Supplementary information

Identification of genetic variations associated with epsilon-poly-lysine biosynthesis in *Streptomyces albulus ZPM* by genome sequencing

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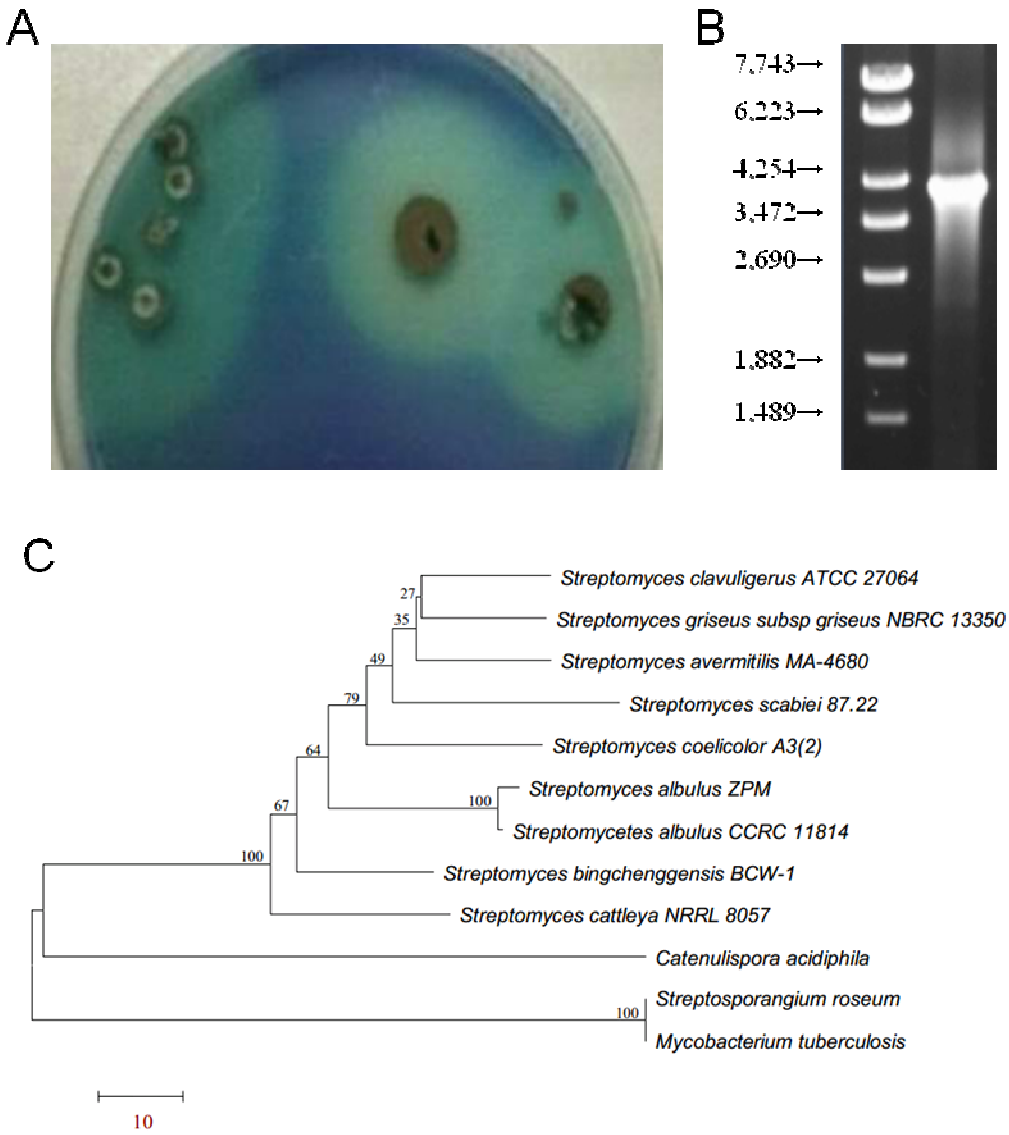

Figure S1. ε-PL-producing strain isolation based on the methylene blue method, molecular identification of the ε-PL synthesis enzyme gene and phylogenetic analysis of the 16S rRNAs of *Streptomyces* species.

(A) Isolation of the ε-PL strain on agar plates embedded with the charged dye methylene blue. (B) PCR of the ε-PL synthesis using specific primer pairs. (C) Phylogenetic analysis of the 16S rRNAs of *Streptomyces* species. The name *S. albulus* ZPM was given because the bacteria has the closest relationship with *S. albulus* CCRC 11814. The bootstrap values are shown on the branch.

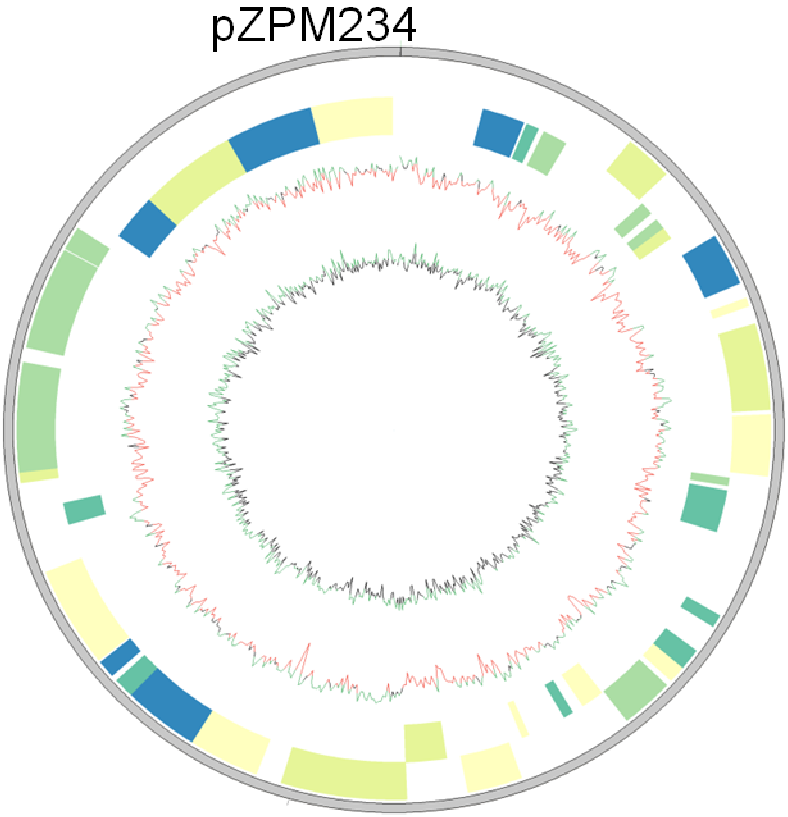

Figure S2. Circular representation of pZPM234. Circles 1 and 2, predicted protein-coding sequences (forward and reverse strands); Circle 3, GC content; Circle 4, GC bias.

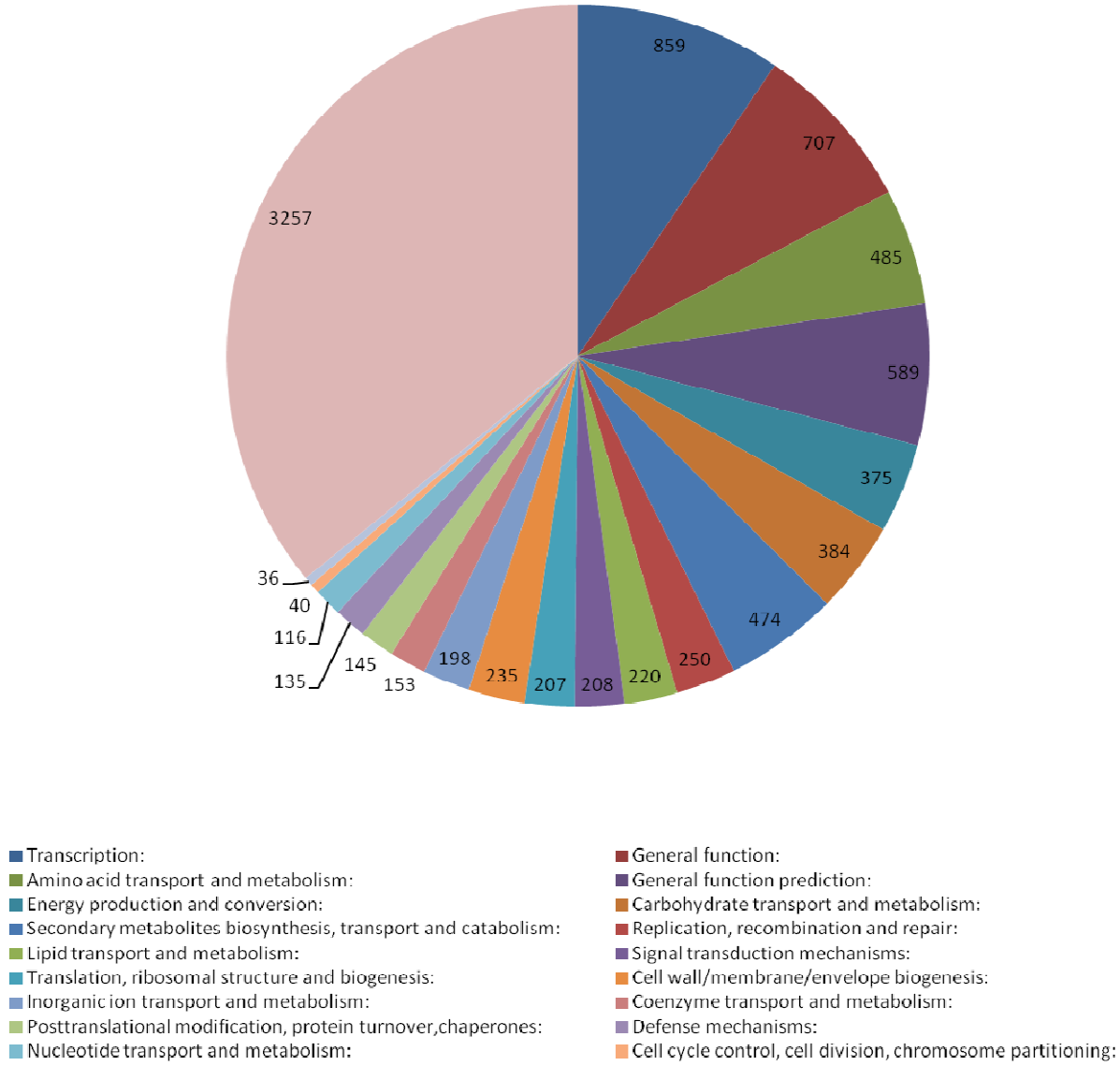

Figure S3. **COG classification of 9073 genes identified in *S. albulus* ZPM.** In total, 5816 of 9073 protein-coding genes (64.1%) have been classified into at least one COG group with known or putative function.

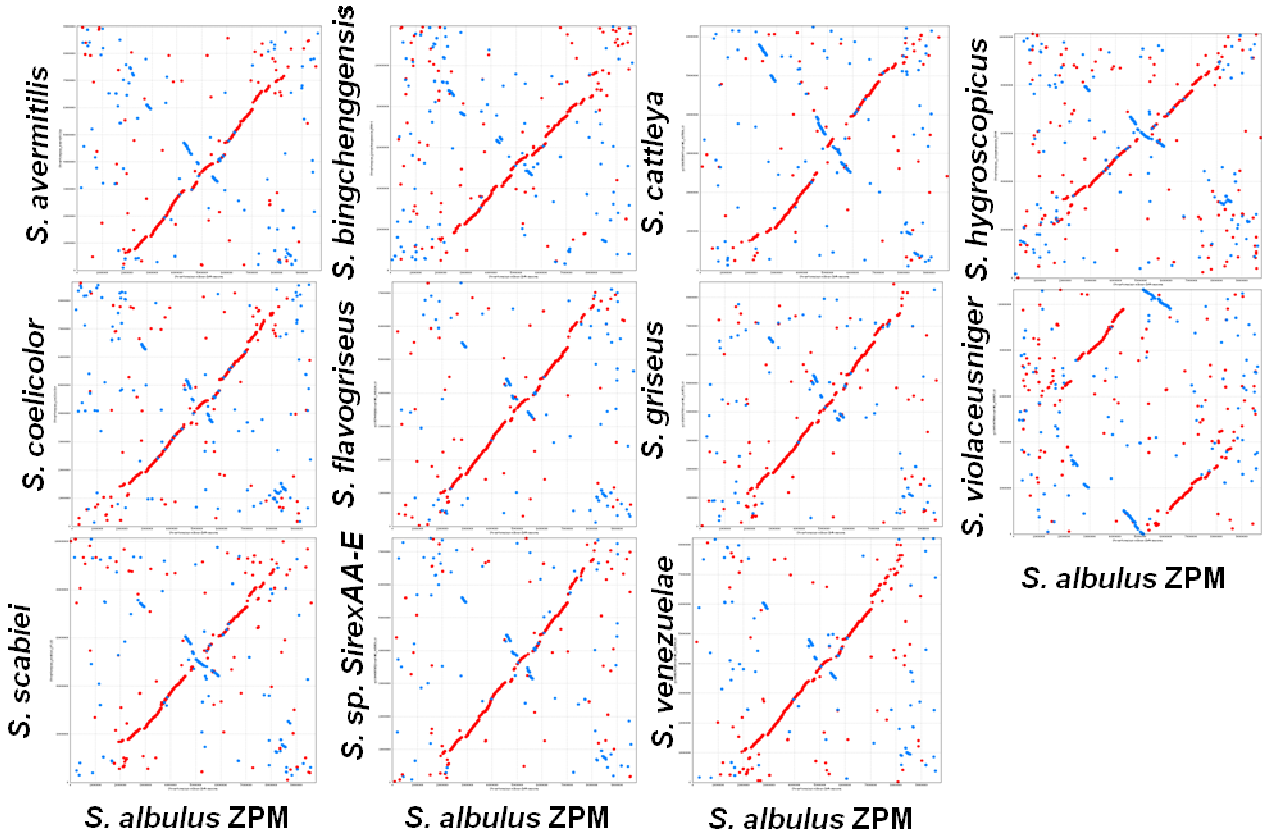

Figure S4. Dot plots of whole-genome comparisons of *S. albulus* ZPM with other *Streptomyces* species.

The whole-genome comparisons between *S. albulus* ZPM and *S. coelicolor, S. griseus, S. avermitilis, S. bingchenggensis, S. flavogriseus, S. sp. SirexAA-E, S. violaceusniger, S. cattleya, S. hygroscopicus, S. scabiei, S. clavuligerus* and *S. venezuelae* were performed and visualized using the Mummer program.

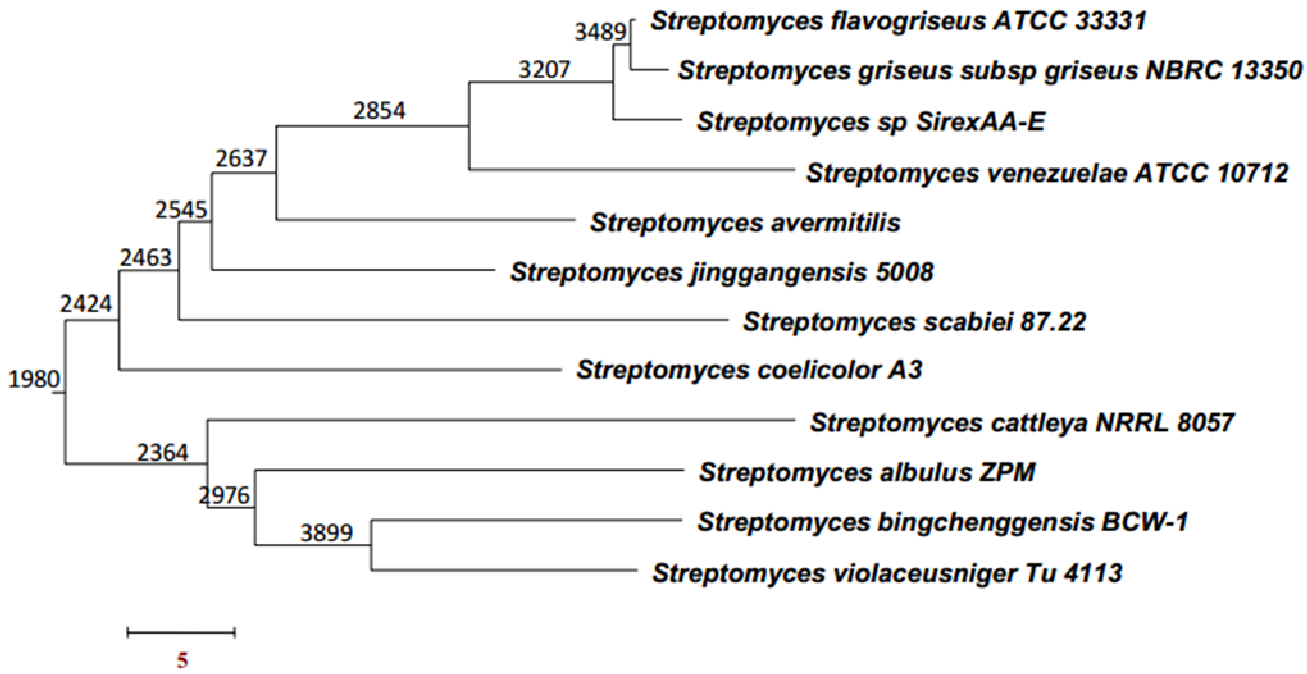

Figure S5. Lineage-specific gene analysis using a phylogenetic tree. The phylogenetic tree was constructed using the neighbor-joining method and was based on 16S rRNA sequences. The number of lineage-specific genes of each node is indicated on the evolutionary branches.

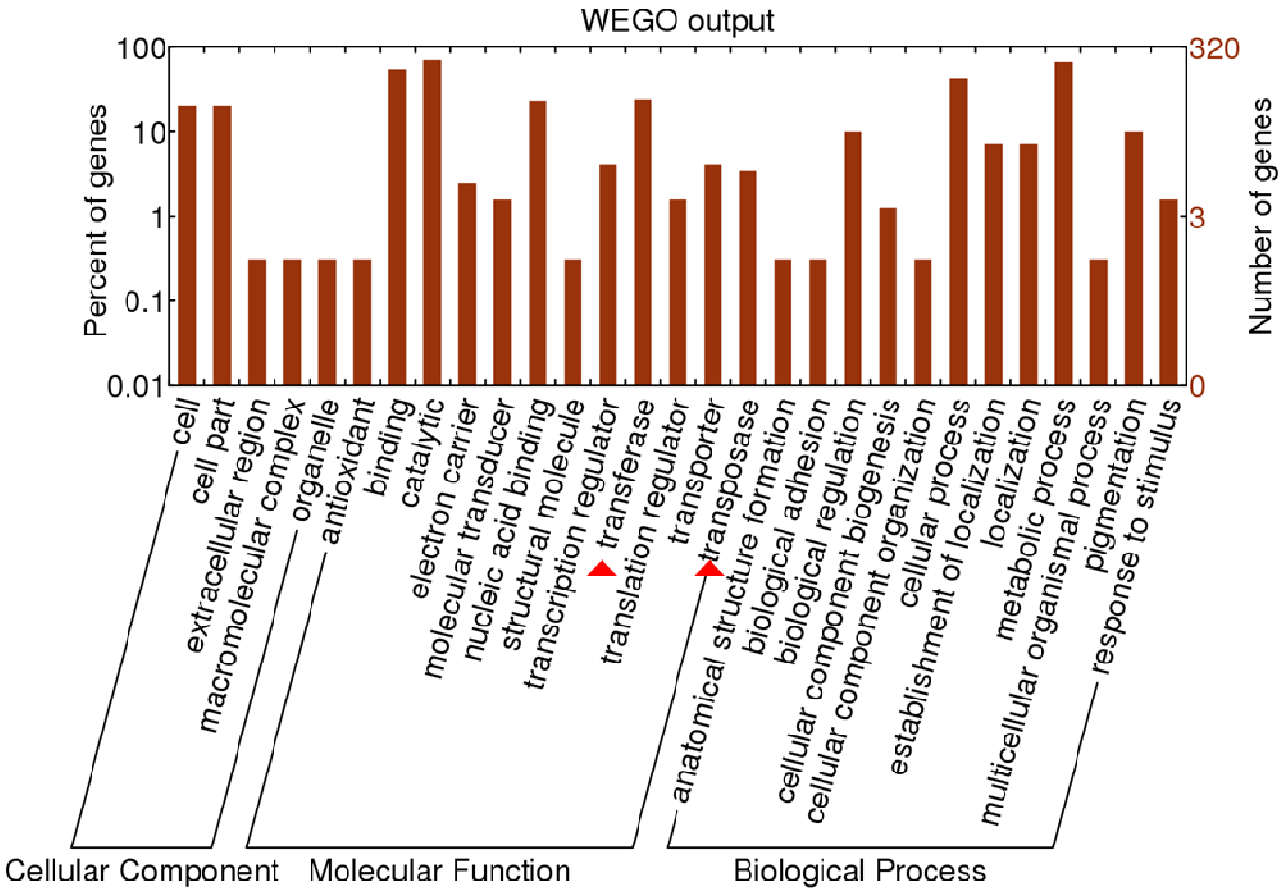

Figure S6. GO enrichment analysis of the specific genes in *S. albulus* ZPM. The classes of phosphopantetheinyl transferase (GO: 0016740) and DNA transposase (GO: 0004803) in the Molecular Function domain are enriched for the specific genes of *S. albulus* ZPM.

Table S1 General features of the chromosome of *S. albulus* ZPM

Component of the chromosome	Property
Total size	9,784,577 bp
Terminal inverted repeat	139,385 bp
G+C content	72.2%
RNA	76
rRNA (16S-23S-5S)	6
tRNA	70 (48 species)
ORFs	9073
Classified in at least one COG group	5816 (64.1%)
Having specific CDD hit(s)	6811 (75.0%)
Coding density	87.5%
Average CDS length	944

Table S2 Pan-genome analysis between *S. albulus* ZPM and other *Streptomyces* species

Organism	CDS	Core CDS	Var CDS	Strain-specific CDS	Core CDS (%)	Var CDS (%)	Strain-specific CDS (%)
S. albulus ZPM	9073	3985	2916	2172	43.92	32.14	23.94
**S. avermitilis* MA 4680	7582	3756	2826	1000	49.54	37.27	13.19
**S. cattleya* NRRL 8057	5822	3105	1467	1250	53.33	25.20	21.47
**S. coelicolor* A3 (2)	7825	3878	3077	870	49.56	39.32	11.12
**S. venezuelae* ATCC 10712	7453	3588	2718	1147	48.14	36.47	15.39
**S. scabiei* 88.02	8746	3889	3386	1471	44.47	38.71	16.82
**S. violaceusniger* Tu 4113	8482	4176	3357	949	49.23	39.58	11.19
**S. bingchenggensis* BCW-1	10023	4555	3628	1840	45.45	36.20	18.36
**S. sp* SirexAA-E	6357	3535	2405	417	55.61	37.83	06.56
**S. flavogriseus* ATCC 33331	6298	3480	2438	380	55.26	38.71	06.03
**S. hygroscopicus* 5008	8849	4014	3306	1529	45.36	37.36	17.28
**S. griseus*	7138	3626	2696	816	50.80	37.77	11.43

*Data were obtained from GenBank: *S. avermitilis* MA-4680 (NC_003155); *S. cattleya* NRRL 8057 (NC_017586); *S. coelicolor* A3 (2) (NC_003888); *S. venezuelae* ATCC 10712 (NC_018750); *S. scabiei* 88.22 (NC_013929); *S. violaceusniger* Tu 4113 (NC_015957); *S. bingchenggensis* BCW-1 (NC_016582); *S. sp* SirexAA-E (NC_015953); *S. flavogriseus* ATCC 33331 (NC_016114); *S. hygroscopicus* 5008 (NC_017765); and *S. griseus* 13350 (NC_010572).

Table S3. The yield of each strain in group-L and group-H

Group-L		Group-H	
No.	Yield (g/L)	No.	Yield (g/L)
1	0.2353	1	1.05916
2	0.2331	2	1.02336
3	0.2197	3	1.0167
4	0.213	4	1.007
5	0.2108	5	0.9786
6	0.1548	6	0.909
7	0.1257	7	0.8913
8	0.1212	8	0.8845
9	0.1167	9	0.8689
10	0.0943	10	0.8644
11	0.0781	11	0.8406
12	0.0541	12	0.8384
13	0.0451	13	0.8362
14	0.0339	14	0.8339
15	0.022	15	0.8317
16	0.0205	16	0.8205
17	0.016	17	0.8183
18	0.0131	18	0.8116
19	0.0086	19	0.8115
20	0.0071	20	0.8106
21	0.0019	21	0.8071
22	0	22	0.807
23	0	23	0.8062
24	0	24	0.8049
25	0	25	0.8039
26	0	26	0.8026
27	0	27	0.8026
28	0	28	0.8017
29	0	29	0.8004
30	0	30	0.7985

Table S4. All genetic variations identified in both group-H and group-L

No.	Chromosomal position (nt)	Ref.	Genetic variations	Frequencies of genetic variations		genetic variations of coding regions			genetic variations of non-coding regions	
				group-L	group-H	Affected genes	Type	Amino acid change	Nearest genes	Positions to genes
1	218244	T	C	100%	100%	SAZ_0187	Ns	E62G		
2	237916	T	G	3.27%	-				SAZ_0210,SAZ_0209	Up, Dn
3	270391	A	C	-	3.50%	SAZ_0249	Ns	Y72S		
4	279849	-	C	13.92%	17.12%				SAZ_0258	Dn
5	343098	A	C	3.04%	-	SAZ_0323	Ns	H259P		
6	400188	A	C	3.27%	-	SAZ_0379	Ns	H289P		
7	440541	A	C	3.16%	-				SAZ_0427,SAZ_0428	Up
8	455109	T	G	-	4.27%				SAZ_0440	Dn
9	505143	T	G	3.86%	-	SAZ_0496	Ns	T258P		
10	584310	T	G	3.29%	-	SAZ_0569	Ns	H275P		
11	635013	T	G	3.23%	-	SAZ_0612	Ns	H214P		
12	643291	G	C	6.09%	-				SAZ_0618,SAZ_0619	Up
13	717229	C	T	5.23%	-	SAZ_0692	Ns	R316H		
14	725634	C	G	8.65%	-	SAZ_0698	S	G371G		
15	725653	C	G	7.69%	-				SAZ_0698,SAZ_0699	Dn
16	750584	A	C	3.76%	-	SAZ_0722	S	A308A		
17	794578	G	C	4.89%	-				SAZ_0770,SAZ_0771	Dn
18	829350	G	A	99.12%	100%	SAZ_0807	S	L94L		
19	829393	C	G	98.96%	100%	SAZ_0807	Ns	R109G		
20	865573	T	C	98.89%	100%	SAZ_0848	Ns	K15E		
21	874584	A	C	-	3.76%				SAZ_0858	Dn
22	887570	A	C	-	3.50%	SAZ_0870	Ns	S15R		
23	890573	A	C	-	3.76%	SAZ_0877	Ns	Q272P		
24	900483	A	C	3.36%	7.01%				SAZ_0889,SAZ_0890,SAZ_0888	Up, Dn
25	982662	A	C	4.76%	-	SAZ_0972	Ns	T13P		
26	1019712	C	T	-	3.51%	SAZ_1010	Ns	G590D		
27	1023457	T	G	4.57%	-	SAZ_1011	Ns	V529G		
28	1023732	G	A	-	7.08%	SAZ_1011	Ns	V621I		

29	1026677	A	C	7.19%	7.53%	SAZ_1014	Ns	H77P		
30	1029236	T	G	3.02%	-	SAZ_1016	Ns	T307P		
31	1053304	T	G	3.38%	-	SAZ_1045	S	A63A		
32	1073978	A	C	-	3.11%	SAZ_1062	Ns	T527P		
33	1102650	C	G	6.11%	-				SAZ_1092,SAZ_1093	IR
34	1102657	C	G	9.62%	-				SAZ_1092,SAZ_1093	IR
35	1104927	G	C	8.33%	10.59%				SAZ_1096,SAZ_1095	Up, Dn
36	1104936	G	C	13.54%	13.64%				SAZ_1096,SAZ_1095	Up, Dn
37	1127129	A	C	-	3%	SAZ_1118	Ns	V1147G		
38	1152312	C	A	34.63%	29.25%	SAZ_1139	S	V141V		
39	1152351	C	G	32.02%	28.22%	SAZ_1139	S	A128A		
40	1152661	C	G	5.26%	6.39%	SAZ_1139	Ns	S25T		
41	1152666	G	A	3.35%	3.33%	SAZ_1139	S	D23D		
42	1155091	C	G	-	13.46%	SAZ_1141	S	P212P		
43	1195075	T	G	-	3.39%	SAZ_1165	Ns	T180P		
44	1223137	T	G	3.36%	-	SAZ_1195	Ns	N8T		
45	1257970	A	C	-	4.61%	SAZ_1227	Ns	T57P		
46	1258765	T	G	-	3.10%	SAZ_1229	Ns	N357H		
47	1321149	A	C	-	3.18%	SAZ_1284	Ns	V116G		
48	1352616	C	G	4.21%	-	SAZ_1312	S	A46A		
49	1428347	G	C	100%	100%	SAZ_1375	Ns	A1197G		
50	1428352	G	C	100%	100%	SAZ_1375	Ns	D1195E		
51	1429342	G	A	45%	38%	SAZ_1375	S	S865S		
52	1431395	T	C	4.97%	6.33%	SAZ_1375	Ns	Q181R		
53	1431598	G	A	13.87%	14.62%	SAZ_1375	S	D113D		
54	1431612	G	A	12.65%	12.65%	SAZ_1375	S	L109L		
55	1431639	G	A	8.93%	10.09%	SAZ_1375	S	L100L		
56	1431641	G	A	8.06%	8.72%	SAZ_1375	Ns	A99V		
57	1431654	G	C	3.66%	6.94%	SAZ_1375	Ns	P95A		
58	1431657	G	-	3.73%	3.93%	SAZ_1375	FS	R94fs		
59	1446132	T	G	-	3.88%	SAZ_1389	Ns	F331C		
60	1465995	-	G	7.04%	4.35%	SAZ_1406	FS	M5fs		
61	1479016	T	G	3.57%	-	SAZ_1419	Ns	T385P		
62	1540684	T	G	-	5.07%	SAZ_1473	Ns	T117P		
63	1602208	A	C	-	3.06%	SAZ_1530	Ns	T357P		

64	1614211	C	T	42.64%	41.84%	SAZ_1542	Ns	E243K		
65	1621069	C	G	100%	100%				SAZ_1549,SAZ_1550	Up
66	1621072	C	G	100%	98.73%				SAZ_1549,SAZ_1550	Up
67	1632665	C	T	5.08%	-	SAZ_1564	Ns	P103S		
68	1634603	T	G	16.42%	-				SAZ_1565,SAZ_1566	Up, Dn
69	1683141	G	C	7.64%	-				SAZ_1611	Up
70	1683155	G	C	6.21%	-				SAZ_1611	Up
71	1683161	G	C	14.89%	7.78%				SAZ_1611	Up
72	1685295	A	C	3.61%	-	SAZ_1614	Ns	T103P		
73	1703572	G	A	-	6.86%	SAZ_1623	S	A1612A		
74	1722049	-	GG	3.70%	4.92%				SAZ_1625,SAZ_1626	Dn
75	1764863	-	A	25.78%	20.20%	SAZ_1632	FS	P811fs		
76	1775973	C	G	3.62%	10.86%	SAZ_1636	S	G424G		
77	1787509	A	C	-	3.56%	SAZ_1645	Ns	V37G		
78	1813141	C	G	13.56%	-	SAZ_1669	Ns	A164P		
79	1813154	C	G	33.33%	-	SAZ_1669	S	P159P		
80	1826689	G	C	3.70%	-				SAZ_1683,SAZ_1682	Up, Dn
81	1850944	G	A	11.65%	22.09%	SAZ_1705	S	T434T		
82	1864425	T	G	-	6.08%	SAZ_1718	Ns	T134P		
83	1864816	C	A	42.67%	38.96%	SAZ_1718	S	P3P		
84	1908546	A	C	-	3.69%	SAZ_1760	Ns	V297G		
85	1974343	T	G	3.48%	-				SAZ_1829,SAZ_1828	Up, Dn
86	1978485	-	GA	-	12.50%	SAZ_1831	FS	T1140fs		
87	1978496	G	A	45.16%	59.62%	SAZ_1831	Ns	T1136I		
88	1978508	C	-	13.04%	19.61%	SAZ_1831	FS	G1132fs		
89	2029888	T	G	4.69%	-	SAZ_1881	Ns	H207P		
90	2057581	A	-	95.97%	92.72%				SAZ_1908	Up
91	2057601	T	C	100%	99.21%				SAZ_1908	Up
92	2057730	TGTTCG	-	77.85%	77.57%				SAZ_1908	Up
93	2073702	C	G	4.86%	-				SAZ_1918,SAZ_1917	Up, Dn
94	2079602	A	G	100%	100%	SAZ_1923	Ns	Q221R		
95	2079610	A	G	98.65%	100%	SAZ_1923	Ns	T224A		
96	2079620	G	T	98.28%	94%	SAZ_1923	Ns	G227V		
97	2135830	T	G	-	3.59%				SAZ_1973,SAZ_1974	Up, Dn
98	2146091	A	C	-	3.10%	SAZ_1981	Ns	V85G		

99	2188229	C	G	3.18%	-	SAZ_2020	S	P255P		
100	2189776	C	G	3.91%	-	SAZ_2021	Ns	A181G		
101	2199062	T	G	5.62%	7.38%	SAZ_2030	Ns	T483P		
102	2206251	C	T	31.62%	15.71%	SAZ_2036	Ns	R232Q		
103	2253313	T	G	-	4.46%				SAZ_2082	Dn
104	2253384	C	T	5.49%	-				SAZ_2082	Dn
105	2253414	T	C	4.18%	5.56%				SAZ_2082	Dn
106	2253429	C	A	-	3.43%				SAZ_2082,SAZ_2083	Dn
107	2253500	A	G	-	4.62%				SAZ_2082,SAZ_2083	Dn
108	2271512	A	C	3.78%	-				SAZ_2100,SAZ_2102,SAZ_2101	Up, Dn
109	2365560	G	C	6.81%	-	SAZ_2192	Ns	A106G		
110	2366219	G	T	3.68%	-	SAZ_2193	Ns	T7N		
111	2380515	G	C	98.46%	-	SAZ_2206	S	P29P		
112	2415088	G	A	15.32%	24.83%				SAZ_2241	Dn
113	2444422	G	-	-	23.08%	SAZ_2269	FS	R71fs		
114	2446251	T	G	-	5.30%				SAZ_2270,SAZ_2271	Up, Dn
115	2456829	T	G	-	3.29%	SAZ_2281	Ns	T445P		
116	2527518	G	A	4.25%	-				SAZ_2346,SAZ_2347	Up
117	2529583	G	C	6.43%	-				SAZ_2348,SAZ_2349	Dn
118	2563317	A	G	9.13%	6.35%	SAZ_2382	S	G937G		
119	2563406	G	T	86.67%	90.70%	SAZ_2382	Ns	P908T		
120	2563413	T	C	-	98%	SAZ_2382	S	S905S		
121	2563429	C	A	97.13%	99.39%	SAZ_2382	Ns	G900V		
122	2563446	C	G	99.56%	99.50%	SAZ_2382	S	G894G		
123	2563465	G	T	98.90%	99.57%	SAZ_2382	Ns	A888E		
124	2563478	T	C	100%	100%	SAZ_2382	Ns	M884V		
125	2563487	G	T	99.31%	100%	SAZ_2382	Ns	Q881K		
126	2563520	G	T	98.82%	99.49%	SAZ_2382	Ns	P870T		
127	2564046	A	C	37.22%	35.84%	SAZ_2382	S	G694G		
128	2564121	A	G	22.62%	26.28%	SAZ_2382	S	L669L		
129	2565574	C	G	32.21%	31.99%	SAZ_2382	Ns	G185A		
130	2578991	T	G	-	5.67%	SAZ_2395	Ns	T542P		
131	2601721	T	G	3.41%	3.59%				SAZ_2416,SAZ_2417	IR
132	2641081	A	C	-	3%	SAZ_2443	Ns	V33G		
133	2643120	A	C	-	3.88%	SAZ_2448	S	G149G		

134	2647165	T	G	99.69%	99.63%	SAZ_2458	Ns	I27M		
135	2670417	G	T	100%	98.08%				SAZ_2485,SAZ_2486	Up
136	2690067	C	G	4.94%	7.14%	SAZ_2501	Ns	R50P		
137	2713580	G	C	23.61%	16.39%				SAZ_2520,SAZ_2521	Dn
138	2713586	-	GA	7.03%	7.69%				SAZ_2520,SAZ_2521	Dn
139	2713603	-	C	10%	-				SAZ_2520,SAZ_2521	Dn
140	2713615	G	C	34.25%	36.54%				SAZ_2520,SAZ_2521	Dn
141	2760201	G	C	5.03%	-				SAZ_2563,SAZ_2564	Up
142	2760205	G	C	6.96%	7.74%				SAZ_2563,SAZ_2564	Up
143	2769273	T	G	6.83%	6.32%	SAZ_2573	Ns	V149G		
144	2769289	G	C	4.23%	6.25%	SAZ_2573	S	P154P		
145	2770127	A	C	4%	-	SAZ_2574	Ns	V258G		
146	2794384	A	G	-	3.54%	SAZ_2595	Ns	L53P		
147	2797669	T	C	4.02%	-	SAZ_2597	Ns	S8P		
148	2809067	C	A	99.49%	100%	SAZ_2610	Ns	A390S		
149	2809088	G	T	99.46%	100%	SAZ_2610	Ns	Q383K		
150	2809094	G	T	100%	100%	SAZ_2610	Ns	R381S		
151	2809675	A	T	99.18%	98.65%	SAZ_2610	Ns	V187D		
152	2809689	G	C	100%	100%	SAZ_2610	Ns	F182L		
153	2809692	G	C	100%	100%	SAZ_2610	Ns	D181E		
154	2809695	A	G	100%	98.81%	SAZ_2610	S	D180D		
155	2809716	T	G	100%	97.87%	SAZ_2610	S	I173I		
156	2809724	A	G	97.90%	98.98%	SAZ_2610	Ns	W171R		
157	2809727	T	G	100%	98.94%	SAZ_2610	Ns	N170H		
158	2809752	G	C	100%	100%	SAZ_2610	S	A161A		
159	2824776	C	G	7.77%	-	SAZ_2625	Ns	A756P		
160	2824785	T	G	20.69%	-	SAZ_2625	Ns	T753P		
161	2824790	C	G	17.33%	19.67%	SAZ_2625	Ns	R751P		
162	2824796	T	G	6.93%	-	SAZ_2625	Ns	H749P		
163	2825154	C	G	4.94%	6.06%	SAZ_2625	Ns	A630P		
164	2852711	T	G	3.63%	-	SAZ_2647	Ns	T352P		
165	2871855	T	G	9.58%	10.07%	SAZ_2662	Ns	T216P		
166	2933742	C	A	36.68%	27.66%	SAZ_2721	Ns	V170F		
167	2943953	A	-	94.84%	94.13%				SAZ_2725	Up
168	2944102	TGTTCG	-	77.84%	80.24%				SAZ_2725	Up

169	2955650	C	A	3.41%	3.76%	SAZ_2735	Ns	A55S		
170	2964936	G	T	100%	100%	SAZ_2744	Ns	P118H		
171	3033409	T	G	-	6.67%	SAZ_2816	Ns	T97P		
172	3050361	G	C	-	3.79%				SAZ_2833,SAZ_2834	Up, Dn
173	3105319	A	G	8.21%	-				SAZ_2885,SAZ_2884	Up, Dn
174	3107253	G	-	3.58%	-				SAZ_2887,SAZ_2888	Up, Dn
175	3131029	G	C	6.10%	-	SAZ_2908	Ns	A42P		
176	3152310	G	C	9.45%	-	SAZ_2922	Ns	A7P		
177	3157805	T	G	-	3.30%	SAZ_2928	Ns	S89R		
178	3158238	A	C	98.97%	100%				SAZ_2928,SAZ_2929	Up
179	3158254	C	A	98.15%	100%	SAZ_2929	Ns	L4M		
180	3158271	C	A	100%	98.86%	SAZ_2929	S	S9S		
181	3158301	A	G	98.75%	100%	SAZ_2929	Ns	I19M		
182	3158309	C	A	100%	100%	SAZ_2929	Ns	A22D		
183	3158316	A	G	100%	-	SAZ_2929	S	R24R		
184	3158320	G	T	100%	-	SAZ_2929	Ns	V26F		
185	3162544	C	G	-	4.58%	SAZ_2931	S	P181P		
186	3164873	C	G	3.73%	4.59%	SAZ_2932	Ns	A360P		
187	3167920	C	G	4.40%	8.45%	SAZ_2934	Ns	A281G		
188	3169895	T	C	3.46%	8.24%	SAZ_2935	Ns	E702G		
189	3210749	C	T	5.03%	-	SAZ_2977	S	P52P		
190	3273560	G	C	95%	-	SAZ_3031	Ns	A99G		
191	3273581	G	C	95.59%	100%	SAZ_3031	Ns	P92R		
192	3273608	G	C	99.32%	99.43%	SAZ_3031	Ns	A83G		
193	3304392	C	G	5.65%	9.02%				SAZ_3061,SAZ_3062	Up
194	3312913	A	T	6.63%	4.17%				SAZ_3069	Dn
195	3334355	G	C	3.10%	3.77%				SAZ_3090,SAZ_3091	Dn
196	3334360	G	C	8.06%	10.78%				SAZ_3090,SAZ_3091	Dn
197	3379969	T	G	4.20%	4.65%	SAZ_3134	Ns	H445P		
198	3381337	G	A	100%	100%				SAZ_3134	Up
199	3386874	A	C	-	7.20%	SAZ_3141	Ns	F119C		
200	3387184	T	G	3.06%	8.51%	SAZ_3141	Ns	T16P		
201	3387193	T	G	-	4.40%	SAZ_3141	Ns	T13P		
202	3391862	G	C	29.41%	31.25%				SAZ_3146,SAZ_3145	Up, Dn
203	3391866	G	C	20.34%	16.13%				SAZ_3146,SAZ_3145	Up, Dn

204	3391870	T	C	-	19.70%				SAZ_3146,SAZ_3145	Up, Dn
205	3408950	A	C	-	4.11%	SAZ_3160	Ns	V303G		
206	3409834	C	G	-	8.82%	SAZ_3160	S	P8P		
207	3409842	C	G	11.67%	-	SAZ_3160	Ns	A6P		
208	3409878	C	G	-	9.41%				SAZ_3160,SAZ_3161	Up, Dn
209	3409885	C	G	-	9.76%				SAZ_3160,SAZ_3161	Up, Dn
210	3438760	A	C	-	3.07%	SAZ_3190	Ns	L345R		
211	3443728	G	C	5.30%	-				SAZ_3193,SAZ_3194	Up
212	3443734	G	C	4.05%	-				SAZ_3193,SAZ_3194	Up
213	3501824	GAT	-	21.62%	18.42%	SAZ_3258	nonFS	361_361del		
214	3507525	C	G	5.19%	-				SAZ_3263	Up
215	3507529	C	G	10.40%	-				SAZ_3263	Up
216	3508510	C	T	98.80%	99.32%				SAZ_3263,SAZ_3264	Dn
217	3508535	-	T	32.14%	-				SAZ_3263,SAZ_3264	Dn
218	3508553	C	G	100%	15%				SAZ_3263,SAZ_3264	Dn
219	3508569	G	C	100%	100%				SAZ_3263,SAZ_3264	Dn
220	3526694	C	G	100%	98.53%	SAZ_3282	Ns	V262L		
221	3539327	T	G	3.15%	-	SAZ_3299	Ns	T680P		
222	3547063	T	G	-	3.29%	SAZ_3304	Ns	V488G		
223	3559196	T	G	10.13%	-	SAZ_3318	Ns	H42P		
224	3569010	A	C	-	7.22%	SAZ_3328	Ns	H202P		
225	3569290	G	C	7.87%	-	SAZ_3328	S	P295P		
226	3569296	G	C	7.76%	5.56%	SAZ_3328	S	P297P		
227	3607011	A	C	3.11%	-	SAZ_3363	Ns	V213G		
228	3614856	T	G	-	3.60%				SAZ_3370,SAZ_3371	Dn
229	3614861	T	G	3.93%	-				SAZ_3370,SAZ_3371	Dn
230	3622775	A	C	-	4.21%	SAZ_3378	Ns	T663P		
231	3623408	A	C	3.24%	-	SAZ_3378	Ns	T874P		
232	3628030	G	C	7.69%	6.67%	SAZ_3380	Ns	R213P		
233	3628039	G	C	6.08%	12.90%	SAZ_3380	Ns	R216P		
234	3631842	G	C	18.10%	13.10%				SAZ_3386,SAZ_3385	Up, Dn
235	3640547	T	G	4.97%	-				SAZ_3393,SAZ_3394	Up, Dn
236	3651736	C	G	3.91%	3.29%	SAZ_3402	Ns	A10P		
237	3659892	C	T	3.37%	-				SAZ_3412,SAZ_3413	Dn
238	3660590	T	G	-	5.52%	SAZ_3413	Ns	T180P		

239	3661216	C	G	6.02%	8.20%				SAZ_3413	Up
240	3664997	T	G	3.49%	-	SAZ_3418	Ns	V174G		
241	3676800	A	G	98.57%	98.41%				SAZ_3427,SAZ_3426	Up, Dn
242	3680271	G	C	5.61%	6.04%				SAZ_3430,SAZ_3429	Up, Dn
243	3680278	G	C	10.15%	11.27%				SAZ_3430,SAZ_3429	Up, Dn
244	3680281	G	C	5.76%	6.34%				SAZ_3430,SAZ_3429	Up, Dn
245	3680294	G	C	7.88%	4.05%				SAZ_3430,SAZ_3429	Up, Dn
246	3686020	G	C	3.85%	4.72%				SAZ_3435,SAZ_3434	Up, Dn
247	3694482	G	C	100%	100%				SAZ_3440,SAZ_3441	Up, Dn
248	3748290	G	-	5%	-	SAZ_3494	FS	T67fs		
249	3748490	T	G	6.80%	9.97%	SAZ_3494	Ns	M1L		
250	3760667	C	G	4.23%	-	SAZ_3504	S	P50P		
251	3765571	T	C	99.55%	99.47%	SAZ_3509	S	Q233Q		
252	3789710	G	C	3.46%	3.26%	SAZ_3532	Ns	R34G		
253	3838267	T	-	36.49%	-				SAZ_3573,SAZ_3572	Up, Dn
254	3846539	T	G	-	5.96%				SAZ_3578,SAZ_3579	Dn
255	3857357	T	G	-	3.46%	SAZ_3587	Ns	E19A		
256	3869592	T	C	10.64%	9.24%	SAZ_3597	Ns	L421P		
257	3869598	T	C	9.25%	9.74%	SAZ_3597	Ns	L423P		
258	3869601	G	C	8.36%	7.17%	SAZ_3597	Ns	R424P		
259	3869607	T	C	5.88%	5.42%	SAZ_3597	Ns	L426P		
260	3872667	G	C	100%	98.33%				SAZ_3601	Dn
261	3873609	T	G	5.07%	4.33%	SAZ_3602	Ns	V214G		
262	3882105	G	A	50.77%	38.03%	SAZ_3609	S	G106G		
263	3882135	G	C	65.85%	62.82%	SAZ_3609	Ns	Q116H		
264	3882138	C	T	66.13%	62.65%	SAZ_3609	S	G117G		
265	3882156	G	T	78.36%	75.26%	SAZ_3609	S	P123P		
266	3882165	G	C	81.38%	79.08%	SAZ_3609	S	P126P		
267	3882198	C	A	7.59%	6.60%	SAZ_3609	S	G137G		
268	3892351	G	C	4.27%	-	SAZ_3618	Ns	A147G		
269	3894107	G	C	8.88%	8.68%	SAZ_3619	S	G153G		
270	3894111	G	C	7.03%	5.88%	SAZ_3619	Ns	A152G		
271	3894115	G	C	6.37%	5.02%	SAZ_3619	Ns	R151G		
272	3894119	G	C	4.80%	3.91%	SAZ_3619	S	R149R		
273	3925048	C	T	98.91%	98.56%				SAZ_3645,SAZ_3646	Up

274	3925060	C	G	100%	99.60%				SAZ_3645,SAZ_3646	Up
275	3925084	C	A	99.42%	98.80%				SAZ_3645,SAZ_3646	Up
276	3925089	A	T	99.34%	99.35%				SAZ_3645,SAZ_3646	Up
277	3925093	C	A	100%	99.25%				SAZ_3645,SAZ_3646	Up
278	3925170	G	C	4.79%	-				SAZ_3646	Up
279	3959063	A	C	6.81%	4.48%				SAZ_3668,SAZ_3667	Up, Dn
280	4030865	C	G	4.85%	3.79%				SAZ_3727	Dn
281	4043008	G	T	100%	100%				SAZ_3738,SAZ_3739	IR
282	4043014	G	T	100%	100%				SAZ_3738,SAZ_3739	IR
283	4043047	G	T	99.42%	99.39%				SAZ_3738,SAZ_3739	IR
284	4043084	A	G	100%	100%				SAZ_3738,SAZ_3739	IR
285	4043180	A	T	20%	22.06%				SAZ_3738,SAZ_3739	IR
286	4043227	G	T	25.41%	24.87%				SAZ_3738,SAZ_3739	IR
287	4043235	C	T	25.99%	28.06%				SAZ_3738,SAZ_3739	IR
288	4043304	-	G	26.89%	33.61%				SAZ_3739	Dn
289	4043381	A	G	27.47%	26.76%				SAZ_3739	Dn
290	4043455	C	G	14.40%	19.49%				SAZ_3739	Dn
291	4078994	T	G	3.12%	-				SAZ_3778,SAZ_3777	Up, Dn
292	4083090	C	T	99.25%	99.64%	SAZ_3781	Ns	P43L		
293	4084423	A	T	46.81%	41.19%	SAZ_3783	Ns	V481E		
294	4133316	G	C	10.75%	12.43%	SAZ_3832	Ns	R61G		
295	4133385	G	C	4.67%	4.90%	SAZ_3832	Ns	R38G		
296	4134391	A	C	3.49%	3.21%	SAZ_3833	Ns	T308P		
297	4138640	C	A	8.07%	4.61%				SAZ_3836	Dn
298	4138646	G	A	4.71%	5.48%				SAZ_3836	Dn
299	4156743	T	G	-	3.91%	SAZ_3850,SAZ_385	Ns	N45T		
300	4161326	C	G	6.30%	3.57%	SAZ_3860	S	G74G		
301	4161329	C	G	10.24%	9.50%	SAZ_3860	S	G75G		
302	4161336	C	G	11.67%	12.96%	SAZ_3860	Ns	R78G		
303	4161341	C	G	9.52%	11.46%	SAZ_3860	S	G79G		
304	4167729	C	-	57.45%	65%				SAZ_3862,SAZ_3863	Dn
305	4167743	-	T	13.75%	17.50%				SAZ_3862,SAZ_3863	Dn
306	4168364	G	C	32.81%	34%	SAZ_3863	Ns	R364G		
307	4168367	A	C	15.25%	-	SAZ_3863	Ns	W363G		
308	4168371	G	C	24.68%	28.81%	SAZ_3863	S	G361G		

309	4168377	G	C	15.28%	15.62%	SAZ_3863	S	G359G		
310	4183545	G	T	-	7.49%	SAZ_3874	Ns	P1341T		
311	4198141	C	A	99.01%	97.67%	SAZ_3885	Ns	G25V		
312	4198147	C	A	98.67%	96.77%	SAZ_3885	Ns	G23V		
313	4211245	A	-	93.66%	93.20%				SAZ_3895,SAZ_3896	IR
314	4211394	TGTTCG	-	79.19%	77.44%				SAZ_3895,SAZ_3896	IR
315	4220198	-	A	5.29%	-				SAZ_3896,SAZ_3897	IR
316	4220236	A	G	12.66%	-				SAZ_3896,SAZ_3897	IR
317	4238490	G	A	-	5.53%				SAZ_3911	Up
318	4272356	T	G	-	3.34%				SAZ_3945	Dn
319	4288943	C	G	4.68%	4%				SAZ_3961,SAZ_3962	Up, Dn
320	4315439	G	T	99.24%	100%	SAZ_3986	Ns	R54M		
321	4315453	G	T	99.61%	99.12%	SAZ_3986	Ns	A59S		
322	4315475	G	A	98.65%	99.51%	SAZ_3986	Ns	R66H		
323	4315498	C	A	100%	100%	SAZ_3986	Ns	L74I		
324	4315520	C	T	97.35%	98.45%	SAZ_3986	Ns	T81I		
325	4315537	C	A	100%	-	SAZ_3986	Ns	P87T		
326	4315543	A	C	100%	100%	SAZ_3986	Ns	M89L		
327	4315546	C	A	100%	-	SAZ_3986	Ns	P90T		
328	4315547	C	A	100%	-	SAZ_3986	Ns	P90Q		
329	4319510	C	G	-	4.18%				SAZ_3989,SAZ_3990	Dn
330	4348859	G	C	9.36%	10.12%	SAZ_4016	S	G32G		
331	4348872	T	C	12.59%	16.15%	SAZ_4016	Ns	W37R		
332	4348968	G	A	-	3.07%	SAZ_4016	Ns	V69I		
333	4348995	A	C	-	3.63%	SAZ_4016	S	R78R		
334	4349097	T	C	3.37%	-	SAZ_4016	Ns	W112R		
335	4349108	C	A	3.40%	-	SAZ_4016	S	S115S		
336	4349229	A	C	-	3.47%				SAZ_4016,SAZ_4017	Dn
337	4368223	C	A	99.04%	100%				SAZ_4030	Dn
338	4368226	C	A	98.95%	100%				SAZ_4030	Dn
339	4368231	G	-	6.14%	10.26%				SAZ_4030	Dn
340	4368257	C	-	75.53%	78.16%				SAZ_4030	Dn
341	4368269	C	T	100%	100%				SAZ_4030	Dn
342	4388418	A	C	-	3.95%				SAZ_4046	Up
343	4389340	G	C	-	5.37%	SAZ_4046	S	P230P		

344	4405089	-	CAGC	-	3.40%				SAZ_4062,SAZ_4063	Up, Dn
345	4422002	G	T	47.61%	41.42%				SAZ_4077,SAZ_4078	IR
346	4432377	A	C	4.37%	6.51%				SAZ_4093,SAZ_4094	Up, Dn
347	4432382	G	C	9.77%	12.93%				SAZ_4093,SAZ_4094	Up, Dn
348	4432388	G	C	7.52%	8.16%				SAZ_4093,SAZ_4094	Up, Dn
349	4432393	G	C	-	3.92%				SAZ_4093,SAZ_4094	Up, Dn
350	4439509	T	C	-	5.05%	SAZ_4102	Ns	T623A		
351	4442880	A	C	-	3.16%	SAZ_4103	Ns	T420P		
352	4446996	C	A	99.46%	98.54%				SAZ_4107,SAZ_4108	IR
353	4447003	C	A	99.02%	100%				SAZ_4107,SAZ_4108	IR
354	4447041	G	T	100%	98.51%				SAZ_4108	Up
355	4447048	C	A	97.79%	99.04%				SAZ_4108	Up
356	4448580	T	G	-	10.11%				SAZ_4109,SAZ_4110	IR
357	4448586	T	G	9.76%	7.95%				SAZ_4109,SAZ_4110	IR
358	4448593	T	G	-	6.25%				SAZ_4109,SAZ_4110	IR
359	4448598	T	G	-	8.33%				SAZ_4109,SAZ_4110	IR
360	4450930	T	G	-	6.48%	SAZ_4111	Ns	V364G		
361	4450933	C	G	3.60%	4%	SAZ_4111	Ns	A365G		
362	4450937	C	G	4.27%	6.13%	SAZ_4111	S	G366G		
363	4451285	C	G	10.08%	10.88%				SAZ_4111,SAZ_4112	Dn
364	4456220	A	C	-	3.25%				SAZ_4115,SAZ_4116	Dn
365	4461545	A	C	9.84%	7.69%				SAZ_4120,SAZ_4119	Up, Dn
366	4461551	A	C	5.41%	8.67%				SAZ_4120,SAZ_4119	Up, Dn
367	4474705	G	A	3.98%	-	SAZ_4132	Ns	A132V		
368	4484704	A	C	-	3.51%	SAZ_4143	S	G119G		
369	4512619	G	C	4.26%	6.55%				SAZ_4171,SAZ_4170	Up, Dn
370	4512633	-	CGAAA	12.02%	-				SAZ_4171,SAZ_4170	Up, Dn
371	4512638	-	GT	6.86%	4.89%				SAZ_4171,SAZ_4170	Up, Dn
372	4523380	T	G	-	8.14%				SAZ_4178,SAZ_4179	Dn
373	4523390	T	G	16.67%	-				SAZ_4178,SAZ_4179	Dn
374	4523395	C	G	16.87%	-				SAZ_4178,SAZ_4179	Dn
375	4564295	G	C	6.63%	5.61%				SAZ_4216,SAZ_4215	Up, Dn
376	4564299	G	C	4.83%	4.71%				SAZ_4216,SAZ_4215	Up, Dn
377	4565125	C	T	-	5.25%	SAZ_4216	S	V267V		
378	4566051	A	C	-	3.49%	SAZ_4218	Ns	W144G		

379	4566794	T	G	81.82%	80.46%				SAZ_4219	Up
380	4566820	G	T	100%	100%				SAZ_4219	Up
381	4571147	A	C	5.43%	-				SAZ_4222,SAZ_4223	Up, Dn
382	4571153	G	C	6.80%	5.38%				SAZ_4222,SAZ_4223	Up, Dn
383	4615553	A	C	3.41%	6.17%	SAZ_4262	StopLoss	*330S		
384	4615557	C	A	39.91%	50%				SAZ_4262,SAZ_4263	Dn
385	4615562	C	G	5.83%	-				SAZ_4262,SAZ_4263	Dn
386	4615564	A	C	3.81%	3.81%				SAZ_4262,SAZ_4263	Dn
387	4623190	A	C	3.15%	-	SAZ_4270	Ns	M1R		
388	4678173	C	G	22.73%	10.67%	SAZ_4336	Ns	A553P		
389	4692608	-	G	17.48%	20%				SAZ_4348	UTR5
390	4743050	C	T	-	3.26%				SAZ_4400	Dn
391	4744698	G	A	4.85%	3.07%				SAZ_4401,SAZ_4402	IR
392	4749899	T	G	3.31%	3.93%				SAZ_4405,SAZ_4406	Dn
393	4758240	G	-	-	4.38%				SAZ_4412,SAZ_4413	Up
394	4779815	T	G	-	3.11%	SAZ_4432	Ns	T21P		
395	4793112	A	C	-	3.68%				SAZ_4445,SAZ_4446	Up, Dn
396	4793120	A	C	5.10%	5.75%				SAZ_4445,SAZ_4446	Up, Dn
397	4793567	C	T	34.39%	29.67%	SAZ_4446	S	L272L		
398	4796460	A	-	92.90%	92.45%				SAZ_4448	Up
399	4796482	T	C	99.54%	99.62%				SAZ_4448	Up
400	4796609	TGTTCG	-	68.99%	63.92%				SAZ_4448	Up
401	4830172	A	C	3.12%	4.65%	SAZ_4470	Ns	V223G		
402	4834424	T	G	5.17%	5.56%	SAZ_4475	Ns	T74P		
403	4857455	C	G	3.76%	3.35%	SAZ_4495	S	A20A		
404	4894220	C	G	-	4.62%	SAZ_4528	Ns	A882P		
405	4900369	C	G	-	6.69%	SAZ_4534	Ns	G205A		
406	4906277	C	T	99.38%	99.42%				SAZ_4537	Dn
407	4906288	C	A	99.53%	100%				SAZ_4537	Dn
408	4906316	G	T	98.38%	100%				SAZ_4537	Dn
409	4906325	G	T	98.75%	99.35%				SAZ_4537	Dn
410	4906519	G	C	99.68%	99.73%				SAZ_4538	Up
411	4937034	C	G	5.57%	4.74%	SAZ_4571	Ns	G584R		
412	4937039	C	G	3.75%	3.80%	SAZ_4571	Ns	R582P		
413	4937044	C	G	7.71%	6.59%	SAZ_4571	S	P580P		

414	4937052	T	G	-	3.73%	SAZ_4571	Ns	T578P		
415	4942967	T	G	3.10%	-	SAZ_4578	Ns	Y40D		
416	4955156	G	C	3.37%	5.86%	SAZ_4593	Ns	R29P		
417	4955160	G	C	-	3.31%	SAZ_4593	S	P30P		
418	4974877	C	G	-	10.84%				SAZ_4609,SAZ_4610	Up, Dn
419	4978962	T	G	3.59%	5.08%	SAZ_4616	Ns	V71G		
420	5059134	A	C	7.01%	3.40%	SAZ_4686	Ns	V58G		
421	5065540	G	C	4.28%	5.73%	SAZ_4693	Ns	A6P		
422	5090774	T	G	-	3.78%	SAZ_4715	Ns	T238P		
423	5091855	A	C	3.09%	3.14%	SAZ_4716	Ns	V95G		
424	5092877	C	G	-	6.67%	SAZ_4718	S	P69P		
425	5092882	C	G	7.14%	12.71%	SAZ_4718	Ns	A68P		
426	5092885	T	G	7.41%	7.46%	SAZ_4718	Ns	T67P		
427	5092897	C	G	4.88%	-	SAZ_4718	Ns	A63P		
428	5097505	-	G	3.70%	4.87%				SAZ_4724	Dn
429	5099653	C	A	98.70%	100%	SAZ_4726	Ns	P362T		
430	5124410	A	C	3.53%	6.60%				SAZ_4748,SAZ_4749	Dn
431	5212135	A	G	6.54%	3.35%				SAZ_4827,SAZ_4828	Up, Dn
432	5212141	C	G	5.74%	4.87%				SAZ_4827,SAZ_4828	Up, Dn
433	5212147	C	G	4.76%	3.90%				SAZ_4827,SAZ_4828	Up, Dn
434	5212151	A	G	7.92%	4.74%				SAZ_4827,SAZ_4828	Up, Dn
435	5212157	A	G	-	3.45%				SAZ_4827,SAZ_4828	Up, Dn
436	5238716	G	C	-	7.09%				SAZ_4856,SAZ_4855	Up, Dn
437	5238720	G	C	4.49%	7.04%				SAZ_4856,SAZ_4855	Up, Dn
438	5238730	G	C	-	3.72%				SAZ_4856,SAZ_4855	Up, Dn
439	5259624	C	G	11.65%	12.64%	SAZ_4874	S	G310G		
440	5261377	C	G	9.20%	-	SAZ_4876	S	P54P		
441	5261382	C	G	17.65%	12.99%	SAZ_4876	Ns	A53P		
442	5261637	T	G	5.04%	4.15%				SAZ_4876	Up
443	5293162	C	G	-	6.11%	SAZ_4904	S	G300G		
444	5301993	G	T	3.06%	-	SAZ_4911	Ns	G188W		
445	5302002	C	G	14.16%	10%	SAZ_4911	Ns	L191V		
446	5319634	T	G	5.62%	-	SAZ_4931	S	P153P		
447	5319639	C	G	4.66%	4.42%	SAZ_4931	Ns	A152P		
448	5319643	C	G	-	4.49%	SAZ_4931	S	P150P		

449	5319648	C	G	7.69%	7.95%	SAZ_4931	Ns	E149Q		
450	5322272	T	C	4.49%	-				SAZ_4933,SAZ_4934	Up, Dn
451	5357670	C	T	49.38%	35.73%	SAZ_4975	Ns	A235V		
452	5373421	C	G	-	3.45%				SAZ_4989,SAZ_4990	Up, Dn
453	5373425	C	G	3.59%	4.09%				SAZ_4989,SAZ_4990	Up, Dn
454	5399901	A	C	4.17%	-	SAZ_5014	Ns	V294G		
455	5440405	A	C	9.09%	-				SAZ_5050,SAZ_5051	Dn
456	5506175	T	G	-	9.20%				SAZ_5103	Up
457	5506178	T	G	-	8.49%				SAZ_5103	Up
458	5506187	T	G	7.29%	7.22%				SAZ_5103	Up
459	5506193	C	G	6.09%	6.84%				SAZ_5103	Up
460	5534991	T	C	8.55%	-				SAZ_5140	Dn
461	5535010	-	C	6.52%	-				SAZ_5140,SAZ_5141	IR
462	5535758	-	G	9.55%	9.02%				SAZ_5141	Dn
463	5535982	G	T	8.46%	10.09%				SAZ_5141,SAZ_5142	IR
464	5562278	T	G	98.33%	99.17%				SAZ_5166,SAZ_5167	Dn
465	5562283	T	G	100%	100%				SAZ_5166,SAZ_5167	Dn
466	5562311	C	G	99.41%	99.46%				SAZ_5166,SAZ_5167	Dn
467	5562319	C	G	98.56%	99.56%				SAZ_5166,SAZ_5167	Dn
468	5584341	C	G	9.09%	6.60%	SAZ_5188	Ns	A243P		
469	5594749	C	T	-	16.08%	SAZ_5199	Ns	E152K		
470	5615628	G	A	45.24%	43.62%	SAZ_5219	S	L204L		
471	5622375	C	A	98.28%	-				SAZ_5225	Up
472	5629416	ACGAAA	-	84.14%	86.71%				SAZ_5228	Dn
473	5657433	T	C	3.35%	-				SAZ_5253,SAZ_5252	Up, Dn
474	5657517	T	C	-	4.26%				SAZ_5253	Up
475	5657528	G	A	-	4.65%				SAZ_5253	Up
476	5657552	T	A	3.34%	6.84%				SAZ_5253	Up
477	5657738	A	-	4.38%	8.52%				SAZ_5253,SAZ_5254	IR
478	5657742	CGCC	-	4.32%	8.03%				SAZ_5253,SAZ_5254	IR
479	5657772	A	C	3.24%	6.96%				SAZ_5253,SAZ_5254	IR
480	5657779	A	G	-	4.80%				SAZ_5253,SAZ_5254	IR
481	5680873	C	G	100%	100%	SAZ_5280,SAZ_5281	Ns	P68A		
482	5680891	-	T	21.33%	31.43%	SAZ_5280,SAZ_5281	FS	A74fs		
483	5689051	A	C	3.19%	-	SAZ_5290	Ns	V144G		

484	5777139	C	G	3.85%	-				SAZ_5392,SAZ_5393	Up
485	5799103	G	C	8.99%	11.90%				SAZ_5416,SAZ_5415	Up, Dn
486	5799107	G	C	8%	6.80%				SAZ_5416,SAZ_5415	Up, Dn
487	5799116	G	C	5.45%	6.23%				SAZ_5416,SAZ_5415	Up, Dn
488	5804556	G	C	6.63%	6.25%				SAZ_5422	Up
489	5807226	C	G	9.09%	11.48%	SAZ_5423	Ns	A123P		
490	5837662	C	G	99.48%	99.52%	SAZ_5452	Ns	V327L		
491	5840154	A	C	-	6.76%	SAZ_5454	S	P19P		
492	5866641	G	T	-	100%	SAZ_5477	Ns	G73V		
493	5867925	C	T	4.86%	-	SAZ_5477	Ns	P501L		
494	5868749	A	C	4.98%	6.72%	SAZ_5477	Ns	T776P		
495	5868752	G	C	4.03%	7.38%	SAZ_5477	Ns	A777P		
496	5875236	G	A	5.95%	-	SAZ_5482	Ns	V244M		
497	5884232	C	T	98.92%	100%				SAZ_5488	Dn
498	5884250	C	T	99.17%	100%				SAZ_5488	Dn
499	5884256	-	C	17.65%	-				SAZ_5488	Dn
500	5884269	-	G	85%	80%				SAZ_5488	Dn
501	5884299	A	C	100%	98.39%				SAZ_5488	Dn
502	5884318	G	T	97.75%	99.09%				SAZ_5488	Dn
503	5884335	G	T	97.44%	99.31%				SAZ_5488	Dn
504	5884353	C	T	99.19%	98.67%				SAZ_5488	Dn
505	5884375	C	G	100%	100%				SAZ_5488	Dn
506	5884394	C	G	100%	100%				SAZ_5488	Dn
507	5884436	C	G	100%	-				SAZ_5488	Dn
508	5884455	G	A	98.75%	100%				SAZ_5488,SAZ_5489	IR
509	5884466	T	G	100%	100%				SAZ_5488,SAZ_5489	IR
510	5884480	A	T	100%	100%				SAZ_5488,SAZ_5489	IR
511	5884498	C	A	100%	100%				SAZ_5488,SAZ_5489	IR
512	5914451	G	C	4.91%	9.59%	SAZ_5514	Ns	A329G		
513	5914457	G	C	11.38%	14.71%	SAZ_5514	Ns	A327G		
514	5938589	C	G	-	3.24%	SAZ_5548	Ns	A18P		
515	5939271	T	G	-	4.25%	SAZ_5549	Ns	Y142S		
516	5969967	C	-	16.33%	15.07%	SAZ_5588	FS	H30fs		
517	5974382	C	G	-	4.02%				SAZ_5592,SAZ_5593	Dn
518	5978420	C	G	-	3.13%	SAZ_5600	S	P461P		

519	5995123	A	G	99.29%	100%	SAZ_5611	Ns	D39G		
520	5995157	A	G	98.67%	100%	SAZ_5611	S	V50V		
521	5995192	G	C	99.60%	100%				SAZ_5610,SAZ_5612,SAZ_5611	Up, Dn
522	6015955	C	G	6.71%	7.35%	SAZ_5625	Ns	R158P		
523	6037597	T	G	7.80%	-				SAZ_5640	Up
524	6037601	C	G	13.72%	7.74%				SAZ_5640	Up
525	6040575	T	G	-	5.15%	SAZ_5643	Ns	H296P		
526	6075469	A	C	3.31%	-				SAZ_5678,SAZ_5677	Up, Dn
527	6081969	A	C	-	3.10%				SAZ_5683	Up
528	6096113	C	G	-	3.35%	SAZ_5699	Ns	R20P		
529	6110223	T	G	-	10%	SAZ_5716	Ns	T429P		
530	6112240	C	G	15.79%	-				SAZ_5717,SAZ_5718	Dn
531	6112254	T	C	98.90%	100%				SAZ_5717,SAZ_5718	Dn
532	6118655	-	C	-	3.11%				SAZ_5723,SAZ_5722	Up, Dn
533	6118660	-	C	4.55%	-				SAZ_5723,SAZ_5722	Up, Dn
534	6118664	G	C	9.44%	12.10%				SAZ_5723,SAZ_5722	Up, Dn
535	6118669	A	C	-	9.38%				SAZ_5723,SAZ_5722	Up, Dn
536	6118672	G	C	5.94%	-				SAZ_5723,SAZ_5722	Up, Dn
537	6118683	A	C	5.68%	-				SAZ_5723,SAZ_5722	Up, Dn
538	6118687	G	C	3.32%	6.67%				SAZ_5723,SAZ_5722	Up, Dn
539	6123831	C	T	3.37%	-	SAZ_5727	S	D5D		
540	6132075	G	C	3.14%	4.02%	SAZ_5733	S	P297P		
541	6132082	G	C	7.41%	5.38%	SAZ_5733	Ns	A300P		
542	6132092	G	C	6.36%	3.93%	SAZ_5733	Ns	R303P		
543	6181373	T	G	6.48%	-				SAZ_5784,SAZ_5785	Up, Dn
544	6184040	A	C	-	4.14%	SAZ_5787	Ns	Y89D		
545	6184794	A	C	-	3.59%	SAZ_5788	Ns	V1G		
546	6197678	C	G	87.10%	80.60%				SAZ_5800,SAZ_5799	Up, Dn
547	6220753	G	C	6.62%	6.06%	SAZ_5821	Ns	A9P		
548	6224397	A	C	3.55%	-				SAZ_5824	Dn
549	6225730	G	C	4.62%	-	SAZ_5826	Ns	A188P		
550	6225854	G	C	-	4.43%				SAZ_5827,SAZ_5826	Up, Dn
551	6261737	G	C	100%	100%	SAZ_5860,SAZ_5861	Ns	D278E		
552	6261741	C	T	98.53%	99.30%	SAZ_5860,SAZ_5861	Ns	R277H		
553	6261754	T	G	100%	99.60%	SAZ_5861	Ns	N273H		

554	6261774	C	T	100%	99.45%	SAZ_5861	Ns	G266E		
555	6261795	T	A	98.26%	98.88%	SAZ_5861	Ns	E259V		
556	6261815	C	A	100%	99.50%	SAZ_5861	S	R252R		
557	6261825	A	C	100%	100%	SAZ_5861	Ns	L249R		
558	6261845	A	G	100%	99.42%	SAZ_5861	S	P242P		
559	6261872	C	T	100%	99.12%	SAZ_5861	S	E233E		
560	6289616	C	G	100%	100%	SAZ_5888	Ns	K313N		
561	6289634	G	T	99.10%	98.53%	SAZ_5888	S	A307A		
562	6289649	G	T	99.59%	100%	SAZ_5888	Ns	D302E		
563	6289659	G	T	99.13%	100%	SAZ_5888	Ns	P299Q		
564	6289684	G	T	98.54%	99.40%	SAZ_5888	Ns	Q291K		
565	6290534	C	A	98.67%	99.49%	SAZ_5888	S	R7R		
566	6290559	G	C	100%	100%				SAZ_5888,SAZ_5889	Up, Dn
567	6315093	C	G	3.74%	6.50%	SAZ_5906	Ns	A139P		
568	6391533	A	C	3.41%	4.08%				SAZ_5984,SAZ_5985	Dn
569	6391537	A	G	16.87%	15%				SAZ_5984,SAZ_5985	Dn
570	6391543	C	G	29.14%	24.36%				SAZ_5984,SAZ_5985	Dn
571	6414293	C	G	4.35%	4.66%				SAZ_6006,SAZ_6007	Up, Dn
572	6418061	T	G	3.02%	-	SAZ_6010	Ns	V285G		
573	6420580	T	G	3.46%	-	SAZ_6013	Ns	V35G		
574	6429425	G	C	4.80%	6.54%	SAZ_6022	Ns	R397P		
575	6429431	T	G	-	3.26%	SAZ_6022	Ns	V399G		
576	6434872	T	G	-	4.06%	SAZ_6026	Ns	Y13S		
577	6475217	T	G	-	6.25%	SAZ_6066	Ns	T41P		
578	6489349	A	C	3.43%	-				SAZ_6082,SAZ_6083	Up, Dn
579	6520942	G	C	3.28%	-	SAZ_6109	S	G28G		
580	6525330	C	G	5.90%	7.18%				SAZ_6112	Up
581	6525337	T	G	4.02%	8.54%				SAZ_6112	Up
582	6525341	C	G	10.61%	13.78%				SAZ_6112	Up
583	6546812	G	C	100%	100%	SAZ_6132	Ns	G196A		
584	6557281	A	G	98.95%	100%	SAZ_6140	Ns	S971G		
585	6561453	T	C	6.12%	-	SAZ_6141	S	L947L		
586	6561457	T	-	7.36%	-	SAZ_6141	FS	V948fs		
587	6561463	-	TGCTGGTGCTGGTGCTGG	17.39%	15.79%	SAZ_6141	nonFS	S950delinsSAGAGAG		
588	6564716	T	C	98.97%	100%	SAZ_6141	S	I2034I		

589	6623163	G	C	13.27%	12.28%				SAZ_6153,SAZ_6154	Dn
590	6629233	G	C	23.81%	-				SAZ_6158,SAZ_6159	Dn
591	6629237	G	C	13.14%	14.60%				SAZ_6158,SAZ_6159	Dn
592	6629240	G	C	5.92%	5.41%				SAZ_6158,SAZ_6159	Dn
593	6634197	G	C	100%	100%				SAZ_6165,SAZ_6164	Up, Dn
594	6635816	C	T	3.39%	4%	SAZ_6165	Ns	A456V		
595	6637563	T	G	-	3.63%	SAZ_6166	Ns	Y126S		
596	6639790	C	-	3.11%	4.17%				SAZ_6168,SAZ_6169	Up
597	6669166	T	G	-	4.18%	SAZ_6197	Ns	T59P		
598	6674070	-	GG	11.70%	-	SAZ_6202	FS	T88fs		
599	6674330	AT	-	92.86%	-	SAZ_6202	FS			
600	6729865	C	G	5.46%	3.83%				SAZ_6247,SAZ_6248	Up, Dn
601	6729870	C	G	3.89%	-				SAZ_6247,SAZ_6248	Up, Dn
602	6731257	C	G	-	5.49%				SAZ_6248,SAZ_6249	Up, Dn
603	6731261	C	G	5.33%	7.95%				SAZ_6248,SAZ_6249	Up, Dn
604	6746269	C	G	11.74%	11.71%				SAZ_6262,SAZ_6261	Up, Dn
605	6799850	A	C	3.11%	-				SAZ_6305,SAZ_6304	Up, Dn
606	6818984	A	C	4.47%	-	SAZ_6320	Ns	T655P		
607	6818993	A	C	4.40%	-	SAZ_6320	Ns	T658P		
608	6842861	C	G	100%	100%				SAZ_6341,SAZ_6342	IR
609	6870050	C	G	100%	99.25%	SAZ_6371	Ns	P809A		
610	6870096	C	A	100%	99.30%	SAZ_6371	Ns	A824E		
611	6870130	G	C	100%	100%	SAZ_6371	S	A835A		
612	6897161	C	G	-	3.54%				SAZ_6396,SAZ_6395	Up, Dn
613	6915646	A	C	8.45%	-				SAZ_6413,SAZ_6414	Dn
614	6915658	A	C	16.46%	-				SAZ_6413,SAZ_6414	Dn
615	6916361	T	G	-	3.14%	SAZ_6414	Ns	T211P		
616	6916929	C	G	4.86%	-	SAZ_6414	S	P21P		
617	6916935	C	G	4.83%	5.56%	SAZ_6414	S	P19P		
618	6939194	A	C	-	3.67%	SAZ_6435	Ns	T183P		
619	6972471	A	C	-	5.66%				SAZ_6465,SAZ_6466	Dn
620	6986067	A	G	3.66%	-	SAZ_6481	Ns	L270P		
621	7006692	C	T	11.41%	6.54%				SAZ_6501	Dn
622	7006694	-	TCTT	3.45%	-				SAZ_6501	Dn
623	7006695	GC	-	-	3.20%				SAZ_6501	Dn

624	7006744	C	T	4.55%	-				SAZ_6501	Dn
625	7006747	A	-	10.62%	7.04%				SAZ_6501	Dn
626	7006752	C	-	9.88%	7.59%				SAZ_6501	Dn
627	7008653	T	C	100%	100%				SAZ_6503,SAZ_6504	Dn
628	7027276	G	T	99.24%	98.90%				SAZ_6517,SAZ_6518	IR
629	7027400	T	C	3.56%	3.12%				SAZ_6517,SAZ_6518	IR
630	7027401	G	A	3.34%	-				SAZ_6517,SAZ_6518	IR
631	7027413	A	G	10.65%	3.80%				SAZ_6517,SAZ_6518	IR
632	7027414	C	T	4.99%	3.02%				SAZ_6517,SAZ_6518	IR
633	7027437	G	C	6.58%	5.45%				SAZ_6517,SAZ_6518	IR
634	7027438	T	A	-	7.13%				SAZ_6517,SAZ_6518	IR
635	7027446	G	A	14.23%	13.23%				SAZ_6517,SAZ_6518	IR
636	7027448	G	C	17.20%	19.29%				SAZ_6517,SAZ_6518	IR
637	7027477	A	G	9.78%	8.42%				SAZ_6517,SAZ_6518	IR
638	7027535	C	T	47.40%	40.62%				SAZ_6517,SAZ_6518	IR
639	7027602	-	C	29%	37.78%				SAZ_6517,SAZ_6518	IR
640	7033347	ACGAAA	-	90.86%	88.74%				SAZ_6519	Up
641	7033414	T	A	100%	99.55%				SAZ_6519	Up
642	7038295	A	G	-	16.42%				SAZ_6523	Dn
643	7040505	G	C	-	8.24%	SAZ_6525	Ns	A282P		
644	7041774	C	G	4.07%	3.61%				SAZ_6526	Dn
645	7041779	C	G	3.35%	-				SAZ_6526	Dn
646	7041787	T	G	7.33%	8.04%				SAZ_6526	Dn
647	7087958	A	C	-	4.17%	SAZ_6560	Ns	T786P		
648	7102722	A	G	-	4.70%	SAZ_6565	Ns	L23P		
649	7171176	C	G	4.91%	-	SAZ_6619	Ns	A35P		
650	7175172	A	C	3.30%	-	SAZ_6624	Ns	V210G		
651	7203843	-	C	-	4.14%	SAZ_6654	FS	D241fs		
652	7217853	C	A	20.90%	15.22%	SAZ_6666	S	T188T		
653	7234060	C	T	-	5.03%	SAZ_6676	S	A79A		
654	7246834	T	G	-	3.03%	SAZ_6691	Ns	L78V		
655	7250449	T	G	90%	-	SAZ_6695	Ns	S328A		
656	7250452	-	A	39.22%	-	SAZ_6695	FS	A329fs		
657	7282614	A	C	3.63%	4.88%	SAZ_6723	S	P190P		
658	7299628	C	T	3.04%	-	SAZ_6739	StopGain	W210*		

659	7325399	A	C	3.60%	-	SAZ_6760	S	G396G		
660	7327972	T	G	-	6.84%	SAZ_6762	Ns	L78R		
661	7365869	C	G	5.64%	3.92%	SAZ_6806	Ns	R27G		
662	7370150	C	G	10.46%	6.36%	SAZ_6808	Ns	R45P		
663	7373400	G	A	3.29%	-				SAZ_6812,SAZ_6813	Up
664	7378839	A	G	3.83%	4.73%	SAZ_6817	S	P8P		
665	7383349	T	G	13.40%	-				SAZ_6824,SAZ_6823	Up, Dn
666	7423470	C	T	3.94%	-	SAZ_6873	Ns	R43C		
667	7431270	A	G	6.52%	11.76%	SAZ_6880	S	D97D		
668	7431280	A	G	5.80%	11.65%	SAZ_6880	Ns	V94A		
669	7451950	A	C	4.63%	4.96%				SAZ_6907	Up
670	7455276	C	A	98.53%	99.09%	SAZ_6911	S	T27T		
671	7455315	T	C	98.72%	100%	SAZ_6911	S	G40G		
672	7455332	C	A	100%	100%	SAZ_6911	Ns	A46D		
673	7455353	T	C	98.96%	100%	SAZ_6911	Ns	V53A		
674	7455857	C	G	100%	100%	SAZ_6911	Ns	S221C		
675	7455877	A	G	100%	100%	SAZ_6911	Ns	S228G		
676	7455899	A	G	100%	99.01%	SAZ_6911	Ns	H235R		
677	7455919	G	C	100%	100%	SAZ_6911	Ns	A242P		
678	7455937	C	A	100%	99.28%	SAZ_6911	S	R248R		
679	7455950	G	A	100%	100%	SAZ_6911	Ns	G252D		
680	7456417	C	T	-	7.01%	SAZ_6911,SAZ_6912	Ns	A352T		
681	7468839	T	G	3.02%	-	SAZ_6927	Ns	T189P		
682	7491151	T	G	5.73%	-	SAZ_6952	Ns	T63P		
683	7492952	C	G	3.65%	-	SAZ_6954	S	P446P		
684	7512773	C	T	-	3.95%	SAZ_6979	S	V337V		
685	7564186	T	G	-	3.52%	SAZ_7036	S	A33A		
686	7585440	T	G	3.25%	-	SAZ_7056	Ns	T158P		
687	7587102	A	C	-	3.12%				SAZ_7057,SAZ_7058	Up
688	7598508	C	T	4%	-	SAZ_7068	S	G46G		
689	7633377	A	G	-	100%				SAZ_7099	Up
690	7653512	C	G	100%	99.48%				SAZ_7117	Up
691	7653524	C	A	99.24%	99.45%				SAZ_7117	Up
692	7653544	C	T	99.59%	98.29%				SAZ_7117	Up
693	7653565	G	T	97.54%	97.78%				SAZ_7117,SAZ_7118	Up

694	7653569	G	T	99.19%	97.85%				SAZ_7117,SAZ_7118	Up
695	7653588	A	C	98.55%	97.98%				SAZ_7117,SAZ_7118	Up
696	7653595	A	C	100%	98.90%				SAZ_7117,SAZ_7118	Up
697	7653606	T	C	100%	100%				SAZ_7117,SAZ_7118	Up
698	7653615	G	C	98.28%	-				SAZ_7117,SAZ_7118	Up
699	7653625	T	C	98.67%	98.08%				SAZ_7117,SAZ_7118	Up
700	7653632	A	C	98.59%	100%				SAZ_7117,SAZ_7118	Up
701	7653636	C	T	100%	40%				SAZ_7117,SAZ_7118	Up
702	7653640	C	A	98.33%	-				SAZ_7117,SAZ_7118	Up
703	7653660	T	G	100%	-				SAZ_7117,SAZ_7118	Up
704	7653664	C	G	100%	-				SAZ_7117,SAZ_7118	Up
705	7653691	G	T	100%	98.18%				SAZ_7117,SAZ_7118	Up
706	7653717	G	T	100%	98.53%				SAZ_7117,SAZ_7118	Up
707	7653722	G	T	100%	95.38%				SAZ_7117,SAZ_7118	Up
708	7653748	C	A	100%	98.65%				SAZ_7117,SAZ_7118	Up
709	7653768	T	G	98.44%	100%				SAZ_7118	Up
710	7653781	A	G	98.53%	100%				SAZ_7118	Up
711	7662348	T	G	-	3.43%	SAZ_7125	S	G433G		
712	7670663	A	C	-	5.10%	SAZ_7134	Ns	D314A		
713	7698581	C	G	3.21%	-	SAZ_7162	Ns	A29P		
714	7733276	-	CCCC	18.75%	-				SAZ_7192	Up
715	7733445	T	G	3.98%	-				SAZ_7193	Dn
716	7757697	G	A	3.65%	-	SAZ_7219	Ns	E506K		
717	7815056	G	C	8.88%	10.61%				SAZ_7268,SAZ_7267	Up, Dn
718	7815060	G	C	7.65%	9.09%				SAZ_7268,SAZ_7267	Up, Dn
719	7815065	G	C	4.23%	6.25%				SAZ_7268,SAZ_7267	Up, Dn
720	7815068	G	C	-	4.73%				SAZ_7268,SAZ_7267	Up, Dn
721	7815740	A	C	-	3.52%	SAZ_7268	Ns	I200L		
722	7819445	C	-	3.03%	-				SAZ_7272,SAZ_7271	Up, Dn
723	7821979	A	C	3.15%	-				SAZ_7274,SAZ_7273	Up, Dn
724	7821982	A	C	3.59%	-				SAZ_7274,SAZ_7273	Up, Dn
725	7823055	G	C	17.78%	18.07%	SAZ_7275	Ns	A40P		
726	7823058	G	C	6.77%	12.24%	SAZ_7275	Ns	A41P		
727	7848627	C	G	5.67%	6.01%	SAZ_7297	Ns	A46P		
728	7862845	A	G	100%	100%	SAZ_7317	S	S142S		

729	7951597	A	C	5.51%	9.52%				SAZ_7400	Up
730	7964488	A	C	-	3.14%	SAZ_7413	Ns	T191P		
731	7973902	G	A	-	4.83%	SAZ_7420	S	A238A		
732	8009485	C	G	44.97%	40.62%	SAZ_7452	Ns	P275R		
733	8032717	T	G	-	3.47%	SAZ_7475	Ns	V144G		
734	8038102	T	G	-	3.08%				SAZ_7480,SAZ_7479	Up, Dn
735	8068333	G	C	11.84%	-	SAZ_7509	Ns	G10R		
736	8094631	A	G	7.88%	6.80%				SAZ_7531,SAZ_7532	Up, Dn
737	8209341	G	A	9.55%	13.07%	SAZ_7637	S	L57L		
738	8262875	T	G	5.66%	-	SAZ_7687	Ns	H430P		
739	8288039	C	G	5.19%	-	SAZ_7711	Ns	A11P		
740	8288043	C	G	6.92%	-	SAZ_7711	S	P9P		
741	8331307	A	C	-	4.23%	SAZ_7753	Ns	H24P		
742	8332943	G	C	9.60%	-	SAZ_7754	Ns	A189P		
743	8332947	G	C	-	7.34%	SAZ_7754	Ns	R190P		
744	8332950	A	C	5.07%	-	SAZ_7754	Ns	H191P		
745	8332953	G	C	6.83%	7.75%	SAZ_7754	Ns	R192P		
746	8344595	G	C	7.45%	6.67%	SAZ_7768	Ns	A294P		
747	8349398	C	G	3.59%	-	SAZ_7774	S	P71P		
748	8381139	A	G	100%	-				SAZ_7805,SAZ_7806,SAZ_7807	Up
749	8381144	A	C	100%	-	SAZ_7807	Ns	M1L		
750	8381154	G	T	100%	-	SAZ_7807	Ns	R4L		
751	8381158	G	C	100%	100%	SAZ_7807	S	A5A		
752	8381167	G	A	96.81%	100%	SAZ_7807	S	E8E		
753	8381184	G	T	100%	98.73%	SAZ_7807	Ns	R14L		
754	8381200	C	T	98.36%	100%	SAZ_7807	S	G19G		
755	8386430	G	C	-	4.61%				SAZ_7811,SAZ_7812	Up, Dn
756	8391463	C	G	13.09%	14.39%				SAZ_7815,SAZ_7817,SAZ_7816	Up, Dn
757	8391467	C	G	20.86%	24.51%				SAZ_7815,SAZ_7817,SAZ_7816	Up, Dn
758	8407393	G	C	10.32%	-	SAZ_7833	Ns	R149P		
759	8407446	G	C	-	4.96%	SAZ_7833	Ns	A167P		
760	8414831	T	G	4.32%	-	SAZ_7840	Ns	T43P		
761	8415233	T	G	-	3.32%				SAZ_7840,SAZ_7841	Up
762	8496014	C	G	5.69%	-				SAZ_7920,SAZ_7921	Up, Dn
763	8570218	C	G	6.57%	6.47%	SAZ_8016	Ns	A321G		

764	8570439	-	C	94.64%	-				SAZ_8016,SAZ_8017	Dn
765	8570455	A	G	98.61%	100%				SAZ_8016,SAZ_8017	Dn
766	8570471	C	A	98.63%	100%				SAZ_8016,SAZ_8017	Dn
767	8570487	C	G	100%	100%				SAZ_8016,SAZ_8017	Dn
768	8570507	A	G	100%	-				SAZ_8016,SAZ_8017	Dn
769	8570520	A	G	98.08%	-				SAZ_8016,SAZ_8017	Dn
770	8570668	G	T	100%	-	SAZ_8017	Ns	A237E		
771	8570686	C	A	99.03%	100%	SAZ_8017	Ns	R231L		
772	8574295	T	G	-	3.68%				SAZ_8020	Dn
773	8684385	A	C	-	3.03%	SAZ_8129	Ns	H185P		
774	8686047	C	G	4.29%	-	SAZ_8131	Ns	R365P		
775	8694246	A	C	-	3.98%	SAZ_8139	Ns	T118P		
776	8697396	-	CC	17.61%	8.53%				SAZ_8142,SAZ_8143	Dn
777	8697398	-	TCCC	17.01%	8.27%				SAZ_8142,SAZ_8143	Dn
778	8697402	G	C	8.82%	7.96%				SAZ_8142,SAZ_8143	Dn
779	8697405	G	C	10.75%	10.38%				SAZ_8142,SAZ_8143	Dn
780	8697412	-	CGGCGGGCA	4.91%	5.59%				SAZ_8142,SAZ_8143	Dn
781	8697413	-	GG	8.53%	11.11%				SAZ_8142,SAZ_8143	Dn
782	8723327	C	G	-	6.11%	SAZ_8166	S	P48P		
783	8743120	G	C	13.51%	-				SAZ_8183,SAZ_8181,SAZ_8182	Up, Dn
784	8763000	T	G	-	3.12%	SAZ_8203,SAZ_820	Ns	H4P		
785	8772597	G	C	5.03%	-				SAZ_8212,SAZ_8213	Up
786	8789182	T	G	4.12%	-	SAZ_8231	Ns	T305P		
787	8821880	G	T	98.29%	100%	SAZ_8261	Ns	G78V		
788	8821915	G	C	97.92%	100%	SAZ_8261	Ns	V90L		
789	8821927	G	T	100%	100%	SAZ_8261	Ns	D94Y		
790	8830881	A	C	3.27%	-	SAZ_8270	Ns	V371G		
791	8856149	G	A	-	8.60%	SAZ_8294	Ns	E463K		
792	8878541	G	C	44.07%	31.41%	SAZ_8320	S	S422S		
793	8880867	C	A	100%	-	SAZ_8322	Ns	R203M		
794	8972523	T	G	-	3.68%	SAZ_8414	Ns	V317G		
795	9038879	T	G	-	3.17%	SAZ_8482	Ns	E1987A		
796	9061489	G	C	14.72%	19%	SAZ_8496	Ns	A220G		
797	9061492	A	C	6.71%	9.30%	SAZ_8496	Ns	V219G		
798	9061495	G	C	9.25%	11.70%	SAZ_8496	Ns	A218G		

799	9073008	G	C	-	7.69%				SAZ_8506,SAZ_8507	Dn
800	9089878	T	G	-	3.21%	SAZ_8527	Ns	D230A		
801	9096894	A	G	32.80%	31%	SAZ_8534	S	N247N		
802	9136001	G	T	99.18%	100%	SAZ_8575	Ns	T226N		
803	9136040	C	A	99.38%	99.24%	SAZ_8575	Ns	G213V		
804	9155131	T	G	6.21%	5.83%				SAZ_8591,SAZ_8590	Up, Dn
805	9176767	A	C	3.11%	-	SAZ_8616	Ns	T364P		
806	9213077	A	C	3.06%	-	SAZ_8649	Ns	T10P		
807	9246026	G	A	100%	-	SAZ_8654	S	Q749Q		
808	9260196	CCC	-	38%	-	SAZ_8655	nonFS	3676_3677del		
809	9267137	G	C	9.62%	-				SAZ_8657,SAZ_8656	Up, Dn
810	9267142	G	C	6.38%	-				SAZ_8657,SAZ_8656	Up, Dn
811	9274035	G	C	7.44%	-	SAZ_8662	S	P432P		
812	9274051	G	C	8.77%	-	SAZ_8662	Ns	A438P		
813	9297984	C	G	100%	100%	SAZ_8665	Ns	L996V		
814	9299495	A	G	98.86%	100%	SAZ_8665	S	R1499R		
815	9302503	A	C	5.41%	6.38%	SAZ_8666	S	T568T		
816	9302512	C	T	8.21%	8.87%	SAZ_8666	S	V571V		
817	9302521	T	G	9.56%	14.08%	SAZ_8666	S	G574G		
818	9302725	C	T	28.36%	35.43%	SAZ_8666	S	D642D		
819	9302842	C	T	18.99%	18.62%	SAZ_8666	S	D681D		
820	9321838	T	C	100%	100%	SAZ_8671	S	R781R		
821	9321889	G	C	100%	100%	SAZ_8671	S	G798G		
822	9322021	T	G	100%	98.31%	SAZ_8671	Ns	F842L		
823	9322552	C	T	98.69%	99.35%	SAZ_8671	S	G1019G		
824	9322564	C	T	100%	100%	SAZ_8671	S	N1023N		
825	9353554	A	G	100%	100%	SAZ_8691	S	A790A		
826	9398102	-	G	32.94%	33.85%				SAZ_8729,SAZ_8730	Up, Dn
827	9398881	G	T	3.27%	-				SAZ_8730,SAZ_8731	IR
828	9402235	A	C	3.65%	-				SAZ_8734,SAZ_8735	Up
829	9405784	T	G	3.32%	-	SAZ_8738	Ns	H481P		
830	9407177	C	G	5.19%	-	SAZ_8738	Ns	A17P		
831	9409320	C	A	100%	-	SAZ_8741	Ns	G397V		
832	9421627	G	-	14.02%	17.33%				SAZ_8748,SAZ_8749	Up, Dn
833	9470272	-	GTGGGCATG	21.15%	-	SAZ_8790	nonFS	E1384delinsEVGM		

834	9563086	G	A	10.47%	-				SAZ_8883	Dn
835	9639547	G	C	12.07%	17.95%	SAZ_8963	S	P1766P		
836	9639550	A	C	19.79%	10.77%	SAZ_8963	S	P1767P		
837	9639554	T	C	6.25%	-	SAZ_8963	Ns	S1769P		
838	9639566	G	C	5.22%	-	SAZ_8963	Ns	A1773P		

*Abbreviations: Ref: genome reference sequence; Ns: non-synonymous mutaion; S: synonymous mutation; FS: frame shift muation; Up: Distances within 300 bp upstream of the coding regions of genes; Dn: Distances within 300 bp downstream of the coding regions of genes; IR: intergenenic region , distance beyond 300 bp upstream or downstream of the coding regions of the nearest genes.

Table S5 Genes associated with PL yield

Gene	low-specific	high-specific	COG	Molecular function
SAZ_0249		Y72S		hypothetical protein
SAZ_0323	H259P		[R]	alpha/beta hydrolase fold protein
SAZ_0379	H289P		[C]	oxidoreductase
SAZ_0496	T258P		[S]	AF110772_1 unknown
SAZ_0569	H275P		[M]	GouI
SAZ_0612	H214P			hypothetical protein
SAZ_0692	R316H		[R]	ABC transporter
SAZ_0870		S15R	[C]	FAD-binding monooxygenase protein
SAZ_0877		Q272P	[K]	MerR family transcriptional regulator
SAZ_0972	T13P		[C]	flavohemoprotein
SAZ_1010		G590D	[G]	glycoside hydrolase 15-like protein
SAZ_1011	V529G	V621I	[P]	potassium-transporting ATPase subunit B

SAZ_1016	T307P			amino acid transporter
SAZ_1062		T527P	[P]	Mn2+ or Fe2+ transporter
SAZ_1118		V1147G	[Q]	putative NRPS-type-I PKS fusion protein
SAZ_1165		T180P	[M]	hypothetical protein
SAZ_1195	N8T		[S]	hypothetical protein
SAZ_1227		T57P		hypothetical protein
SAZ_1229		N357H	[C]	citrate synthase
SAZ_1284		V116G		hypothetical protein
SAZ_1389		F331C	[K]	hypothetical protein
SAZ_1419	T385P		[T]	two-component sensor kinase
SAZ_1473		T117P	[S]	putative surface layer protein
SAZ_1530		T357P	[T]	magnesium or manganese-dependent protein phosphatase
SAZ_1564	P103S		[F]	hypothetical protein
SAZ_1614	T103P		[E]	cholesterol oxidase
SAZ_1645		V37G		hypothetical protein
SAZ_1669	A164P			hypothetical protein
SAZ_1718		T134P	[K]	acetyltransferase
SAZ_1760		V297G	[M]	glycosyl transferase family protein

SAZ_1831		T1140fs	[T]	hypothetical protein
SAZ_1881	H207P		[K]	TetR-family transcriptional regulator
SAZ_1981		V85G	[I]	acyl-CoA dehydrogenase
SAZ_2021	A181G		[K]	LysR family transcriptional regulator
SAZ_2192	A106G		[F]	guanylate kinase
SAZ_2193	T7N			hypothetical protein
SAZ_2269		R71fs		nicotinate-nucleotide-dimethylbenzimidazole phosphoribosyltransferase, partial
SAZ_2281		T445P	[G]	major facilitator superfamily
SAZ_2395		T542P	[G]	ABC transporter
SAZ_2443		V33G	[L]	CRISPR-associated protein
SAZ_2574	V258G		[G]	HAD-superfamily hydrolase, subfamily IIA
SAZ_2595		L53P	[K]	two-component system response regulator
SAZ_2597	S8P			aminoglycoside 2'-N-acetyltransferase
SAZ_2625	A756P, T753P, H749P		[C]	acyl-CoA synthetase
SAZ_2647	T352P			hypothetical protein SU9_05461, partial
SAZ_2816		T97P	[C]	aldehyde dehydrogenase
SAZ_2908	A42P		[R]	hypothetical protein

SAZ_2922	A7P		[E]	branched-chain amino acid ABC transporter ATP-binding protein
SAZ_2928		S89R	[S]	hypothetical protein
SAZ_2929	V26F		[F]	5'-nucleotidase
SAZ_3031	A99G			hypothetical protein
SAZ_3141		F119C, T13P	[R]	hypothetical protein
SAZ_3160	A6P	V303G	[R]	amidohydrolase
SAZ_3190		L345R	[G]	major facilitator superfamily protein
SAZ_3299	T680P		[G]	multidrug-efflux transporter
SAZ_3304		V488G		hypothetical protein
SAZ_3318	H42P			hypothetical protein
SAZ_3328		H202P	[T]	stress protein
SAZ_3363	V213G		[G]	ribose ABC transporter substrate-binding protein
SAZ_3378	T874P	T663P		hypothetical protein
SAZ_3413		T180P		hypothetical protein
SAZ_3418	V174G		[R]	metallopeptidase
SAZ_3494	T67fs		[K]	heat-inducible transcription repressor
SAZ_3587		E19A		hypothetical protein

SAZ_3618	A147G		[R]	ATP-binding membrane protein, partial
SAZ_3850		L333V	[G]	ABC transporter permease, partial
SAZ_3853		N45T		hypothetical protein
SAZ_3863	W363G		[R]	hydrolase
SAZ_3874		P1341T	[E]	NAD-glutamate dehydrogenase
SAZ_3986	P87T, P90T, P90Q		[V]	ABC transporter ATP-binding protein
SAZ_4016	W112R	V69I		hypothetical protein
SAZ_4102		T623A	[R]	penicillin acylase
SAZ_4103		T420P	[P]	potassium/proton antiporter
SAZ_4111		V364G	[G]	major facilitator superfamily protein
SAZ_4132	A132V		[K]	RNA polymerase principal sigma factor hrdD
SAZ_4218		W144G	[K]	ECF subfamily RNA polymerase sigma factor
SAZ_4270	M1R		[K]	DNA-directed RNA polymerase subunit alpha
SAZ_4432		T21P	[H]	delta-aminolevulinic acid dehydratase
SAZ_4528		A882P	[O]	ATP-dependent chaperone ClpB
SAZ_4534		G205A	[O]	heat shock protein GrpE
SAZ_4571		T578P	[E]	amino acid permease-associated region
SAZ_4578	Y40D		[L]	conserved hypothetical protein

SAZ_4715		T238P	[M]	sortase
SAZ_4718	A63P		[M]	hypothetical protein
SAZ_4911	G188W		[G]	major facilitator superfamily permease
SAZ_5014	V294G		[V]	beta-lactamase
SAZ_5199		E152K		hypothetical protein
SAZ_5290	V144G		[J]	HemK family modification methylase
SAZ_5477	P501L	G73V	[C]	FAD linked oxidase domain-containing protein
SAZ_5482	V244M			hypothetical protein
SAZ_5548		A18P	[V]	hypothetical protein
SAZ_5549		Y142S	[K]	hypothetical protein
SAZ_5643		H296P		hypothetical protein
SAZ_5699		R20P		OHCU decarboxylase
SAZ_5716		T429P	[C]	hypothetical protein
SAZ_5787		Y89D		hypothetical protein
SAZ_5788		V1G		RNA polymerase ECF-subfamily sigma factor
SAZ_5826	A188P			secreted protein
SAZ_6010	V285G		[P]	KatA1
SAZ_6013	V35G			TetR family transcriptional regulator

SAZ_6022		V399G	[T]	hypothetical protein
SAZ_6026		Y13S	[M]	putative penicillin-binding protein
SAZ_6066		T41P		peptidase M7 snapalysin
SAZ_6141	V948fs		[Q]	beta-ketoacyl synthase
SAZ_6166		Y126S	[L]	hypothetical protein (sigma-70 factor)
SAZ_6197		T59P	[K]	TetR-family transcriptional regulator
SAZ_6202	T88fs,		[G]	pyruvate kinase
SAZ_6320	T655P, T658P			lyase
SAZ_6414		T211P	[M]	M23 family peptidase
SAZ_6435		T183P	[C]	aldehyde dehydrogenase
SAZ_6481	L270P		[D]	hypothetical protein
SAZ_6525		A282P	[V]	ABC-type drug export system, ATP-binding protein
SAZ_6560		T786P	[Q]	amino acid adenylation domain-containing protein, partial
SAZ_6565		L23P	[Q]	hypothetical protein
SAZ_6619	A35P		[R]	protease
SAZ_6624	V210G		[E]	LysE family efflux protein
SAZ_6654		D241fs	[G]	glycogen debranching protein
SAZ_6691		L78V		hypothetical protein

SAZ_6695	S328A, A329fs		[S]	ribonuclease BN
SAZ_6739	W210X		[K]	MerR family transcriptional regulator
SAZ_6762		L78R	[R]	hypothetical protein
SAZ_6873	R43C		[R]	short-chain dehydrogenase/reductase SDR
SAZ_6911		L408F		agarase
SAZ_6912		A352T		hypothetical protein
SAZ_6927	T189P			hypothetical protein
SAZ_6952	T63P			hypothetical protein
SAZ_7056	T158P			hypothetical protein
SAZ_7134		D314A	[R]	methyltransferase
SAZ_7162	A29P			hypothetical protein
SAZ_7219	E506K		[S]	SNF2/RAD54 family helicase
SAZ_7268		I200L	[G]	AF164960_3 transporter
SAZ_7413		T191P	[C]	fatty acid-CoA racemase
SAZ_7475		V144G		hypothetical protein
SAZ_7509	G10R		[R]	amidohydrolase
SAZ_7687	H430P		[M]	cyclopropane-fatty-acyl-phospholipid synthase
SAZ_7711	A11P		[R]	putative sugar acetyltransferase

SAZ_7753		H24P	[E]	pyridoxal-5'-phosphate-dependent protein beta subunit
SAZ_7754	A189P, H191P	R190P	[G]	putative MFS transporter
SAZ_7807	M1L, R4L		[M]	apolipoprotein N-acyltransferase
SAZ_7833	R149P	A167P	[K]	LacI family transcriptional regulator
SAZ_7840	T43P		[R]	hypothetical protein
SAZ_8017	A237E		[L]	hypothetical protein
SAZ_8129		H185P	[I]	acetyl-CoA acetyltransferase
SAZ_8131	R365P		[R]	enoyl-ACP reductase II
SAZ_8139		T118P	[E]	4-hydroxy-2-oxovalerate aldolase
SAZ_8203		H4P		hypothetical protein
SAZ_8204		T431P	[R]	von Willebrand factor type A
SAZ_8231	T305P			putative cytoplasmic protein
SAZ_8270	V371G			hypothetical protein
SAZ_8294		E463K	[J]	amidase
SAZ_8322	R203M		[E]	methionine synthase
SAZ_8414		V317G		VanZ-like protein
SAZ_8482		E1987A	[G]	Rhs protein, partial
SAZ_8527		D230A		membrane protein, PF10067 family

SAZ_8616	T364P		[I]	acyl-CoA dehydrogenase
SAZ_8649	T10P		[M]	AF263912_4NysDIII
SAZ_8655	3676_3677del		[Q]	AF263912_6NysJ
SAZ_8662	A438P		[Q]	AF263912_13NysA
SAZ_8738	H481P, A17P		[V]	beta-lactamase
SAZ_8741	G397V		[C]	radical SAM domain containing enzyme
SAZ_8790	E1384delinsEVGM		[Q]	beta-ketoacyl synthase
SAZ_8963	S1769P, A1773P		[Q]	type I polyketide synthase