Supporting Information:

FIGURE S1. ClustalW2 (1) results from a multiple sequence alignment of Rubisco activases.

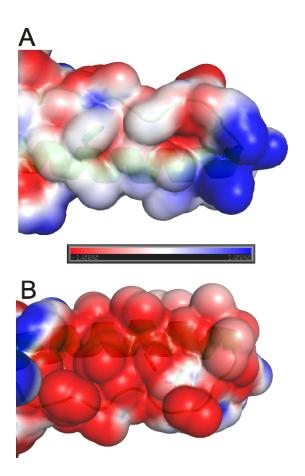
CLUSTAL 2.1 multiple sequence alignment

```
Creosote \alpha
                  -AQEISEDQQTDKDKWKGLAY--DISDDQQDITRGKGMVDTLFQAPMQSG-THYAVMSSY 56
Creosote B
                  -AQEISEDQQTDKDKWKGLAY--DISDDQQDITRGKGMVDTLFQAPMQSG-THYAIMSSY 56
Cotton B
                  -AKEIDEDTQTDQDRWKGLAY--DISDDQQDITRGKGMVDSLFQAPMNDG-THYAVMSSY 56
Tobacco β
                  EEKDADPKKQTDSDRWKGLVQ--DFSDDQQDITRGKGMVDSLFQAPTGTG-THHAVLQSY 57
Spinach \alpha
                  ---AAENEEKNTDKWAHLAK--DFSDDQLDIRRGKGMVDSLFQAPADAG-THVPIQSSF 53
Arabidopsis_β
                  ---AVKEDKQTDGDRWRGLAY--DTSDDQQDITRGKGMVDSVFQAPMGTG-THHAVLSSY 54
                  AQLQVVASSRKQMGRWRSIDAGVDASDDQQDITRGREMVDDLFQGGFGAGGTHNAVLSSQ 60
C.reinhardtii
                                        * **** ** **: *** :**.
                         . . . : . : * :
                  DYISQGLRQ--LDNNMDGLYIAPAFMDKLVVHITKNYLNLPNIKVPLILGIWGGKGQGKS 114
Creosote \alpha
Creosote B
                  DHISQGLRQYNLDNNMDGFYIAPAFMDKLVVHITKNFLSLPNIKIPLILGIWGGKGQGKS 116
Cotton_\beta
                  EYLSQGLRTYDLDNNMDGFYIAPAFMDKLVVHITKNFMTLPNIKVPLILGVWGGKGQGKS 116
Tobacco \beta
                  EYVSQGLRQYNLDNKLDGFYIAPAFMDKLVVHITKNFLKLPNIKVPLILGIWGGKGQGKS 117
Spinach &
                  EYESQGLRKYDIDNMLGDFYIAPAFMDKLVVHITKNFLNLPNIKIPLILGVWGGMGQGKS 113
Arabidopsis B
                  EYVSQGLRQYNLDNMMDGFYIAPAFMDKLVVHITKNFLTLPNIKVPLILGIWGGKGQGKS 114
C.reinhardtii
                  EYLSOSRAS--FNNIEDGFYISPAFLDKMTIHIAKNFMDLPKIKVPLILGIWGGKGOGKT 118
                             ::* ..:**:**:**: **:**:***** ****
Creosote \alpha
                  GAGRMGGTTOYTVNNOMVNATLMNIADNPTNVOLPGMYNKEENPRVPIIVTGNDFSTLYA 234
Creosote_\beta
                  GAGRMGGTTQYTVNNQMVNATLMNIADNPTNVQLPGMYNKEENPRVPIIVTGNDFSTLYA 236
Cotton_B
                  GAGRMGGTTQYTVNNQMVNATLMNIADNPTNVQLPGMYNKEENPRVPIIVTGNDFSTLYA 236
Tobacco_β
                  GAGRMGGTTQYTVNNQMVNATLMNIADNPTNVQLPGMYNKQENARVPIIVTGNDFSTLYA 237
Spinach \alpha
                  GAGRMGGTTQYTVNNQMVNATLMNIADNPTNVQLPGMYNKQDNARVPIIVTGNDFSTLYA 233
Arabidopsis \beta
                  GAGRMGGTTQYTVNNQMVNATLMNIADNPTNVQLPGMYNKEENARVPIICTGNDFSTLYA 234
C.reinhardtii
                  GAGRMGDTTQYTVNNQMVNATLMNIADNPTNVQLPGVYKNEEIPRVPIVCTGNDFSTLYA 238
                  Creosote \alpha
                  PLIRDGRMEKFYWAPTREDRIGVCKGIFRTDNVADDDIVKLVDTFPGQSIDFFGALRARV 294
                  PLIRDGRMEKFYWAPTREDRIGVCKGIFRTDNVPEEDIVKVVDQFPGQSIDFFGALRARV 296
Creosote_{\beta}
Cotton B
                  PLIRDGRMEKFYWAPTREDRIGVCTGIFRTDNVPVDDLVKLVDTFPGQSIDFFGALRARV 296
Tobacco_β
                  PLIRDGRMEKFYWAPTREDRIGVCTGIFRTDNVPAEDVVKIVDNFPGQSIDFFGALRARV 297
Spinach \alpha
                  PLIRDGRMEKFYWAPTREDRIGVCTGIFKTDKVPAEHVVKLVDAFPGQSIDFFGALRARV 293
{\tt Arabidopsis}\_\beta
                  PLIRDGRMEKFYWAPTREDRIGVCKGIFRTDKIKDEDIVTLVDQFPGQSIDFFGALRARV 294
C.reinhardtii
                  PLIRDGRMEKYYWNPTREDRIGVCMGIFQEDNVQRREVENLVDTFPGQSIDFFGALRARV 298
                                                     .: .:** **********
                  ********* ******* ***
                  YDDEVRKWVSEVGVDTIGKKLVNSKEGPPSFEOPKMTIDKLLGYGGMLVOEOENVKRVOL 354
Creosote \alpha
Creosote B
                  YDDEVRKWVSEVGVDTIGKKLVNSKEGPPTFEQPKMTIDKLLQYGNMLVEEQENVKRVQL 356
Cotton B
                  YDDEVRKWIGEVGVNGVGKKLVNSREGPPSFEOPKMTIEKLLEYGYMLVAEOENVKRVOL 356
Tobacco β
                  YDDEVRKWVSGTGIEKIGDKLLNSFDGPPTFEQPKMTIEKLLEYGNMLVQEQENVKRVQL 357
Spinach_\alpha
                  YDDEVRKWVNSVGVDNVGKKLVNSKDGPPVFEQPEMTLQKLMEYGNMLVQEQENVKRVQL 353
Arabidopsis \beta
                  YDDEVRKFVESLGVEKIGKRLVNSREGPPVFEQPEMTYEKLMEYGNMLVMEQENVKRVQL 354
                  YDDMVRQWITDTGVDKIGQQLVNAR-QKVAMPKVSMDLNVLIKYGKSLVDEQENVKRVQL 357
C.reinhardtii
                  *** **:::
                                               : : .* : *: **
                              *:: :*.:*:*:
Creosote \alpha
                  ADKYMSEAALGDANNDAIKRGTFYGGQAAQQVGNVPVPEGCTDPQATNYDPTARSDDGSC 414
\texttt{Creosote}\_\beta
                  ADKYMSEAALGDANQDAIKRGTF---- 379
Cotton_\beta
                  ADKYLSEAALGNANDDAIKRGAF---- 379
Tobacco B
                  ADKYLKEAALGDANADATNNGSFFAS----- 383
Spinach \alpha
                  ADQYMSSAALGDANKDAIDRGTFFGKAAQQVS--LPVAQGCTDPEAKNYDPTARSDDGSC 411
Arabidopsis β
                  AETYLSQAALGDANADAIGRGTFYGKTEEKEPSK----- 388
C.reinhardtii
                  ADAYLSGAELAGHGGSSLPEAYSR----- 381
                  *: *:. * *.. . .:: ..
Creosote \alpha
                  VYKF 418
Creosote_\beta
Cotton_{\beta}
Tobacco β
Spinach_{\alpha}
                  TYNL 415
Arabidopsis β
C.reinhardtii
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FIGURE S2. Structure-based sequence alignment of the creosote C-domain fragment with the C-domain of FtsH (PDB ID 3KDS) using the Dali server (2).

C-domain TREDRIGVCKGIFRTDNVADDDIVKLVDTFPGQSIDFFGALRARVYDDEVRKWVSEVGVDTIGKKLVNSKEGPPSFEQFKMTIDKLLGYGGMLVQEQ
FtsH (3KDS) DMLGRKKILE:HTRNKFL--NLEIJAKRTFGFVGADLENLVNEALLAAREG------DKITMKDFEEAIDRVIAG-

FIGURE S3. Electrostatic surface potential calculation using the program APBS (3). Shown is the surface of the paddle-like extension in two different orientations, rotated around the long axis by 180 degrees. **A**, surface bearing Trp302 ("inner surface"); **B**, surface bearing Lys313 ("outer surface"). The calculations were carried out with a protein dielectric constant of 5.0, a solvent dielectric of 78.0, a solvent access radius of 1.4 Å, and 150 mM salt concentration in bulk solvent. Red: acidic regions; blue: basic regions; grey: neutral regions.



REFERENCES

- 1) Larkin et al. (2007) Bioinformatics 23 (21), 2947-2948.
- 2) Holm, L. & Rosenström, P. (2010) Nucleic Acids Res. 38, W545-549.
- 3) Baker NA, Sept D, Joseph S, Holst MJ, McCammon JA. (2007) *Proc. Natl. Acad. Sci. USA* **98**, 10037-10041.