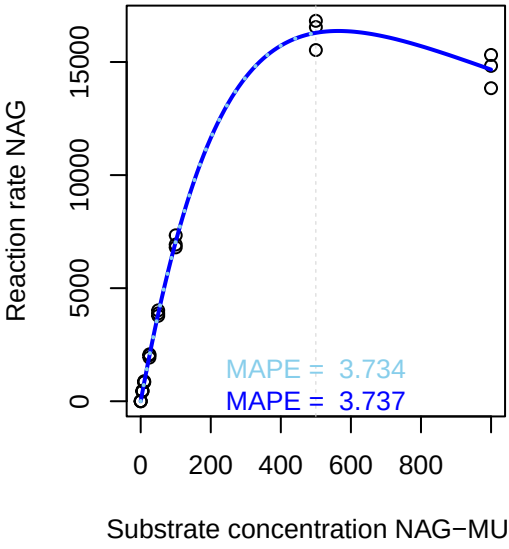
Model fit



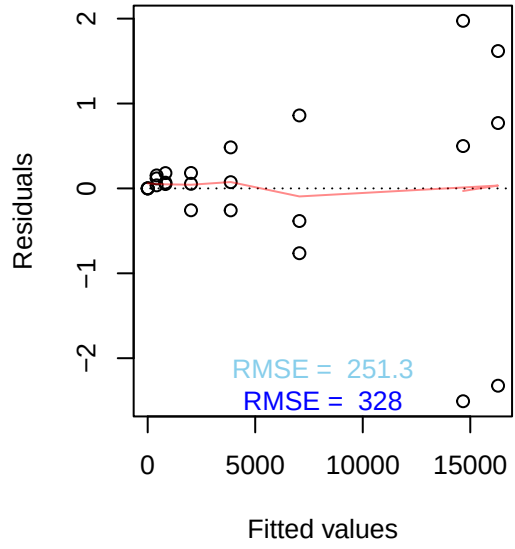
Model residuals

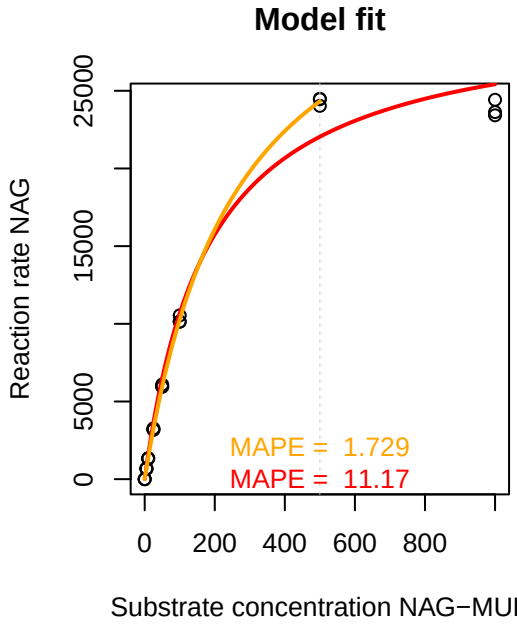


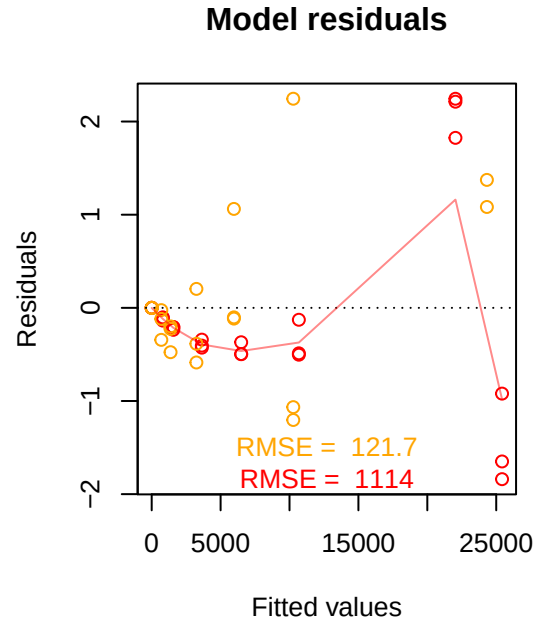
Model fit

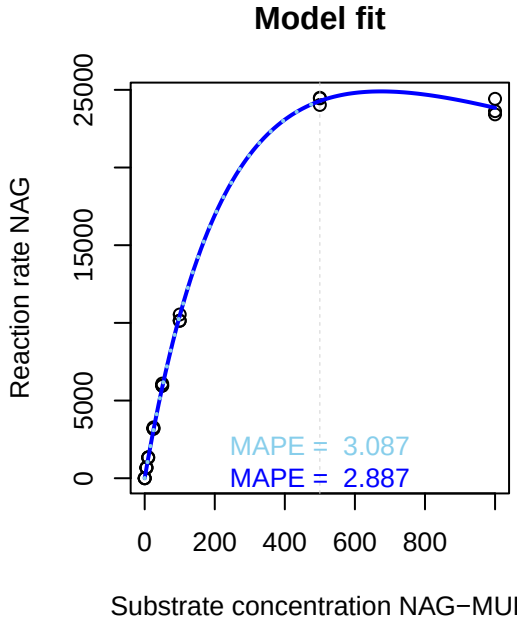


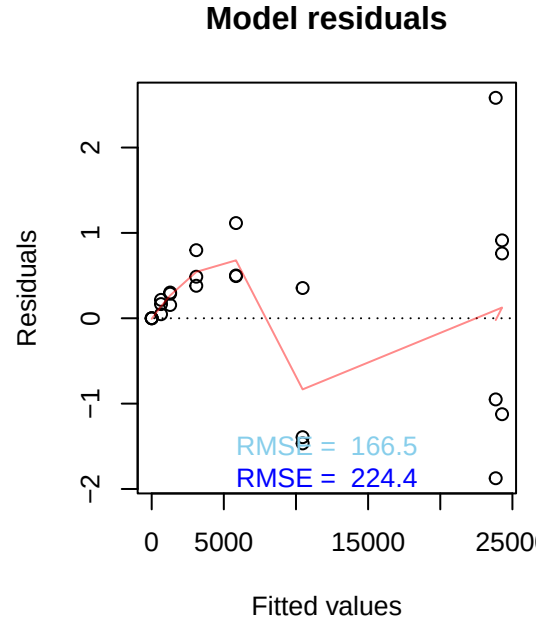
Model residuals

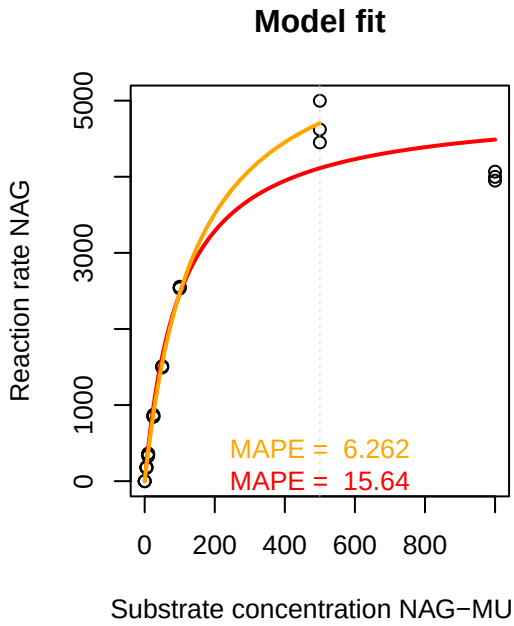


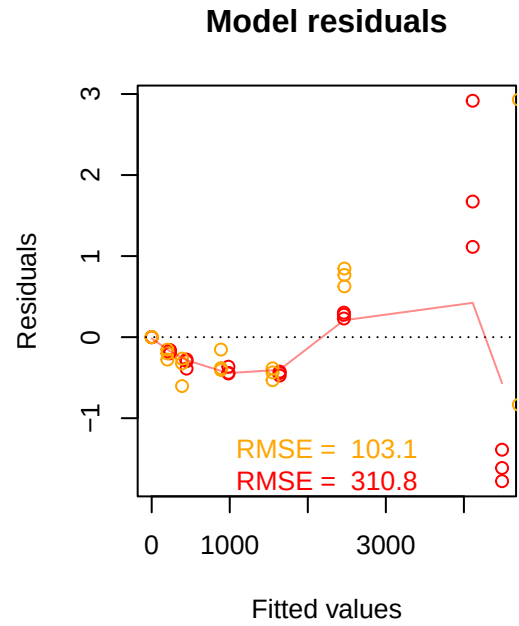

Model fit
Reaction rate NAG
0
5000
15000
25000
0
200
400
600
800
MAPE = 1.729
MAPE = 11.17
Substrate concentration NAG−MUF

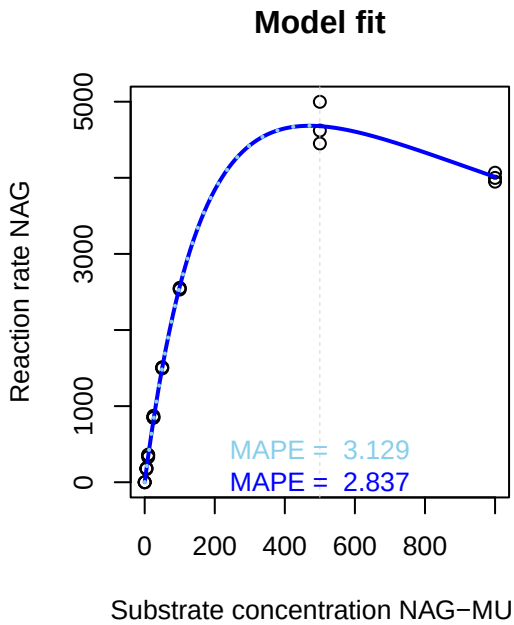

Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
25000
RMSE = 121.7
RMSE = 1114
Fitted values

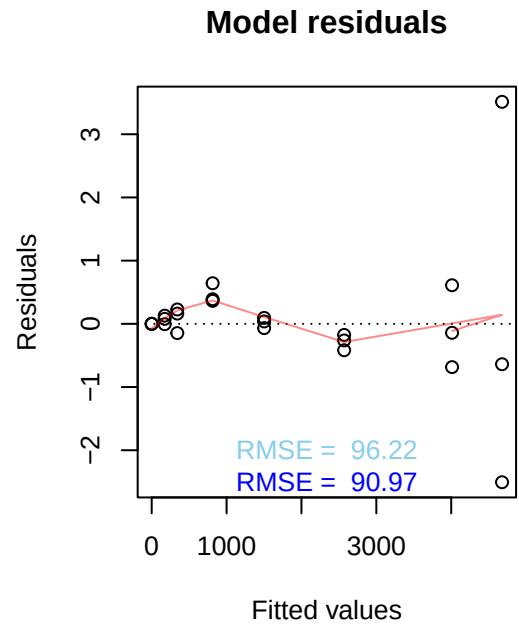

Model fit
Reaction rate NAG
0
5000
15000
25000
0
200
400
600
800
MAPE = 3.087
MAPE = 2.887
Substrate concentration NAG−MUF

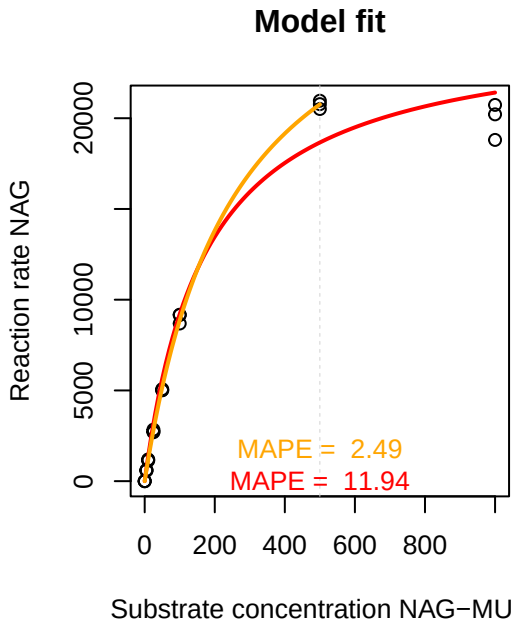

Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
25000
RMSE = 166.5
RMSE = 224.4
Fitted values

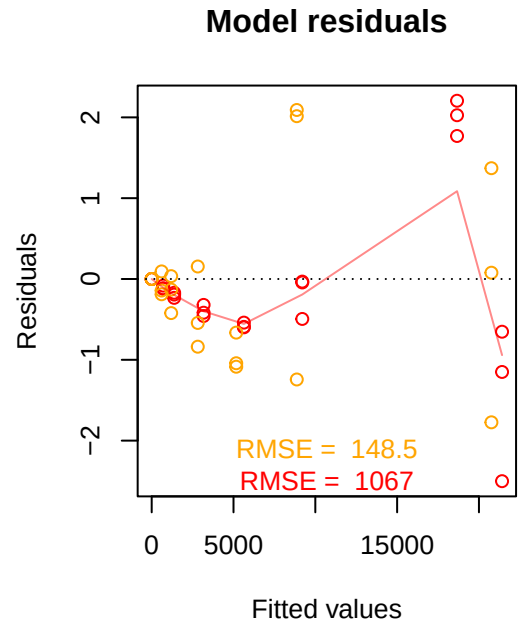

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 6.262
MAPE = 15.64
0
200
400
600
800
Substrate concentration NAG−MUF

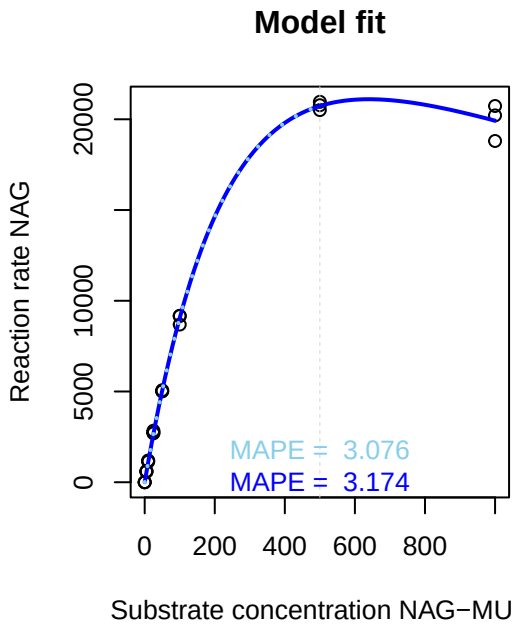

Model residuals
Residuals
−1
0
1
2
3
RMSE = 103.1
RMSE = 310.8
0
1000
3000
Fitted values

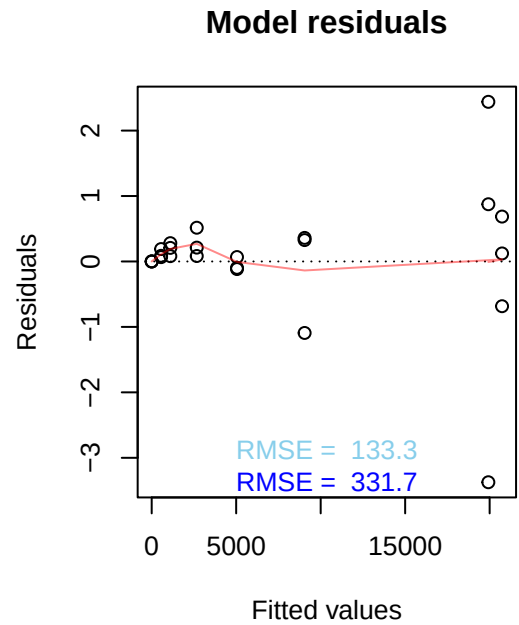

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 3.129
MAPE = 2.837
0
200
400
600
800
Substrate concentration NAG−MUF

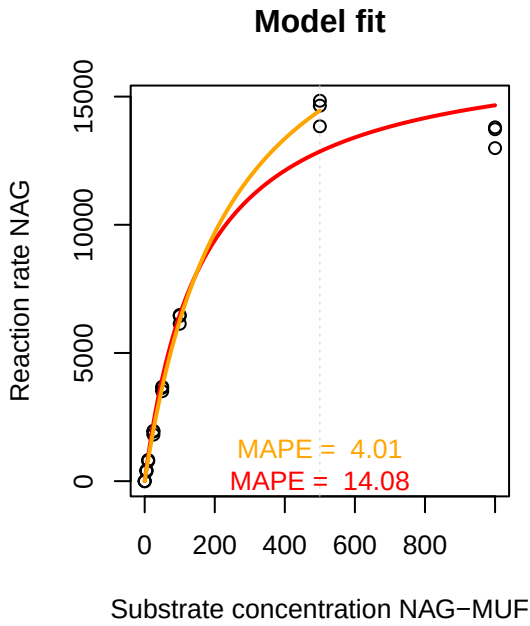

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 96.22
RMSE = 90.97
0
1000
3000
Fitted values

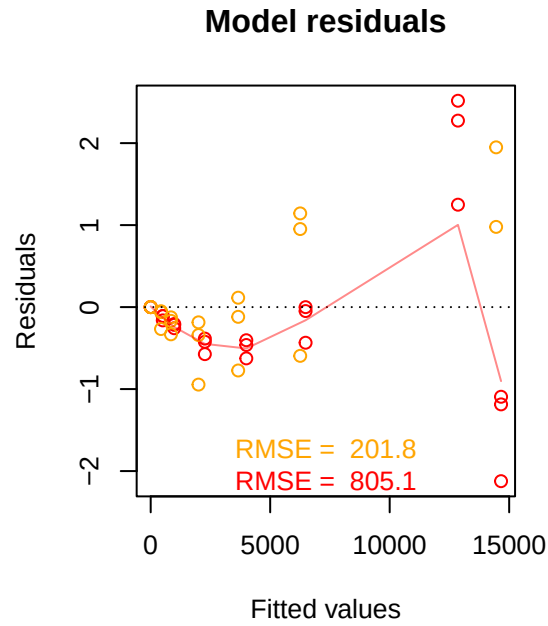

Model fit
Reaction rate NAG
0
5000
10000
20000
MAPE = 2.49
MAPE = 11.94
0
200
400
600
800
Substrate concentration NAG−MUF

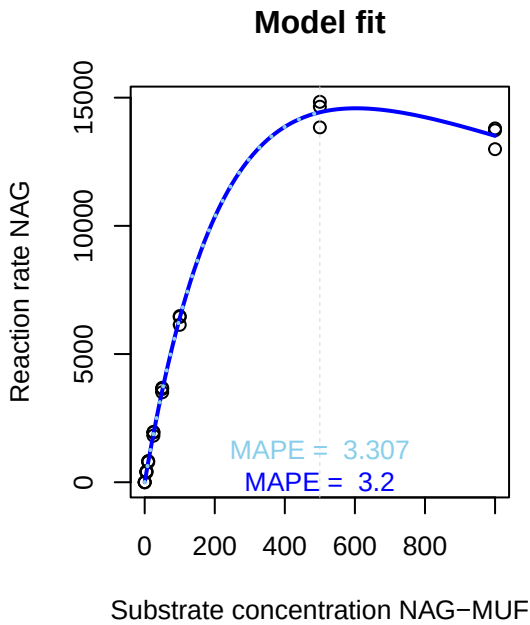

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 148.5
RMSE = 1067
0
5000
15000
Fitted values

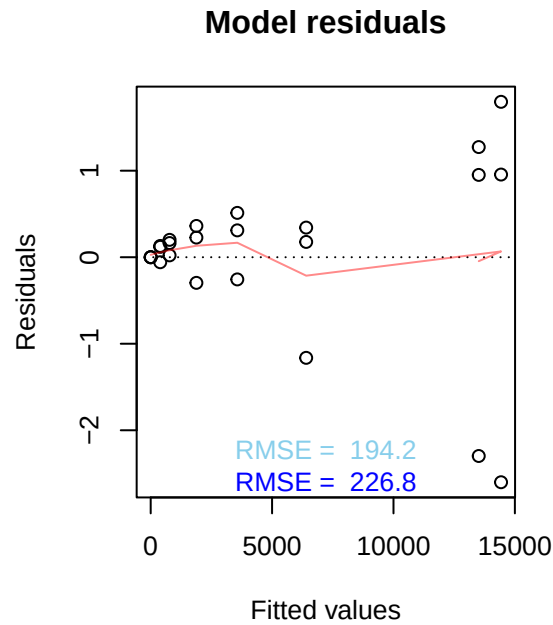

Model fit
Reaction rate NAG
0
5000
10000
20000
MAPE = 3.076
MAPE = 3.174
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−3
−2
−1
0
1
2
RMSE = 133.3
RMSE = 331.7
0
5000
15000
Fitted values

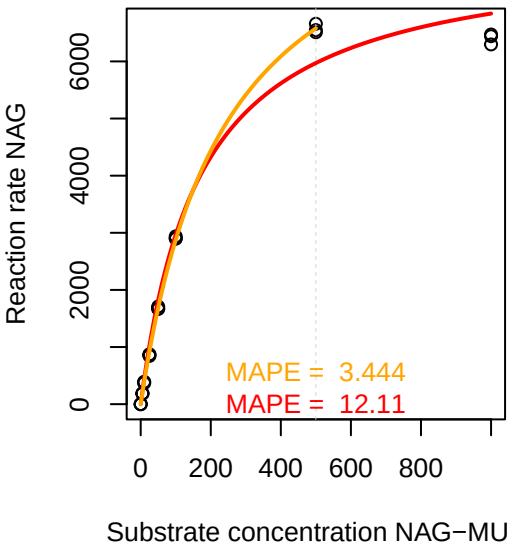

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 4.01
MAPE = 14.08
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
RMSE = 201.8
RMSE = 805.1
Fitted values

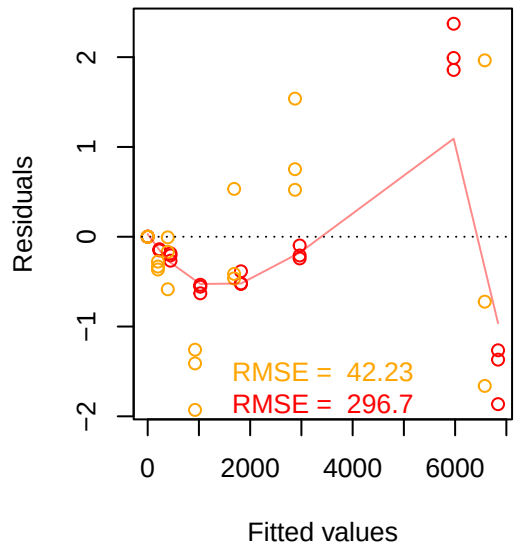

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 3.307
MAPE = 3.2
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
0
5000
10000
15000
RMSE = 194.2
RMSE = 226.8
Fitted values

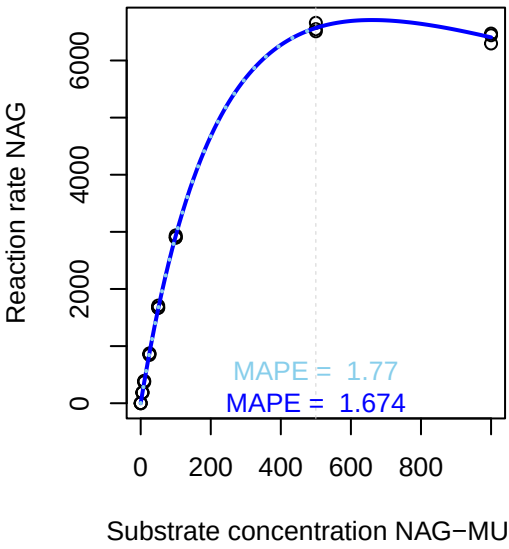
Model fit



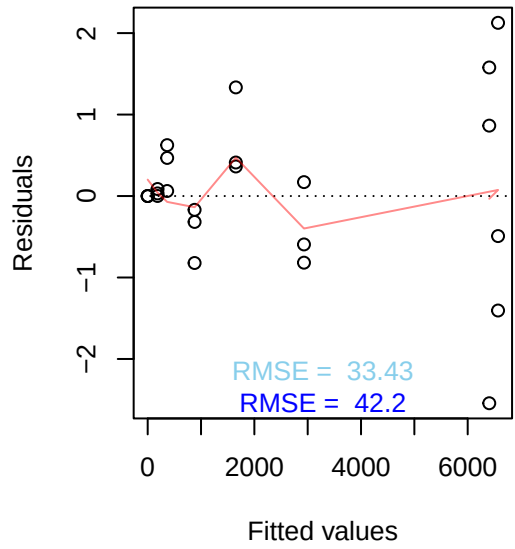
Model residuals

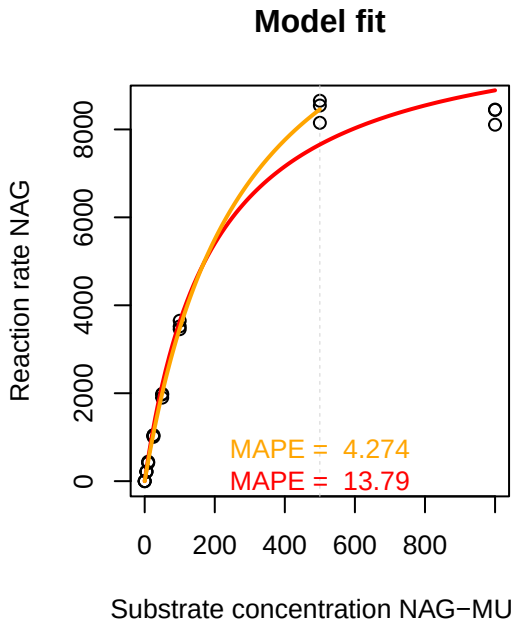


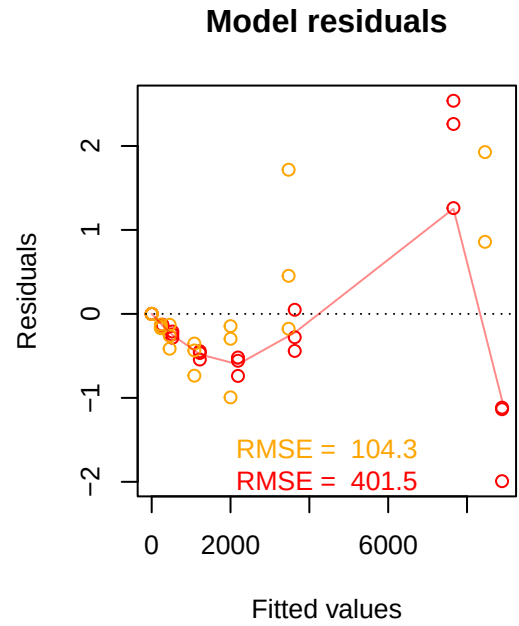
Model fit

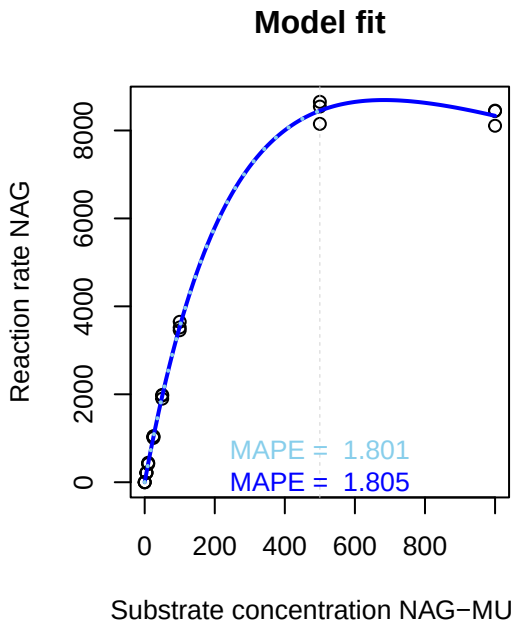


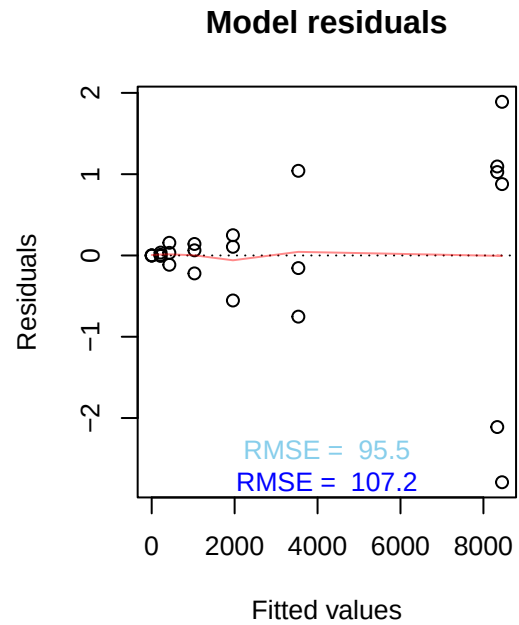
Model residuals

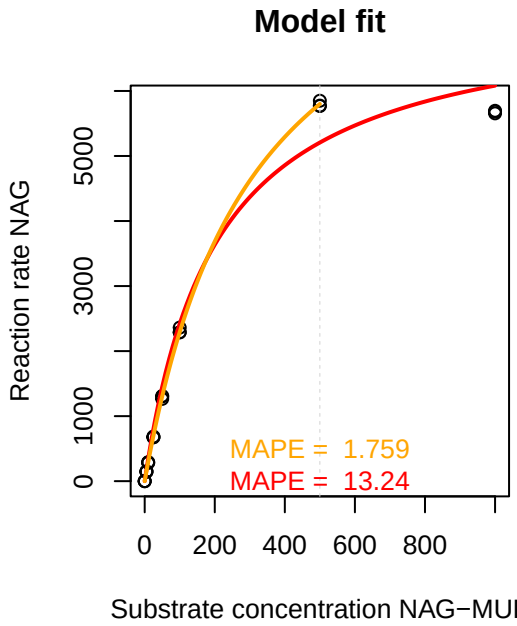


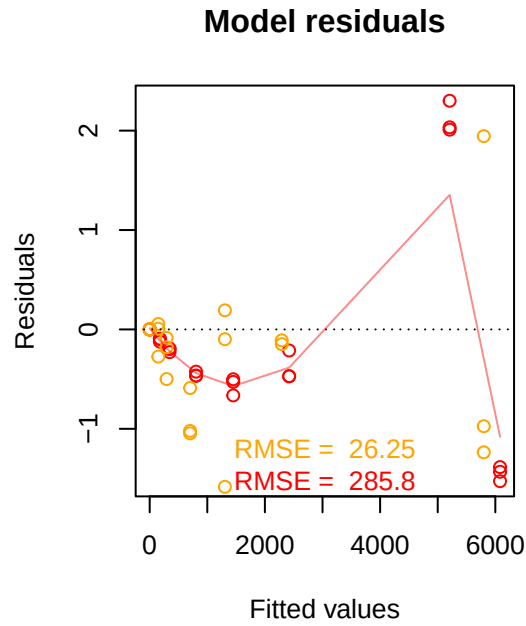

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 4.274
MAPE = 13.79
0
200
400
600
800
Substrate concentration NAG−MUF

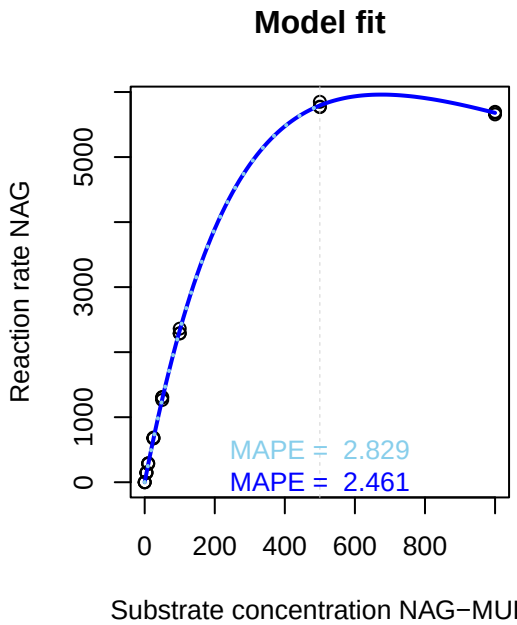

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 104.3
RMSE = 401.5
0
2000
6000
Fitted values

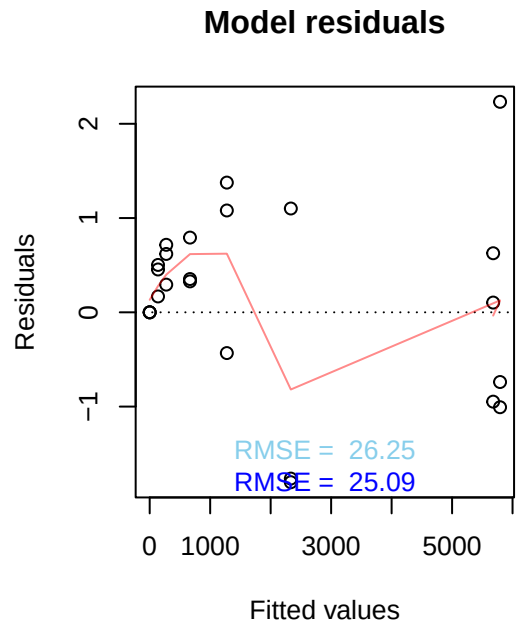

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 1.801
MAPE = 1.805
0
200
400
600
800
Substrate concentration NAG−MUF

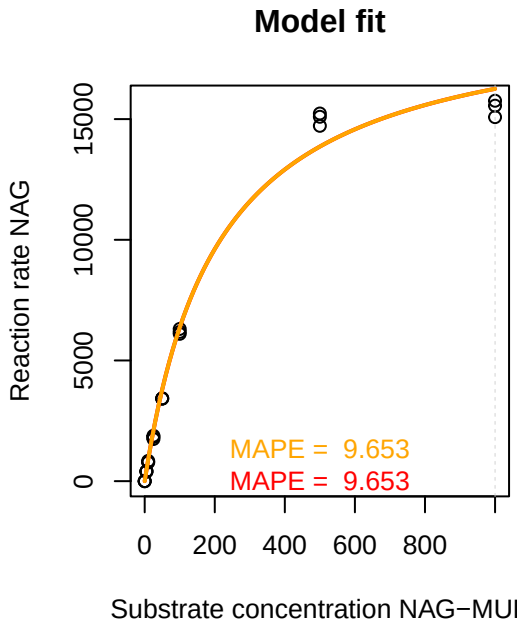

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 95.5
RMSE = 107.2
0
2000
4000
6000
8000
Fitted values

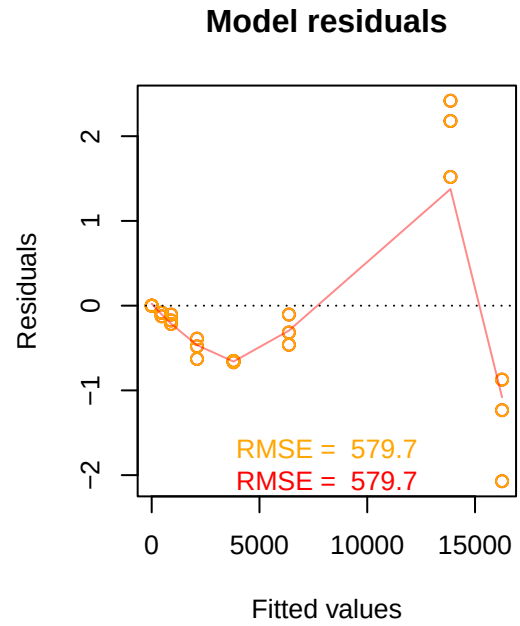

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 1.759
MAPE = 13.24
0
200
400
600
800
Substrate concentration NAG−MUF

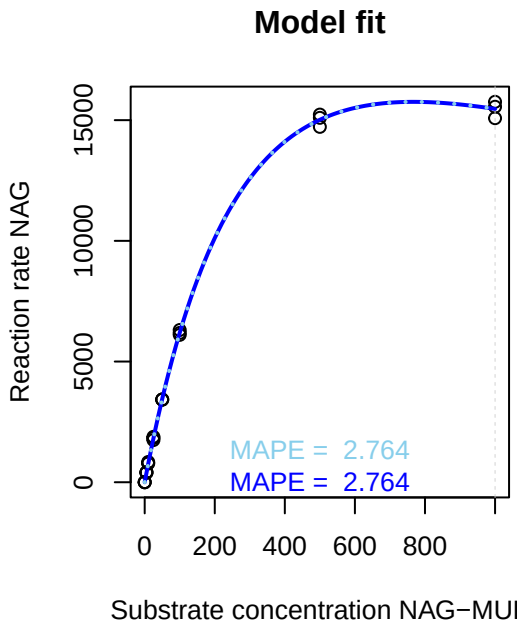

Model residuals
Residuals
−1
0
1
2
RMSE = 26.25
RMSE = 285.8
0
2000
4000
6000
Fitted values

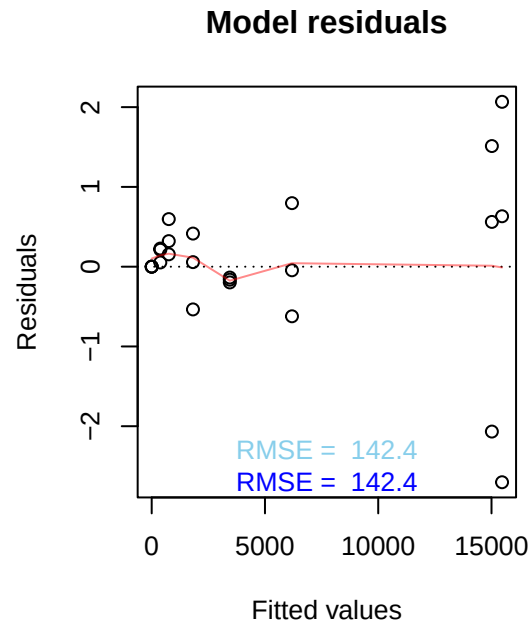

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 2.829
MAPE = 2.461
0
200
400
600
800
Substrate concentration NAG−MUF

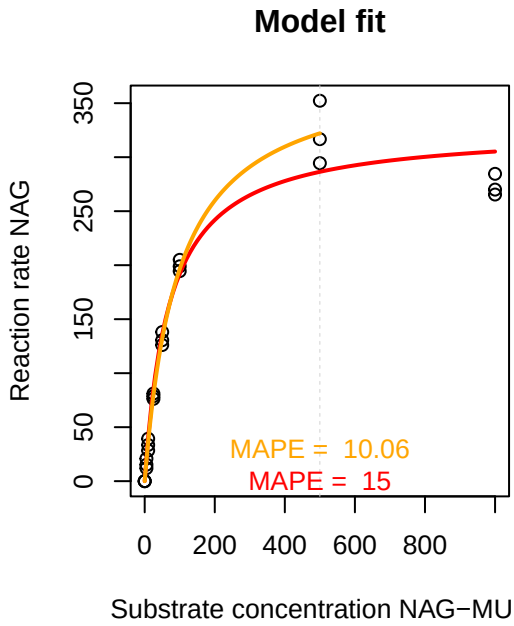

Model residuals
Residuals
−1
0
1
2
RMSE = 26.25
RMSE = 25.09
0
1000
3000
5000
Fitted values

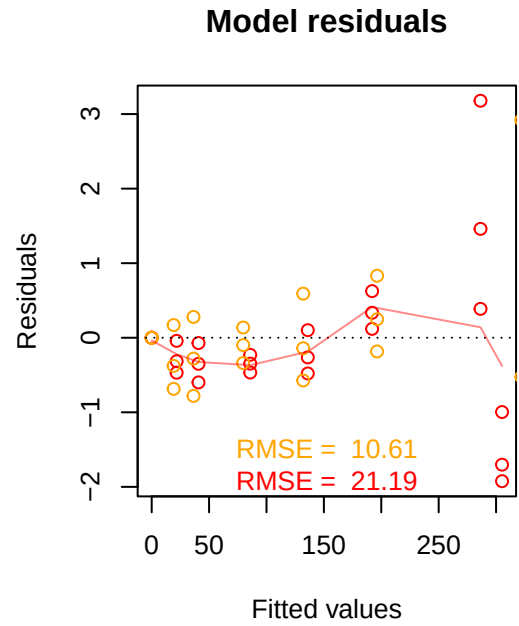

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 9.653
MAPE = 9.653

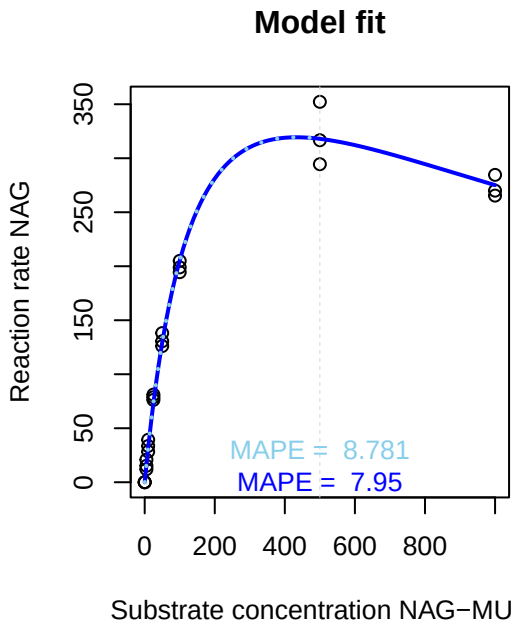

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 579.7
RMSE = 579.7

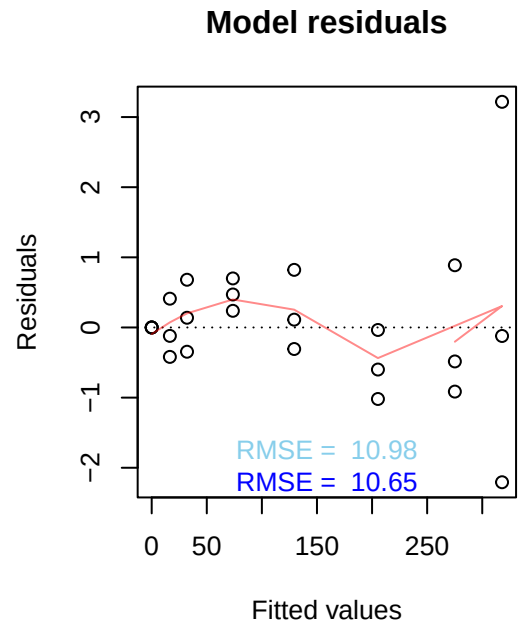

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 2.764
MAPE = 2.764

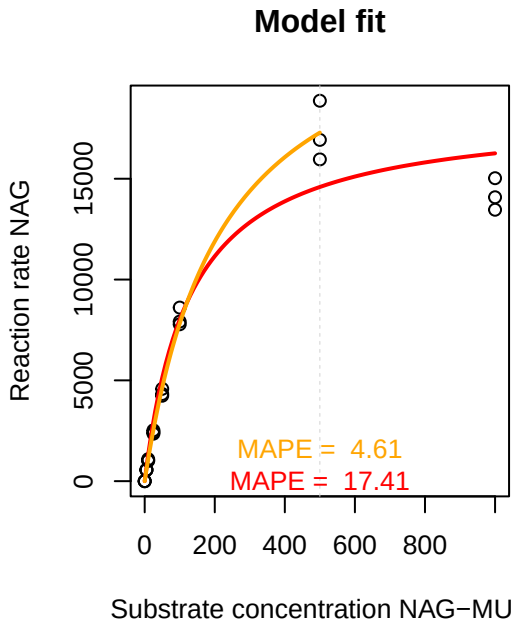

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 142.4
RMSE = 142.4

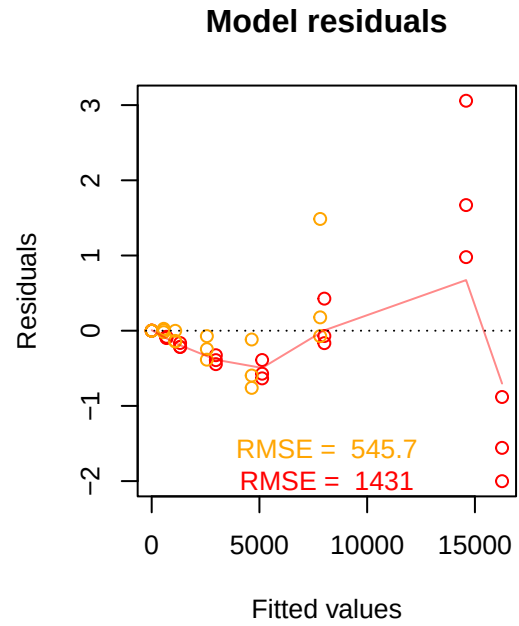

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 10.06
MAPE = 15
0
50
150
250
350
0
200
400
600
800

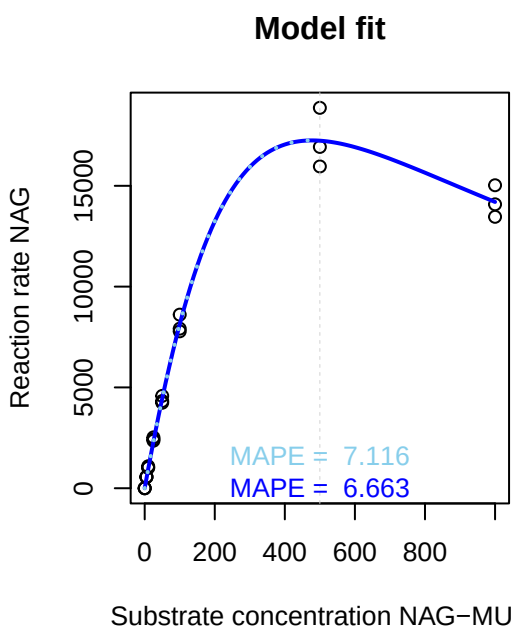

Model residuals
Residuals
Fitted values
RMSE = 10.61
RMSE = 21.19
−2
−1
0
1
2
3
0
50
150
250

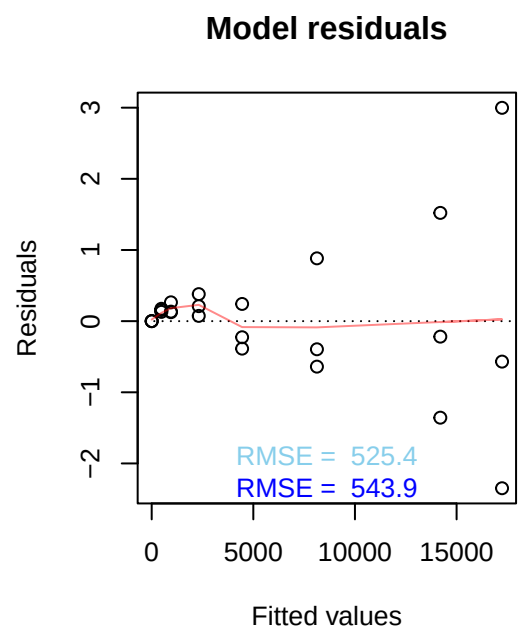

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 8.781
MAPE = 7.95
0
50
150
250
350
0
200
400
600
800

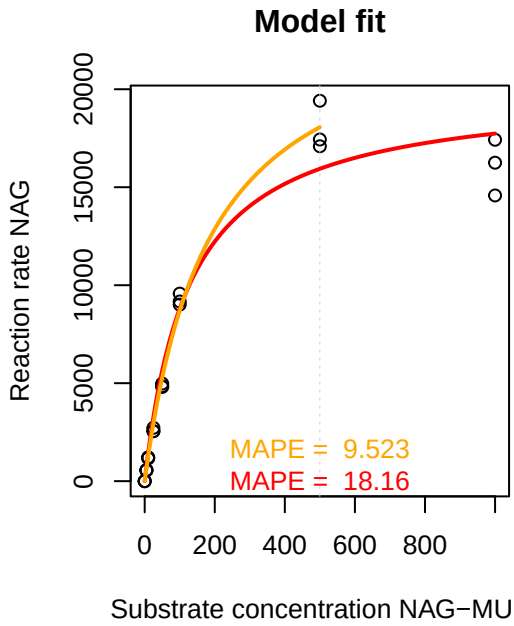

Model residuals
Residuals
Fitted values
RMSE = 10.98
RMSE = 10.65
−2
−1
0
1
2
3
0
50
150
250

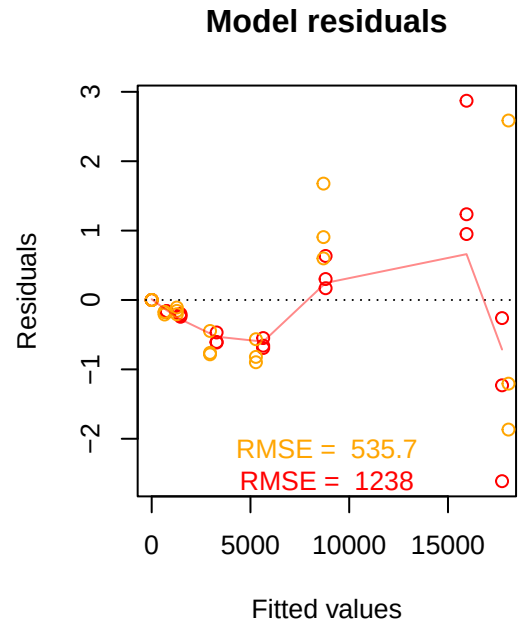

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 4.61
MAPE = 17.41
Substrate concentration NAG−MUF

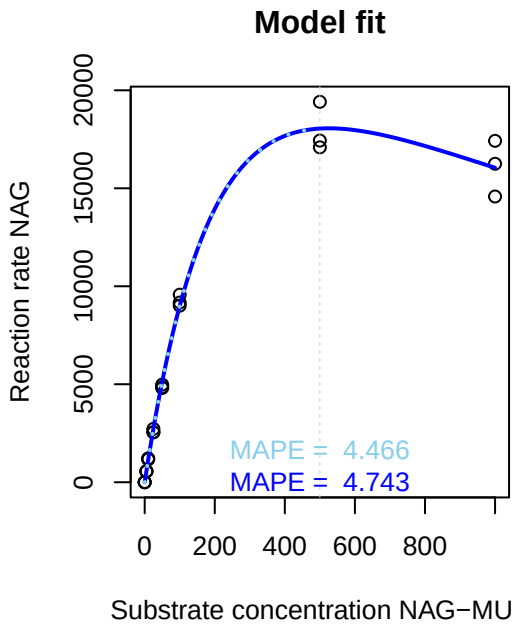

Model residuals
Residuals
−2
−1
0
1
2
3
0
5000
10000
15000
RMSE = 545.7
RMSE = 1431
Fitted values

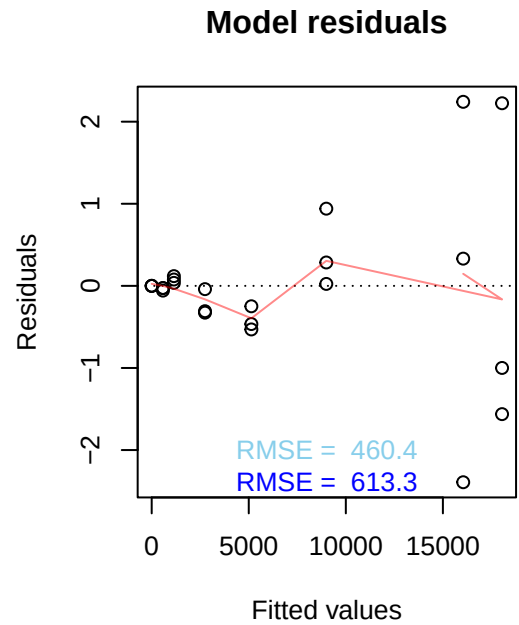

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
MAPE = 7.116
MAPE = 6.663
Substrate concentration NAG−MUF

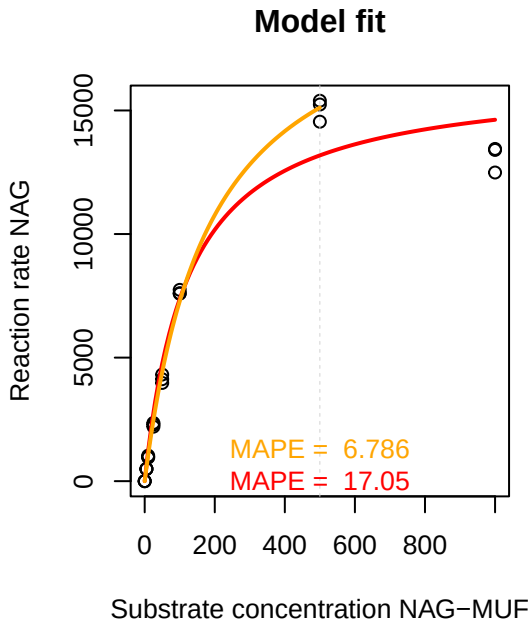

Model residuals
Residuals
−2
−1
0
1
2
3
0
5000
10000
15000
RMSE = 525.4
RMSE = 543.9
Fitted values

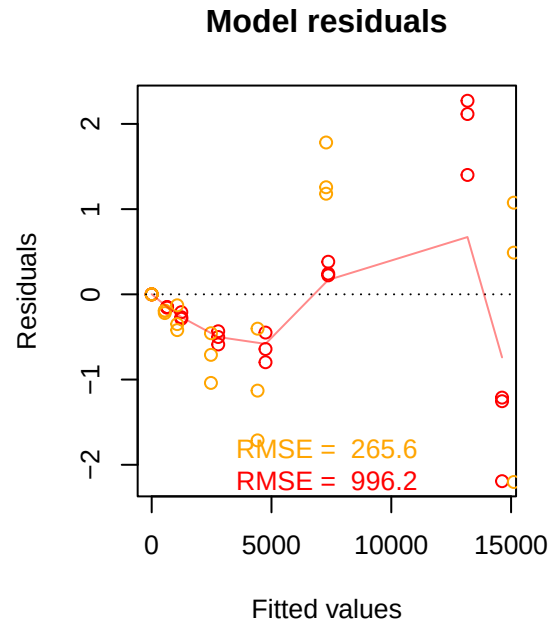

Model fit
Reaction rate NAG
0
5000
10000
15000
20000
0
200
400
600
800
MAPE = 9.523
MAPE = 18.16
Substrate concentration NAG−MUF

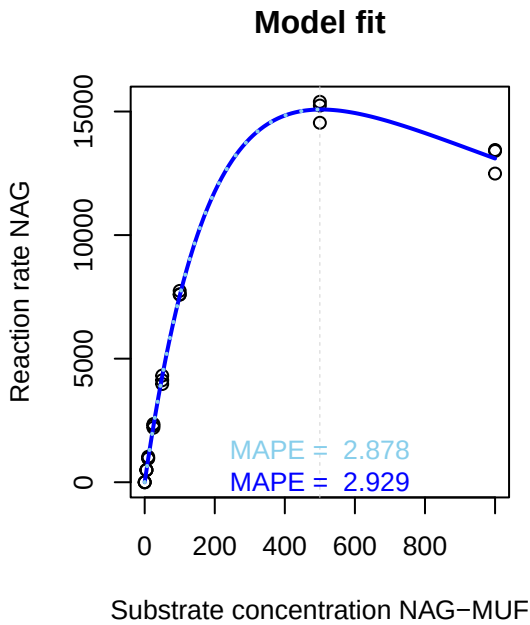

Model residuals
Residuals
−2
−1
0
1
2
3
0
5000
10000
15000
RMSE = 535.7
RMSE = 1238
Fitted values

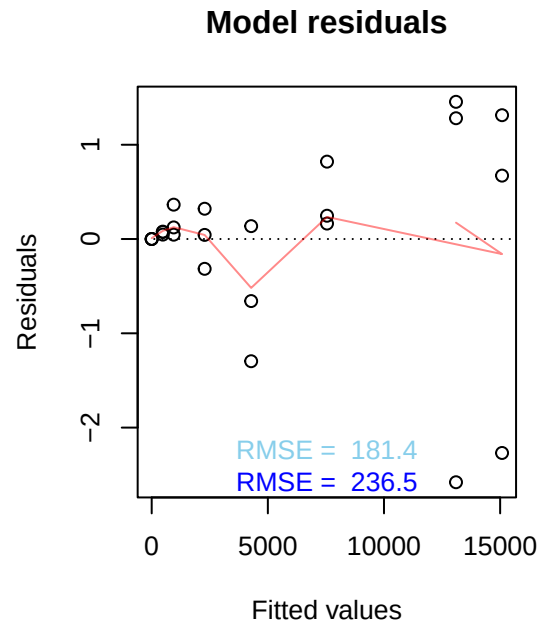

Model fit
Reaction rate NAG
0
5000
10000
15000
20000
0
200
400
600
800
MAPE = 4.466
MAPE = 4.743
Substrate concentration NAG−MUF

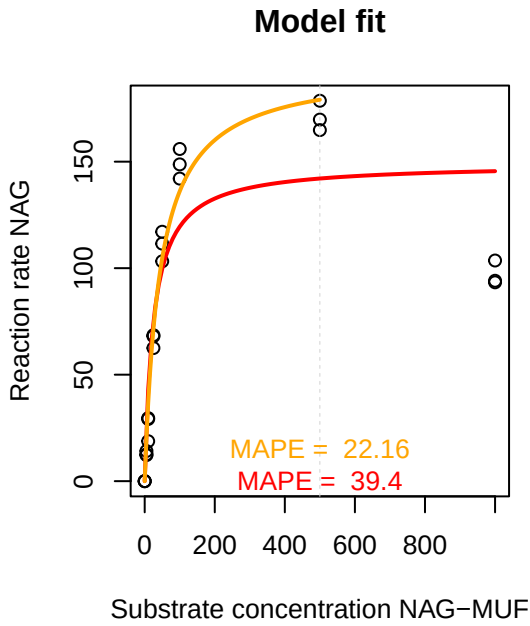

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
RMSE = 460.4
RMSE = 613.3
Fitted values

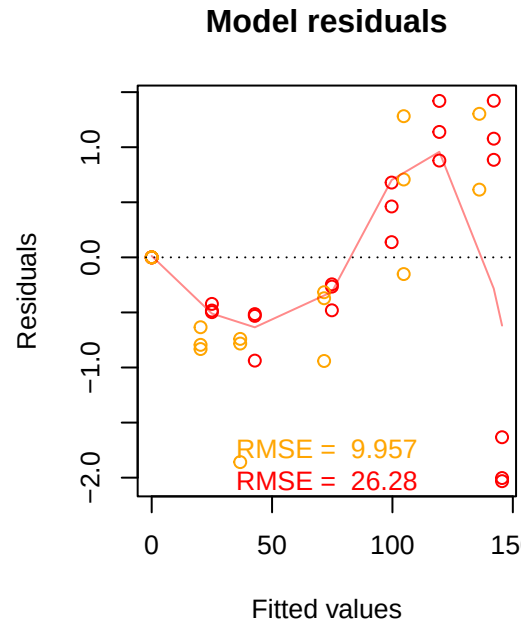

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 6.786
MAPE = 17.05

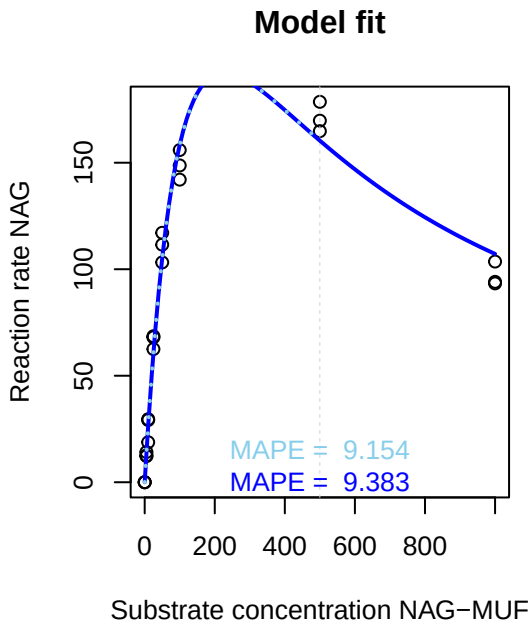

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 265.6
RMSE = 996.2

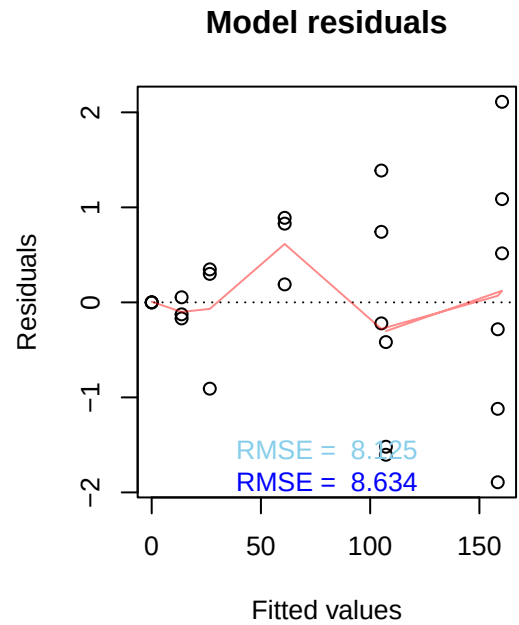

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 2.878
MAPE = 2.929

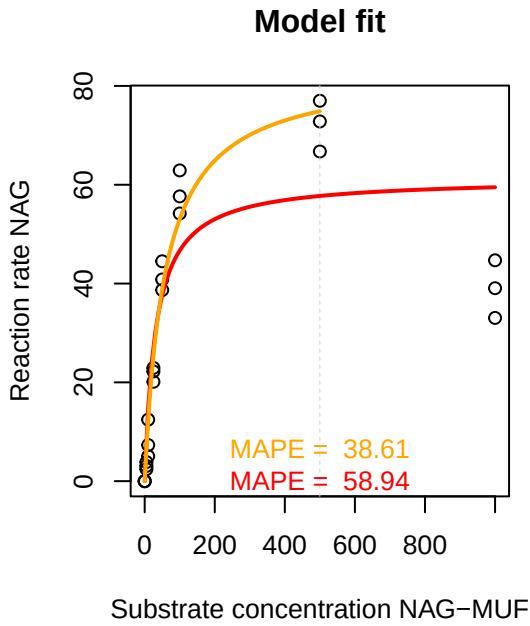

Model residuals
Residuals
−2
−1
0
1
0
5000
10000
15000
Fitted values
RMSE = 181.4
RMSE = 236.5

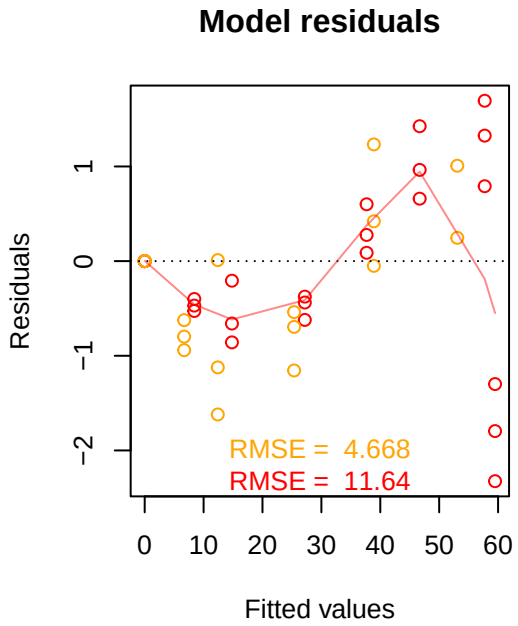

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 22.16
MAPE = 39.4
Substrate concentration NAG−MUF

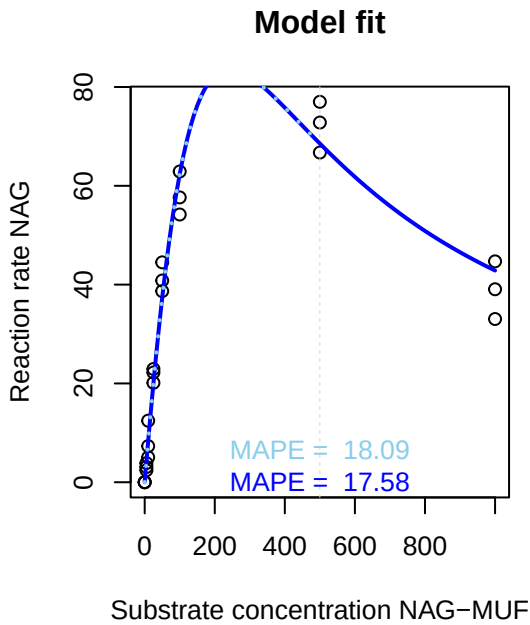

Model residuals
Residuals
−2.0
−1.0
0.0
1.0
0
50
100
150
RMSE = 9.957
RMSE = 26.28
Fitted values

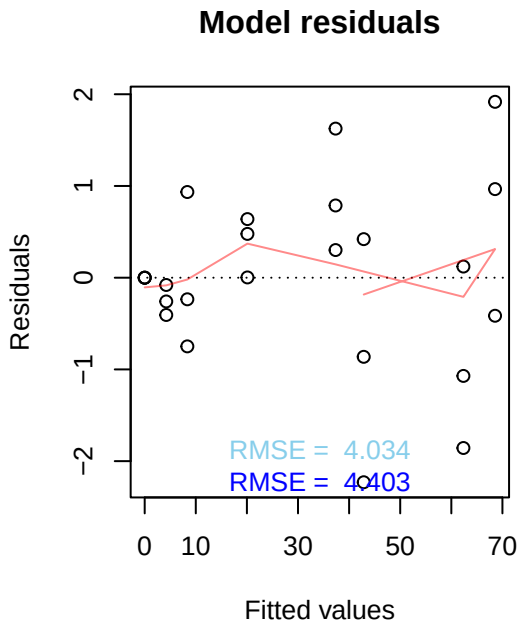

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 9.154
MAPE = 9.383
Substrate concentration NAG−MUF

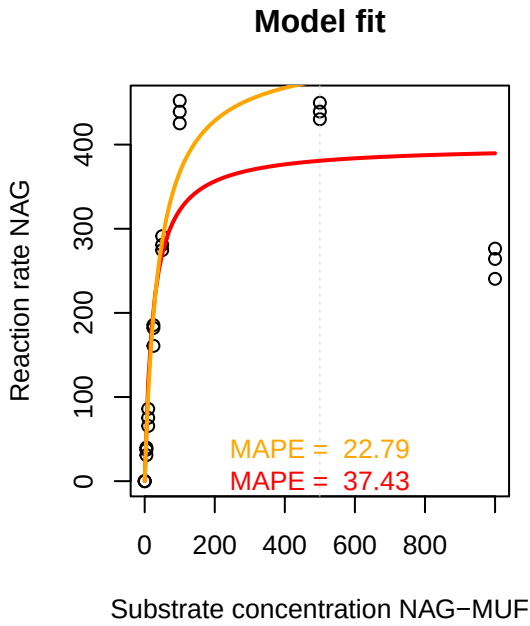

Model residuals
Residuals
−2
−1
0
1
2
0
50
100
150
RMSE = 8.825
RMSE = 8.634
Fitted values

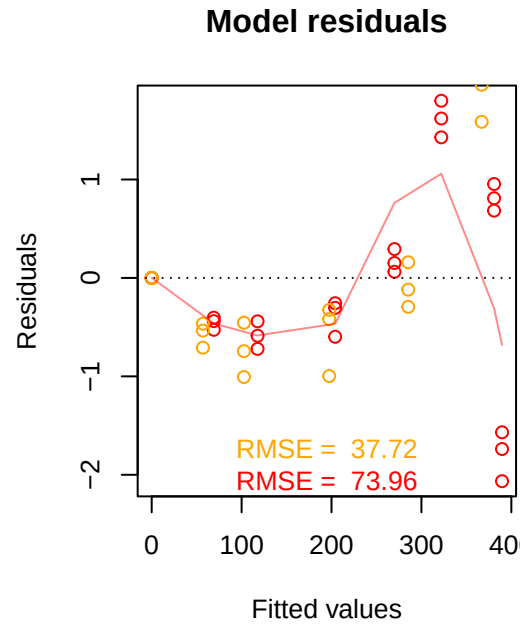

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 38.61
MAPE = 58.94
0
20
40
60
80
0
200
400
600
800

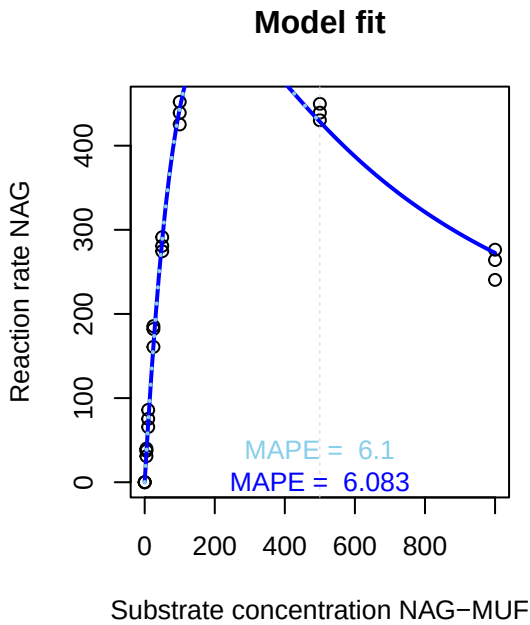

Model residuals
Residuals
Fitted values
RMSE = 4.668
RMSE = 11.64
−2
−1
0
1
0
10
20
30
40
50
60

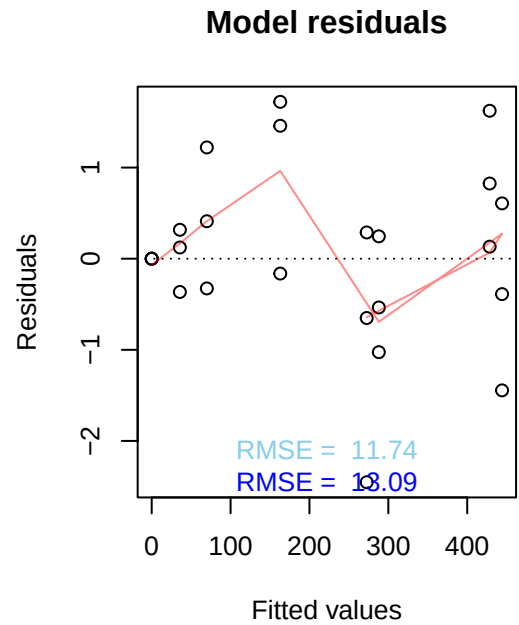

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 18.09
MAPE = 17.58
0
20
40
60
80
0
200
400
600
800

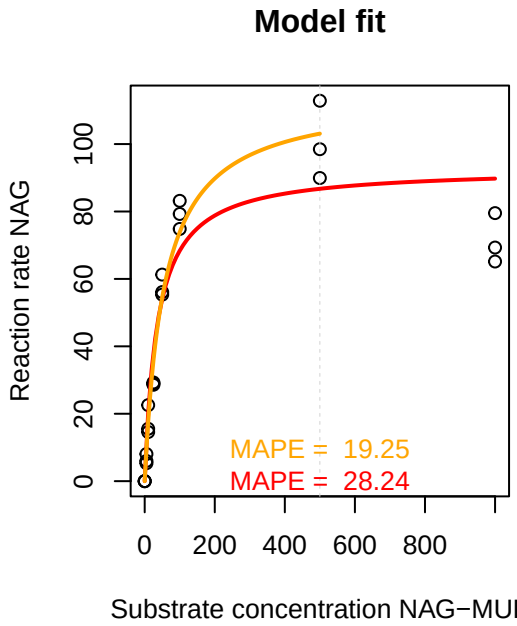

Model residuals
Residuals
Fitted values
RMSE = 4.034
RMSE = 4.403
−2
−1
0
1
2
0
10
30
50
70

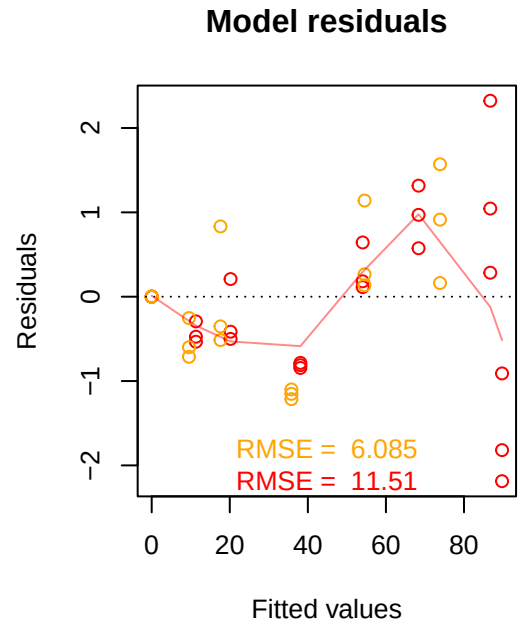

Model fit
Reaction rate NAG
0
100
200
300
400
0
200
400
600
800
MAPE = 22.79
MAPE = 37.43
Substrate concentration NAG−MUF

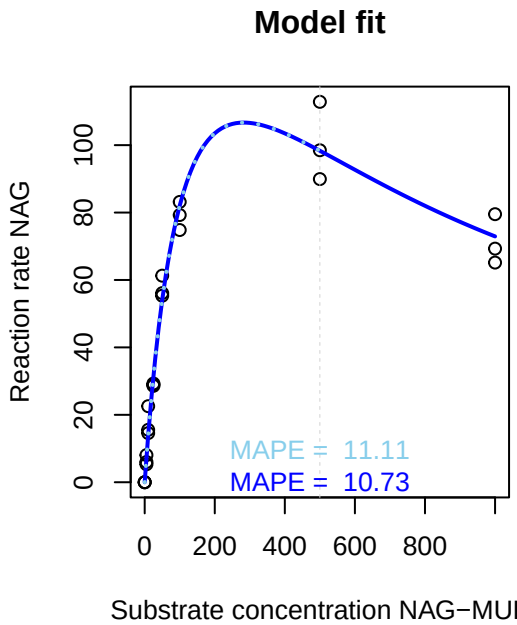

Model residuals
Residuals
−2
−1
0
1
0
100
200
300
400
RMSE = 37.72
RMSE = 73.96
Fitted values

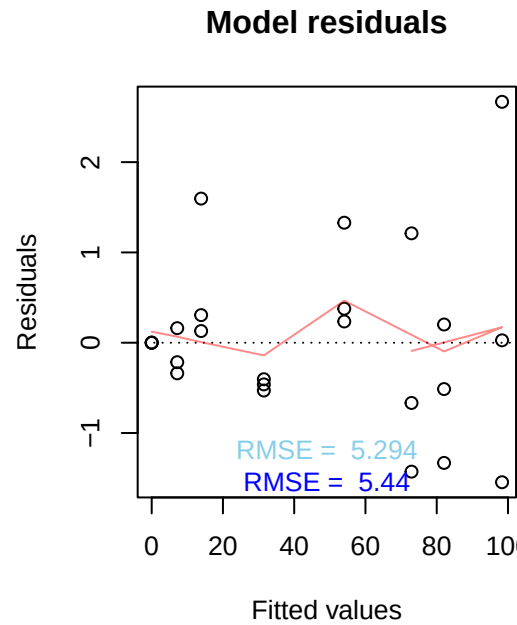

Model fit
Reaction rate NAG
0
100
200
300
400
0
200
400
600
800
MAPE = 6.1
MAPE = 6.083
Substrate concentration NAG−MUF

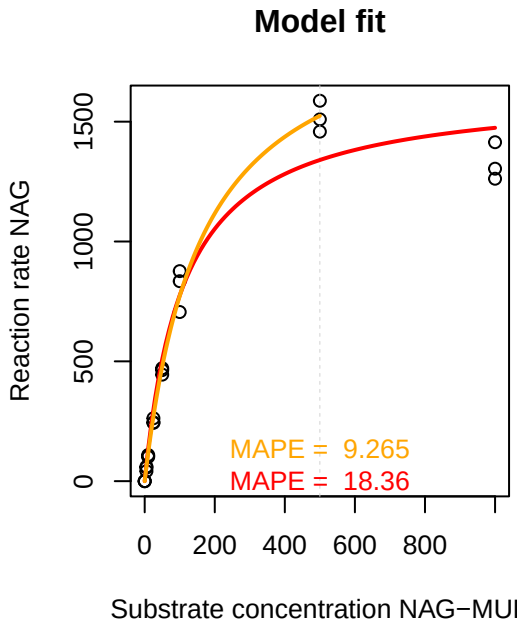

Model residuals
Residuals
−2
−1
0
1
0
100
200
300
400
RMSE = 11.74
RMSE = 13.09
Fitted values

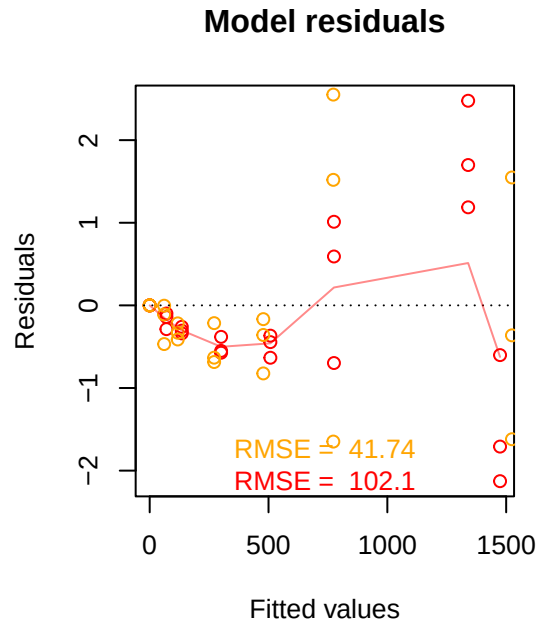

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 19.25
MAPE = 28.24
0
20
40
60
80
100
0
200
400
600
800

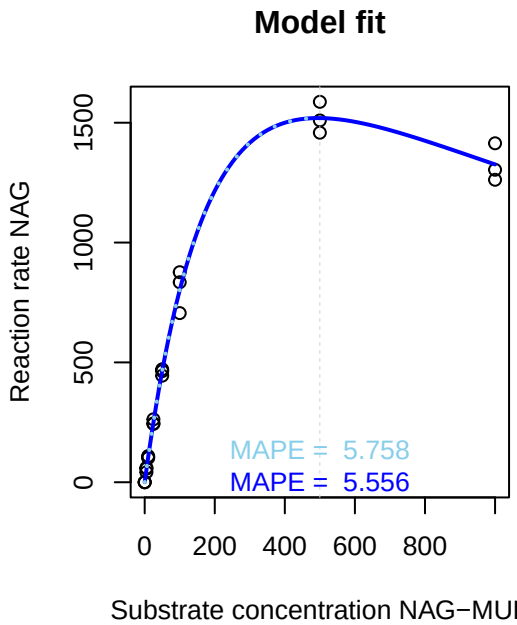

Model residuals
Residuals
Fitted values
RMSE = 6.085
RMSE = 11.51
−2
−1
0
1
2
0
20
40
60
80

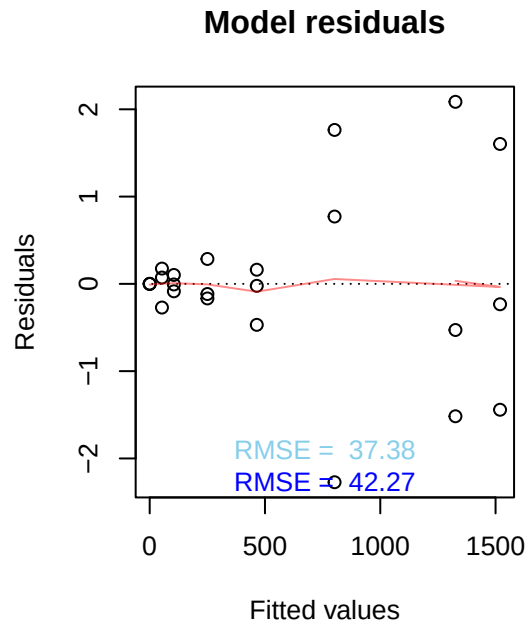

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 11.11
MAPE = 10.73
0
20
40
60
80
100
0
200
400
600
800

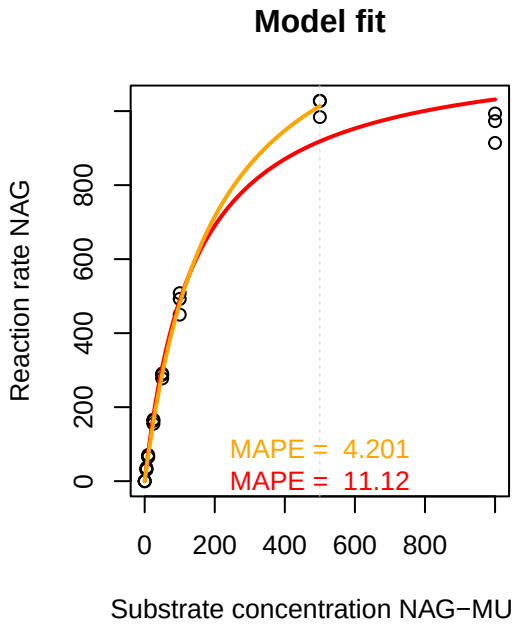

Model residuals
Residuals
Fitted values
RMSE = 5.294
RMSE = 5.44
−1
0
1
2
0
20
40
60
80
100

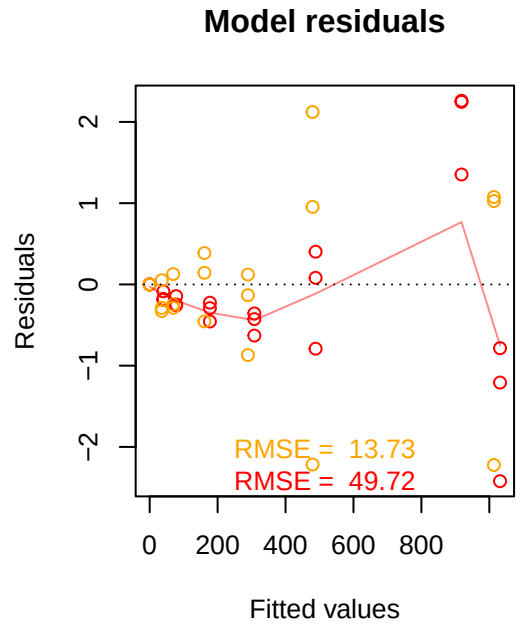

Model fit
Reaction rate NAG
0
500
1000
1500
MAPE = 9.265
MAPE = 18.36
0
200
400
600
800
Substrate concentration NAG−MUF

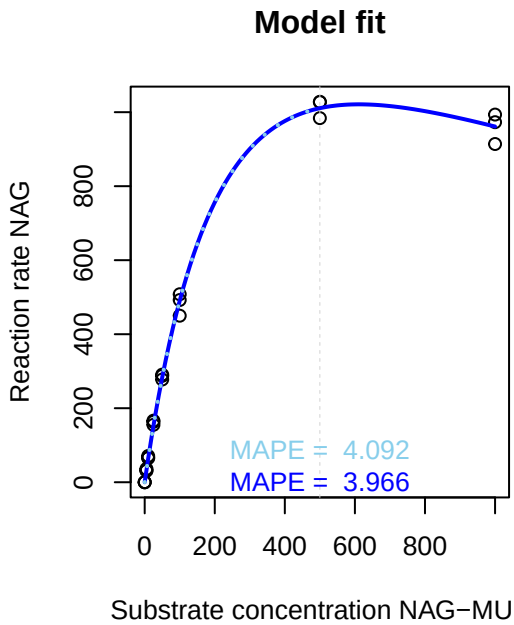

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 41.74
RMSE = 102.1
0
500
1000
1500
Fitted values

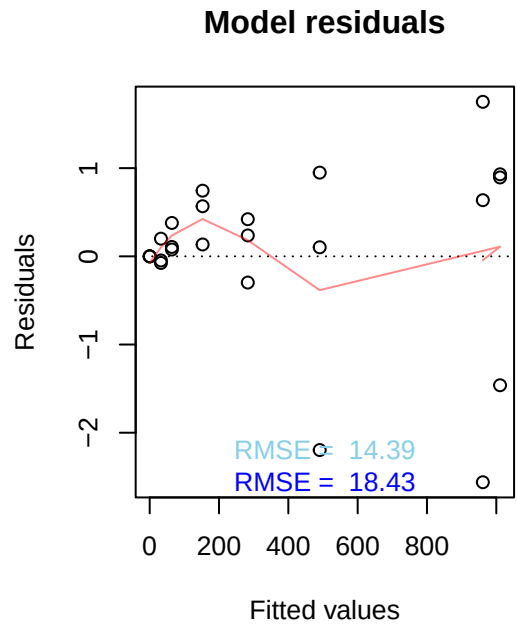

Model fit
Reaction rate NAG
0
500
1000
1500
MAPE = 5.758
MAPE = 5.556
0
200
400
600
800
Substrate concentration NAG−MUF

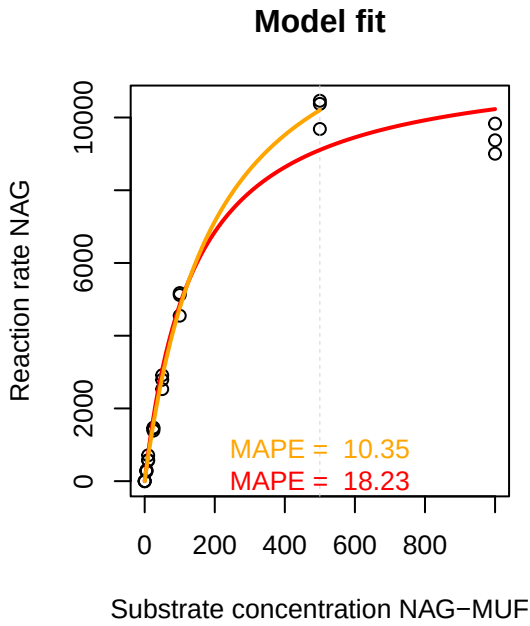

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 37.38
RMSE = 42.27
0
500
1000
1500
Fitted values

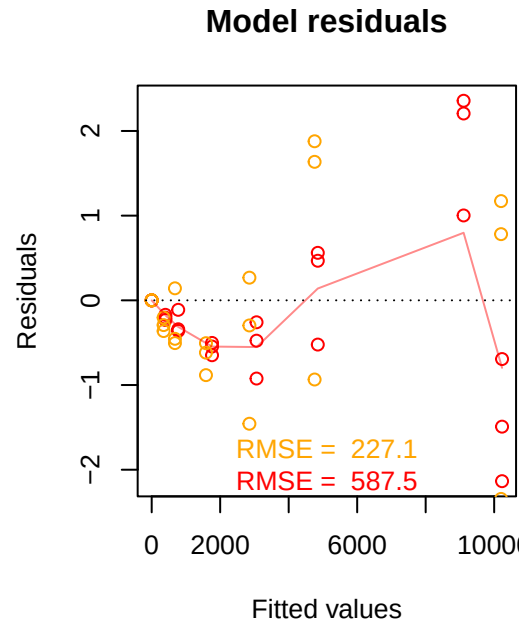

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 4.201
MAPE = 11.12
0
200
400
600
800
Substrate concentration NAG−MUF

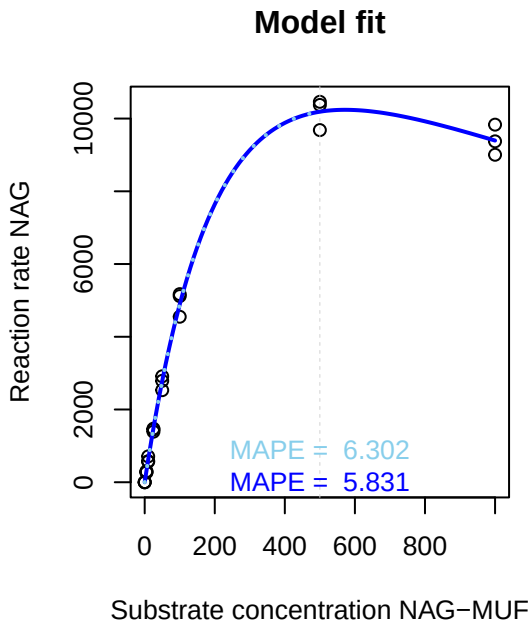

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 13.73
RMSE = 49.72
0
200
400
600
800
Fitted values

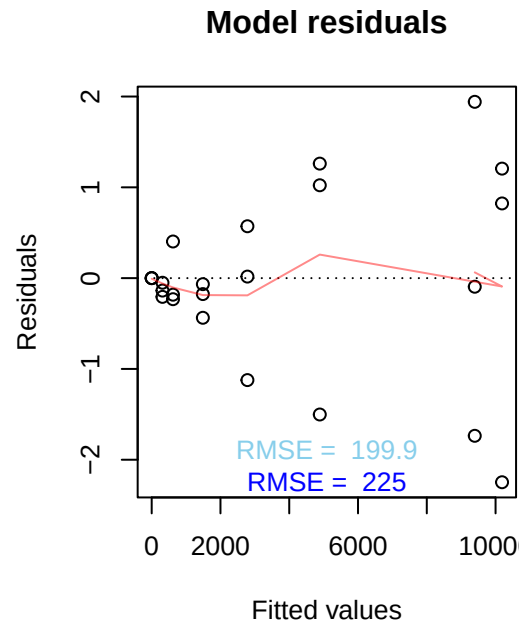

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 4.092
MAPE = 3.966
0
200
400
600
800
Substrate concentration NAG−MUF

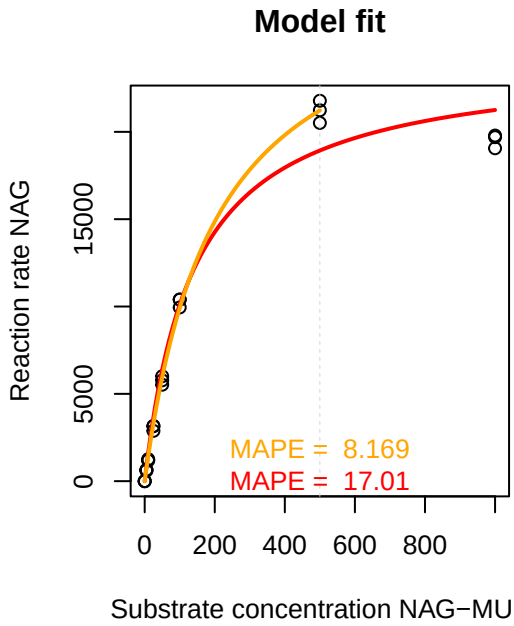

Model residuals
Residuals
−2
−1
0
1
RMSE = 14.39
RMSE = 18.43
0
200
400
600
800
Fitted values

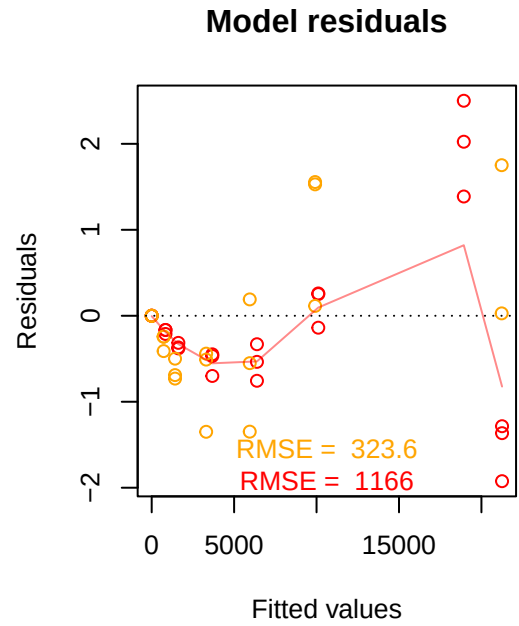

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 10.35
MAPE = 18.23
Substrate concentration NAG−MUF

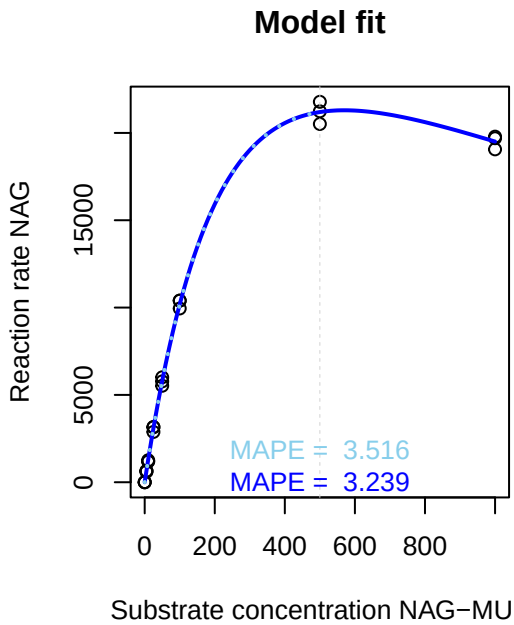

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 227.1
RMSE = 587.5
Fitted values

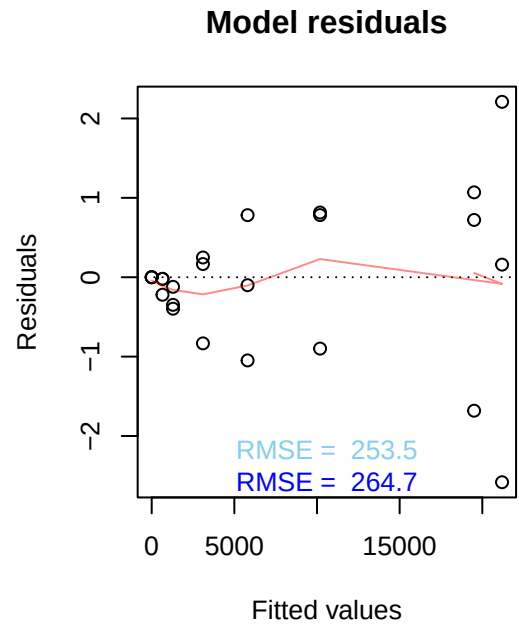

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 6.302
MAPE = 5.831
Substrate concentration NAG−MUF

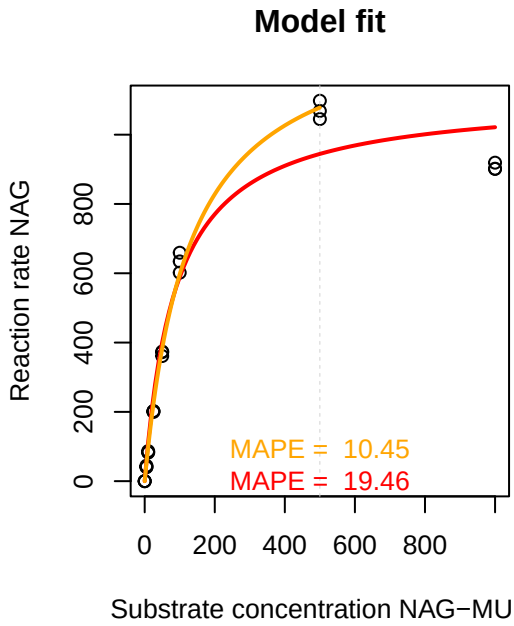

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 199.9
RMSE = 225
Fitted values

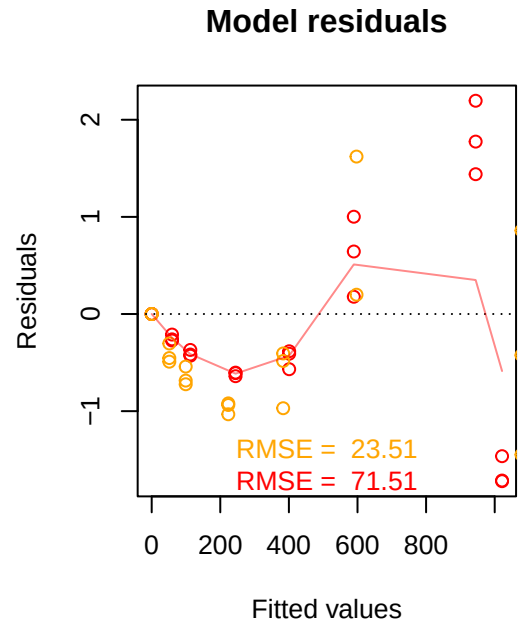

Model fit
Reaction rate NAG
0
5000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 8.169
MAPE = 17.01

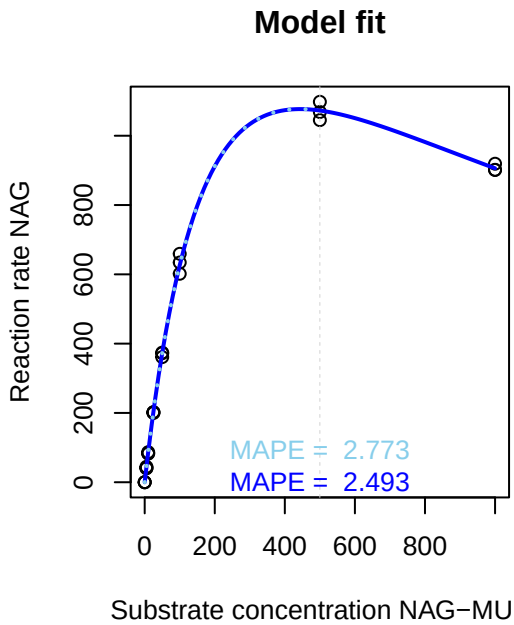

Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
Fitted values
RMSE = 323.6
RMSE = 1166

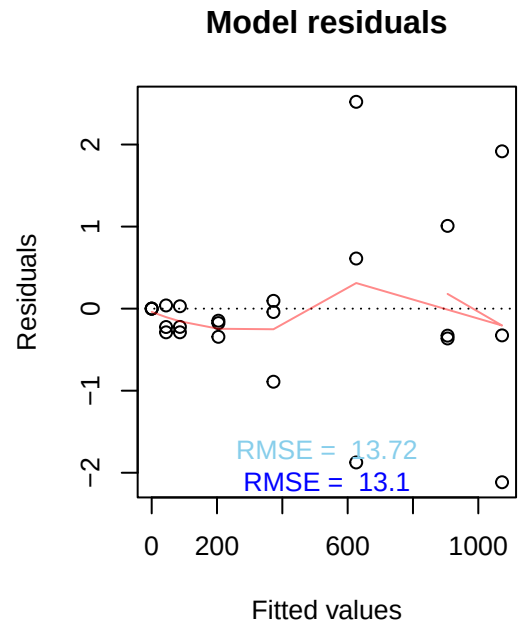

Model fit
Reaction rate NAG
0
5000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 3.516
MAPE = 3.239


Model residuals
Residuals
−2
−1
0
1
2
0
5000
15000
Fitted values
RMSE = 253.5
RMSE = 264.7

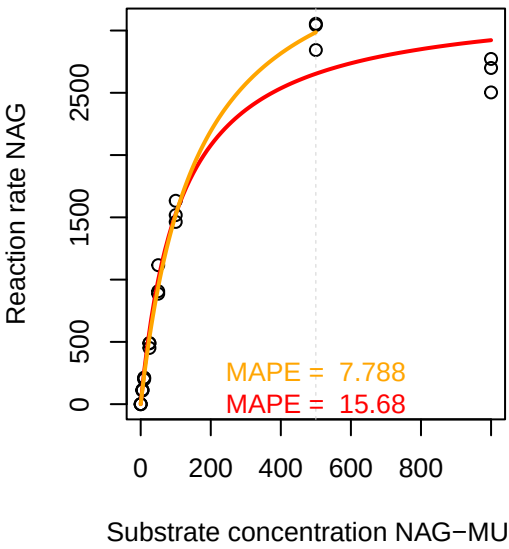

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 10.45
MAPE = 19.46
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−1
0
1
2
RMSE = 23.51
RMSE = 71.51
0
200
400
600
800
Fitted values

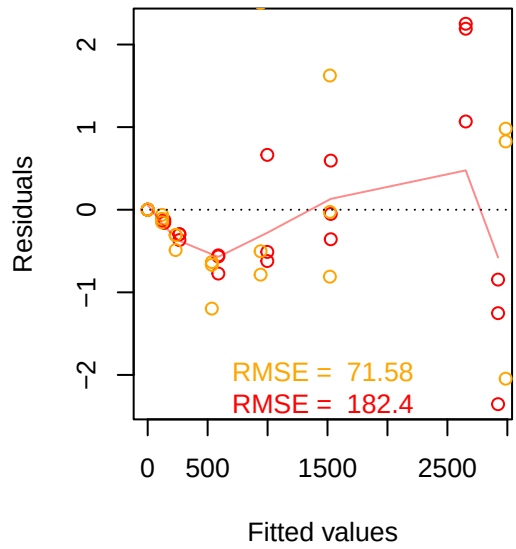

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 2.773
MAPE = 2.493
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 13.72
RMSE = 13.1
0
200
600
1000
Fitted values

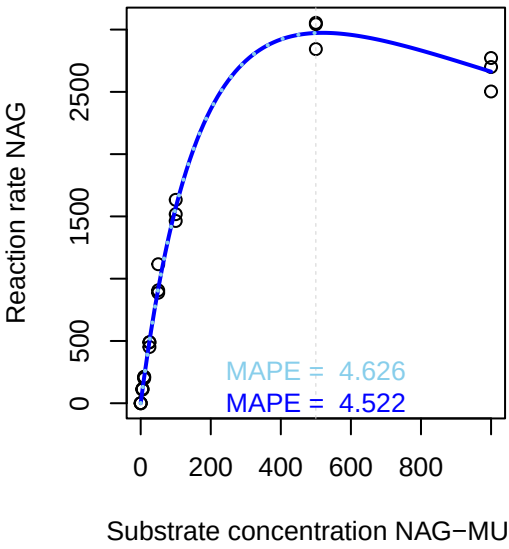
Model fit



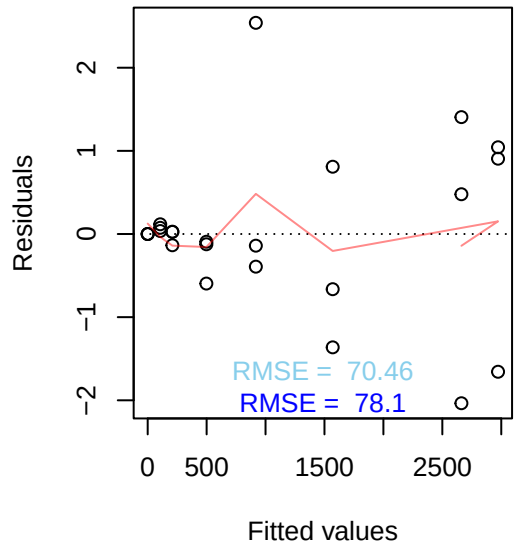
Model residuals

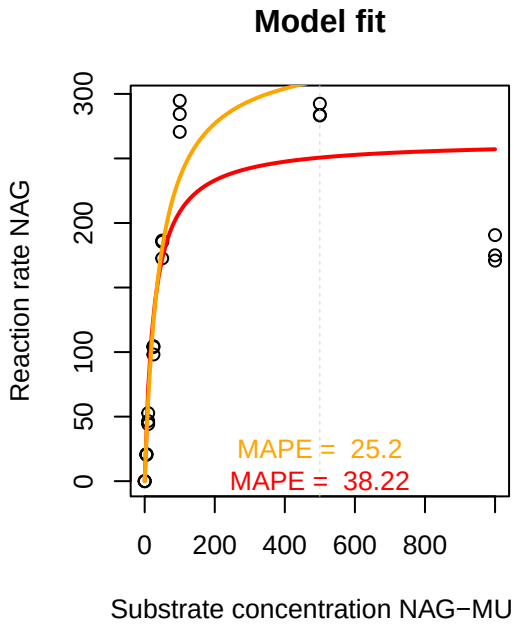


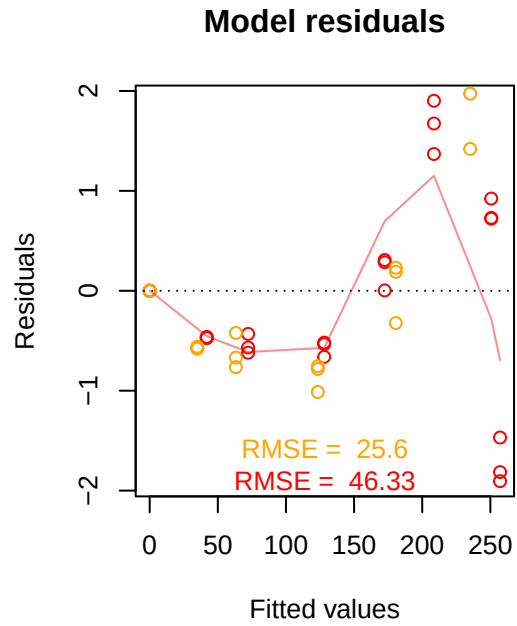
Model fit

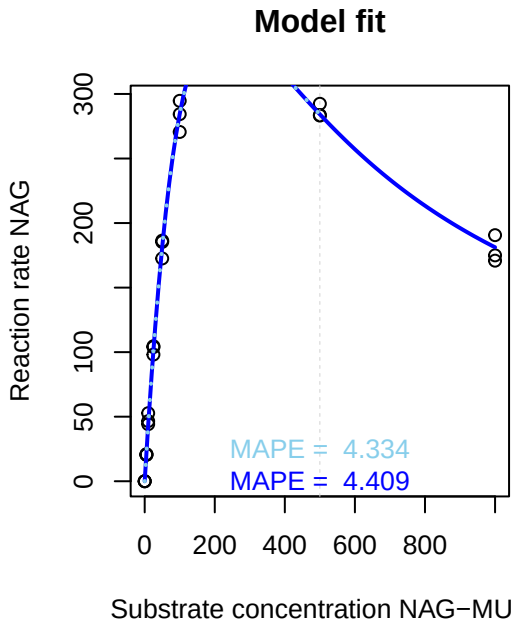


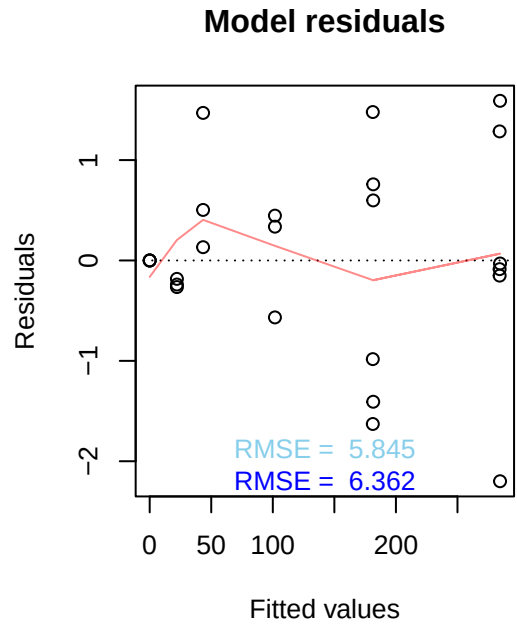
Model residuals

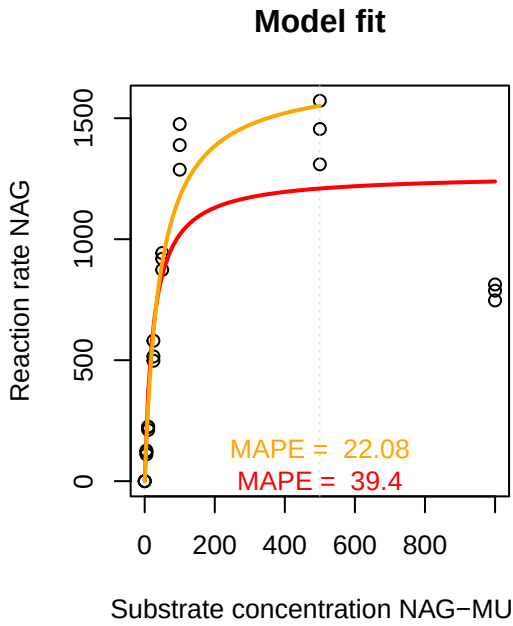


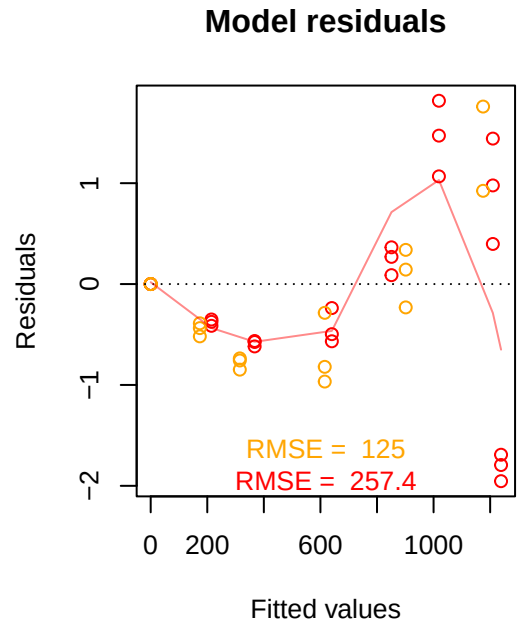

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 25.2
MAPE = 38.22
0
50
100
200
300
0
200
400
600
800

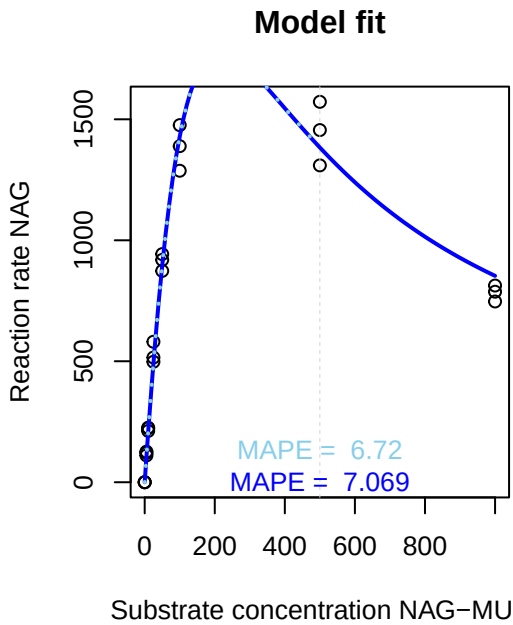

Model residuals
Residuals
Fitted values
RMSE = 25.6
RMSE = 46.33
−2
−1
0
1
2
0
50
100
150
200
250

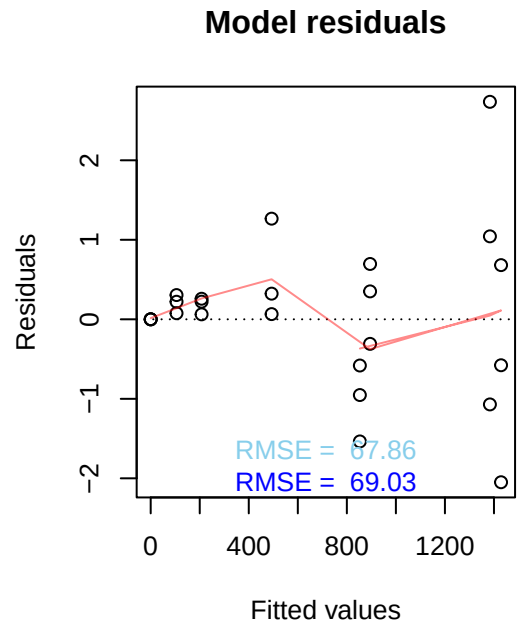

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 4.334
MAPE = 4.409
0
50
100
200
300
0
200
400
600
800

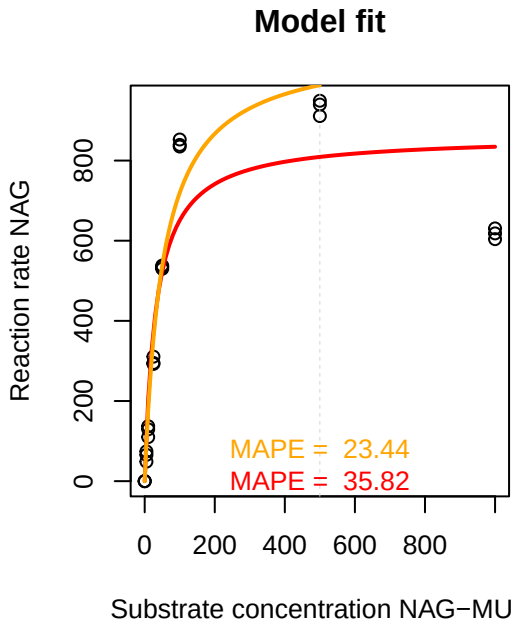

Model residuals
Residuals
Fitted values
RMSE = 5.845
RMSE = 6.362
−2
−1
0
1
0
50
100
200

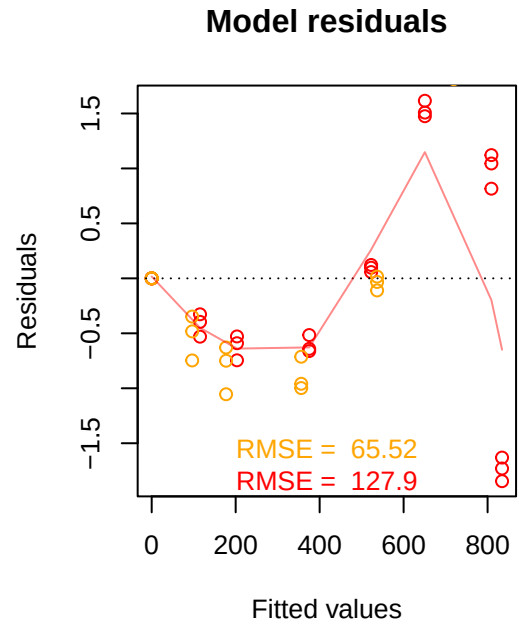

Model fit
Reaction rate NAG
0
500
1000
1500
MAPE = 22.08
MAPE = 39.4
0
200
400
600
800
Substrate concentration NAG−MUF

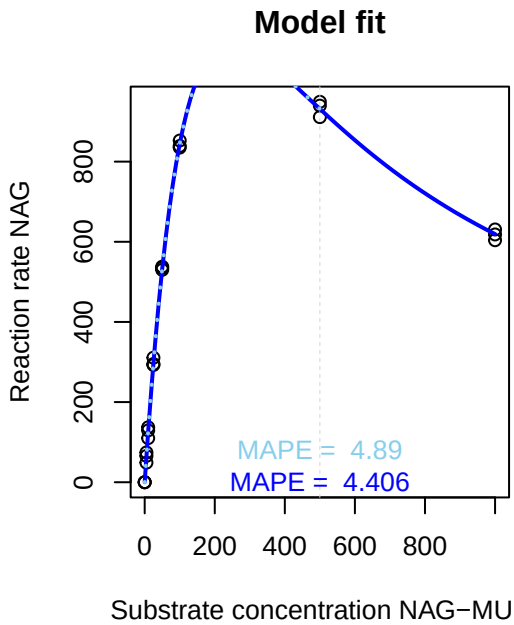

Model residuals
Residuals
−2
−1
0
1
RMSE = 125
RMSE = 257.4
0
200
600
1000
Fitted values

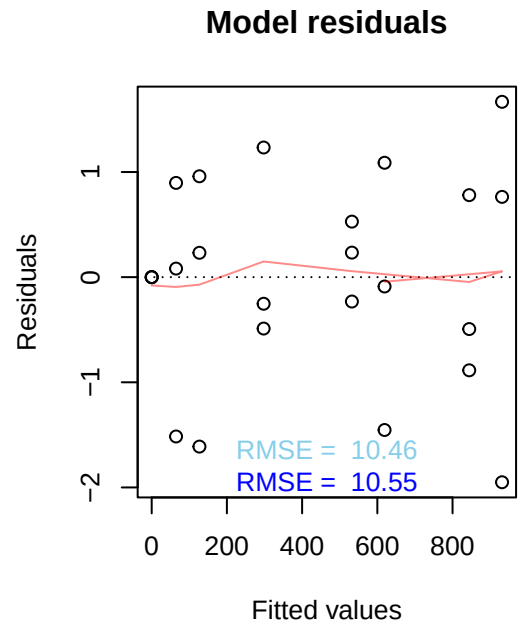

Model fit
Reaction rate NAG
0
500
1000
1500
MAPE = 6.72
MAPE = 7.069
0
200
400
600
800
Substrate concentration NAG−MUF

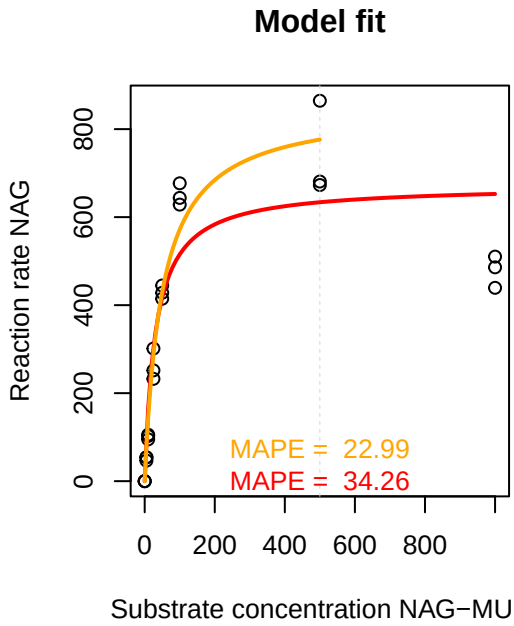

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 67.86
RMSE = 69.03
0
400
800
1200
Fitted values

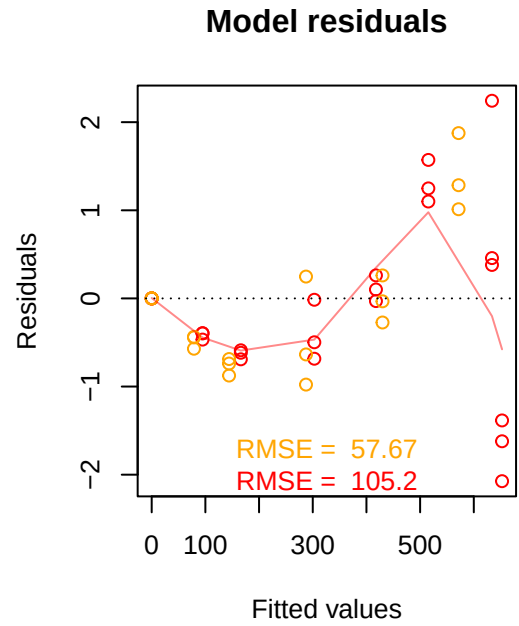

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 23.44
MAPE = 35.82
0
200
400
600
800
Substrate concentration NAG−MUF

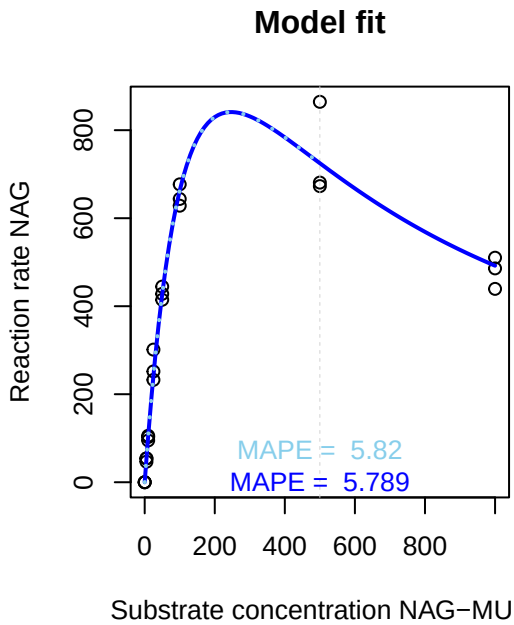

Model residuals
Residuals
1.5
0.5
−0.5
−1.5
RMSE = 65.52
RMSE = 127.9
0
200
400
600
800
Fitted values

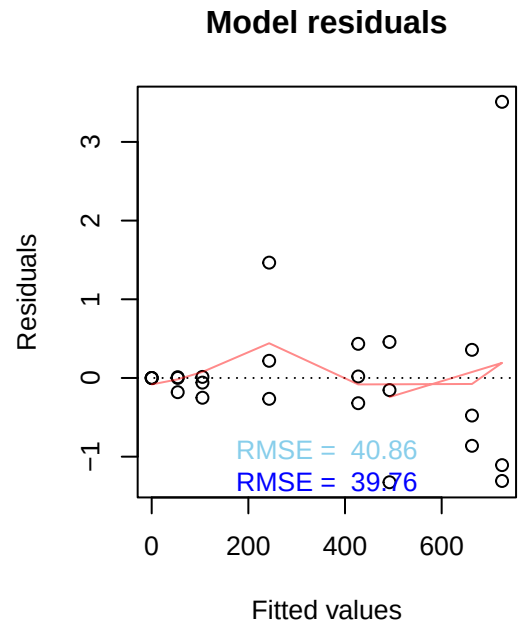

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 4.89
MAPE = 4.406
0
200
400
600
800
Substrate concentration NAG−MUF

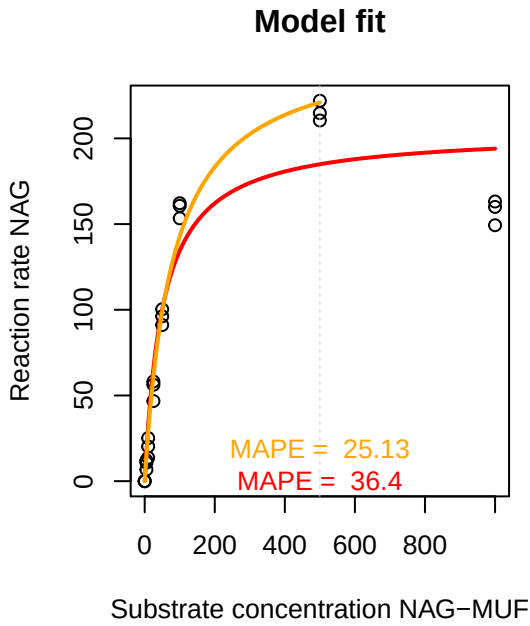

Model residuals
Residuals
1
0
−1
−2
RMSE = 10.46
RMSE = 10.55
0
200
400
600
800
Fitted values

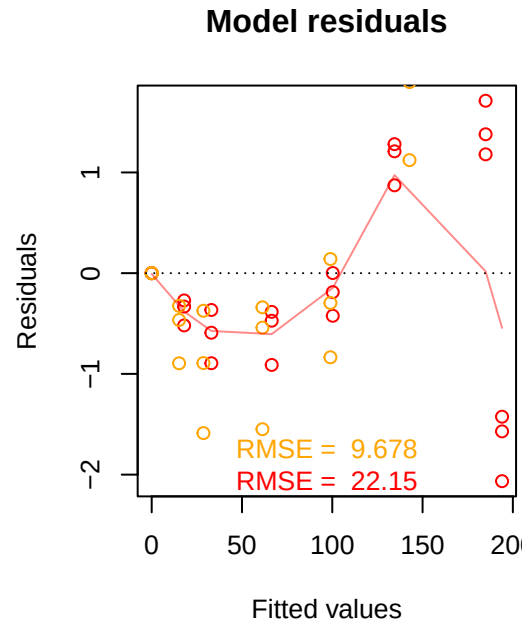

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 22.99
MAPE = 34.26
0
200
400
600
800
Substrate concentration NAG−MUF

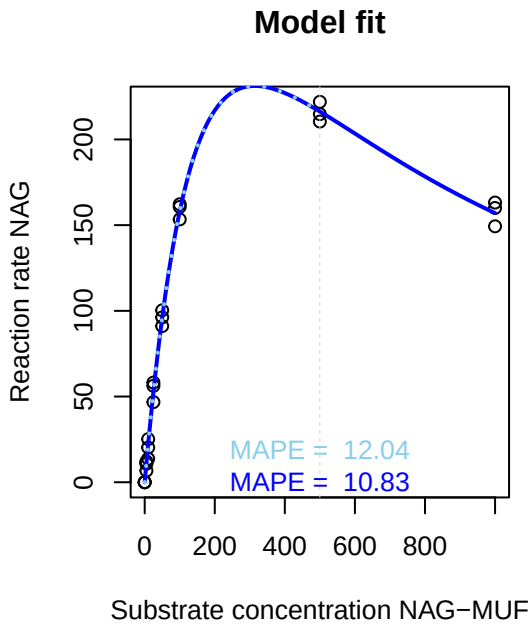

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 57.67
RMSE = 105.2
0
100
300
500
Fitted values

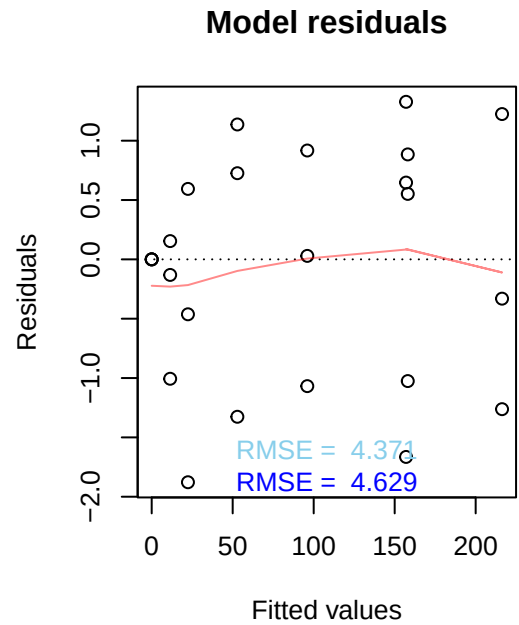

Model fit
Reaction rate NAG
0
200
400
600
800
MAPE = 5.82
MAPE = 5.789
0
200
400
600
800
Substrate concentration NAG−MUF

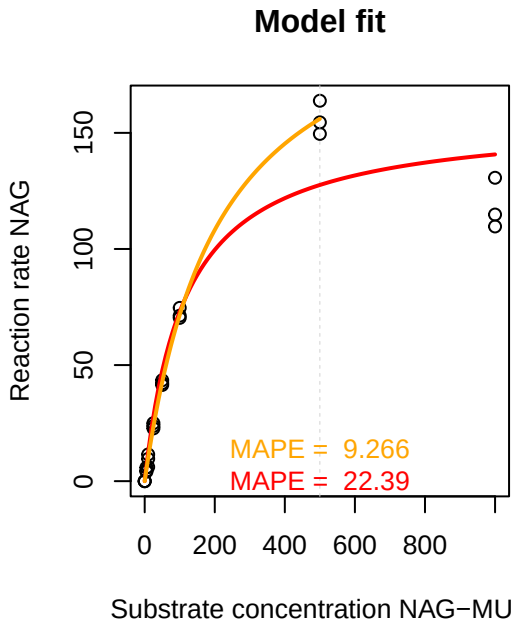

Model residuals
Residuals
−1
0
1
2
3
RMSE = 40.86
RMSE = 39.76
0
200
400
600
Fitted values

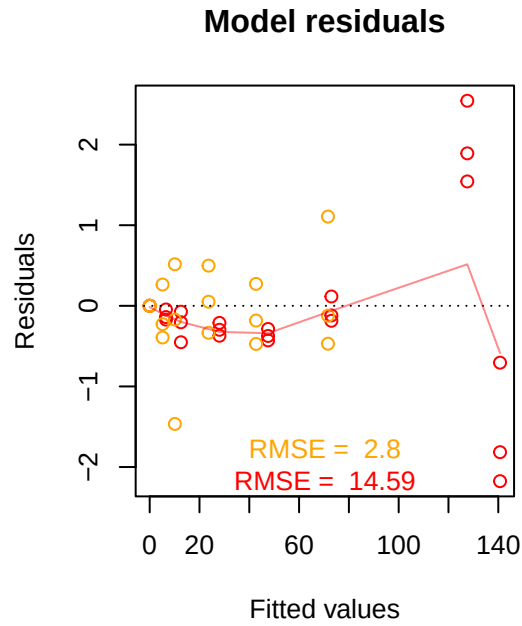

Model fit
Reaction rate NAG
0
50
100
150
200
0
200
400
600
800
MAPE = 25.13
MAPE = 36.4
Substrate concentration NAG−MUF

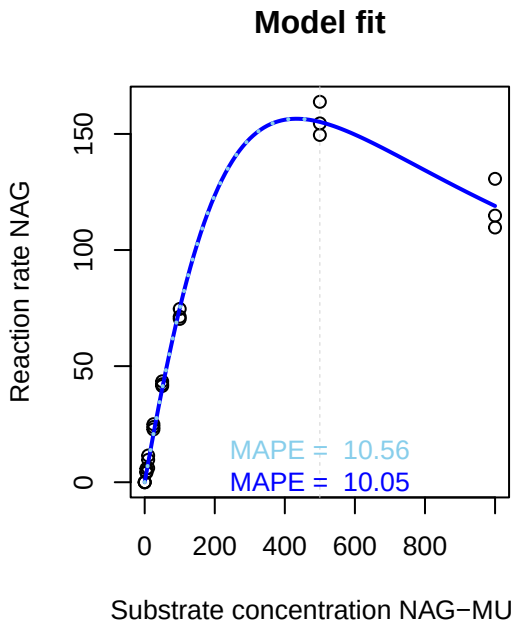

Model residuals
Residuals
−2
−1
0
1
0
50
100
150
200
RMSE = 9.678
RMSE = 22.15
Fitted values

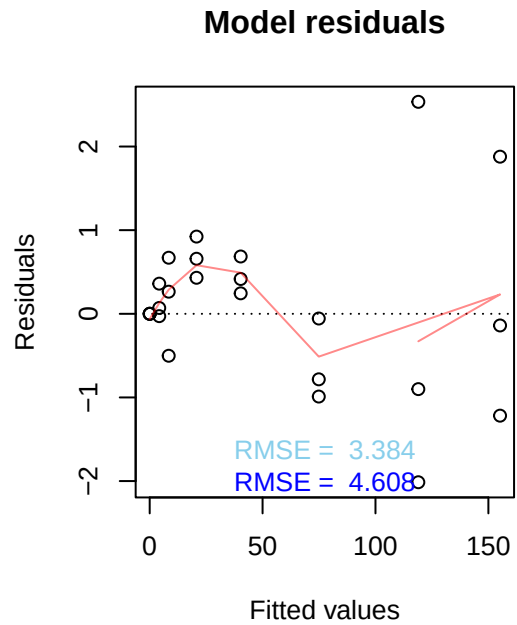

Model fit
Reaction rate NAG
0
50
100
150
200
0
200
400
600
800
MAPE = 12.04
MAPE = 10.83
Substrate concentration NAG−MUF

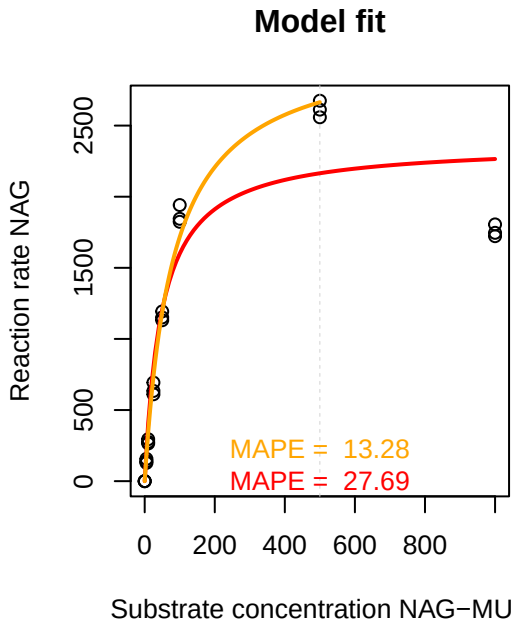

Model residuals
Residuals
−2.0
−1.0
0.0
0.5
1.0
0
50
100
150
200
RMSE = 4.371
RMSE = 4.629
Fitted values

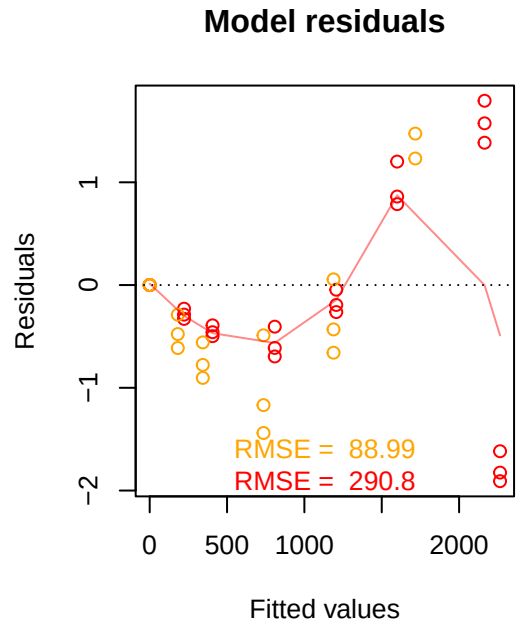

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 9.266
MAPE = 22.39
0
50
100
150
0
200
400
600
800

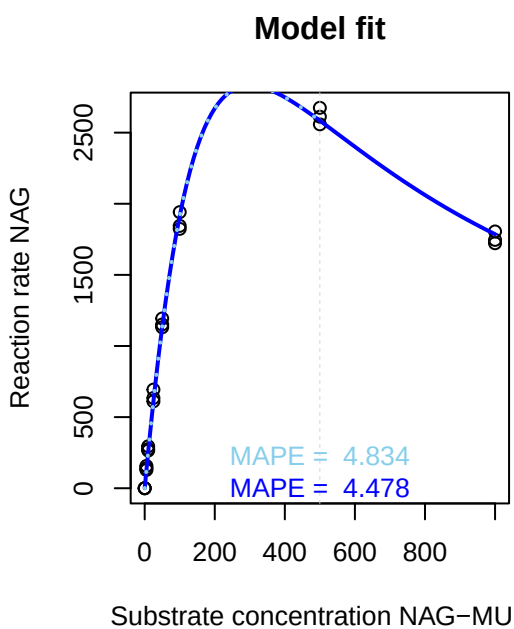

Model residuals
Residuals
Fitted values
RMSE = 2.8
RMSE = 14.59
−2
−1
0
1
2
0
20
60
100
140

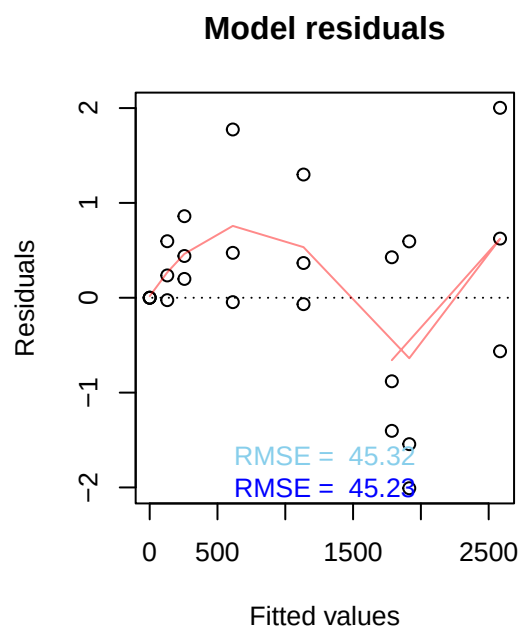

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 10.56
MAPE = 10.05
0
50
100
150
0
200
400
600
800

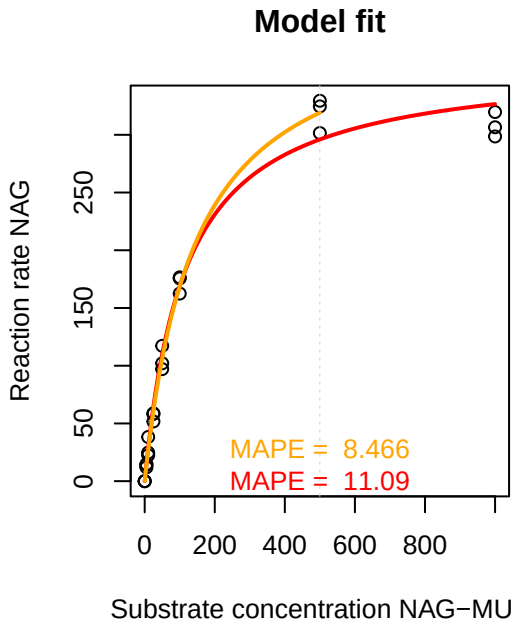

Model residuals
Residuals
Fitted values
RMSE = 3.384
RMSE = 4.608
−2
−1
0
1
2
0
50
100
150

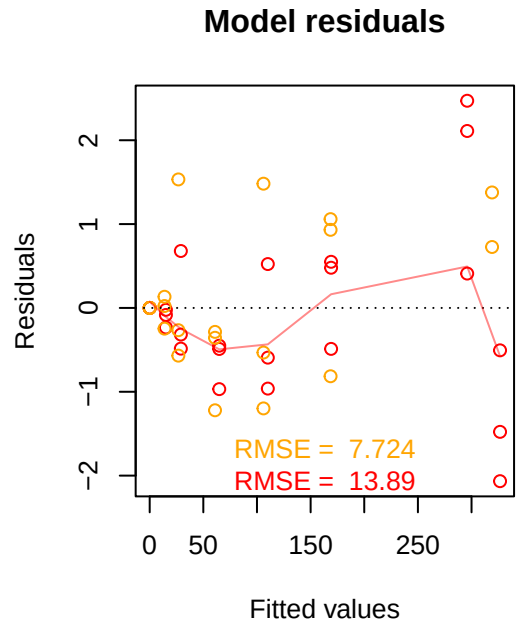

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 13.28
MAPE = 27.69
0
200
400
600
800
Substrate concentration NAG−MUF

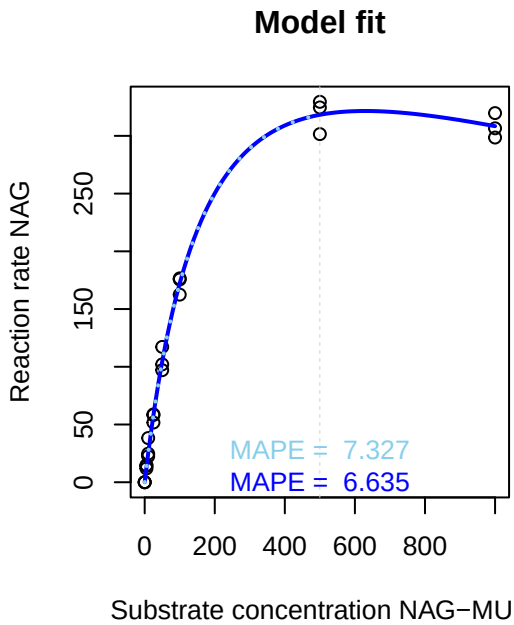

Model residuals
Residuals
−2
−1
0
1
RMSE = 88.99
RMSE = 290.8
0
500
1000
2000
Fitted values

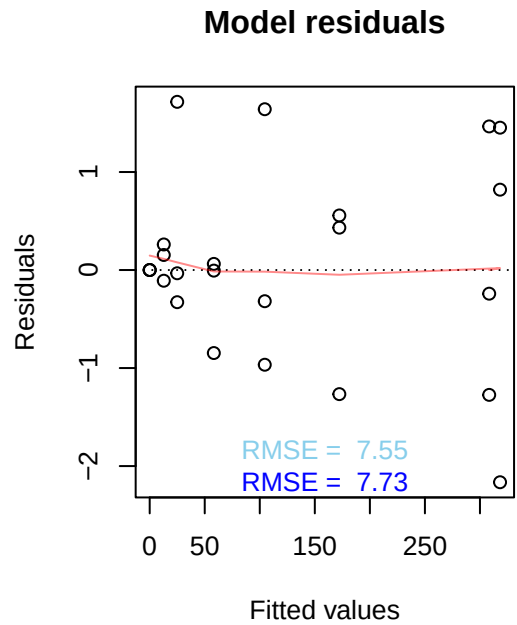

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 4.834
MAPE = 4.478
0
200
400
600
800
Substrate concentration NAG−MUF

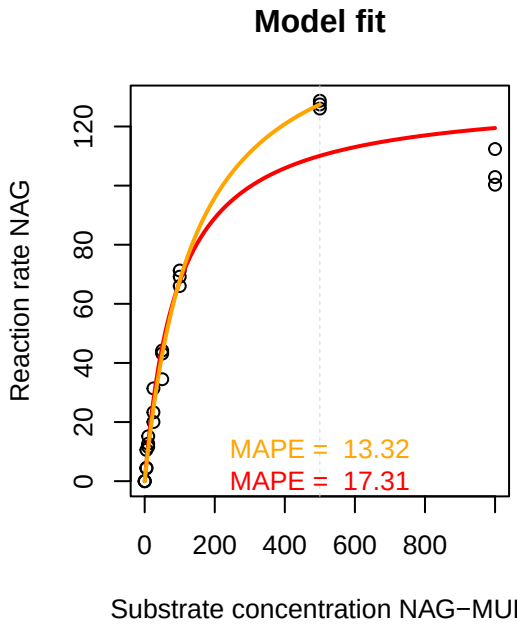

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 45.32
RMSE = 45.28
0
500
1500
2500
Fitted values

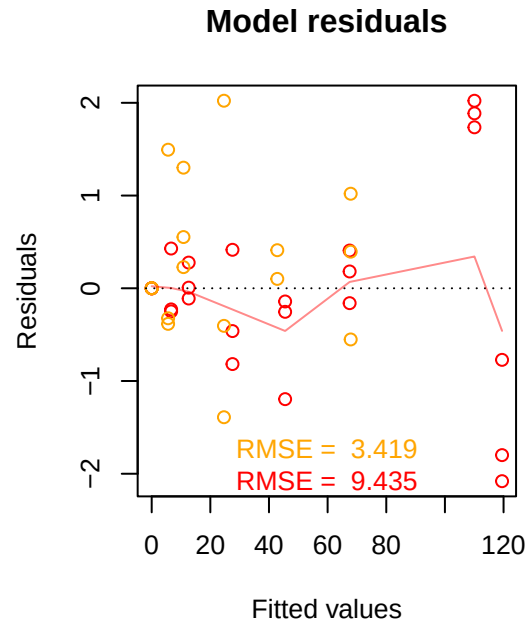

Model fit
Reaction rate NAG
0
50
150
250
0
200
400
600
800
MAPE = 8.466
MAPE = 11.09
Substrate concentration NAG−MUF

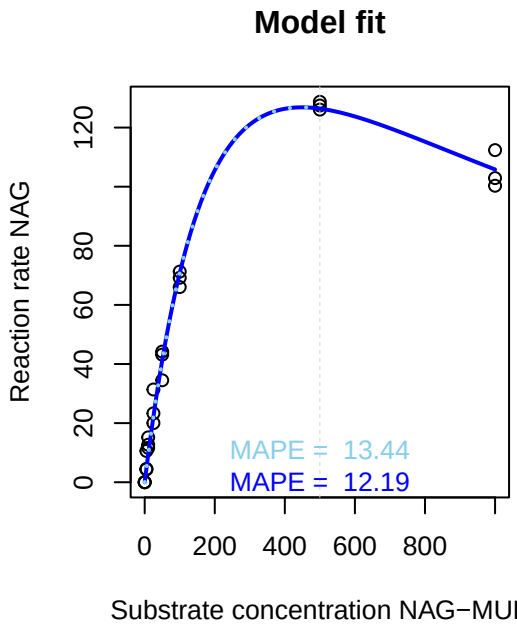

Model residuals
Residuals
−2
−1
0
1
2
0
50
150
250
RMSE = 7.724
RMSE = 13.89
Fitted values

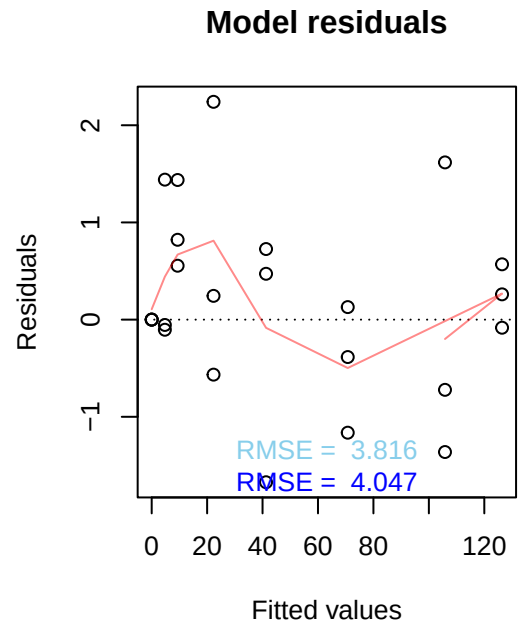

Model fit
Reaction rate NAG
0
50
150
250
0
200
400
600
800
MAPE = 7.327
MAPE = 6.635
Substrate concentration NAG−MUF

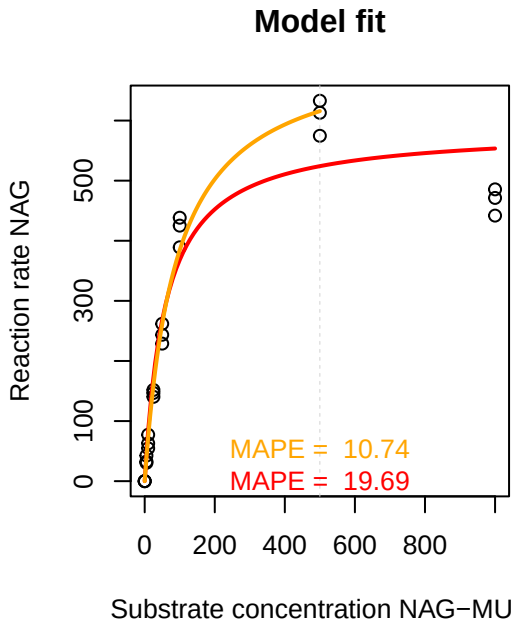

Model residuals
Residuals
−2
−1
0
1
0
50
150
250
RMSE = 7.55
RMSE = 7.73
Fitted values

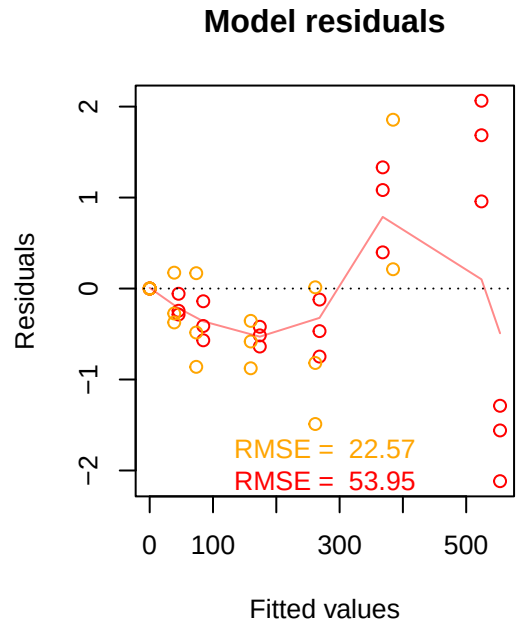

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 13.32
MAPE = 17.31
0
20
40
60
80
120
0
200
400
600
800

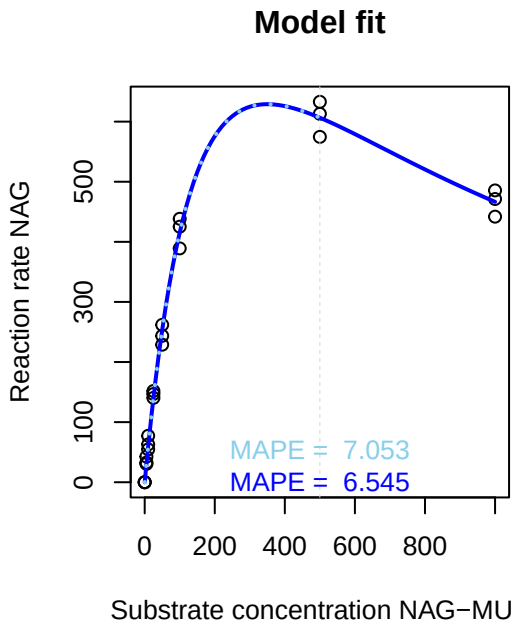

Model residuals
Residuals
Fitted values
RMSE = 3.419
RMSE = 9.435
−2
−1
0
1
2
0
20
40
60
80
120

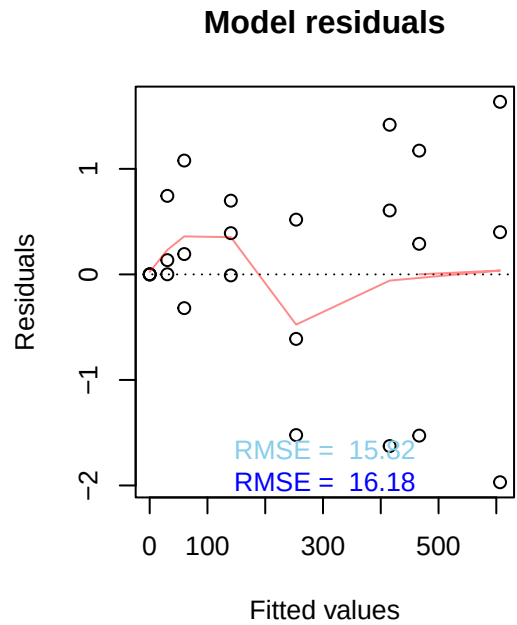

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 13.44
MAPE = 12.19
0
20
40
60
80
120
0
200
400
600
800

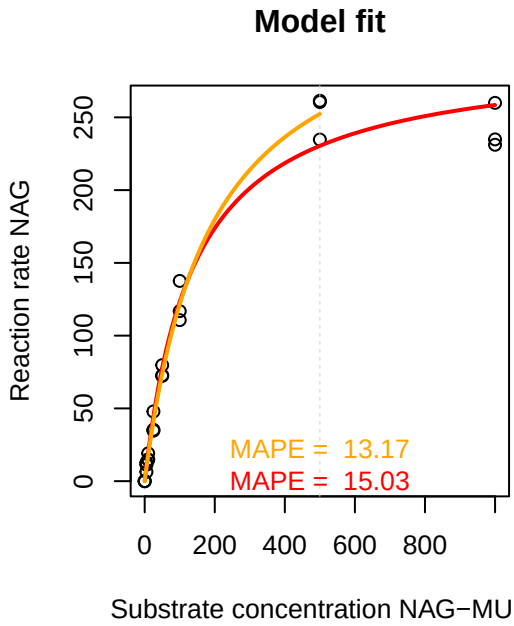

Model residuals
Residuals
Fitted values
RMSE = 3.816
RMSE = 4.047
−1
0
1
2
0
20
40
60
80
120

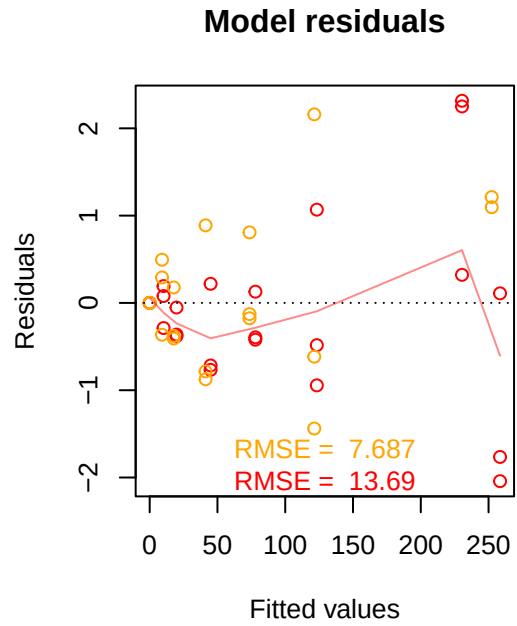

Model fit
Reaction rate NAG
0
100
300
500
MAPE = 10.74
MAPE = 19.69
0
200
400
600
800
Substrate concentration NAG−MUF

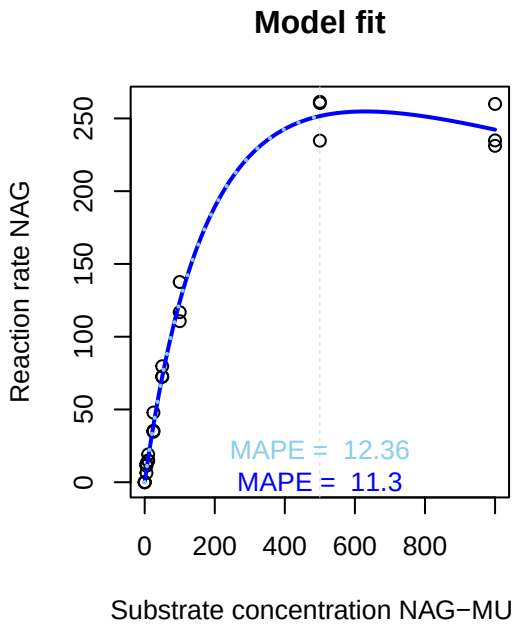

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 22.57
RMSE = 53.95
0
100
300
500
Fitted values

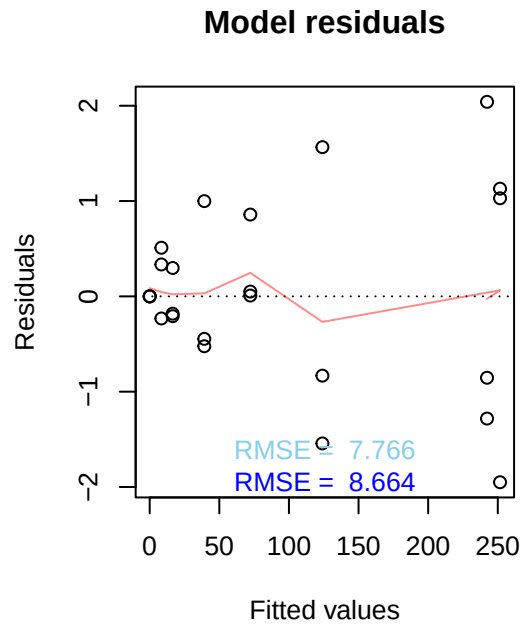

Model fit
Reaction rate NAG
0
100
300
500
MAPE = 7.053
MAPE = 6.545
0
200
400
600
800
Substrate concentration NAG−MUF

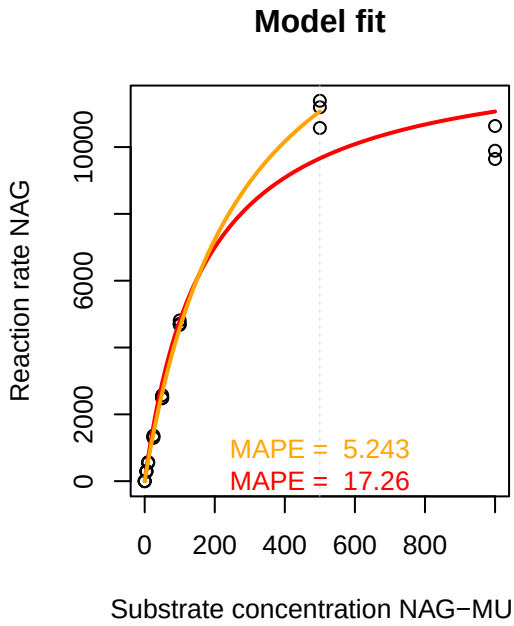

Model residuals
Residuals
−2
−1
0
1
RMSE = 15.82
RMSE = 16.18
0
100
300
500
Fitted values

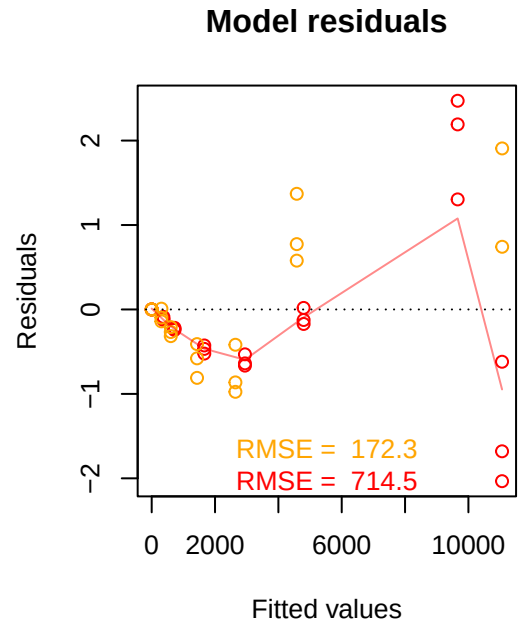

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 13.17
MAPE = 15.03
0
50
100
150
200
250
0
200
400
600
800

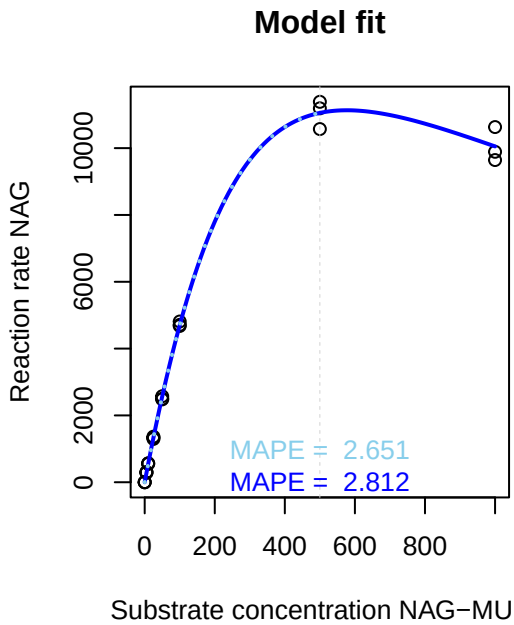

Model residuals
Residuals
Fitted values
RMSE = 7.687
RMSE = 13.69
−2
−1
0
1
2
0
50
100
150
200
250

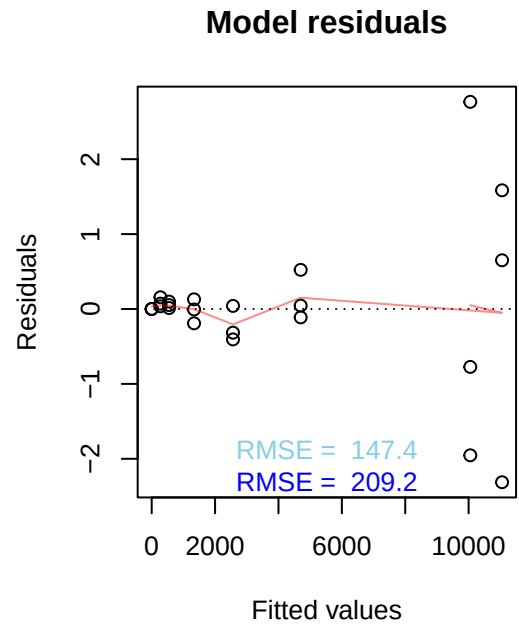

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 12.36
MAPE = 11.3
0
50
100
150
200
250
0
200
400
600
800

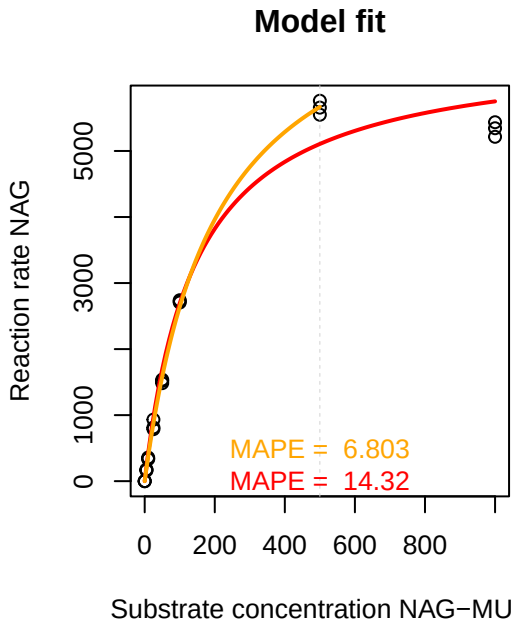

Model residuals
Residuals
Fitted values
RMSE = 7.766
RMSE = 8.664
−2
−1
0
1
2
0
50
100
150
200
250

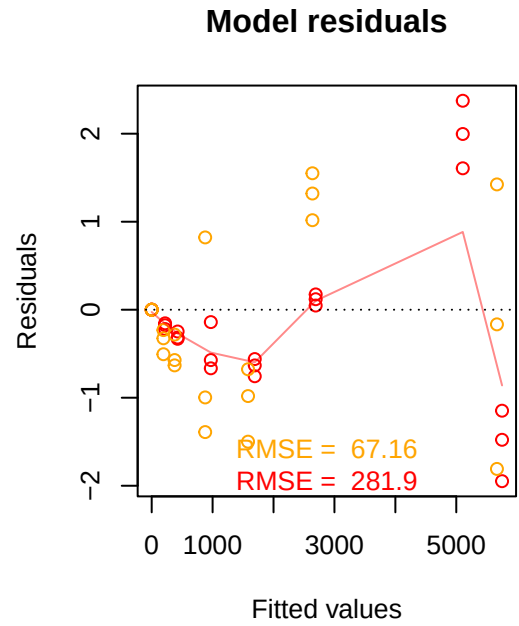

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 5.243
MAPE = 17.26
Substrate concentration NAG−MUF

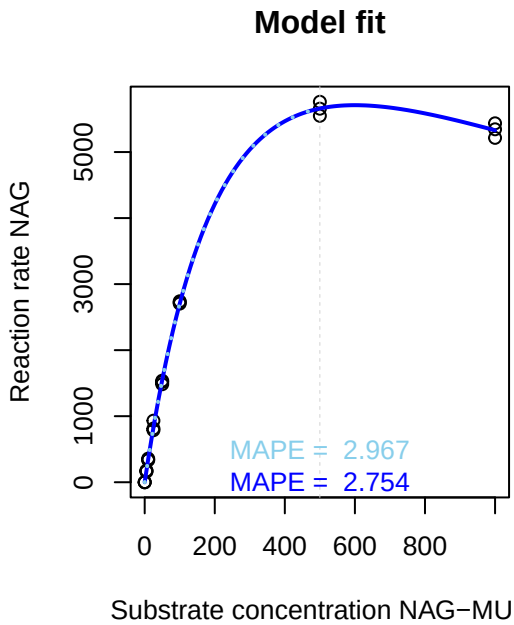

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 172.3
RMSE = 714.5
Fitted values

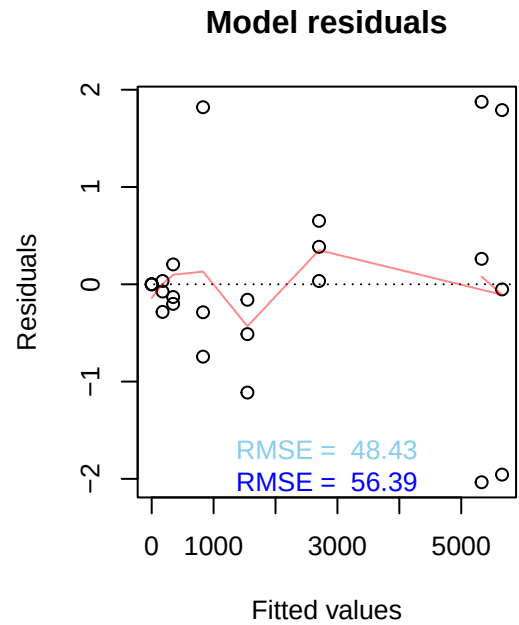

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 2.651
MAPE = 2.812
Substrate concentration NAG−MUF

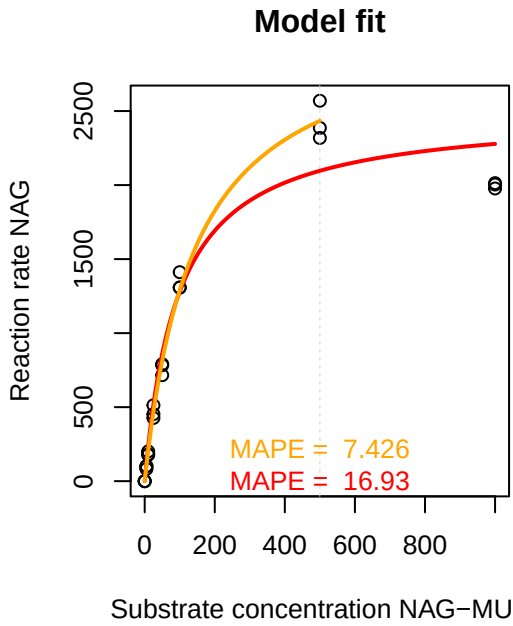

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 147.4
RMSE = 209.2
Fitted values

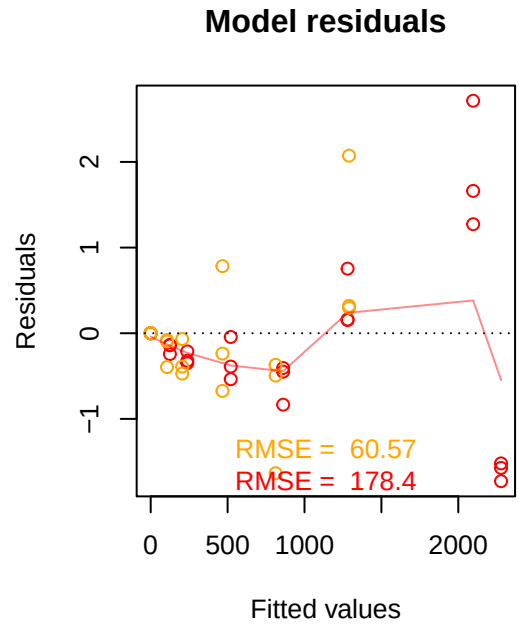

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 6.803
MAPE = 14.32
0
200
400
600
800
Substrate concentration NAG−MUF

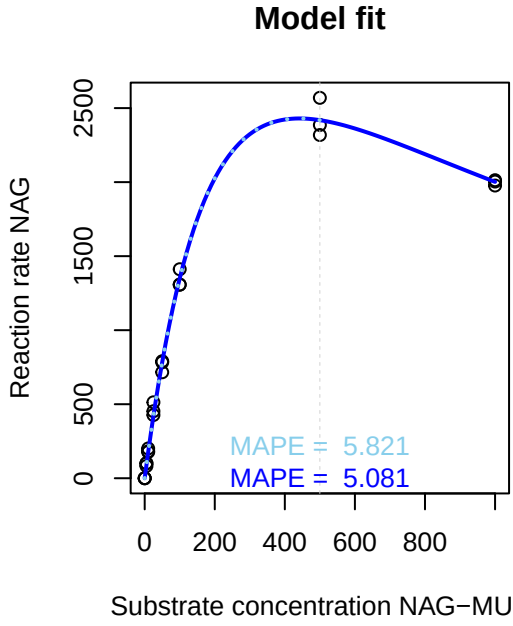

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 67.16
RMSE = 281.9
0
1000
3000
5000
Fitted values

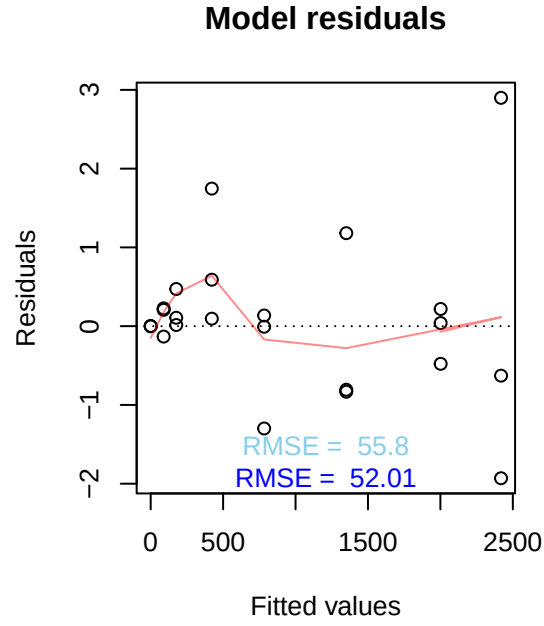

Model fit
Reaction rate NAG
0
1000
3000
5000
MAPE = 2.967
MAPE = 2.754
0
200
400
600
800
Substrate concentration NAG−MUF

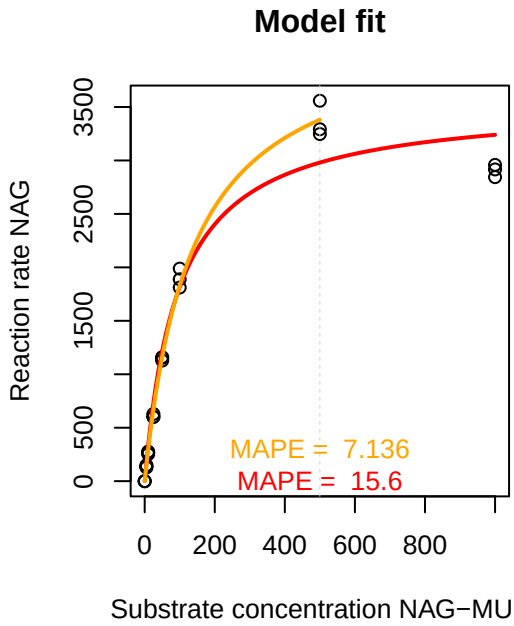

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 48.43
RMSE = 56.39
0
1000
3000
5000
Fitted values

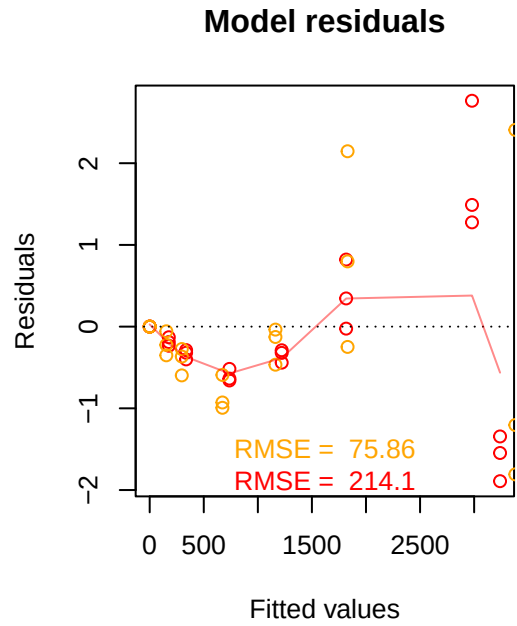

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 7.426
MAPE = 16.93
0
200
400
600
800
Substrate concentration NAG−MUF

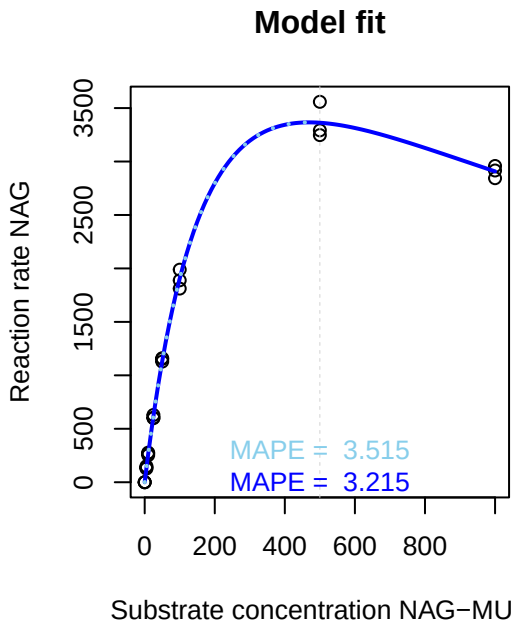

Model residuals
Residuals
−1
0
1
2
RMSE = 60.57
RMSE = 178.4
0
500
1000
2000
Fitted values

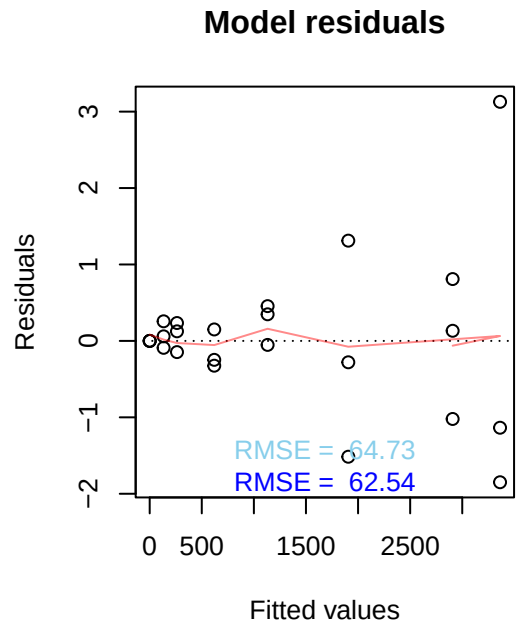

Model fit
Reaction rate NAG
0
500
1500
2500
MAPE = 5.821
MAPE = 5.081
0
200
400
600
800
Substrate concentration NAG−MUF

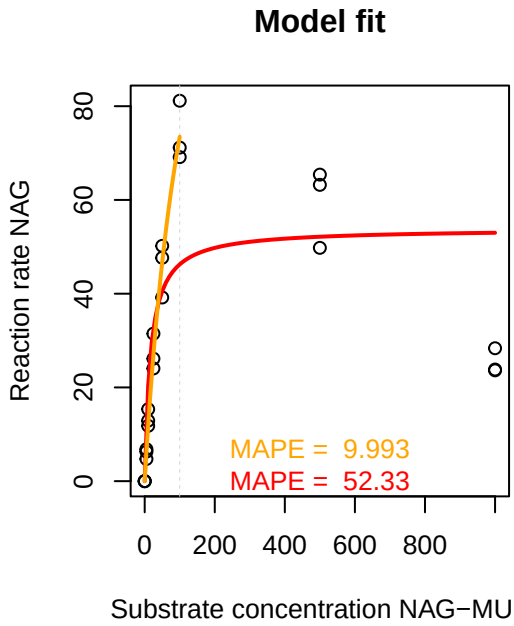

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 55.8
RMSE = 52.01
0
500
1500
2500
Fitted values

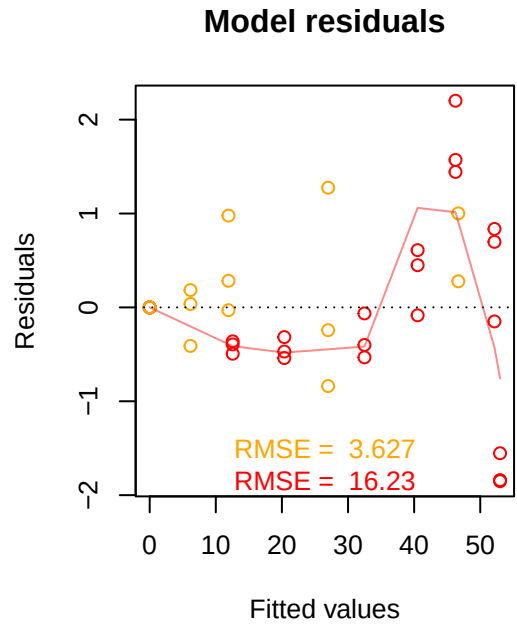

Model fit
Reaction rate NAG
0
500
1500
2500
3500
MAPE = 7.136
MAPE = 15.6
0
200
400
600
800
Substrate concentration NAG−MUF

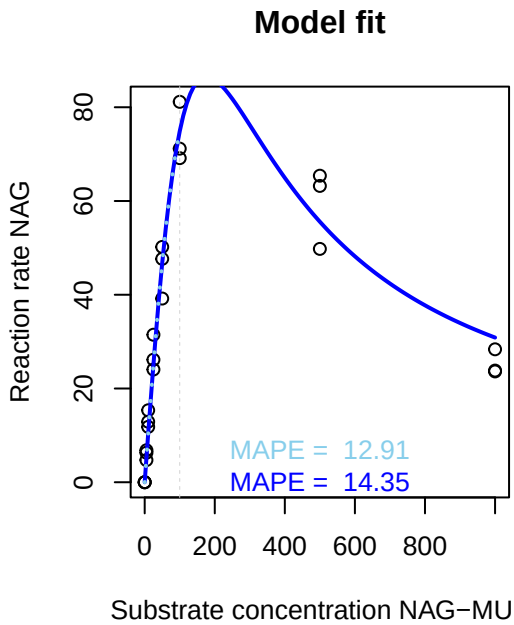

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 75.86
RMSE = 214.1
0
500
1500
2500
Fitted values

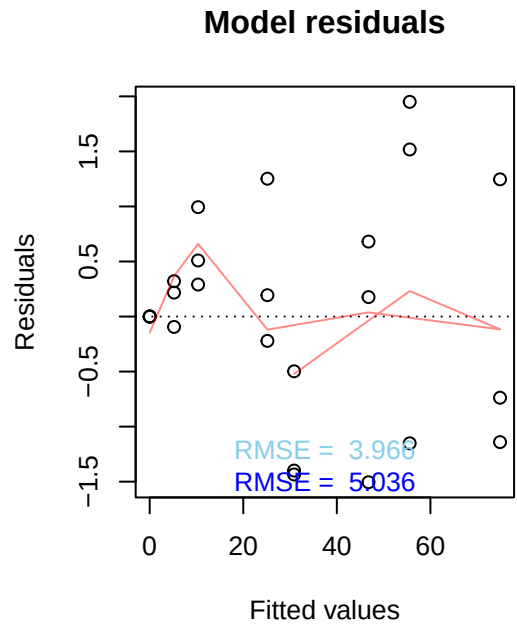

Model fit
Reaction rate NAG
0
500
1500
2500
3500
MAPE = 3.515
MAPE = 3.215
0
200
400
600
800
Substrate concentration NAG−MUF

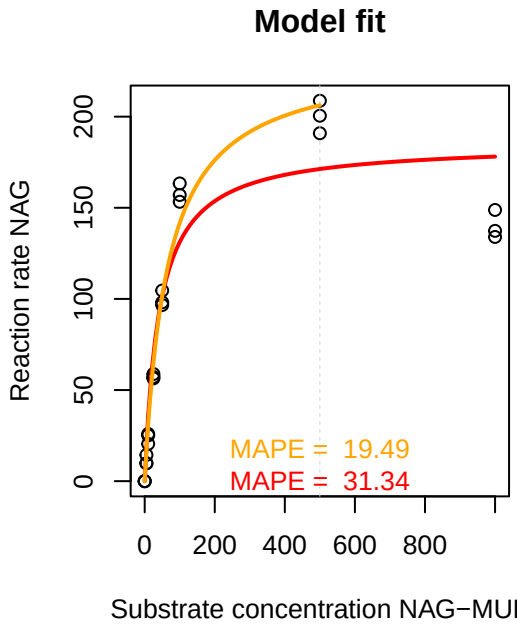

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 64.73
RMSE = 62.54
0
500
1500
2500
Fitted values

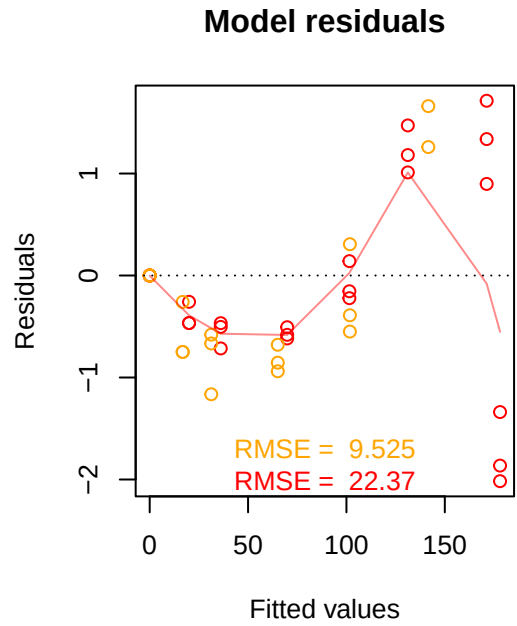

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 9.993
MAPE = 52.33
0
20
40
60
80
0
200
400
600
800

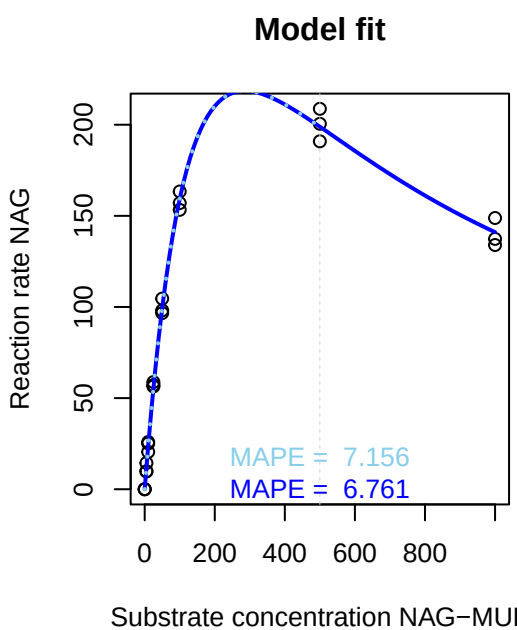

Model residuals
Residuals
Fitted values
RMSE = 3.627
RMSE = 16.23
−2
−1
0
1
2
0
10
20
30
40
50

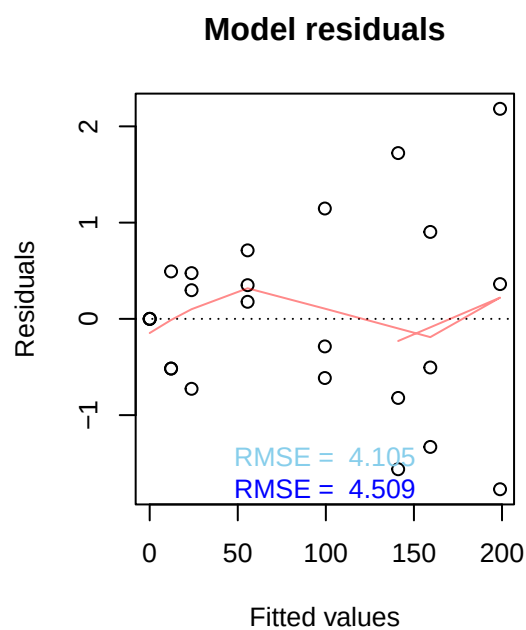

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 12.91
MAPE = 14.35
0
20
40
60
80
0
200
400
600
800

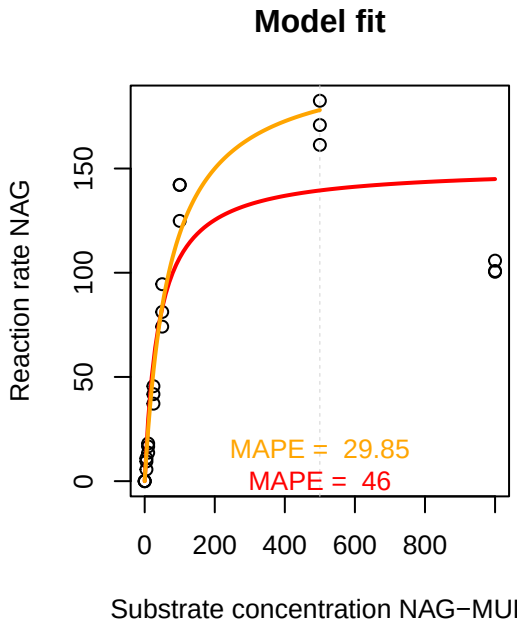

Model residuals
Residuals
Fitted values
RMSE = 3.968
RMSE = 5.036
−1.5
−0.5
0.5
1.5
0
20
40
60

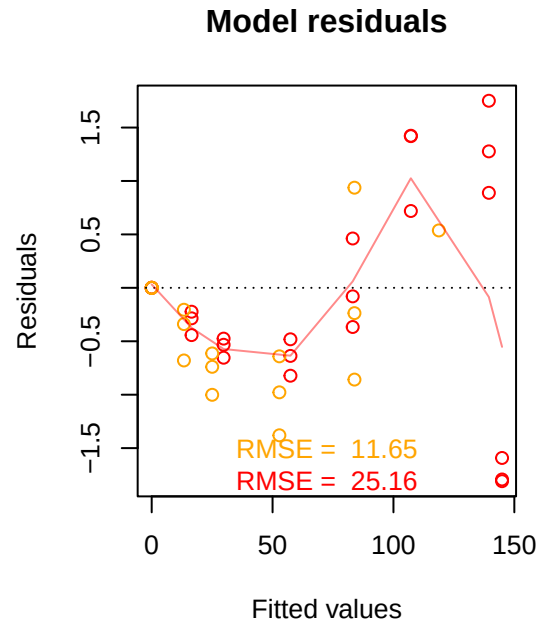

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 19.49
MAPE = 31.34
0
50
100
150
200
0
200
400
600
800

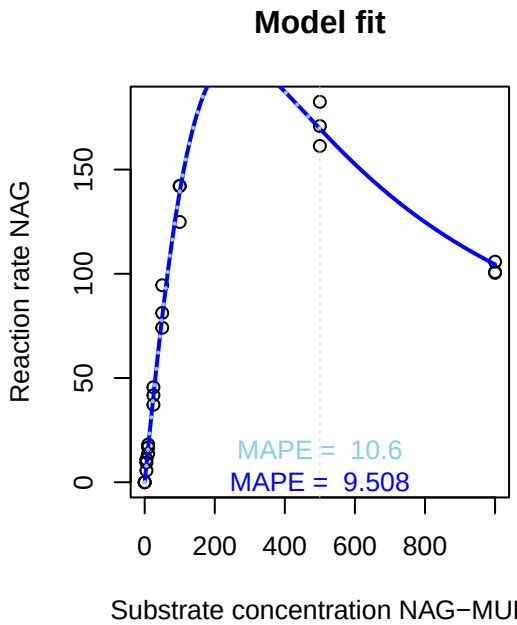

Model residuals
Residuals
Fitted values
RMSE = 9.525
RMSE = 22.37
−2
−1
0
1
0
50
100
150

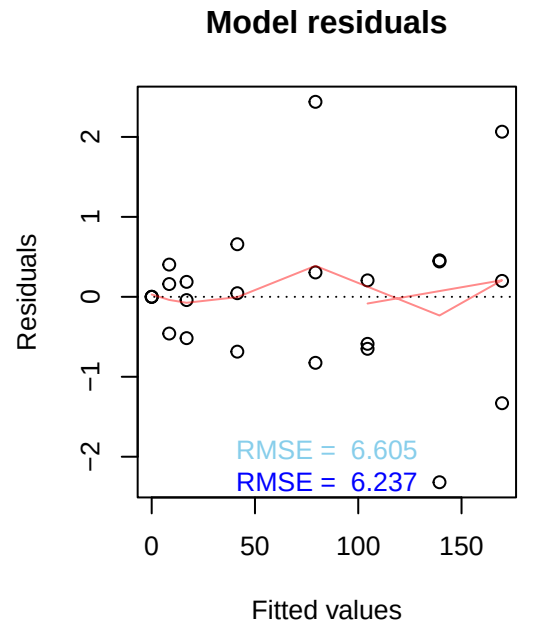

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 7.156
MAPE = 6.761
0
50
100
150
200
0
200
400
600
800

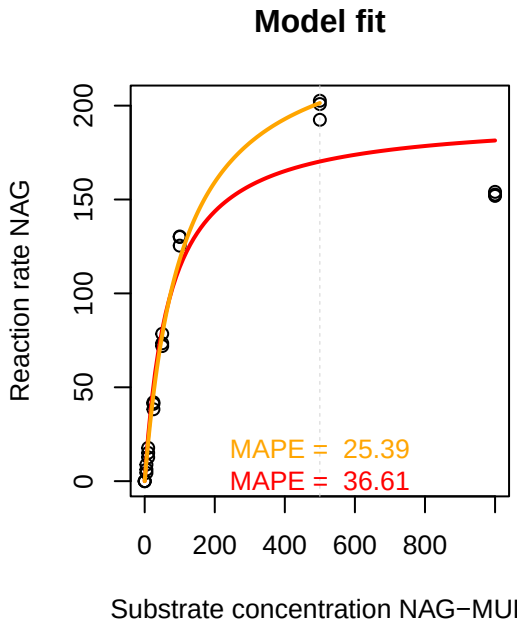

Model residuals
Residuals
Fitted values
RMSE = 4.105
RMSE = 4.509
−1
0
1
2
0
50
100
150
200

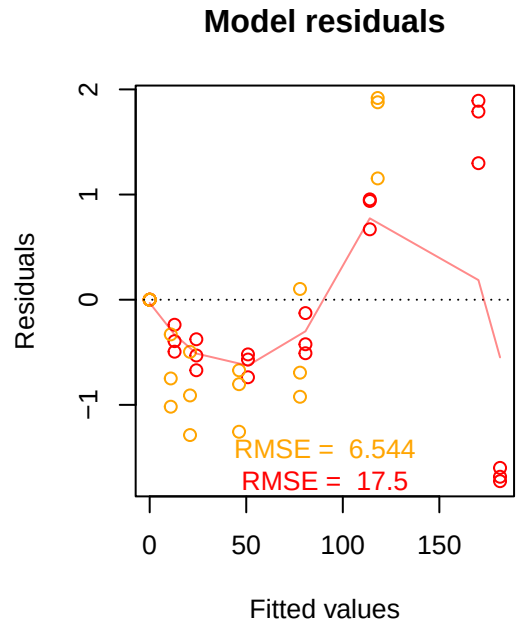

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 29.85
MAPE = 46
Substrate concentration NAG−MUF

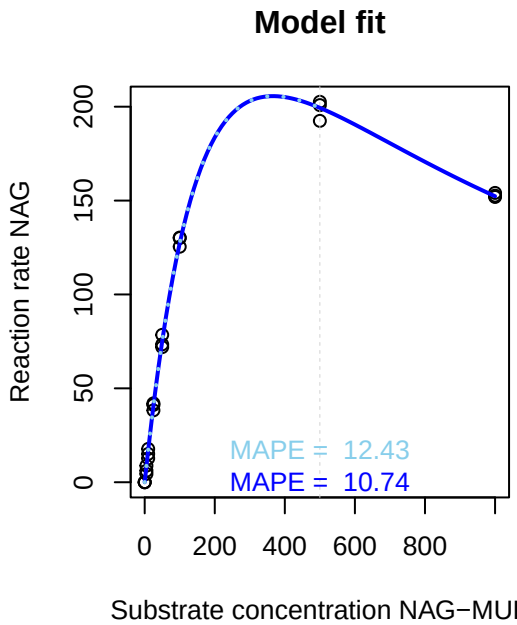

Model residuals
Residuals
−1.5
−0.5
0.5
1.5
0
50
100
150
RMSE = 11.65
RMSE = 25.16
Fitted values

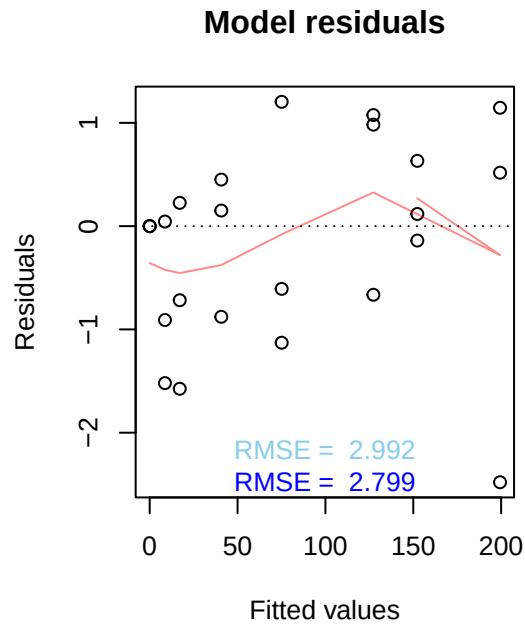

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 10.6
MAPE = 9.508
Substrate concentration NAG−MUF

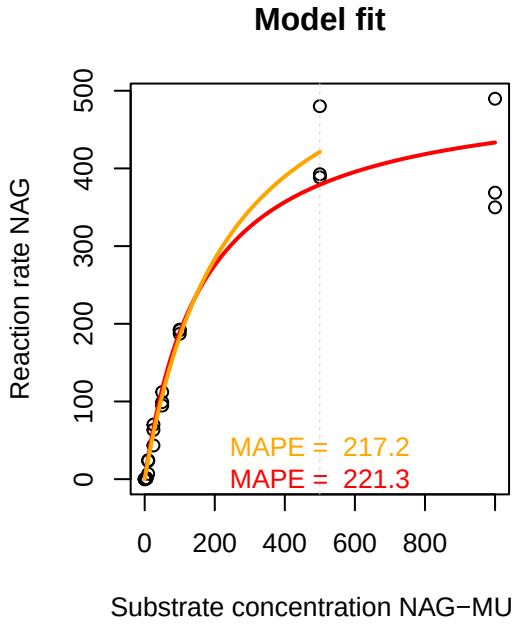

Model residuals
Residuals
−2
−1
0
1
2
0
50
100
150
RMSE = 6.605
RMSE = 6.237
Fitted values

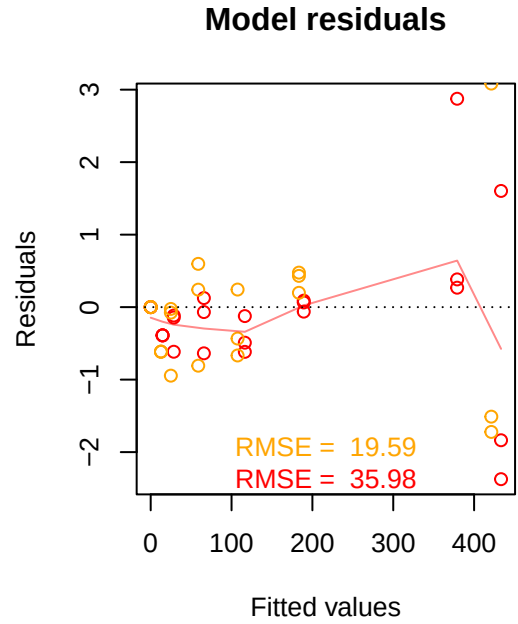

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 25.39
MAPE = 36.61
0
50
100
150
200
0
200
400
600
800

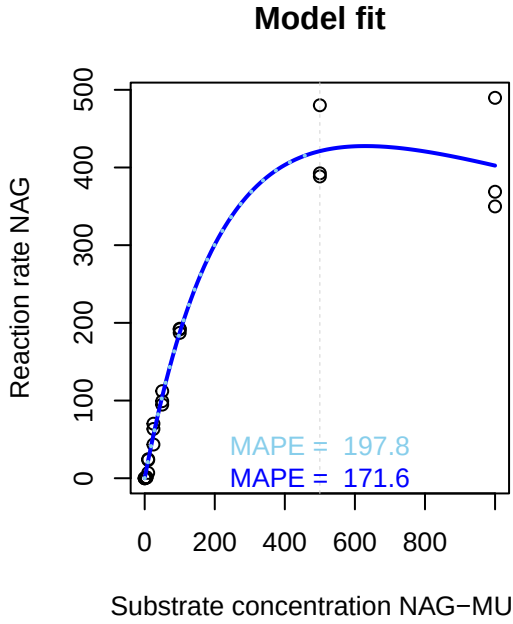

Model residuals
Residuals
Fitted values
RMSE = 6.544
RMSE = 17.5
−1
0
1
2
0
50
100
150

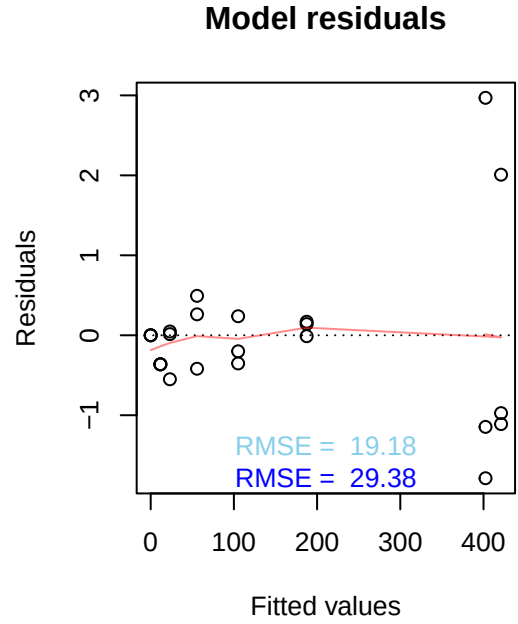

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 12.43
MAPE = 10.74
0
50
100
150
200
0
200
400
600
800

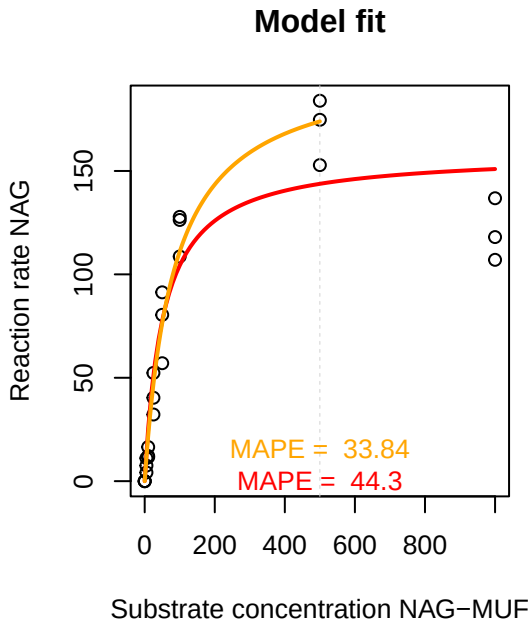

Model residuals
Residuals
Fitted values
RMSE = 2.992
RMSE = 2.799
−2
−1
0
1
0
50
100
150
200

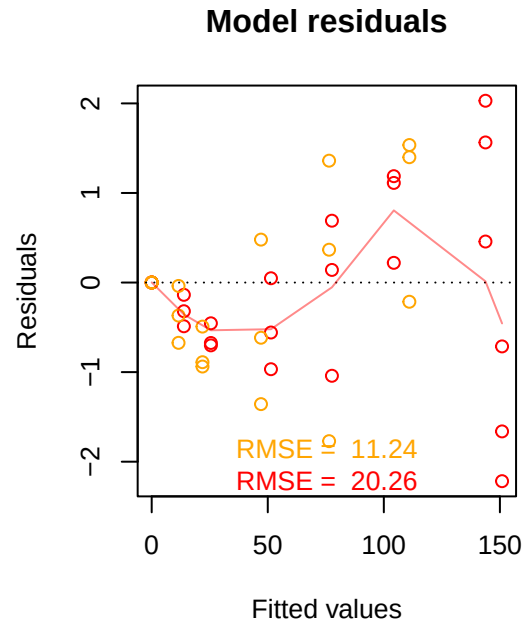

Model fit
Reaction rate NAG
0
100
200
300
400
500
MAPE = 217.2
MAPE = 221.3
0
200
400
600
800
Substrate concentration NAG−MUF

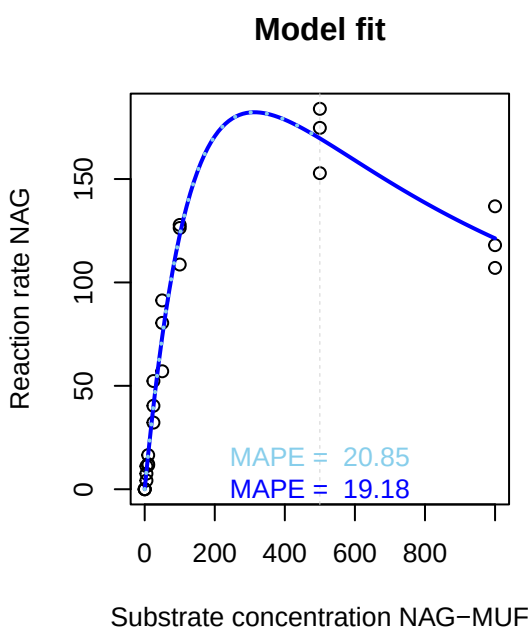

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 19.59
RMSE = 35.98
0
100
200
300
400
Fitted values

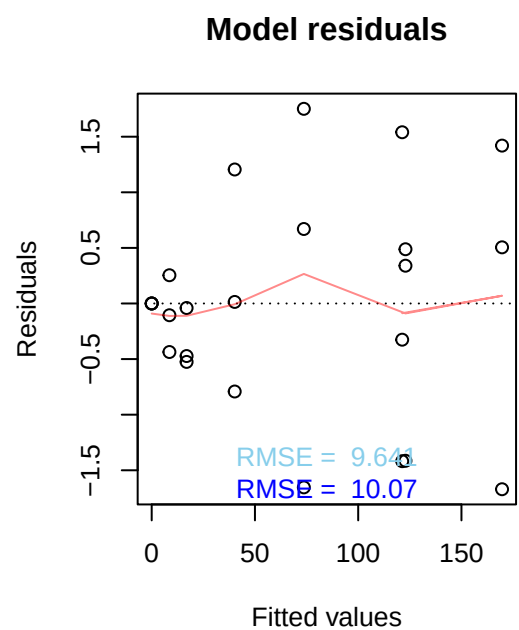

Model fit
Reaction rate NAG
0
100
200
300
400
500
MAPE = 197.8
MAPE = 171.6
0
200
400
600
800
Substrate concentration NAG−MUF

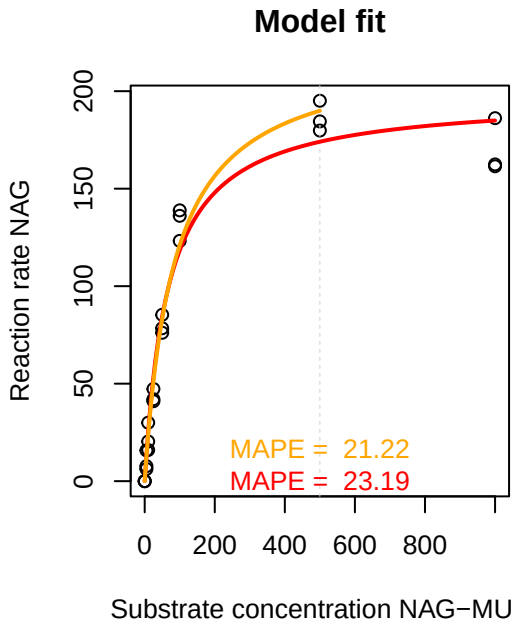

Model residuals
Residuals
−1
0
1
2
3
RMSE = 19.18
RMSE = 29.38
0
100
200
300
400
Fitted values

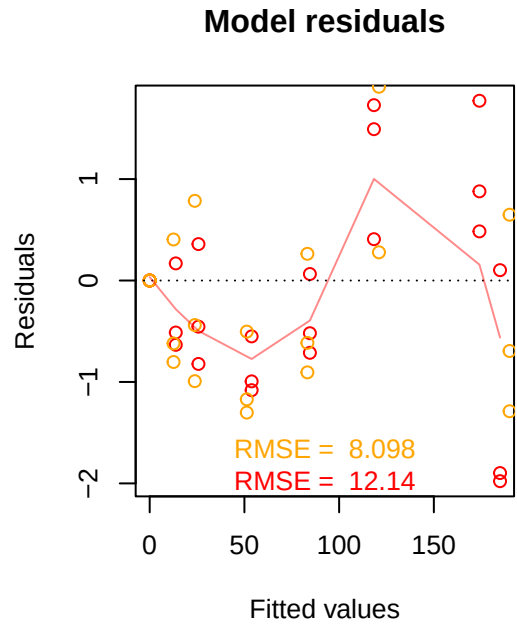

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 33.84
MAPE = 44.3
0
50
100
150
0
200
400
600
800

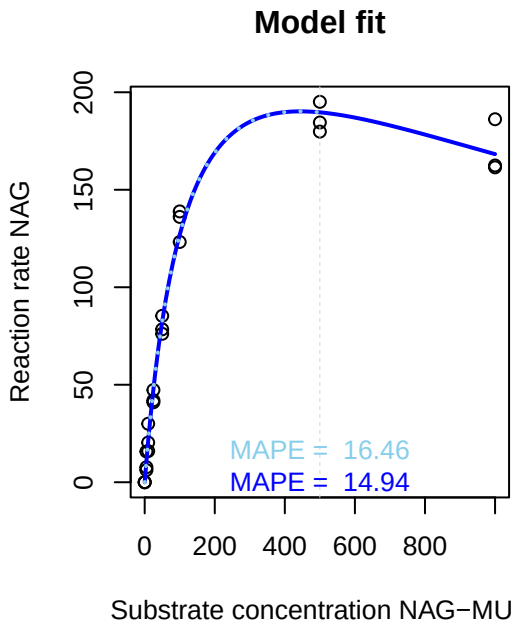

Model residuals
Residuals
Fitted values
RMSE = 11.24
RMSE = 20.26
−2
−1
0
1
2
0
50
100
150

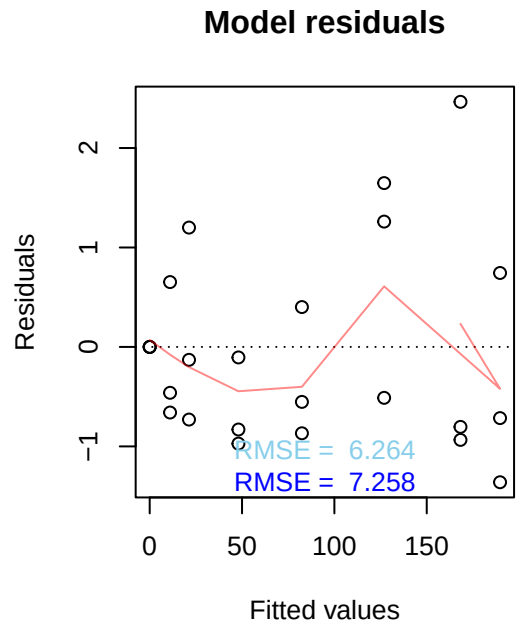

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 20.85
MAPE = 19.18
0
50
100
150
0
200
400
600
800

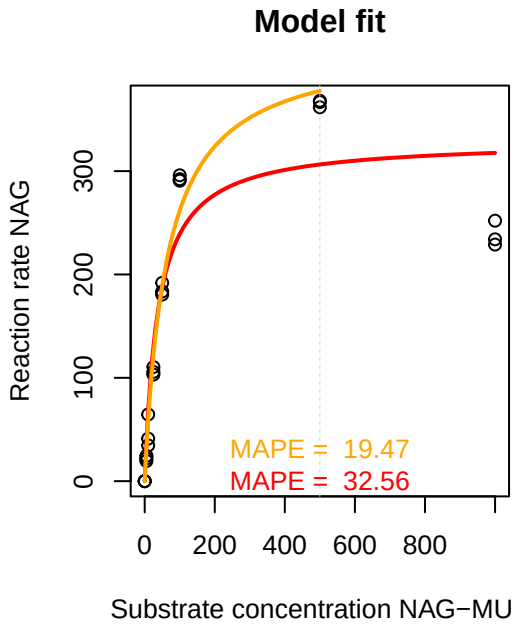

Model residuals
Residuals
Fitted values
RMSE = 9.641
RMSE = 10.07
−1.5
−0.5
0.5
1.5
0
50
100
150

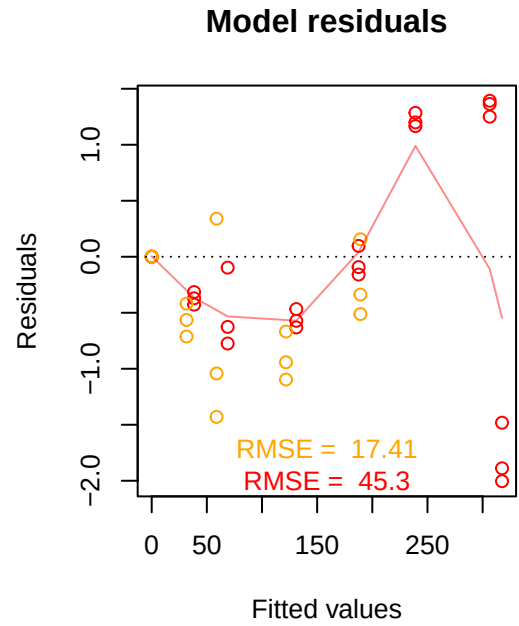

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 21.22
MAPE = 23.19
0
50
100
150
200
0
200
400
600
800

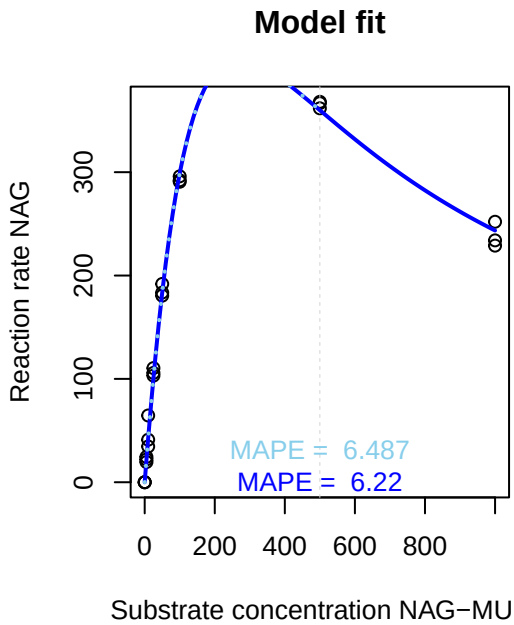

Model residuals
Residuals
Fitted values
RMSE = 8.098
RMSE = 12.14
−2
−1
0
1
0
50
100
150

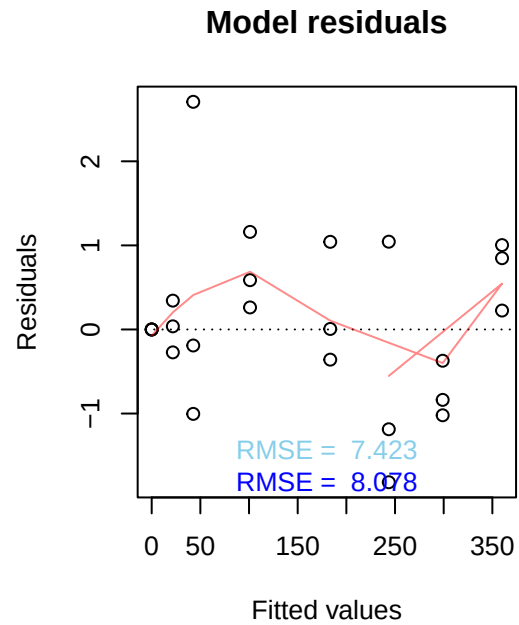

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 16.46
MAPE = 14.94
0
50
100
150
200
0
200
400
600
800

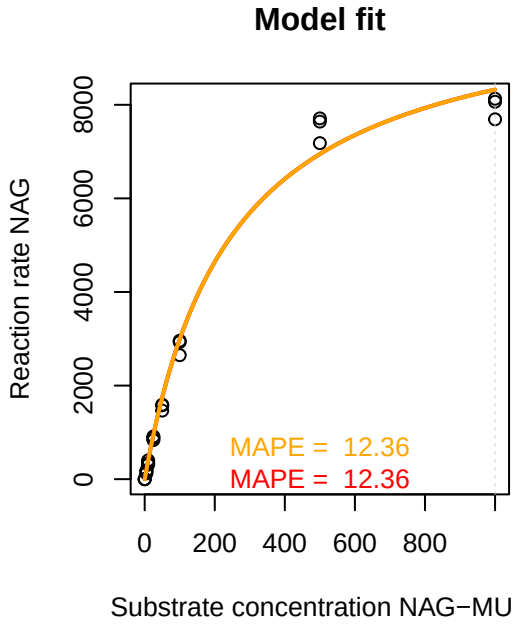

Model residuals
Residuals
Fitted values
RMSE = 6.264
RMSE = 7.258
−1
0
1
2
0
50
100
150

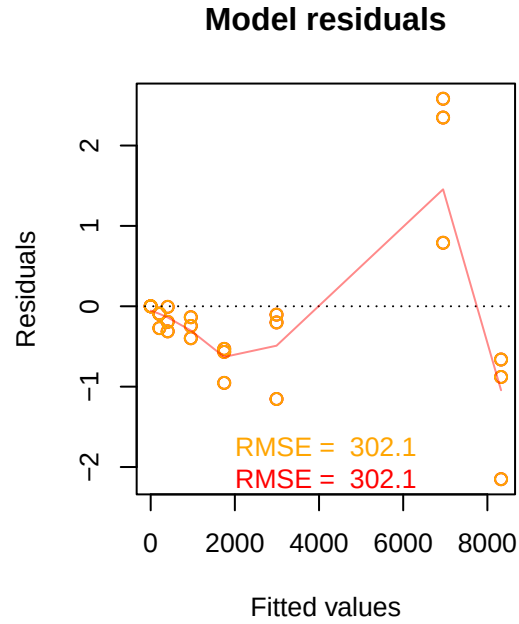

Model fit
Reaction rate NAG
0
100
200
300
0
200
400
600
800
MAPE = 19.47
MAPE = 32.56
Substrate concentration NAG−MUF

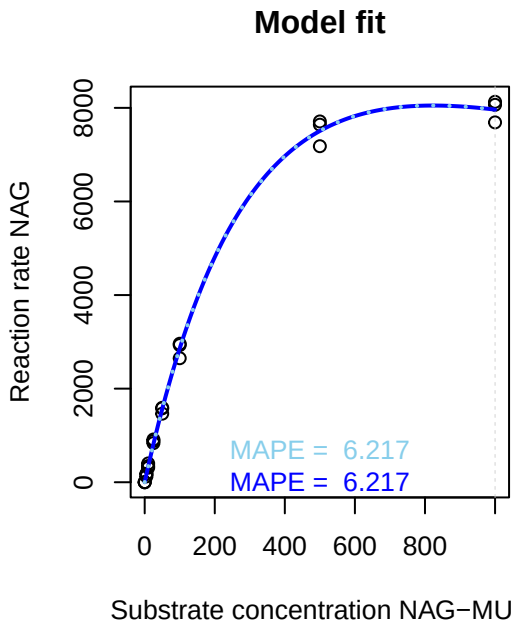

Model residuals
Residuals
−2.0
−1.0
0.0
1.0
0
50
150
250
RMSE = 17.41
RMSE = 45.3
Fitted values

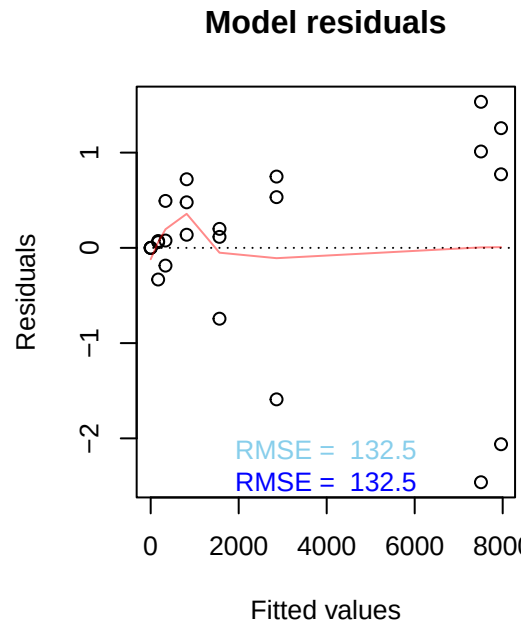

Model fit
Reaction rate NAG
0
100
200
300
0
200
400
600
800
MAPE = 6.487
MAPE = 6.22
Substrate concentration NAG−MUF

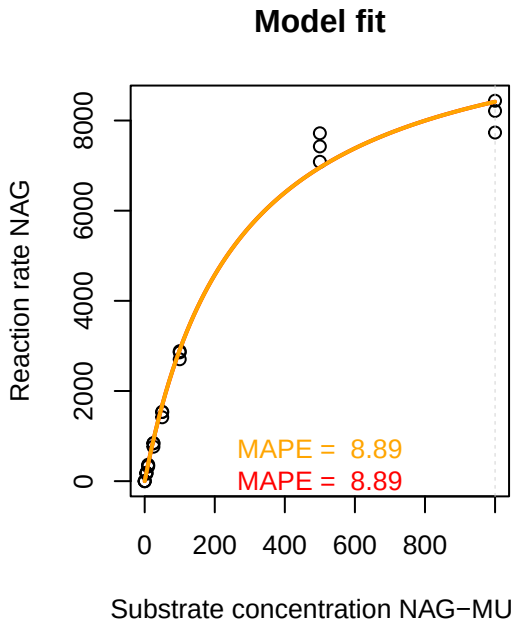

Model residuals
Residuals
−1
0
1
2
0
50
150
250
350
RMSE = 7.423
RMSE = 8.078
Fitted values

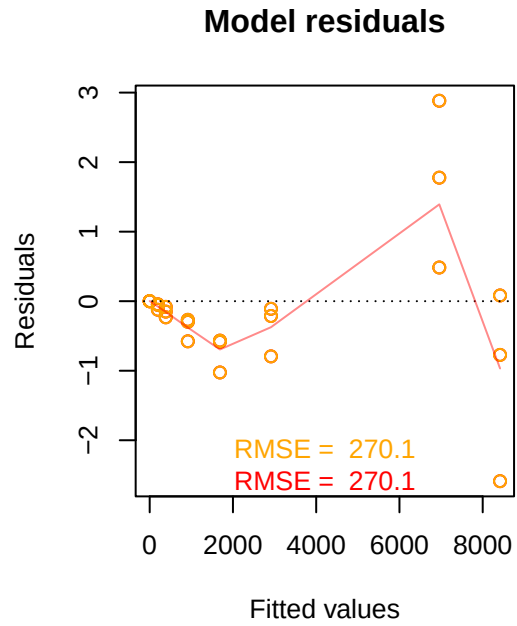

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 12.36
MAPE = 12.36
0
2000
4000
6000
8000
0
200
400
600
800

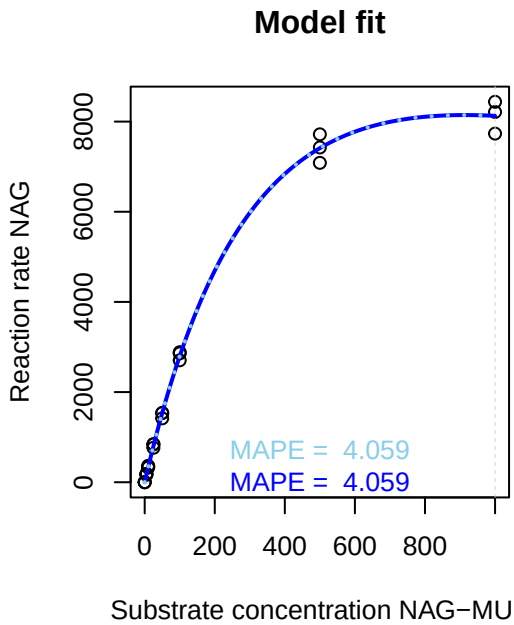

Model residuals
Residuals
Fitted values
RMSE = 302.1
RMSE = 302.1
−2
−1
0
1
2
0
2000
4000
6000
8000

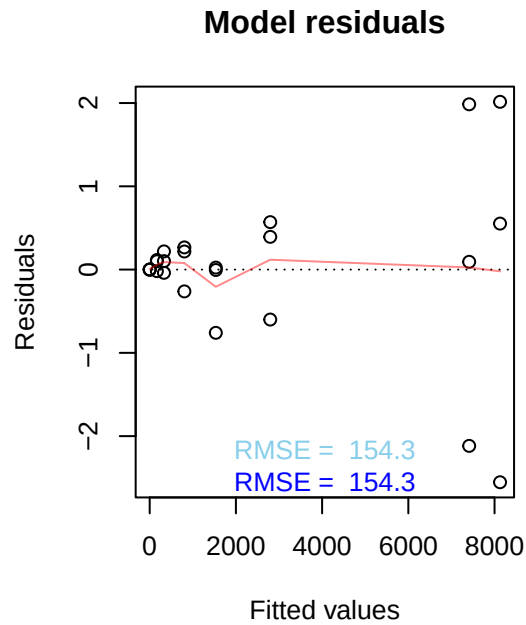

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 6.217
MAPE = 6.217
0
2000
4000
6000
8000
0
200
400
600
800

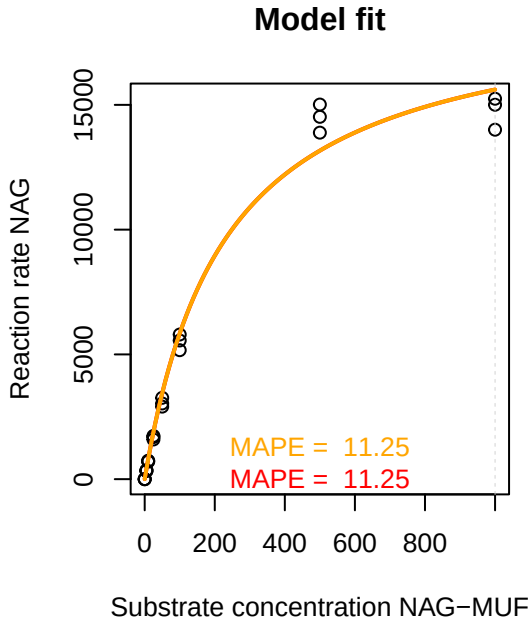

Model residuals
Residuals
Fitted values
RMSE = 132.5
RMSE = 132.5
−2
−1
0
1
0
2000
4000
6000
8000

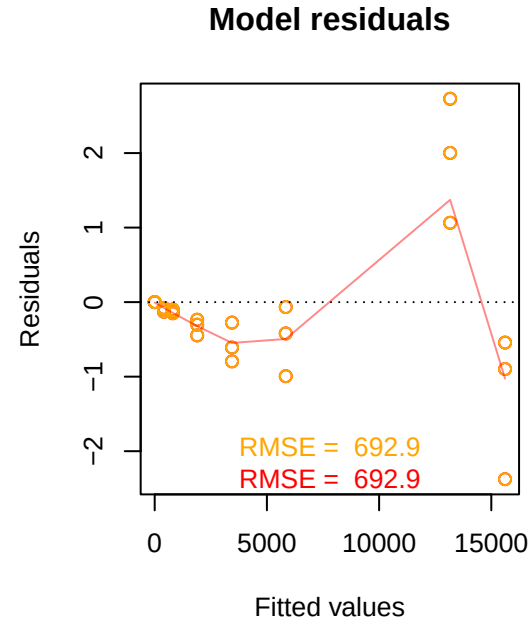

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 8.89
MAPE = 8.89
0
200
400
600
800
Substrate concentration NAG−MUF

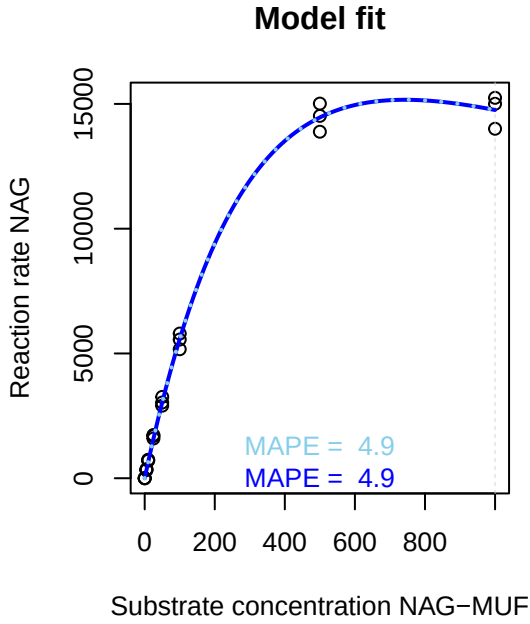

Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 270.1
RMSE = 270.1
0
2000
4000
6000
8000
Fitted values

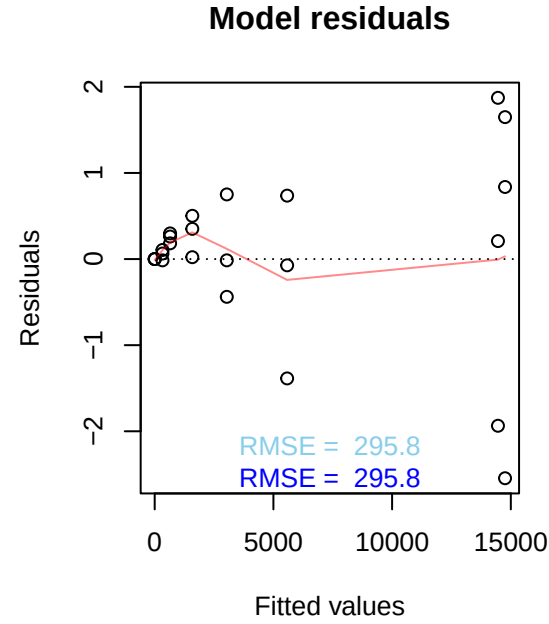

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 4.059
MAPE = 4.059
0
200
400
600
800
Substrate concentration NAG−MUF

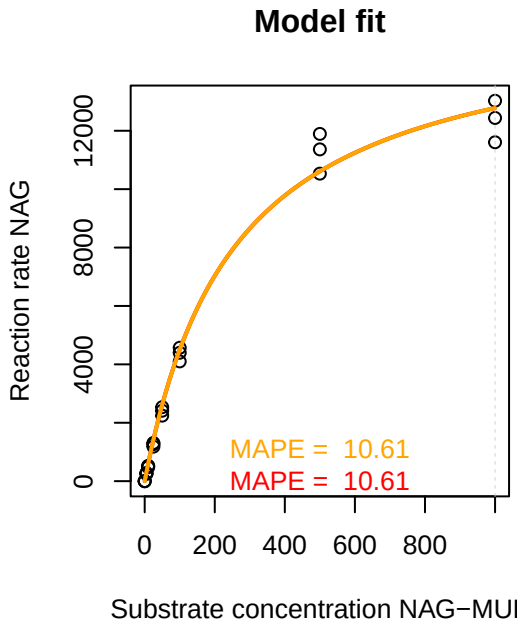

Model residuals
Residuals
−2
−1
0
1
2
RMSE = 154.3
RMSE = 154.3
0
2000
4000
6000
8000
Fitted values

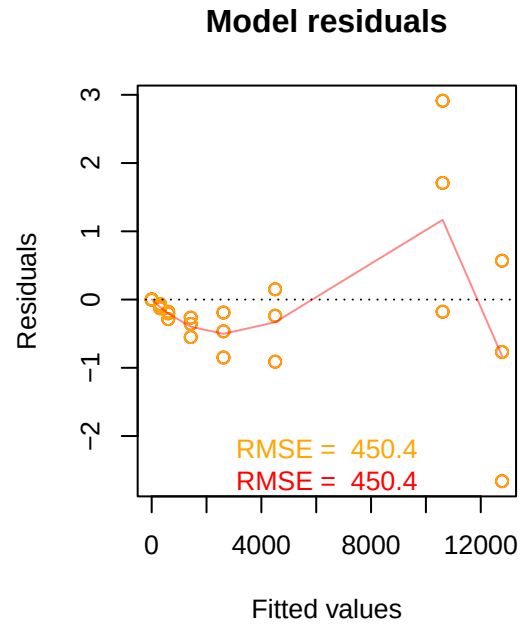

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 11.25
MAPE = 11.25

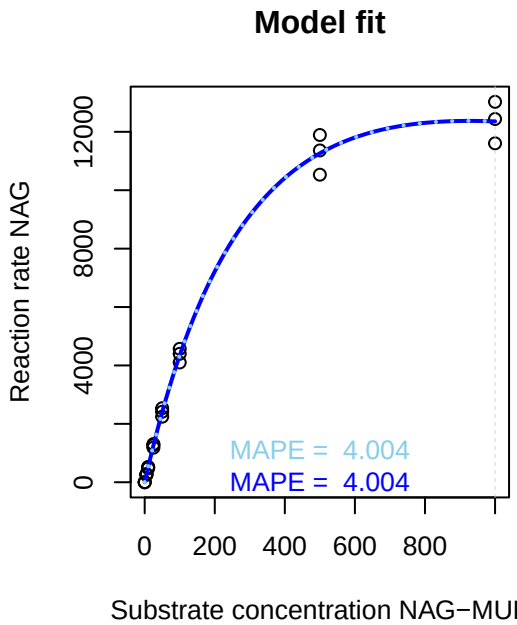

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 692.9
RMSE = 692.9

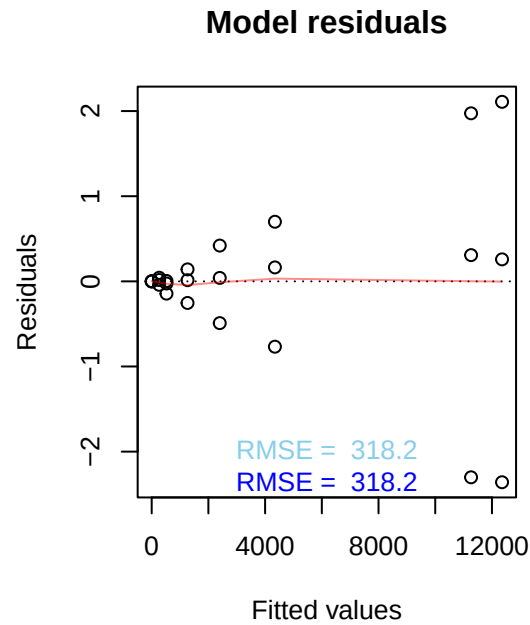

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 4.9
MAPE = 4.9

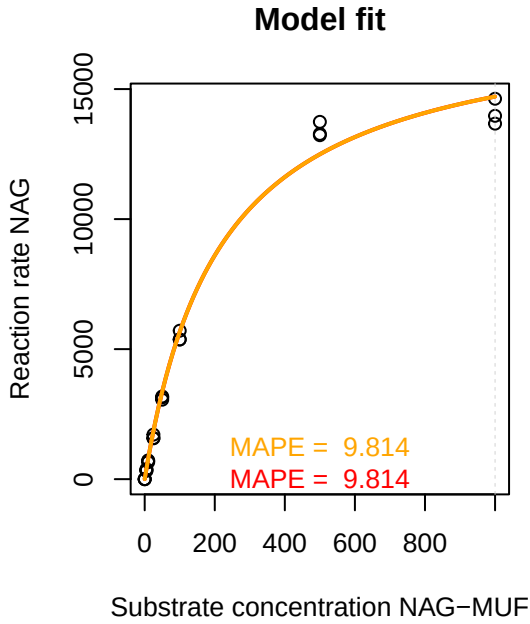

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 295.8
RMSE = 295.8

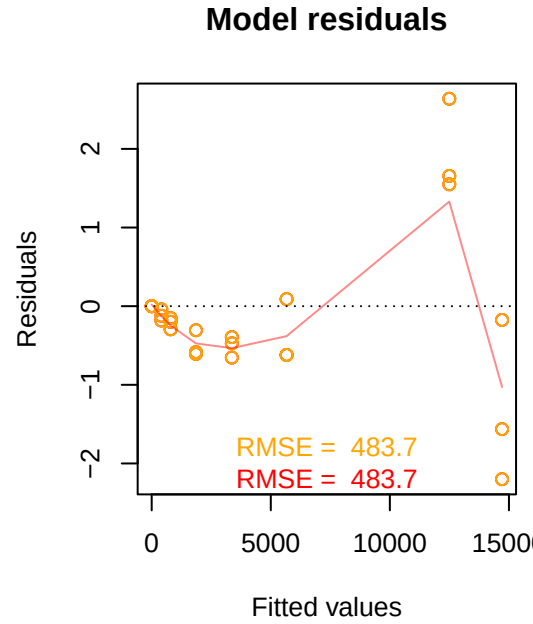

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 10.61
MAPE = 10.61

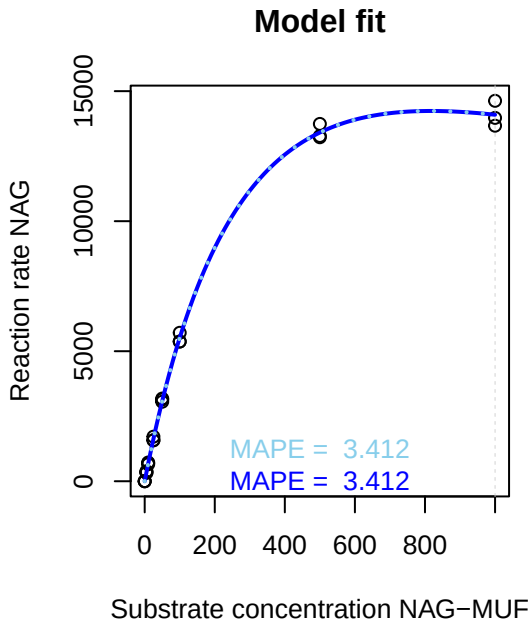

Model residuals
Residuals
−2
−1
0
1
2
3
0
4000
8000
12000
Fitted values
RMSE = 450.4
RMSE = 450.4

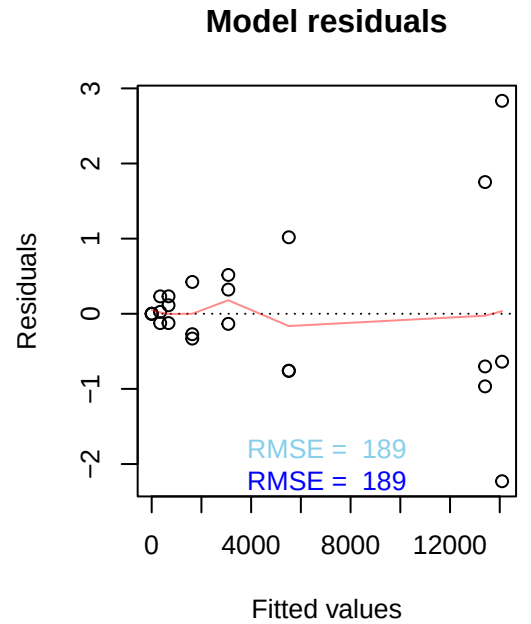

Model fit
Reaction rate NAG
0
4000
8000
12000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 4.004
MAPE = 4.004

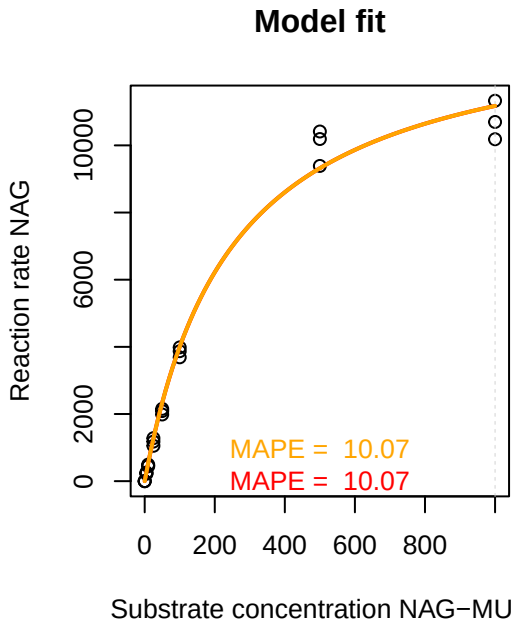

Model residuals
Residuals
−2
−1
0
1
2
0
4000
8000
12000
Fitted values
RMSE = 318.2
RMSE = 318.2

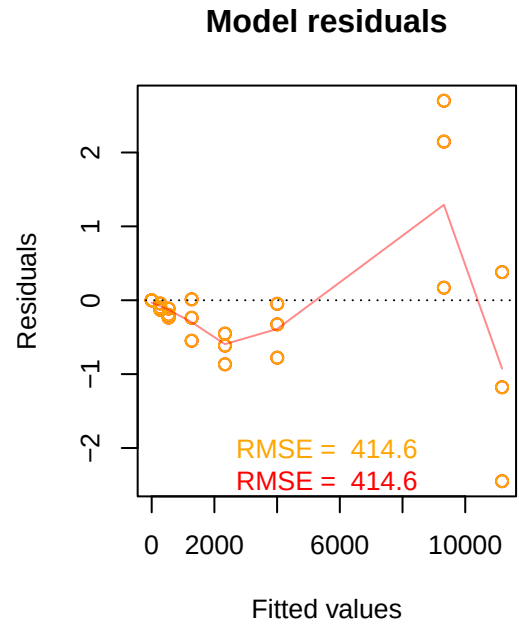

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 9.814
MAPE = 9.814

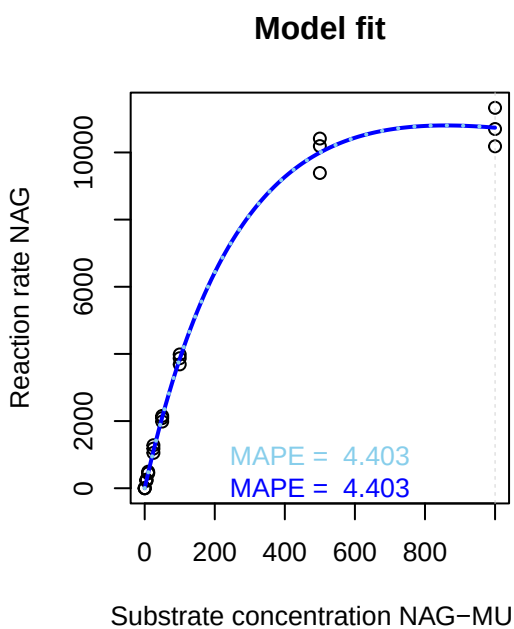

Model residuals
Residuals
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 483.7
RMSE = 483.7

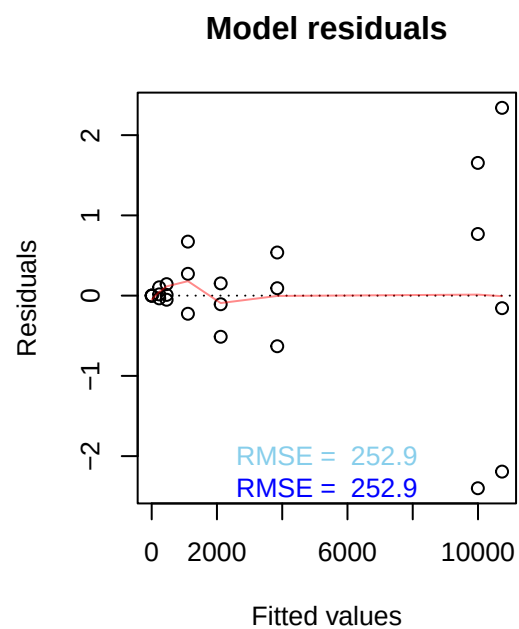

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 3.412
MAPE = 3.412

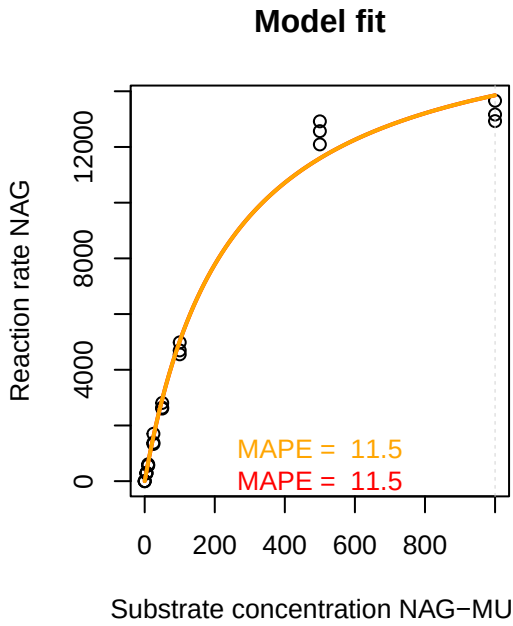

Model residuals
Residuals
−2
−1
0
1
2
3
0
4000
8000
12000
Fitted values
RMSE = 189
RMSE = 189

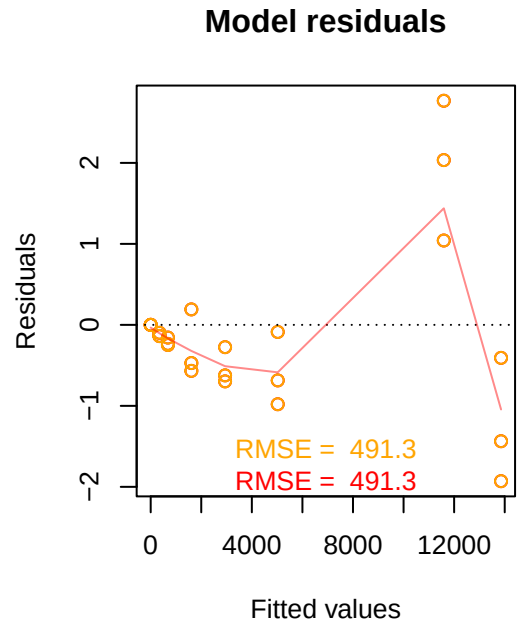

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 10.07
MAPE = 10.07
Substrate concentration NAG−MUF

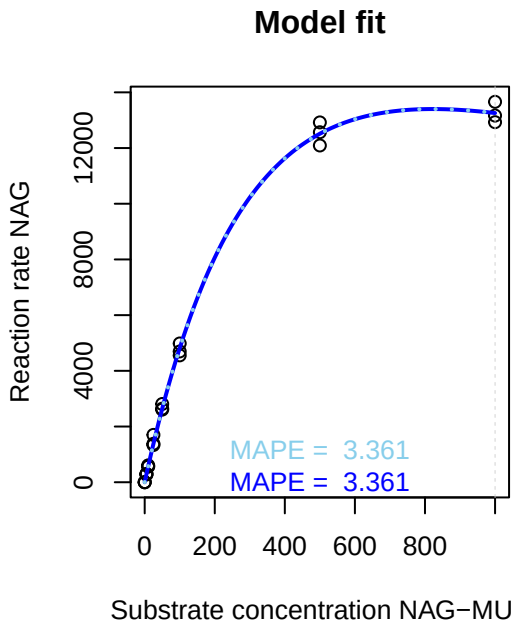

Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 414.6
RMSE = 414.6
Fitted values

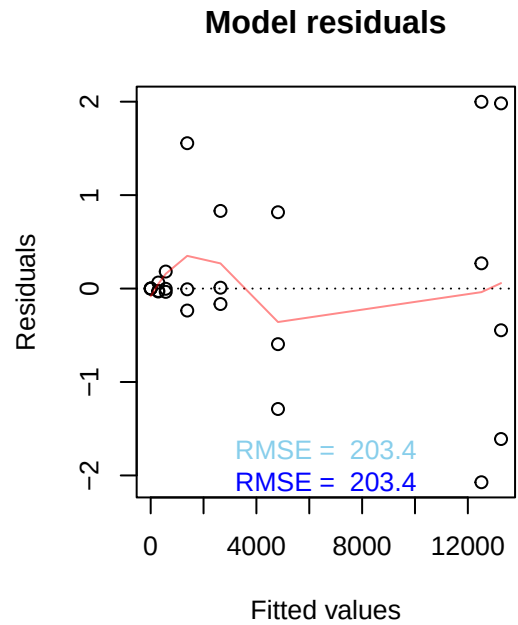

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 4.403
MAPE = 4.403
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 252.9
RMSE = 252.9
Fitted values

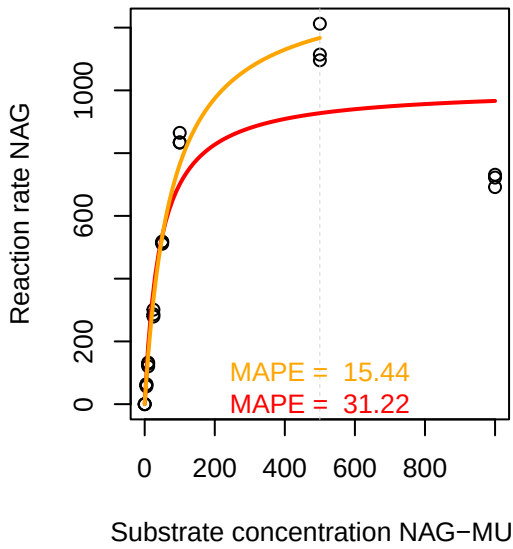

Model fit
Reaction rate NAG
0
4000
8000
12000
MAPE = 11.5
MAPE = 11.5
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 491.3
RMSE = 491.3
0
4000
8000
12000
Fitted values

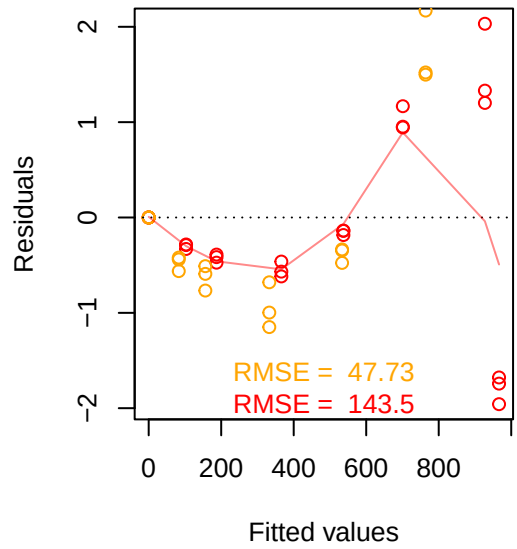

Model fit
Reaction rate NAG
0
4000
8000
12000
MAPE = 3.361
MAPE = 3.361
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 203.4
RMSE = 203.4
0
4000
8000
12000
Fitted values

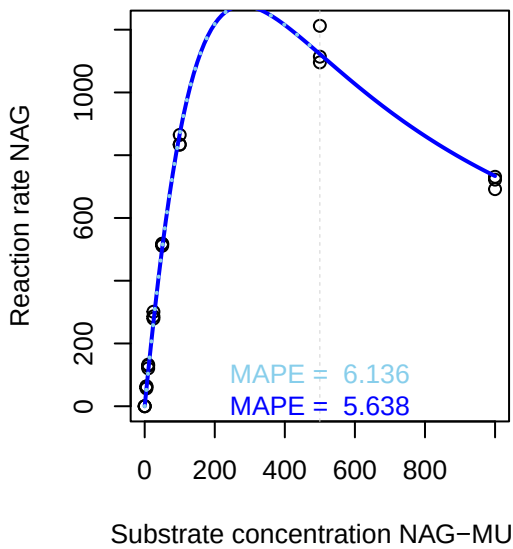
Model fit



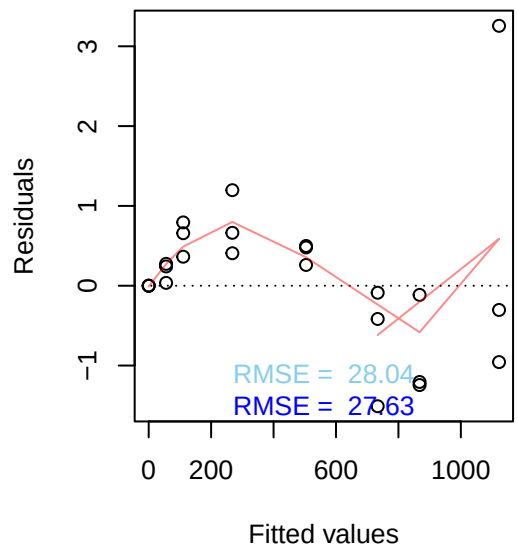
Model residuals



Model fit

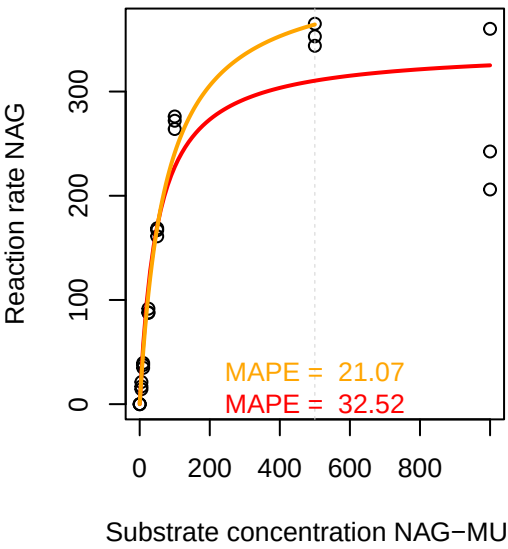


Model residuals

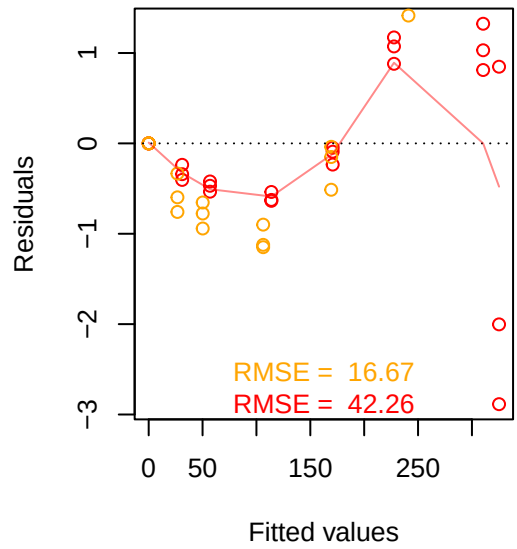


100

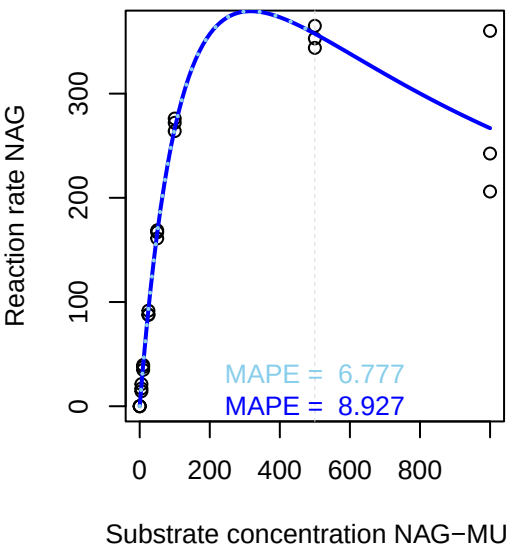
Model fit



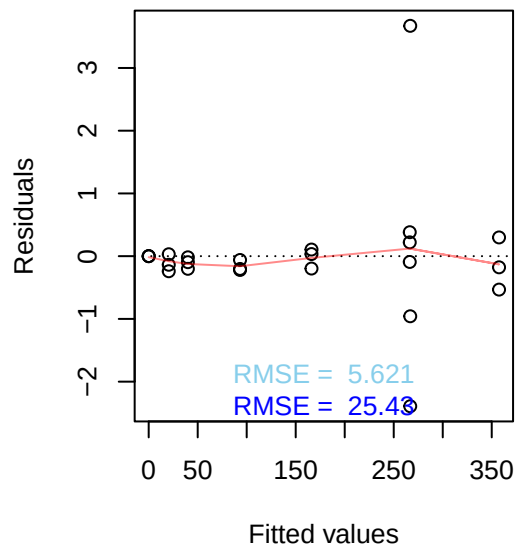
Model residuals

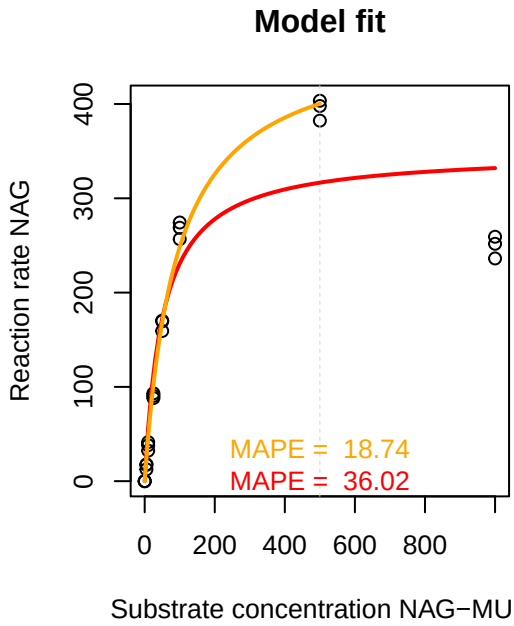


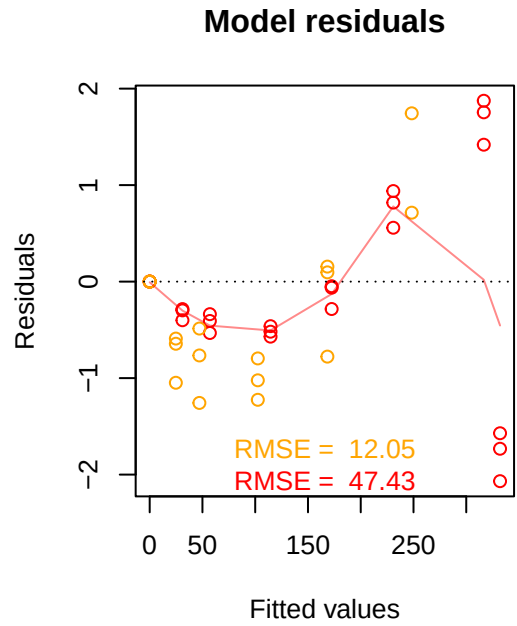
Model fit

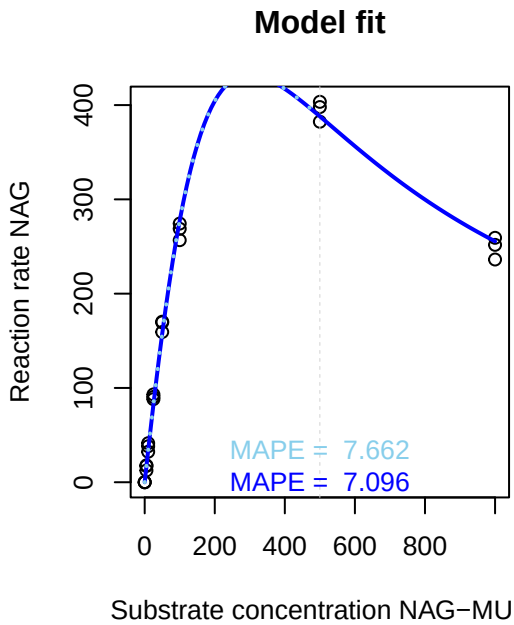


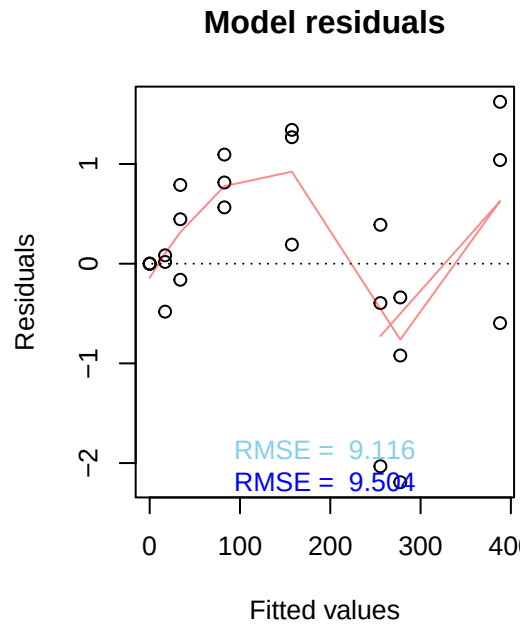
Model residuals

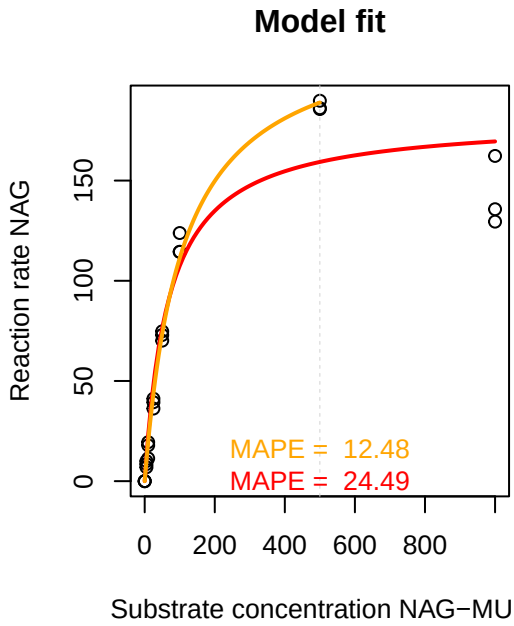


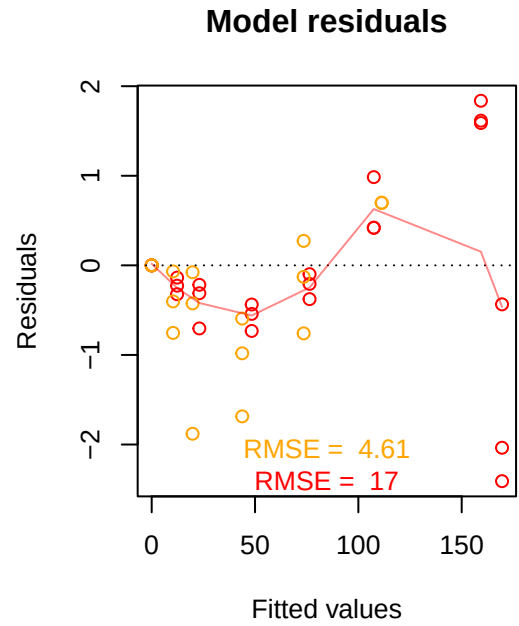

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 18.74
MAPE = 36.02
0
100
200
300
400
0
200
400
600
800

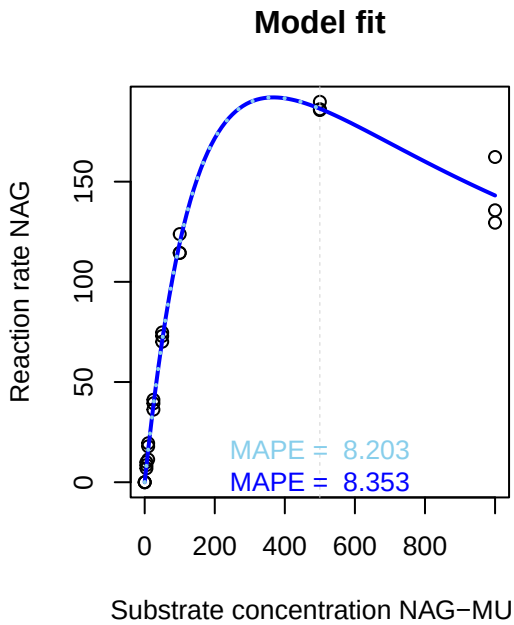

Model residuals
Residuals
Fitted values
RMSE = 12.05
RMSE = 47.43
−2
−1
0
1
2
0
50
150
250

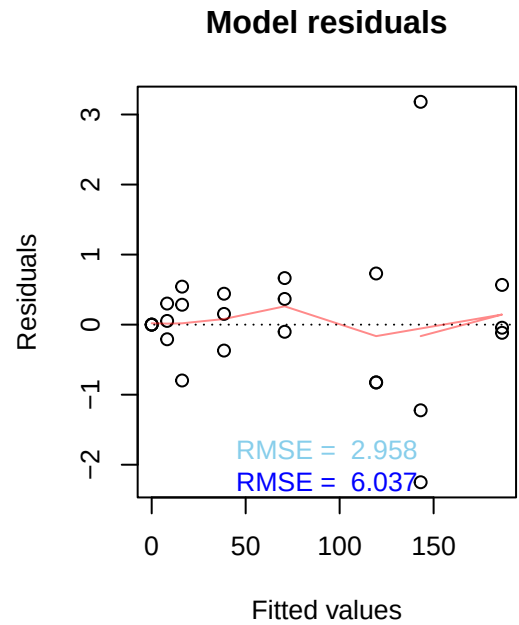

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 7.662
MAPE = 7.096
0
100
200
300
400
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 9.116
RMSE = 9.504
−2
−1
0
1
0
100
200
300
400

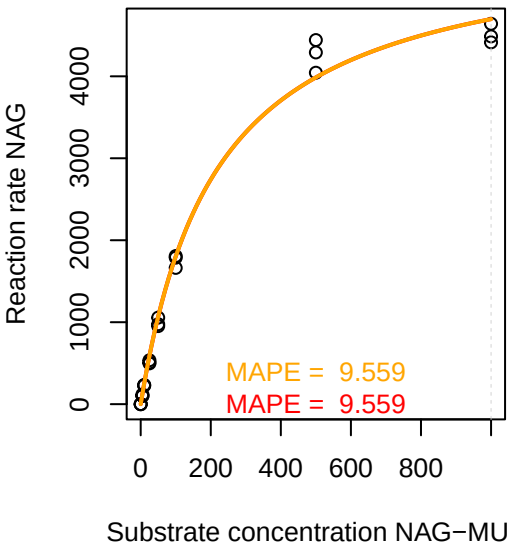

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 12.48
MAPE = 24.49
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
0
50
100
150
RMSE = 4.61
RMSE = 17
Fitted values

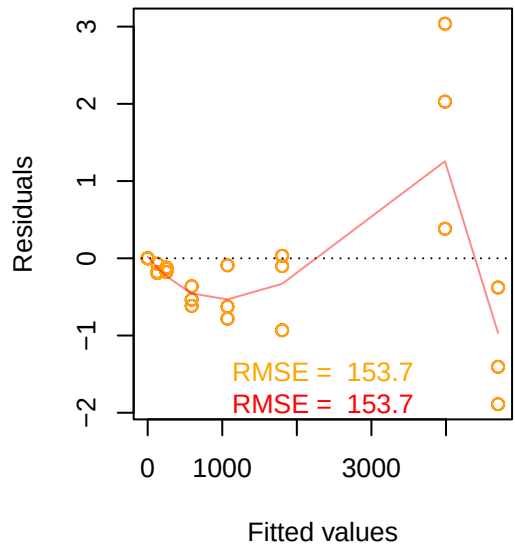

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 8.203
MAPE = 8.353
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
3
0
50
100
150
RMSE = 2.958
RMSE = 6.037
Fitted values

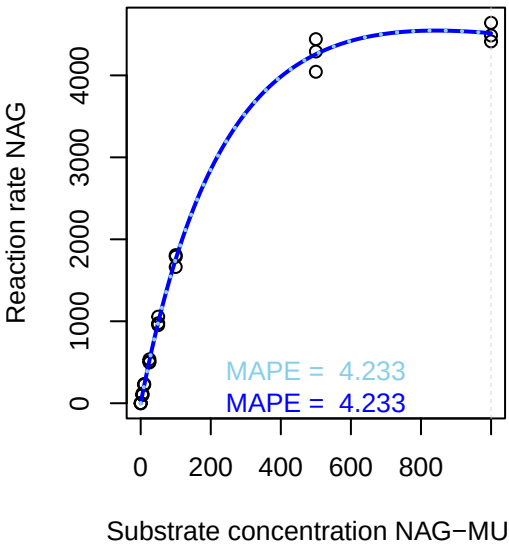
Model fit



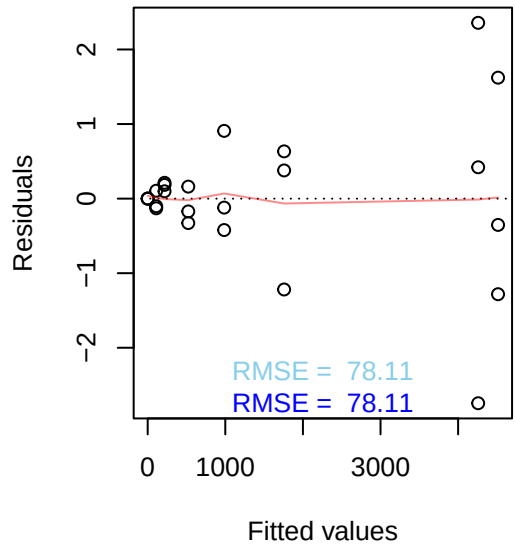
Model residuals

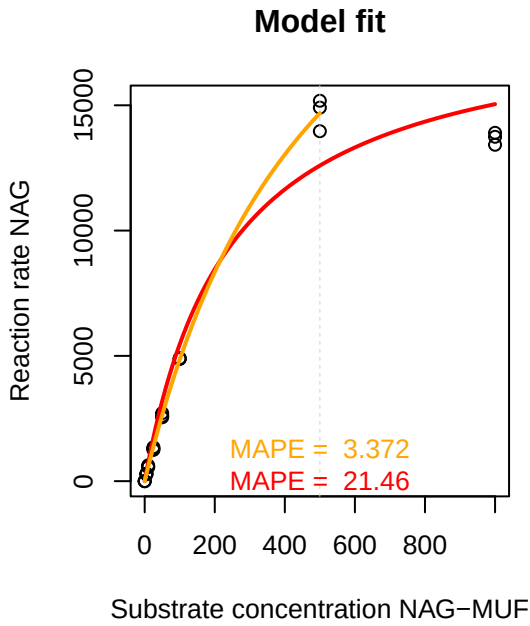


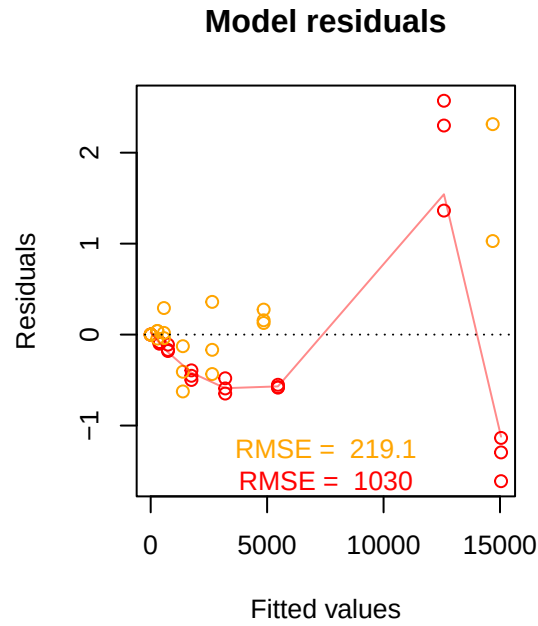
Model fit

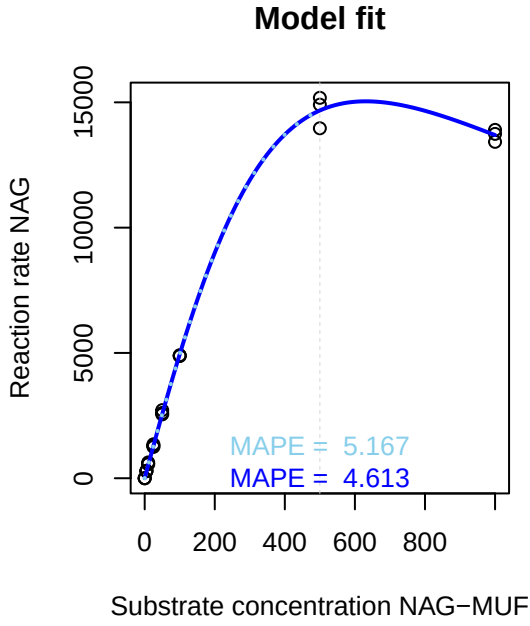


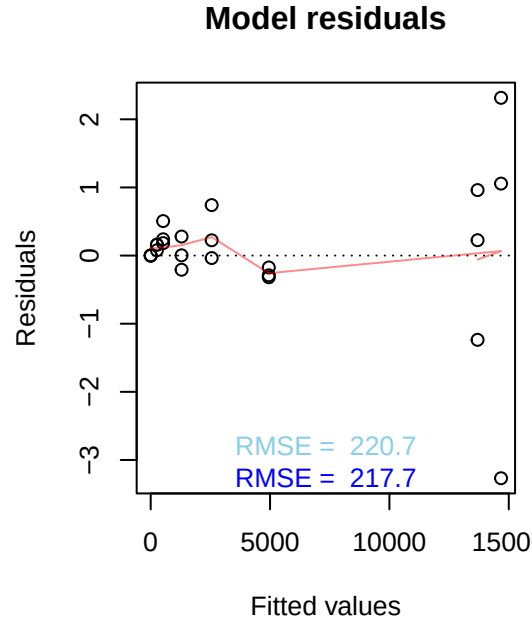
Model residuals



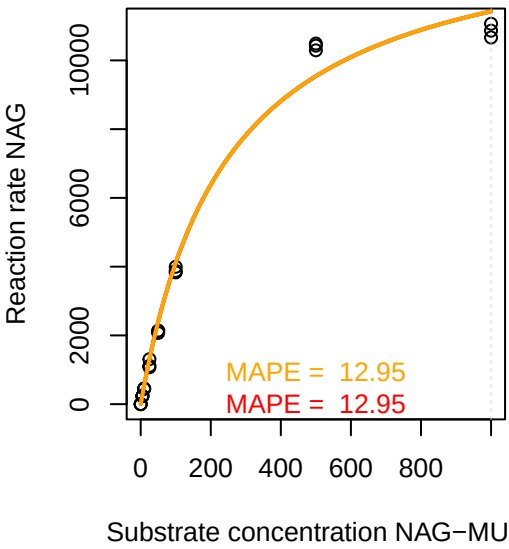

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 3.372
MAPE = 21.46


Model residuals
Residuals
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 219.1
RMSE = 1030

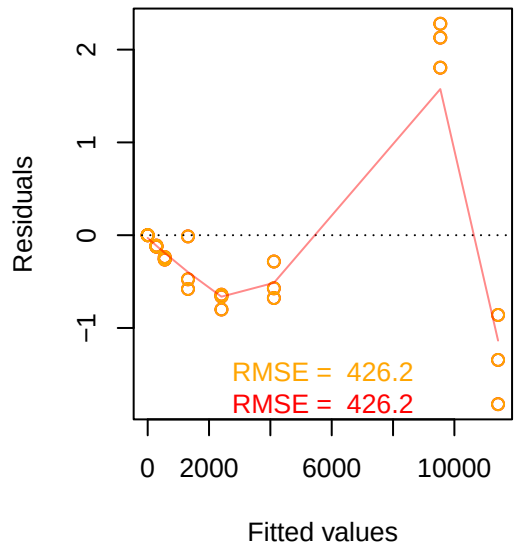

Model fit
Reaction rate NAG
0
5000
10000
15000
0
200
400
600
800
Substrate concentration NAG−MUF
MAPE = 5.167
MAPE = 4.613


Model residuals
Residuals
−3
−2
−1
0
1
2
0
5000
10000
15000
Fitted values
RMSE = 220.7
RMSE = 217.7

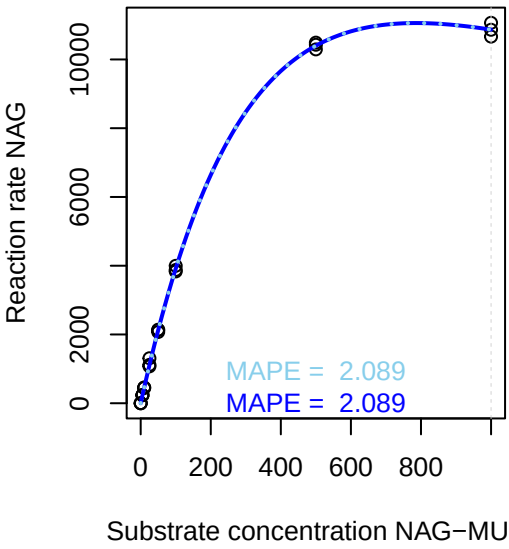
Model fit



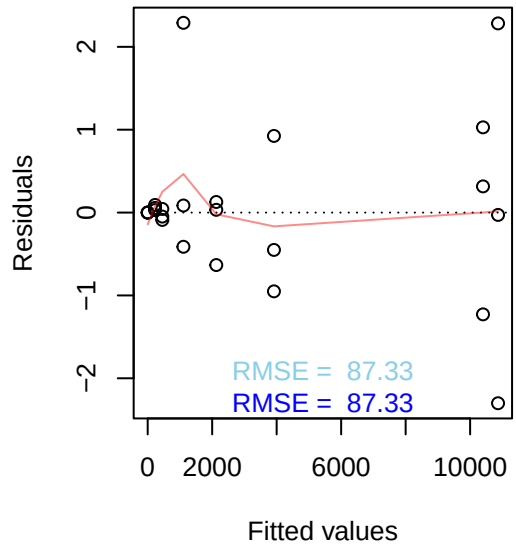
Model residuals

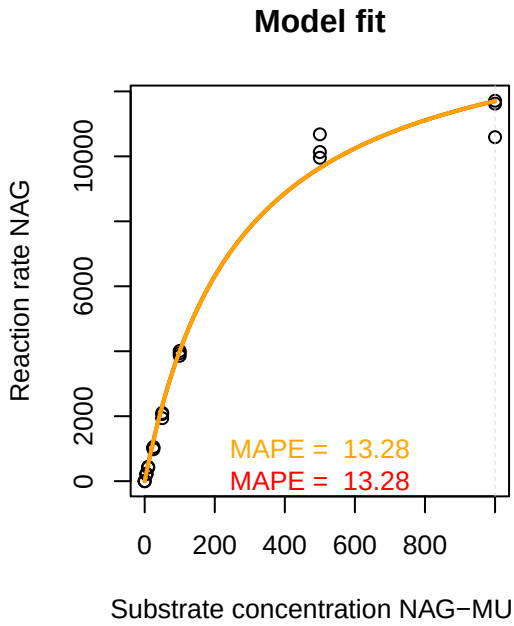


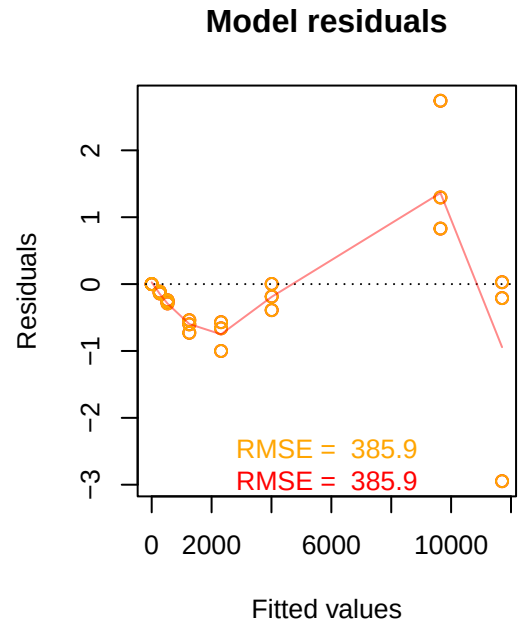
Model fit

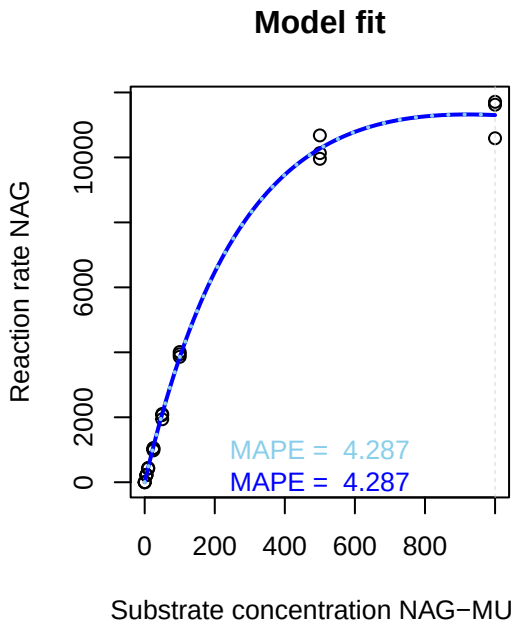


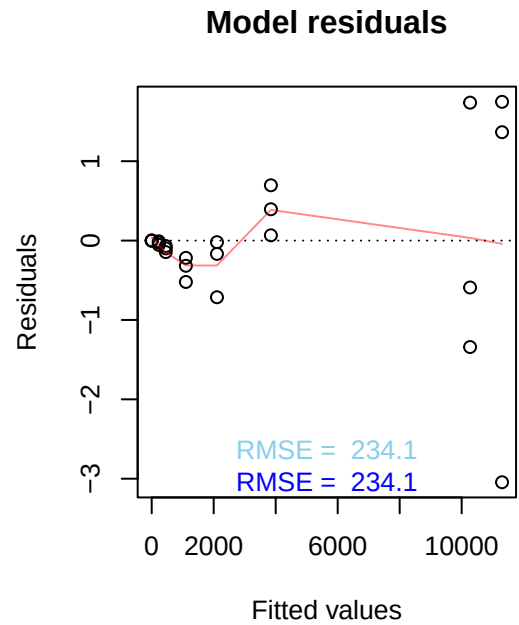
Model residuals

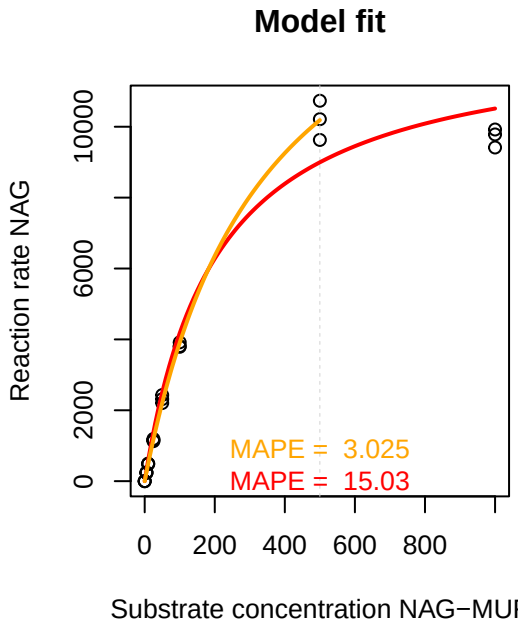


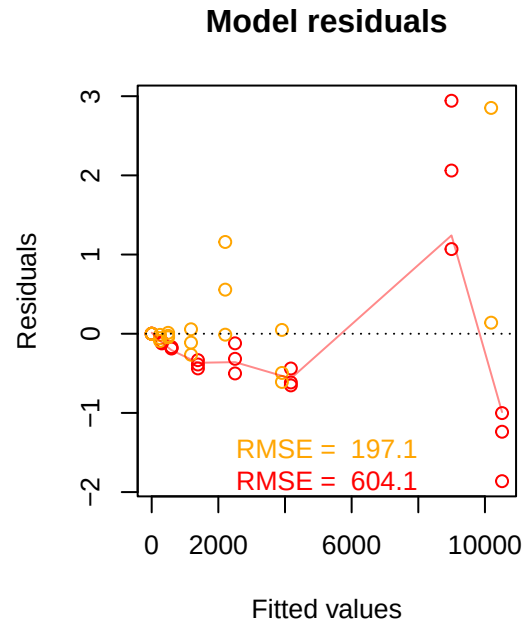

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 13.28
MAPE = 13.28
Substrate concentration NAG−MUF

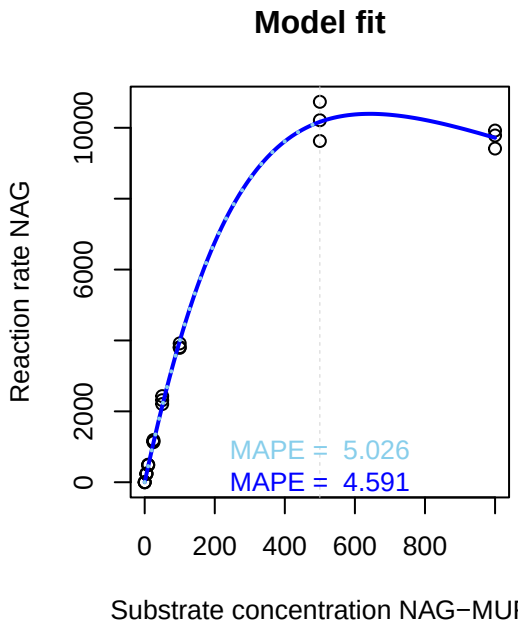

Model residuals
Residuals
−3
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 385.9
RMSE = 385.9
Fitted values

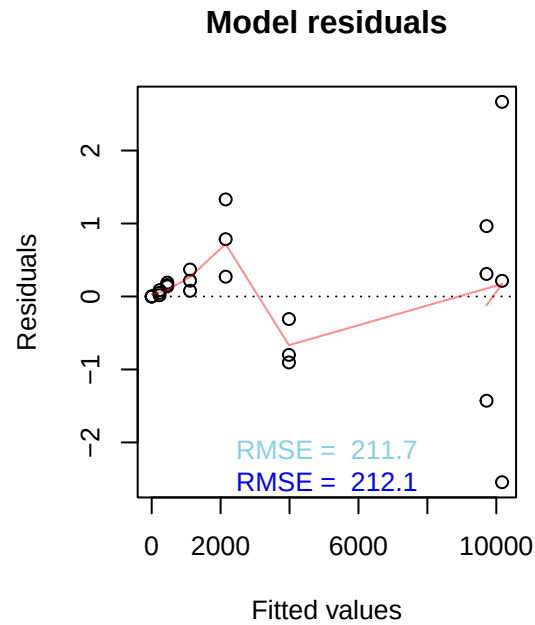

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 4.287
MAPE = 4.287
Substrate concentration NAG−MUF

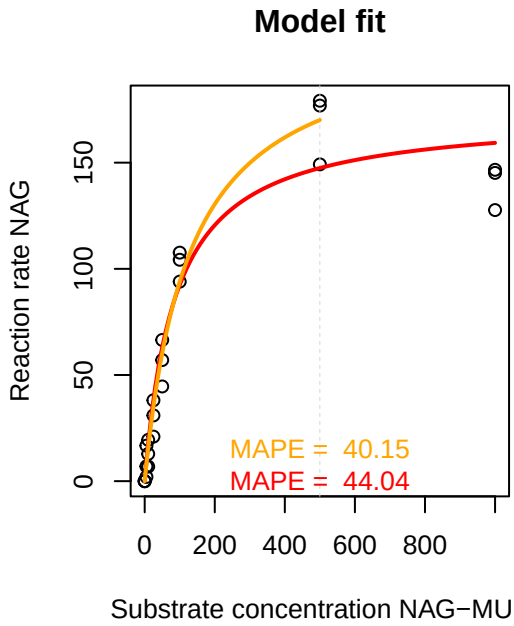

Model residuals
Residuals
−3
−2
−1
0
1
0
2000
6000
10000
RMSE = 234.1
RMSE = 234.1
Fitted values

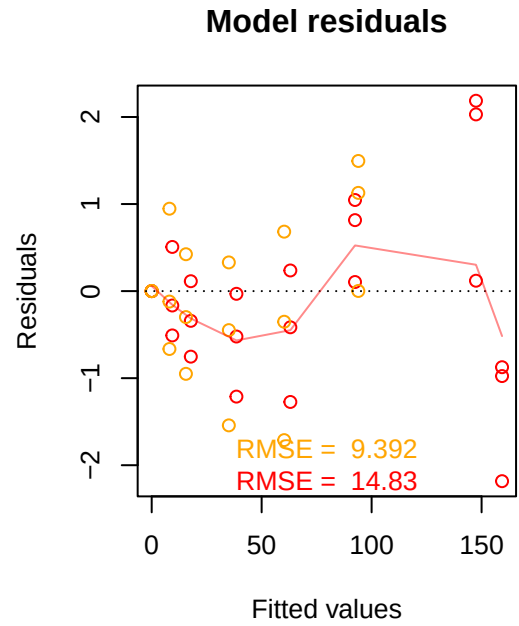

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 3.025
MAPE = 15.03
Substrate concentration NAG−MUF

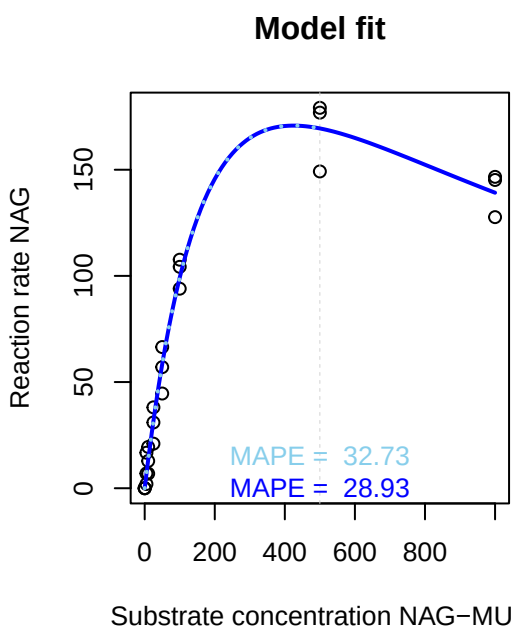

Model residuals
Residuals
−2
−1
0
1
2
3
0
2000
6000
10000
RMSE = 197.1
RMSE = 604.1
Fitted values

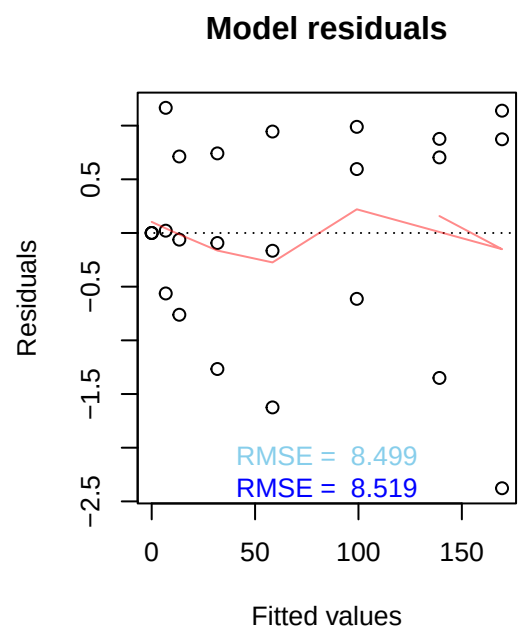

Model fit
Reaction rate NAG
0
2000
6000
10000
0
200
400
600
800
MAPE = 5.026
MAPE = 4.591
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
0
2000
6000
10000
RMSE = 211.7
RMSE = 212.1
Fitted values

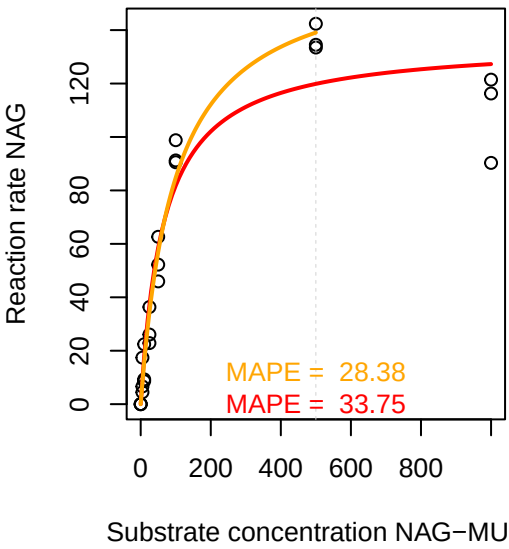

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 40.15
MAPE = 44.04
0
50
100
150
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 9.392
RMSE = 14.83
−2
−1
0
1
2
0
50
100
150

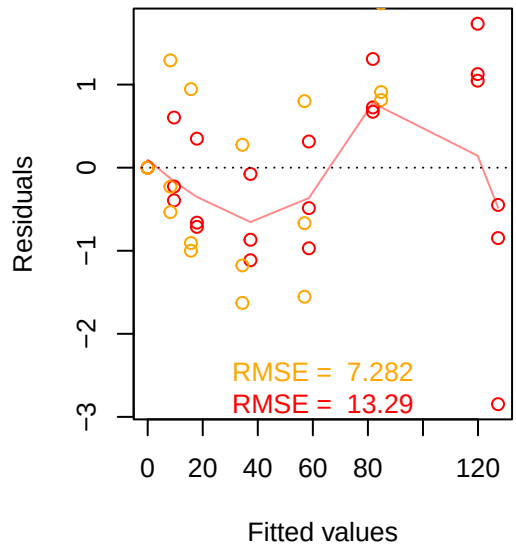

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 32.73
MAPE = 28.93
0
50
100
150
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 8.499
RMSE = 8.519
−2.5
−1.5
−0.5
0.5
0
50
100
150

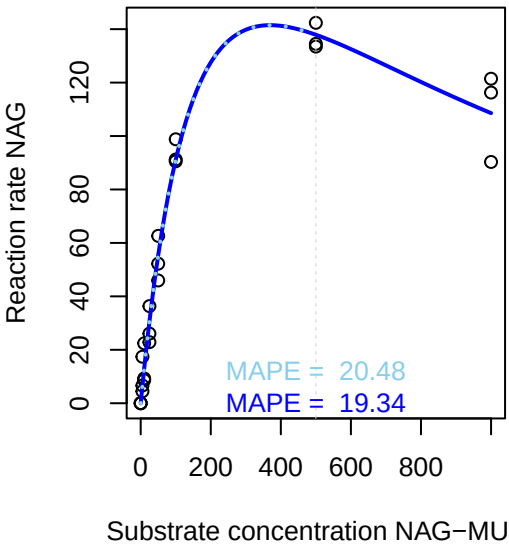
Model fit



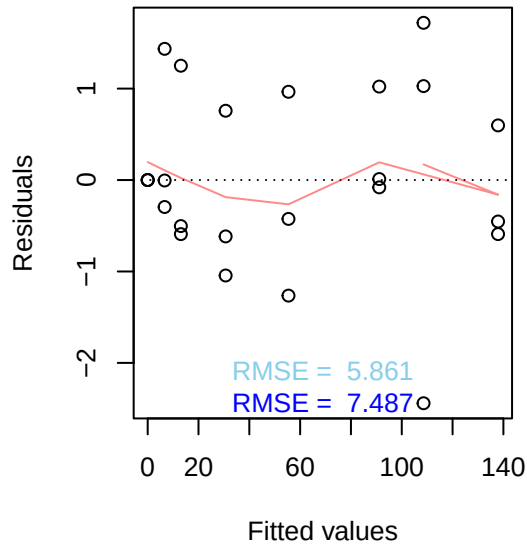
Model residuals

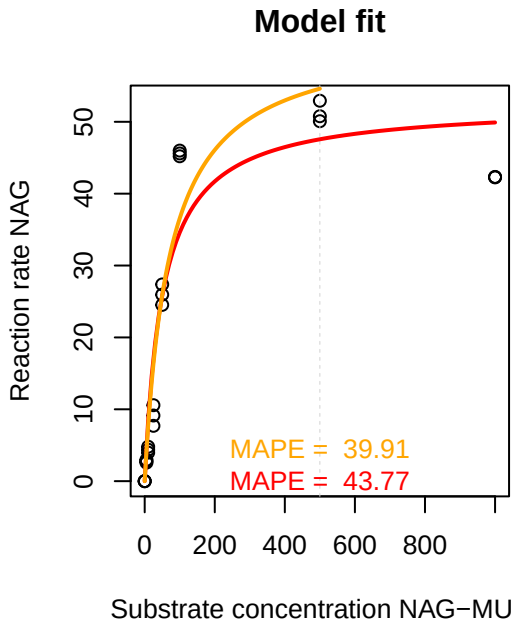


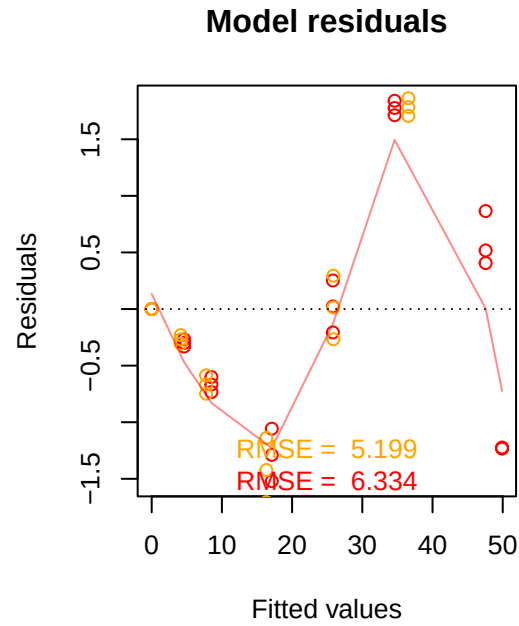
Model fit

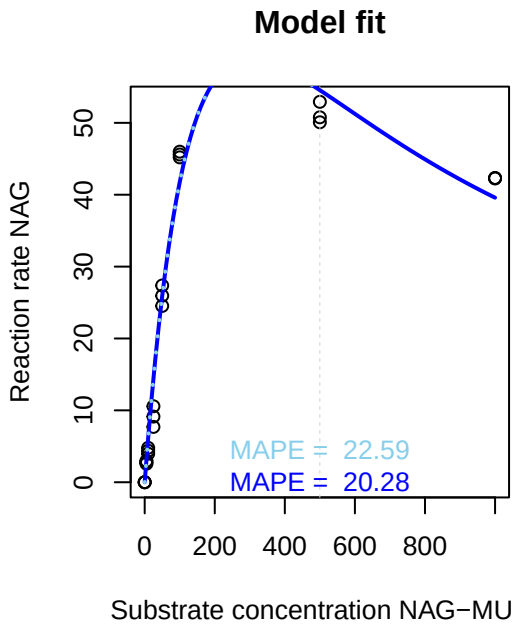


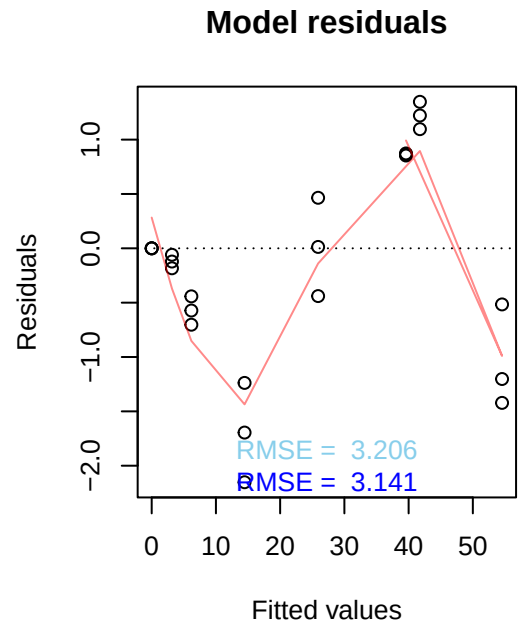
Model residuals



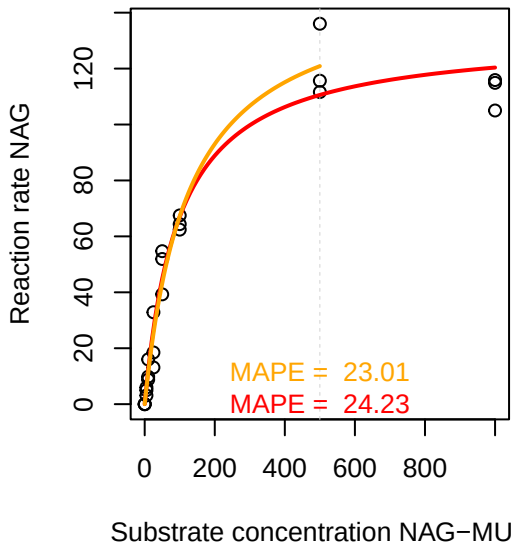

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 39.91
MAPE = 43.77
0
10
20
30
40
50
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 5.199
RMSE = 6.334
−1.5
−0.5
0.5
1.5
0
10
20
30
40
50

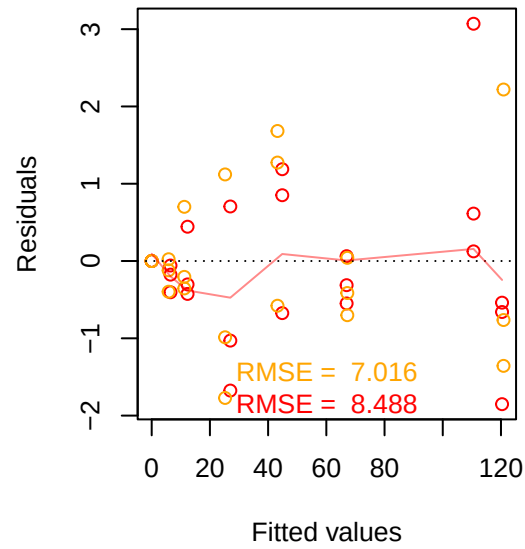

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 22.59
MAPE = 20.28
0
10
20
30
40
50
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 3.206
RMSE = 3.141
−2.0
−1.0
0.0
1.0
0
10
20
30
40
50

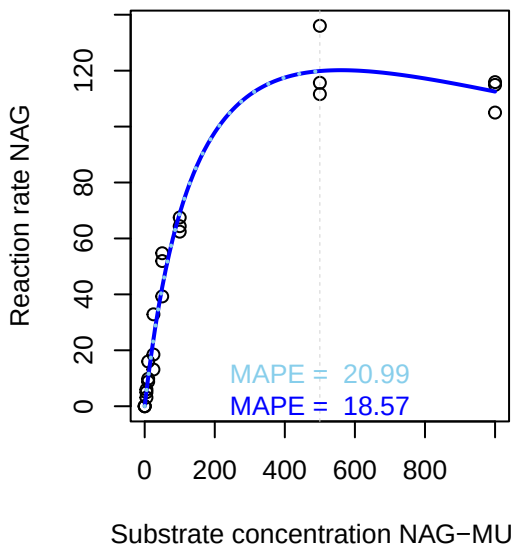
Model fit



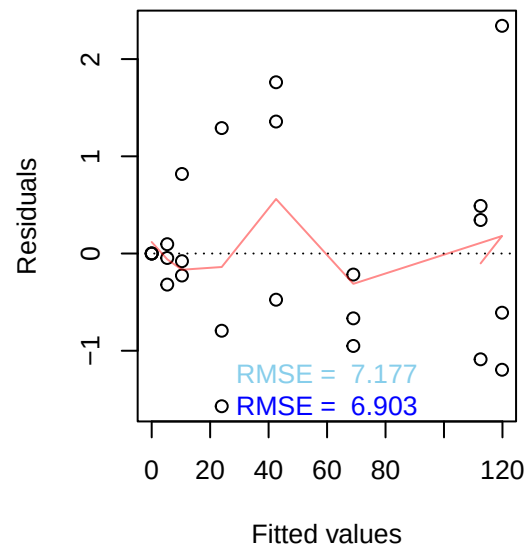
Model residuals

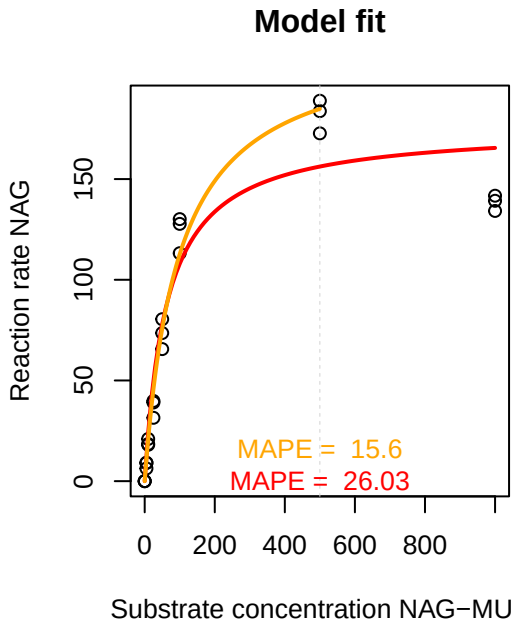


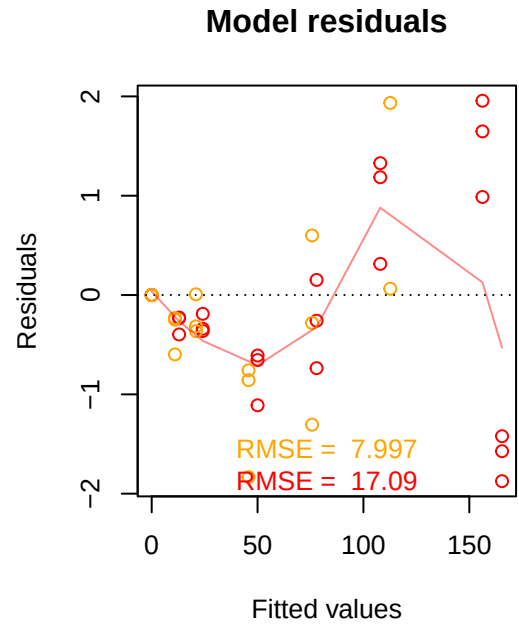
Model fit

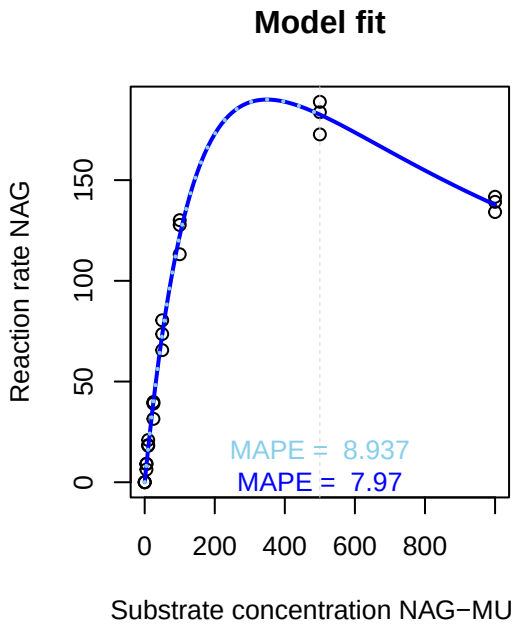


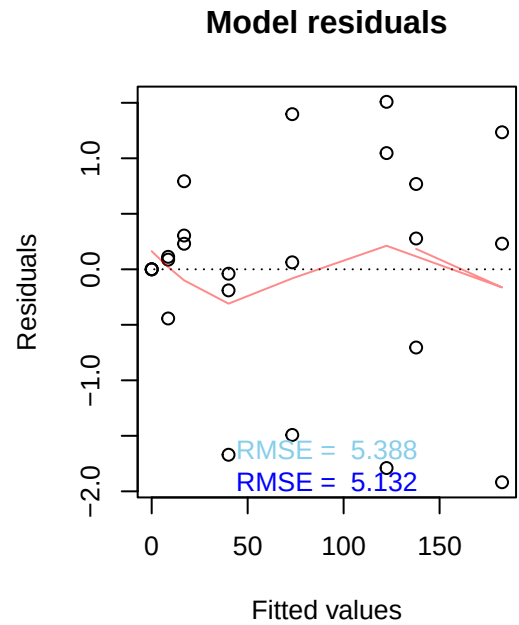
Model residuals



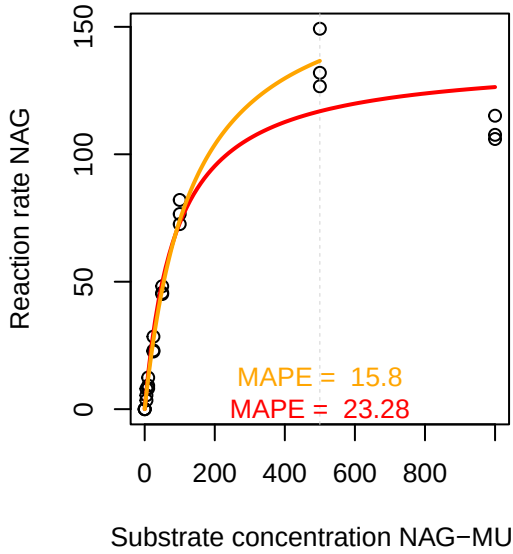

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 15.6
MAPE = 26.03
Substrate concentration NAG−MUF


Model residuals
Residuals
2
1
0
−1
−2
0
50
100
150
RMSE = 7.997
RMSE = 17.09
Fitted values

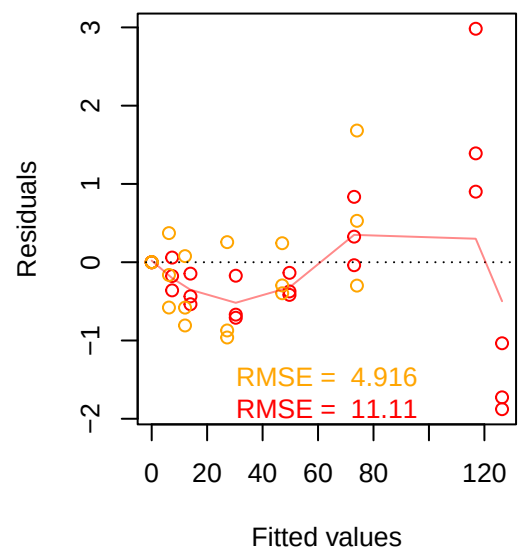

Model fit
Reaction rate NAG
0
50
100
150
0
200
400
600
800
MAPE = 8.937
MAPE = 7.97
Substrate concentration NAG−MUF


Model residuals
Residuals
1.0
0.0
−1.0
−2.0
0
50
100
150
RMSE = 5.388
RMSE = 5.132
Fitted values

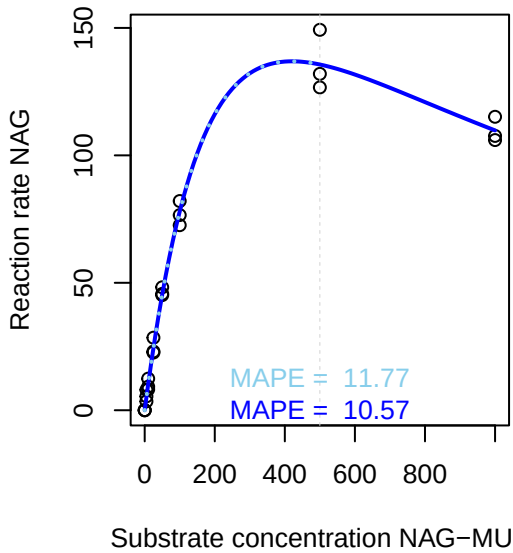
Model fit



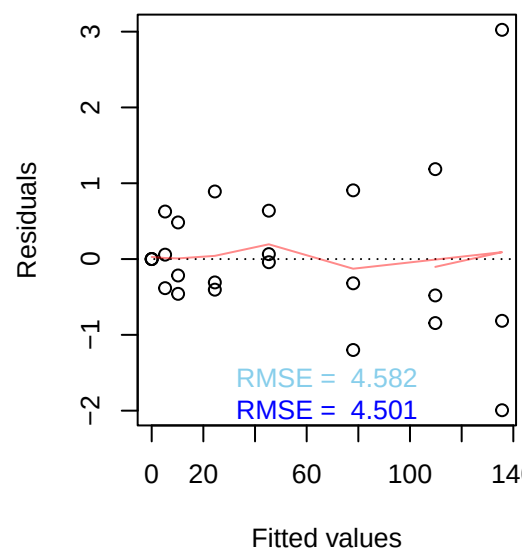
Model residuals



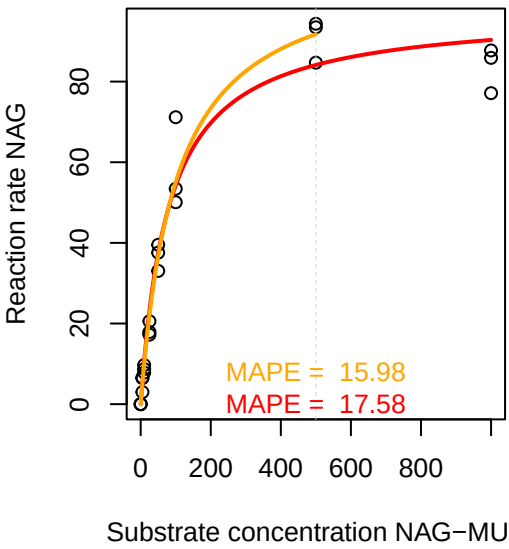
Model fit



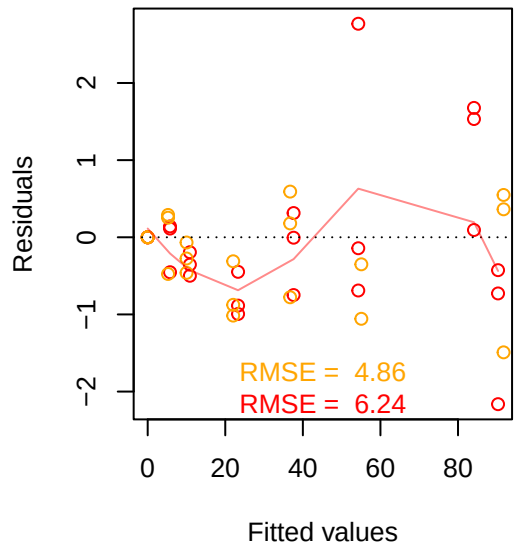
Model residuals



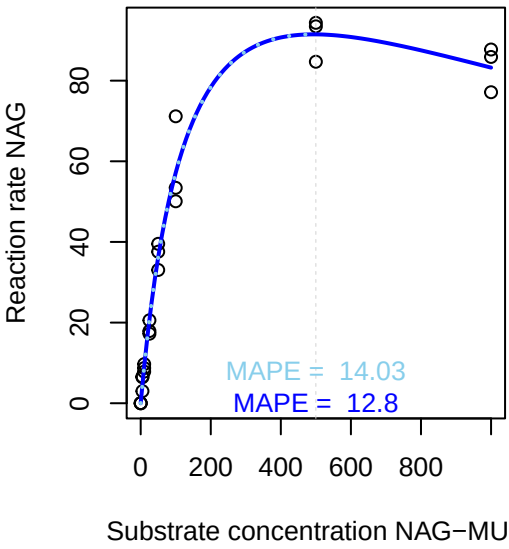
Model fit



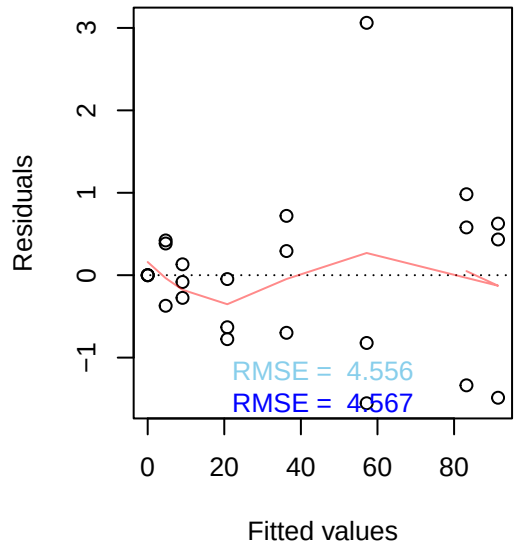
Model residuals

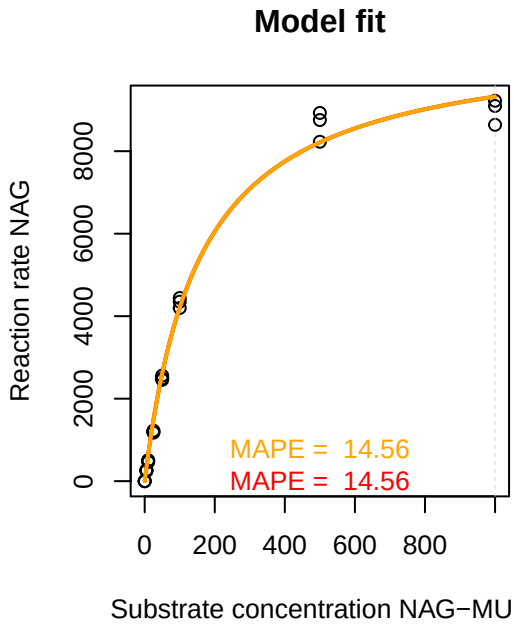


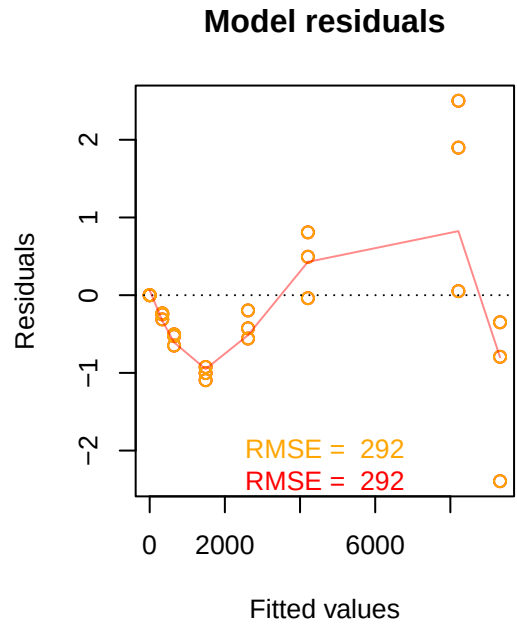
Model fit

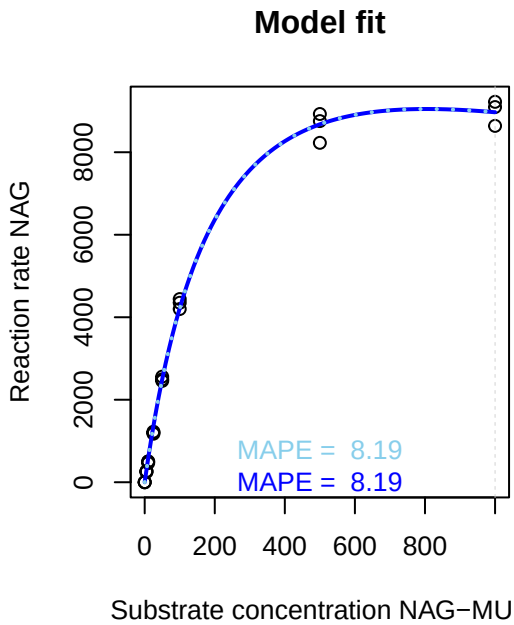


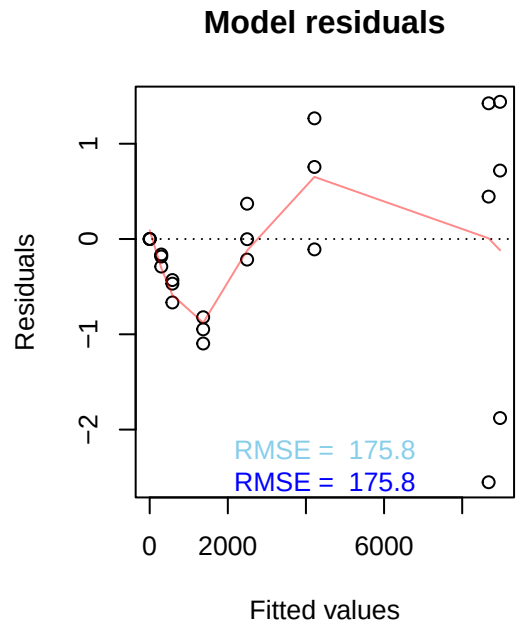
Model residuals



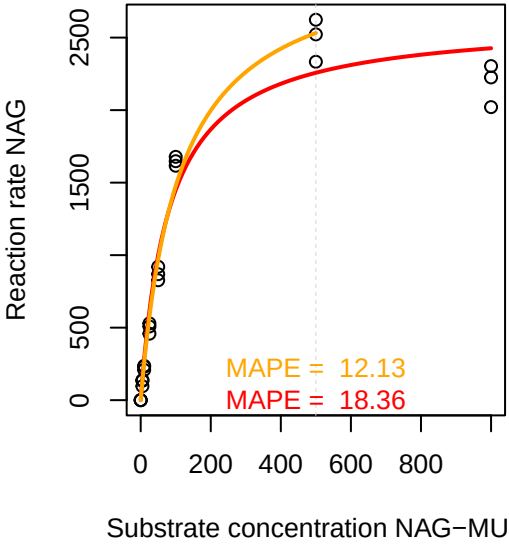

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 14.56
MAPE = 14.56
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 292
RMSE = 292
0
2000
6000
Fitted values

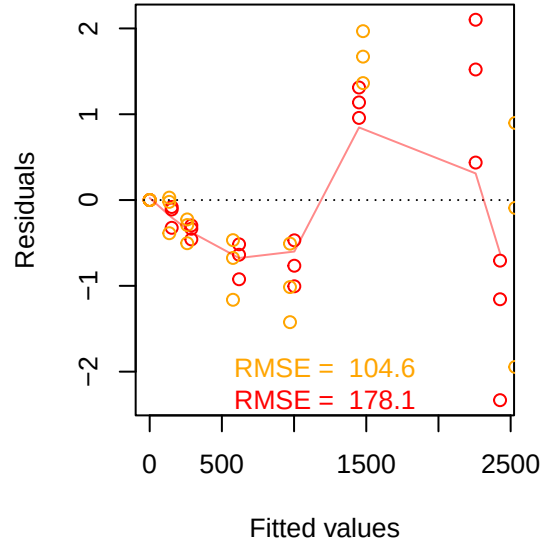

Model fit
Reaction rate NAG
0
2000
4000
6000
8000
MAPE = 8.19
MAPE = 8.19
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
RMSE = 175.8
RMSE = 175.8
0
2000
6000
Fitted values

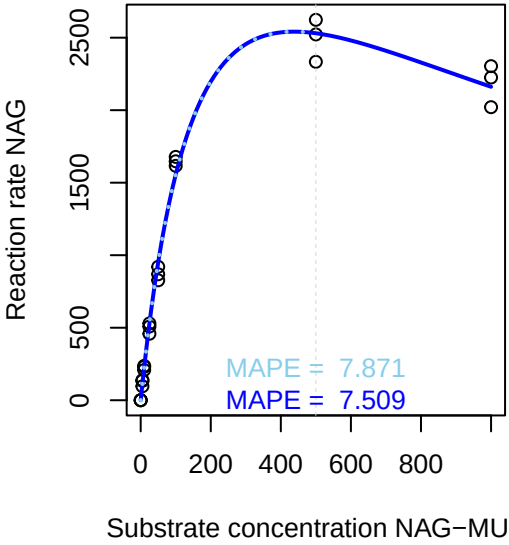
Model fit



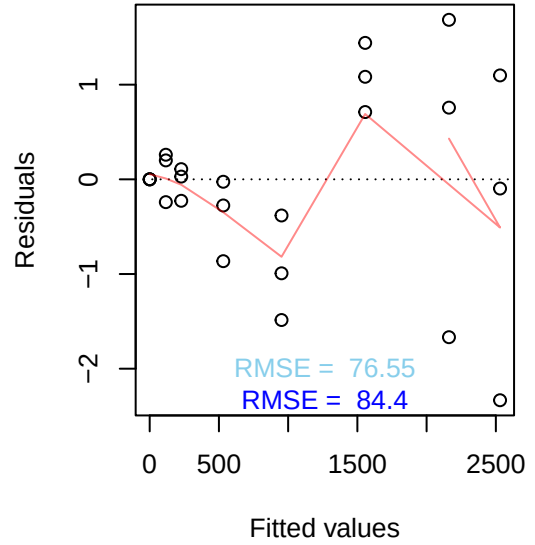
Model residuals

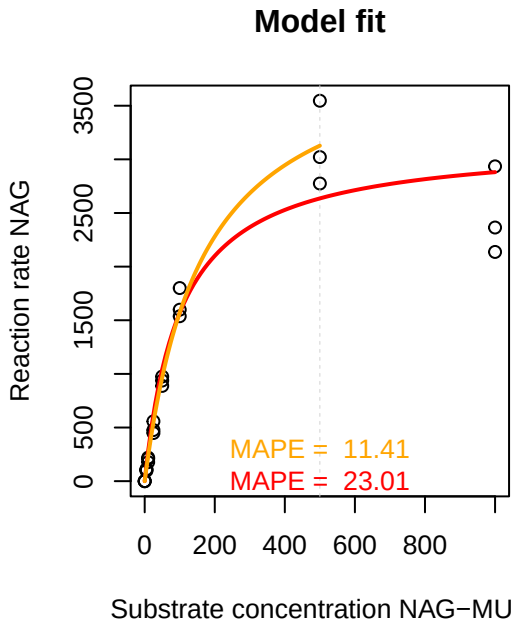


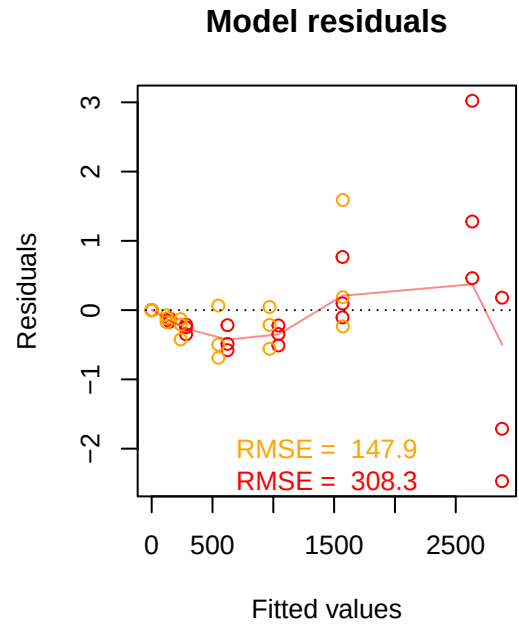
Model fit

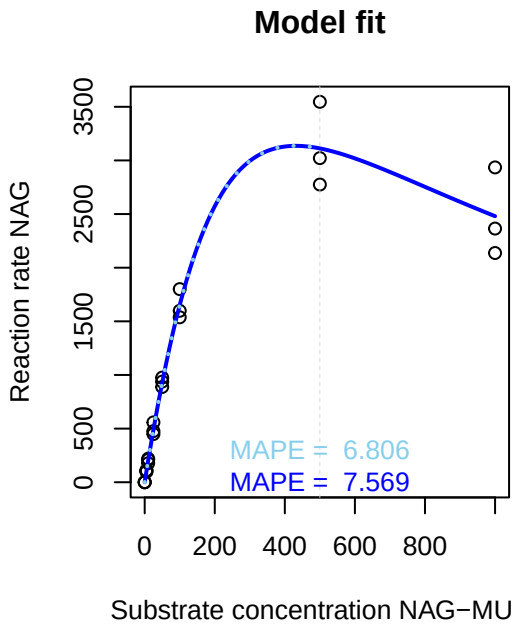


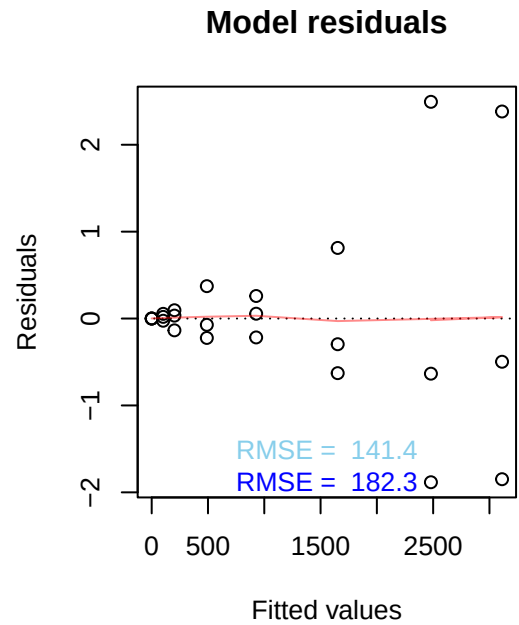
Model residuals



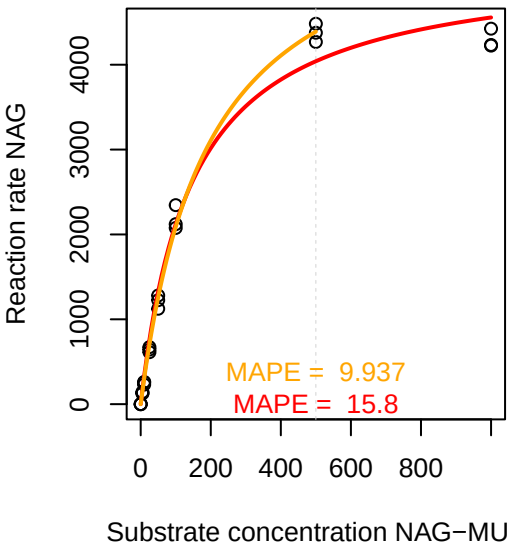

Model fit
Reaction rate NAG
0
500
1500
2500
3500
MAPE = 11.41
MAPE = 23.01
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
3
RMSE = 147.9
RMSE = 308.3
0
500
1500
2500
Fitted values

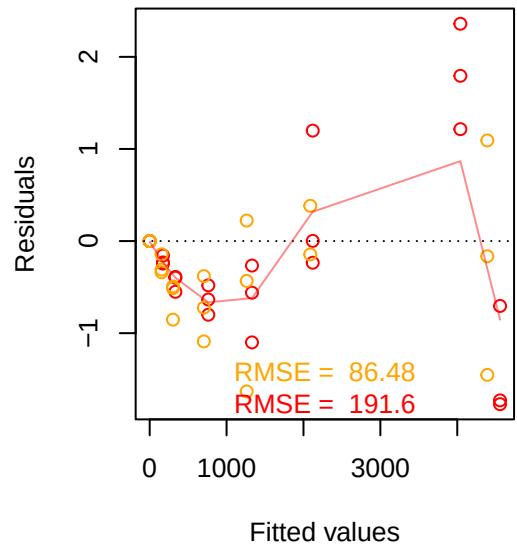

Model fit
Reaction rate NAG
0
500
1500
2500
3500
MAPE = 6.806
MAPE = 7.569
0
200
400
600
800
Substrate concentration NAG−MUF


Model residuals
Residuals
−2
−1
0
1
2
RMSE = 141.4
RMSE = 182.3
0
500
1500
2500
Fitted values

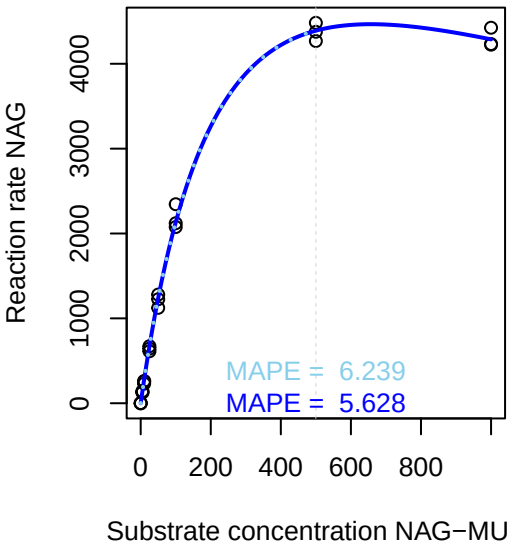
Model fit



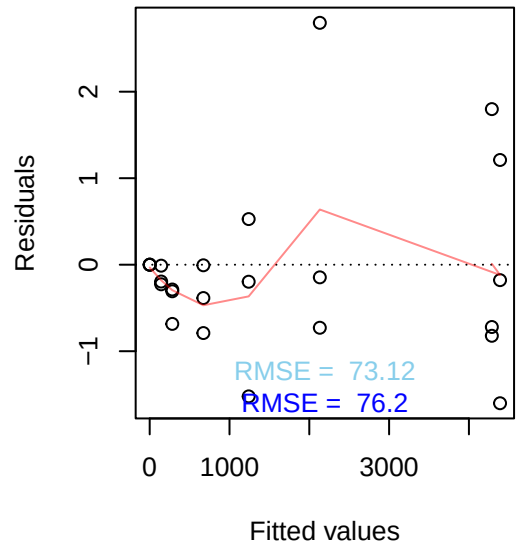
Model residuals

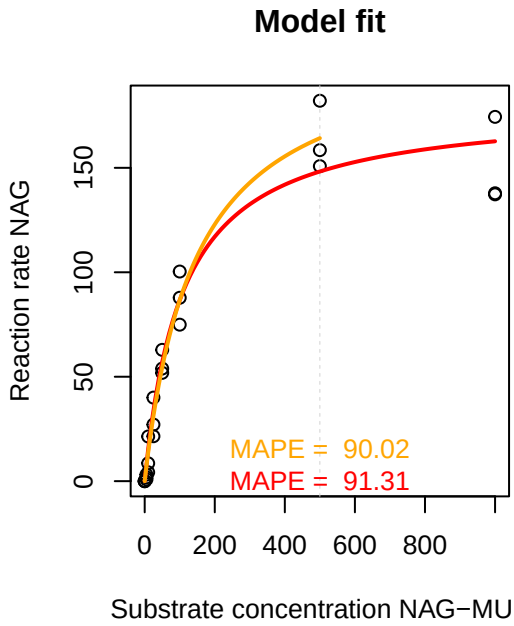


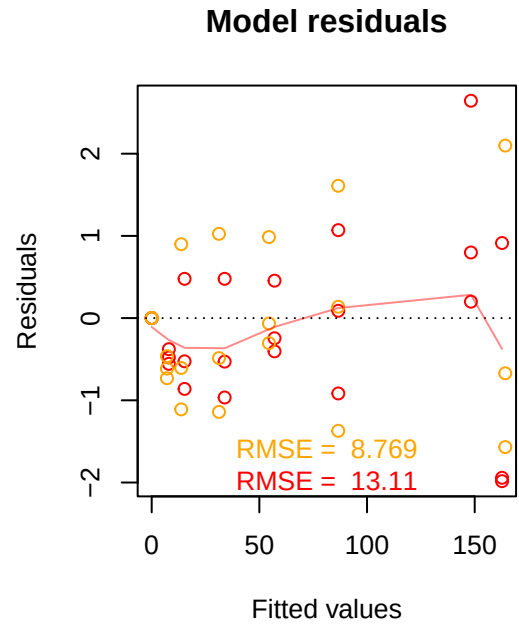
Model fit

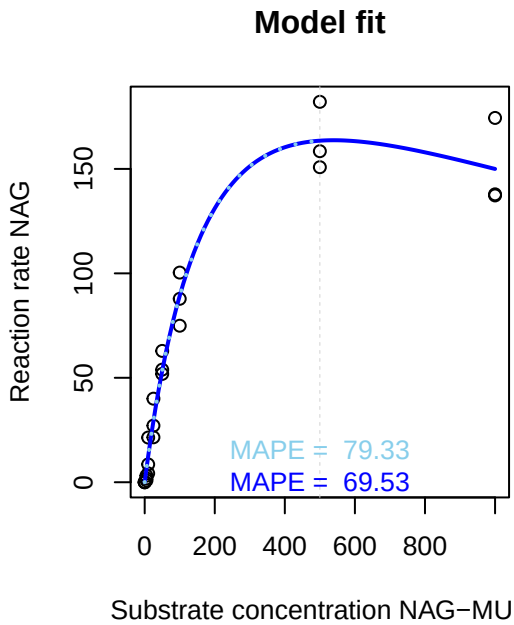


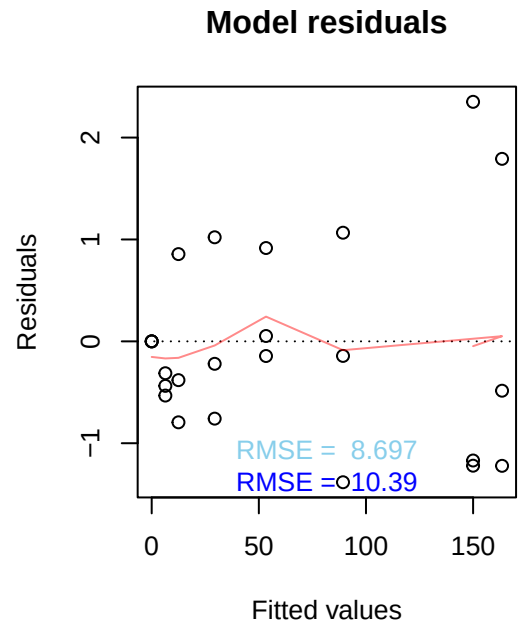
Model residuals



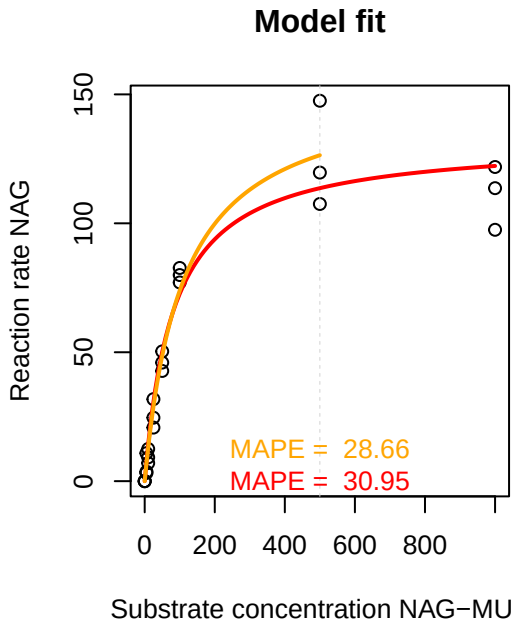

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 90.02
MAPE = 91.31
0
50
100
150
0
200
400
600
800

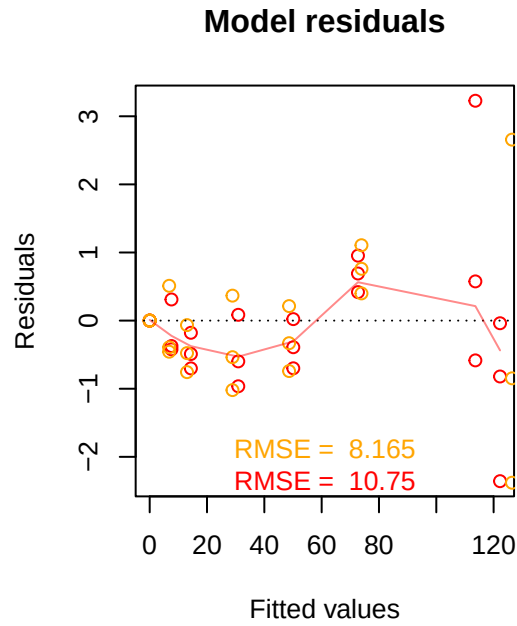

Model residuals
Residuals
Fitted values
RMSE = 8.769
RMSE = 13.11
−2
−1
0
1
2
0
50
100
150

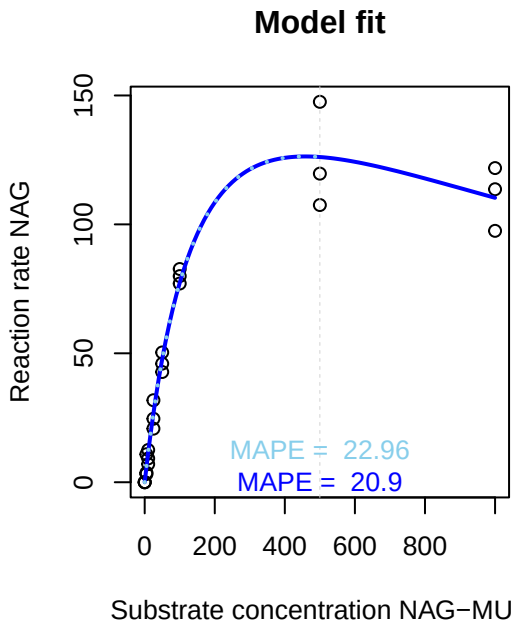

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 79.33
MAPE = 69.53
0
50
100
150
0
200
400
600
800

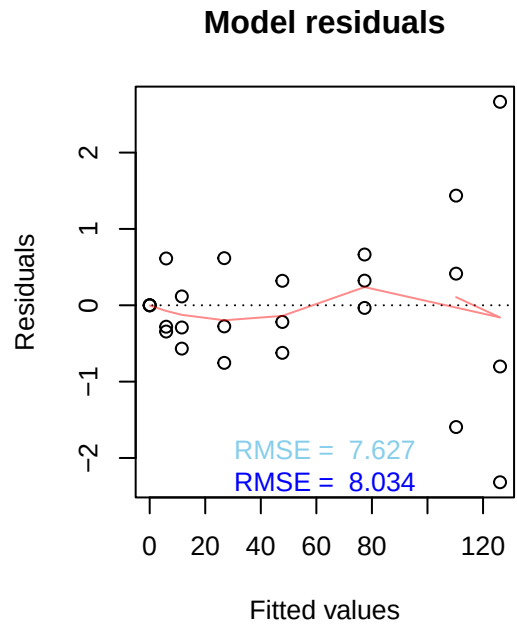

Model residuals
Residuals
Fitted values
RMSE = 8.697
RMSE = 10.39
−1
0
1
2
0
50
100
150

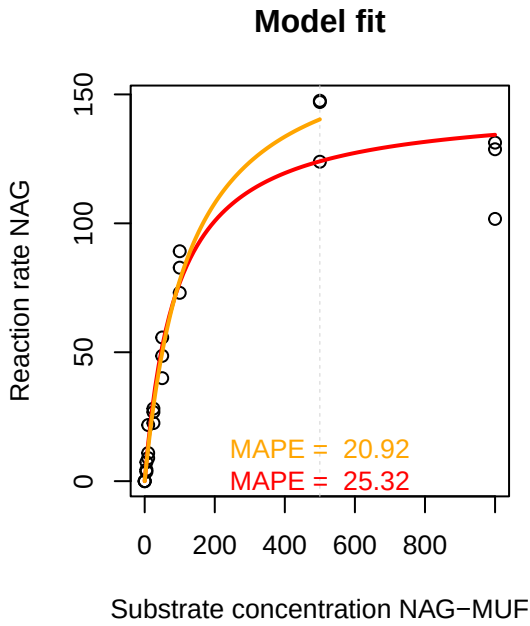
120

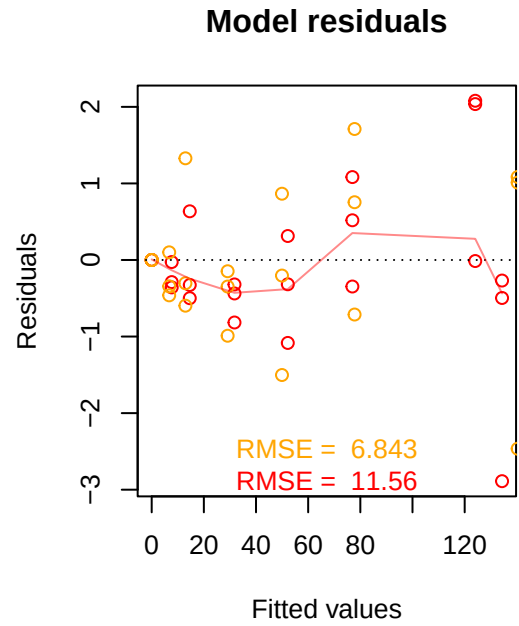

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 28.66
MAPE = 30.95

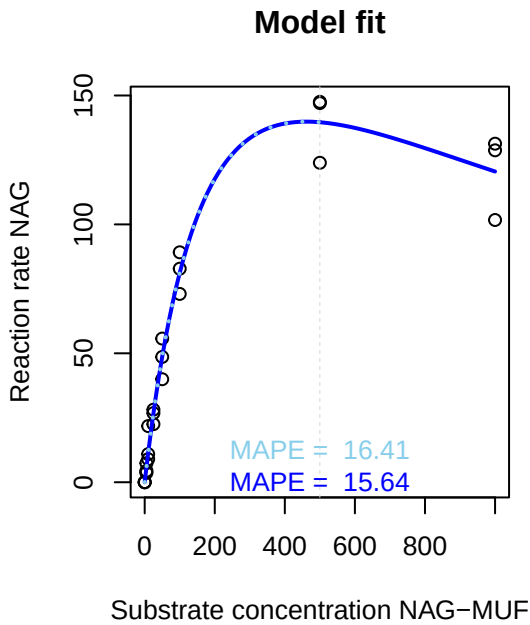

Model residuals
Residuals
Fitted values
RMSE = 8.165
RMSE = 10.75

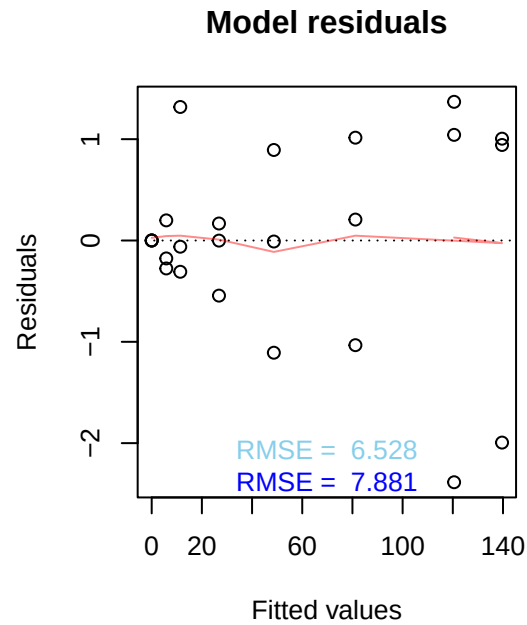

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 22.96
MAPE = 20.9

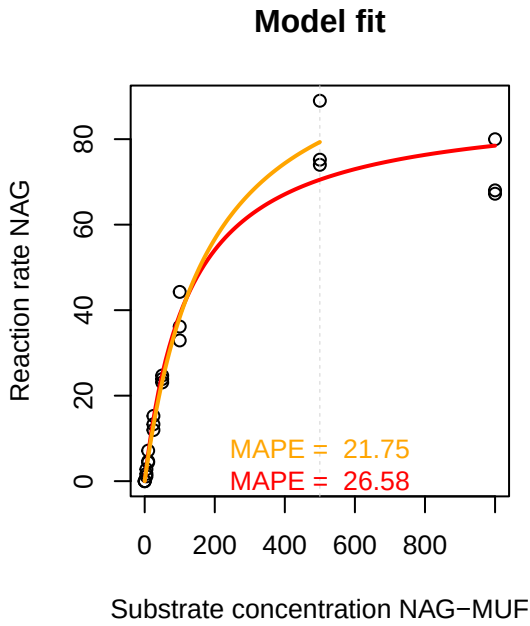

Model residuals
Residuals
Fitted values
RMSE = 7.627
RMSE = 8.034

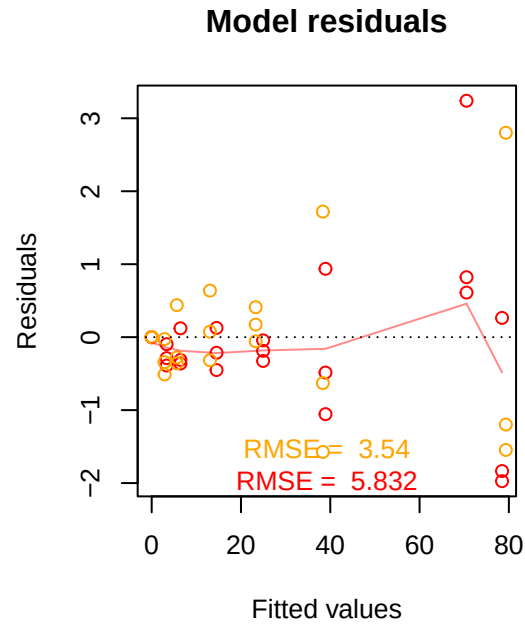

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 20.92
MAPE = 25.32
0
50
100
150
0
200
400
600
800

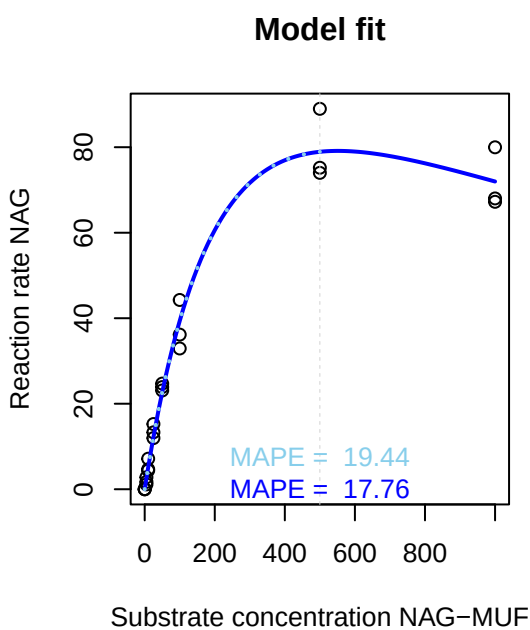

Model residuals
Residuals
Fitted values
RMSE = 6.843
RMSE = 11.56
−3
−2
−1
0
1
2
0
20
40
60
80
120

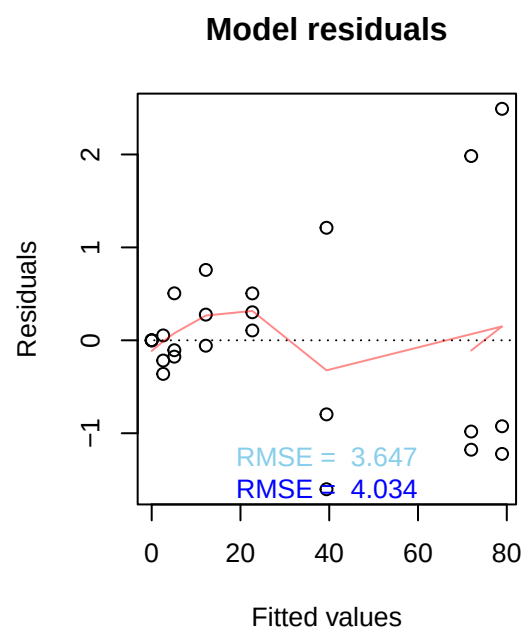

Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 16.41
MAPE = 15.64
0
50
100
150
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 6.528
RMSE = 7.881
−2
−1
0
1
0
20
60
100
140


Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 21.75
MAPE = 26.58
0
20
40
60
80
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 3.54
RMSE = 5.832
−2
−1
0
1
2
3
0
20
40
60
80


Model fit
Reaction rate NAG
Substrate concentration NAG−MUF
MAPE = 19.44
MAPE = 17.76
0
20
40
60
80
0
200
400
600
800


Model residuals
Residuals
Fitted values
RMSE = 3.647
RMSE = 4.034
−1
0
1
2
0
20
40
60
80