

Genetic markers for bunt resistance



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GRAINGOOD (Organic RDD-10)
BOOST (Organic RDD-7)
DIVERSILIENCE (CoreOrganic)

Phenotyping with
10 races with
different virulences



Bt-genes, overview

- Bt1 at 2B
- Bt2 at 1D (and 5A+7A+2B...)
- Bt3 at 1A (few candidate genes)
- **Bt4=Bt6** at 1B
- Bt5 at 1B
- Bt7 at 2D
- **Bt8** Unknown
- Bt9 at 6D (few candidate genes)
- **Bt10=BtZ** at 6D
- **Bt11= +4 genes** at 4B+ 6D
- **Bt12= +4 genes** at 4B+7D
- Bt13 at 7D

Bt mapping overview

<u>Gene denomination</u>	<u>Chromosome</u>	<u>Estimated interval for gene position</u>	<u>Number of markers in haplotype usable for MAS</u>	<u>Number of candidate genes</u>
Bt1	2B	799.991.797 - 803.471.810	38	38
Bt2	1D	41.696.687 - 44.673.116	12	12
Bt3	1A	498.451.021 - 506.854.738	57	15
Bt5	1B	163.225.664 - 283.930.031	39	180
Bt5_4	1B	164.434.808 - 271.683.087	24	
Bt6 = Bt4	1B	16.381.367 - 28.018.966	5	91
Bt7	2D	616.022.196 - 621.068.156	3	29
Bt9	6D	490.336.412 - 491.341.666	4	13
Bt10 - BtZ	6D	2.087.623 - 3.140.478	9	2
Bt13	7D	5.005.482 - 5.661.151	5	9
Bt12A	7D	14.162.621 - 20.933.158		13
Bt12B	7D	14.162.621 - 20.933.158		14
QChifa-7A	7A	717.923.349 - 735.886.510	141	
QChifa-7D	7D	16.714.366 - 21.837.392		
QChifa-4B	4B	1.306.080 - 15.855.852	105	
QChifa-4B	4B	650.383.778 - 670.633.612	192	
QChifa-4BS	4B	15.740.035 - 17.787.306	19	
QChifa-6D	6D	492.544.825 - 492.584.866	2	
QChifa-1B	1B	7.600.000 - 18.000.000		
QChifa-2A	2A	0 - 35.085.507		
Chl_CDC_Go	2B	244.000.000 - 244.000.000		

Bt2

- Bt2 in PI 554097 at 1D
- Same phenotypic reaction found in:
 - Bussard at 2B
 - Magnifik at 5D
 - Hereward at 7A

11 candidate genes within the haplotype

Gene	Function
TraesCS1D03G0128700	Disease resistance protein RPM1
TraesCS1D03G0128800	50S ribosomal protein L10
TraesCS1D03G0129100	AP2-like ethylene-responsive transcription factor
TraesCS1D03G0129800	Receptor-like protein kinase
TraesCS1D03G0130100	DNA repair RAD51-like protein
TraesCS1D03G0130600	Xylulose kinase
TraesCS1D03G0131800	Patatin
TraesCS1D03G0131900	Adenine/guanine permease
TraesCS1D03G0132800	Vacuolar processing enzyme
TraesCS1D03G0133500	Pentatricopeptide repeat-containing protein
TraesCS1D03G0133700	Ribosome biogenesis regulatory protein-like protein
TraesCS1D03G0133800	E3 ubiquitin-protein ligase

Bt3

14 candidate genes within the haplotype

Chromosome	Phys Pos	Min	Phys Pos	Max	Gene	Function
Chr1A	498145915		498153380		TraesCS1A03G0753800	Cytochrome P450-like protein
Chr1A	498597231		498598850		TraesCS1A03G0754700	Patatin
Chr1A	498752292		498755441		TraesCS1A03G0755400	Cation/H(+) antiporter
Chr1A	498792527		498794622		TraesCS1A03G0755600	BTB/POZ domain containing protein
Chr1A	499005223		499007511		TraesCS1A03G0756300	L-ascorbate oxidase-like protein
Chr1A	499012373		499018117		TraesCS1A03G0756400	Protein kinase-like protein
Chr1A	499025083		499031407		TraesCS1A03G0756800	CCR4-NOT transcription complex subunit 2
Chr1A	499087711		499088987		TraesCS1A03G0757000	Peroxidase
Chr1A	499092963		499093940		TraesCS1A03G0757100	Peroxidase
Chr1A	499256965		499260137		TraesCS1A03G0757300	ATP-dependent Clp protease ATP-binding subunit
Chr1A	499369457		499375225		TraesCS1A03G0758200	Protein DETOXIFICATION
Chr1A	499553904		499556149		TraesCS1A03G0759700	Myb family transcription factor APL
Chr1A	499644013		499647429		TraesCS1A03G0760300	NADH-cytochrome b5 reductase
Chr1A	499668003		499673449		TraesCS1A03G0760400	Type I inositol-1
Chr1A	499675305		499678489		TraesCS1A03G0760500	Prolyl 4-hydroxylase alpha subunit

Bt9

13 candidate genes within the haplotype

Gene	Function
TraesCS6D03G0910400	B3 domain-containing protein
TraesCS6D03G0910500	Peroxidase
TraesCS6D03G0911600	F-box family protein
TraesCS6D03G0911900	4-hydroxybenzoate octaprenyltransferase
TraesCS6D03G0912000	LisH and RanBPM domains containing protein
TraesCS6D03G0912200	Replication protein A 32 kDa subunit
TraesCS6D03G0912400	C2 calcium/lipid-binding domain
TraesCS6D03G0912800	F-box protein
TraesCS6D03G0913200	Disease resistance protein RPM1
TraesCS6D03G0913300	Disease resistance protein RPM1
TraesCS6D03G0913400	Rp1-like protein
TraesCS6D03G0913700	Disease resistance protein (NBS-LRR class) family
TraesCS6D03G0913900	NBS-LRR-like resistance protein

Bt10=BtZ

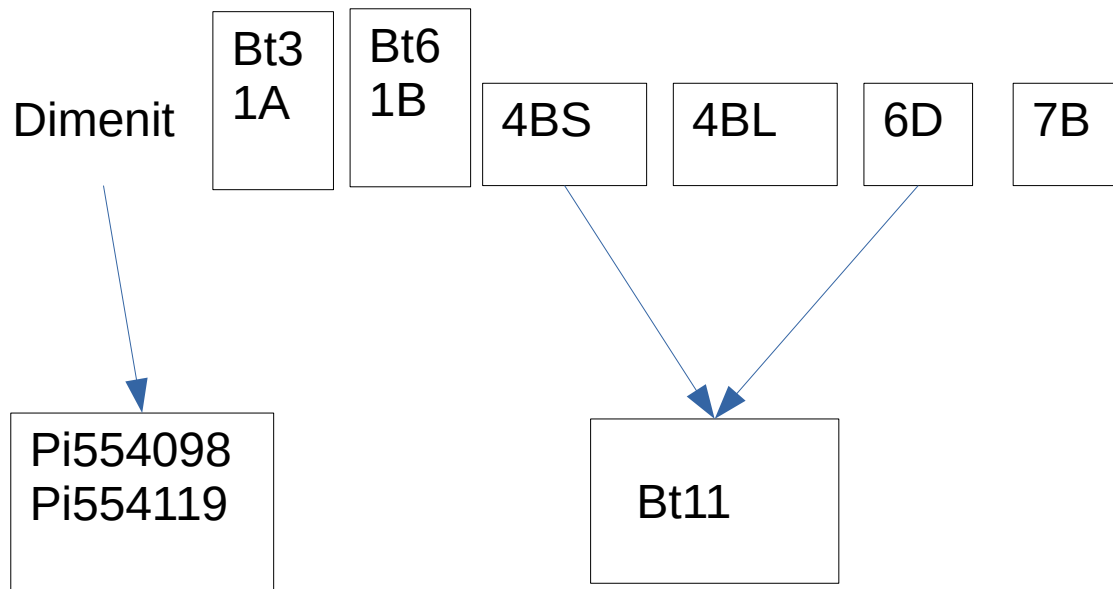
2 candidate genes within the haplotype

Gene	Function
TraesCS6D03G0022800	Receptor-like protein kinase
TraesCS6D03G0023800	F-box family protein

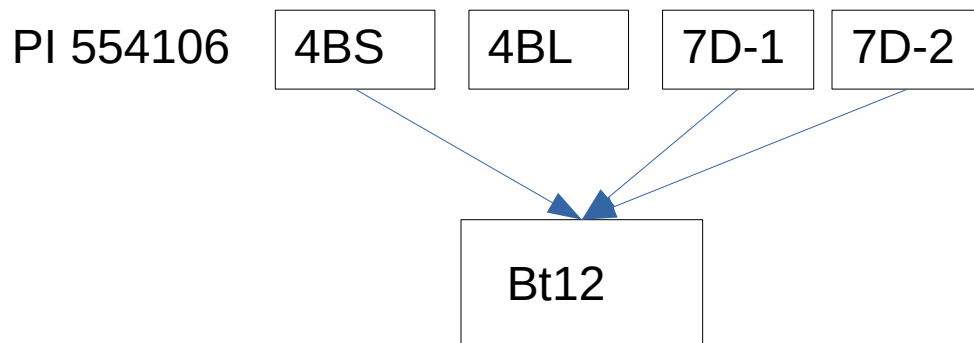
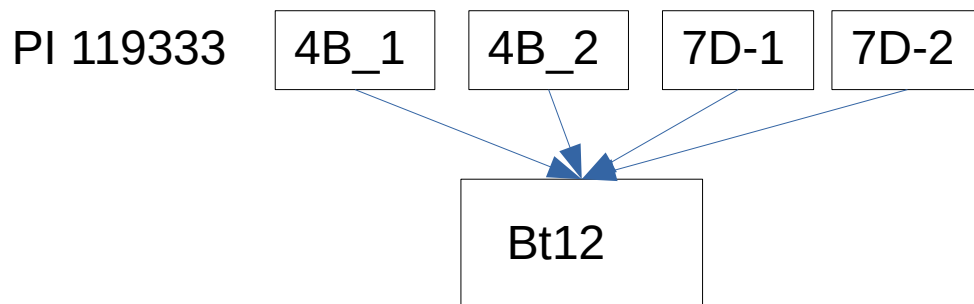
Bt8

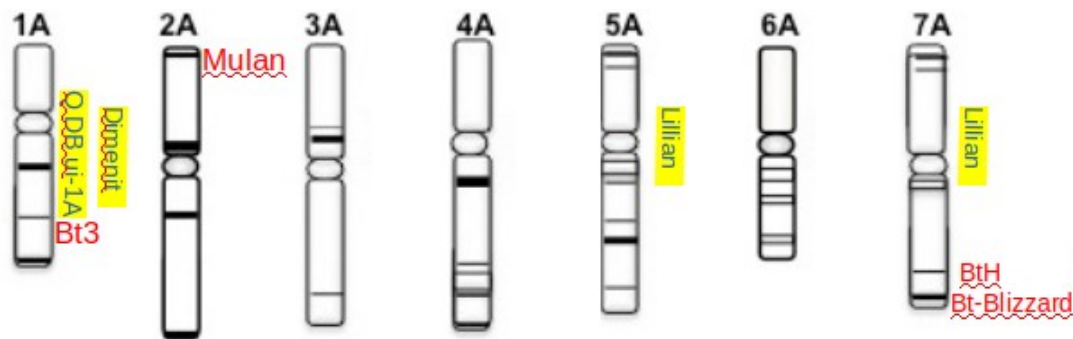
- Bt8 has been found in:
 - Yayla 305 (multiple genes) (Red Bob NILs)
 - PI 178383 (multiple genes) (source of most breeding lines)
 - PI 173438 (multiple genes) (PI 554120)
- New data upcoming in June 2025!

Bt11 (please don't use the name Bt11 anymore)

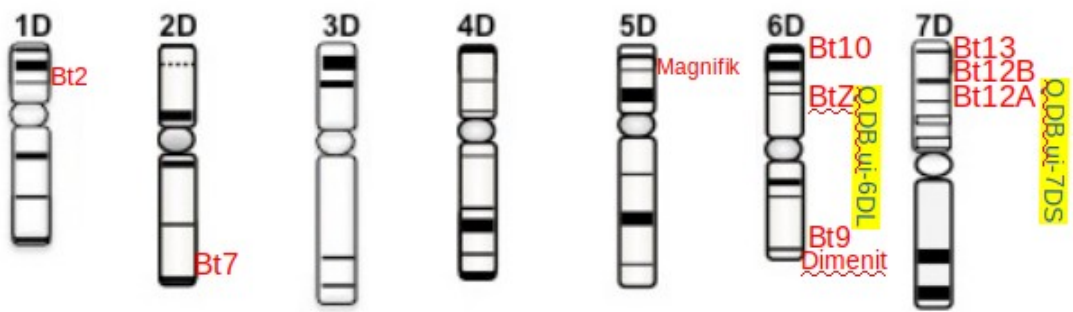
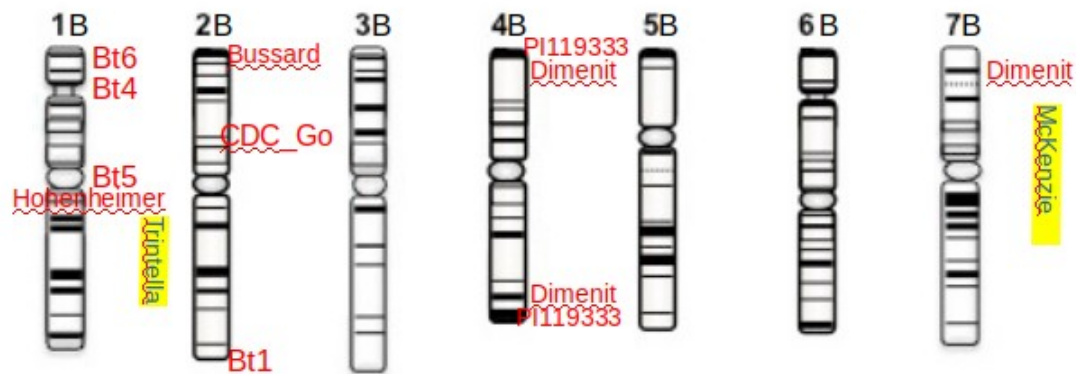


Bt12 (please don't use the name Bt12 anymore)

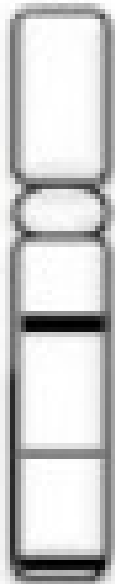




***T.*
*aestivum***
cv Chinese Spring



1A



Bt3
Position: 502Mbp

Q.DB.ui-1A (=Bt3)
Position: Unknown

2A



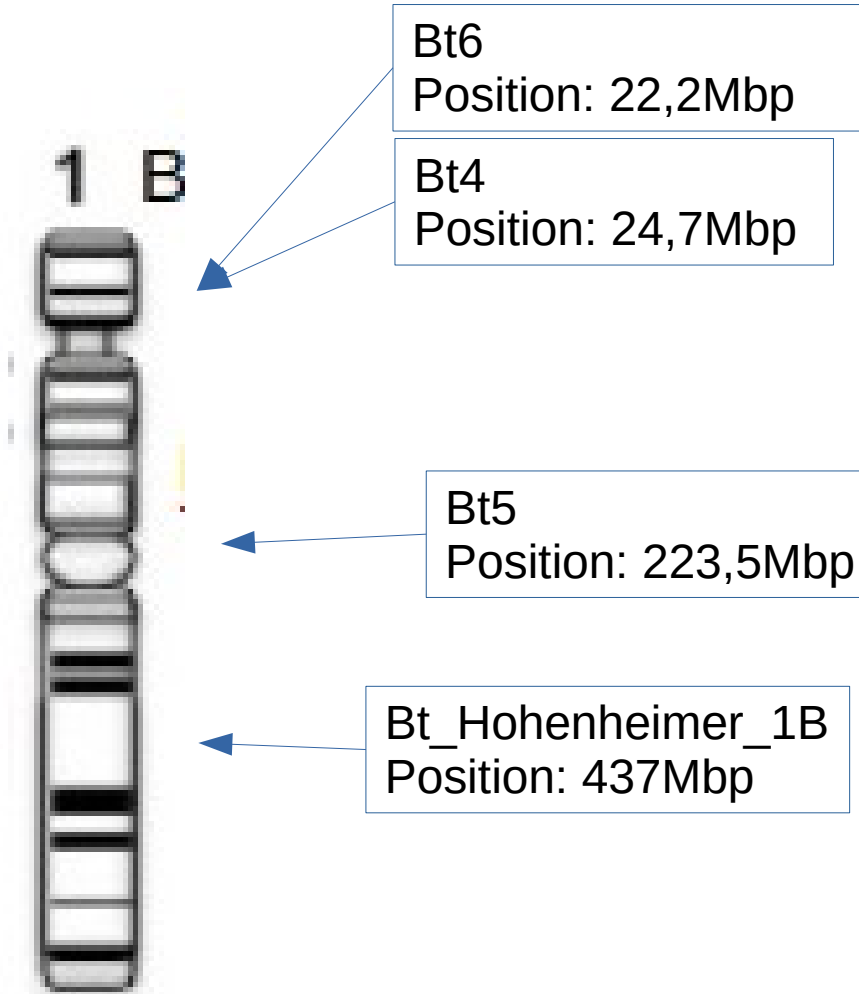
QCbt.ifa-2A/Bt_Mulan_2A
Position: 17,5Mbp

7A



BtH
Position: 674Mbp

Bt_Blizzard_7A/QCbt.ifa
Position: 727Mbp



Bt_Trintella
Position: unknown

2 B



Bt_Bussard_2B
Position: 10,9Mbp

Bt_CDC_Go
Position: 244Mbp

Bt1
Position: 805Mbp

Q.DB.ui-2B
Position: unknown

4 B



Bt_Dimenit_4BS
Position: 16,7Mbp

Bt_PI119333_4BS
Position: 8,6Mbp

Bt_PI119333_4BL
Position: 660,5Mbp

Bt_Dimenit_4BL
Position: 660,3Mbp

7 B



Bt_Dimenit_7B
Position: 120Mbp

Bt_McKenzie_7B
Position: unknown



Bt2

Position: 54Mbp

2D



Bt7
Position: 623Mbp

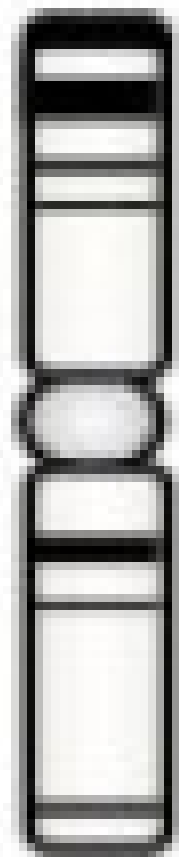


50

Bt_Magnifik_5D
Position: 45Mbp

Position: 45Mbp

6D



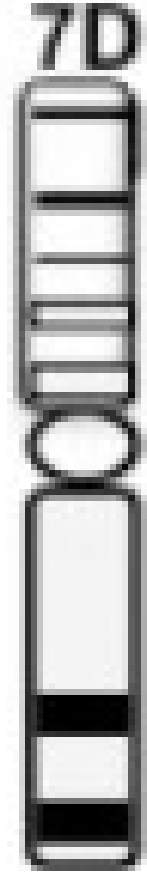
BtZ
Position: 4,0Mbp

Bt10
Position: 2,7Mbp

Q.DB.ui-6DL
Position: 492,5Mbp

QCbt.ifa-6D/Bt_Dimenit_6D
Position: 492,5Mbp

Bt9
Position: 490Mbp



Bt13
Position: 5,3Mbp

Bt12B
Position: 16,2Mbp

Bt12A
Position: 16,2Mbp

QCbt.ifa-7D
Position: 18,5Mbp

Q.DB.ui-7DS
Position: Unknown



Tank you for your attention