Volume 17 Number 9 1989 Nucleic Acids Research

Nucleotide sequence of the chloroplast *petD* gene of *Chlamydomonas eugametos*

Monique Turmel, Jean Boulanger and André Bergeron

Département de Biochimie, Faculté des Sciences et de Génie, Université Laval, Québec G1K 7P4, Canada
Submitted March 27, 1989 EMBL accession no. X14503

In land plant chloroplast DNAs, the gene coding for subunit IV of the cytochrome *b6/f* complex (*petD*) is interrupted by a group II intron and is part of a well-known operon containing also the *psbB*, *psbH* and *petB* genes (1). We have located the chloroplast *petD* gene of *Chlamydomonas eugametos* on the 1.4 kbp *Hind*III subfragment of *Eco*RI fragment 4 (2) and determined its sequence. In contrast to land plants, this green algal gene is continuous and unlinked to *psbB* and *petB* (3). Like its land plant homologues, it encodes a protein of 160 amino acid residues with three potential membrane-spanning regions (underlined) (4). The amino acid sequence derived from the *C. eugametos petD* gene is 82%, 82% and 83% identical with the corresponding sequences from *Marchantia polymorpha* (1), tobacco (5) and spinach (6), respectively. No putative -10 and -35 promoter elements were identified upstream of the region corresponding to the 5' terminus of the *C. eugametos petD* transcript (1.2 kb) as determined by S1 nuclease protection (see the region delimited by the bracket) and primer extension (5' termini are indicated by triangles, with their size reflecting RNA abundancy) analyses. Sequences capable of forming stem-loop structures with at least 10 nucleotides in the stem (arrows) were found upstream and downstream of the coding region.

```
   1  AAGCTTTTGCGCAACTAAAACAAATCAGACTTTTTTAATTCTTTAGTTTTTATAGAGTCGAGTAATCGATTAACATAAAAACCTTGTTTTTTCTAAAAGTTATAAACTGTCCACTAAAGC

 121  TACAGTCACTCGAACTTTAAATAAAGGCTACGTCAAAGCGCGCAGCGCTTTGACTAAACCTGAACGTTGTGGGGAGCACAACGTTCAAGGCCTCGTTATTCTCCTGAACCCGCCTCCCAC

 241  TCAAAAACACGCAATCCTTTAATTCGACCTACGCTATATTTTCTTTAGGCGTAGGCCACCGTCGTTTATAAAAGAAAACAAAGCGCCTACCTGCAACGTGGGACGGCGAACGGGTGAGCC

 361  AAAACAAAGCAAGAAAAATATAAAACTTAAAATATAAAAGCGATTCTGTATATATAATCGTAAAAAGGTTAATATCTTTAGCCACAAGGCGGCCTGTACGTGGTGCGGCGCACGACGCAA
                S1

 481  GCCAGTACTACCTTAACTTCGCGGGGCATCGCCCCGCGAAGTTAAGGTTAACACGGTGTTGACACCGTAAAGTTCTCGTACAGCTTTACTTTTTTATCGTAACTGTTTTGCAAGGTCGAT

 601  TGTTTTTATTTCGCGTTGCAAGAAGATAGAACAGACTAGCTCTTTTTTAAAAAAGTGTCAGTGTCTAGTTTTGCTTCCAGTAATTAGACCTCCGCCTATTTTGGCCAAGCCAAAATAGGC

 721  ACGTCGACAAGTACTTTTATACTAAATTCTGAAAAAATAAGTTTGTCATTTGTTTTAAAGCTACTGACTGCCCGCGGCAAAGCCGCGGGCAAGAATTGTTTTTTTTCAAAAAAACACTGT

 841  AAAAACACTACAAAATGTCTGTTACTAAAAAACCTGACTTAAATGATCCTGTATTACGTGCAAAACTAGCAAAAGGTTTTGGTCATAACACTTATGGAGAACCAGCTTGGCCAAATGATC
   1                M  S  V  T  K  K  P  D  L  N  D  P  V  L  R  A  K  L  A  K  G  F  G  H  N  T  Y  G  E  P  A  W  P  N  D

 961  TTTTATATATTTCCCAGTTGTAATCTTTGGTACGTTTGCTTGTTGTATTGGTTTAGCTGTTTTAGATCCTGCTGCTATGGGTGAGCCAGCAAACCCATTCGCAACACCACTTGAAATTT
  36  L  L  Y  I  F  P  V  V  I  F  G  T  F  A  C  C  I  G  L  A  V  L  D  P  A  A  M  G  E  P  A  N  P  F  A  T  P  L  E  I

1081  TACCTGAGTGGTATTTCTACCCTGTTTTCCAAATTTTACGTACTGTGCCTAACAAACTACTAGGAGTGCTTGCCATGGCTGCAGTGCCTGTGGGTCTTCTAACAGTGCCATTCATTGAAA
  76  L  P  E  W  Y  F  Y  P  V  F  Q  I  L  R  T  V  P  N  K  L  L  G  V  L  A  M  A  A  V  P  V  G  L  L  T  V  P  F  I  E

1201  GTATTAACAAGTTCCAAAACCCGTATCGTCGTCCTATTGCTACTATTTTATTCTTAGTAGGTACTTTAGTTGCAGTTTGGTTAGGTATTGGTGCTACTTTCCCAATTGATATTTCATTAA
 116  S  I  N  K  F  Q  N  P  Y  R  R  P  I  A  T  I  L  F  L  V  G  T  L  V  A  V  W  L  G  I  G  A  T  F  P  I  D  I  S  L

1321  CACTTGGTTTATTTTAATTAATAATTTTTGATTTTCTTAAAAAATCAACTTTTTTTTGAACTAGTTTACTTTTATACATACAGTAAACTAGTTCAAACTTGAGACAACTAATATTAATAG
 156  T  L  G  L  F  .oc

1441  TTATAACACTTACTTTGAATTC
```

Acknowledgements
This work was supported by grant no. A3293 from NSERC Canada.

References

1. Fukuzawa,H., Kohchi,T., Sano,T., Shirai,H., et al. (1988) J. Mol. Biol. 203, 333-351.
2. Turmel,M., Bellemare,G. and Lemieux,C. (1987) Curr. Genet. 11, 543-552.
3. Turmel,M., Lemieux,B. and Lemieux,C. (1988) Mol. Gen. Genet. 214, 412-419.
4. Widger,W.R., Cramer,W.A., Herrmann,R.G., and Trebst,A. (1984) Proc. Natl. Acad. Sci. U.S.A. 81, 674-678.
5. Shinozaki,K., Ohme,M., Tanaka, M., Wakasugi,T. et al. (1986) EMBO J. 5, 2043-2049.
6. Heinemeyer,W., Alt,J. and Herrmann,R.G. (1984) Curr. Genet.8, 543-549.