

Figure S1. Decay of linkage disequilibrium (LD) in the snap bean genome.

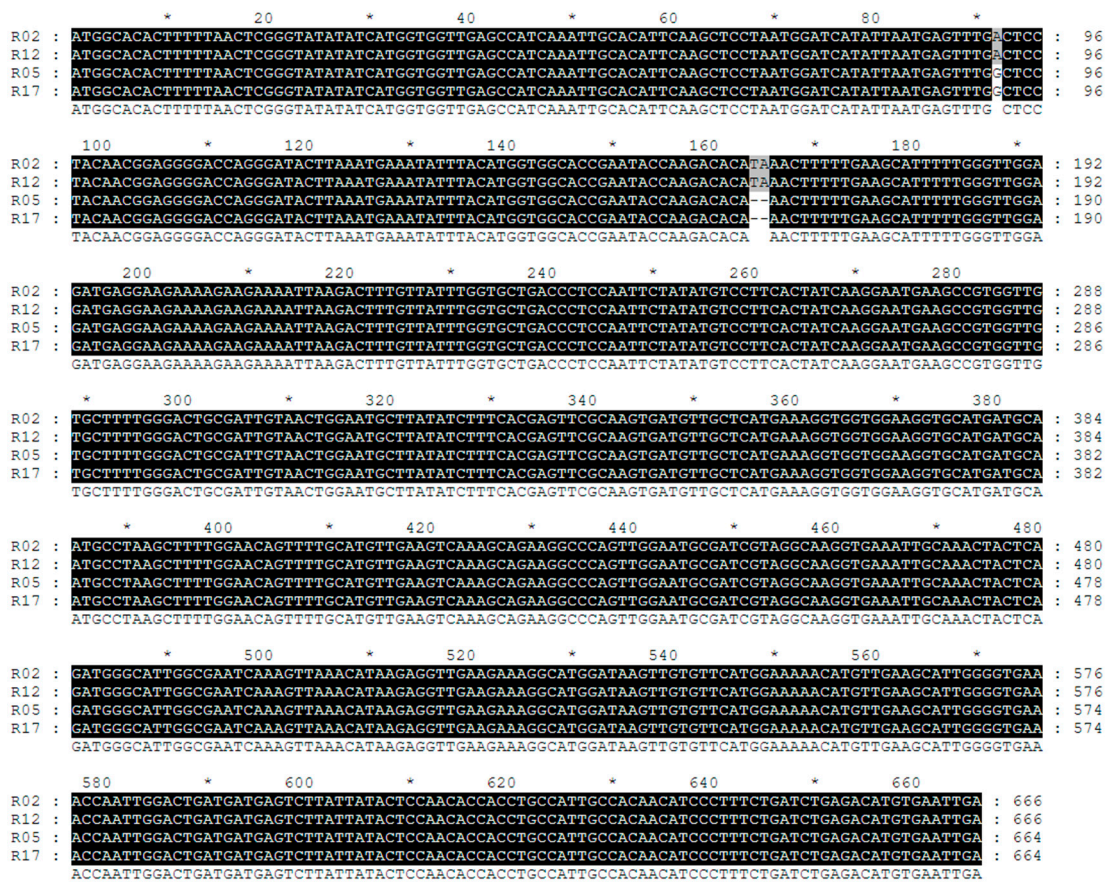


Figure S2. Sequence alignment of Phvul.002G270800 in four different accessions. R02 and R12 are stringless; R05 and R17 have suture strings.

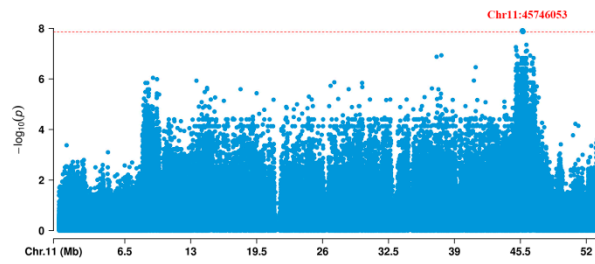


Figure S3. The Manhattan plots of ST1-2019 on chromosome 11. The red dashed line represents the threshold.

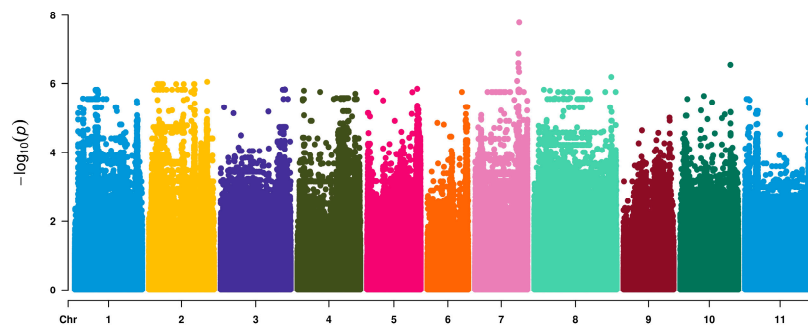


Figure S4. The Manhattan plots of GWAS for stringy snap bean on ST1-2019.

Table S1. List of common bean germplasm used in this study including ID, name, type of accession, variation of 2bp and source of data. + indicates exist of 2bp; - for 2bp deletion; u for unknown. IVF_CAAS for Institute of Vegetables and Flowers, Chinese Academy of Agricultural Sciences.

ID	Name	Genepool	2-bp	Source	ST1_201 9	ST2_2019	ST1_202 0	ST2_2 020
R01	8030	Mesoamerican	+	IVF CAAS	0	0	0	0
R02	15B5	Mesoamerican	+	IVF CAAS	0	0	0	0
R03	17B1-1	Mesoamerican	-	IVF CAAS	1	1	1	1
R04	14-2	Mesoamerican	-	IVF CAAS	1	1	0.54	1
R05	09B2	Mesoamerican	-	IVF CAAS	1	1	1	1
R06	96B44-1	Mesoamerican	-	IVF CAAS	1	1	1	1
R07	17B2	Mesoamerican	-	IVF CAAS	1	1	1	1
R08	09B5	Mesoamerican	-	IVF CAAS	1	1	1	1
R09	15B8	Mesoamerican	-	IVF CAAS	1	1	1	1
R10	16B1	Mesoamerican	+	IVF CAAS	0	0	0	0
R11	17B4	Mesoamerican	-	IVF CAAS	1	1	1	1
R12	10B7	Mesoamerican	+	IVF CAAS	0	0	0	0
R13	10B4	Mesoamerican	+	IVF CAAS	0.36	1	0	0
R14	15-28	Mesoamerican	+	IVF CAAS	0	0	0	0
R15	17B3-1	Mesoamerican	-	IVF CAAS	1	1	1	1
R16	18B4	Mesoamerican	-	IVF CAAS	1	1	1	1
R17	16B3	Mesoamerican	-	IVF CAAS	1	1	1	1
R18	15-68	Mesoamerican	-	IVF CAAS	1	1	1	1
R19	15-69	Mesoamerican	+	IVF CAAS	0	0	0	0
R20	15-73	Mesoamerican	+	IVF CAAS	0	0	0	0
R21	82-3	Mesoamerican	+	IVF CAAS	0	0	0	0
R22	82-62	Andean	+	IVF CAAS	0	0	0	0
R23	12B3	Mesoamerican	+	IVF CAAS	0	0	0	0
R25	15-20	Mesoamerican	+	IVF CAAS	0	0	0	0
R26	15-22-1	Mesoamerican	+	IVF CAAS	0	0	0	0
R27	15-30-1	Mesoamerican	+	IVF CAAS	0.17	1	0	0
R28	15-32-2	Mesoamerican	+	IVF CAAS	0.27	1	0	0
R29	15-39-1	Mesoamerican	+	IVF CAAS	0	0	0	0
R30	15-74-2	Mesoamerican	+	IVF CAAS	0	0	0	0
R31	17B12	Mesoamerican	-	IVF CAAS	0.68	1	1	1
R32	17B8	Mesoamerican	-	IVF CAAS	1	1	1	1
R33	16B2	Andean	+	IVF CAAS	0	0	0	0
R34	98-5	Mesoamerican	+	IVF CAAS	0	0	0	0
B35	C18	Mesoamerican	-	IVF CAAS	1	1	1	1
B36	C21	Mesoamerican	+	IVF CAAS	1	1	1	1
B37	Shuang2	Mesoamerican	-	IVF CAAS	1	1	1	1
B38	Shuang3	Mesoamerican	-	IVF CAAS	1	1	1	1
B39	S1	Mesoamerican	-	IVF CAAS	1	1	1	1
B40	H1	Andean	+	IVF CAAS	0	0	0	0
B41	H3	Andean	+	IVF CAAS	0	0	0	0
B42	H4	Andean	+	IVF CAAS	0	0	0	0
B43	C1	Mesoamerican	-	IVF CAAS	0.82	1	0.21	1
B44	C2	Andean	+	IVF CAAS	0	0	0	0
B45	C4	Mesoamerican	-	IVF CAAS	1	1	1	1
B46	C5	Mesoamerican	-	IVF CAAS	1	1	1	1
B47	C8	Mesoamerican	-	IVF CAAS	1	1	0.25	1
B48	C9	Andean	+	IVF CAAS	0.64	1	0.3	1
B49	C10	Mesoamerican	-	IVF CAAS	1	1	1	1
B50	C11	Mesoamerican	-	IVF CAAS	1	1	1	1
B51	C19	Mesoamerican	-	IVF CAAS	1	1	1	1

B52	C20	Andean	+	IVF CAAS	0	0	0	0
B53	C22	Andean	+	IVF CAAS	0	0	0	0
B54	C23	Mesoamerican	-	IVF CAAS	1	1	1	1
B55	C24	Andean	+	IVF CAAS	0	0	0	0
B56	C26	Mesoamerican	-	IVF CAAS	1	1	1	1
B57	C29	Andean	+	IVF CAAS	0	0	0	0
B58	K1	Mesoamerican	+	IVF CAAS	0	0	0	0
B59	K6	Mesoamerican	-	IVF CAAS	1	1	0.24	1
B60	D6	Mesoamerican	-	IVF CAAS	1	1	1	1
B61	T8	Andean	+	IVF CAAS	0	0	0	0
B62	T20	Andean	+	IVF CAAS	0	0	0	0
B63	9100	Mesoamerican	-	IVF CAAS	1	1	1	1
B64	9128 7A179	Mesoamerican	-	IVF CAAS	1	1	1	1
B65	9240 7A1875	Mesoamerican	-	IVF CAAS	1	1	1	1
B66	9251 7A1955	Mesoamerican	-	IVF CAAS	1	1	0.28	1
B67	9252 7A1957	Mesoamerican	-	IVF CAAS	1	1	1	1
B68	9270 7A237	Mesoamerican	-	IVF CAAS	1	1	1	1
B69	9270 7A237	Mesoamerican	-	IVF CAAS	1	1	1	1
B70	9272 7A240	Mesoamerican	-	IVF CAAS	1	1	1	1
B71	7A431	Mesoamerican	-	IVF CAAS	1	1	1	1
B72	7A140	Andean	-	IVF CAAS	1	1	1	1
B73	7A1834	Mesoamerican	-	IVF CAAS	1	1	0.31	1
B74	7A1826	Mesoamerican	-	IVF CAAS	1	1	1	1
B75	7A1423	Andean	+	IVF CAAS	0	0	0	0
B76	7A1086	Mesoamerican	-	IVF CAAS	1	1	0.34	1
B77	7A1119	Andean	+	IVF CAAS	0	0	0	0
B78	9081	Mesoamerican	-	IVF CAAS	1	1	1	1
B79	9244 7A1916	Mesoamerican	-	IVF CAAS	1	1	1	1
B80	C13	Andean	+	IVF CAAS	0	0	0	0
B81	C14	Mesoamerican	-	IVF CAAS	1	1	1	1
B82	9055	Mesoamerican	-	IVF CAAS	1	1	1	1
B83	C30	Andean	+	IVF CAAS	0	0	0	0
B84	T5	Andean	+	IVF CAAS	0	0	0	0
B85	T6ao	Andean	+	IVF CAAS	0	0	0	0
B86	T6tu	Andean	+	IVF CAAS	0	0	0	0
B87	C27	Andean	+	IVF CAAS	0	0	0	0
B88	T7	Andean	+	IVF CAAS	0	0	0	0
B89	7A372	Mesoamerican	-	IVF CAAS	1	1	1	1
B90	C15	Andean	+	IVF CAAS	0	0	0	0
B91	T6	Andean	+	IVF CAAS	0	0	0	0
B92	K9	Mesoamerican	-	IVF CAAS	1	1	0.72	1
B93	T23	Andean	+	IVF CAAS	0	0	0	0
B94	T3	Andean	+	IVF CAAS	0	0	0	0
B95	C7	Andean	+	IVF CAAS	0	0	0	0
B96	C17	Andean	+	IVF CAAS	0.08	1	0.69	1
B97	80-107	Mesoamerican	-	IVF CAAS	1	1	1	1
B98	C3	Andean	+	IVF CAAS	0	0	0.54	1
B99	C12	Andean	+	IVF CAAS	0	0	0	0
B100	C16	Andean	+	IVF CAAS	0	0	0	0
B101	C6	Andean	+	IVF CAAS	0	0	0	0
B102	T17	Andean	+	IVF CAAS	0	0	0	0
B103	Shuangl	Mesoamerican	-	IVF CAAS	1	1	1	1
B104	T27	Mesoamerican	-	IVF CAAS	1	1	0.64	1
B105	H2	Andean	+	IVF CAAS	0	0	0	0
B106	2504	Mesoamerican	+	IVF CAAS	0.77	1	0.69	1
B107	V07A0978	Mesoamerican	-	IVF CAAS	1	1	1	1
B108	H7	Andean	+	IVF CAAS	0	0	0	0
B109	H6	Andean	+	IVF CAAS	0	0	0	0

B110	H5	Andean	+	IVF CAAS	0	0	0	0
B111	K2	Mesoamerican	-	IVF CAAS	1	1	1	1
B112	7A1795	Mesoamerican	-	IVF CAAS	1	1	1	1
B113	T22	Andean	+	IVF CAAS	0.85	1	1	1
B114	H8	Andean	+	IVF CAAS	0	0	0	0
B115	7A394	Mesoamerican	-	IVF CAAS	1	1	1	1
B116	C25	Andean	+	IVF CAAS	0	0	0	0
B117	2404	Mesoamerican	+	IVF CAAS	0	0	0	0
B118	86-2	Mesoamerican	+	IVF CAAS	0	0	0	0
B119	T32	Andean	+	IVF CAAS	1	1	1	1
B120	80-143	Mesoamerican	-	IVF CAAS	1	1	1	1
B121	C28	Andean	+	IVF CAAS	0	0	0	0
B122	19B1	Mesoamerican	-	IVF CAAS	1	1	1	1
B123	19B2	Mesoamerican	+	IVF CAAS	0	0	u	u
B124	19B4	Mesoamerican	-	IVF CAAS	1	1	1	1
B125	19B5	Mesoamerican	-	IVF CAAS	1	1	1	1
B126	19B6	Andean	+	IVF CAAS	0.04	1	0	0
B127	19B7-1	Andean	+	IVF CAAS	0	0	0	0
B128	19B7-2	Mesoamerican	-	IVF CAAS	1	1	1	1
B129	19B8	Mesoamerican	-	IVF CAAS	1	1	1	1
B130	19B9	Mesoamerican	-	IVF CAAS	1	1	u	u
B131	19B10	Mesoamerican	-	IVF CAAS	1	1	0.71	1
B132	19B11	Mesoamerican	-	IVF CAAS	1	1	1	1
B133	19B12	Mesoamerican	-	IVF CAAS	1	1	0.83	1
B134	19B13	Mesoamerican	+	IVF CAAS	0	0	0	0
B135	19B14	Mesoamerican	-	IVF CAAS	1	1	1	1
B136	19B15	Mesoamerican	-	IVF CAAS	1	1	0.68	1
B137	B20B1	Mesoamerican	+	IVF CAAS	0	0	0	0
B138	B20B2	Mesoamerican	-	IVF CAAS	1	1	1	1
B139	B20B3	Andean	+	IVF CAAS	0	0	0	0

Table S2. Primer sequence used in qRT-PCR.

Primer name	Primer sequence(5'-3')
PvGUX1_1	GGTTGAAGAAAGGCATGGATAAG
	GCAGGTGGTGTGGAGTATAA
Actin	GAAGTTCTCT TCCAACCATCC
	TTCCTTGCTCATT CTGTCCG

Table S3. SNP distribution on chromosomes.

Chromosome	Length of Chromosome(bp)	SNP number	SNP density (No./kb)
Chr01	51433939	360596	7.01
Chr02	49670989	411294	8.28
Chr03	53438756	384632	7.2
Chr04	48048378	339438	7.06
Chr05	40923498	278286	6.8
Chr06	31236378	238452	7.63
Chr07	40041001	269564	6.73

Chr08	63048260	376474	5.97
Chr09	38250102	310259	8.11
Chr10	44302882	290060	6.55
Chr11	53580169	330923	6.18

Table S4. LD decay on each chromosome.

Chromosome	LD decay
Chr01	976,100
Chr02	491,800
Chr03	478,700
Chr04	350,300
Chr05	284,100
Chr06	904,100
Chr07	546,000
Chr08	473,300
Chr09	876,300
Chr10	184,100
Chr11	963,000

Table S5. Significantly association signal for four traits by GWAS analysis.

Traits	SNP	Chromosome	Position	P.value	Rsquare.of.Model. without.SNP	Rsquare.of.Model. el.with.SNP
ST1-2019	SNP709759	Chr02	44026689	8.34E-11	0.66408708	0.809364444
ST1-2019	SNP710876	Chr02	44194695	4.22E-10	0.66408708	0.796539037
ST1-2019	SNP711816	Chr02	44328013	6.69E-10	0.66408708	0.792947758
ST1-2019	SNP711895	Chr02	44336662	7.34E-10	0.66408708	0.792232159
ST1-2019	SNP709536	Chr02	44002717	7.36E-10	0.66408708	0.79221138
ST1-2019	SNP711217	Chr02	44248269	8.14E-10	0.66408708	0.791438515
ST1-2019	SNP710933	Chr02	44206976	8.15E-10	0.66408708	0.791427149
ST1-2019	SNP711387	Chr02	44282675	8.25E-10	0.66408708	0.791333946
ST1-2019	SNP709538	Chr02	44002794	8.42E-10	0.66408708	0.791176773
ST1-2019	SNP709539	Chr02	44002817	8.42E-10	0.66408708	0.791176773

ST1-2019	SNP709540	Chr02	44002827	8.42E-10	0.66408708	0.791176773
ST1-2019	SNP709541	Chr02	44002840	8.42E-10	0.66408708	0.791176773
ST1-2019	SNP711694	Chr02	44321072	8.42E-10	0.66408708	0.791176773
ST1-2019	SNP712010	Chr02	44370231	1.46E-09	0.66408708	0.786975435
ST1-2019	SNP711219	Chr02	44248320	1.69E-09	0.66408708	0.785822964
ST1-2019	SNP711220	Chr02	44248346	1.69E-09	0.66408708	0.785822964
ST1-2019	SNP711221	Chr02	44248367	1.69E-09	0.66408708	0.785822964
ST1-2019	SNP711222	Chr02	44248372	1.69E-09	0.66408708	0.785822964
ST1-2019	SNP711218	Chr02	44248299	2.29E-09	0.66408708	0.783553738
ST1-2019	SNP711944	Chr02	44353434	2.30E-09	0.66408708	0.783510915
ST1-2019	SNP710706	Chr02	44169322	2.34E-09	0.66408708	0.783360845
ST1-2019	SNP712825	Chr02	44491321	2.82E-09	0.66408708	0.781978564
ST1-2019	SNP709797	Chr02	44031896	2.87E-09	0.66408708	0.781841832
ST1-2019	SNP709798	Chr02	44031898	2.87E-09	0.66408708	0.781841832
ST1-2019	SNP709799	Chr02	44031901	2.87E-09	0.66408708	0.781841832
ST1-2019	SNP711609	Chr02	44318734	3.39E-09	0.66408708	0.780580849
ST1-2019	SNP711611	Chr02	44318755	3.39E-09	0.66408708	0.780580849
ST1-2019	SNP709727	Chr02	44022619	4.06E-09	0.66408708	0.779234572
ST1-2019	SNP709537	Chr02	44002751	4.37E-09	0.66408708	0.778672472
ST1-2019	SNP711044	Chr02	44219414	4.96E-09	0.66408708	0.77772635
ST1-2019	SNP710014	Chr02	44075208	5.19E-09	0.66408708	0.777400934
ST1-2019	SNP709519	Chr02	44001188	5.27E-09	0.66408708	0.777287553

ST1-2019	SNP709591	Chr02	44007852	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709741	Chr02	44025318	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709764	Chr02	44027832	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709767	Chr02	44028010	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709893	Chr02	44052567	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709894	Chr02	44052573	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP709922	Chr02	44062112	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710125	Chr02	44087774	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710126	Chr02	44087811	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710127	Chr02	44087825	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710312	Chr02	44116457	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710313	Chr02	44116481	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710314	Chr02	44116482	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710430	Chr02	44124153	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710435	Chr02	44124331	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710511	Chr02	44134874	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710512	Chr02	44134877	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710583	Chr02	44142506	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710584	Chr02	44142508	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710585	Chr02	44142510	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710913	Chr02	44198506	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP710976	Chr02	44215281	5.27E-09	0.66408708	0.777287553

ST1-2019	SNP710977	Chr02	44215287	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711125	Chr02	44233252	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711137	Chr02	44236154	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711240	Chr02	44250218	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711445	Chr02	44284893	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711546	Chr02	44298694	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711547	Chr02	44298699	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711591	Chr02	44301978	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711697	Chr02	44321080	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711720	Chr02	44321354	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711721	Chr02	44321405	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711725	Chr02	44321473	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP711873	Chr02	44332589	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712120	Chr02	44381836	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712181	Chr02	44387934	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712356	Chr02	44411445	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712580	Chr02	44454963	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712581	Chr02	44455001	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712638	Chr02	44460429	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712639	Chr02	44460430	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712651	Chr02	44460809	5.27E-09	0.66408708	0.777287553
ST1-2019	SNP712822	Chr02	44485863	5.27E-09	0.66408708	0.777287553

ST1-2019	SNP709758	Chr02	44026581	5.31E-09	0.66408708	0.777218034
ST1-2019	SNP711356	Chr02	44274949	5.61E-09	0.66408708	0.776810251
ST1-2019	SNP710484	Chr02	44131778	6.25E-09	0.66408708	0.776013424
ST1-2019	SNP710021	Chr02	44075340	6.29E-09	0.66408708	0.775960942
ST1-2019	SNP712733	Chr02	44467441	6.72E-09	0.66408708	0.775478009
ST1-2019	SNP710148	Chr02	44090056	7.38E-09	0.66408708	0.77478214
ST1-2019	SNP709736	Chr02	44024697	7.44E-09	0.66408708	0.774723688
ST1-2019	SNP709760	Chr02	44026855	7.81E-09	0.66408708	0.774361094
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ST2-2020	SNP710871	Chr02	44194640	2.42E-10	0.589833533	0.783118593
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