```
                    1                                                   60
Repeat 1      (1)   GTGTCCAACGAGTTGCTTGAGAAAGCTGAGACAGTTGTGATGGAGGTTCTCGCTGCCAAG
Repeat 3      (1)   GTCTCAAACGAACTCCTTGAAAAAGCTGAGACCGTCGTGATGGAGGTCTTGGCAGCTAAA
Repeat 4      (1)   GTTTCTTCAGAACTCTTGGAGAAGGCTGAGACGGTTGTGATGGAGGTTTTGGCTGCAAAG
Repeat 8      (1)   GTCTCCTCAGAACTCCTGGAAAAGGCTGAGACAGTTGTGATGGAAGTCCTTGCTGCGAAA
Repeat 5      (1)   GTTTCATCCGAACTCCTGGAAAAGGCCGAGACGGTTGTGATGGAGGTGCTCGCAGCTAAG
Repeat 9      (1)   GTCAGCAACGAACTCCTTGAAAAAGCTGAAACTGTTGTGATGGAGGTTTTGGCTGCAAAG
Repeat 2      (1)   GTTTCTAATGAGCTGCTCGAAAAGGCAGAAACTGTTGTGATGGAAGTCCTTGCTGCCAAA
Repeat 6      (1)   GTCAGCAATGAGTTGCTGGAGAAAGCCGAAACAGTTGTGATGGAAGTCCTTGCTGCAAAA
Repeat 7      (1)   GTCAGCAACGAATTGCTTGAGAAGGCTGAAACAGTTGTCATGGAAGTGCTGGCTGCAAAA

                    61                                                  120
Repeat 1     (61)   ACTGGATACGAAACAGACATGATTGAGGCGGACATGGAGCTTGAGACTGAGTTGGGAATT
Repeat 3     (61)   ACCGGCTATGAGACTGACATGATTGAGTCTGACATGGAATTGGAGACAGAACTTGGGATA
Repeat 4     (61)   ACTGGCTATGAGACCGACATGATTGAATCTGATATGGAATTGGAGACAGAGCTTGGGATC
Repeat 8     (61)   ACTGGCTATGAGACCGACATGATTGAATCTGACATGGAACTGGAGACCGAGCTTGGAATT
Repeat 5     (61)   ACTGGTTACGAGACCGACATGATTGAAAGTGACATGGAGCTTGAAACCGAGTTGGGAATA
Repeat 9     (61)   ACTGGATACGAGACTGACATGATAGAGTCAGACATGGAGTTGGAAACAGAGCTTGGGATT
Repeat 2     (61)   ACTGGCTACGAAACTGACATGATAGAATCAGACATGGAGCTTGAGACGGAGCTTGGAATT
Repeat 6     (61)   ACTGGTTACGAAACGGACATGATTGAGTCAGACATGGAATTGGAGACCGAACTTGGAATA
Repeat 7     (61)   ACCGGCTATGAGACTGACATGATTGAGTCTGACATGGAACTTGAGACGGAATTGGGCATT

                    121                                                 180
Repeat 1    (121)   GACAGCATCAAGAGGGTTGAAATTCTTTCTGAAGTCCAAGCTATGCTTAACGTTGAGGCG
Repeat 3    (121)   GACAGCATCAAACGTGTTGAAATCCTCAGTGAGGTCCAAGCTATGCTGAACGTGGAAGCG
Repeat 4    (121)   GATTCCATCAAAAGAGTGGAGATCCTGAGTGAAGTCCAAGCCATGCTCAATGTTGAAGCT
Repeat 8    (121)   GACTCCATCAAACGTGTTGAAATCCTCTCTGAGGTTCAAGCGATGTTGAATGTGGAGGCC
Repeat 5    (121)   GATAGCATCAAACGTGTTGAAATCTTGTCTGAGGTCCAAGCTATGTTGAACGTGGAGGCA
Repeat 9    (121)   GATAGCATCAAGCGTGTGGAAATCCTTTCTGAGGTTCAAGCCATGCTGAACGTTGAGGCC
Repeat 2    (121)   GATTCCATCAAGCGTGTGGAAATCCTCAGTGAAGTCCAAGCCATGCTCAATGTGGAAGCT
Repeat 6    (121)   GATTCCATCAAGAGAGTGGAGATCCTCTCTGAGGTGCAAGCCATGCTCAACGTTGAGGCT
Repeat 7    (121)   GACAGCATCAAGCGTGTTGAGATCCTCAGTGAAGTCCAAGCAATGCTCAATGTGGAGGCT

                    181                                                 240
Repeat 1    (181)   AAAGATGTTGATGCTCTCTCTAGGACGAGAACAGTGGGTGAAGTTGTCAACGCTATGAAG
Repeat 3    (181)   AAGGATGTTGATGCTCTGTCCAGAACGAGGACCGTTGGTGAGGTTGTGGATGCCATGAAG
Repeat 4    (181)   AAGGATGTTGATGCACTTTCAAGAACAAGGACAGTGGGTGAGGTTGTGGATGCCATGAAG
Repeat 8    (181)   AAAGATGTTGATGCTCTTTCCAGAACAAGGACGGTGGGAGAGGTGGTTGATGCCATGAAG
Repeat 5    (181)   AAAGATGTCGATGCGCTTTCAAGAACCAGAACAGTCGGTGAGGTCGTGGACGCCATGAAG
Repeat 9    (181)   AAAGATGTCGATGCTTTGTCAAGGACCAGAACGGTTGGAGAAGTGGTCGATGCCATGAAG
Repeat 2    (181)   AAGGATGTGGATGCTCTCTCAAGGACCAGAACTGTCGGTGAGGTTGTCAATGCCATGAAG
Repeat 6    (181)   AAAGATGTTGATGCACTCAGTAGGACAAGAACTGTGGGGGAAGTTGTCGATGCGATGAAG
Repeat 7    (181)   AAGGATGTGGATGCCCTCTCAAGGACCAGAACAGTTGGTGAGGTCGTTGATGCGATGAAG

                    241                 261
Repeat 1    (241)   GCAGAAATCGCTGGTTCTTCC
Repeat 3    (241)   GCTGAAATTGCTGGAGGGTCT
Repeat 4    (241)   GCGGAGATTGCTGGAGGGAGC
Repeat 8    (241)   GCTGAGATAGCTGGGGGTTCT
Repeat 5    (241)   GCTGAAATTGCCGGAAGCTCT
Repeat 9    (241)   GCTGAGATAGCTGGTGGATCA
Repeat 2    (241)   GCTGAGATAGCTGGAGGCTCC
Repeat 6    (241)   GCTGAGATTGCTGGAGGCTCT
Repeat 7    (241)   GCGGAGATCGCTGGAAGTTCC
```

FIG. 1

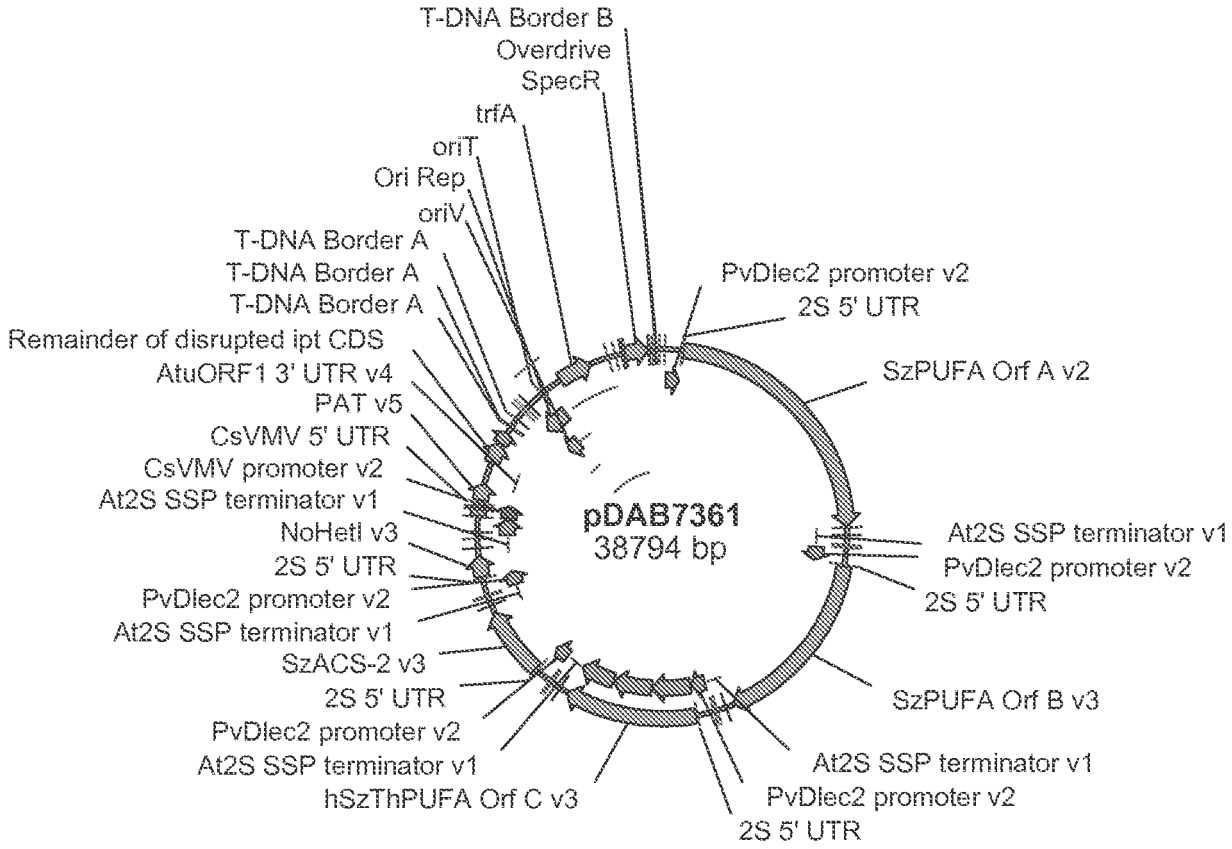

T-DNA Border B
Overdrive
SpecR
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
Remainder of disrupted ipt CDS
AtuORF1 3' UTR v4
PAT v5
CsVMV 5' UTR
CsVMV promoter v2
At2S SSP terminator v1
NoHetI v3
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
SzACS-2 v3
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
hSzThPUFA Orf C v3
pDAB7361
38794 bp
PvDlec2 promoter v2
2S 5' UTR
SzPUFA Orf A v2
At2S SSP terminator v1
PvDlec2 promoter v2
2S 5' UTR
SzPUFA Orf B v3
At2S SSP terminator v1
PvDlec2 promoter v2
2S 5' UTR

FIG. 2

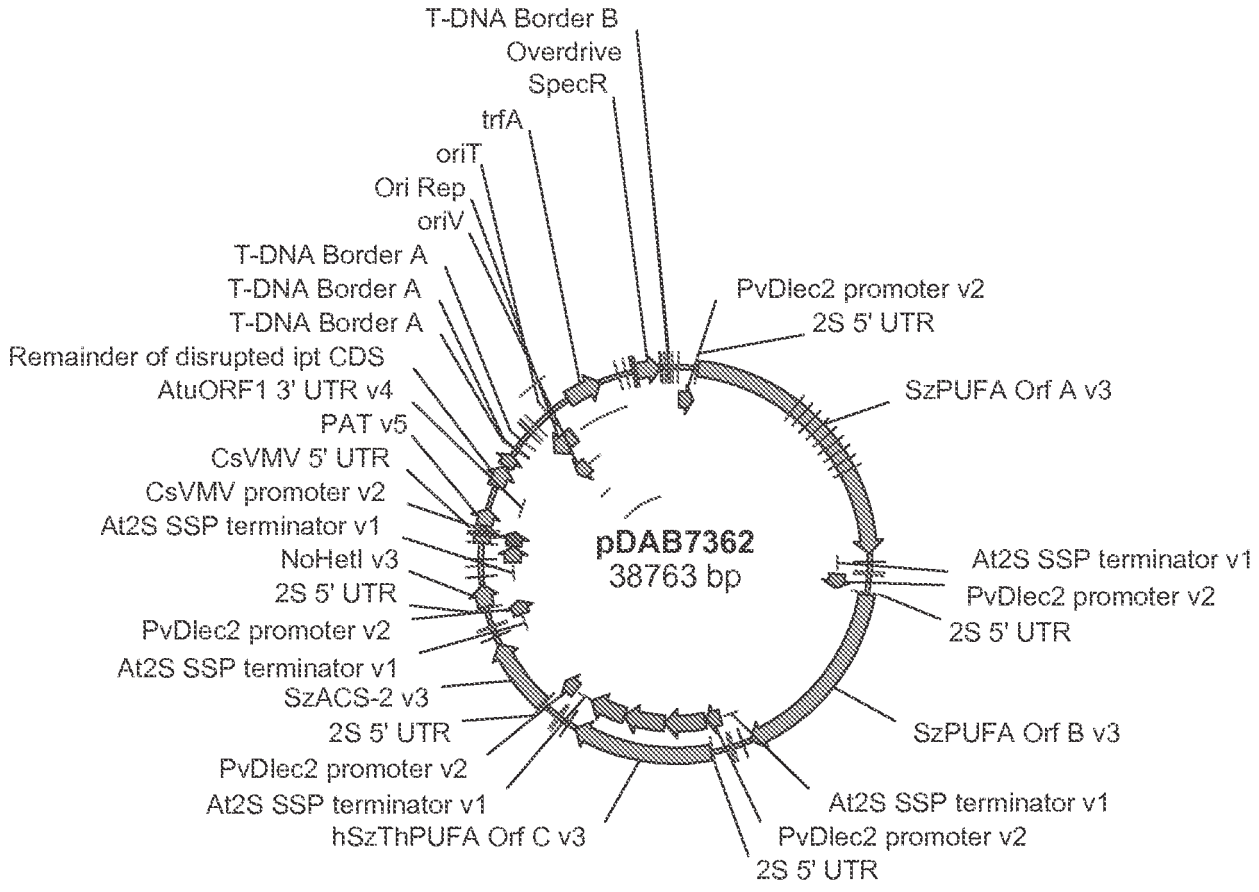

T-DNA Border B
Overdrive
SpecR
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
Remainder of disrupted ipt CDS
AtuORF1 3' UTR v4
PAT v5
CsVMV 5' UTR
CsVMV promoter v2
At2S SSP terminator v1
NoHetI v3
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
SzACS-2 v3
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
hSzThPUFA Orf C v3
pDAB7362
38763 bp
PvDlec2 promoter v2
2S 5' UTR
SzPUFA Orf A v3
At2S SSP terminator v1
PvDlec2 promoter v2
2S 5' UTR
SzPUFA Orf B v3
At2S SSP terminator v1
PvDlec2 promoter v2
2S 5' UTR

FIG. 3

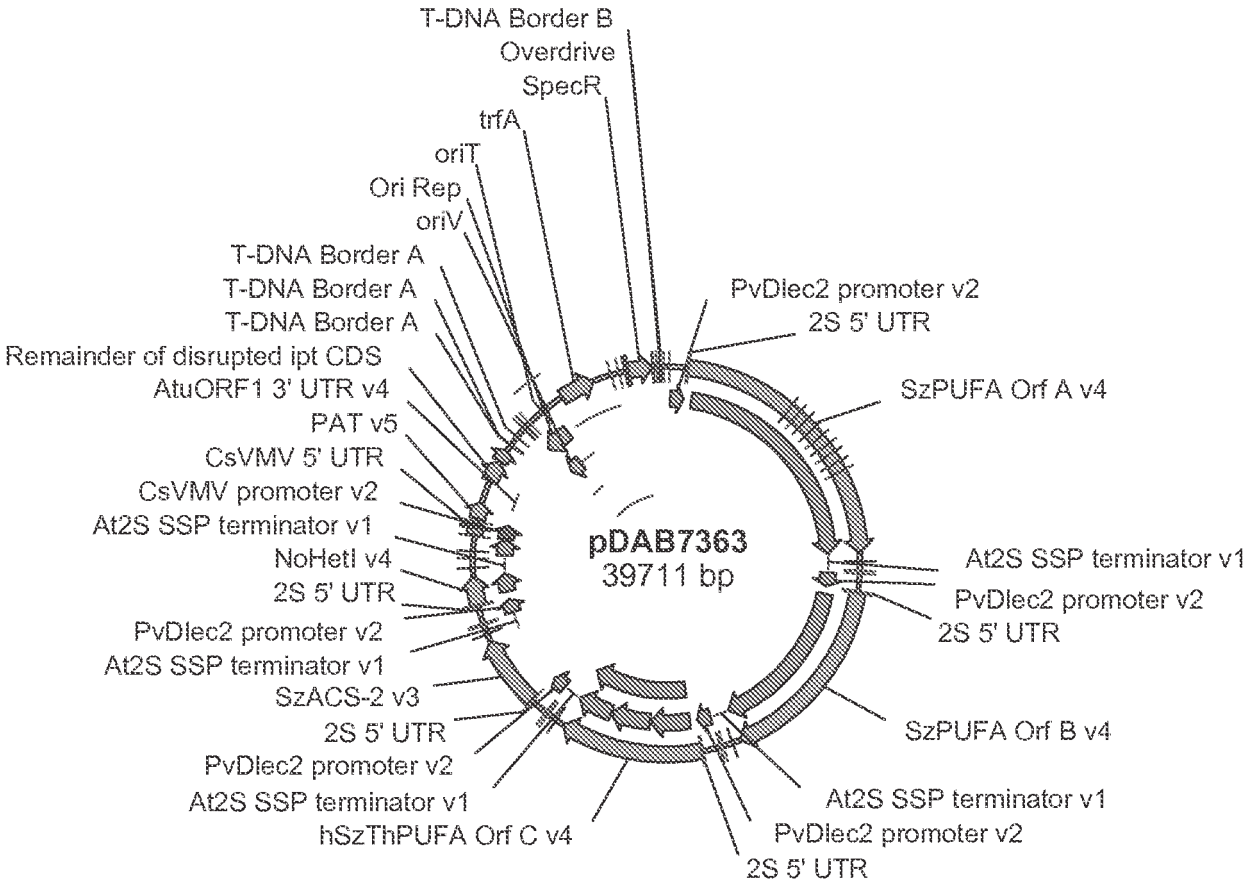

T-DNA Border B
Overdrive
SpecR
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
Remainder of disrupted ipt CDS
AtuORF1 3' UTR v4
PAT v5
CsVMV 5' UTR
CsVMV promoter v2
At2S SSP terminator v1
NoHetI v4
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
SzACS-2 v3
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
hSzThPUFA Orf C v4
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
SzPUFA Orf B v4
2S 5' UTR
PvDlec2 promoter v2
At2S SSP terminator v1
SzPUFA Orf A v4
2S 5' UTR
PvDlec2 promoter v2
pDAB7363
39711 bp

FIG. 4

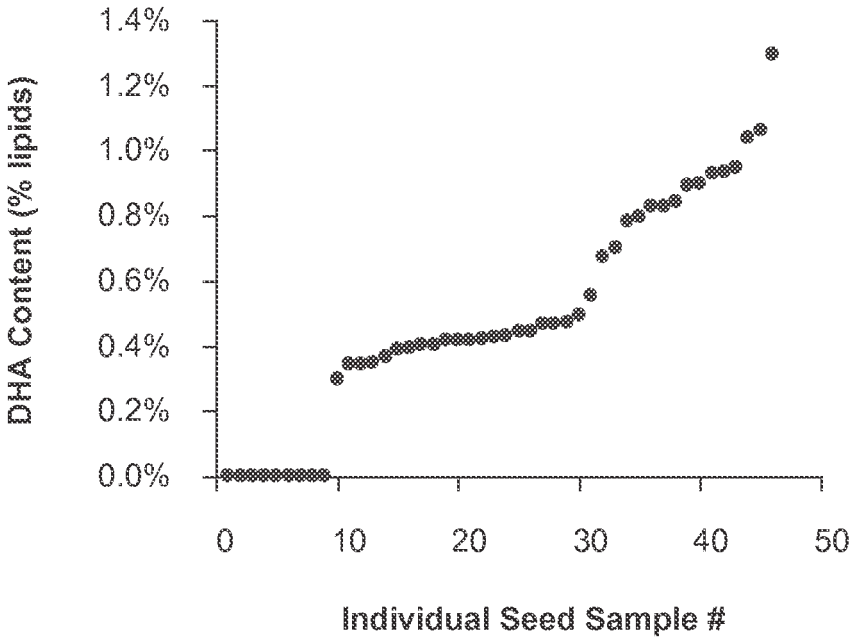
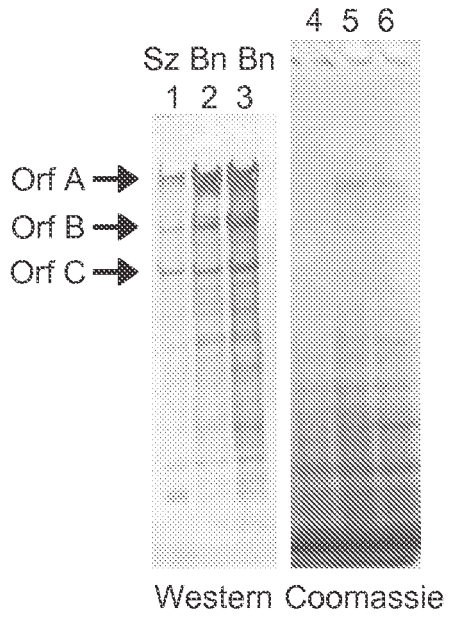

DHA Content (% lipids)
1.4%
1.2%
1.0%
0.8%
0.6%
0.4%
0.2%
0.0%
0
10
20
30
40
50
Individual Seed Sample #

FIG. 5



Western blot
1. *Schizochytrium* extract
2. *B. napus* Event 5197[14]-032.002
3. *B. napus* Event 5197[14]-032.002

Coomassie Blue-stained
4. *B. napus* Nex710 control
5. *B. napus* Event 5197[14]-032.002
6. *B. napus* Event 5197[14]-032.002

FIG. 6

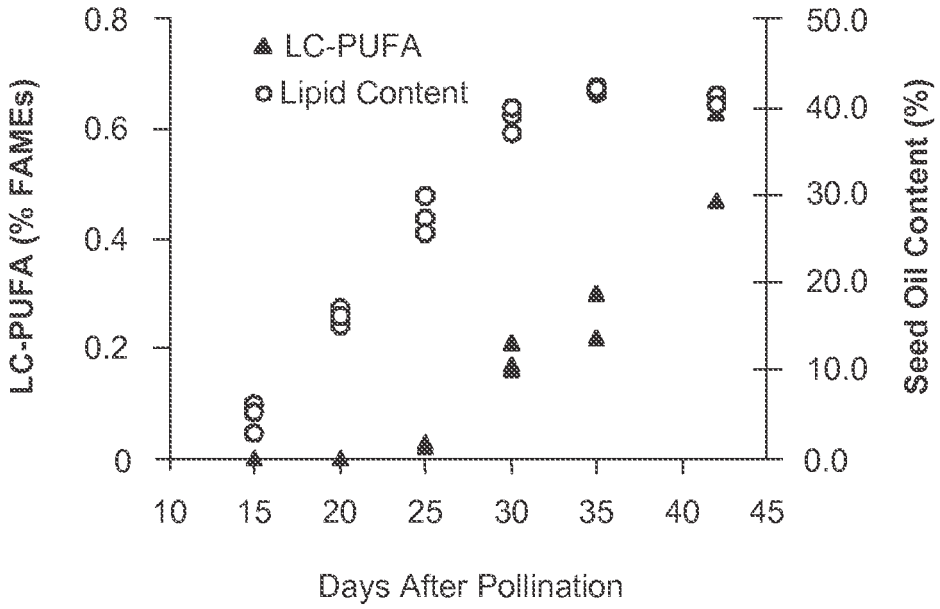
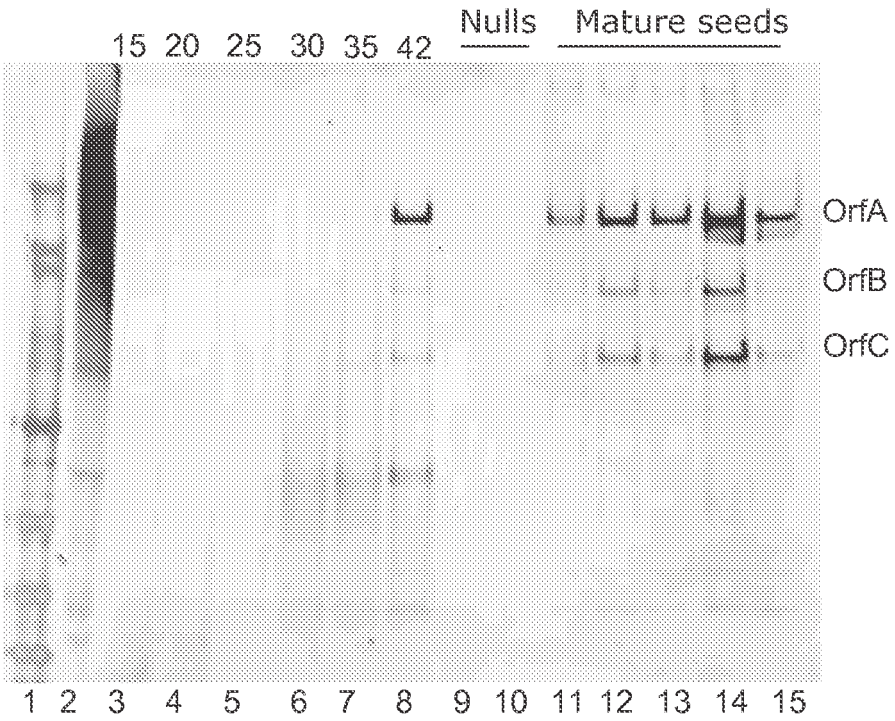

LC-PUFA
Lipid Content
LC-PUFA (% FAMEs)
Seed Oil Content (%)
Days After Pollination
0.8
0.6
0.4
0.2
0
50.0
40.0
30.0
20.0
10.0
0.0
10
15
20
25
30
35
40
45

FIG. 7A



Lane 1 Molecular Weight Marker
Lane 2 *Schizochytrium* extract positive control
Lane 3, 15 days after pollination (DAP)
Lane 4 20 DAP
Lane 5 25 DAP
Lane 6 30 DAP
Lane 7 35 DAP
Lane 8 42 DAP
Lane 9 15 DAP Null
Lane 10 20 DAP Null
Lane 11 5197-[14]-032.Sx002.Sx050.020 Mature
Lane 12 5197-[14]-032.Sx002.Sx050.012 Mature
Lane 13 5197-[14]-032.Sx002.Sx050.011 Mature
Lane 14 5197-[14]-032.Sx002.Sx050.017 Mature
Lane 15 5197-[14]-032.Sx002.Sx050.016 Mature

FIG. 7B

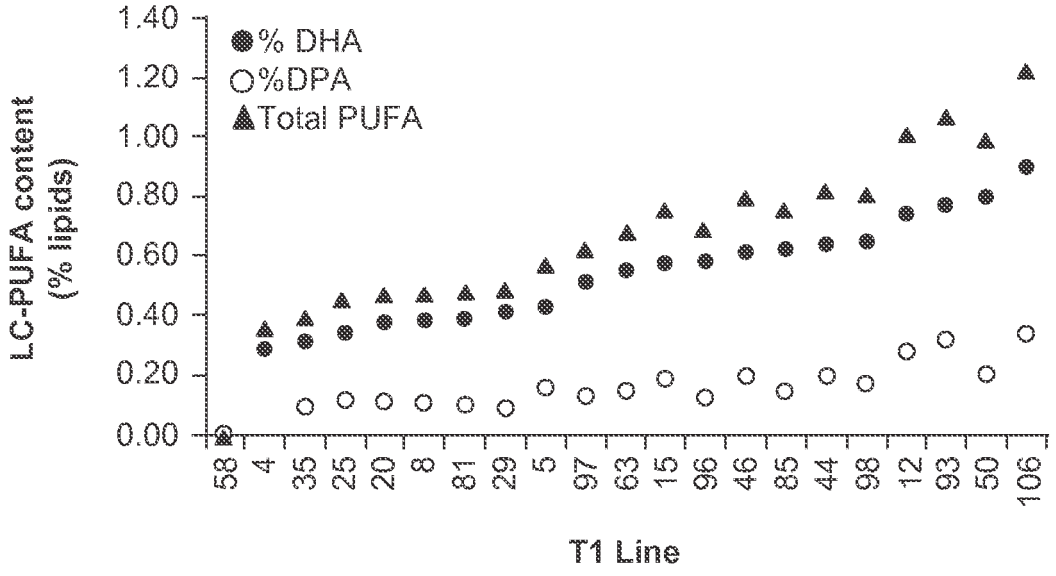

1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
LC-PUFA content
(% lipids)
% DHA
%DPA
Total PUFA
58
4
35
25
20
8
81
29
5
97
63
15
96
46
85
44
98
12
93
50
106
T1 Line

FIG. 8

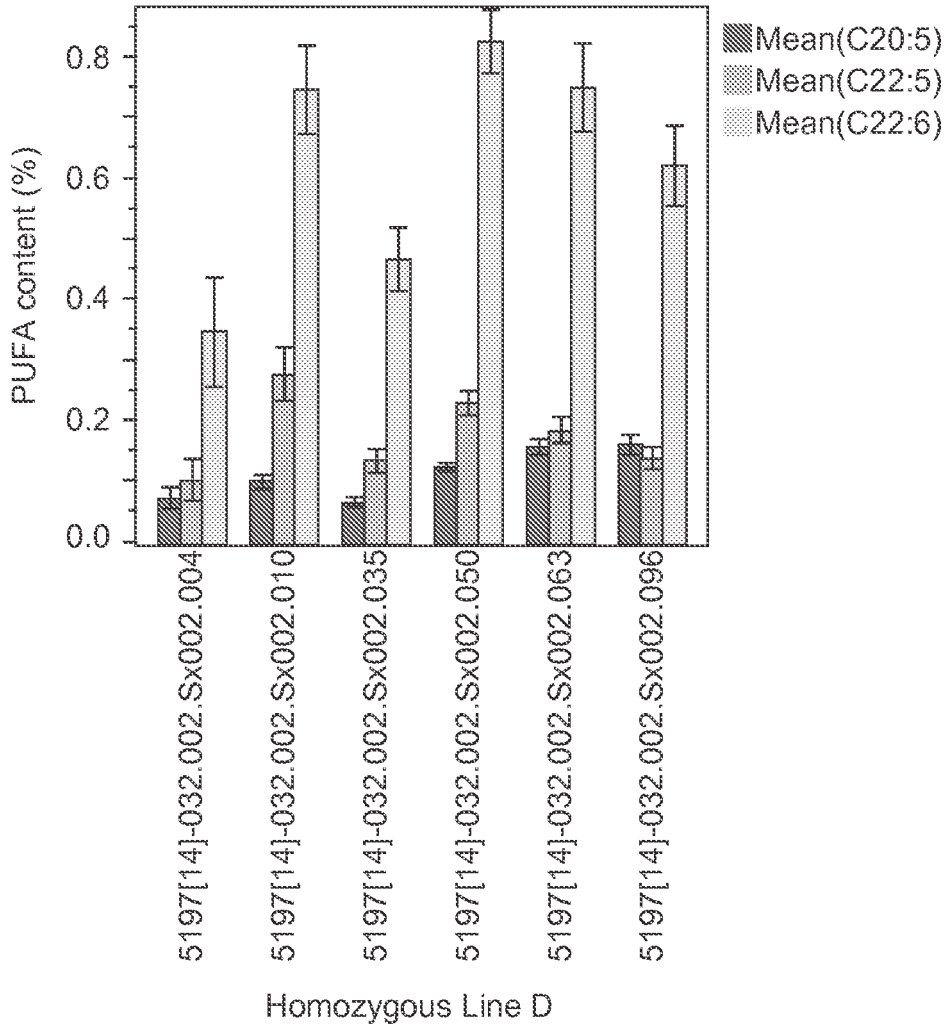

Mean(C20:5)
Mean(C22:5)
Mean(C22:6)
PUFA content (%)
0.0
0.2
0.4
0.6
0.8
5197[14]-032.002.Sx002.004
5197[14]-032.002.Sx002.010
5197[14]-032.002.Sx002.035
5197[14]-032.002.Sx002.050
5197[14]-032.002.Sx002.063
5197[14]-032.002.Sx002.096
Homozygous Line D
Error bars represent a 95%
confidence interval of the mean

FIG. 9

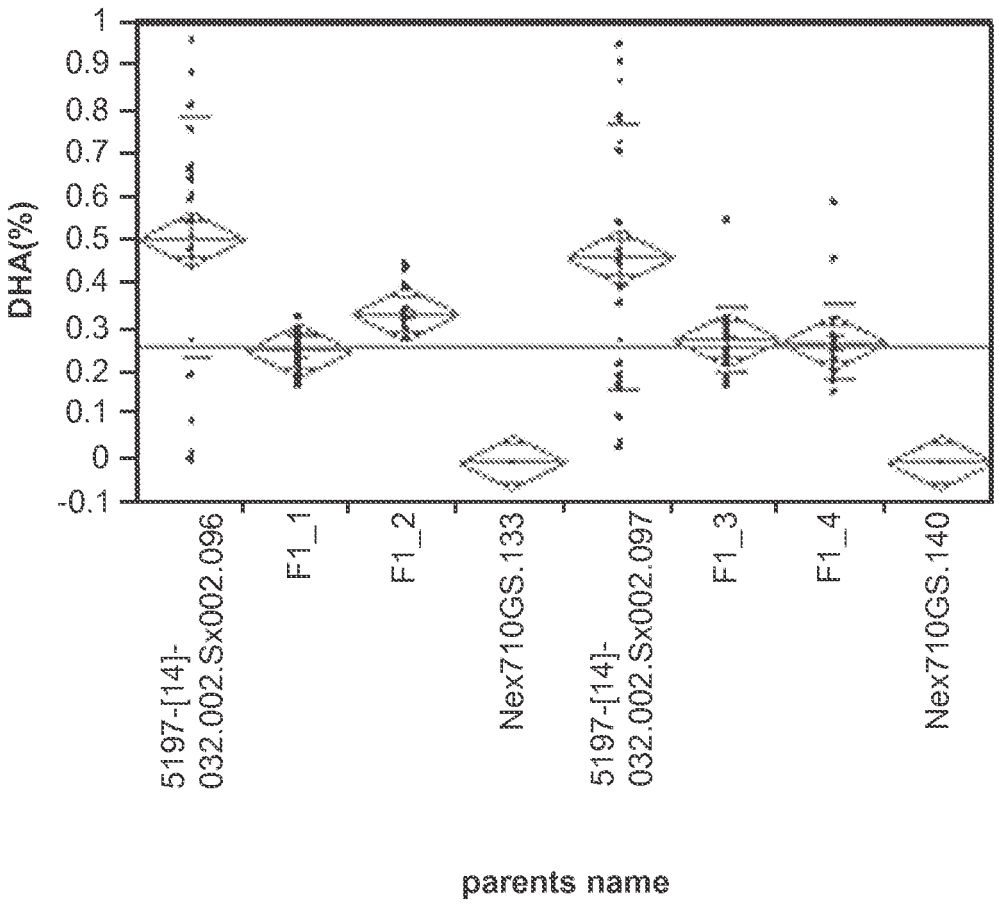

DHA(%)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
5197-[14]-032.002.Sx002.096
F1_1
F1_2
Nex710GS.133
5197-[14]-032.002.Sx002.097
F1_3
F1_4
Nex710GS.140
parents name

FIG. 10

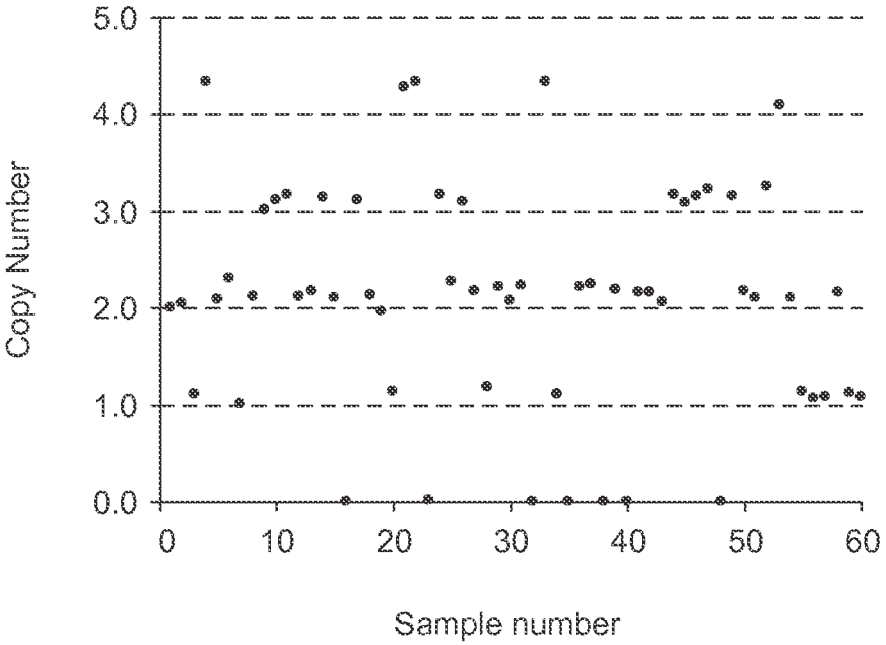


FIG. 11

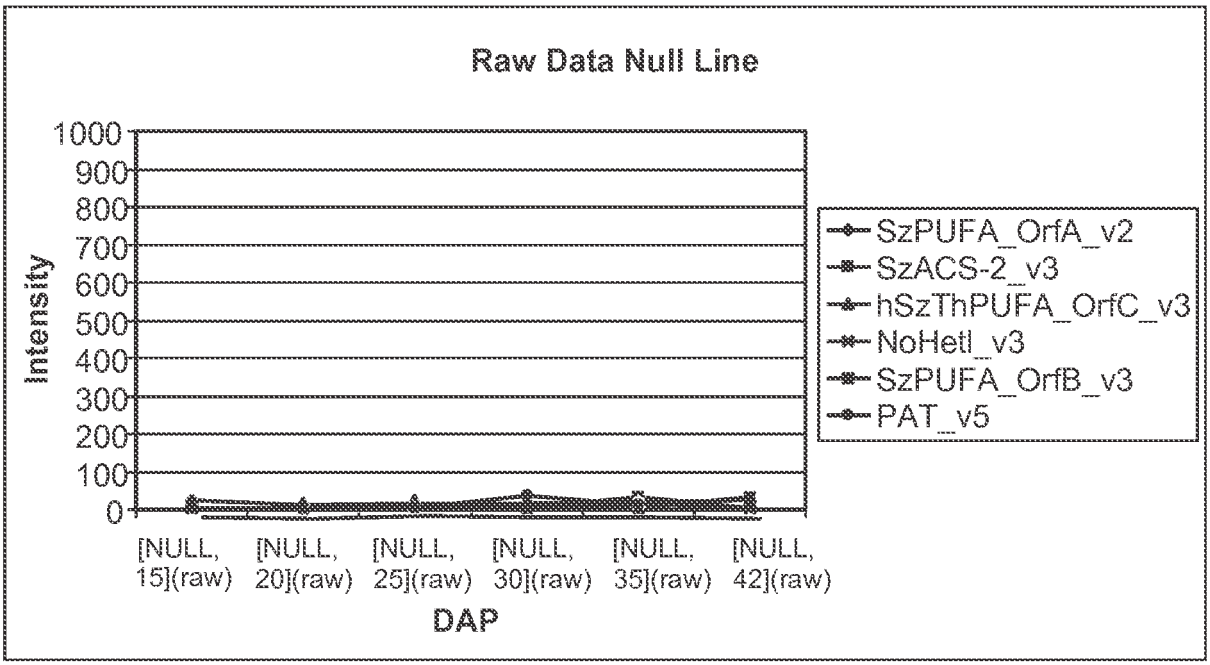

Raw Data Null Line
Intensity
1000
900
800
700
600
500
400
300
200
100
0
[NULL, 15](raw)
[NULL, 20](raw)
[NULL, 25](raw)
[NULL, 30](raw)
[NULL, 35](raw)
[NULL, 42](raw)
DAP
SzPUFA_OrfA_v2
SzACS-2_v3
hSzThPUFA_OrfC_v3
NoHetI_v3
SzPUFA_OrfB_v3
PAT_v5

FIG. 12

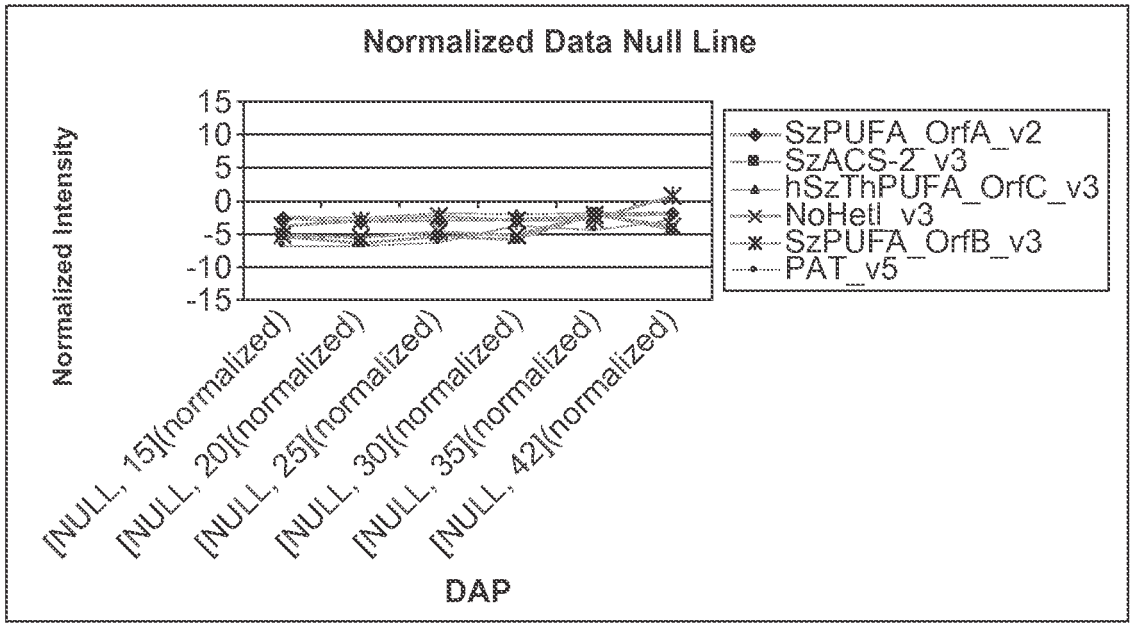

Normalized Data Null Line
Normalized Intensity
15
10
5
0
-5
-10
-15
[NULL, 15](normalized)
[NULL, 20](normalized)
[NULL, 25](normalized)
[NULL, 30](normalized)
[NULL, 35](normalized)
[NULL, 42](normalized)
DAP
SzPUFA_OrfA_v2
SzACS-2_v3
hSzThPUFA_OrfC_v3
NoHell_v3
SzPUFA_OrfB_v3
PAT_v5

FIG. 13

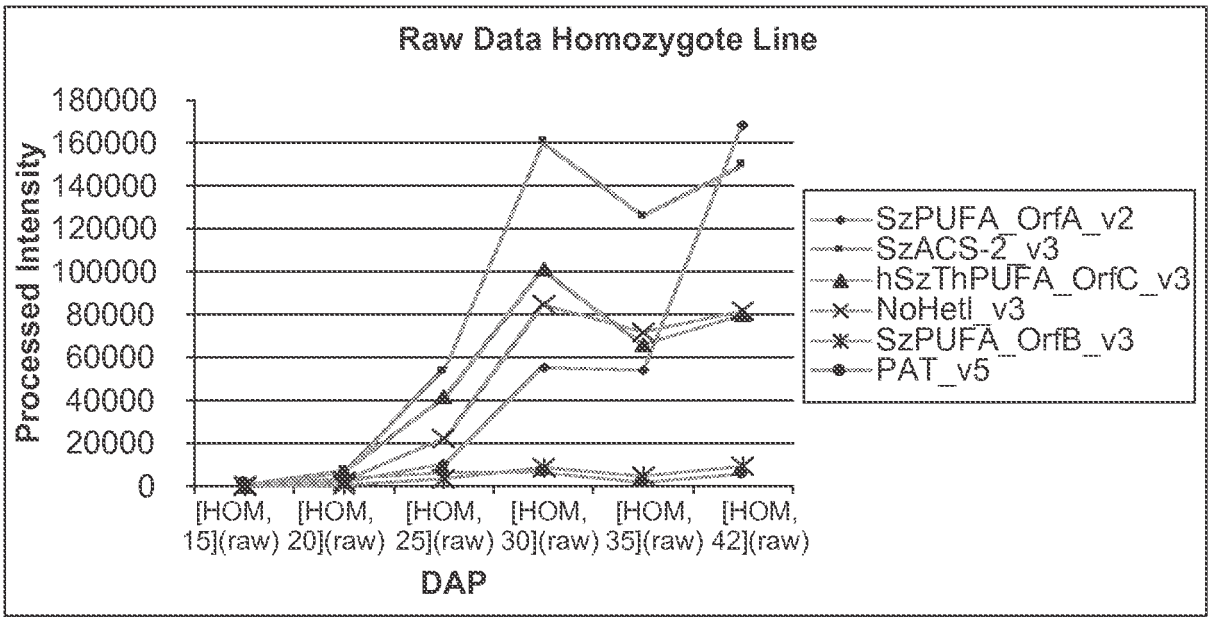

Raw Data Homozygote Line
Processed Intensity
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
[HOM, 15](raw)
[HOM, 20](raw)
[HOM, 25](raw)
[HOM, 30](raw)
[HOM, 35](raw)
[HOM, 42](raw)
DAP
SzPUFA_OrfA_v2
SzACS-2_v3
hSzThPUFA_OrfC_v3
NoHetI_v3
SzPUFA_OrfB_v3
PAT_v5

FIG. 14

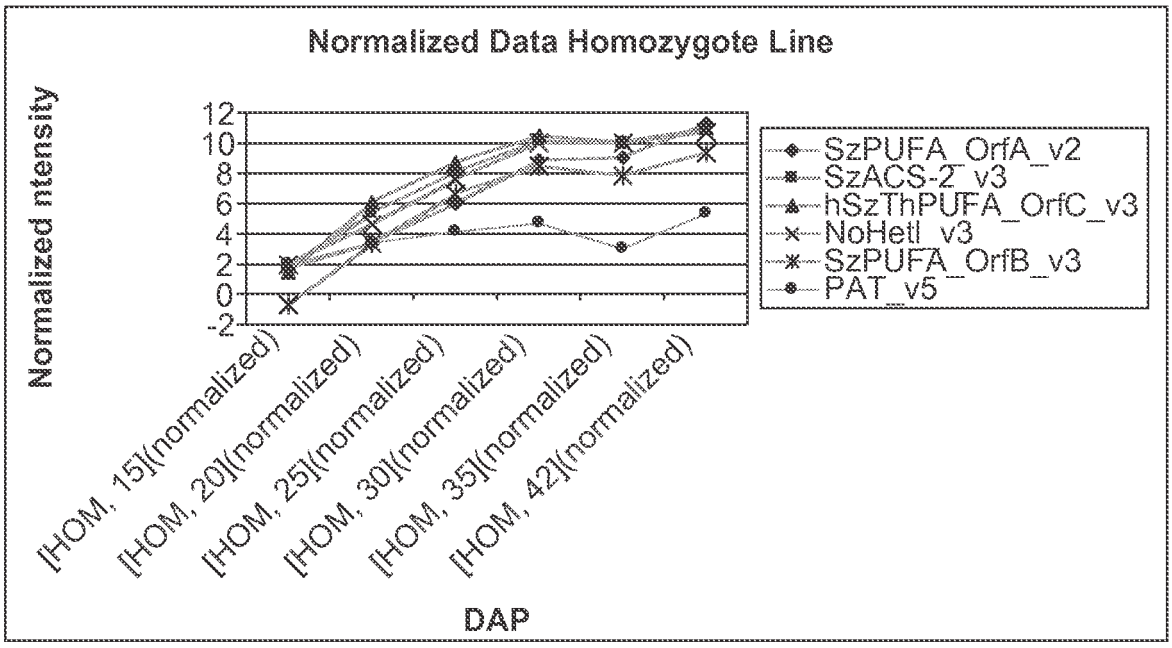

Normalized Data Homozygote Line
Normalized intensity
12
10
8
6
4
2
0
-2
[HOM, 15](normalized)
[HOM, 20](normalized)
[HOM, 25](normalized)
[HOM, 30](normalized)
[HOM, 35](normalized)
[HOM, 42](normalized)
DAP
SzPUFA_OrfA_v2
SzACS-2_v3
hSzThPUFA_OrfC_v3
NoHetI_v3
SzPUFA_OrfB_v3
PAT_v5

FIG. 15

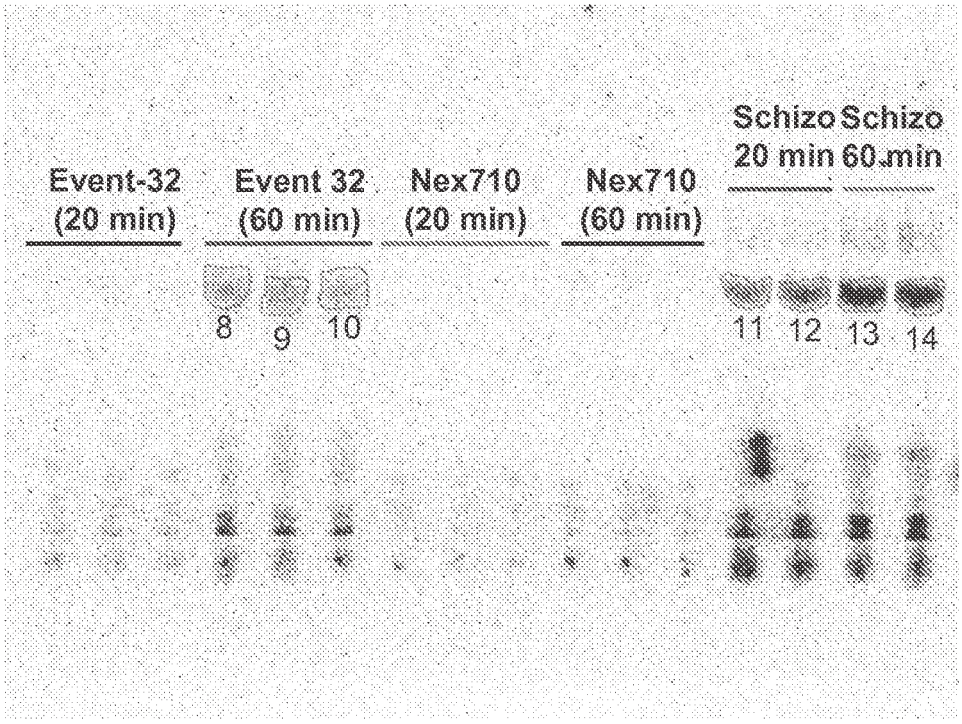

Event-32
(20 min)
Event 32
(60 min)
Nex710
(20 min)
Nex710
(60 min)
Schizo
20 min
Schizo
60 min
8
9
10
11
12
13
14

FIG. 16

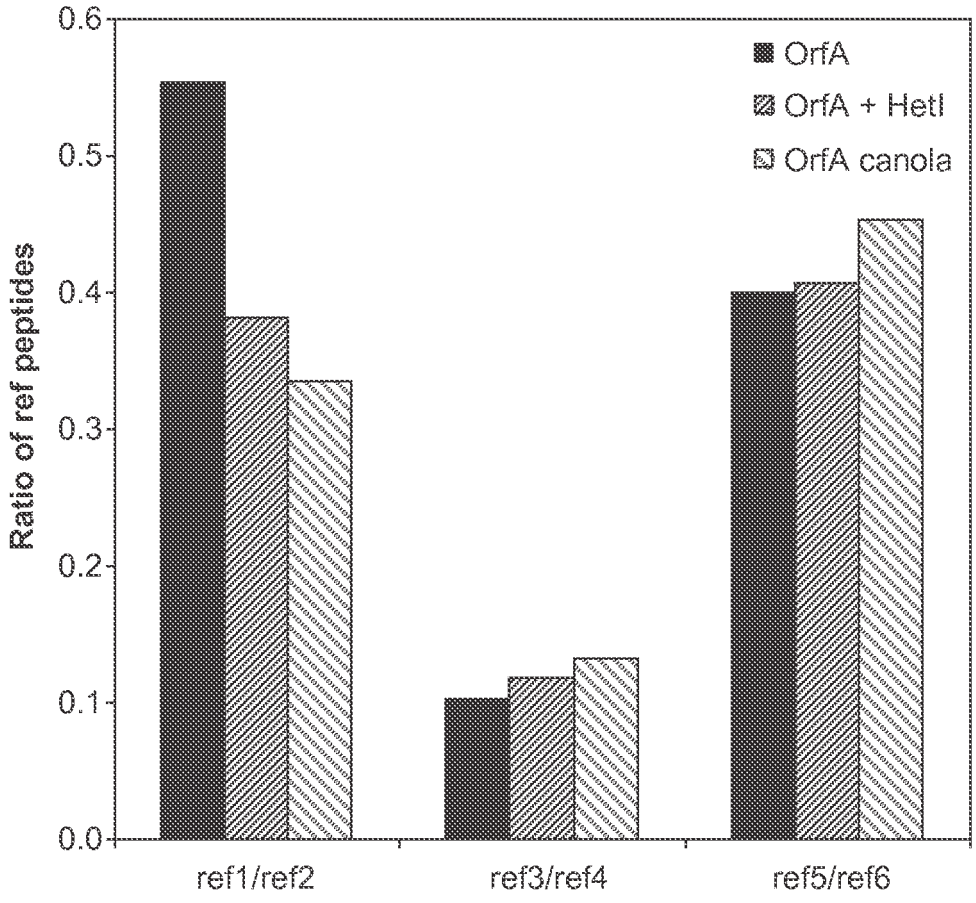

0.6
0.5
0.4
0.3
0.2
0.1
0.0
Ratio of ref peptides
OrfA
OrfA + HetI
OrfA canola
ref1/ref2
ref3/ref4
ref5/ref6

FIG. 17

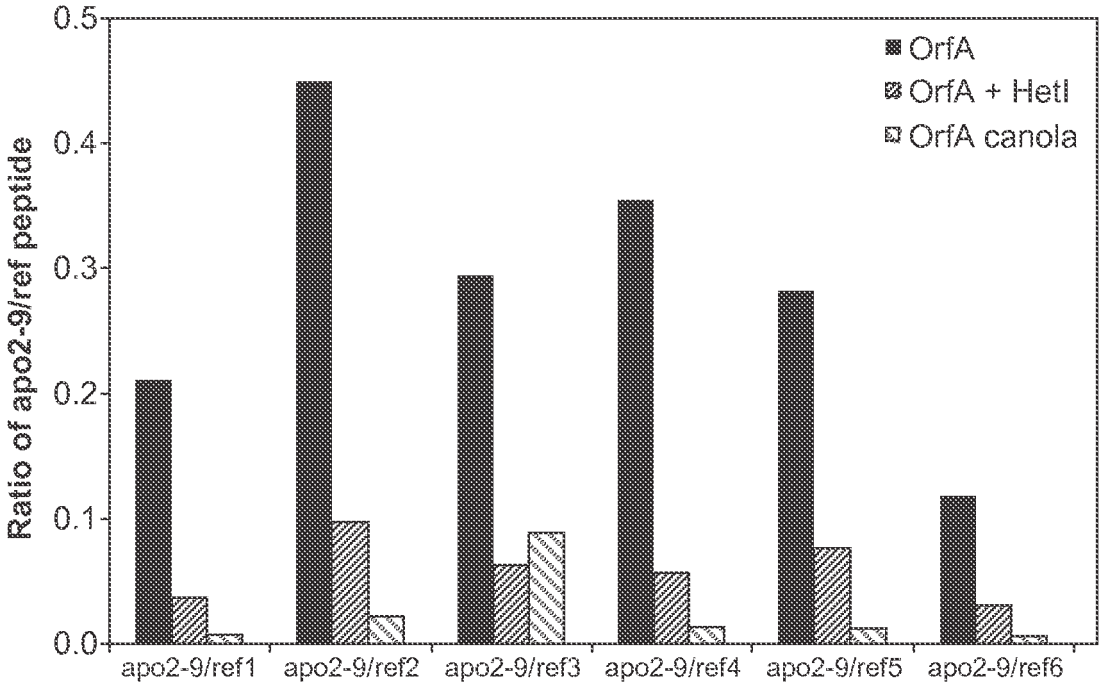

0.5
0.4
0.3
0.2
0.1
0.0
Ratio of apo2-9/ref peptide
OrfA
OrfA + HetI
OrfA canola
apo2-9/ref1
apo2-9/ref2
apo2-9/ref3
apo2-9/ref4
apo2-9/ref5
apo2-9/ref6

FIG. 18

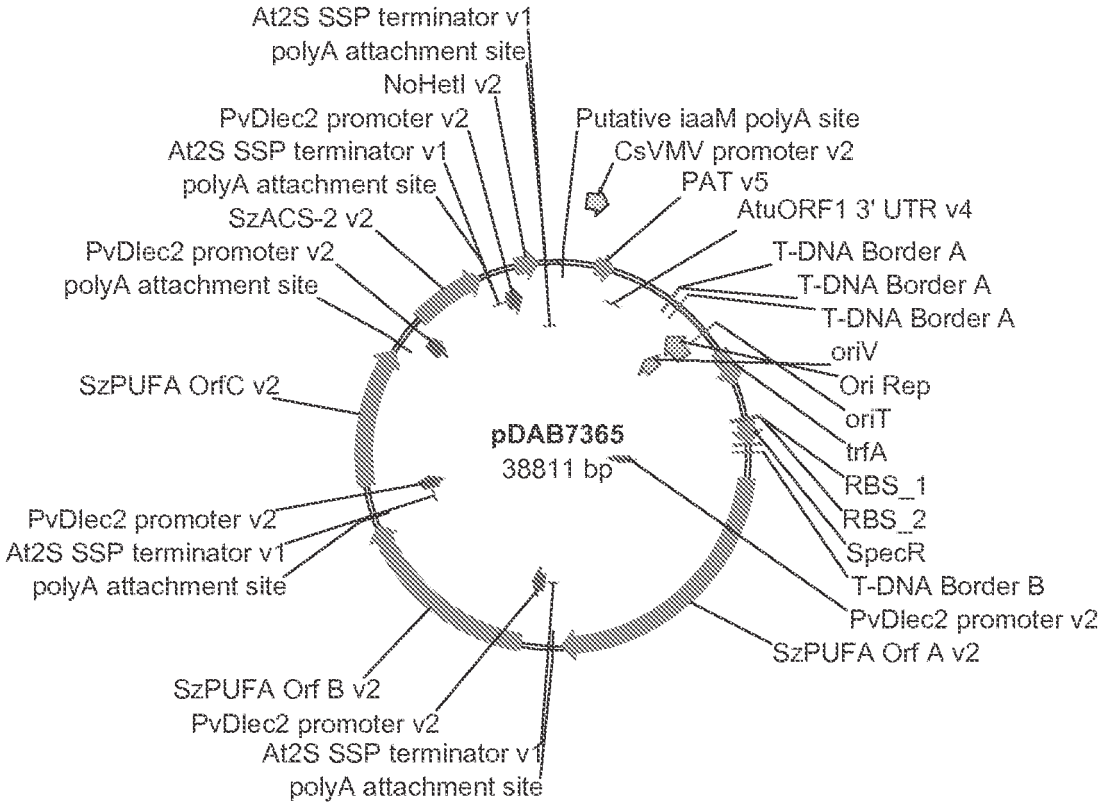

At2S SSP terminator v1
polyA attachment site
NoHetI v2
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzACS-2 v2
PvDlec2 promoter v2
polyA attachment site
SzPUFA OrfC v2
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v2
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v2
pDAB7365
38811 bp

FIG. 19

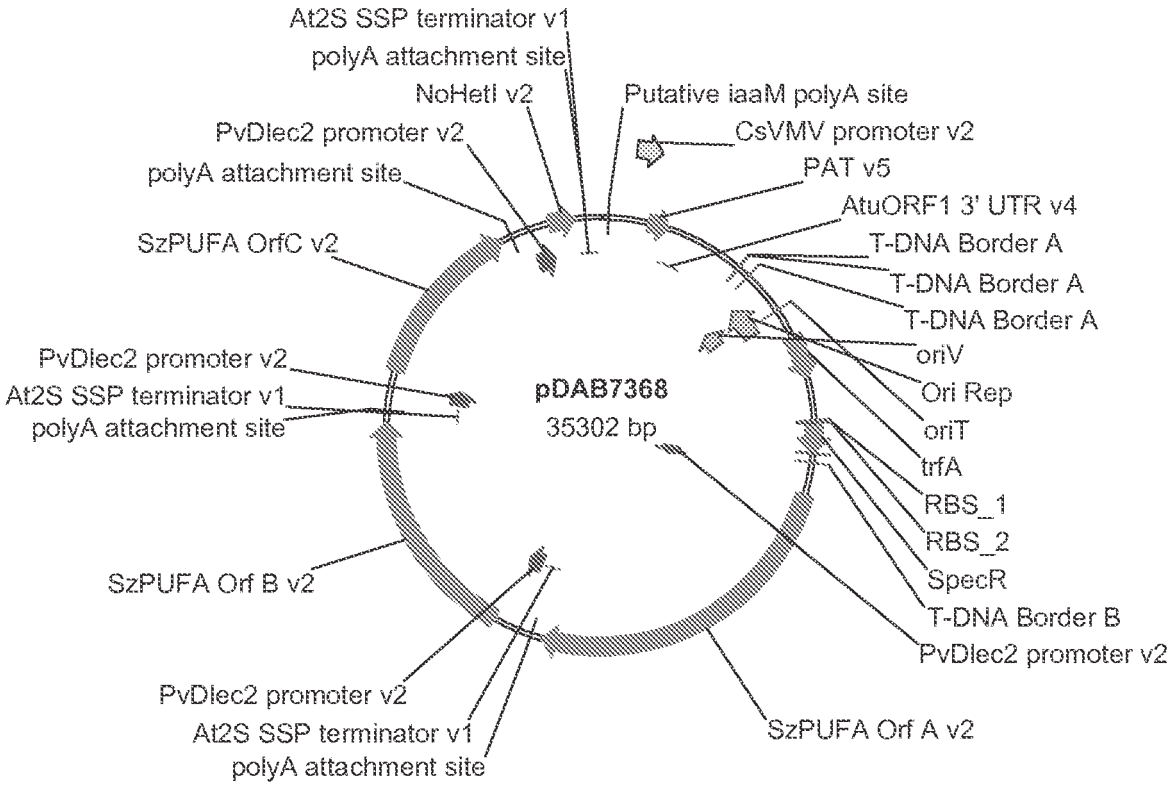

At2S SSP terminator v1
polyA attachment site
NoHetI v2
Putative iaaM polyA site
PvDlec2 promoter v2
CsVMV promoter v2
polyA attachment site
PAT v5
AtuORF1 3' UTR v4
SzPUFA OrfC v2
T-DNA Border A
T-DNA Border A
T-DNA Border A
PvDlec2 promoter v2
oriV
pDAB7368
Ori Rep
At2S SSP terminator v1
35302 bp
polyA attachment site
oriT
trfA
RBS_1
RBS_2
SzPUFA Orf B v2
SpecR
T-DNA Border B
PvDlec2 promoter v2
PvDlec2 promoter v2
SzPUFA Orf A v2
At2S SSP terminator v1
polyA attachment site

FIG. 20

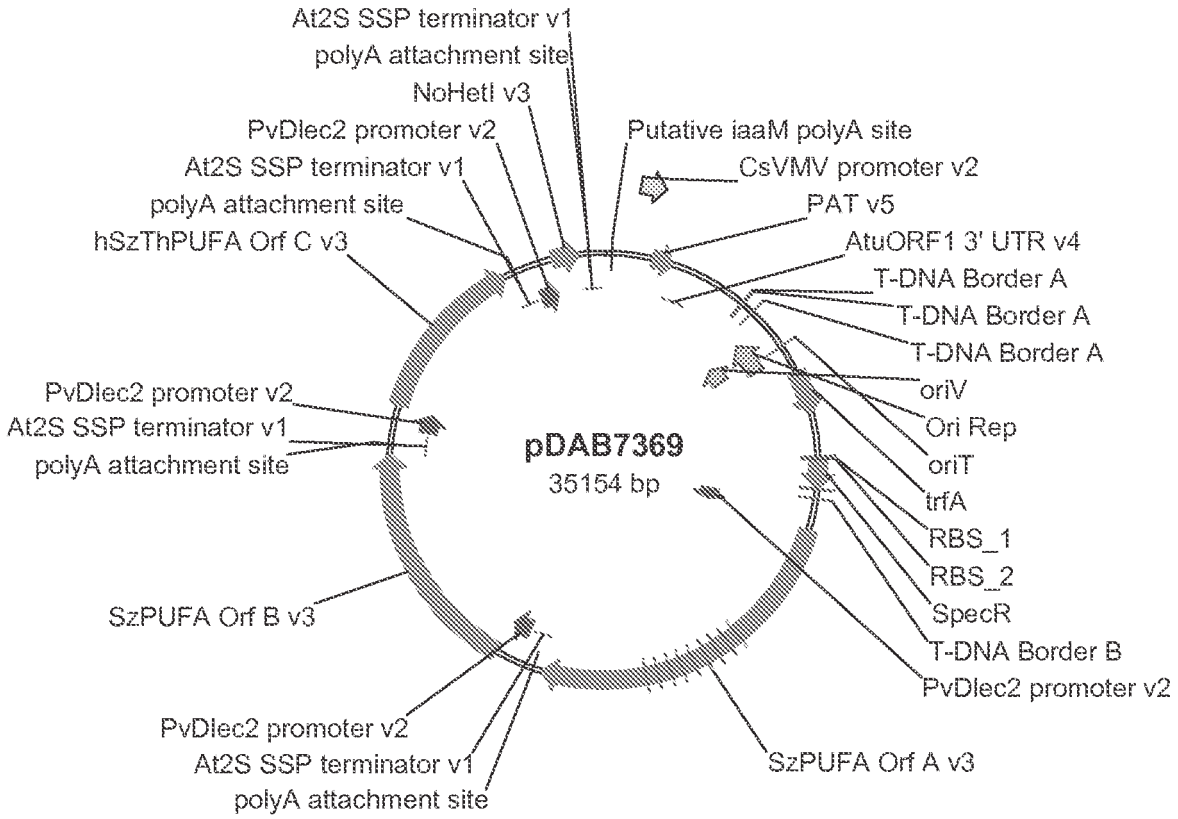

At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
pDAB7369
35154 bp

FIG. 21

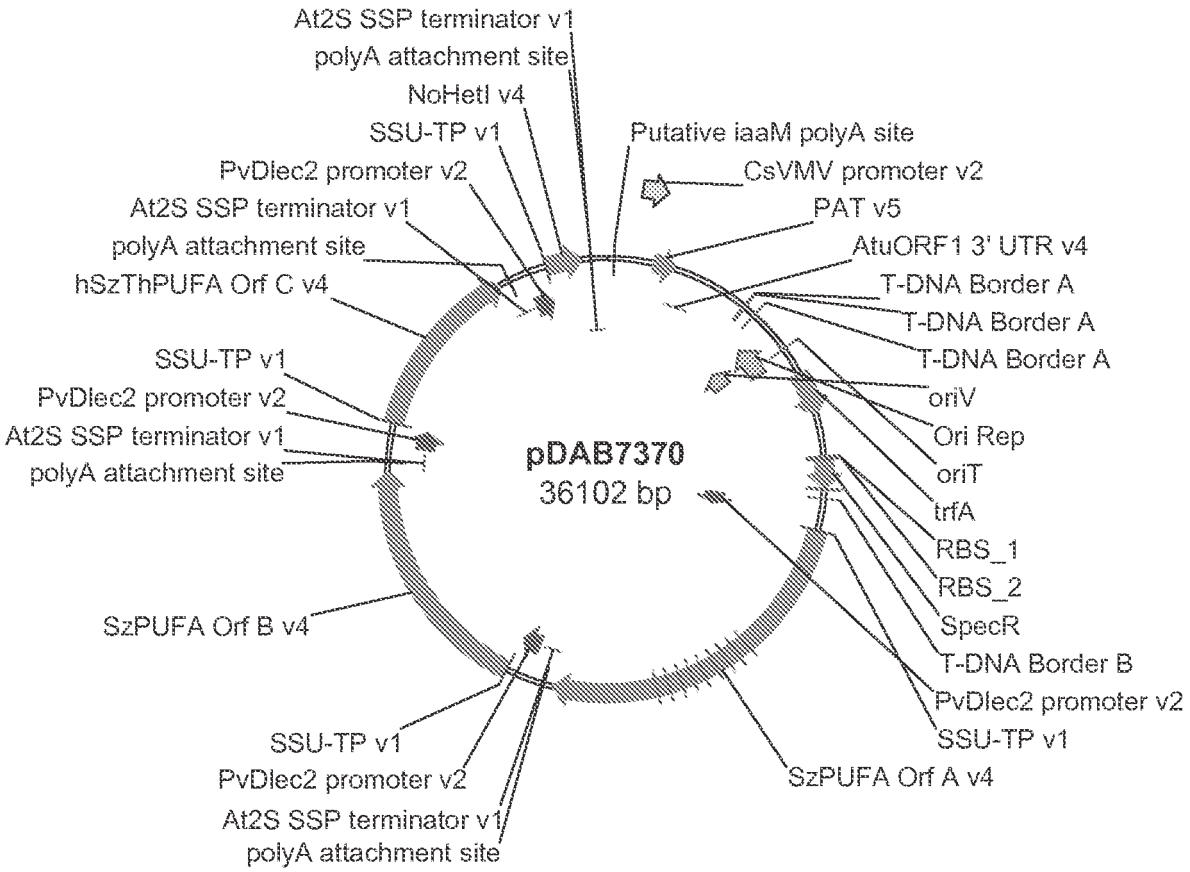

At2S SSP terminator v1
polyA attachment site
NoHetI v4
SSU-TP v1
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v4
SSU-TP v1
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v4
SSU-TP v1
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvDlec2 promoter v2
SSU-TP v1
SzPUFA Orf A v4
pDAB7370
36102 bp

FIG. 22

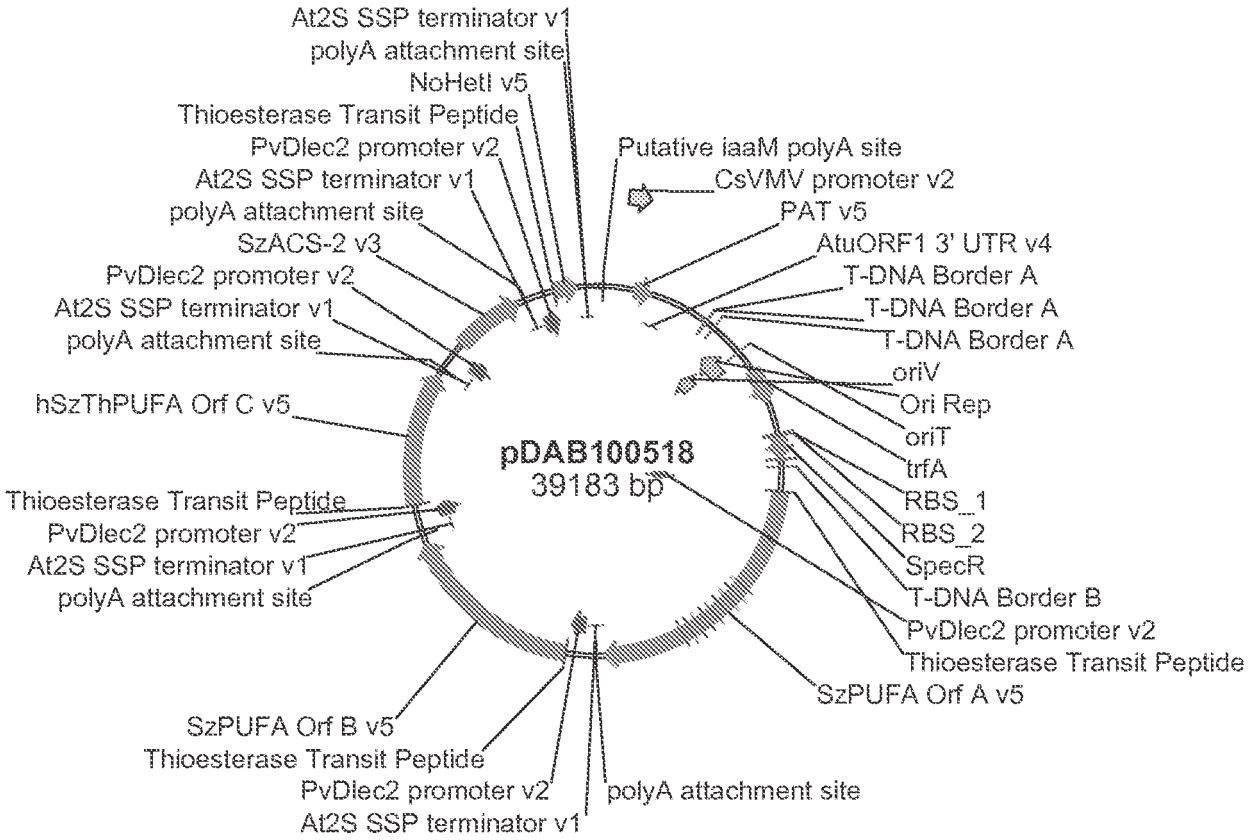

At2S SSP terminator v1
polyA attachment site
NoHetI v5
Thioesterase Transit Peptide
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzACS-2 v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v5
Thioesterase Transit Peptide
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v5
Thioesterase Transit Peptide
PvDlec2 promoter v2
At2S SSP terminator v1
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvDlec2 promoter v2
Thioesterase Transit Peptide
SzPUFA Orf A v5
polyA attachment site
pDAB100518
39183 bp

FIG. 23

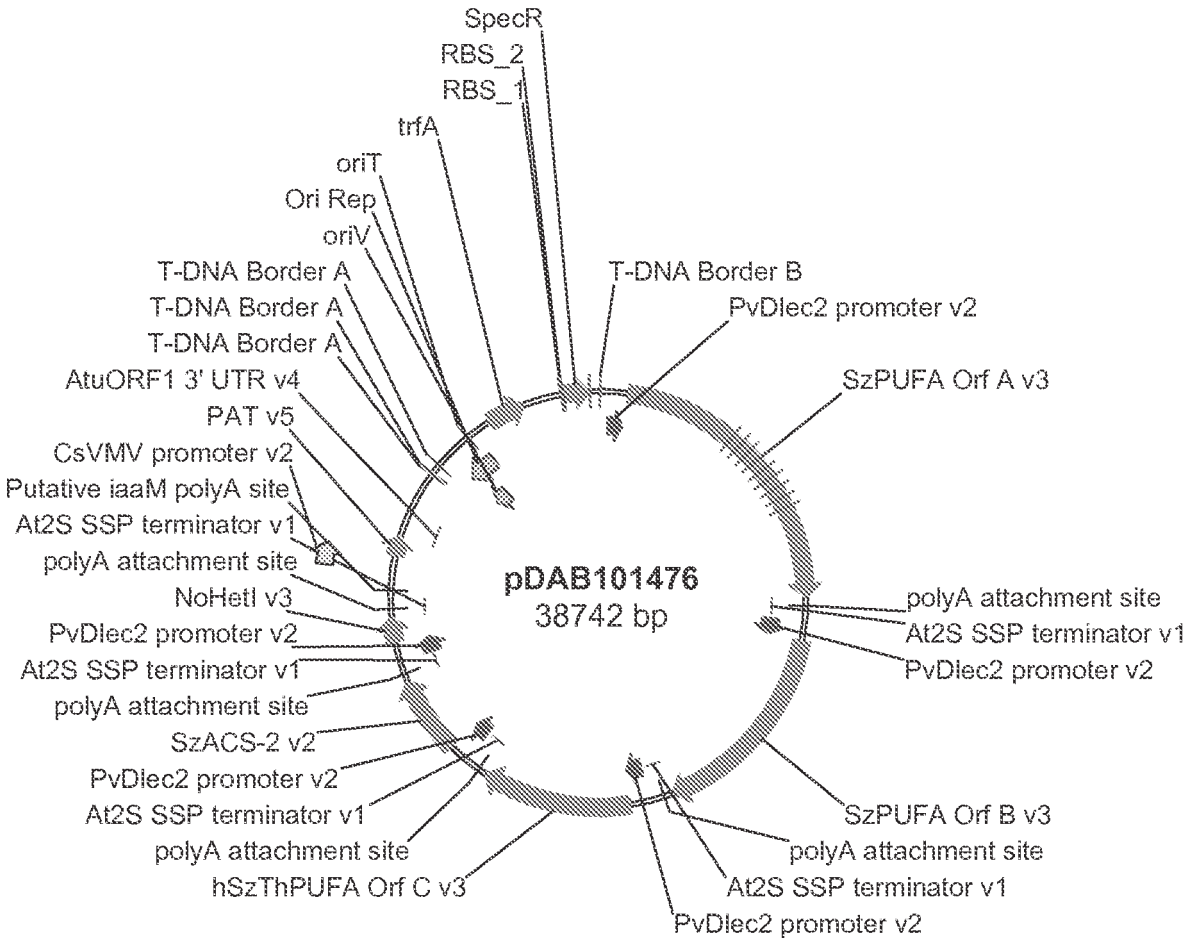

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzACS-2 v2
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v3
pDAB101476
38742 bp
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2
SzPUFA Orf B v3
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2

FIG. 24

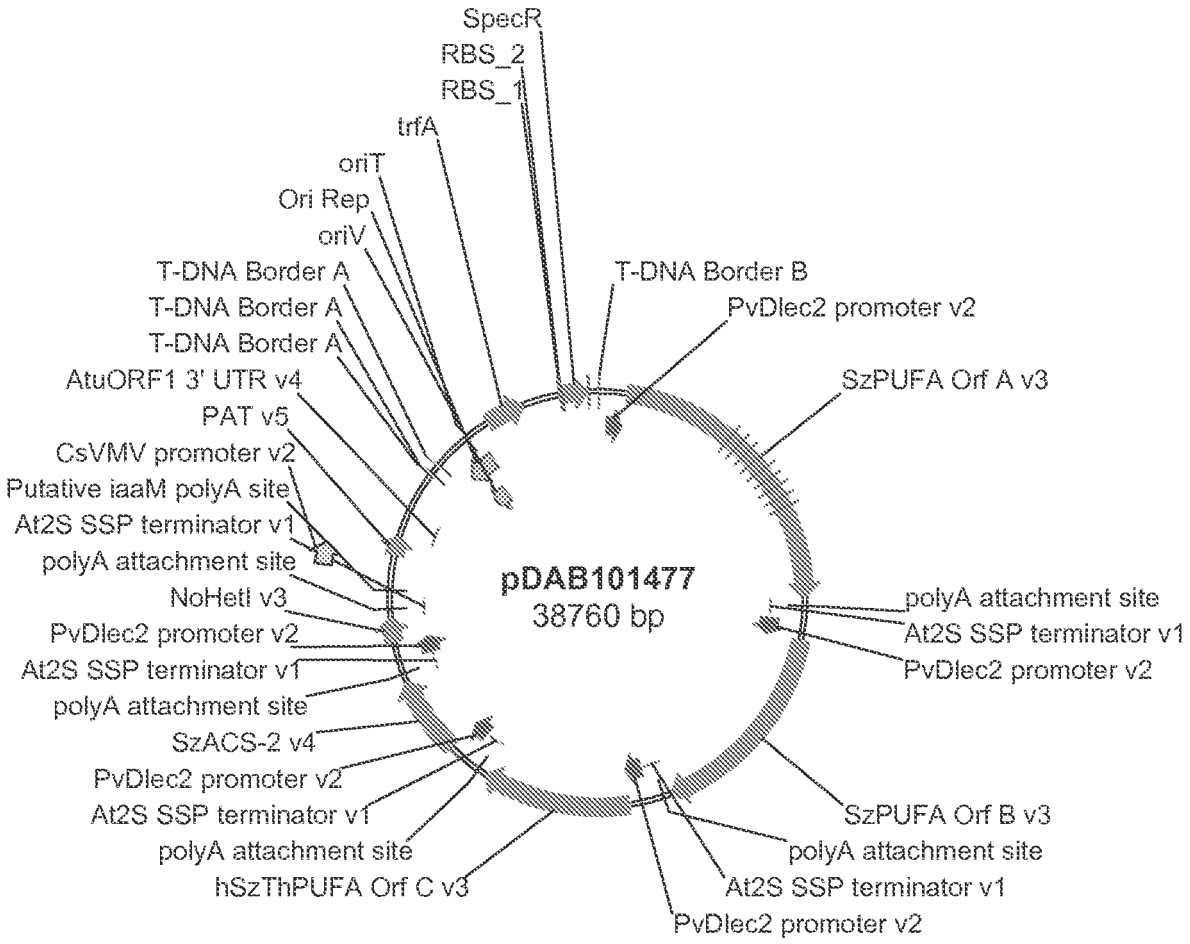

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzACS-2 v4
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v3
pDAB101477
38760 bp
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2
SzPUFA Orf B v3
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2

FIG. 25

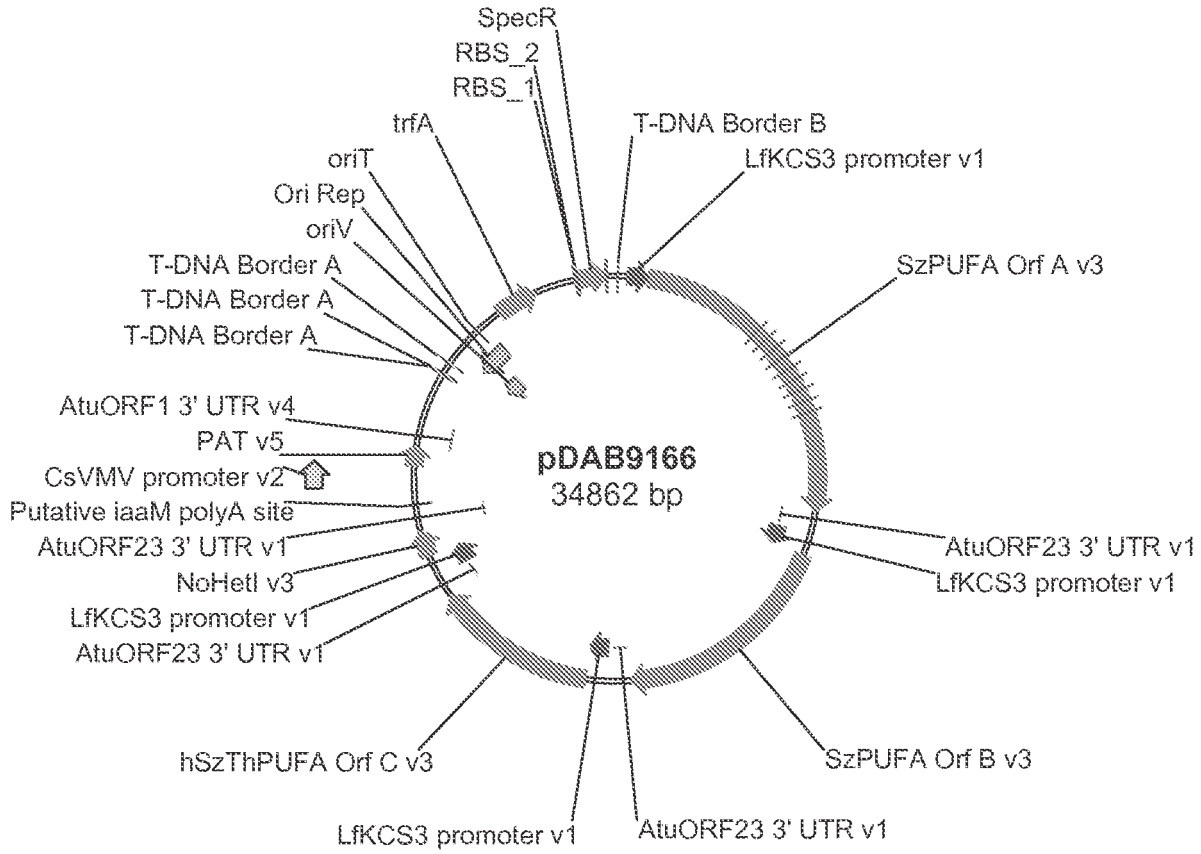

SpecR
RBS_2
RBS_1
trfA
T-DNA Border B
LfKCS3 promoter v1
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
SzPUFA Orf A v3
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
LfKCS3 promoter v1
AtuORF23 3' UTR v1
pDAB9166
34862 bp
AtuORF23 3' UTR v1
LfKCS3 promoter v1
hSzThPUFA Orf C v3
SzPUFA Orf B v3
LfKCS3 promoter v1
AtuORF23 3' UTR v1

FIG. 26

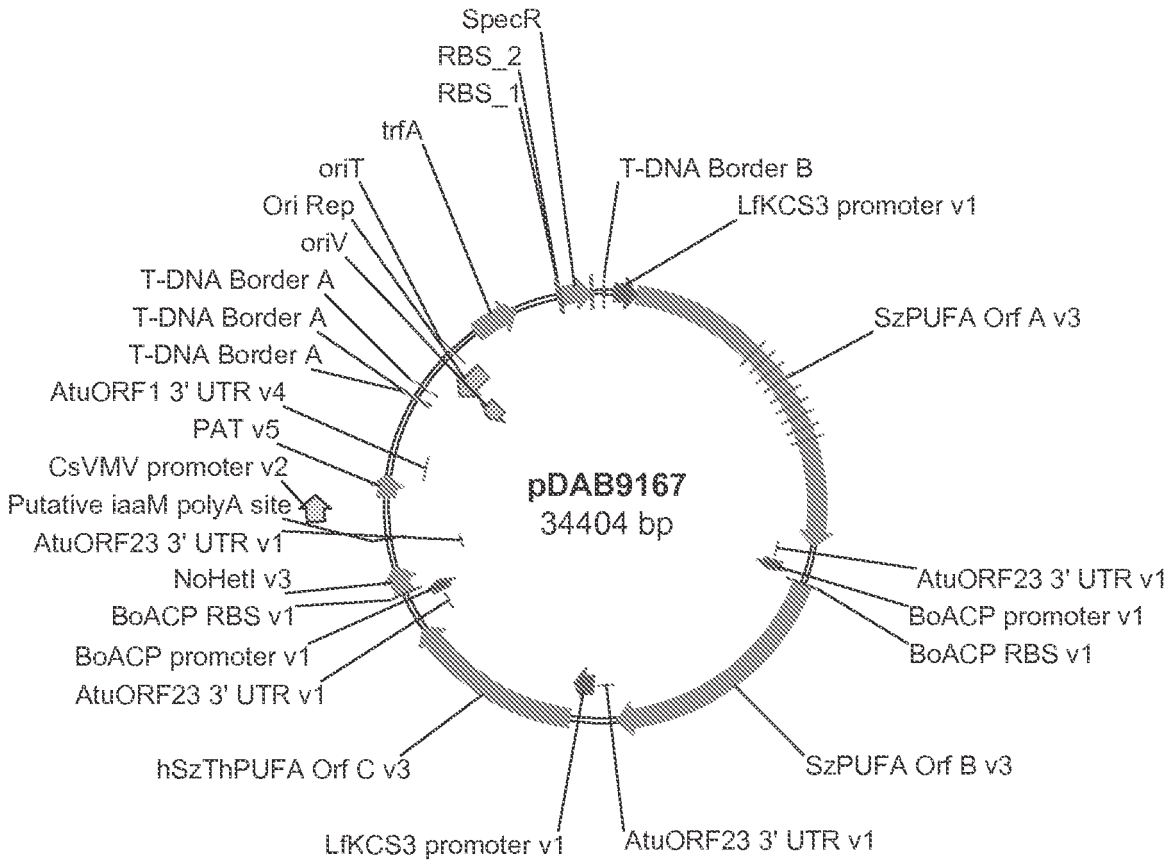

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
BoACP RBS v1
BoACP promoter v1
AtuORF23 3' UTR v1
hSzThPUFA Orf C v3
LfKCS3 promoter v1
AtuORF23 3' UTR v1
SzPUFA Orf B v3
AtuORF23 3' UTR v1
BoACP promoter v1
BoACP RBS v1
SzPUFA Orf A v3
LfKCS3 promoter v1
T-DNA Border B
pDAB9167
34404 bp

FIG. 27

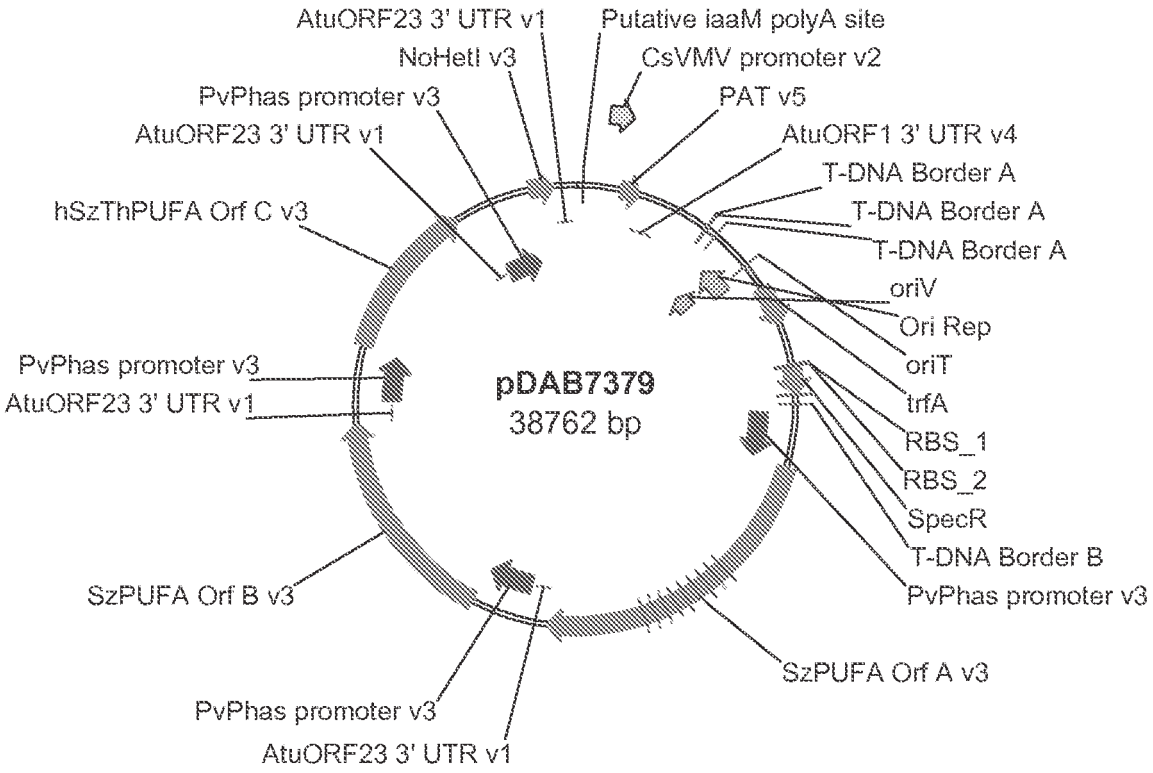

AtuORF23 3' UTR v1
Putative iaaM polyA site
NoHetI v3
CsVMV promoter v2
PvPhas promoter v3
PAT v5
AtuORF23 3' UTR v1
AtuORF1 3' UTR v4
T-DNA Border A
hSzThPUFA Orf C v3
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
PvPhas promoter v3
pDAB7379
38762 bp
oriT
AtuORF23 3' UTR v1
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvPhas promoter v3
SzPUFA Orf B v3
SzPUFA Orf A v3
PvPhas promoter v3
AtuORF23 3' UTR v1

FIG. 28

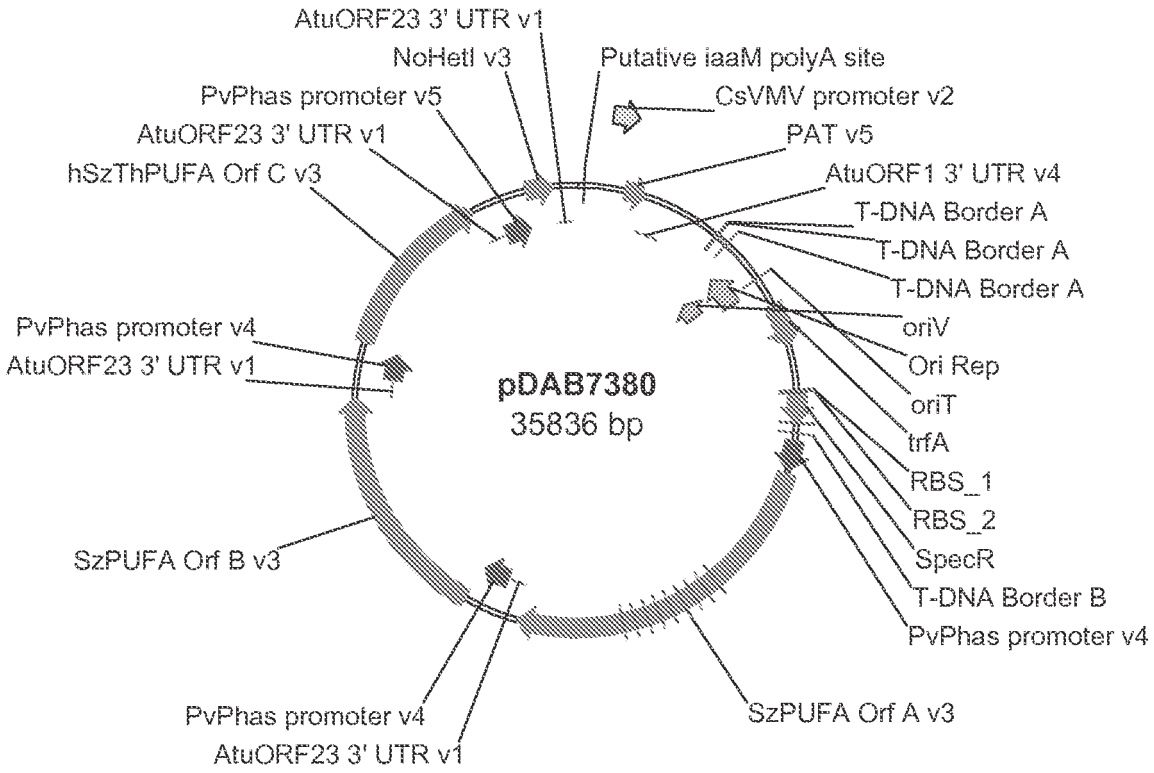

AtuORF23 3' UTR v1
NoHetI v3
Putative iaaM polyA site
PvPhas promoter v5
CsVMV promoter v2
AtuORF23 3' UTR v1
PAT v5
hSzThPUFA Orf C v3
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
PvPhas promoter v4
oriV
AtuORF23 3' UTR v1
Ori Rep
pDAB7380
35836 bp
oriT
trfA
RBS_1
RBS_2
SzPUFA Orf B v3
SpecR
T-DNA Border B
PvPhas promoter v4
PvPhas promoter v4
SzPUFA Orf A v3
AtuORF23 3' UTR v1

FIG. 29

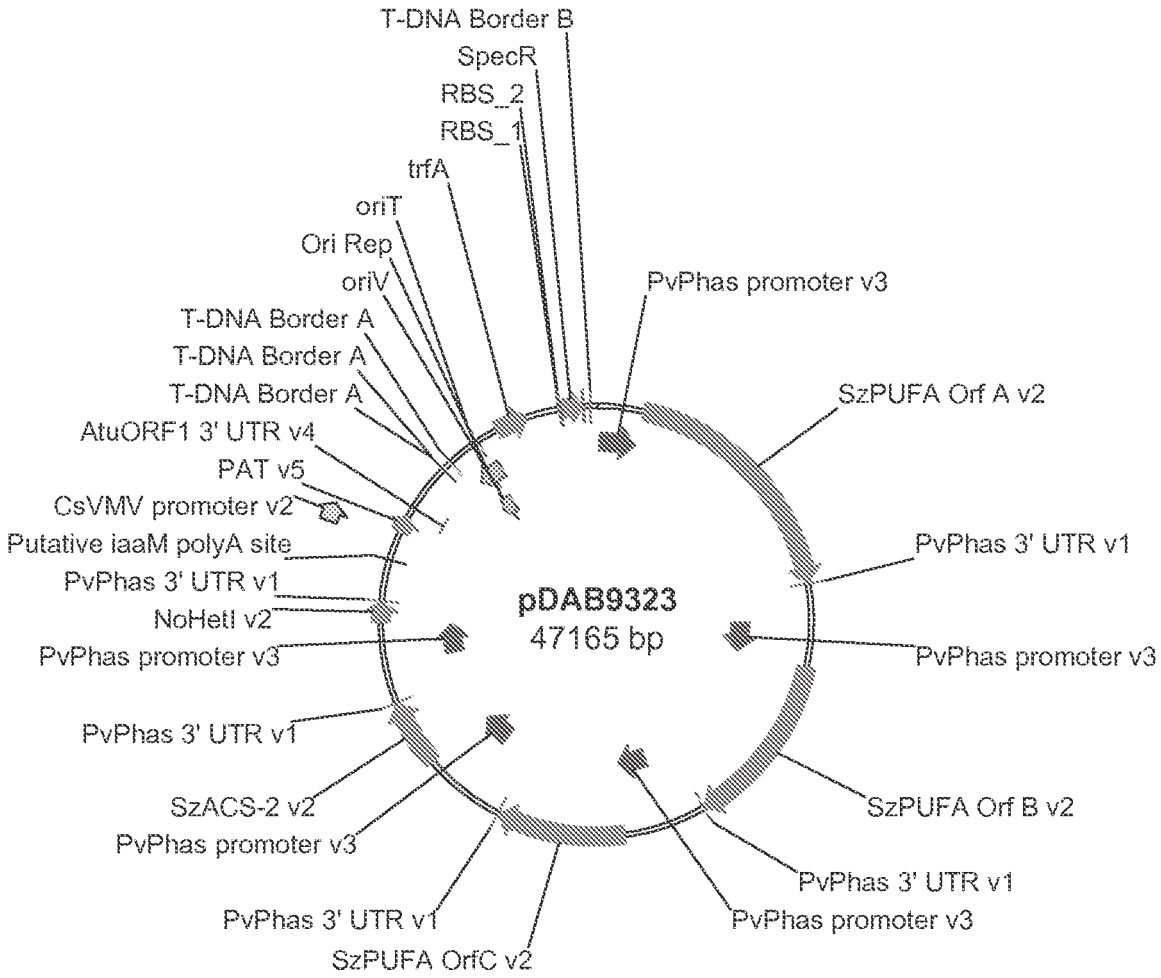

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
PvPhas 3' UTR v1
NoHetI v2
PvPhas promoter v3
PvPhas 3' UTR v1
SzACS-2 v2
PvPhas promoter v3
PvPhas 3' UTR v1
SzPUFA OrfC v2
PvPhas promoter v3
PvPhas 3' UTR v1
SzPUFA Orf B v2
PvPhas promoter v3
PvPhas 3' UTR v1
SzPUFA Orf A v2
PvPhas promoter v3
pDAB9323
47165 bp

FIG. 30

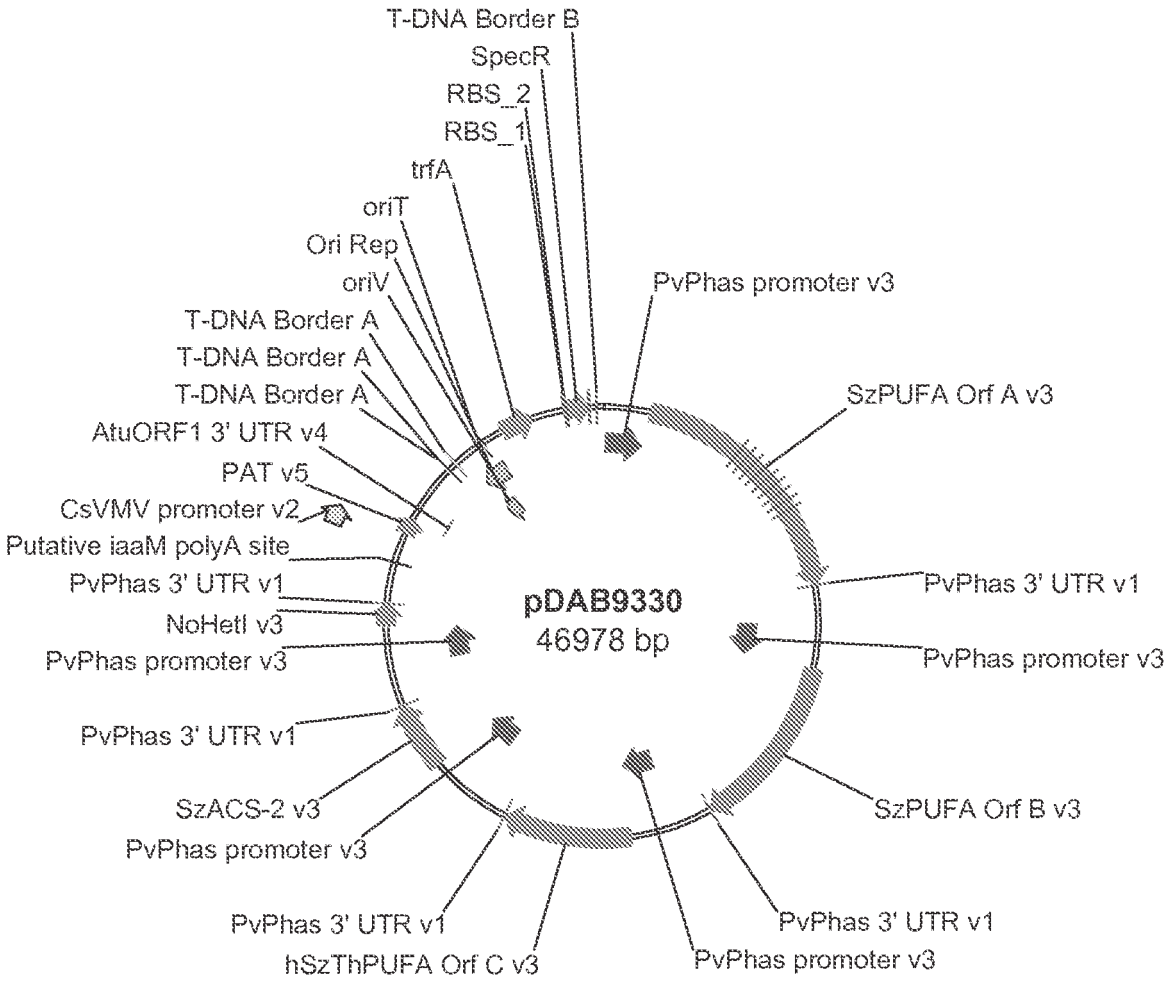

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
PvPhas 3' UTR v1
NoHetI v3
PvPhas promoter v3
PvPhas 3' UTR v1
SzACS-2 v3
PvPhas promoter v3
PvPhas 3' UTR v1
hSzThPUFA Orf C v3
PvPhas promoter v3
PvPhas 3' UTR v1
PvPhas promoter v3
SzPUFA Orf B v3
PvPhas 3' UTR v1
PvPhas promoter v3
SzPUFA Orf A v3
PvPhas promoter v3
pDAB9330
46978 bp

FIG. 31

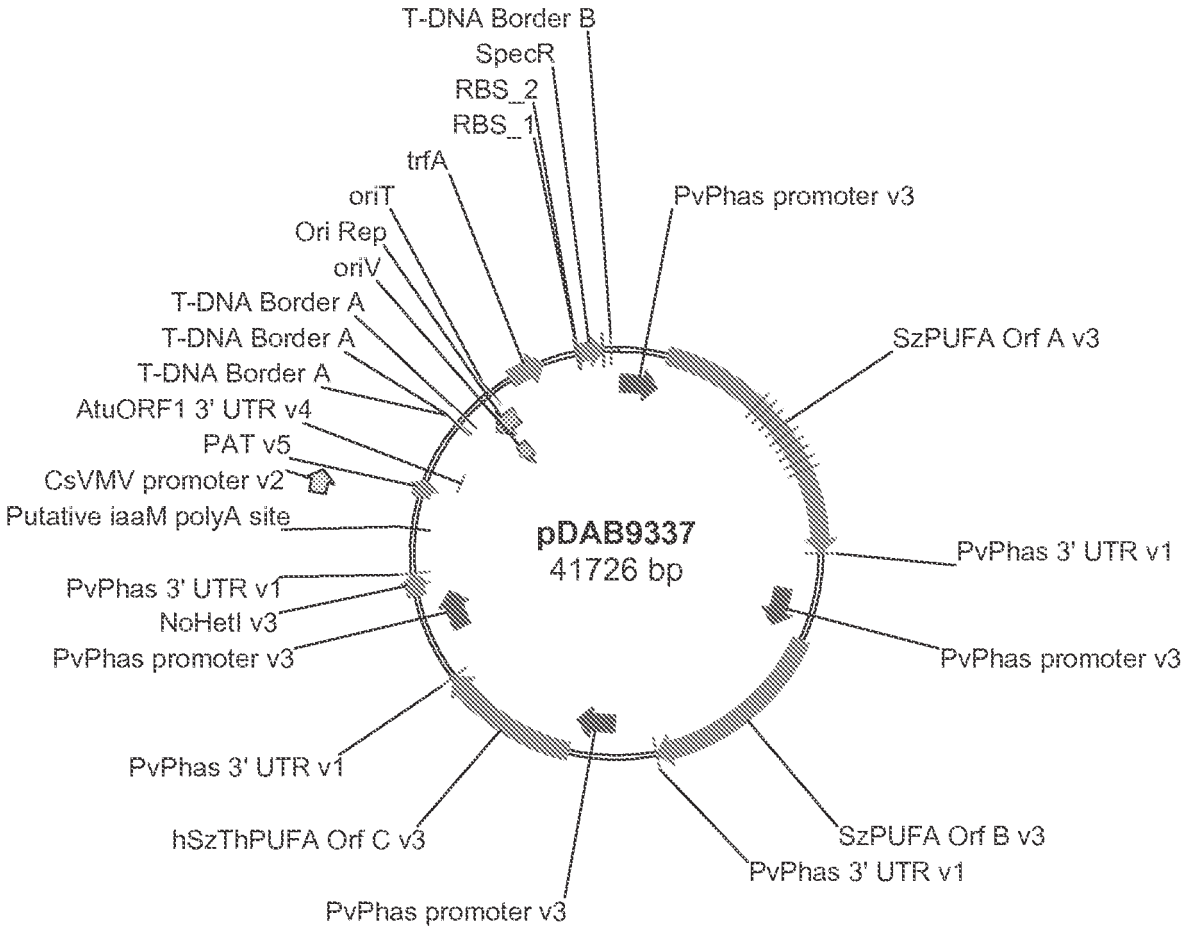

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
PvPhas 3' UTR v1
NoHetI v3
PvPhas promoter v3
PvPhas 3' UTR v1
hSzThPUFA Orf C v3
PvPhas promoter v3
PvPhas promoter v3
SzPUFA Orf A v3
PvPhas 3' UTR v1
PvPhas promoter v3
SzPUFA Orf B v3
PvPhas 3' UTR v1
pDAB9337
41726 bp

FIG. 32

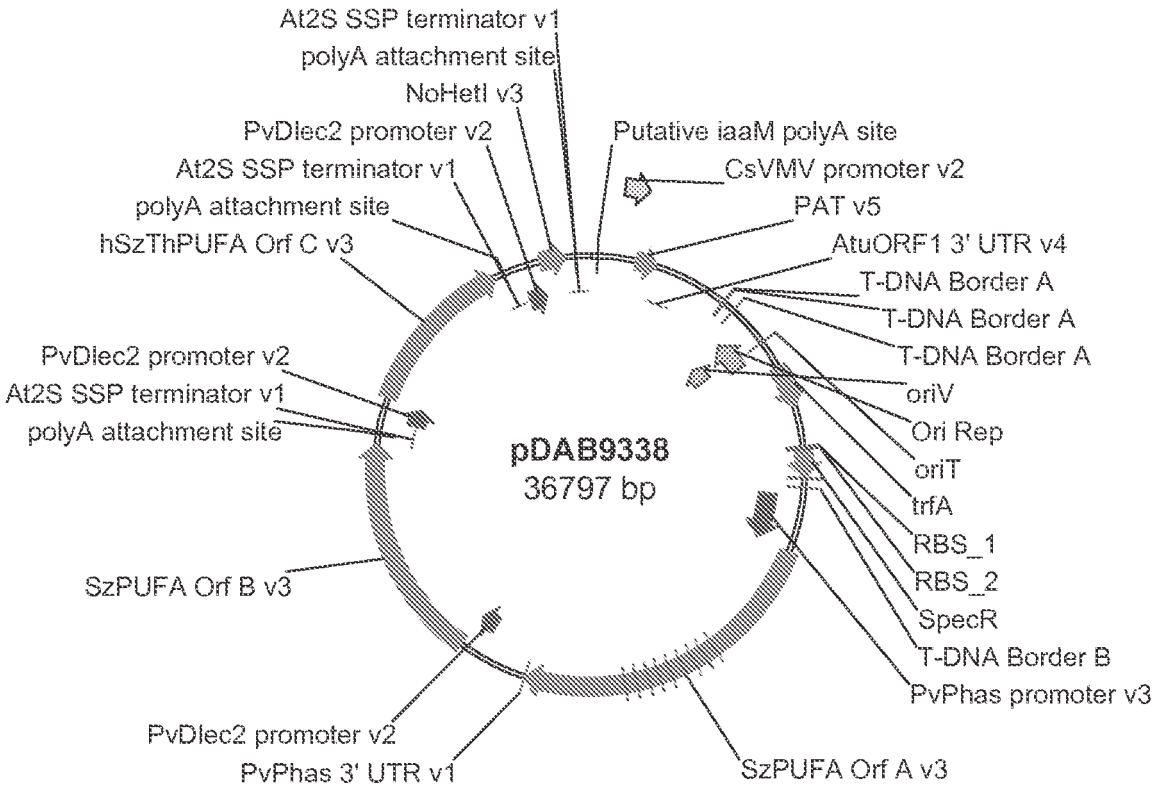

At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v3
PvDlec2 promoter v2
PvPhas 3' UTR v1
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvPhas promoter v3
SzPUFA Orf A v3
pDAB9338
36797 bp

FIG. 33

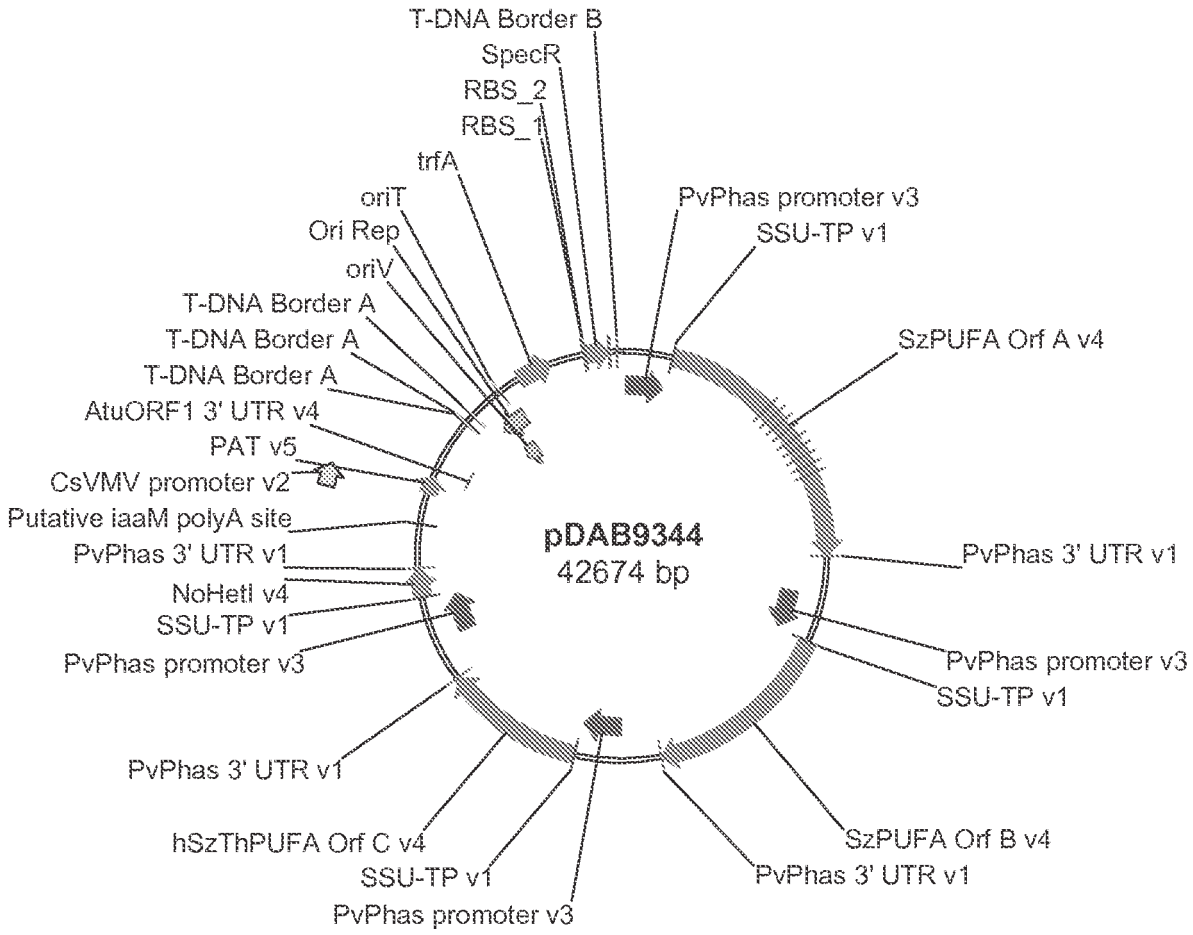

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
PvPhas 3' UTR v1
NoHetI v4
SSU-TP v1
PvPhas promoter v3
PvPhas 3' UTR v1
hSzThPUFA Orf C v4
SSU-TP v1
PvPhas promoter v3
PvPhas promoter v3
SSU-TP v1
SzPUFA Orf A v4
PvPhas 3' UTR v1
PvPhas promoter v3
SSU-TP v1
SzPUFA Orf B v4
PvPhas 3' UTR v1
pDAB9344
42674 bp

FIG. 34

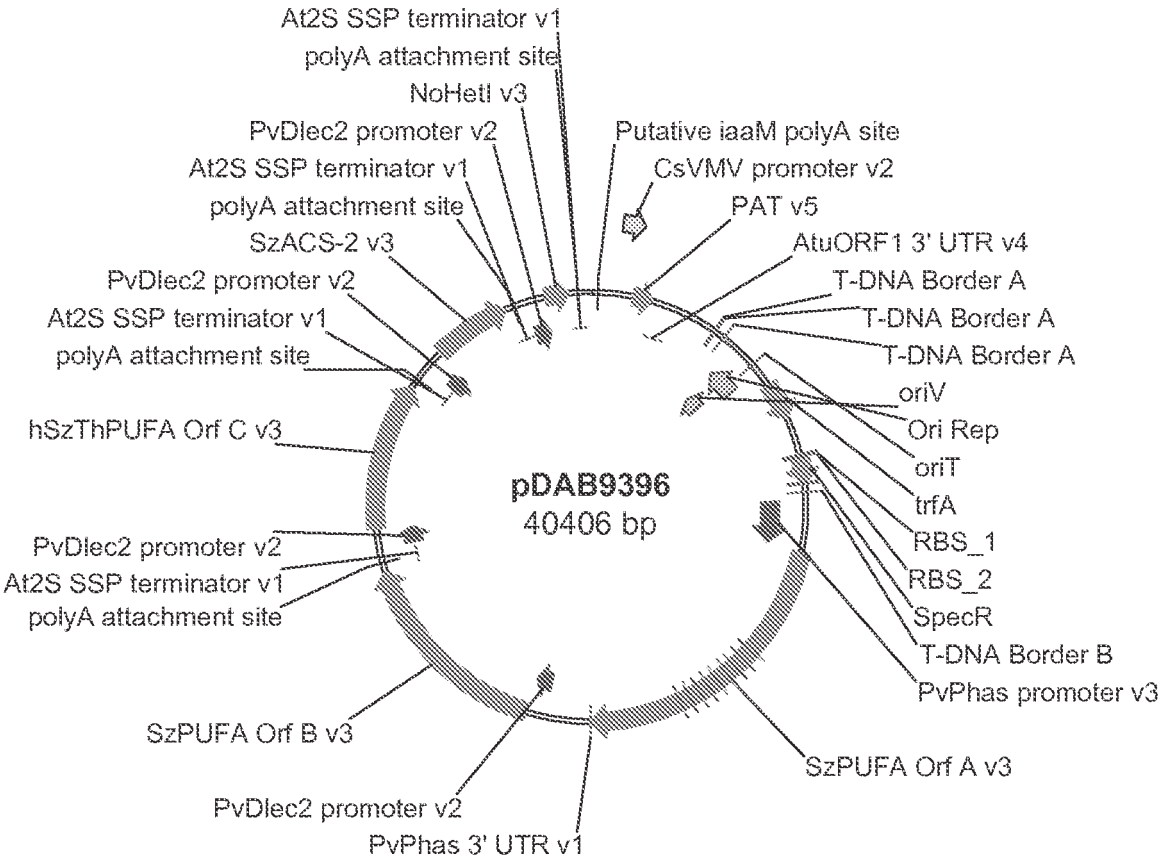

At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzACS-2 v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf B v3
PvDlec2 promoter v2
PvPhas 3' UTR v1
Putative iaaM polyA site
CsVMV promoter v2
PAT v5
AtuORF1 3' UTR v4
T-DNA Border A
T-DNA Border A
T-DNA Border A
oriV
Ori Rep
oriT
trfA
RBS_1
RBS_2
SpecR
T-DNA Border B
PvPhas promoter v3
SzPUFA Orf A v3
pDAB9396
40406 bp

FIG. 35

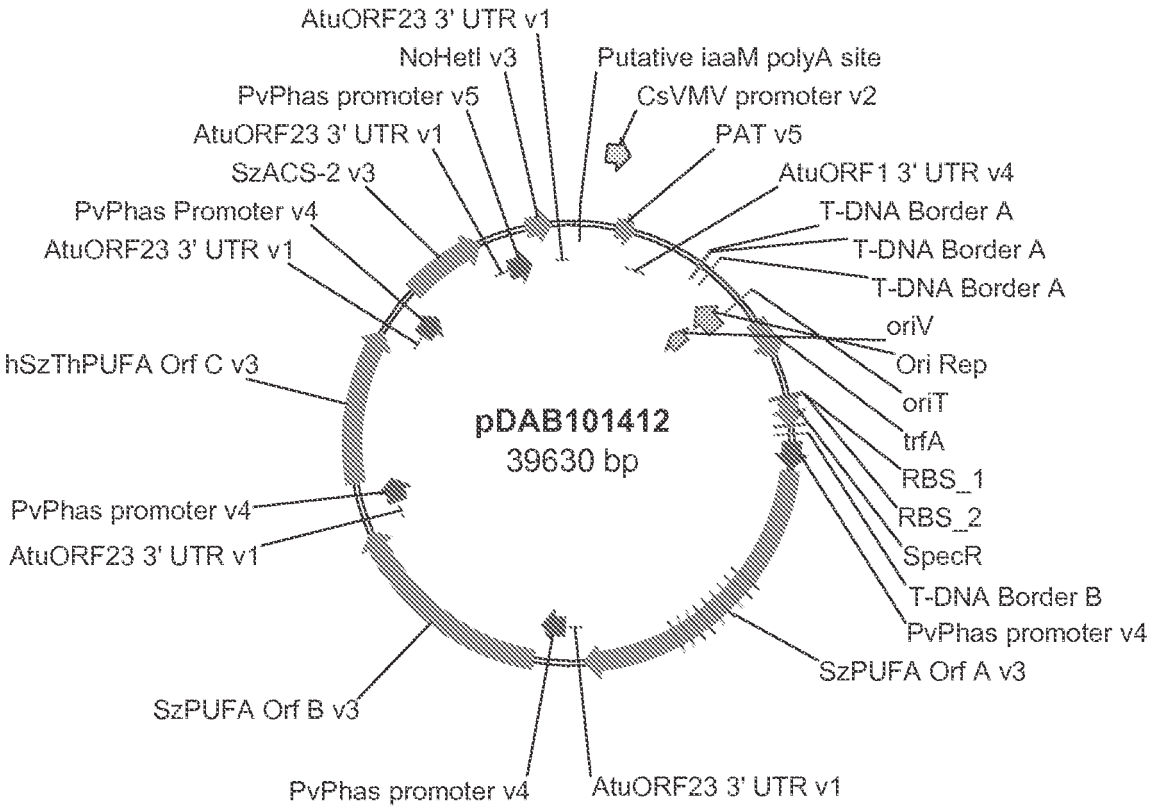

AtuORF23 3' UTR v1
NoHetI v3
Putative iaaM polyA site
PvPhas promoter v5
CsVMV promoter v2
AtuORF23 3' UTR v1
PAT v5
SzACS-2 v3
AtuORF1 3' UTR v4
PvPhas Promoter v4
T-DNA Border A
AtuORF23 3' UTR v1
T-DNA Border A
T-DNA Border A
oriV
hSzThPUFA Orf C v3
Ori Rep
oriT
pDAB101412
39630 bp
trfA
RBS_1
PvPhas promoter v4
RBS_2
AtuORF23 3' UTR v1
SpecR
T-DNA Border B
PvPhas promoter v4
SzPUFA Orf A v3
SzPUFA Orf B v3
PvPhas promoter v4
AtuORF23 3' UTR v1

FIG. 36

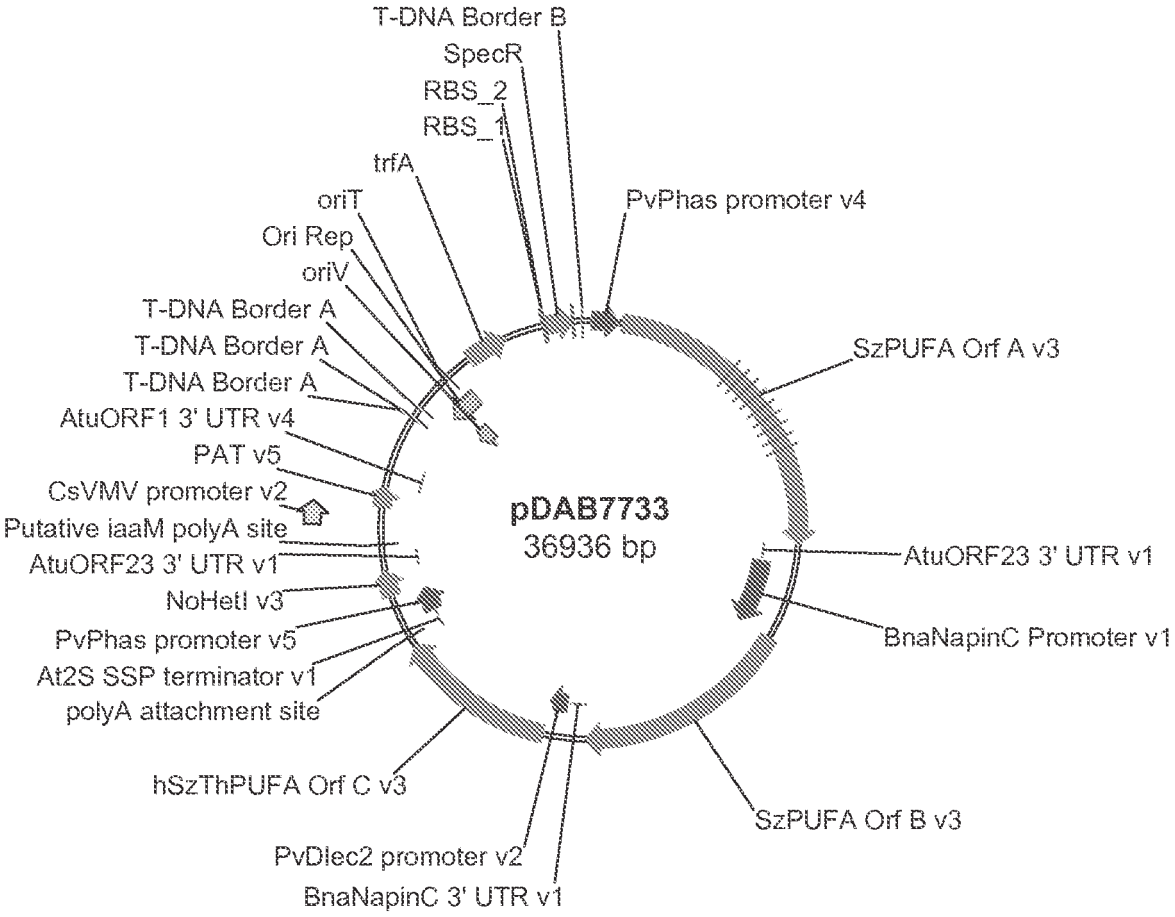

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
PvPhas promoter v5
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
BnaNapinC 3' UTR v1
SzPUFA Orf B v3
BnaNapinC Promoter v1
AtuORF23 3' UTR v1
SzPUFA Orf A v3
PvPhas promoter v4
pDAB7733
36936 bp

FIG. 37

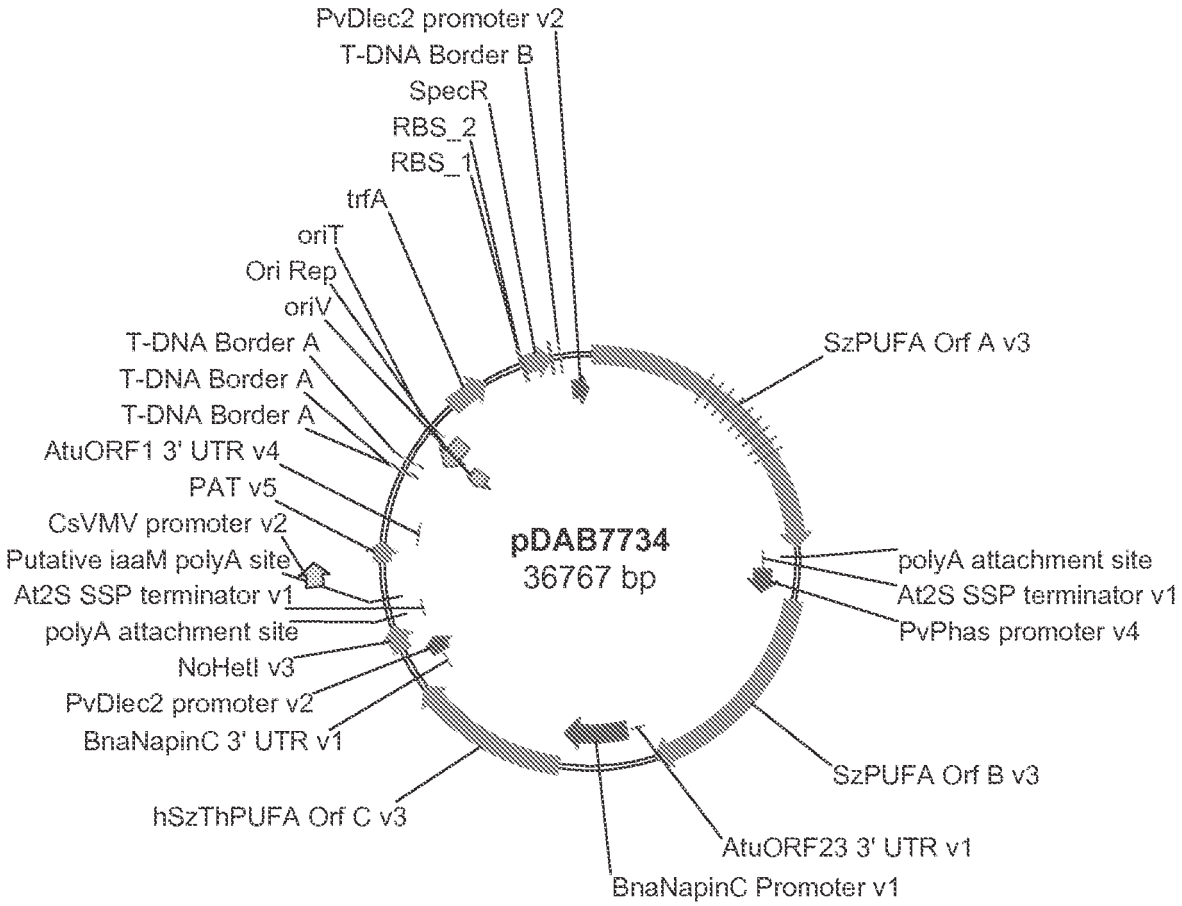

PvDlec2 promoter v2
T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
BnaNapinC 3' UTR v1
hSzThPUFA Orf C v3
SzPUFA Orf A v3
pDAB7734
36767 bp
polyA attachment site
At2S SSP terminator v1
PvPhas promoter v4
SzPUFA Orf B v3
AtuORF23 3' UTR v1
BnaNapinC Promoter v1

FIG. 38

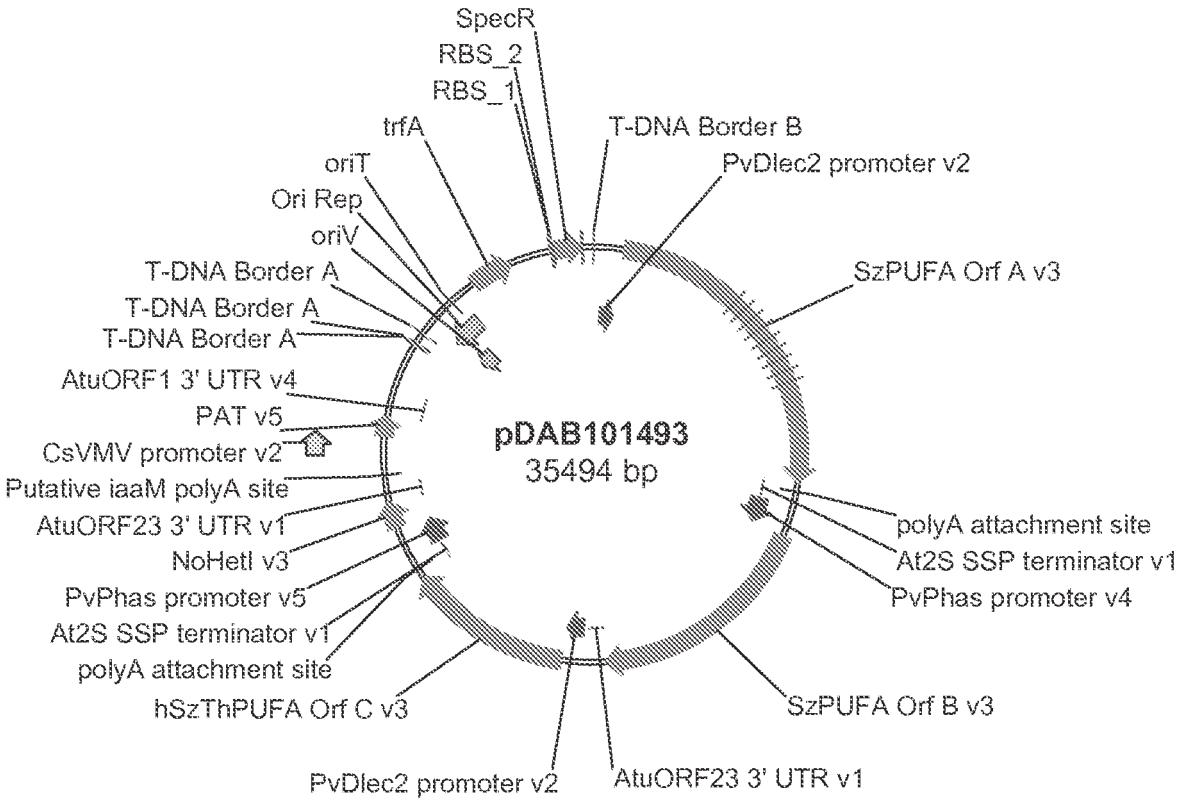

SpecR
RBS_2
RBS_1
trfA
T-DNA Border B
PvDlec2 promoter v2
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
SzPUFA Orf A v3
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
PvPhas promoter v5
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
pDAB101493
35494 bp
polyA attachment site
At2S SSP terminator v1
PvPhas promoter v4
SzPUFA Orf B v3
PvDlec2 promoter v2
AtuORF23 3' UTR v1

FIG. 39

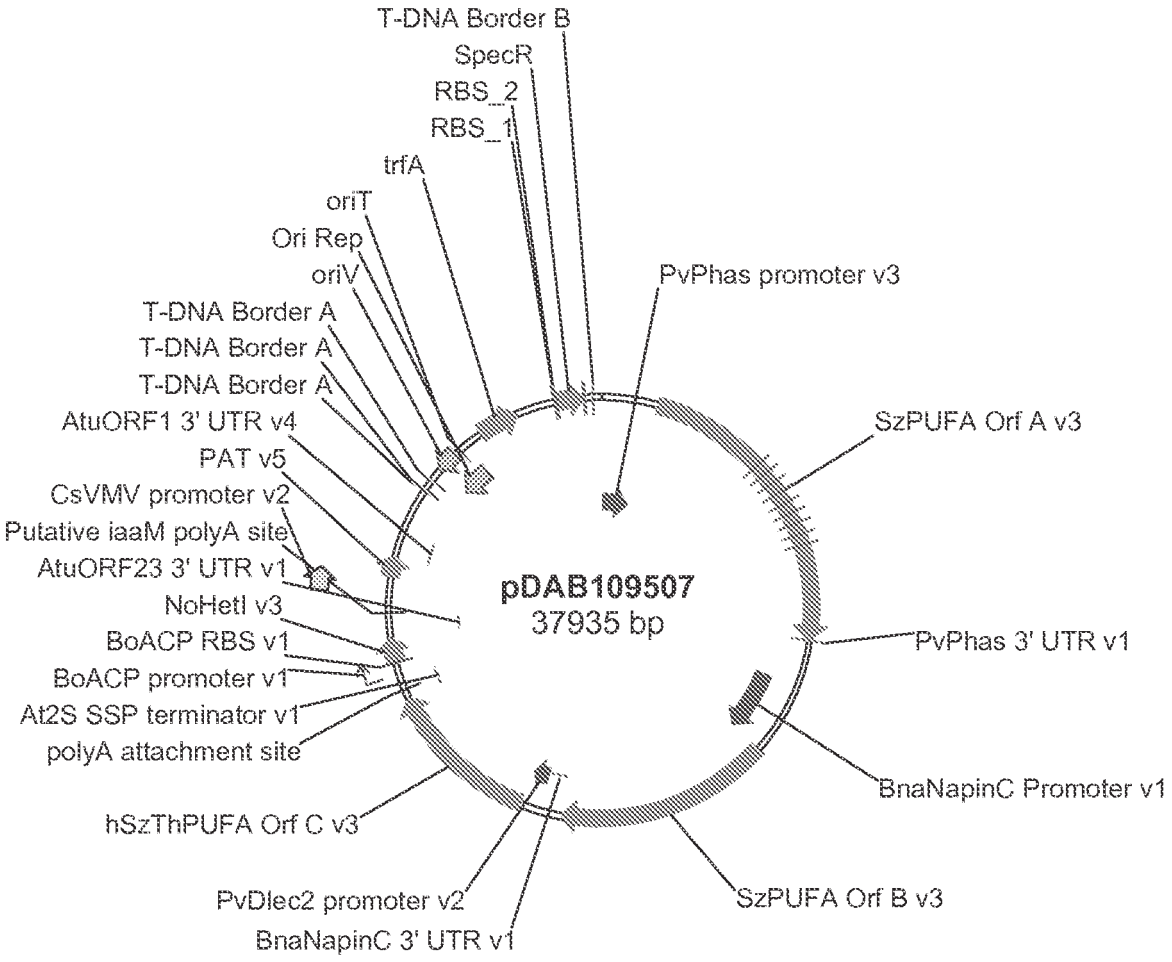

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
BoACP RBS v1
BoACP promoter v1
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
BnaNapinC 3' UTR v1
PvPhas promoter v3
SzPUFA Orf A v3
PvPhas 3' UTR v1
BnaNapinC Promoter v1
SzPUFA Orf B v3
pDAB109507
37935 bp

FIG. 40

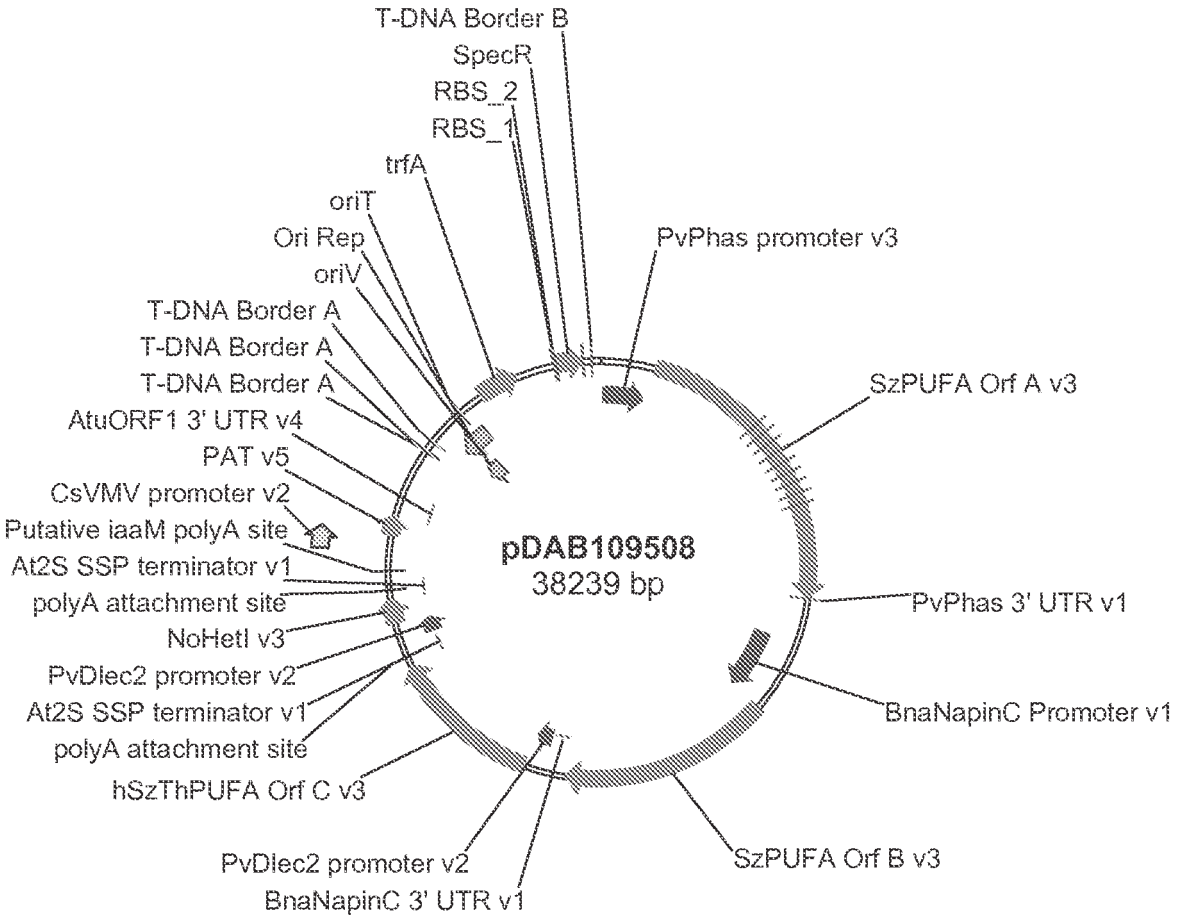

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
BnaNapinC 3' UTR v1
PvPhas promoter v3
SzPUFA Orf A v3
PvPhas 3' UTR v1
BnaNapinC Promoter v1
SzPUFA Orf B v3
pDAB109508
38239 bp

FIG. 41

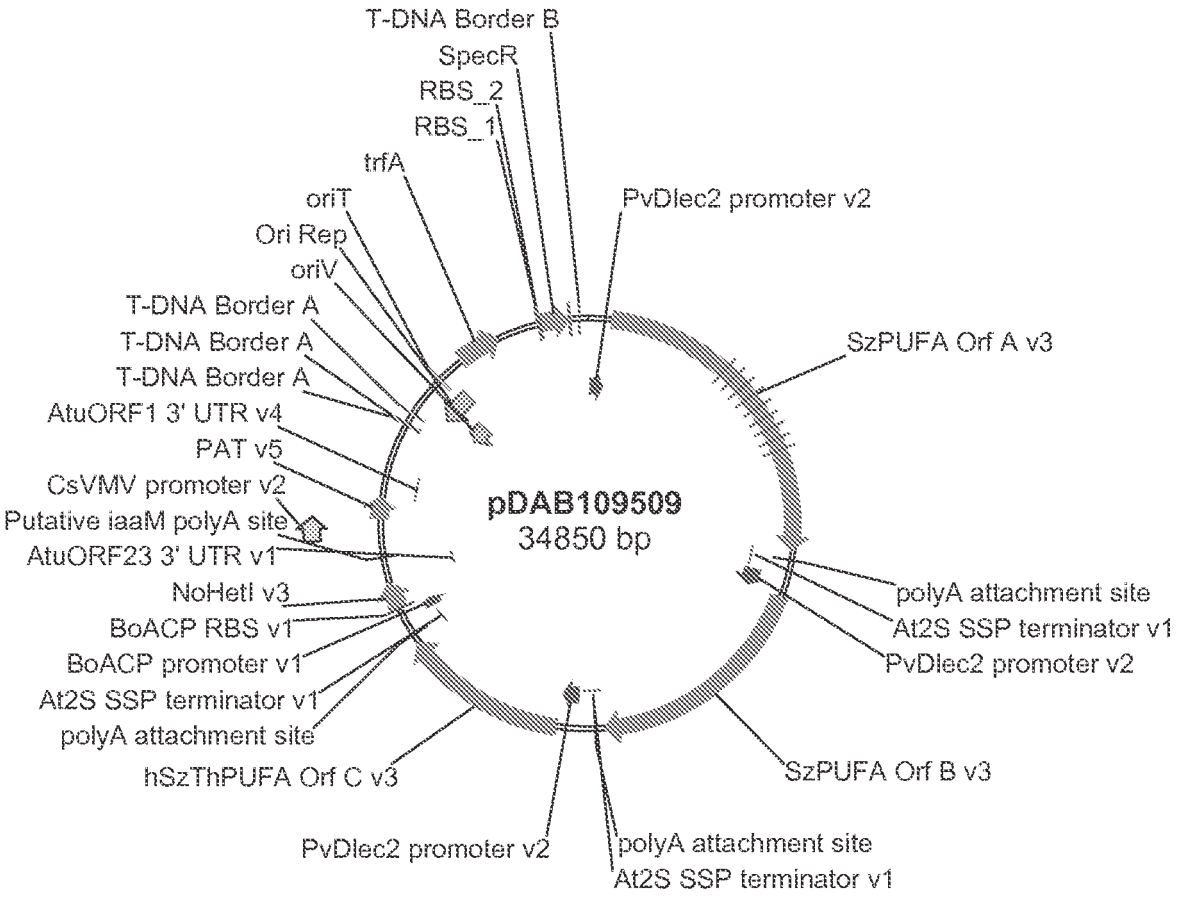

T-DNA Border B
SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
BoACP RBS v1
BoACP promoter v1
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
polyA attachment site
At2S SSP terminator v1
SzPUFA Orf B v3
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2
SzPUFA Orf A v3
PvDlec2 promoter v2
pDAB109509
34850 bp

FIG. 42

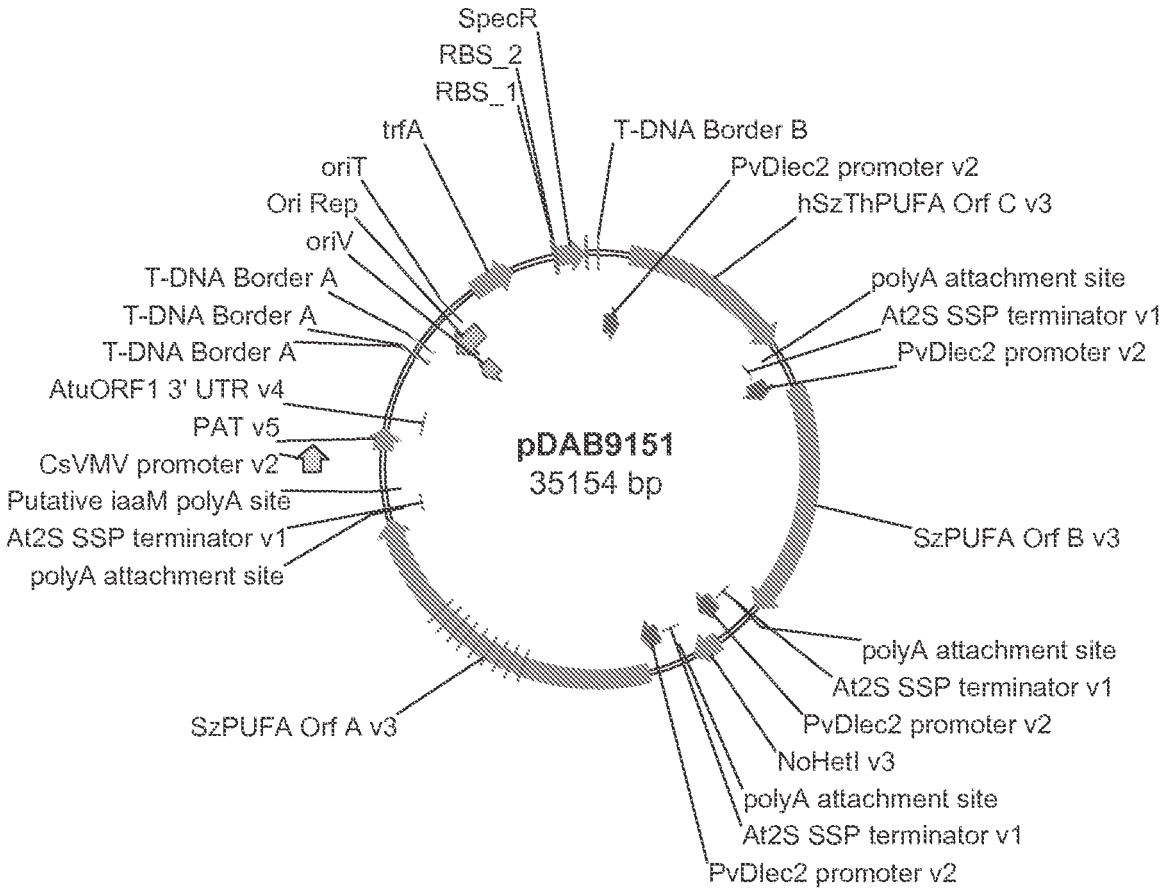

SpecR
RBS_2
RBS_1
trfA
T-DNA Border B
oriT
PvDlec2 promoter v2
Ori Rep
hSzThPUFA Orf C v3
oriV
polyA attachment site
T-DNA Border A
At2S SSP terminator v1
T-DNA Border A
PvDlec2 promoter v2
T-DNA Border A
AtuORF1 3' UTR v4
pDAB9151
35154 bp
PAT v5
CsVMV promoter v2
SzPUFA Orf B v3
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2
SzPUFA Orf A v3
NoHetI v3
polyA attachment site
At2S SSP terminator v1
PvDlec2 promoter v2

FIG. 43

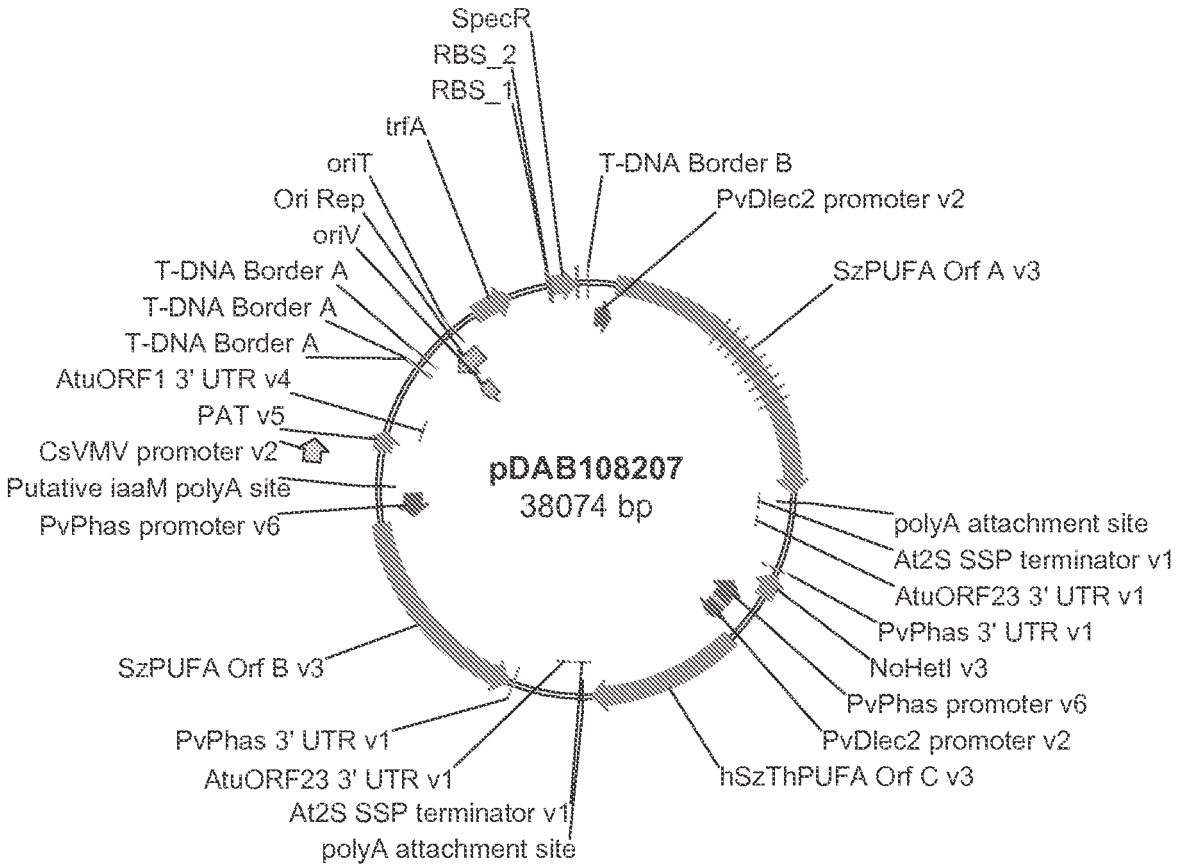

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
PvPhas promoter v6
SzPUFA Orf B v3
PvPhas 3' UTR v1
AtuORF23 3' UTR v1
At2S SSP terminator v1
polyA attachment site
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v3
polyA attachment site
At2S SSP terminator v1
AtuORF23 3' UTR v1
PvPhas 3' UTR v1
NoHetI v3
PvPhas promoter v6
PvDlec2 promoter v2
hSzThPUFA Orf C v3
pDAB108207
38074 bp

FIG. 44

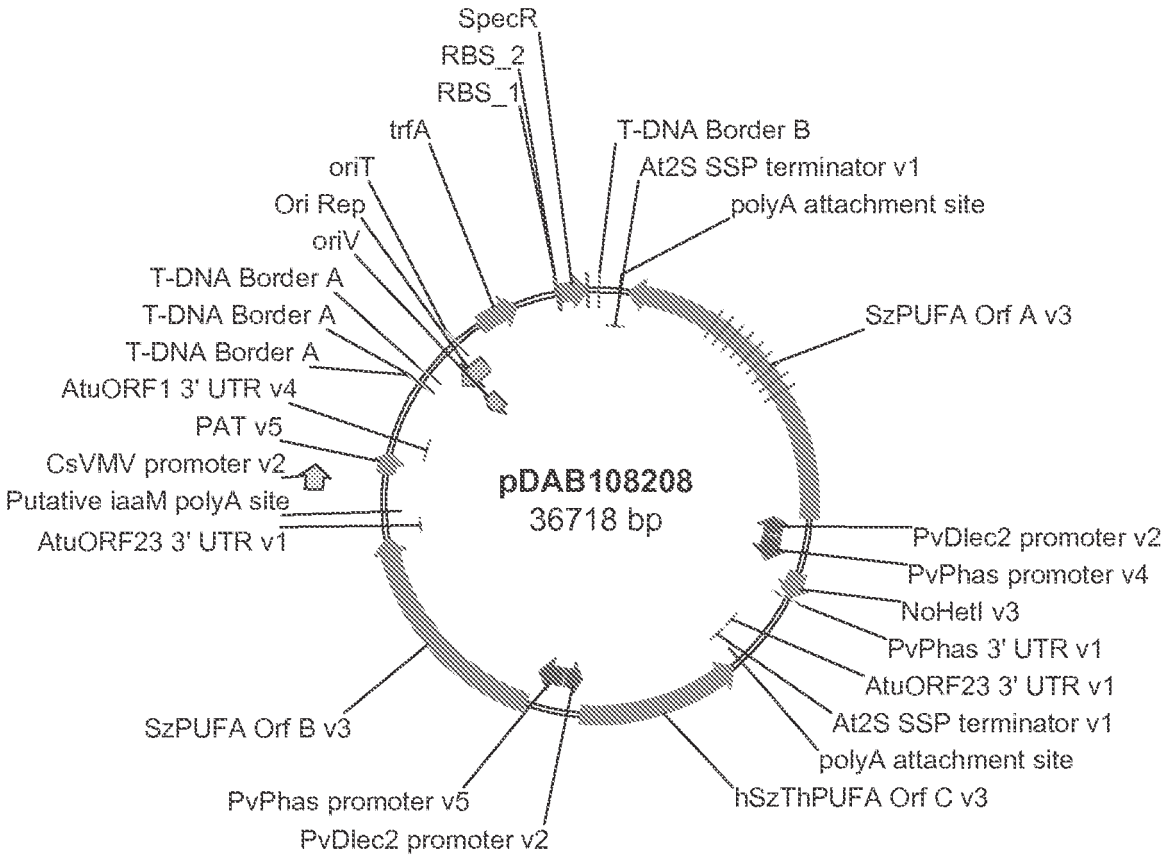

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
T-DNA Border B
At2S SSP terminator v1
polyA attachment site
SzPUFA Orf A v3
pDAB108208
36718 bp
PvDlec2 promoter v2
PvPhas promoter v4
NoHetI v3
PvPhas 3' UTR v1
AtuORF23 3' UTR v1
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
SzPUFA Orf B v3
PvPhas promoter v5
PvDlec2 promoter v2

FIG. 45

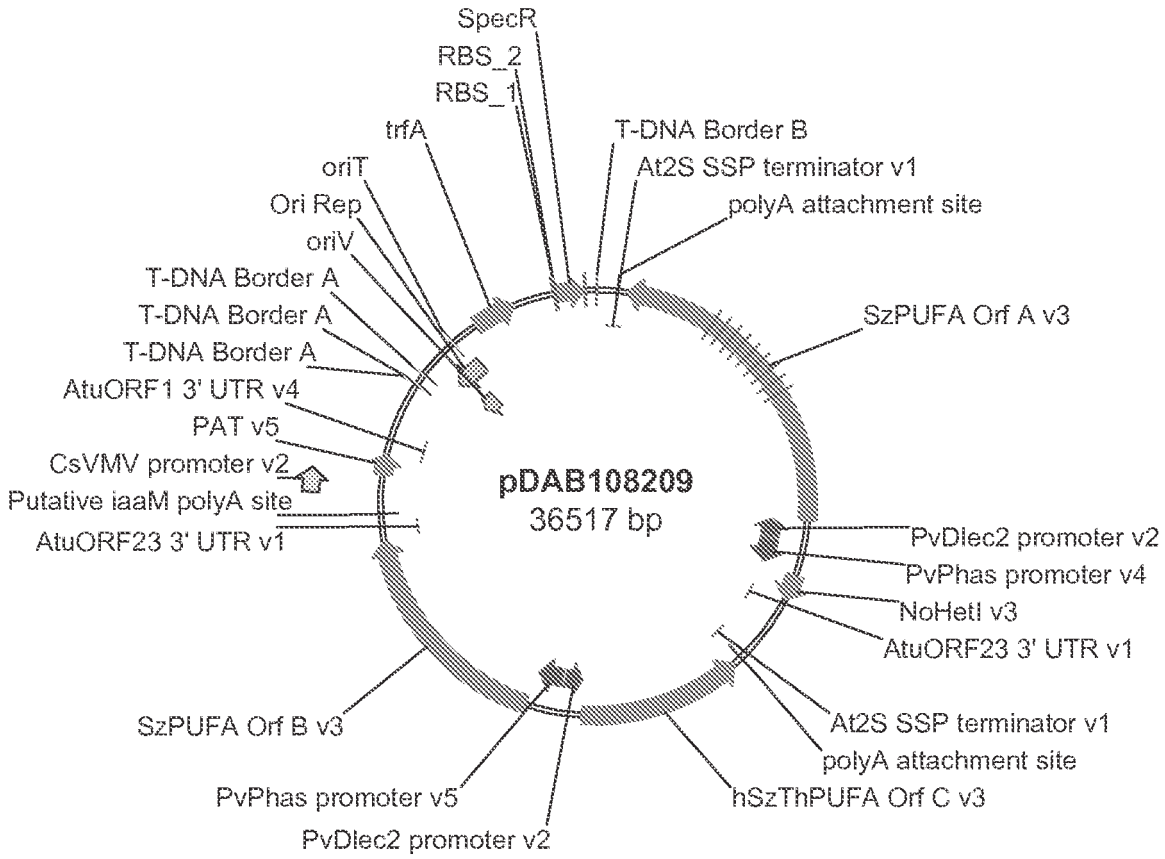

SpecR
RBS_2
RBS_1
trfA
T-DNA Border B
At2S SSP terminator v1
polyA attachment site
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
SzPUFA Orf A v3
pDAB108209
36517 bp
PvDlec2 promoter v2
PvPhas promoter v4
NoHetI v3
AtuORF23 3' UTR v1
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
SzPUFA Orf B v3
PvPhas promoter v5
PvDlec2 promoter v2

FIG. 46

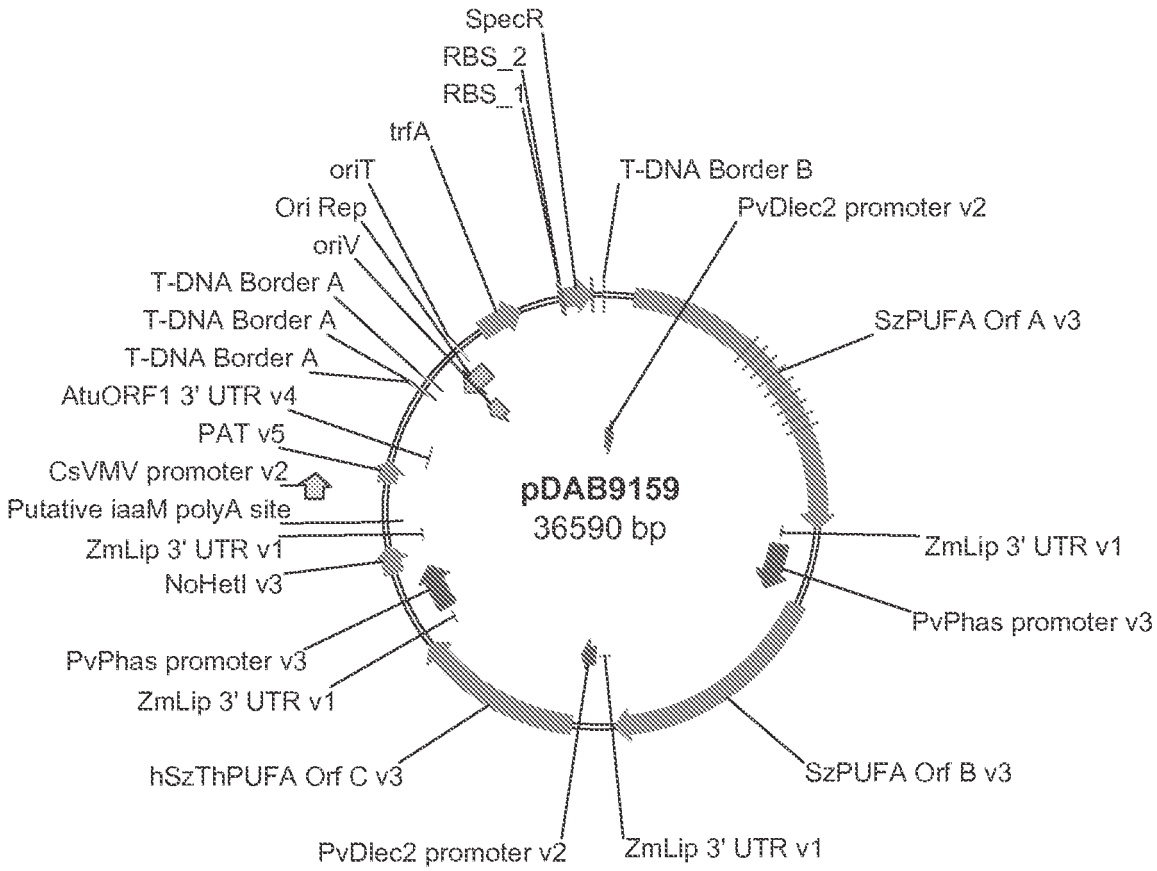

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
ZmLip 3' UTR v1
NoHetI v3
PvPhas promoter v3
ZmLip 3' UTR v1
hSzThPUFA Orf C v3
PvDlec2 promoter v2
ZmLip 3' UTR v1
SzPUFA Orf B v3
PvPhas promoter v3
ZmLip 3' UTR v1
pDAB9159
36590 bp
T-DNA Border B
PvDlec2 promoter v2
SzPUFA Orf A v3

FIG. 47

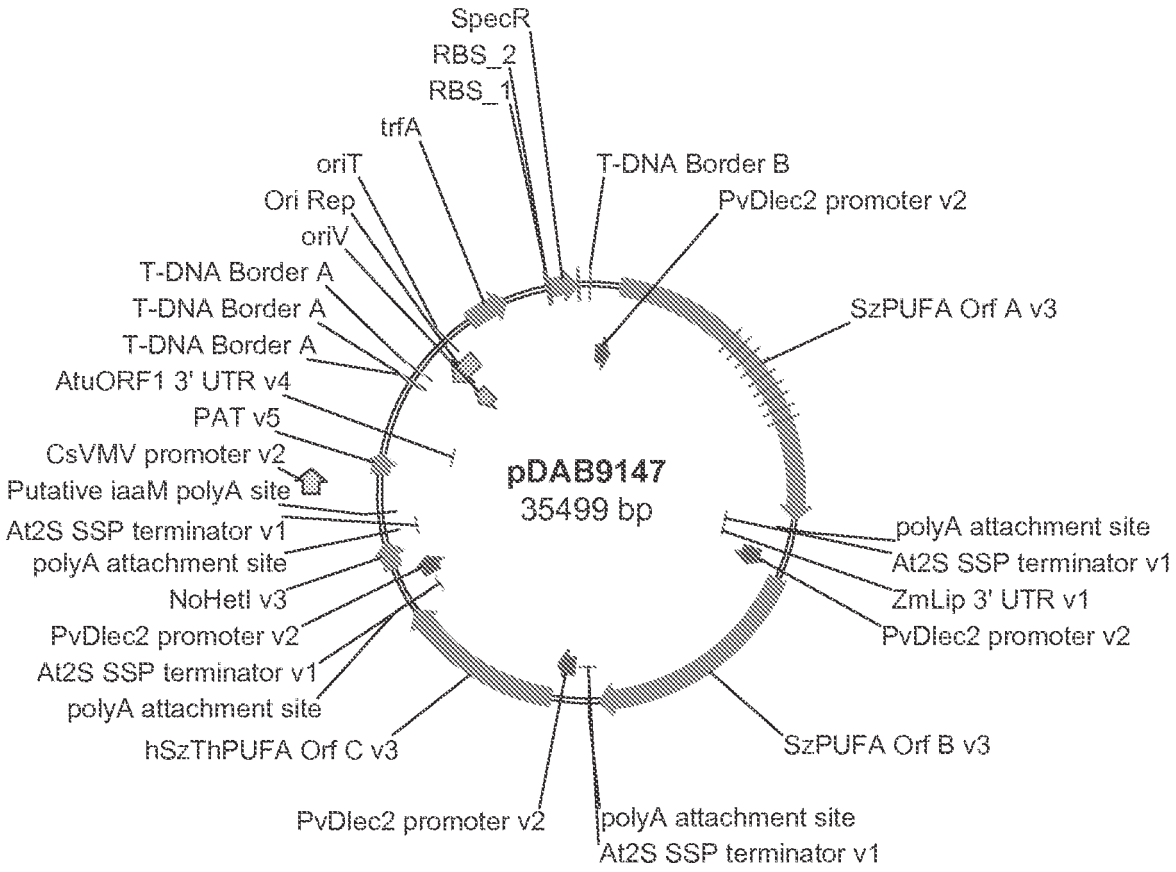

SpecR
RBS_2
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
At2S SSP terminator v1
polyA attachment site
NoHetI v3
PvDlec2 promoter v2
At2S SSP terminator v1
polyA attachment site
hSzThPUFA Orf C v3
PvDlec2 promoter v2
polyA attachment site
At2S SSP terminator v1
SzPUFA Orf B v3
polyA attachment site
At2S SSP terminator v1
ZmLip 3' UTR v1
PvDlec2 promoter v2
SzPUFA Orf A v3
T-DNA Border B
PvDlec2 promoter v2
pDAB9147
35499 bp

FIG. 48

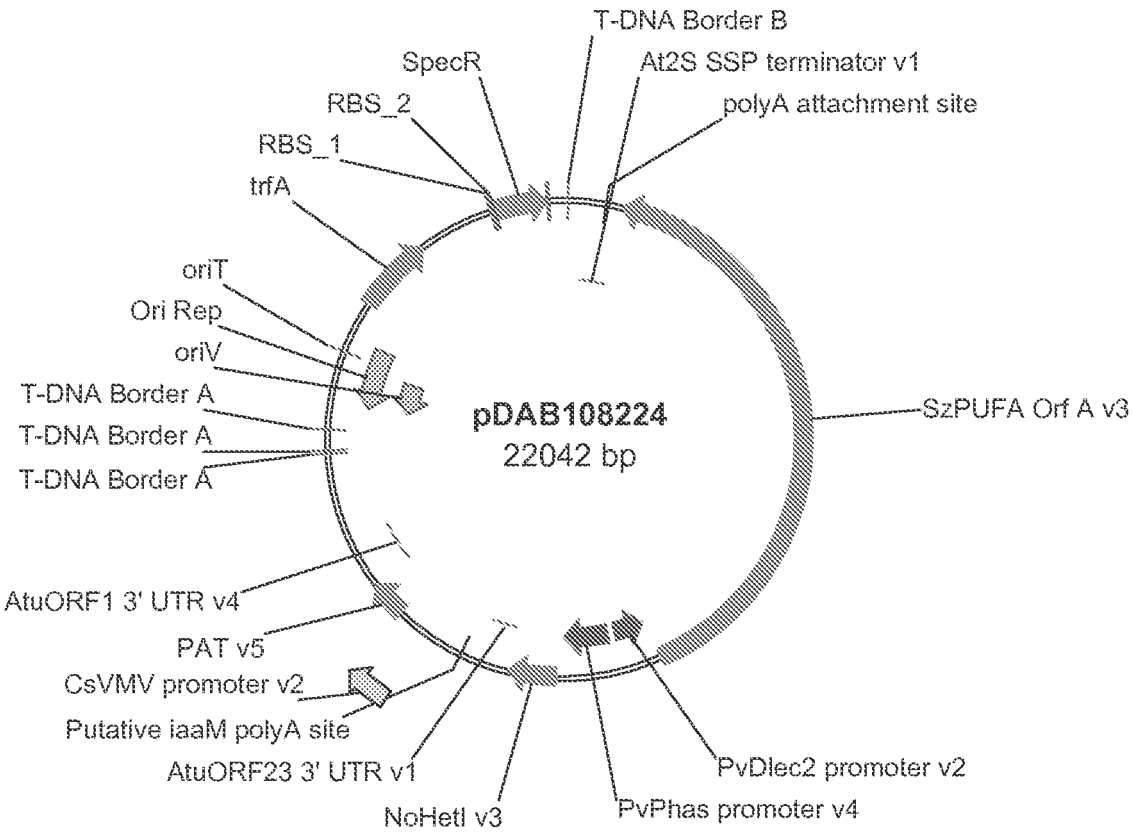

T-DNA Border B
SpecR
At2S SSP terminator v1
RBS_2
polyA attachment site
RBS_1
trfA
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
pDAB108224
22042 bp
SzPUFA Orf A v3
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
NoHetI v3
PvPhas promoter v4
PvDlec2 promoter v2

FIG. 49

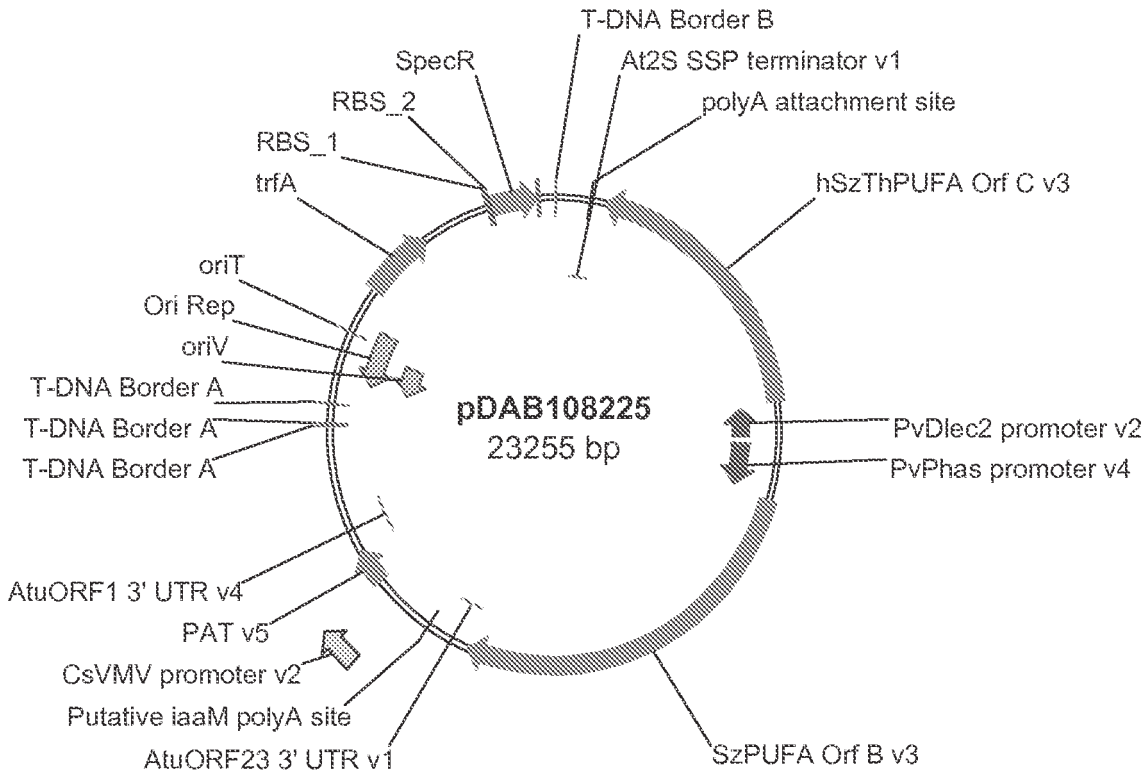

T-DNA Border B
SpecR
At2S SSP terminator v1
RBS_2
polyA attachment site
RBS_1
trfA
hSzThPUFA Orf C v3
oriT
Ori Rep
oriV
T-DNA Border A
T-DNA Border A
T-DNA Border A
pDAB108225
23255 bp
PvDlec2 promoter v2
PvPhas promoter v4
AtuORF1 3' UTR v4
PAT v5
CsVMV promoter v2
Putative iaaM polyA site
AtuORF23 3' UTR v1
SzPUFA Orf B v3

FIG. 50

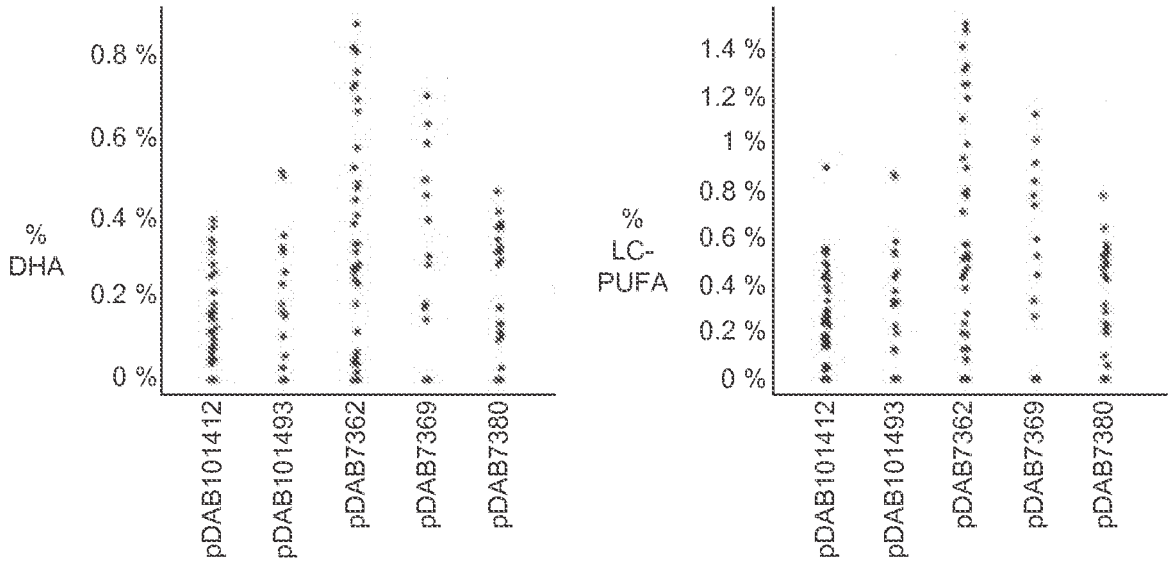

% DHA
0.8 %
0.6 %
0.4 %
0.2 %
0 %
pDAB101412
pDAB101493
pDAB7362
pDAB7369
pDAB7380
% LC-PUFA
1.4 %
1.2 %
1 %
0.8 %
0.6 %
0.4 %
0.2 %
0 %
pDAB101412
pDAB101493
pDAB7362
pDAB7369
pDAB7380

FIG. 51

SEQUENCE LISTING

<110> Dow AgroSciences LLC
Martek Biosciences Corporation

<120> Production of DHA and Other LC-PUFAs in Plants

<130> 2715.146PC01

<140> To be assigned
<141> Herewith

<150> 61/345,537
<151> 2010-05-17

<160> 78

<170> PatentIn version 3.5

<210> 1
<211> 2910
<212> PRT
<213> Schizochytrium sp. ATCC_20888

<220>
<223> SzPUFA OrfA v3 protein

<300>
<308> GenBank: AF378327
<309> 2007-10-22

<400> 1

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Met Ala Ala Arg Leu Gln Glu Gln Lys Gly Gly Glu Met Asp Thr Arg
1               5                  10                  15

Ile Ala Ile Ile Gly Met Ser Ala Ile Leu Pro Cys Gly Thr Thr Val
            20                  25                  30

Arg Glu Ser Trp Glu Thr Ile Arg Ala Gly Ile Asp Cys Leu Ser Asp
        35                  40                  45

Leu Pro Glu Asp Arg Val Asp Val Thr Ala Tyr Phe Asp Pro Val Lys
    50                  55                  60

Thr Thr Lys Asp Lys Ile Tyr Cys Lys Arg Gly Gly Phe Ile Pro Glu
65                  70                  75                  80

Tyr Asp Phe Asp Ala Arg Glu Phe Gly Leu Asn Met Phe Gln Met Glu
                85                  90                  95

Asp Ser Asp Ala Asn Gln Thr Ile Ser Leu Leu Lys Val Lys Glu Ala
            100                 105                 110

Leu Gln Asp Ala Gly Ile Asp Ala Leu Gly Lys Glu Lys Lys Asn Ile
        115                 120                 125

Gly Cys Val Leu Gly Ile Gly Gly Gly Gln Lys Ser Ser His Glu Phe
    130                 135                 140
```

```
Tyr Ser Arg Leu Asn Tyr Val Val Val Glu Lys Val Leu Arg Lys Met
145                 150                 155                 160

Gly Met Pro Glu Glu Asp Val Lys Val Ala Val Glu Lys Tyr Lys Ala
                165                 170                 175

Asn Phe Pro Glu Trp Arg Leu Asp Ser Phe Pro Gly Phe Leu Gly Asn
            180                 185                 190

Val Thr Ala Gly Arg Cys Thr Asn Thr Phe Asn Leu Asp Gly Met Asn
        195                 200                 205

Cys Val Val Asp Ala Ala Cys Ala Ser Ser Leu Ile Ala Val Lys Val
    210                 215                 220

Ala Ile Asp Glu Leu Leu Tyr Gly Asp Cys Asp Met Met Val Thr Gly
225                 230                 235                 240

Ala Thr Cys Thr Asp Asn Ser Ile Gly Met Tyr Met Ala Phe Ser Lys
                245                 250                 255

Thr Pro Val Phe Ser Thr Asp Pro Ser Val Arg Ala Tyr Asp Glu Lys
            260                 265                 270

Thr Lys Gly Met Leu Ile Gly Glu Gly Ser Ala Met Leu Val Leu Lys
        275                 280                 285

Arg Tyr Ala Asp Ala Val Arg Asp Gly Asp Glu Ile His Ala Val Ile
    290                 295                 300

Arg Gly Cys Ala Ser Ser Ser Asp Gly Lys Ala Ala Gly Ile Tyr Thr
305                 310                 315                 320

Pro Thr Ile Ser Gly Gln Glu Glu Ala Leu Arg Arg Ala Tyr Asn Arg
                325                 330                 335

Ala Cys Val Asp Pro Ala Thr Val Thr Leu Val Glu Gly His Gly Thr
            340                 345                 350

Gly Thr Pro Val Gly Asp Arg Ile Glu Leu Thr Ala Leu Arg Asn Leu
        355                 360                 365

Phe Asp Lys Ala Tyr Gly Glu Gly Asn Thr Glu Lys Val Ala Val Gly
    370                 375                 380

Ser Ile Lys Ser Ser Ile Gly His Leu Lys Ala Val Ala Gly Leu Ala
385                 390                 395                 400

Gly Met Ile Lys Val Ile Met Ala Leu Lys His Lys Thr Leu Pro Gly
                405                 410                 415
```

```
Thr Ile Asn Val Asp Asn Pro Pro Asn Leu Tyr Asp Asn Thr Pro Ile
            420                 425                 430

Asn Glu Ser Ser Leu Tyr Ile Asn Thr Met Asn Arg Pro Trp Phe Pro
        435                 440                 445

Pro Pro Gly Val Pro Arg Arg Ala Gly Ile Ser Ser Phe Gly Phe Gly
    450                 455                 460

Gly Ala Asn Tyr His Ala Val Leu Glu Glu Ala Glu Pro Glu His Thr
465                 470                 475                 480

Thr Ala Tyr Arg Leu Asn Lys Arg Pro Gln Pro Val Leu Met Met Ala
                485                 490                 495

Ala Thr Pro Ala Ala Leu Gln Ser Leu Cys Glu Ala Gln Leu Lys Glu
            500                 505                 510

Phe Glu Ala Ala Ile Lys Glu Asn Glu Thr Val Lys Asn Thr Ala Tyr
        515                 520                 525

Ile Lys Cys Val Lys Phe Gly Glu Gln Phe Lys Phe Pro Gly Ser Ile
    530                 535                 540

Pro Ala Thr Asn Ala Arg Leu Gly Phe Leu Val Lys Asp Ala Glu Asp
545                 550                 555                 560

Ala Cys Ser Thr Leu Arg Ala Ile Cys Ala Gln Phe Ala Lys Asp Val
                565                 570                 575

Thr Lys Glu Ala Trp Arg Leu Pro Arg Glu Gly Val Ser Phe Arg Ala
            580                 585                 590

Lys Gly Ile Ala Thr Asn Gly Ala Val Ala Ala Leu Phe Ser Gly Gln
        595                 600                 605

Gly Ala Gln Tyr Thr His Met Phe Ser Glu Val Ala Met Asn Trp Pro
    610                 615                 620

Gln Phe Arg Gln Ser Ile Ala Ala Met Asp Ala Ala Gln Ser Lys Val
625                 630                 635                 640

Ala Gly Ser Asp Lys Asp Phe Glu Arg Val Ser Gln Val Leu Tyr Pro
                645                 650                 655

Arg Lys Pro Tyr Glu Arg Glu Pro Glu Gln Asp His Lys Lys Ile Ser
            660                 665                 670

Leu Thr Ala Tyr Ser Gln Pro Ser Thr Leu Ala Cys Ala Leu Gly Ala
        675                 680                 685
```

```
Phe Glu Ile Phe Lys Glu Ala Gly Phe Thr Pro Asp Phe Ala Ala Gly
    690                 695                 700

His Ser Leu Gly Glu Phe Ala Ala Leu Tyr Ala Ala Gly Cys Val Asp
705                 710                 715                 720

Arg Asp Glu Leu Phe Glu Leu Val Cys Arg Arg Ala Arg Ile Met Gly
                725                 730                 735

Gly Lys Asp Ala Pro Ala Thr Pro Lys Gly Cys Met Ala Ala Val Ile
            740                 745                 750

Gly Pro Asn Ala Glu Asn Ile Lys Val Gln Ala Ala Asn Val Trp Leu
        755                 760                 765

Gly Asn Ser Asn Ser Pro Ser Gln Thr Val Ile Thr Gly Ser Val Glu
    770                 775                 780

Gly Ile Gln Ala Glu Ser Ala Arg Leu Gln Lys Glu Gly Phe Arg Val
785                 790                 795                 800

Val Pro Leu Ala Cys Glu Ser Ala Phe His Ser Pro Gln Met Glu Asn
                805                 810                 815

Ala Ser Ser Ala Phe Lys Asp Val Ile Ser Lys Val Ser Phe Arg Thr
            820                 825                 830

Pro Lys Ala Glu Thr Lys Leu Phe Ser Asn Val Ser Gly Glu Thr Tyr
        835                 840                 845

Pro Thr Asp Ala Arg Glu Met Leu Thr Gln His Met Thr Ser Ser Val
    850                 855                 860

Lys Phe Leu Thr Gln Val Arg Asn Met His Gln Ala Gly Ala Arg Ile
865                 870                 875                 880

Phe Val Glu Phe Gly Pro Lys Gln Val Leu Ser Lys Leu Val Ser Glu
                885                 890                 895

Thr Leu Lys Asp Asp Pro Ser Val Val Thr Val Ser Val Asn Pro Ala
            900                 905                 910

Ser Gly Thr Asp Ser Asp Ile Gln Leu Arg Asp Ala Ala Val Gln Leu
        915                 920                 925

Val Val Ala Gly Val Asn Leu Gln Gly Phe Asp Lys Trp Asp Ala Pro
    930                 935                 940

Asp Ala Thr Arg Met Gln Ala Ile Lys Lys Lys Arg Thr Thr Leu Arg
945                 950                 955                 960
```

```
Leu Ser Ala Ala Thr Tyr Val Ser Asp Lys Thr Lys Lys Val Arg Asp
                965                 970                 975

Ala Ala Met Asn Asp Gly Arg Cys Val Thr Tyr Leu Lys Gly Ala Ala
            980                 985                 990

Pro Leu Ile Lys Ala Pro Glu Pro  Val Val Asp Glu Ala  Ala Lys Arg
        995                 1000                1005

Glu Ala  Glu Arg Leu Gln Lys  Glu Leu Gln Asp Ala  Gln Arg Gln
    1010                1015                1020

Leu Asp  Asp Ala Lys Arg Ala  Ala Ala Glu Ala Asn  Ser Lys Leu
    1025                1030                1035

Ala Ala  Ala Lys Glu Glu Ala  Lys Thr Ala Ala Ala  Ser Ala Lys
    1040                1045                1050

Pro Ala  Val Asp Thr Ala Val  Val Glu Lys His Arg  Ala Ile Leu
    1055                1060                1065

Lys Ser  Met Leu Ala Glu Leu  Asp Gly Tyr Gly Ser  Val Asp Ala
    1070                1075                1080

Ser Ser  Leu Gln Gln Gln Gln  Gln Gln Gln Thr Ala  Pro Ala Pro
    1085                1090                1095

Val Lys  Ala Ala Ala Pro Ala  Ala Pro Val Ala Ser  Ala Pro Ala
    1100                1105                1110

Pro Ala  Val Ser Asn Glu Leu  Leu Glu Lys Ala Glu  Thr Val Val
    1115                1120                1125

Met Glu  Val Leu Ala Ala Lys  Thr Gly Tyr Glu Thr  Asp Met Ile
    1130                1135                1140

Glu Ala  Asp Met Glu Leu Glu  Thr Glu Leu Gly Ile  Asp Ser Ile
    1145                1150                1155

Lys Arg  Val Glu Ile Leu Ser  Glu Val Gln Ala Met  Leu Asn Val
    1160                1165                1170

Glu Ala  Lys Asp Val Asp Ala  Leu Ser Arg Thr Arg  Thr Val Gly
    1175                1180                1185

Glu Val  Val Asn Ala Met Lys  Ala Glu Ile Ala Gly  Ser Ser Ala
    1190                1195                1200

Pro Ala  Pro Ala Ala Ala Ala  Pro Ala Pro Ala Lys  Ala Ala Pro
    1205                1210                1215
```

```
Ala Ala  Ala Ala Pro Ala Val  Ser Asn Glu Leu Leu  Glu Lys Ala
    1220                1225                1230

Glu Thr  Val Val Met Glu Val  Leu Ala Ala Lys Thr  Gly Tyr Glu
    1235                1240                1245

Thr Asp  Met Ile Glu Ser Asp  Met Glu Leu Glu Thr  Glu Leu Gly
    1250                1255                1260

Ile Asp  Ser Ile Lys Arg Val  Glu Ile Leu Ser Glu  Val Gln Ala
    1265                1270                1275

Met Leu  Asn Val Glu Ala Lys  Asp Val Asp Ala Leu  Ser Arg Thr
    1280                1285                1290

Arg Thr  Val Gly Glu Val Val  Asn Ala Met Lys Ala  Glu Ile Ala
    1295                1300                1305

Gly Gly  Ser Ala Pro Ala Pro  Ala Ala Ala Ala Pro  Gly Pro Ala
    1310                1315                1320

Ala Ala  Ala Pro Ala Pro Ala  Ala Ala Ala Pro Ala  Val Ser Asn
    1325                1330                1335

Glu Leu  Leu Glu Lys Ala Glu  Thr Val Val Met Glu  Val Leu Ala
    1340                1345                1350

Ala Lys  Thr Gly Tyr Glu Thr  Asp Met Ile Glu Ser  Asp Met Glu
    1355                1360                1365

Leu Glu  Thr Glu Leu Gly Ile  Asp Ser Ile Lys Arg  Val Glu Ile
    1370                1375                1380

Leu Ser  Glu Val Gln Ala Met  Leu Asn Val Glu Ala  Lys Asp Val
    1385                1390                1395

Asp Ala  Leu Ser Arg Thr Arg  Thr Val Gly Glu Val  Val Asp Ala
    1400                1405                1410

Met Lys  Ala Glu Ile Ala Gly  Gly Ser Ala Pro Ala  Pro Ala Ala
    1415                1420                1425

Ala Ala  Pro Ala Pro Ala Ala  Ala Ala Pro Ala Pro  Ala Ala Pro
    1430                1435                1440

Ala Pro  Ala Val Ser Ser Glu  Leu Leu Glu Lys Ala  Glu Thr Val
    1445                1450                1455

Val Met  Glu Val Leu Ala Ala  Lys Thr Gly Tyr Glu  Thr Asp Met
    1460                1465                1470
```

```
Ile Glu  Ser Asp Met Glu Leu  Glu Thr Glu Leu Gly  Ile Asp Ser
    1475                1480                1485

Ile Lys  Arg Val Glu Ile Leu  Ser Glu Val Gln Ala  Met Leu Asn
    1490                1495                1500

Val Glu  Ala Lys Asp Val Asp  Ala Leu Ser Arg Thr  Arg Thr Val
    1505                1510                1515

Gly Glu  Val Val Asp Ala Met  Lys Ala Glu Ile Ala  Gly Gly Ser
    1520                1525                1530

Ala Pro  Ala Pro Ala Ala Ala  Ala Pro Ala Pro Ala  Ala Ala Ala
    1535                1540                1545

Pro Ala  Pro Ala Ala Pro Ala  Pro Ala Ala Pro Ala  Pro Ala Val
    1550                1555                1560

Ser Ser  Glu Leu Leu Glu Lys  Ala Glu Thr Val Val  Met Glu Val
    1565                1570                1575

Leu Ala  Ala Lys Thr Gly Tyr  Glu Thr Asp Met Ile  Glu Ser Asp
    1580                1585                1590

Met Glu  Leu Glu Thr Glu Leu  Gly Ile Asp Ser Ile  Lys Arg Val
    1595                1600                1605

Glu Ile  Leu Ser Glu Val Gln  Ala Met Leu Asn Val  Glu Ala Lys
    1610                1615                1620

Asp Val  Asp Ala Leu Ser Arg  Thr Arg Thr Val Gly  Glu Val Val
    1625                1630                1635

Asp Ala  Met Lys Ala Glu Ile  Ala Gly Ser Ser Ala  Ser Ala Pro
    1640                1645                1650

Ala Ala  Ala Ala Pro Ala Pro  Ala Ala Ala Ala Pro  Ala Pro Ala
    1655                1660                1665

Ala Ala  Ala Pro Ala Val Ser  Asn Glu Leu Leu Glu  Lys Ala Glu
    1670                1675                1680

Thr Val  Val Met Glu Val Leu  Ala Ala Lys Thr Gly  Tyr Glu Thr
    1685                1690                1695

Asp Met  Ile Glu Ser Asp Met  Glu Leu Glu Thr Glu  Leu Gly Ile
    1700                1705                1710

Asp Ser  Ile Lys Arg Val Glu  Ile Leu Ser Glu Val  Gln Ala Met
    1715                1720                1725
```

```
Leu Asn  Val Glu Ala Lys Asp  Val Asp Ala Leu Ser  Arg Thr Arg
    1730                1735                1740

Thr Val  Gly Glu Val Val Asp  Ala Met Lys Ala Glu  Ile Ala Gly
    1745                1750                1755

Gly Ser  Ala Pro Ala Pro Ala  Ala Ala Ala Pro Ala  Pro Ala Ala
    1760                1765                1770

Ala Ala  Pro Ala Val Ser Asn  Glu Leu Leu Glu Lys  Ala Glu Thr
    1775                1780                1785

Val Val  Met Glu Val Leu Ala  Ala Lys Thr Gly Tyr  Glu Thr Asp
    1790                1795                1800

Met Ile  Glu Ser Asp Met Glu  Leu Glu Thr Glu Leu  Gly Ile Asp
    1805                1810                1815

Ser Ile  Lys Arg Val Glu Ile  Leu Ser Glu Val Gln  Ala Met Leu
    1820                1825                1830

Asn Val  Glu Ala Lys Asp Val  Asp Ala Leu Ser Arg  Thr Arg Thr
    1835                1840                1845

Val Gly  Glu Val Val Asp Ala  Met Lys Ala Glu Ile  Ala Gly Ser
    1850                1855                1860

Ser Ala  Pro Ala Pro Ala Ala  Ala Ala Pro Ala Pro  Ala Ala Ala
    1865                1870                1875

Ala Pro  Ala Pro Ala Ala Ala  Ala Pro Ala Val Ser  Ser Glu Leu
    1880                1885                1890

Leu Glu  Lys Ala Glu Thr Val  Val Met Glu Val Leu  Ala Ala Lys
    1895                1900                1905

Thr Gly  Tyr Glu Thr Asp Met  Ile Glu Ser Asp Met  Glu Leu Glu
    1910                1915                1920

Thr Glu  Leu Gly Ile Asp Ser  Ile Lys Arg Val Glu  Ile Leu Ser
    1925                1930                1935

Glu Val  Gln Ala Met Leu Asn  Val Glu Ala Lys Asp  Val Asp Ala
    1940                1945                1950

Leu Ser  Arg Thr Arg Thr Val  Gly Glu Val Val Asp  Ala Met Lys
    1955                1960                1965

Ala Glu  Ile Ala Gly Gly Ser  Ala Pro Ala Pro Ala  Ala Ala Ala
    1970                1975                1980
```

```
Pro Ala  Pro Ala Ala Ala Ala  Pro Ala Val Ser Asn  Glu Leu Leu
    1985                 1990                 1995

Glu Lys  Ala Glu Thr Val Val  Met Glu Val Leu Ala  Ala Lys Thr
    2000                 2005                 2010

Gly Tyr  Glu Thr Asp Met Ile  Glu Ser Asp Met Glu  Leu Glu Thr
    2015                 2020                 2025

Glu Leu  Gly Ile Asp Ser Ile  Lys Arg Val Glu Ile  Leu Ser Glu
    2030                 2035                 2040

Val Gln  Ala Met Leu Asn Val  Glu Ala Lys Asp Val  Asp Ala Leu
    2045                 2050                 2055

Ser Arg  Thr Arg Thr Val Gly  Glu Val Val Asp Ala  Met Lys Ala
    2060                 2065                 2070

Glu Ile  Ala Gly Gly Ser Ala  Pro Ala Pro Ala Ala  Ala Ala Pro
    2075                 2080                 2085

Ala Ser  Ala Gly Ala Ala Pro  Ala Val Lys Ile Asp  Ser Val His
    2090                 2095                 2100

Gly Ala  Asp Cys Asp Asp Leu  Ser Leu Met His Ala  Lys Val Val
    2105                 2110                 2115

Asp Ile  Arg Arg Pro Asp Glu  Leu Ile Leu Glu Arg  Pro Glu Asn
    2120                 2125                 2130

Arg Pro  Val Leu Val Val Asp  Asp Gly Ser Glu Leu  Thr Leu Ala
    2135                 2140                 2145

Leu Val  Arg Val Leu Gly Ala  Cys Ala Val Val Leu  Thr Phe Glu
    2150                 2155                 2160

Gly Leu  Gln Leu Ala Gln Arg  Ala Gly Ala Ala Ala  Ile Arg His
    2165                 2170                 2175

Val Leu  Ala Lys Asp Leu Ser  Ala Glu Ser Ala Glu  Lys Ala Ile
    2180                 2185                 2190

Lys Glu  Ala Glu Gln Arg Phe  Gly Ala Leu Gly Gly  Phe Ile Ser
    2195                 2200                 2205

Gln Gln  Ala Glu Arg Phe Glu  Pro Ala Glu Ile Leu  Gly Phe Thr
    2210                 2215                 2220

Leu Met  Cys Ala Lys Phe Ala  Lys Ala Ser Leu Cys  Thr Ala Val
    2225                 2230                 2235
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Ala Gly  Gly Arg Pro Ala Phe  Ile Gly Val Ala Arg  Leu Asp Gly
    2240                2245                2250

Arg Leu  Gly Phe Thr Ser Gln  Gly Thr Ser Asp Ala  Leu Lys Arg
    2255                2260                2265

Ala Gln  Arg Gly Ala Ile Phe  Gly Leu Cys Lys Thr  Ile Gly Leu
    2270                2275                2280

Glu Trp  Ser Glu Ser Asp Val  Phe Ser Arg Gly Val  Asp Ile Ala
    2285                2290                2295

Gln Gly  Met His Pro Glu Asp  Ala Ala Val Ala Ile  Val Arg Glu
    2300                2305                2310

Met Ala  Cys Ala Asp Ile Arg  Ile Arg Glu Val Gly  Ile Gly Ala
    2315                2320                2325

Asn Gln  Gln Arg Cys Thr Ile  Arg Ala Ala Lys Leu  Glu Thr Gly
    2330                2335                2340

Asn Pro  Gln Arg Gln Ile Ala  Lys Asp Asp Val Leu  Leu Val Ser
    2345                2350                2355

Gly Gly  Ala Arg Gly Ile Thr  Pro Leu Cys Ile Arg  Glu Ile Thr
    2360                2365                2370

Arg Gln  Ile Ala Gly Gly Lys  Tyr Ile Leu Leu Gly  Arg Ser Lys
    2375                2380                2385

Val Ser  Ala Ser Glu Pro Ala  Trp Cys Ala Gly Ile  Thr Asp Glu
    2390                2395                2400

Lys Ala  Val Gln Lys Ala Ala  Thr Gln Glu Leu Lys  Arg Ala Phe
    2405                2410                2415

Ser Ala  Gly Glu Gly Pro Lys  Pro Thr Pro Arg Ala  Val Thr Lys
    2420                2425                2430

Leu Val  Gly Ser Val Leu Gly  Ala Arg Glu Val Arg  Ser Ser Ile
    2435                2440                2445

Ala Ala  Ile Glu Ala Leu Gly  Gly Lys Ala Ile Tyr  Ser Ser Cys
    2450                2455                2460

Asp Val  Asn Ser Ala Ala Asp  Val Ala Lys Ala Val  Arg Asp Ala
    2465                2470                2475

Glu Ser  Gln Leu Gly Ala Arg  Val Ser Gly Ile Val  His Ala Ser
    2480                2485                2490
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Gly Val  Leu Arg Asp Arg Leu  Ile Glu Lys Lys Leu  Pro Asp Glu
    2495                 2500                 2505

Phe Asp  Ala Val Phe Gly Thr  Lys Val Thr Gly Leu  Glu Asn Leu
    2510                 2515                 2520

Leu Ala  Ala Val Asp Arg Ala  Asn Leu Lys His Met  Val Leu Phe
    2525                 2530                 2535

Ser Ser  Leu Ala Gly Phe His  Gly Asn Val Gly Gln  Ser Asp Tyr
    2540                 2545                 2550

Ala Met  Ala Asn Glu Ala Leu  Asn Lys Met Gly Leu  Glu Leu Ala
    2555                 2560                 2565

Lys Asp  Val Ser Val Lys Ser  Ile Cys Phe Gly Pro  Trp Asp Gly
    2570                 2575                 2580

Gly Met  Val Thr Pro Gln Leu  Lys Lys Gln Phe Gln  Glu Met Gly
    2585                 2590                 2595

Val Gln  Ile Ile Pro Arg Glu  Gly Gly Ala Asp Thr  Val Ala Arg
    2600                 2605                 2610

Ile Val  Leu Gly Ser Ser Pro  Ala Glu Ile Leu Val  Gly Asn Trp
    2615                 2620                 2625

Arg Thr  Pro Ser Lys Lys Val  Gly Ser Asp Thr Ile  Thr Leu His
    2630                 2635                 2640

Arg Lys  Ile Ser Ala Lys Ser  Asn Pro Phe Leu Glu  Asp His Val
    2645                 2650                 2655

Ile Gln  Gly Arg Arg Val Leu  Pro Met Thr Leu Ala  Ile Gly Ser
    2660                 2665                 2670

Leu Ala  Glu Thr Cys Leu Gly  Leu Phe Pro Gly Tyr  Ser Leu Trp
    2675                 2680                 2685

Ala Ile  Asp Asp Ala Gln Leu  Phe Lys Gly Val Thr  Val Asp Gly
    2690                 2695                 2700

Asp Val  Asn Cys Glu Val Thr  Leu Thr Pro Ser Thr  Ala Pro Ser
    2705                 2710                 2715

Gly Arg  Val Asn Val Gln Ala  Thr Leu Lys Thr Phe  Ser Ser Gly
    2720                 2725                 2730

Lys Leu  Val Pro Ala Tyr Arg  Ala Val Ile Val Leu  Ser Asn Gln
    2735                 2740                 2745
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Gly Ala  Pro Pro Ala Asn Ala  Thr Met Gln Pro Pro  Ser Leu Asp
    2750                 2755                 2760


Ala Asp  Pro Ala Leu Gln Gly  Ser Val Tyr Asp Gly  Lys Thr Leu
    2765                 2770                 2775


Phe His  Gly Pro Ala Phe Arg  Gly Ile Asp Asp Val  Leu Ser Cys
    2780                 2785                 2790


Thr Lys  Ser Gln Leu Val Ala  Lys Cys Ser Ala Val  Pro Gly Ser
    2795                 2800                 2805


Asp Ala  Ala Arg Gly Glu Phe  Ala Thr Asp Thr Asp  Ala His Asp
    2810                 2815                 2820


Pro Phe  Val Asn Asp Leu Ala  Phe Gln Ala Met Leu  Val Trp Val
    2825                 2830                 2835


Arg Arg  Thr Leu Gly Gln Ala  Ala Leu Pro Asn Ser  Ile Gln Arg
    2840                 2845                 2850


Ile Val  Gln His Arg Pro Val  Pro Gln Asp Lys Pro  Phe Tyr Ile
    2855                 2860                 2865


Thr Leu  Arg Ser Asn Gln Ser  Gly Gly His Ser Gln  His Lys His
    2870                 2875                 2880


Ala Leu  Gln Phe His Asn Glu  Gln Gly Asp Leu Phe  Ile Asp Val
    2885                 2890                 2895


Gln Ala  Ser Val Ile Ala Thr  Asp Ser Leu Ala Phe
    2900                 2905                 2910


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Arg Ile Ala Val Val Gly Met Ala Val Gln Tyr Ala Gly Cys Lys Thr
            20                  25                  30


Lys Asp Glu Phe Trp Glu Val Leu Met Asn Gly Lys Val Glu Ser Lys
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        35                  40                  45

Val Ile Ser Asp Lys Arg Leu Gly Ser Asn Tyr Arg Ala Glu His Tyr
    50                  55                  60

Lys Ala Glu Arg Ser Lys Tyr Ala Asp Thr Phe Cys Asn Glu Thr Tyr
65                  70                  75                  80

Gly Thr Leu Asp Glu Asn Glu Ile Asp Asn Glu His Glu Leu Leu Leu
                85                  90                  95

Asn Leu Ala Lys Gln Ala Leu Ala Glu Thr Ser Val Lys Asp Ser Thr
            100                 105                 110

Arg Cys Gly Ile Val Ser Gly Cys Leu Ser Phe Pro Met Asp Asn Leu
        115                 120                 125

Gln Gly Glu Leu Leu Asn Val Tyr Gln Asn His Val Glu Lys Lys Leu
    130                 135                 140

Gly Ala Arg Val Phe Lys Asp Ala Ser His Trp Ser Glu Arg Glu Gln
145                 150                 155                 160

Ser Asn Lys Pro Glu Ala Gly Asp Arg Arg Ile Phe Met Asp Pro Ala
                165                 170                 175

Ser Phe Val Ala Glu Glu Leu Asn Leu Gly Ala Leu His Tyr Ser Val
            180                 185                 190

Asp Ala Ala Cys Ala Thr Ala Leu Tyr Val Leu Arg Leu Ala Gln Asp
        195                 200                 205

His Leu Val Ser Gly Ala Ala Asp Val Met Leu Cys Gly Ala Thr Cys
    210                 215                 220

Leu Pro Glu Pro Phe Phe Ile Leu Ser Gly Phe Ser Thr Phe Gln Ala
225                 230                 235                 240

Met Pro Val Gly Thr Gly Gln Asn Val Ser Met Pro Leu His Lys Asp
                245                 250                 255

Ser Gln Gly Leu Thr Pro Gly Glu Gly Gly Ser Ile Met Val Leu Lys
            260                 265                 270

Arg Leu Asp Asp Ala Ile Arg Asp Gly Asp His Ile Tyr Gly Thr Leu
        275                 280                 285

Leu Gly Ala Asn Val Ser Asn Ser Gly Thr Gly Leu Pro Leu Lys Pro
    290                 295                 300

Leu Leu Pro Ser Glu Lys Lys Cys Leu Met Asp Thr Tyr Thr Arg Ile
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305 310 315 320

Asn Val His Pro His Lys Ile Gln Tyr Val Glu Cys His Ala Thr Gly
325 330 335

Thr Pro Gln Gly Asp Arg Val Glu Ile Asp Ala Val Lys Ala Cys Phe
340 345 350

Glu Gly Lys Val Pro Arg Phe Gly Thr Thr Lys Gly Asn Phe Gly His
355 360 365

Thr Leu Val Ala Ala Gly Phe Ala Gly Met Cys Lys Val Leu Leu Ser
370 375 380

Met Lys His Gly Ile Ile Pro Pro Thr Pro Gly Ile Asp Asp Glu Thr
385 390 395 400

Lys Met Asp Pro Leu Val Val Ser Gly Glu Ala Ile Pro Trp Pro Glu
405 410 415

Thr Asn Gly Glu Pro Lys Arg Ala Gly Leu Ser Ala Phe Gly Phe Gly
420 425 430

Gly Thr Asn Ala His Ala Val Phe Glu Glu His Asp Pro Ser Asn Ala
435 440 445

Ala Cys Thr Gly His Asp Ser Ile Ser Ala Leu Ser Ala Arg Cys Gly
450 455 460

Gly Glu Ser Asn Met Arg Ile Ala Ile Thr Gly Met Asp Ala Thr Phe
465 470 475 480

Gly Ala Leu Lys Gly Leu Asp Ala Phe Glu Arg Ala Ile Tyr Thr Gly
485 490 495

Ala His Gly Ala Ile Pro Leu Pro Glu Lys Arg Trp Arg Phe Leu Gly
500 505 510

Lys Asp Lys Asp Phe Leu Asp Leu Cys Gly Val Lys Ala Thr Pro His
515 520 525

Gly Cys Tyr Ile Glu Asp Val Glu Val Asp Phe Gln Arg Leu Arg Thr
530 535 540

Pro Met Thr Pro Glu Asp Met Leu Leu Pro Gln Gln Leu Leu Ala Val
545 550 555 560

Thr Thr Ile Asp Arg Ala Ile Leu Asp Ser Gly Met Lys Lys Gly Gly
565 570 575

Asn Val Ala Val Phe Val Gly Leu Gly Thr Asp Leu Glu Leu Tyr Arg

580 585 590

His Arg Ala Arg Val Ala Leu Lys Glu Arg Val Arg Pro Glu Ala Ser
595 600 605

Lys Lys Leu Asn Asp Met Met Gln Tyr Ile Asn Asp Cys Gly Thr Ser
610 615 620

Thr Ser Tyr Thr Ser Tyr Ile Gly Asn Leu Val Ala Thr Arg Val Ser
625 630 635 640

Ser Gln Trp Gly Phe Thr Gly Pro Ser Phe Thr Ile Thr Glu Gly Asn
645 650 655

Asn Ser Val Tyr Arg Cys Ala Glu Leu Gly Lys Tyr Leu Leu Glu Thr
660 665 670

Gly Glu Val Asp Gly Val Val Val Ala Gly Val Asp Leu Cys Gly Ser
675 680 685

Ala Glu Asn Leu Tyr Val Lys Ser Arg Arg Phe Lys Val Ser Thr Ser
690 695 700

Asp Thr Pro Arg Ala Ser Phe Asp Ala Ala Ala Asp Gly Tyr Phe Val
705 710 715 720

Gly Glu Gly Cys Gly Ala Phe Val Leu Lys Arg Glu Thr Ser Cys Thr
725 730 735

Lys Asp Asp Arg Ile Tyr Ala Cys Met Asp Ala Ile Val Pro Gly Asn
740 745 750

Val Pro Ser Ala Cys Leu Arg Glu Ala Leu Asp Gln Ala Arg Val Lys
755 760 765

Pro Gly Asp Ile Glu Met Leu Glu Leu Ser Ala Asp Ser Ala Arg His
770 775 780

Leu Lys Asp Pro Ser Val Leu Pro Lys Glu Leu Thr Ala Glu Glu Glu
785 790 795 800

Ile Gly Gly Leu Gln Thr Ile Leu Arg Asp Asp Asp Lys Leu Pro Arg
805 810 815

Asn Val Ala Thr Gly Ser Val Lys Ala Thr Val Gly Asp Thr Gly Tyr
820 825 830

Ala Ser Gly Ala Ala Ser Leu Ile Lys Ala Ala Leu Cys Ile Tyr Asn
835 840 845

Arg Tyr Leu Pro Ser Asn Gly Asp Asp Trp Asp Glu Pro Ala Pro Glu

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    850                 855                 860

Ala Pro Trp Asp Ser Thr Leu Phe Ala Cys Gln Thr Ser Arg Ala Trp
865                 870                 875                 880

Leu Lys Asn Pro Gly Glu Arg Arg Tyr Ala Ala Val Ser Gly Val Ser
                885                 890                 895

Glu Thr Arg Ser Cys Tyr Ser Val Leu Leu Ser Glu Ala Glu Gly His
            900                 905                 910

Tyr Glu Arg Glu Asn Arg Ile Ser Leu Asp Glu Glu Ala Pro Lys Leu
        915                 920                 925

Ile Val Leu Arg Ala Asp Ser His Glu Glu Ile Leu Gly Arg Leu Asp
    930                 935                 940

Lys Ile Arg Glu Arg Phe Leu Gln Pro Thr Gly Ala Ala Pro Arg Glu
945                 950                 955                 960

Ser Glu Leu Lys Ala Gln Ala Arg Arg Ile Phe Leu Glu Leu Leu Gly
                965                 970                 975

Glu Thr Leu Ala Gln Asp Ala Ala Ser Ser Gly Ser Gln Lys Pro Leu
            980                 985                 990

Ala Leu Ser Leu Val Ser Thr Pro  Ser Lys Leu Gln Arg  Glu Val Glu
        995                 1000                1005

Leu Ala  Ala Lys Gly Ile Pro  Arg Cys Leu Lys Met  Arg Arg Asp
    1010                1015                1020

Trp Ser  Ser Pro Ala Gly Ser  Arg Tyr Ala Pro Glu  Pro Leu Ala
    1025                1030                1035

Ser Asp  Arg Val Ala Phe Met  Tyr Gly Glu Gly Arg  Ser Pro Tyr
    1040                1045                1050

Tyr Gly  Ile Thr Gln Asp Ile  His Arg Ile Trp Pro  Glu Leu His
    1055                1060                1065

Glu Val  Ile Asn Glu Lys Thr  Asn Arg Leu Trp Ala  Glu Gly Asp
    1070                1075                1080

Arg Trp  Val Met Pro Arg Ala  Ser Phe Lys Ser Glu  Leu Glu Ser
    1085                1090                1095

Gln Gln  Gln Glu Phe Asp Arg  Asn Met Ile Glu Met  Phe Arg Leu
    1100                1105                1110

Gly Ile  Leu Thr Ser Ile Ala  Phe Thr Asn Leu Ala  Arg Asp Val
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1115 1120 1125

Leu Asn Ile Thr Pro Lys Ala Ala Phe Gly Leu Ser Leu Gly Glu
1130 1135 1140

Ile Ser Met Ile Phe Ala Phe Ser Lys Lys Asn Gly Leu Ile Ser
1145 1150 1155

Asp Gln Leu Thr Lys Asp Leu Arg Glu Ser Asp Val Trp Asn Lys
1160 1165 1170

Ala Leu Ala Val Glu Phe Asn Ala Leu Arg Glu Ala Trp Gly Ile
1175 1180 1185

Pro Gln Ser Val Pro Lys Asp Glu Phe Trp Gln Gly Tyr Ile Val
1190 1195 1200

Arg Gly Thr Lys Gln Asp Ile Glu Ala Ala Ile Ala Pro Asp Ser
1205 1210 1215

Lys Tyr Val Arg Leu Thr Ile Ile Asn Asp Ala Asn Thr Ala Leu
1220 1225 1230

Ile Ser Gly Lys Pro Asp Ala Cys Lys Ala Ala Ile Ala Arg Leu
1235 1240 1245

Gly Gly Asn Ile Pro Ala Leu Pro Val Thr Gln Gly Met Cys Gly
1250 1255 1260

His Cys Pro Glu Val Gly Pro Tyr Thr Lys Asp Ile Ala Lys Ile
1265 1270 1275

His Ala Asn Leu Glu Phe Pro Val Val Asp Gly Leu Asp Leu Trp
1280 1285 1290

Thr Thr Ile Asn Gln Lys Arg Leu Val Pro Arg Ala Thr Gly Ala
1295 1300 1305

Lys Asp Glu Trp Ala Pro Ser Ser Phe Gly Glu Tyr Ala Gly Gln
1310 1315 1320

Leu Tyr Glu Lys Gln Ala Asn Phe Pro Gln Ile Val Glu Thr Ile
1325 1330 1335

Tyr Lys Gln Asn Tyr Asp Val Phe Val Glu Val Gly Pro Asn Asn
1340 1345 1350

His Arg Ser Thr Ala Val Arg Thr Thr Leu Gly Pro Gln Arg Asn
1355 1360 1365

His Leu Ala Gly Ala Ile Asp Lys Gln Asn Glu Asp Ala Trp Thr

1370 1375 1380

Thr Ile Val Lys Leu Val Ala Ser Leu Lys Ala His Leu Val Pro
1385 1390 1395

Gly Val Thr Ile Ser Pro Leu Tyr His Ser Lys Leu Val Ala Glu
1400 1405 1410

Ala Glu Ala Cys Tyr Ala Ala Leu Cys Lys Gly Glu Lys Pro Lys
1415 1420 1425

Lys Asn Lys Phe Val Arg Lys Ile Gln Leu Asn Gly Arg Phe Asn
1430 1435 1440

Ser Lys Ala Asp Pro Ile Ser Ser Ala Asp Leu Ala Ser Phe Pro
1445 1450 1455

Pro Ala Asp Pro Ala Ile Glu Ala Ala Ile Ser Ser Arg Ile Met
1460 1465 1470

Lys Pro Val Ala Pro Lys Phe Tyr Ala Arg Leu Asn Ile Asp Glu
1475 1480 1485

Gln Asp Glu Thr Arg Asp Pro Ile Leu Asn Lys Asp Asn Ala Pro
1490 1495 1500

Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser Ser
1505 1510 1515

Pro Ser Pro Ala Pro Ser Ala Pro Val Gln Lys Lys Ala Ala Pro
1520 1525 1530

Ala Ala Glu Thr Lys Ala Val Ala Ser Ala Asp Ala Leu Arg Ser
1535 1540 1545

Ala Leu Leu Asp Leu Asp Ser Met Leu Ala Leu Ser Ser Ala Ser
1550 1555 1560

Ala Ser Gly Asn Leu Val Glu Thr Ala Pro Ser Asp Ala Ser Val
1565 1570 1575

Ile Val Pro Pro Cys Asn Ile Ala Asp Leu Gly Ser Arg Ala Phe
1580 1585 1590

Met Lys Thr Tyr Gly Val Ser Ala Pro Leu Tyr Thr Gly Ala Met
1595 1600 1605

Ala Lys Gly Ile Ala Ser Ala Asp Leu Val Ile Ala Ala Gly Arg
1610 1615 1620

Gln Gly Ile Leu Ala Ser Phe Gly Ala Gly Gly Leu Pro Met Gln

1625 1630 1635

Val Val Arg Glu Ser Ile Glu Lys Ile Gln Ala Ala Leu Pro Asn
1640 1645 1650

Gly Pro Tyr Ala Val Asn Leu Ile His Ser Pro Phe Asp Ser Asn
1655 1660 1665

Leu Glu Lys Gly Asn Val Asp Leu Phe Leu Glu Lys Gly Val Thr
1670 1675 1680

Phe Val Glu Ala Ser Ala Phe Met Thr Leu Thr Pro Gln Val Val
1685 1690 1695

Arg Tyr Arg Ala Ala Gly Leu Thr Arg Asn Ala Asp Gly Ser Val
1700 1705 1710

Asn Ile Arg Asn Arg Ile Ile Gly Lys Val Ser Arg Thr Glu Leu
1715 1720 1725

Ala Glu Met Phe Met Arg Pro Ala Pro Glu His Leu Leu Gln Lys
1730 1735 1740

Leu Ile Ala Ser Gly Glu Ile Asn Gln Glu Gln Ala Glu Leu Ala
1745 1750 1755

Arg Arg Val Pro Val Ala Asp Asp Ile Ala Val Glu Ala Asp Ser
1760 1765 1770

Gly Gly His Thr Asp Asn Arg Pro Ile His Val Ile Leu Pro Leu
1775 1780 1785

Ile Ile Asn Leu Arg Asp Arg Leu His Arg Glu Cys Gly Tyr Pro
1790 1795 1800

Ala Asn Leu Arg Val Arg Val Gly Ala Gly Gly Gly Ile Gly Cys
1805 1810 1815

Pro Gln Ala Ala Leu Ala Thr Phe Asn Met Gly Ala Ser Phe Ile
1820 1825 1830

Val Thr Gly Thr Val Asn Gln Val Ala Lys Gln Ser Gly Thr Cys
1835 1840 1845

Asp Asn Val Arg Lys Gln Leu Ala Lys Ala Thr Tyr Ser Asp Val
1850 1855 1860

Cys Met Ala Pro Ala Ala Asp Met Phe Glu Glu Gly Val Lys Leu
1865 1870 1875

Gln Val Leu Lys Lys Gly Thr Met Phe Pro Ser Arg Ala Asn Lys

1880 1885 1890

Leu Tyr Glu Leu Phe Cys Lys Tyr Asp Ser Phe Glu Ser Met Pro
1895 1900 1905

Pro Ala Glu Leu Ala Arg Val Glu Lys Arg Ile Phe Ser Arg Ala
1910 1915 1920

Leu Glu Glu Val Trp Asp Glu Thr Lys Asn Phe Tyr Ile Asn Arg
1925 1930 1935

Leu His Asn Pro Glu Lys Ile Gln Arg Ala Glu Arg Asp Pro Lys
1940 1945 1950

Leu Lys Met Ser Leu Cys Phe Arg Trp Tyr Leu Ser Leu Ala Ser
1955 1960 1965

Arg Trp Ala Asn Thr Gly Ala Ser Asp Arg Val Met Asp Tyr Gln
1970 1975 1980

Val Trp Cys Gly Pro Ala Ile Gly Ser Phe Asn Asp Phe Ile Lys
1985 1990 1995

Gly Thr Tyr Leu Asp Pro Ala Val Ala Asn Glu Tyr Pro Cys Val
2000 2005 2010

Val Gln Ile Asn Lys Gln Ile Leu Arg Gly Ala Cys Phe Leu Arg
2015 2020 2025

Arg Leu Glu Ile Leu Arg Asn Ala Arg Leu Ser Asp Gly Ala Ala
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Ala Leu Val Ala Ser Ile Asp Asp Thr Tyr Val Pro Ala Glu Lys
2045 2050 2055

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Leu Leu Glu Phe Ala Glu Gly Asp Ile Ala Lys Val Phe Gly Pro Glu
        35                  40                  45

Phe Ala Val Ile Asp Lys Tyr Pro Arg Arg Val Arg Leu Pro Ala Arg
    50                  55                  60

Glu Tyr Leu Leu Val Thr Arg Val Thr Leu Met Asp Ala Glu Val Asn
65                  70                  75                  80

Asn Tyr Arg Val Gly Ala Arg Met Val Thr Glu Tyr Asp Leu Pro Val
                85                  90                  95

Asn Gly Glu Leu Ser Glu Gly Gly Asp Cys Pro Trp Ala Val Leu Val
            100                 105                 110

Glu Ser Gly Gln Cys Asp Leu Met Leu Ile Ser Tyr Met Gly Ile Asp
        115                 120                 125

Phe Gln Asn Gln Gly Asp Arg Val Tyr Arg Leu Leu Asn Thr Thr Leu
    130                 135                 140

Thr Phe Tyr Gly Val Ala His Glu Gly Glu Thr Leu Glu Tyr Asp Ile
145                 150                 155                 160

Arg Val Thr Gly Phe Ala Lys Arg Leu Asp Gly Gly Ile Ser Met Phe
                165                 170                 175

Phe Phe Glu Tyr Asp Cys Tyr Val Asn Gly Arg Leu Leu Ile Glu Met
            180                 185                 190

Arg Asp Gly Cys Ala Gly Phe Phe Thr Asn Glu Glu Leu Asp Ala Gly
        195                 200                 205

Lys Gly Val Val Phe Thr Arg Gly Asp Leu Ala Ala Arg Ala Lys Ile
    210                 215                 220

Pro Lys Gln Asp Val Ser Pro Tyr Ala Val Ala Pro Cys Leu His Lys
225                 230                 235                 240

Thr Lys Leu Asn Glu Lys Glu Met Gln Thr Leu Val Asp Lys Asp Trp
                245                 250                 255

Ala Ser Val Phe Gly Ser Lys Asn Gly Met Pro Glu Ile Asn Tyr Lys
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260 265 270

Leu Cys Ala Arg Lys Met Leu Met Ile Asp Arg Val Thr Ser Ile Asp
275 280 285

His Lys Gly Gly Val Tyr Gly Leu Gly Gln Leu Val Gly Glu Lys Ile
290 295 300

Leu Glu Arg Asp His Trp Tyr Phe Pro Cys His Phe Val Lys Asp Gln
305 310 315 320

Val Met Ala Gly Ser Leu Val Ser Asp Gly Cys Ser Gln Met Leu Lys
325 330 335

Met Tyr Met Ile Trp Leu Gly Leu His Leu Thr Thr Gly Pro Phe Asp
340 345 350

Phe Arg Pro Val Asn Gly His Pro Asn Lys Val Arg Cys Arg Gly Gln
355 360 365

Ile Ser Pro His Lys Gly Lys Leu Val Tyr Val Met Glu Ile Lys Glu
370 375 380

Met Gly Phe Asp Glu Asp Asn Asp Pro Tyr Ala Ile Ala Asp Val Asn
385 390 395 400

Ile Ile Asp Val Asp Phe Glu Lys Gly Gln Asp Phe Ser Leu Asp Arg
405 410 415

Ile Ser Asp Tyr Gly Lys Gly Asp Leu Asn Lys Lys Ile Val Val Asp
420 425 430

Phe Lys Gly Ile Ala Leu Lys Met Gln Lys Arg Ser Thr Asn Lys Asn
435 440 445

Pro Ser Lys Val Gln Pro Val Phe Ala Asn Gly Ala Ala Thr Val Gly
450 455 460

Pro Glu Ala Ser Lys Ala Ser Ser Gly Ala Ser Ala Ser Ala Ser Ala
465 470 475 480

Ala Pro Ala Lys Pro Ala Phe Ser Ala Asp Val Leu Ala Pro Lys Pro
485 490 495

Val Ala Leu Pro Glu His Ile Leu Lys Gly Asp Ala Leu Ala Pro Lys
500 505 510

Glu Met Ser Trp His Pro Met Ser Lys Leu Pro Gly Asn Pro Thr Pro
515 520 525

Phe Phe Ser Pro Ser Ser Tyr Pro Pro Arg Ala Ile Cys Phe Ile Pro

530 535 540

Phe Pro Gly Asn Pro Leu Asp Asn Asn Cys Lys Ala Gly Glu Met Pro
545 550 555 560

Leu Asn Trp Tyr Asn Met Ser Glu Phe Met Cys Gly Lys Val Ser Asn
565 570 575

Cys Leu Gly Pro Glu Phe Ala Arg Phe Asp Lys Ser Asn Thr Ser Arg
580 585 590

Ser Pro Ala Phe Asp Leu Ala Leu Val Thr Arg Val Val Glu Val Thr
595 600 605

Asn Met Glu His Gly Lys Phe Leu Asn Val Asp Cys Asn Pro Ser Lys
610 615 620

Gly Thr Met Val Gly Glu Phe Asp Cys Pro Gln Asp Ala Trp Phe Phe
625 630 635 640

Asp Gly Ser Cys Asn Asp Gly His Met Pro Tyr Ser Ile Ile Met Glu
645 650 655

Ile Gly Leu Gln Thr Ser Gly Val Leu Thr Ser Val Leu Lys Ala Pro
660 665 670

Leu Thr Met Asp Lys Asp Asp Ile Leu Phe Arg Asn Leu Asp Ala Ser
675 680 685

Ala Glu Met Val Arg Pro Asp Val Asp Val Arg Gly Lys Thr Ile Arg
690 695 700

Asn Val Thr Lys Cys Thr Gly Tyr Ala Met Leu Gly Lys Met Gly Ile
705 710 715 720

His Arg Phe Thr Phe Glu Leu Ser Val Asp Gly Val Val Phe Tyr Lys
725 730 735

Gly Ser Thr Ser Phe Gly Trp Phe Thr Pro Glu Val Phe Ala Gln Gln
740 745 750

Ala Gly Leu Asp Asn Gly Lys Lys Thr Glu Pro Trp Cys Lys Thr Asn
755 760 765

Asn Thr Ser Val Arg Arg Val Glu Ile Ala Ser Ala Lys Gly Lys Glu
770 775 780

Gln Leu Thr Glu Lys Leu Pro Asp Ala Thr Asn Ala Gln Val Leu Arg
785 790 795 800

Arg Ser Glu Gln Cys Glu Tyr Leu Asp Tyr Leu Asn Ile Ala Pro Asp

805 810 815

Ser Gly Leu His Gly Lys Gly Tyr Ala His Gly His Lys Asp Val Asn
820 825 830

Pro Gln Asp Trp Phe Phe Ser Cys His Phe Trp Phe Asp Pro Val Met
835 840 845

Pro Gly Ser Leu Gly Ile Glu Ser Met Phe Gln Leu Ile Glu Ala Phe
850 855 860

Ala Val Asp Gln Asn Ile Pro Gly Glu Tyr Asn Val Ser Asn Pro Thr
865 870 875 880

Phe Ala His Ala Pro Gly Lys Thr Ala Trp Lys Tyr Arg Gly Gln Leu
885 890 895

Thr Pro Lys Asn Arg Ala Met Asp Cys Glu Val His Ile Val Ser Ile
900 905 910

Thr Ala Ser Pro Glu Asn Gly Gly Tyr Val Asp Ile Val Ala Asp Gly
915 920 925

Ala Leu Trp Val Asp Gly Leu Arg Val Tyr Glu Ala Lys Glu Leu Arg
930 935 940

Val Arg Val Val Ser Ala Lys Pro Gln Ala Ile Pro Asp Val Gln Gln
945 950 955 960

Gln Pro Pro Ser Ala Lys Ala Asp Pro Gly Lys Thr Gly Val Ala Leu
965 970 975

Ser Pro Thr Gln Leu Arg Asp Val Leu Leu Glu Val Asp Asn Pro Leu
980 985 990

Tyr Leu Gly Val Glu Asn Ser Asn Leu Val Gln Phe Glu Ser Lys Pro
995 1000 1005

Ala Thr Ser Ser Arg Ile Val Ser Ile Lys Pro Cys Ser Ile Ser
1010 1015 1020

Asp Leu Gly Asp Lys Ser Phe Met Glu Thr Tyr Asn Val Ser Ala
1025 1030 1035

Pro Leu Tyr Thr Gly Ala Met Ala Lys Gly Ile Ala Ser Ala Asp
1040 1045 1050

Leu Val Ile Ala Ala Gly Lys Arg Lys Ile Leu Gly Ser Phe Gly
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Ile Lys Gly Lys Leu Gly Leu Thr Lys Cys Lys Phe Ala Phe Ala Gly
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Gly Gln Val Lys Phe Asp Tyr Glu Ser Arg Gly Lys Pro Ile Leu Gly
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Asn Leu Ala Leu Cys Ala Val Asn Tyr Thr Arg Gln Ile Gly Ile Asp
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Leu Glu Tyr Leu Arg Pro Thr Ser Asp Leu Glu Ser Leu Ala Lys Arg
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Gln Lys Gln Lys Ile Phe Phe Arg Tyr Trp Thr Cys Lys Glu Ala Tyr
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