```
--------------------------- jModeltest 0.1.1 ---------------------------
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------------------------------------------------------------------------
Wed Oct 19 16:56:26 CEST 2011  (Mac OS X 10.6.8, arch: x86_64)


***************************** NOTICE **********************************
This program may contain errors. Please inspect the results carefully.
**********************************************************************

Reading data file "Glaucoreseda_LF.nex"... OK.
  number of sequences: 17
  number of sites: 736



----------------------------------------------------------------
*                                                              *
*          COMPUTATION OF LIKELIHOOD SCORES WITH PHYML         *
*                                                              *
----------------------------------------------------------------

Settings:
 Phyml version = 3.0
 Candidate models = 24
  number of substitution schemes = 3
  including models with equal/unequal base frequencies (+F)
  including models with/without a proportion of invariable sites (+I)
  including models with/without rate variation among sites (+G) (nCat = 4)
 Optimized free parameters (K) = substitution parameters + 31 branch lengths + topology
 Base tree for likelihood calculations = ML tree

Maximum likelihod estimation for the JC model.
  ML optimized tree topology
   Model = JC
   partition = 000000
   -lnL = 1268.3066
   K = 32
  Computation time = 00h:00:00:02  (00h:00:00:02)

Maximum likelihod estimation for the JC+I model.
  ML optimized tree topology
   Model = JC+I
   partition = 000000
   -lnL = 1266.9034
   K = 33
   p-inv = 0.7670
  Computation time = 00h:00:00:03  (00h:00:00:05)

Maximum likelihod estimation for the JC+G model.
  ML optimized tree topology
   Model = JC+G
   partition = 000000
   -lnL = 1266.9228
   K = 33
   gamma shape = 0.0480
  Computation time = 00h:00:00:03  (00h:00:00:08)
```

Maximum likelihod estimation for the JC+I+G model.
  ML optimized tree topology
   Model = JC+I+G
   partition = 000000
   -lnL = 1276.1621
   K = 34
   p-inv = 0.9380
   gamma shape = 97.7320
  Computation time = 00h:00:00:05 (00h:00:01:03)

Maximum likelihod estimation for the F81 model.
  ML optimized tree topology
   Model = F81
   partition = 000000
   -lnL = 1221.1708
   K = 35
    freqA = 0.3526
    freqC = 0.1677
    freqG = 0.1611
    freqT = 0.3186
  Computation time = 00h:00:00:02 (00h:00:01:05)

Maximum likelihod estimation for the F81+I model.
  ML optimized tree topology
   Model = F81+I
   partition = 000000
   -lnL = 1219.7011
   K = 36
    freqA = 0.3526
    freqC = 0.1674
    freqG = 0.1612
    freqT = 0.3187
   p-inv = 0.7740
  Computation time = 00h:00:00:05 (00h:00:02:00)

Maximum likelihod estimation for the F81+G model.
  ML optimized tree topology
   Model = F81+G
   partition = 000000
   -lnL = 1219.7236
   K = 36
    freqA = 0.3526
    freqC = 0.1675
    freqG = 0.1612
    freqT = 0.3187
   gamma shape = 0.0420
  Computation time = 00h:00:00:05 (00h:00:02:05)

Maximum likelihod estimation for the F81+I+G model.
  ML optimized tree topology
   Model = F81+I+G
   partition = 000000
   -lnL = 1228.1433
   K = 37
    freqA = 0.3517
    freqC = 0.1658

```
   freqG = 0.1624
   freqT = 0.3201
  p-inv = 0.9360
  gamma shape = 97.7600
 Computation time = 00h:00:01:09  (00h:00:04:04)


Maximum likelihod estimation for the K80 model.
  ML optimized tree topology
   Model = K80
   partition = 010010
   -lnL = 1268.2918
   K = 33
   kappa = 0.9413 (ti/tv = 0.4707)
 Computation time = 00h:00:00:02  (00h:00:04:06)


Maximum likelihod estimation for the K80+I model.
  ML optimized tree topology
   Model = K80+I
   partition = 010010
   -lnL = 1266.8899
   K = 34
   kappa = 0.9413 (ti/tv = 0.4707)
   p-inv = 0.7670
 Computation time = 00h:00:00:03  (00h:00:04:09)


Maximum likelihod estimation for the K80+G model.
  ML optimized tree topology
   Model = K80+G
   partition = 010010
   -lnL = 1266.9094
   K = 34
   kappa = 0.9413 (ti/tv = 0.4707)
   gamma shape = 0.0490
 Computation time = 00h:00:00:04  (00h:00:05:03)


Maximum likelihod estimation for the K80+I+G model.
  ML optimized tree topology
   Model = K80+I+G
   partition = 010010
   -lnL = 1276.1477
   K = 35
   kappa = 1.1036 (ti/tv = 0.5518)
   p-inv = 0.9380
   gamma shape = 97.7310
 Computation time = 00h:00:00:05  (00h:00:05:08)


Maximum likelihod estimation for the HKY model.
  ML optimized tree topology
   Model = HKY
   partition = 010010
   -lnL = 1221.1483
   K = 36
   freqA = 0.3527
   freqC = 0.1676
   freqG = 0.1611
   freqT = 0.3186
   kappa = 1.0783 (ti/tv = 0.4757)
```

```
  Computation time = 00h:00:00:02  (00h:00:06:01)


Maximum likelihod estimation for the HKY+I model.
  ML optimized tree topology
   Model = HKY+I
   partition = 010010
   -lnL = 1219.6742
   K = 37
    freqA = 0.3527
    freqC = 0.1674
    freqG = 0.1611
    freqT = 0.3188
   kappa = 1.0918 (ti/tv = 0.4816)
   p-inv = 0.7740
  Computation time = 00h:00:00:06  (00h:00:06:06)


Maximum likelihod estimation for the HKY+G model.
  ML optimized tree topology
   Model = HKY+G
   partition = 010010
   -lnL = 1219.6969
   K = 37
    freqA = 0.3527
    freqC = 0.1674
    freqG = 0.1611
    freqT = 0.3188
   kappa = 1.0900 (ti/tv = 0.4808)
   gamma shape = 0.0410
  Computation time = 00h:00:00:05  (00h:00:07:02)


Maximum likelihod estimation for the HKY+I+G model.
  ML optimized tree topology
   Model = HKY+I+G
   partition = 010010
   -lnL = 1228.0581
   K = 38
    freqA = 0.3518
    freqC = 0.1657
    freqG = 0.1623
    freqT = 0.3202
   kappa = 1.2725 (ti/tv = 0.5612)
   p-inv = 0.9360
   gamma shape = 97.7600
  Computation time = 00h:00:02:00  (00h:00:09:02)


Maximum likelihod estimation for the SYM model.
  ML optimized tree topology
   Model = SYM
   partition = 012345
   -lnL = 1264.4136
   K = 37
   R(a) [AC] =  0.5313
   R(b) [AG] =  1.1864
   R(c) [AT] =  0.7266
   R(d) [CG] =  0.6964
   R(e) [CT] =  0.2148
   R(f) [GT] =  1.0000
```

```
  Computation time = 00h:00:00:07  (00h:00:09:09)

Maximum likelihod estimation for the SYM+I model.
  ML optimized tree topology
   Model = SYM+I
   partition = 012345
   -lnL = 1263.7731
   K = 38
   R(a) [AC] =  0.4862
   R(b) [AG] =  1.2479
   R(c) [AT] =  0.6645
   R(d) [CG] =  0.8812
   R(e) [CT] =  0.0006
   R(f) [GT] =  1.0000
   p-inv = 0.8610
  Computation time = 00h:00:00:06  (00h:00:10:05)

Maximum likelihod estimation for the SYM+G model.
  ML optimized tree topology
   Model = SYM+G
   partition = 012345
   -lnL = 1262.8926
   K = 38
   R(a) [AC] =  0.5287
   R(b) [AG] =  1.2658
   R(c) [AT] =  0.7293
   R(d) [CG] =  0.7358
   R(e) [CT] =  0.1833
   R(f) [GT] =  1.0000
   gamma shape = 0.0330
  Computation time = 00h:00:00:05  (00h:00:10:09)

Maximum likelihod estimation for the SYM+I+G model.
  ML optimized tree topology
   Model = SYM+I+G
   partition = 012345
   -lnL = 1271.3983
   K = 39
   R(a) [AC] =  0.2089
   R(b) [AG] =  2.3875
   R(c) [AT] =  0.9660
   R(d) [CG] =  1.7364
   R(e) [CT] =  0.0007
   R(f) [GT] =  1.0000
   p-inv = 0.9370
   gamma shape = 96.3090
  Computation time = 00h:00:02:02  (00h:00:13:02)

Maximum likelihod estimation for the GTR model.
  ML optimized tree topology
   Model = GTR
   partition = 012345
   -lnL = 1216.1572
   K = 40
    freqA = 0.3529
    freqC = 0.1705
    freqG = 0.1553
```

```
  freqI = 0.3213
  R(a) [AC] =   0.4770
  R(b) [AG] =   1.1452
  R(c) [AT] =   0.4423
  R(d) [CG] =   0.8862
  R(e) [CT] =   0.2001
  R(f) [GT] =   1.0000
  Computation time = 00h:00:00:02  (00h:00:13:04)

Maximum likelihod estimation for the GTR+I model.
  ML optimized tree topology
  Model = GTR+I
  partition = 012345
  -lnL = 1215.0594
  K = 41
   freqA = 0.3531
   freqC = 0.1702
   freqG = 0.1543
   freqT = 0.3224
  R(a) [AC] =   0.3504
  R(b) [AG] =   1.1559
  R(c) [AT] =   0.3130
  R(d) [CG] =   1.1827
  R(e) [CT] =   0.0003
  R(f) [GT] =   1.0000
   p-inv = 0.8610
  Computation time = 00h:00:00:05  (00h:00:13:09)

Maximum likelihod estimation for the GTR+G model.
  ML optimized tree topology
  Model = GTR+G
  partition = 012345
  -lnL = 1214.4396
  K = 41
   freqA = 0.3530
   freqC = 0.1704
   freqG = 0.1547
   freqT = 0.3218
  R(a) [AC] =   0.4428
  R(b) [AG] =   1.2005
  R(c) [AT] =   0.4022
  R(d) [CG] =   0.9542
  R(e) [CT] =   0.1607
  R(f) [GT] =   1.0000
   gamma shape = 0.0280
  Computation time = 00h:00:00:06  (00h:00:14:05)

Maximum likelihod estimation for the GTR+I+G model.
  ML optimized tree topology
  Model = GTR+I+G
  partition = 012345
  -lnL = 1223.2225
  K = 42
   freqA = 0.3507
   freqC = 0.1669
   freqG = 0.1602
   freqT = 0.3222
  R(a) [AC] =   0.000E
```

```
  R(a) [AC] =   0.0005
  R(b) [AG] =   2.4050
  R(c) [AT] =   0.5701
  R(d) [CG] =   2.9501
  R(e) [CT] =   0.0005
  R(f) [GT] =   1.0000
  p-inv = 0.9340
  gamma shape = 94.0660
  Computation time = 00h:00:02:04  (00h:00:16:09)
```

Computation of likelihood scores completed. It took 00h:00:16:09.


```
----------------------------------------------------------------
*                                                              *
*          CORRECTED AKAIKE INFORMATION CRITERION (AICc)       *
*                                                              *
----------------------------------------------------------------
```

Settings:
 Sample size = 736

 Model selected:
   Model = F81+I
   partition = 000000
   -lnL = 1219.7011
   K = 36
    freqA = 0.3526
    freqC = 0.1674
    freqG = 0.1612
    freqT = 0.3187
   p-inv = 0.7740

* AICc MODEL SELECTION : Selection uncertainty

Model	-lnL	K	AICc	delta	weight	cumWeight
F81+I	1219.7011	36	2515.2134	0.0000	0.1959	0.1959
F81+G	1219.7236	36	2515.2584	0.0450	0.1916	0.3875
GTR+G	1214.4396	41	2515.8417	0.6283	0.1431	0.5306
F81	1221.1708	35	2515.9417	0.7283	0.1361	0.6667
GTR	1216.1572	40	2517.0338	1.8204	0.0788	0.7456
GTR+I	1215.0594	41	2517.0813	1.8679	0.0770	0.8226
HKY+I	1219.6742	37	2517.3771	2.1637	0.0664	0.8890
HKY+G	1219.6969	37	2517.4225	2.2091	0.0649	0.9539
HKY	1221.1483	36	2518.1077	2.8943	0.0461	1.0000
F81+I+G	1228.1433	37	2534.3153	19.1019	1.39e-005	1.0000
GTR+I+G	1223.2225	42	2535.6571	20.4437	7.12e-006	1.0000
HKY+I+G	1228.0581	38	2536.3687	21.1553	4.99e-006	1.0000
JC+I	1266.9034	33	2603.0033	87.7899	1.69e-020	1.0000
JC+G	1266.9228	33	2603.0422	87.8288	1.66e-020	1.0000
JC	1268.3066	32	2603.6174	88.4040	1.25e-020	1.0000
K80+I	1266.8899	34	2605.1750	89.9617	5.72e-021	1.0000
K80+G	1266.9094	34	2605.2139	90.0005	5.61e-021	1.0000
K80	1268.2918	33	2605.7803	90.5669	4.22e-021	1.0000

K80	1268.2918	35	2605.7805	90.5009	4.22e-021	1.0000
SYM+G	1262.8926	38	2606.0377	90.8243	3.71e-021	1.0000
SYM	1264.4136	37	2606.8558	91.6424	2.47e-021	1.0000
SYM+I	1263.7731	38	2607.7988	92.5854	1.54e-021	1.0000
JC+I+G	1276.1621	34	2623.7193	108.5059	5.37e-025	1.0000
SYM+I+G	1271.3983	39	2625.2793	110.0659	2.46e-025	1.0000
K80+I+G	1276.1477	35	2625.8954	110.6820	1.81e-025	1.0000

```
-------------------------------------------------------------------------
-lnL:      negative log likelihod
 K:        number of estimated parameters
 AICc:     Corrected Akaike Information Criterion
 delta:    AICc difference
 weight:   AICc weight
 cumWeight: cumulative AICc weight
```

Model selection results also available at the "Model > Show model table" menu

* AICc MODEL SELECTION : Confidence interval

There are 24 models in the 100% confidence interval: [F81+I F81+G GTR+G F81 GTR GTR+I HKY+I HKY+G HKY F81+I+G GTR+I+G HKY+I+G JC+I JC+G JC K80+I K80+G K80 SYM+G SYM SYM+I JC+I+G SYM+I+G K80+I+G]

* AICc MODEL SELECTION : Parameter importance

```
Parameter   Importance
-----------------------
fA              1.0000
fC              1.0000
fG              1.0000
fT              1.0000
kappa           0.1774
titv            0.1774
rAC             0.2990
rAG             0.2990
rAT             0.2990
rCG             0.2990
rCT             0.2990
rGT             0.2990
pinv(I)         0.3393
alpha(G)        0.3996
pinv(IG)        0.0000
alpha(IG)       0.0000
-----------------------
Values have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.
```


* AICc MODEL SELECTION : Model averaged estimates

```
          Model-averaged
Parameter      estimates
-------------------------
fA                0.3528
```

```
...                        0,5525
fC                         0,1684
fG                         0,1593
fT                         0,3196
kappa                      1,0876
titv                       0,4798
rAC                        0,4280
rAG                        1,1745
rAT                        0,3898
rCG                        0,9952
rCT                        0,1298
rGT                        1,0000
pinv(I)                    0,7937
alpha(G)                   0,0368
pinv(IG)                   0,9355
alpha(IG)                 96,7498
-------------------------
Numbers have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.




-----------------------------------------------------------------
*                                                               *
*              BAYESIAN INFORMATION CRITERION (BIC)             *
*                                                               *
-----------------------------------------------------------------

Settings:
sample size = 736

  Model  selected:
    Model = F81
    partition = 000000
    -lnL = 1221.1708
    K = 35
     freqA = 0.3526
     freqC = 0.1677
     freqG = 0.1611
     freqT = 0.3186


* BIC MODEL SELECTION : Selection uncertainty

Model           -lnL    K       BIC      delta      weight cumWeight
-------------------------------------------------------------------
F81          1221.1708   35   2673.3848   0.0000     0.7317    0.7317
F81+I        1219.7011   36   2677.0465   3.6618     0.1173    0.8490
F81+G        1219.7236   36   2677.0916   3.7068     0.1147    0.9636
HKY          1221.1483   36   2679.9408   6.5561     0.0276    0.9912
HKY+I        1219.6742   37   2683.5940  10.2092     0.0044    0.9956
HKY+G        1219.6969   37   2683.6393  10.2546     0.0043    1.0000
GTR          1216.1572   40   2696.3636  22.9788   7.49e-006   1.0000
GTR+G        1214.4396   41   2699.5296  26.1448   1.54e-006   1.0000
F81+I+G      1228.1433   37   2700.5322  27.1474   9.32e-007   1.0000
GTR+I        1215.0594   41   2700.7692  27.3844   8.28e-007   1.0000
```

```
HKY+I+G     1228.0581   38   2706.9630    33.5782   3.74e-008   1.0000
GTR+I+G     1223.2225   42   2723.6967    50.3119   8.69e-012   1.0000
JC          1268.3066   32   2747.8525    74.4677   4.94e-017   1.0000
JC+I        1266.9034   33   2751.6473    78.2625   7.41e-018   1.0000
JC+G        1266.9228   33   2751.6862    78.3015   7.27e-018   1.0000
K80         1268.2918   33   2754.4243    81.0395   1.85e-018   1.0000
K80+I       1266.8899   34   2758.2217    84.8370   2.77e-019   1.0000
K80+G       1266.9094   34   2758.2606    84.8758   2.72e-019   1.0000
SYM         1264.4136   37   2773.0727    99.6879   1.65e-022   1.0000
SYM+G       1262.8926   38   2776.6320   103.2472   2.78e-023   1.0000
JC+I+G      1276.1621   34   2776.7659   103.3812   2.60e-023   1.0000
SYM+I       1263.7731   38   2778.3930   105.0082   1.15e-023   1.0000
K80+I+G     1276.1477   35   2783.3385   109.9537   9.73e-025   1.0000
SYM+I+G     1271.3983   39   2800.2446   126.8598   2.08e-028   1.0000
--------------------------------------------------------------------------
-lnL:       negative log likelihod
K:          number of estimated parameters
BIC:        Bayesian Information Criterion
delta:      BIC difference
weight:     BIC weight
cumWeight:  cumulative BIC weight
```

Model selection results also available at the "Model > Show model table" menu

* BIC MODEL SELECTION : Confidence interval

There are 24 models in the 100% confidence interval: [F81 F81+I F81+G HKY HKY+I HKY+G GTR
GTR+G F81+I+G GTR+I HKY+I+G GTR+I+G JC JC+I JC+G K80 K80+I K80+G SYM SYM+G JC+I+G SYM+I
K80+I+G SYM+I+G]

* BIC MODEL SELECTION : Parameter importance

```
Parameter   Importance
----------------------
fA             1.0000
fC             1.0000
fG             1.0000
fT             1.0000
kappa          0.0364
titv           0.0364
rAC            0.0000
rAG            0.0000
rAT            0.0000
rCG            0.0000
rCT            0.0000
rGT            0.0000
pinv(I)        0.1217
alpha(G)       0.1190
pinv(IG)       0.0000
alpha(IG)      0.0000
----------------------
```
Values have been rounded.
 (I): considers only +I models.
 (G): considers only +G models.

* BIC MODEL SELECTION : Model averaged estimates

```
           Model-averaged
Parameter      estimates
-------------------------
fA                0,3526
fC                0,1676
fG                0,1611
fT                0,3186
kappa             1,0813
titv              0,4770
rAC               0,4610
rAG               1,1547
rAT               0,4252
rCG               0,9217
rCT               0,1772
rGT               1,0000
pinv(I)           0,7740
alpha(G)          0,0420
pinv(IG)          0,9360
alpha(IG)        97,7600
-------------------------
```
Numbers have been rounded.
 (I): considers only +I models.
 (G): considers only +G models.
 (IG): considers only +I+G models.