FIGURE 1

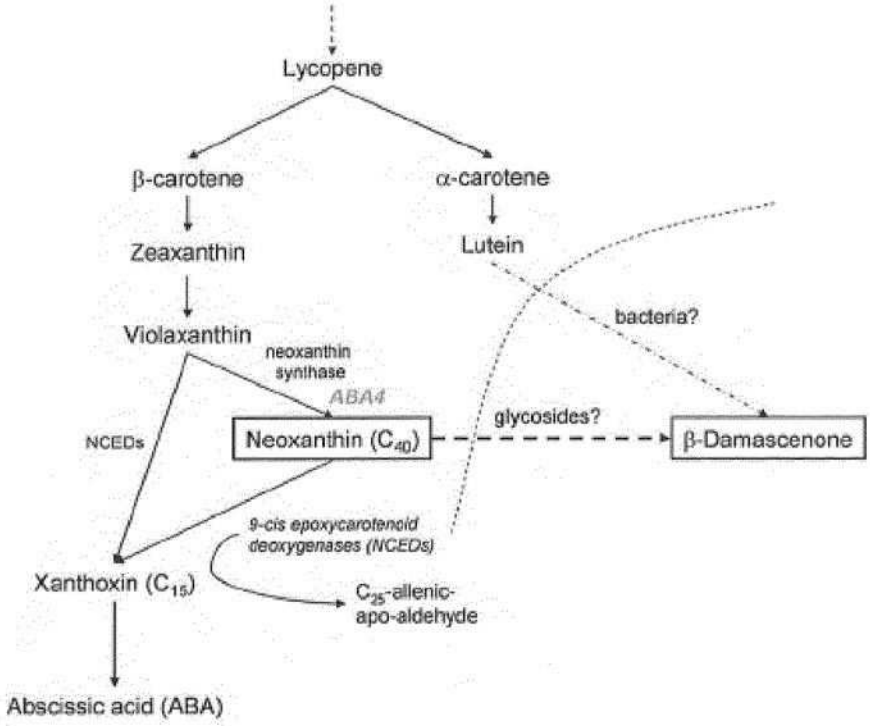

Lycopene
β-carotene
α-carotene
Zeaxanthin
Lutein
Violaxanthin
neoxanthin synthase
ABA4
bacteria?
NCEDs
Neoxanthin (C40)
glycosides?
β-Damascenone
9-cis epoxycarotenoid deoxygenases (NCEDs)
Xanthoxin (C15)
C25-allenic-apo-aldehyde
Abscissic acid (ABA)

FIGURE 2

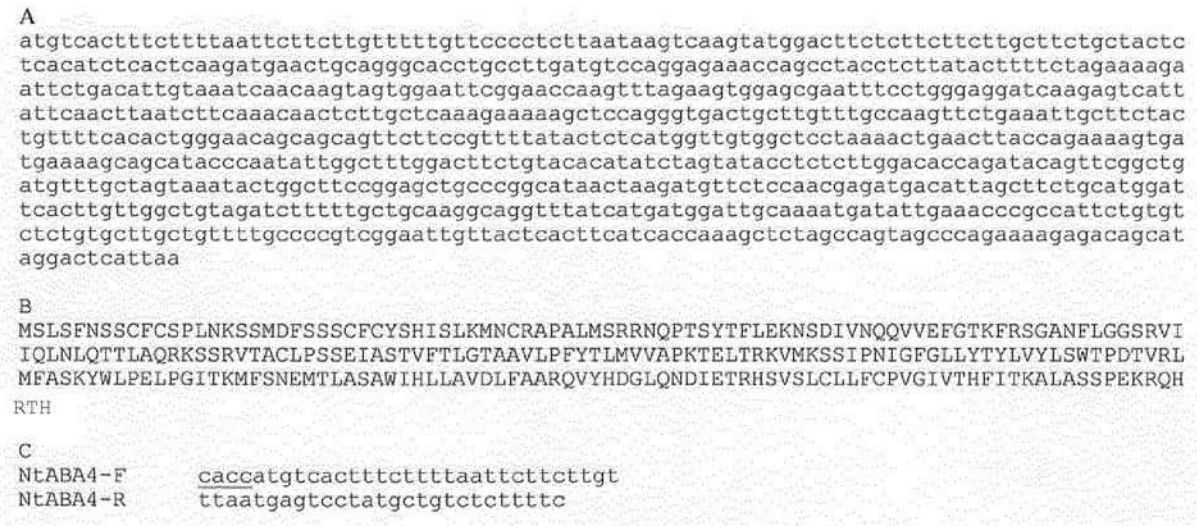
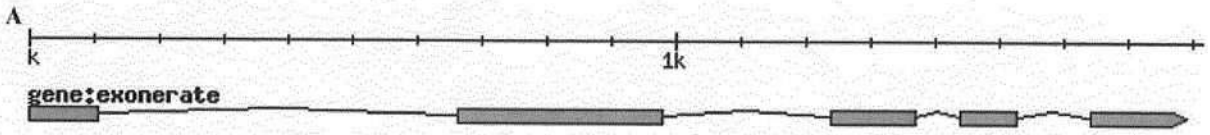

A
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attctgacattgtaaatcaacaagtagtggaattcggaaccaagtttagaagtggagcgaatttcctgggaggatcaagagtcatt
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B
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MFASKYWLPELPGITKMFSNEMTLASAWIHLLAVDLFAARQVYHDGLQNDIETRHSVSLCLLFCPVGIVTHFITKALASSPEKRQH
RTH
C
NtABA4-F caccatgtcactttcttttaattcttcttgt
NtABA4-R ttaatgagtcctatgctgtctcttttc

FIGURE 3



B

```
Q    1 : ATGTCACTTTCTTTTAA---TTCTTCTTGTTTTTGTTCCCCTCTTAATAAGTCAAGTATGGA :   59
         ||||||||||||||||    ||||||||||||||||||||||||||||||||||||||||||
T    1 : ATGTCACTTTCTTTTAATTCTTCTTCTTGTTTTTGTTCCCCTCTTAATAAGTCAAGTATGGA :   62

   60 : CTTCTCTTCTTCTTGCTTCTGCTACTCTCACATCTCACTCAAG  >>>> Target Intro :  103
         ||||||||||||||||||||||||||||||||||||||||||++          558 bp
   63 : CTTCTCTTCTTCTTGCTTCTGCTACTCTCACATCTCACTCAAGgt.................. :  108

  104 : n 1 >>>>  ATGAACTGCAGGGCACCTGCCTTGATGTCCAGGAGAAACCAGCCTACCTCTT :  154
                +++|||||||||||||||||||||||||||||||||||||||||||||||||||||
  109 : ........agATGAACTGCAGGGCACCTGCCTTGATGTCCAGGAGAAACCAGCCTACCTCTT :  715

  155 : ATACTTTTCTAGAAAAGAATTCTGACATTGTAAATCAACAAGTAGTGGAATTCGGAACCAAG :  216
         |||||||||||||||||||||||||||||||||||||||||| |||||||||||||| ||||||||
  716 : ATACTTTTCTAGAAAAGAATTCTGACATTGTAAATCAACGAGTAGTGGAATTCAGAACCAAG :  777

  217 : TTTAGAAGTGGAGCGAATTTCCTGGGAGGATCAAGAGTCATTATTCAACTTAATCTTCAAAC :  278
         ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
  778 : TTTAGAAGTGGAGCGAATTTCCTGGGAGGATCAAGAGTCATTATTCAACTTAATCTTCAAAC :  839

  279 : AACTCTTGCTCAAAGAAAAAGCTCCAGGGTGACTGCTTGTTTGCCAAGTTCTGAAATTGCTT :  340
         ||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
  840 : AACTCTTGCTCAAAGAAAAAGCTCCAGGGTGACTGCTTGTTTGCCAAGTTCTGAAATTGCTT :  901

  341 : CTACTGTTTTCACACTGGGAACAGCAGCAGTTCTTCCGTTTTATACTCTCATGGTTGTGGCT :  402
         |||||||||||||||||||||||||||| |||||||||||||||| |||||||| ||||||
  902 : CTACTGTTTTCACACTGGGAACAGCAGCGGTTCTTCCGTTTTATACACTCATGGTAGTGGCT :  963

  403 : CCTAAAACTGAACTT  >>>> Target Intron 2 >>>>  ACCAGAAAAGTGATGAAA :  435
         |||||| ||||||||++          261 bp         ++||||||||||||||||||
  964 : CCTAAAGCTGAACTTgt.......................agACCAGAAAAGTGATGAAA : 1257

  436 : AGCAGCATACCCAATATTGGCTTTGGACTTCTGTACACATATCTAGTATACCTCTCTTGGAC :  497
         |||||||||||| ||||||||||||||||||||||||||||||||||||||||||||||||
```

FIGURE 3 Cont'd

```
1258 : AGCAGCATACCCTATATTGGCTTTGGACTTCTGTACACATATCTAGTATACCTCTCTTGGAC : 1319

 498 : ACCAGATACAGTTCGGCTGATGTTTGCTAGTAAATACTGGCTTCCGGAG  >>>> Target :  547
       |||||||||||||||||||||||||||||||||||||||||||||||||||||||||||++          7
1320 : ACCAGATACAGTTCGGCTGATGTTTGCTAGTAAATACTGGCTTCCGGAGgt..........  : 1371

 548 :  Intron 3 >>>>  CTGCCCGGCATAACTAAGATGTTCTCCAACGAGATGACATTAGCTT :  592
       0 bp          ++|||||||||||||||||||||||||||||||||||||||||||||||||||||
1372 : ..............agCTGCCCGGCATAACTAAGATGTTCTCCAACGAGATGACATTAGCTT : 1484

 593 : CTGCATGGATTCACTTGTTGGCTGTAGATCTTTTTGCTGCAAG  >>>> Target Intro :  636
       |||||||||||||||||||||| ||||||||||||||||||||++          114 bp
1485 : CTGCATGGATTCACTTGTTGGCCGTAGATCTTTTTGCTGCAAGgt.................. : 1530

 637 : n 4 >>>>  GCAGGTTTATCATGATGGATTGCAAAATGATATTGAAACCCGCCATTCTGTG :  687
               ++|||||||||||||||||||||||||||||||||||||||||||||||||||||||||||
1531 : ........agGCAGGTTTATCATGATGGATTGCAAAATGATATTGAAACCCGCCATTCTGTG : 1693

 688 : TCTCTGTGCTTGCTGTTTTGCCCCGTCGGAATTGTTACTCACTTCATCACCAAAGCTCTAGC :  749
       |||||||||||||||||||||| |||||||||||||||||||||||||||||||||||||| |
1694 : TCTCTGTGCTTGCTGTTTTGCCCCTTCGGAATTGTTACTCACTTCATCACCAAAGCTCTAAC : 1755

 750 : CAGTAGCCCAGAAAAGAGACAGCATAGGACTCATTAA :  786
       |||||||||||||||||||||||||||||||||||||
1756 : CAGTAGCCCAGAAAAGAGACAGCATAGGACTCATTAA : 1792
```

C

```
Query: 1   MSLSFNSSSCFCSPLNKSSMDFSSSCFCYSHISLKMNCRAPALMSRRNQPTSYTFLEKNS 60
           MSLSFNSS CFCSPLNKSSMDFSSSCFCYSHISLKMNCRAPALMSRRNQPTSYTFLEKNS
Sbjct: 1   MSLSFNSS-CFCSPLNKSSMDFSSSCFCYSHISLKMNCRAPALMSRRNQPTSYTFLEKNS 59

Query: 61  DIVNQRVVEFRTKFRSGANFLGGSRVIIQLNLQTTLAQRKSSRVTACLPSSEIASTVFTL 120
           DIVNQ+VVEF TKFRSGANFLGGSRVIIQLNLQTTLAQRKSSRVTACLPSSEIASTVFTL
Sbjct: 60  DIVNQQVVEFGTKFRSGANFLGGSRVIIQLNLQTTLAQRKSSRVTACLPSSEIASTVFTL 119

Query: 121 GTAAVLPFYTLMVVAPKAELTRKVMKSSIPYIGFGLLYTYLVYLSWTPDTVRLMFASKYW 180
           GTAAVLPFYTLMVVAPK ELTRKVMKSSIP IGFGLLYTYLVYLSWTPDTVRLMFASKYW
Sbjct: 120 GTAAVLPFYTLMVVAPKTELTRKVMKSSIPNIGFGLLYTYLVYLSWTPDTVRLMFASKYW 179

Query: 181 LPELPGITKMFSNEMTLASAWIHLLAVDLFAARQVYHDGLQNDIETRHSVSLCLLFCPFG 240
           LPELPGITKMFSNEMTLASAWIHLLAVDLFAARQVYHDGLQNDIETRHSVSLCLLFCP G
Sbjct: 180 LPELPGITKMFSNEMTLASAWIHLLAVDLFAARQVYHDGLQNDIETRHSVSLCLLFCPVG 239

Query: 241 IVTHFITKALTSSPEKRQHRTH 262
           IVTHFITKAL SSPEKRQHRTH
Sbjct: 240 IVTHFITKALASSPEKRQHRTH 261
```

FIGURE 4

A

```
ATGGAAACTCTTCTCAAACCTTTTCCATCTCCTTTACTTTTCACTCCTACACCTCACAGGTCTATTTTTCAACTGAAT
TCTACTTTTCTGAATCCAACCACCCAGAACTTTTCAAGAAAAGTTCATCGCAGAAACAAAAGTAGTAGTAACAAATTT
TGTAGCTTTCTTGACTTAGCACCCACATCAAAACCAGAGTCTTTAGATGTTGACATCTCATGGGTTGATCCTAATTCG
GGCCGGGCTCTATTCGACGTGATCATCATCGGAGCTGGTCCTGCGGGCCTCCGGCTAGCTGAGCAAGTATCAAGATAT
GGTATTAAGGTATGTTGTGTTGACCCTTCACCACTTTCCATGTGGCCAAATAATTATGGTGTTTGGGTTGATGAGTTT
GAGAAGTTAGGATTGGAAGATTGTTTAGATCATAAGTGGCCTATGACTTGTGTTCATATAAATGATAACAAGACTAAG
TATTTGGGAAGACCATATGGTAGAGTCAGTAGAAAAAAGTTGAAGTTGAAATTGTTGAATAGTTGTGTTGATAATGGA
GGGAAGTTTTATAAAGCCAAGGTTTGGAAAGTGGAGCATGAAGAATTTGAGTCTTCAGTTGTTTGTGATGATGGTAGG
AAGATAAGGGGTAGTTTGATTGTAGATGCAAGTGGTTTTGCTAGTCCTTTTATAGAATATGACAAGCCAAGAAACCAT
GGTTATCAAATAGCTCATGGGATTTTAGCACAAGTGGATAATCATCCATTTGATTTGGATAAAATGGTGCTTATGGAT
TGGAGGGATTCTCATCTGGGAAATGAGCCATATTTGAGGGTGAACAATACTAAAGAACCAACATTCTTGTATGTGATG
CCATTTGATAGGAATTTGGTATTCTTGGAAGAGACTTCTTTGGTGAGTCGGCCTGTGCTATCGTATAGGGAAGTGAAA
AATAGGATGGTGGCAAGGTTAAGGCATTTGGGGATCAAAGTGACAAGTGTTATTGAGGATGAGAAATGTGTGATCCCC
ATGGGAGGACCACTTCCGCGGATCCCTCAAAATGTTATGGCAATTGGTGGAAATTCAGGGATAGTTCATCCATCGACA
GGGTACATGGTGGCTCGGAGCATGGCATTGGCACCAGTTTTGGCTGAGGCCATTGCTGAGAGCCTCGGCACAACCAGA
ATGATAAGAGGATCTCCACTTTACCATAAAGTTTGGAATGGTTTGTGGCCTCTAGAGAGAAGAAGTGTGAGAGAATGT
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GATCCCAAATACTGGCAAGGGTTCCTTTCCTCAAGGTTGTCTGTCAAAGAACTTGCTATGCTTAGCTTGTACCTTTTT
GGGCATGCCTCAAATTTGGCTAGGTTGGATATTGTTACAAAATGCCCGGTGCCCTTGGTTAAAATGATGGAAATCTAG
```

B

```
METLLKPFPSPLLFTPTPHRSIFQLNSTFLNPTTQNFSRKVHRRNKSSSNKFCSFLDLAPTSKPESLDVDISWVDPNS
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YLGRPYGRVSRKKLKLKLLNSCVDNGGKFYKAKVWKVEHEEFESSVVCDDGRKIRGSLIVDASGFASPFIEYDKPRNH
GYQIAHGILAQVDNHPFDLDKMVLMDWRDSHLGNEPYLRVNNTKEPTFLYVMPFDRNLVFLEETSLVSRPVLSYREVK
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MIRGSPLYHKVWNGLWPLERRSVRECYSFGMETLLKLDLKGTRRLFDAFFDLDPKYWQGFLSSRLSVKELAMLSLYLF
GHASNLARLDIVTKCPVPLVKMMEI
```

C

NeSY-F	CACCATGGAAACTCTTCTCAAACCTTTTC
NeSY-R	CTAGATTTCCATCATTTTAACCAAG

FIGURE 5

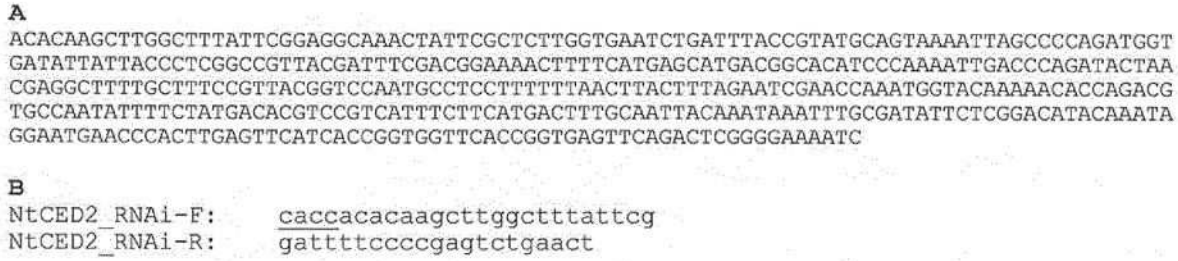

A
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GATATTATTACCCTCGGCCGTTACGATTTCGACGGAAAACTTTTCATGAGCATGACGGCACATCCCAAAATTGACCCAGATACTAA
CGAGGCTTTTGCTTTCCGTTACGGTCCAATGCCTCCTTTTTTAACTTACTTTAGAATCGAACCAAATGGTACAAAAACACCAGACG
TGCCAATATTTTCTATGACACGTCCGTCATTTCTTCATGACTTTGCAATTACAAATAAATTTGCGATATTCTCGGACATACAAATA
GGAATGAACCCACTTGAGTTCATCACCGGTGGTTCACCGGTGAGTTCAGACTCGGGGAAAATC
B
NtCED2_RNAi-F: caccacacaagcttggctttattcg
NtCED2_RNAi-R: gattttccccgagtctgaact

FIGURE 6

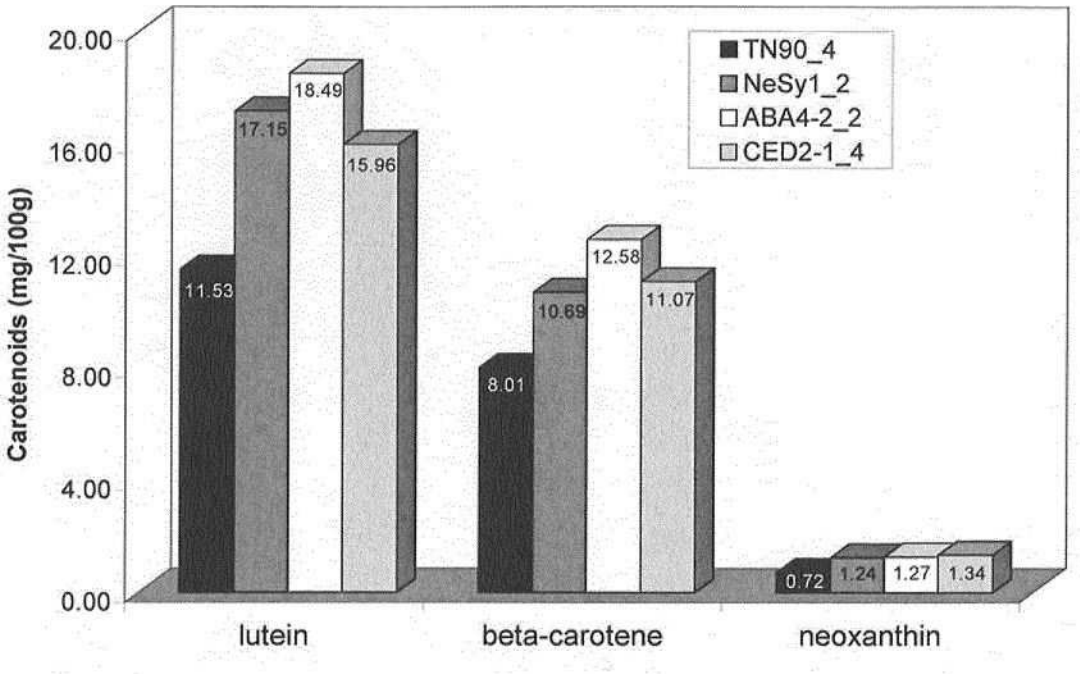
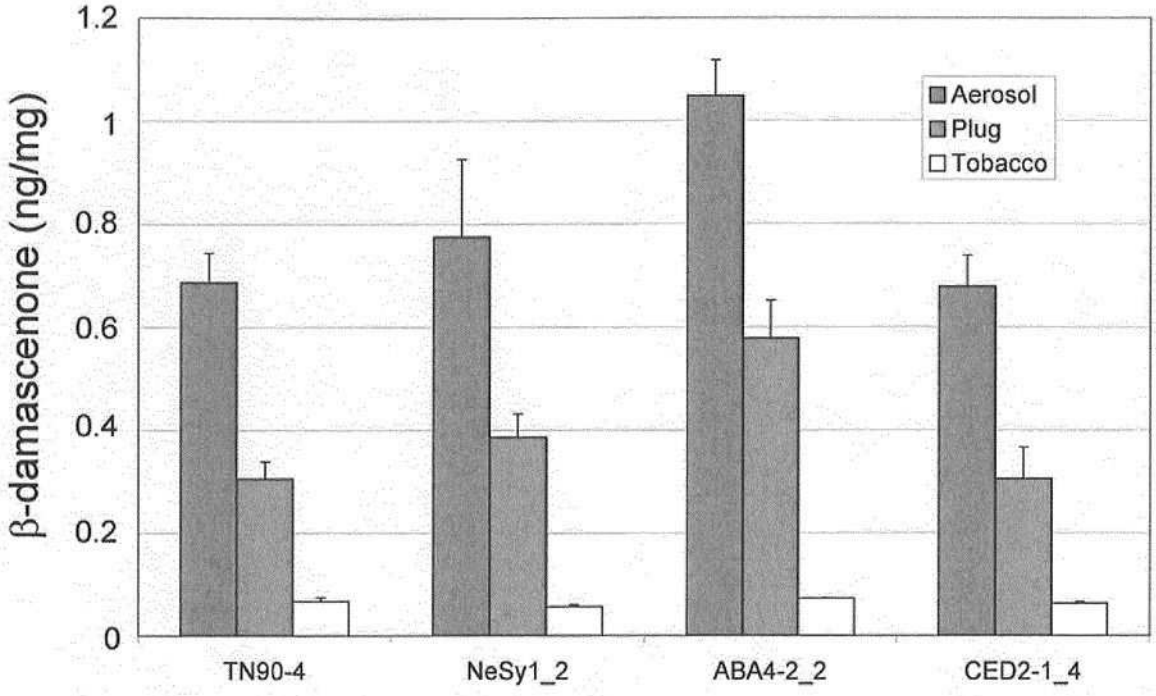

20.00
16.00
12.00
8.00
4.00
0.00
Carotenoids (mg/100g)
TN90_4
NeSy1_2
ABA4-2_2
CED2-1_4
11.53
17.15
18.49
15.96
8.01
10.69
12.58
11.07
0.72
1.24
1.27
1.34
lutein
beta-carotene
neoxanthin

FIGURE 7


1.2
1
0.8
0.6
0.4
0.2
0
β-damascenone (ng/mg)
Aerosol
Plug
Tobacco
TN90-4
NeSy1_2
ABA4-2_2
CED2-1_4