Appendix 3. BIC model ranks and ΔBIC values for models selected under the alternative hLRT, AIC_c, and DT methods. Values were obtained from the weighted BIC output generated by Modeltest3.7. Missing data indicates that the given method selected the same model as the BIC.

Data Set	1	2	3
TreeBASE ID	S1266/M2209	S685/M1075	S388/M542
hLRT model	5 / 2.930	2 / 0.323	-
AIC_c model	7 / 3.601	3 / 3.161	-
DT model	3 / 2.150	-	19 / 372.707

Data Set	4	5	6
TreeBASE ID	S904/M1486	S631/M977	S1067/M1819
hLRT model	-	-	2 / 0.074
AIC_c model	-	3 / 8.898	18 / 12.335
DT model	-	-	5 / 2.598

Data Set	7	8	9
TreeBASE ID	S769/M1216	S1038/M1767	S320/M391
hLRT model	8 / 7.012	-	-
AIC_c model	6 / 5.032	2 / 2.793	-
DT model	-	-	-

Data Set	10	11	12
TreeBASE ID	S430/M630	S981/M1631	S869/M1410
hLRT model	-	4 / 5.484	-
AIC_c model	2 / 4.329	6 / 7.395	-

| DT model | - | - | - |

Data Set	13	14	15
TreeBASE ID	S927/M1533	S1120/M1917	S1123/M1924
hLRT model	-	5 / 30.652	-
AIC$_c$ model	3 / 14.685	-	3 / 6.852
DT model	-	-	-

Data Set	16	17	18
TreeBASE ID	S662/M1038	S736/M1168	S756/M1194
hLRT model	3 / 37.086	4 / 1.775	-
AIC$_c$ model	-	4 / 1.775	2 / 1.193
DT model	-	2 / 0.242	-

Data Set	19	20	21
TreeBASE ID	S644/M1001	S1213/M2099	S1078/M1849
hLRT model	-	3 / 4.129	-
AIC$_c$ model	-	3 / 4.129	3 / 2.316
DT model	-	-	-

Data Set	22	23	24
TreeBASE ID	S3x27x98c12c26c10/ M186c3x27x33c47	S1234/M2146	S1112/M1902
hLRT model	3 / 36.895	-	3 / 32.426
AIC$_c$ model	-	2 / 7.856	-
DT model	-	-	-

Data Set	25	26	27
TreeBASE ID	S1316/M2309	S426/M620	S808/M1278
hLRT model	3 / 4.016	-	-
AIC$_c$ model	3 / 4.016	-	-
DT model	3 / 4.016	-	-

Data Set	28	29	30
TreeBASE ID	S1088/M1862	S498/M725	S1096/M1874
hLRT model	2 / 0.233	-	2 / 4.432
AIC$_c$ model	17 / 11.030	8 / 9.368	6 / 16.461
DT model	2 / 0.233	-	-

Data Set	31	32	33
TreeBASE ID	S1315/M2308	S725/M1156	S259/M299
hLRT model	-	5 / 7.809	5 / 8.742
AIC$_c$ model	2 / 2.949	5 / 7.809	11 / 21.209
DT model	-	-	-

Data Set	34	35	36
TreeBASE ID	S1069/M1823	S1095/M1873	S771/M1220
hLRT model	2 / 0.995	-	-
AIC$_c$ model	13 / 9.356	-	7 / 8.050
DT model	-	-	-

Data Set	37	38	39
TreeBASE ID	S428/M626	S553/M824	S1178/M2038
hLRT model	2 / 1.665	-	2 / 1.240
AIC$_c$ model	11 / 14.234	6 / 26.100	9 / 14.746
DT model	-	-	-

Data Set	40	41	42
TreeBASE ID	S911/M1509	S570/M863	S724/M1155
hLRT model	8 / 12.499	12 / 21.211	3 / 5.529
AIC$_c$ model	6 / 3.748	3 / 5.332	10 / 8.687
DT model	2 / 0.014	-	-

Data Set	43	44	45
TreeBASE ID	S890/M1452	S390/M545	S693/M1102
hLRT model	-	5 / 11.878	-
AIC$_c$ model	-	4 / 1.598	5 / 11.512
DT model	-	-	-

Data Set	46	47	48
TreeBASE ID	S1243/M2167	S425/M619	S1304/M2284
hLRT model	-	-	-
AIC$_c$ model	-	-	5 / 2.319
DT model	-	-	2 / 0.425

Data Set	49	50	51

TreeBASE ID	S3x10x98c09c42c47/ M184c3x2x98c11c12c31	S333/M435	S1262/M2204
hLRT model	5 / 168.500	6 / 15.611	2 / 0.725
AIC$_c$ model	-	-	18 / 17.376
DT model	-	-	-

Data Set	**52**	**53**	**54**
TreeBASE ID	S2x14x97c16c11c45/ M165c2x14xM165c2x14x	S659/M1034	S711/M1134
hLRT model	9 / 25.258	-	-
AIC$_c$ model	2 / 1.484	4 / 14.289	-
DT model	-	-	-

Data Set	**55**	**56**	**57**
TreeBASE ID	-	-	-
hLRT model	-	-	-
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	**58**	**59**	**60**
TreeBASE ID	S367/M502	S322/M401	S1046/M1782
hLRT model	-	11 / 49.386	-
AIC$_c$ model	11 / 8.621	4 / 10.557	2 / 5.893
DT model	-	-	-

Data Set	**61**	**62**	**63**

TreeBASE ID	S529/M777	S1217/M2104	S400/M568
hLRT model	6 / 8.770	4 / 216.184	5 / 2.968
AIC$_c$ model	6 / 8.770	-	4 / 2.799
DT model	-	-	-

Data Set	64	65	66
TreeBASE ID	S958/M1589	S964/M1596	S522/M760
hLRT model	3 / 22.340	3 / 5.269	4 / 8.888
AIC$_c$ model	-	7 / 8.593	9 / 21.410
DT model	-	-	-

Data Set	67	68	69
TreeBASE ID	S967/M1604	S608/M935	S385/M537
hLRT model	2 / 3.850	7 / 14.562	4 / 4.992
AIC$_c$ model	5 / 8.609	4 / 5.666	4 / 4.992
DT model	-	-	-

Data Set	70	71	72
TreeBASE ID	S6x22x97c14c38c41/ M170c6x22x97c14c48c20	S1000/M1688	S1227/M2133
hLRT model	-	-	4 / 101.273
AIC$_c$ model	7 / 7.623	-	-
DT model	-	-	-

Data Set	73	74	75
TreeBASE ID	S440/M647	S1212/M2098	S463/M676

hLRT model	-	-	-
AIC$_c$ model	-	-	2 / 3.044
DT model	-	-	-

Data Set	76	77	78
TreeBASE ID	S990/M1650	S1013/M1709	S560/M847
hLRT model	-	-	2 / 6.217
AIC$_c$ model	2 / 2.244	-	2 / 6.217
DT model	-	-	-

Data Set	79	80	81
TreeBASE ID	S1053/M1794	S980/M1630	S548/M808
hLRT model	13 / 30.979	-	-
AIC$_c$ model	2 / 4.955	-	-
DT model	-	-	-

Data Set	82	83	84
TreeBASE ID	S1186/M2053	S605/M929	S1099/M1881
hLRT model	-	-	14 / 48.930
AIC$_c$ model	-	2 / 0.981	3 / 3.543
DT model	-	2 / 0.981	-

Data Set	85	86	87
TreeBASE ID	S945/M1568	S436/M641	S489/M714
hLRT model	-	2 / 0.085	13 / 6.793

AIC$_c$ model	-	2 / 0.085	-
DT model	2 / 0.477	3 / 0.570	2 / 0

Data Set	**88**	**89**	**90**
TreeBASE ID	S413/M603	S1192/M2059	S1313/M2305
hLRT model	2 / 2.153	3 / 29.762	8 / 10.047
AIC$_c$ model	8 / 12.439	-	14 / 15.354
DT model	-	-	-

Data Set	**91**	**92**	**93**
TreeBASE ID	S472/M688	S1030/M1749	S1036/M1760
hLRT model	-	3 / 6.738	4 / 3.046
AIC$_c$ model	2 / 2.898	2 / 5.559	3 / 2.596
DT model	2 / 2.898	-	-

Data Set	**94**	**95**	**96**
TreeBASE ID	S432/M636	S578/M872	S804/M1270
hLRT model	4 / 90.617	-	-
AIC$_c$ model	-	-	3 / 13.238
DT model	-	-	-

Data Set	**97**	**98**	**99**
TreeBASE ID	S821/M1318	S568/M861	S1051/M1792
hLRT model	-	11 / 23.237	-
AIC$_c$ model	2 / 0.790	8 / 14.050	-

| DT model | 10 / 6.291 | - | - |

Data Set	100	101	102
TreeBASE ID	S11x6x95c10c11c33/ M58c11x6x95c10c13c27	S1094/M1869	S777/M1232
hLRT model	2 / 0.071	2 / 20.461	7 / 5.268
AIC$_c$ model	-	-	13 / 12.769
DT model	-	-	-

Data Set	103	104	105
TreeBASE ID	S421/M615	S916/M1516	S664/M1042
hLRT model	6 / 11.094	-	-
AIC$_c$ model	6 / 11.094	-	2 / 3.625
DT model	-	-	-

Data Set	106	107	108
TreeBASE ID	S1140/M1958	S671/M1053	S584/M880
hLRT model	-	-	2 / 1.787
AIC$_c$ model	-	3 / 3.573	18 / 11.859
DT model	-	-	-

Data Set	109	110	111
TreeBASE ID	S753/M1189	S533/M780	S375/M515
hLRT model	-	-	9 / 17.175
AIC$_c$ model	8 / 15.602	2 / 3.143	4 / 3.710
DT model	-	-	-

Data Set	112	113	114
TreeBASE ID	S1197/M2066	S884/M1435	S1322/M2318
hLRT model	4 / 5.687	-	-
AIC$_c$ model	2 / 1.514	5 / 8.659	-
DT model	-	-	-

Data Set	115	116	117
TreeBASE ID	S941/M1560	S6x23x97c17c57c34/ M171c6x23x97c18c01c10	S557/M837
hLRT model	2 / 177.832	-	7 / 35.224
AIC$_c$ model	4 / 6.462	-	-
DT model	-	-	-

Data Set	118	119	120
TreeBASE ID	S703/M1124	S1089/M1864	S1020/M1727
hLRT model	5 / 0.508	2 / 0.777	2 / 6.703
AIC$_c$ model	5 / 0.508	2 / 0.777	-
DT model	-	-	-

Data Set	121	122	123
TreeBASE ID	S1278/M2234	S1097/M1877	S619/M955
hLRT model	4 / 7.869	5 / 8.300	2 / 6.356
AIC$_c$ model	4 / 7.869	5 / 8.300	2 / 6.356
DT model	-	-	-

Data Set	124	125	126
TreeBASE ID	S902/M1482	S824/M1323	S667/M1048
hLRT model	3 / 2.585	2 / 2.737	-
AIC$_c$ model	3 / 2.585	-	3 / 8.680
DT model	-	-	-

Data Set	127	128	129
TreeBASE ID	S700/M1118	S1061/M1811	S731/M1163
hLRT model	2 / 38.391	2 / 0.339	-
AIC$_c$ model	-	2 / 0.339	6 / 4.959
DT model	-	-	-

Data Set	130	131	132
TreeBASE ID	S1307/M2290	S470/M685	S681/M1066
hLRT model	2 / 0	-	-
AIC$_c$ model	9 / 7.983	-	3 / 3.039
DT model	2 / 0	-	-

Data Set	133	134	135
TreeBASE ID	S1052/M1793	S284/M322	S1071/M1827
hLRT model	3 / 54.156	3 / 3.440	-
AIC$_c$ model	-	4 / 5.475	2 / 3.857
DT model	-	-	-

Data Set	136	137	138

TreeBASE ID	S554/M825	S1037/M1765	S816/M1305
hLRT model	-	-	-
AIC$_c$ model	3 / 2.101	6 / 7.547	2 / 4.797
DT model	-	-	-

Data Set	**139**	**140**	**141**
TreeBASE ID	S643/M1000	S669/M1051	S1230/M2141
hLRT model	-	-	4 / 15.924
AIC$_c$ model	5 / 5.459	-	4 / 15.924
DT model	4 / 2.703	-	-

Data Set	**142**	**143**	**144**
TreeBASE ID	S647/M1013	S1296/M2273	S397/M565
hLRT model	-	12 / 15.728	3 / 12.719
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	**145**	**146**	**147**
TreeBASE ID	S404/M584	S997/M1673	S422/M616
hLRT model	-	5 / 5.538	11 / 17.308
AIC$_c$ model	8 / 20.877	8 / 6.784	2 / 2.268
DT model	-	-	-

Data Set	**148**	**149**	**150**

TreeBASE ID	S818/M1310	S357/M489	S1177/M2035
hLRT model	2 / 0.023	7 / 9.391	2 / 0.402
AIC$_c$ model	5 / 3.936	-	9 / 11.031
DT model	2 / 0.023	-	-

Data Set	151	152	153
TreeBASE ID	S726/M1157	S351/M468	S971/M1612
hLRT model	4 / 3.968	6 / 19.434	-
AIC$_c$ model	-	5 / 13.965	-
DT model	-	-	-

Data Set	154	155	156
TreeBASE ID	S1006/M1698	S1057/M1802	S658/M1032
hLRT model	-	-	-
AIC$_c$ model	5 / 7.932	-	6 / 6.526
DT model	-	-	-

Data Set	157	158	159
TreeBASE ID	S657/M1031	S1180/M2041	S1090/M1865
hLRT model	6 / 33.520	2 / 5.775	-
AIC$_c$ model	2 / 1.699	2 / 5.775	12 / 18.815
DT model	-	-	-

Data Set	160	161	162
TreeBASE ID	S466/M680	S799/M1265	S757/M1197

hLRT model	2 / 4.858	12 / 12.345	-
AIC$_c$ model	2 / 4.858	6 / 5.357	6 / 3.994
DT model	-	-	3 / 1.692

Data Set	163	164	165
TreeBASE ID	S928/M1538	S1023/M1734	S1229/M2139
hLRT model	2 / 2.047	2 / 1.867	-
AIC$_c$ model	6 / 5.920	2 / 1.867	2 / 1.044
DT model	-	-	3 / 1.072

Data Set	166	167	168
TreeBASE ID	S305/M347	S1161/M1998	S414/M604
hLRT model	5 / 28.896	3 / 3.211	-
AIC$_c$ model	-	4 / 4.455	-
DT model	-	-	-

Data Set	169	170	171
TreeBASE ID	S1059/M1806	S969/M1606	S1125/M1928
hLRT model	-	-	-
AIC$_c$ model	6 / 18.724	2 / 3.503	2 / 4.450
DT model	-	-	-

Data Set	172	173	174
TreeBASE ID	S1301/M2279	S543/M801	S1041/M1775
hLRT model	3 / 3.625	4 / 79.859	-

AIC$_c$ model	2 / 2.586	-	-
DT model	-	-	-

Data Set	**175**	**176**	**177**
TreeBASE ID	S701/M1119	S887/M1438	S1199/M2068
hLRT model	4 / 2.171	-	2 / 4.544
AIC$_c$ model	3 / 1.995	8 / 11.708	-
DT model	-	-	-

Data Set	**178**	**179**	**180**
TreeBASE ID	S655/M1029	S709/M1131	S1028/M1746
hLRT model	4 / 14.664	2 / 101.391	-
AIC$_c$ model	-	-	8 / 14.289
DT model	-	-	-

Data Set	**181**	**182**	**183**
TreeBASE ID	S833/M1334	S672/M1054	S331/M433
hLRT model	-	4 / 9.053	15 / 7.325
AIC$_c$ model	-	-	14 / 7.250
DT model	-	-	-

Data Set	**184**	**185**	**186**
TreeBASE ID	S903/M1483	S1162/M1999	S1001/M1692
hLRT model	8 / 49.907	7 / 9.554	5 / 6.754
AIC$_c$ model	2 / 4.574	9 / 12.542	7 / 9.307

| DT model | - | - | - |

Data Set	187	188	189
TreeBASE ID	S892/M1465	S1195/M2064	S798/M1263
hLRT model	-	-	-
AIC$_c$ model	8 / 11.127	6 / 20.945	-
DT model	-	-	-

Data Set	190	191	192
TreeBASE ID	S1018/M1725	S1155/M1984	S979/M1629
hLRT model	3 / 54.512	-	2 / 3.879
AIC$_c$ model	-	5 / 5.736	-
DT model	-	-	-

Data Set	193	194	195
TreeBASE ID	S532/M779	S935/M1550	S1101/M1883
hLRT model	3 / 40.256	-	11 / 12.343
AIC$_c$ model	-	8 / 7.399	30 / 22.483
DT model	-	3 / 3.442	-

Data Set	196	197	198
TreeBASE ID	S1008/M1704	S1050/M1790	S621/M959
hLRT model	-	2 / 0.051	-
AIC$_c$ model	6 / 5.644	-	-
DT model	-	5 / 7.816	2 / 0.256

Data Set	199	200	201
TreeBASE ID	S1092/M1867	S914/M1512	S1312/M2300
hLRT model	2 / 0.012	-	-
AIC$_c$ model	-	-	3 / 4.498
DT model	-	-	-

Data Set	202	203	204
TreeBASE ID	S1320/M2316	S838/M1354	S1044/M1780
hLRT model	-	-	-
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	205	206	207
TreeBASE ID	S1295/M2266	S920/M1521	S1298/M2276
hLRT model	-	8 / 7.426	-
AIC$_c$ model	-	8 / 7.426	2 / 1.598
DT model	-	5 / 1.773	-

Data Set	208	209	210
TreeBASE ID	S1253/M2191	S338/M441	S565/M856
hLRT model	7 / 5.671	-	8 / 10.201
AIC$_c$ model	7 / 5.671	11 / 12.459	17 / 19.366
DT model	-	-	-

Data Set	211	212	213
TreeBASE ID	S1010/M1706	S384/M536	S1303/M2283
hLRT model	5 / 10.172	2 / 11.160	-
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	214	215	216
TreeBASE ID	S524/M765	S837/M1353	S392/M548
hLRT model	4 / 36.273	-	-
AIC$_c$ model	-	-	3 / 8.033
DT model	-	-	-

Data Set	217	218	219
TreeBASE ID	S1072/M1828	S496/M722	S1122/M1919
hLRT model	-	2 / 0.887	6 / 17.443
AIC$_c$ model	-	13 / 10.308	2 / 3.352
DT model	-	-	-

Data Set	220	221	222
TreeBASE ID	S1200/M2069	S983/M1636	S773/M1224
hLRT model	4 / 131.121	3 / 2.281	8 / 18.714
AIC$_c$ model	-	33 / 11.866	3 / 3.687
DT model	-	2 / 0.392	-

Data Set	223	224	225

TreeBASE ID	S1310/M2295	S1126/M1930	S836/M1352
hLRT model	4 / 11.106	6 / 9.529	2 / 3.484
AIC$_c$ model	AIC$_c$ model	AIC$_c$ model	AIC$_c$ model
DT model	-	-	-

Data Set	226	227	228
TreeBASE ID	S1102/M1884	S396/M564	S382/M529
hLRT model	-	-	4 / 1.987
AIC$_c$ model	3 / 5.718	5 / 12.686	14 / 15.387
DT model	-	-	3 / 1.565

Data Set	229	230	231
TreeBASE ID	S1305/M2286	S962/M1594	S1007/M1700
hLRT model	-	6 / 10.698	-
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	232	233	234
TreeBASE ID	S1014/M1717	S737/M1169	S1289/M2256
hLRT model	-	-	-
AIC$_c$ model	-	-	-
DT model	-	-	-

Data Set	235	236	237

TreeBASE ID	S792/M1215	S1270/M2218	S1231/M2143
hLRT model	-	3 / 5.767	3 / 0.952
AIC$_c$ model	-	-	3 / 0.952
DT model	-	-	-

Data Set	238	239	240
TreeBASE ID	S1075/M1832	S1070/M1826	S403/M581
hLRT model	-	-	2 / 4.992
AIC$_c$ model	-	2 / 3.820	7 / 10.864
DT model	-	-	-

Data Set	241	242	243
TreeBASE ID	S1127/M1933	S1163/M000	S537/M787
hLRT model	4 / 4.413	-	7 / 14.188
AIC$_c$ model	28 / 14.745	33 / 19.404	3 / 5.941
DT model	-	-	-

Data Set	244	245	246
TreeBASE ID	S1235/M2149	S1216/M2102	S1039/M1769
hLRT model	5 / 9.002	3 / 4.174	6 / 3.948
AIC$_c$ model	11 / 22.645	4 / 4.895	6 / 3.948
DT model	2 / 0.148	-	3 / 0.403

Data Set	247	248	249
TreeBASE ID	S1060/M1809	S368/M503	S389/M543

hLRT model	2 / 1.992	2 / 4.659	-
AIC$_c$ model	2 / 1.992	2 / 4.659	5 / 12.371
DT model	-	-	-

Data Set	**250**

TreeBASE ID	S939/M1556
hLRT model	15 / 37.843
AIC$_c$ model	-
DT model	-