|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sequence** | **Amino acid** | **N315 mapping** | **Protein/Gene** | **GWAS method** |
| CAAATACAATACCAATGACACGTCGATTGCTAATGACTATTTTAATAAACCGGCAAAGTACATTAAGAAAAATGGTAAATTGTATGTTCAAATAACTGTAAACCACAGTCATTGGATTACAGGAATGAGTATA -> G C -> A T -> A  | S47SV72VT79T | 1108175 - 1108306(33 kmers)110819911082741108295  | [WP\_000789821.1](https://www.ncbi.nlm.nih.gov/protein/446712477)isdC | SEERBinary phenotype |
| CCAGCTCAAATTGAGGCTTATACTGAAGAAGTTGAGCAAGCAATTAAAGAAGCGCAACATGGAAATAATCAACCAGCAGTTAAAGAATAATTAATTTGTACAATCATAAACTGA -> GA -> T | E533EA534A | 1300876 - 1300988(14 kmers)13008901300893 | [WP\_001218596.1](https://www.ncbi.nlm.nih.gov/protein/447141340)glpD | SEERBinary phenotype |
| ACAGTCTTTTCAGTTGATTCTGAAATACCATCTAAATCTACTTCTGCATCAACTTCGCTTATATTTTGCAAGTCATCTCGACTACCGAAGATTTCAATTTCTTTATCTTCTAAGTCAATCGAACTTAATTCTTTATCATCTGCTAAACTACCTTTCTGTTTAACATTTACTTTAACCTTTTTGCTAT -> CA -> GC -> T | L264LD249DE244E | 2227323 - 2227508(87 kmers)222739122274362227451 | [WP\_000894032.1](https://www.ncbi.nlm.nih.gov/protein/446816776)YbbR-like domain-containing protein | SEERBinary phenotype |
| C -> T | N220N | 1182697 | [WP\_001190913.1](https://www.ncbi.nlm.nih.gov/protein/447113657)carA | BugwasBinary phenotype |
| T -> C (complement) | D194D | 349263 | [WP\_000745087.1](https://www.ncbi.nlm.nih.gov/protein/446667741)brnQ | BugwasBinary phenotype |
| T -> CC -> TG -> A | D426DP643LA663A | 473701474351474412 | [WP\_000211545.1](https://www.ncbi.nlm.nih.gov/protein/446133690)DUF2309 family protein | BugwasBinary phenotype |
| T -> C | L242L | 2481094 | [WP\_000783428.1](https://www.ncbi.nlm.nih.gov/protein/446706082)hlgB | BugwasBinary phenotype |
| G -> A (complement)A -> G (complement) | M435IK436E | 23801692380168 | [WP\_000451828.1](https://www.ncbi.nlm.nih.gov/protein/446373973)Na+/H+ antiporter NhaC family protein | BugwasBinary phenotype |
| T -> A (complement) | D83E | 2532805 | [WP\_001229087.1](https://www.ncbi.nlm.nih.gov/protein/447151831)opp1A | BugwasBinary phenotype |
| T -> A | R282R | 26493 | [WP\_000871607.1](https://www.ncbi.nlm.nih.gov/protein/446794351)walK | BugwasBinary phenotype |
| A -> T (complement) | P4P | 1037680 | [WP\_000104254.1](https://www.ncbi.nlm.nih.gov/protein/446026399)qoxD | BugwasBinary phenotype |
| A -> G | V84V | 299201 | [WP\_000610204.1](https://www.ncbi.nlm.nih.gov/protein/446532858)tarJ | BugwasBinary phenotype |
| C -> T | V467V | 132180 | [WP\_001179385.1](https://www.ncbi.nlm.nih.gov/protein/447102129)sbnC | BugwasBinary phenotype |
| T -> C (complement)G -> T (complement) | R259RT321T | 17066271706441 | [WP\_000472302.1](https://www.ncbi.nlm.nih.gov/protein/446394447)clpX | BugwasBinary phenotype |
| A -> G | D146G | 546992 | [WP\_000613722.1](https://www.ncbi.nlm.nih.gov/protein/446536376)folK | BugwasBinary phenotype |
| C -> T (complement)T -> C (complement)G -> A (complement) | G98GV116VT164T | 171028117102271710083 | [WP\_000032657.1](https://www.ncbi.nlm.nih.gov/protein/445954802)NUDIX domain-containing protein | BugwasBinary phenotype |
| G -> A (complement)C -> T (complement)C -> T (complement)C -> A,T (complement) | V227VI251IT265TG285G | 1702275170220317021611702101 | [WP\_001230232.1](https://www.ncbi.nlm.nih.gov/protein/WP_001230232.1)hemC | BugwasBinary phenotype |
| G -> A (complement) | T299T | 1699418 | [WP\_001270865.1](https://www.ncbi.nlm.nih.gov/protein/WP_001270865.1)hemL1 | BugwasBinary phenotype |
| T -> C (complement) | N263N | 272940 | [WP\_001008400.1](https://www.ncbi.nlm.nih.gov/protein/446931144)fadE | BugwasBinary phenotype |
| G -> A (complement) | A102A | 1680683 | [WP\_000457386.1](https://www.ncbi.nlm.nih.gov/protein/446379531)50S ribosomal protein L21 | BugwasBinary phenotype |
| A -> G (complement) | G277G | 1676466 | [WP\_001005768.1](https://www.ncbi.nlm.nih.gov/protein/446928512)ruvB | BugwasBinary phenotype |
| T -> AT -> C | S146SC179C | 16974131697512 | [WP\_001001237.1](https://www.ncbi.nlm.nih.gov/protein/446923981)tag | BugwasBinary phenotype |
| C -> T, A (complement) | R353R | 271053 | [WP\_000142198.1](https://www.ncbi.nlm.nih.gov/protein/446064343)fadD | treeWAS |
| A -> G | K116K | 2803540 | [WP\_000154162.1](https://www.ncbi.nlm.nih.gov/protein/446076307)vraD | treeWAS |
| A -> G (complement) | L69L | 316218 | [WP\_000757880.1](https://www.ncbi.nlm.nih.gov/protein/446680534)degA | treeWAS |
| T -> C | V549V | 19974 | [WP\_001081640.1](https://www.ncbi.nlm.nih.gov/protein/447004384)cyclic-di-AMP phosphodiesterase | treeWAS |
| G -> A | G520G | 240930 | [WP\_000236427.1](https://www.ncbi.nlm.nih.gov/protein/446158572)ggt | treeWAS |
| A -> G, T (complement)C -> T (complement) | V287VY319Y | 25272152527119 | [WP\_000675401.1](https://www.ncbi.nlm.nih.gov/protein/446598055)MFS transporter | treeWAS |
| T -> G | P347P | 1306337 | [WP\_000652047.1](https://www.ncbi.nlm.nih.gov/protein/446574701)aminotransferase class I/II-fold pyridoxal              phosphate-dependent enzyme | treeWAS |
| T -> A | V360V | 885317 | [WP\_001074405.1](https://www.ncbi.nlm.nih.gov/protein/446997149)sufB | treeWAS |
| C -> T | D113D | 2698328 | [WP\_000198598.1](https://www.ncbi.nlm.nih.gov/protein/446120743) | treeWAS |
| C -> A,T (complement) | H181N, H181Y | 312161 | [WP\_000031262.1](https://www.ncbi.nlm.nih.gov/protein/445953407)class I SAM-dependent methyltransferase | treeWAS |
| G -> T, A (complement) | G196V, G196D | 2148703 | [WP\_000594954.1](https://www.ncbi.nlm.nih.gov/protein/446517608)thiD | treeWAS |
| GATAGGGGCTATTTTAATAAAATTCGTCCTC | N/A | 1383811 - 1383841 | Intergenic, 18 bp into end of [WP\_000523668.1](https://www.ncbi.nlm.nih.gov/protein/446445813)SWIM zinc finger family protein  | DBGWAS |