(A)

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CATAAAAAGCAAAGCATCAGGCAACGGCGCCTATCAGTCGTTCCTTTTTCATCTACGGTCAATGGGCCGCCCACATCGAGAGGCAAGG

ATGACGACCATCGCCCCCCCGCACAGCGCTGGCGCTGATCACGATCAGCCACTGGCCGTCGCACATGCGGCCGTAGAAGCCCGGCTG

MetThrThrIleAlaProProHisSerAlaGlyAlaAspHisAspGlnProLeuAlaValAlaHisAlaAlaValGluAlaArgLeu

*crtE* →

GCGGCATTGCTGCCATCGGCAGGTCACGAGCGTGACCTAGTGGTTGCGGCCATGCGCGACTGCACCCTGGCGCCAGGCAAGCGCTTG

AlaAlaLeuLeuProSerAlaGlyHisGluArgAspLeuValValAlaAlaMetArgAspCysThrLeuAlaProGlyLysArgLeu

CGGCCCTTGCTGTTACTCTTCACGGCACAAGGCCTGGGCGCGTGCCCACACGCCGCGCTCGACCTTGGCTGCGCCGTGGAGATGGTT

ArgProLeuLeuLeuLeuPheThrAlaGlnGlyLeuGlyAlaCysProHisAlaAlaLeuAspLeuGlyCysAlaValGluMetVal

CATGCAGCCTCCCTTGTACTGGACGACCTCCCCTGTATGGACAACGCCGCCTTGCGCCGCGGTCGCCCTACCTTGCACCTGGCGTTT

HisAlaAlaSerLeuValLeuAspAspLeuProCysMetAspAsnAlaAlaLeuArgArgGlyArgProThrLeuHisLeuAlaPhe

GGGGAAGATGTGGCAGTGTTGACGGCCATTGCCTTGCTCTCCCGTGCATTCGGGGTTGTGGCGGGGTTGCAGACGGTCGGGCCGGAT

GlyGluAspValAlaValLeuThrAlaIleAlaLeuLeuSerArgAlaPheGlyValValAlaGlyLeuGlnThrValGlyProAsp

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AlaArgProArgThrAlaAlaGluIleAlaGluThrAsnGlnLeuLysThrGlyAlaLeuPheSerAlaLeuLeuGlyMetAlaGly

CGGTTGGCGGGGGCTGGCGAAACCCAGCAGGGCACCTTGCAGCAGTTGGCGGGGGAATTGGGGCAAGCGTTTCAATTGCACGATGAT

ArgLeuAlaGlyAlaGlyGluThrGlnGlnGlyThrLeuGlnGlnLeuAlaGlyGluLeuGlyGlnAlaPheGlnLeuHisAspAsp

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LeuHisAspArgAspProGluSerGlyLysSerMetGlyLeuAspGlnGlyLysSerThrLeuLeuAlaMetCysGlyGluMetGln

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TTGCGAAAGGTGTTCGCTGCGAAGGGTGTGCCGGCTGGCGGCAGCACCGTATGGCGTCAAGGCCTGAGCGGGCTTGCGGTGGGTGGG

LeuArgLysValPheAlaAlaLysGlyValProAlaGlyGlySerThrValTrpArgGlnGlyLeuSerGlyLeuAlaValGlyGly

GCGGTCATGCATCACGTCTAA

AlaValMetHisHisVal\*\*\*

(B)

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ATGAACAAAAGCCCGTTGAGTCAACGCAAGGATGATCACCTCGATATCGTTCTGGCCGCCGGCACCATCTCGCATGGGGTCGATGCT

MetAsnLysSerProLeuSerGlnArgLysAspAspHisLeuAspIleValLeuAlaAlaGlyThrIleSerHisGlyValAspAla

*idi* →

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ArgLeuAlaProAspValProLeuLeuAlaAsnLeuGlyAlaAlaGlnLeuArgGluAlaAspGlyValAspLeuAlaArgArgAla

GTCGATACACTCGATGCCAGCGCCCTGATCATTCATCTCAACCCCTTGCAGGAAGCCGTTCAGCCCGAGGGGGACCGCAACTGGAAC

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GGGGTGCTCGCCTGCATCGAGCACGTCGCCGGGCAGCTTCACGCGCCCATCATCGTCAAGGAAGTAGGCGCCGGTATCTCCCCAGGC

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LeuArgIleAlaCysPheCysThrGlySerAlaThrLeuAlaHisLeuArgArgAlaArgLeuValAsnAlaGlnLeuAspPro

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Lys\*\*\*

--MetSerHisPheAlaLeuIleAlaProProTyrProSerHisPheAlaAlaMetGlnAlaLeuGlyGlyGluLeuValGluArg

 *crtX* →

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GlyHisGlnValSerPhePheHisGlnProGluAlaGluArgTrpLeuSerAspSerArgLeuGlyPheValAlaIleGlyHisAla

GAGTGCCCGCCGGGCAGCCTTGACCTCGCCATGCGTCGCGTGGCCGACCCCGCCGGGCCGCTGCGTCTGCGTCGCTTGATCAAGCAG

GluCysProProGlySerLeuAspLeuAlaMetArgArgValAlaAspProAlaGlyProLeuArgLeuArgArgLeuIleLysGln

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LeuProLeuProValMetProPheGlyLeuGlyLeuAspAlaArgLeuTyrGluGlySerAlaGlnValHisAspTrpLeuMetArg

CCGCTGCACGACACCTTAGTGCAGGCGTGTCATCGCCACGGGCTGCCACCGCGCAGCGGTGCCCATGAGTTTCTCTCGCCGCTGGCC

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GlnLeuSerGlnThrProLeuHisLeuAspPheProArgAlaAspLeuProLysHisPheHisAlaValGlyProLeuArgSerThr

CCCTCCCAGGCGAGCCCCAACTGGTCTTTCGAATCCGGCAAGCCTTTGGTATTCGCAAGCCTGGGAACGCTGCAGGGCCACCGGTTC

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SerHisGlyGlyLeuAsnThrValLeuAspThrValCysAlaGlyThrAlaLeuLeuValMetProIleAlaPheAspGlnProGly

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ValAlaAlaArgValArgHisHisArgLeuGlyArgValLeuSerLysArgAlaSerAlaSerAlaIleGlyGlnAlaLeuArgGln

CTGCTTGATGAGGCTGCACCACGTGATGCGGCGCTTGAAGCCGAGCTTGCCACCTGCGGTGGCGTACAGCGCGCTGCCAGCCTCATC

LeuLeuAspGluAlaAlaProArgAspAlaAlaLeuGluAlaGluLeuAlaThrCysGlyGlyValGlnArgAlaAlaSerLeuIle

GAAGCCGCTCTGCGCAGTGGCCAGCCCAGCATTTCGGAGAATGTACCGTGCCCTATGACCTGATCCTGGTAGGTGGGGGGTTGGCC

GluAlaAlaLeuArgSerGlyGlnProSerIleSerGluAsnValProCysProMetThr\*\*\*

-----------------------------------------------ValProTyrAspLeuIleLeuValGlyGlyGlyLeuAla

　　　　　　　　　　　　　　　　　　　　　　　　　　　　*crtY* →

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HisValHisPheProAlaPheSerArgArgMetGluGlyGlyTyrAlaSerIleThrSerGluArgPheAlaGlnValIleThrPro

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GCCGCGGTGGTGATCGATGGCCGGGGCATGCAGCACAGCCCTCACCGGGTCCTCGGCCAGCAGGCGTTCCTCGGGCAGGTCGTACGT

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TGCGGCAAACCGCCTGTGCCCGTTGGCGAGGCCATGAAGGCTGCCTTGCGACACTCCCCTGCCCATTTCAAGGATTATCCATGAGC

CysGlyLysProProValProValGlyGluAlaMetLysAlaAlaLeuArgHisSerProAlaHisPheLysAspTyrPro\*\*\*

--------------------------------------------------------------------------------MetSer

 *crtI* →

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LysAspValGluGlyTyrArgGlnPheLeuAlaTyrSerLysAlaValLeuGlnGluGlyTyrIleLysLeuGlyAlaValProPhe

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LeuSerPheArgAspMetLeuHisAlaGlyProGlnLeuAlaArgLeuGlnAlaTrpArgSerValTyrSerMetValAlaArgPhe

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ThrAspLeuGlyGlyThrLeuGluLeuAsnAlaGluValAlaAlaPheGluThrGlnGlySerArgValThrGlyValArgThrGln

GACGGGCGGCGCTGGCGGGCAGACGCAGTCGCCTCGAATGCCGATGTGGTGCACACCTACTCCGACCTGCTGGCCGAACACCCTCGC

AspGlyArgArgTrpArgAlaAspAlaValAlaSerAsnAlaAspValValHisThrTyrSerAspLeuLeuAlaGluHisProArg

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GlnLeuArgHisHisThrValCysPheGlyProArgTyrArgGluLeuIleAspGluIlePheAsnGlyHisGluLeuAlaGluAsp

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AlaPheSerLeuGluProIleLeuThrGlnSerAlaTrpPheArgProHisAsnArgAspSerGluValSerAsnLeuTyrLeuVal

GGGGCAGGCACGCACCCAGGGGCCGGTGTGCCAGGCGTGATCGCCTCGGCCAAGGCCACCGCAGGCCTGATGCTCGAGGACCTGGGC

GlyAlaGlyThrHisProGlyAlaGlyValProGlyValIleAlaSerAlaLysAlaThrAlaGlyLeuMetLeuGluAspLeuGly

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Ala\*\*\*

--MetThrAlaProAsnHisAspGlnLeuLeuAlaArgAlaGluHisSerIleAlaValGlySerLysSerPheAlaAlaAlaAla

*crtB* →

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ArgLeuPheAspAlaHisThrArgArgSerAlaValLeuLeuTyrAlaTrpCysArgHisCysAspAspValIleAspGlyGlnGln

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AlaGlyHisGluAlaValValIleSerGlnGluGluAlaGlnValArgLeuLeuAspLeuGlnArgGlnThrGluAlaAlaCysAla

GACTTGCCCGTGAACCAGCCGGCCTTCGCCGCACTGCGCGAAGTGGCCAGGCGCCACGGCATTCCCCGCGCCGAAGCCTTCGACTTG

AspLeuProValAsnGlnProAlaPheAlaAlaLeuArgGluValAlaArgArgHisGlyIleProArgAlaGluAlaPheAspLeu

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AlaAspAspLeuAlaAspValArgHisArgAlaAlaValAlaThrLeuAlaArgArgLeuValAlaHisAlaGluProTyrTyrAla

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AlaAlaProGluValAlaGlyAlaAlaAlaArg\*\*\*

(C)

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HisHisGluProHisLeuGlyValLeuGluThrAsnAspValTyrLeuLeuAlaLeuAlaValIleSerLeuAlaLeuValAlaVal

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PheHisArgHisTrpProArgLysMetArgProValGlyArgTyrLeuThrArgLeuHisArgAlaHisArgLeuHisHisAlaVal

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GCCGGTCACTGAGATCTCACGCGCACAGGCGCTTTAGCTGAGCGAGTTCCCCCGCGATCCTACCGGTTCGGGCATACATTGCACTGT

AlaGlyHis\*\*\*

CTGGGTCTGCGCAGTAGCATGCGCGCTTTTCAGCCCAGGACTCGCTCTTCATGTCGTATCAGCAAGGTCTGCTTGCCACGCCCGTGC

CGGTGCACGCGCGTCACCTGTTCTTTTCCATC

Supplementary Figure 1. Genomic sequence and its deduced amino acid sequence of the carotenoid biosynthesis genes.

1. The region around *crtE* gene; (B) the region including *idi*, *crtX*, *crtY*, *crtI* and *crtB* genes; (C) the region around *crtZ* gene. Red and blue letters indicate the start and stop codons, respectively. Purple letters indicate the overlapping sequences of start and stop codons. The sequences of the shaded regions in (A) and (B) are complement to each other.