

Table S1. BPH-resistant genes/QTLs in rice.

Gene	Germplasm	Chr.	Encoded protein	Subcellular localization	Expression pattern	Resistance against	References
<i>BPH1</i>	Mudgo	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Zhao et al. 2016
<i>bph2</i>	ASD7	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Tamura et al. 2014
<i>BPH3</i>	Rathu Heenati	4S	Lectin receptor kinases	Plasma membrane	Vascular bundle	BPH and WBPH	Liu et al. 2015
<i>BPH6</i>	Swarnalata	4L	Atypical LRR	Exocyst	Vascular bundle/sclerenchyma	BPH and WBPH	Guo et al. 2018
<i>bph7</i>	T12	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Du et al. 2009
<i>BPH9</i>	Pokkali	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Zhao et al. 2016
<i>BPH10</i>	IR65482-4-136-2-2	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Zhao et al. 2016
<i>BPH14</i>	B5	3L	CC-NB-LRR	Nucleus and cytoplasm	Vascular bundle	BPH	Du et al. 2009
<i>BPH15</i>	B5	4S	Lectin receptor kinase	Plasma membrane	Vascular bundle	BPH	Cheng et al. 2013
<i>BPH18</i>	IR65482-7-216-1-2(<i>O. australiensis</i>)	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Ji et al. 2016
<i>BPH21</i>	IR71033-121-15 (<i>O. minuta</i>)	12L	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Zhao et al. 2016
<i>BPH26</i>	ADR52	6S	CC-NB-NB-LRR	Endomembrane system	Vascular bundle	BPH	Zhang et al. 2024
<i>bph29</i>	RBPH54	6S	B3 DNA-binding domain	Nucleus	Vascular bundle	BPH	Zhang et al. 2015

<i>Bph30</i>	AC-1613	4S	LRD	Endomembrane system	Vascular bundle	BPH	Shi et al. 2021
<i>BPH32</i>	PTB33	6S	Unknown SCR domain	Plasma membrane	Vascular bundle	BPH	Ren et al. 2016
<i>Bph37</i>	SE382	6L	CC-NB	-	Vascular bundle	BPH	Zhou et al. 2021
<i>Bph40</i>	SE232, SE67, C334	4S	LRD	-	Vascular bundle	BPH	Shi et al. 2021

Table S2. The cloned insect-resistant genes in rice

Genes/QTLs	Chromosome	Germplasm	Linked Markers	Position (Mbp)	PEV	Reference
<i>Bph1</i>	12L	Mudgo	pBPH4-pBPH14	22.86	Major gene	Cha et al. 2008
<i>Bph2 (bph2)</i>	12L	ASD7	RM463-RM7102	22.87~22.89	Major gene	Sun et al. 2006
<i>Bph3-1 (Bph3)</i> [#]	6S	Ptb33, Rathu Heenati	RM589-RM588	1.38~1.48	Major gene	Jairin et al. 2007
<i>Bph3-2 (Bph3)</i> ^{*#}	4S	Rathu Heenatis	RHD9-RHC10	6.20~6.97	Major gene	Liu et al. 2015
<i>Bph4 (bph4)</i>	6S	Babawee RM589-	RM586	1.38~1.47	58.8–70.1%	Jairin et al. 2010
<i>Bph5 (bph5)</i>	—	ARC10550	—	—	Major gene	Khush et al. 1985
<i>Bph6</i> [*]	4L	Swarnalata	H-Y9	21.40	Major gene	Guo et al. 2018
<i>Bph7</i>	12L	T12	RM3448-RM313	19.95~20.87	38.3%	Qiu et al. 2014
<i>Bph8 (bph8)</i>	—	Chin Saba	—	—	Major gene	Nemoto et al. 1989
<i>Bph9</i> [*]	12L	Pokkali	InD2-RsaI	22.85~22.97	Major gene	Wang et al. 2021
<i>Bph10 (bph10)</i>	12L	<i>O. australiensis</i>	RG457	19.55~26.98	Major gene	Ishii et al. 1994
<i>Bph11(t) (bph11)</i>	3L	<i>O. officinalis</i>	G1318	35.60~35.80	Major gene	Renganayaki et al. 2002

<i>Bph12-1 (Bph12)</i> [#]	4S	B14 (<i>O. officinalis</i>)	RM16459- RM1305	5.21~5.56	73.8%	Qiu et al. 2012
<i>Bph12-2 (bph12)</i> [#]	4L	<i>O. officinalis</i>	G271-R93	20.34~21.31	Major gene	Hirabayashi et al. 1998
<i>Bph12(t)</i>	4S	<i>O. latifolia</i>	RM261-RM8213	4.44~6.57	70.6 %	Yang et al. 2002
<i>Bph13(t)-1 [Bph13(t)]</i> [#]	2L	<i>O. eichingeri</i>	RM240-RM250	31.50~32.78	90%	Liu et al. 2001
<i>Bph13(t)-2 [Bph13(t)]</i> [#]	3S	IR54745-2-21 (<i>O. officinalis</i>)	RG100-RG191	5.18~5.70	Major gene	Renganayaki et al, 2002
<i>Bph14*</i>	3L	B5 (<i>O. officinalis</i>)	SM1-G1318	35.68~35.70	Major gene	Du et al. 2009
<i>Bph15*</i>	4S	B5 (<i>O. officinalis</i>)	RG1-RG2	6.68~6.90	Major gene	Yang et al. 2002
<i>Bph16</i>	4L	<i>O. officinalis</i>	G271-R93	20.17~21.14	Major gene	Hirabayashi et al. 1998
<i>Bph17</i>	4S	Rathu Heenati	RM8213- RM5953	4.44~9.38	Major gene	Sun et al. 2005
<i>Bph18(t) [bph18(t)]</i>	4L	<i>O. rufipogon</i>	RM273-RM6506	24.05~25.05	Major gene	Rongbai et al. 2010
<i>Bph18*</i>	12L	IR65482-7-216-1-2 (<i>O. australiensis</i>)	BIM3-BN162	22.88	Major gene	Ji et al. 2016
<i>Bph19(t)-1 [bph19(t)]</i> [#]	3S	AS20-1	RM6308- RM3134	7.18~7.24	Major gene	Chen et al. 2006
<i>Bph19(t)-2 [bph19(t)]</i> [#]	12L	<i>O. rufipogon</i>	RM17	26.98	Major gene	Rongbai et al. 2010
<i>Bph20(t)-1 [Bph20(t)]</i> [#]	4S	IR71033-121-15 (<i>O. minuta</i>)	B42-B44	8.76	Major gene	Rahman et al. 2009
<i>Bph20(t)-2 [bph20(t)]</i> [#]	6S	<i>O. rufipogon</i>	BYL7-BYL8	0.47~0.53	Major gene	Yang et al. 2012
<i>Bph21(t)-1 [Bph21(t)]</i> [#]	12L	IR71033-121-15 (<i>O. minuta</i>)	S12094A-B122	24.20~24.36	Major gene	Rahman et al. 2009
<i>Bph21(t)-2 [bph21(t)]</i> [#]	10S	<i>O. rufipogon</i>	RM222-RM244	2.62~5.00	Major gene	Yang et al. 2012

<i>Bph22(t)</i> -1 [<i>Bph22(t)</i>] [#]	4L	<i>O. glaberrima</i>	RM471-RM5742	18.99~21.56	Major gene	Ram et al. 2010
<i>Bph23(t)</i> -1 [<i>Bph23(t)</i>] [#]	—	<i>O. minuta</i>	—	—	Major gene	Deen et al. 2010
<i>Bph22(t)</i> -2 [<i>bph22(t)</i>] [#]	4L	<i>O. rufipogon</i>	RM8212-RM261	19.11~19.57	11.3%	Hou et al. 2011
<i>Bph23(t)</i> -2 [<i>bph23(t)</i>] [#]	8L	<i>O. rufipogon</i>	RM2655-RM3572	16.63~17.07	14.9%	Hou et al. 2011
<i>Bph24(t)</i> [<i>bph24(t)</i>]	—	IR73678-6-9-B (<i>O. rufipogon</i>)	—	—	Major gene	Deen et al. 2010
<i>Bph25</i>	6S	ADR52	S00310-RM8101	0.21	Major gene	Myint et al. 2012
<i>Bph26</i> *	12L	ADR52	DS72B-DS173B	22.87~22.89	Major gene	Tamura et al. 2014
<i>Bph27</i>	4L	GX2183 (<i>O. rufipogon</i>)	RM16846-RM16888	19.12~19.50	Major gene	Huang et al. 2013
<i>Bph27(t)</i>	4L	Balamawee	Q52-Q20	20.79~21.33	Major gene	He et al. 2013
<i>Bph28(t)</i>	11L	DV85	Indel55-Indel66	16.90~16.96	Major gene	Wu et al. 2014
<i>Bph29 (bph29)</i> *	6S	RBPH54 (<i>O. rufipogon</i>)	BYL8-BID2	0.48~0.49	Major gene	Wang et al. 2015
<i>Bph30</i> *	4S	AC-1613	SSR28-SSR69	0.92~0.94	Major gene	Shi et al. 2021
<i>Bph31</i>	3L	CR2711-76	PA25-RM2334	26.25~26.57	Major gene	Prahalada et al. 2017
<i>Bph32</i> *	6S	Ptb33	RM19291-RM8072	12.23~12.36	Major gene	Wang et al. 2015
<i>Bph33</i>	4S	KOLAYAL, PPLIYAL	H99-H101	19.29~19.79	Major gene	Hu et al. 2018
<i>Bph34</i>	4L	IRGC104646 (<i>O. nivara</i>)	RM17007-RM1699	21.32~21.47	Major gene	Kumar et al. 2018
<i>Bph35</i>	4S	RBPH660 (<i>O. rufipogon</i>)	RM3471-PSM20	6.28~6.94	51.27%	Zhang et al. 2020
<i>Bph36</i>	4S	GX2183 (<i>O. rufipogon</i>)	S13-X48	6.46~6.50	Major gene	Li et al. 2019
<i>Bph37-1 (Bph37)</i> [#]	1L	IR64	RM302-YM35	19.10~19.20	36.9%	Yang et al. 2019

<i>Bph37-2 (Bph37) ^{*#}</i>	6S	SE382	—	3.45	Major gene	Zhou et al. 2021
<i>Bph38(t)</i>	1L	Khazar	SNP693369-id 10112165	20.80~20.90	35.91%	Balachiranjeevi et al. 2019
<i>Bph38</i>	4L	GX2183 (<i>O. rufipogon</i>)	YM112-YM190	15.00~15.10	Major gene	Yang et al. 2020
<i>Bph40[*]</i>	4S	SE232, SE67, C334,	—	4.48~4.49	Major gene	Shi et al. 2021
<i>Bph41-1 (Bph41) [#]</i>	4S	SWD10	SWRm_01617-SWRm_01522	0.90~1.10	Major gene	Tan et al. 2022
<i>Bph41-2 (Bph41) [#]</i>	4S	GXU202 (<i>O. rufipogon</i>)	W4_4_3-W1_6_3	4.68~4.78	Major gene	Wang et al. 2022
<i>Bph42-1 (Bph42) [#]</i>	4S	SWD10	SWRm_01695-SWRm_00328	20.60~21.80	Major gene	Tan et al. 2022
<i>Bph42-2 (bph42) [#]</i>	4S	<i>O. rufipogon</i>	RM16282-RM16335	9.07~9.58	29%	Kaur et al. 2022
<i>Bph43</i>	11S	IRGC 8678	InDel16_22-InDel16-30 1	6.79~16.90	Major gene	Kim et al. 2022
<i>Bph44</i>	4L	Balamawee	Q31-RM17007	21.38~21.47	Major gene	Kiswanto et al. 2022
<i>Bph45</i>	4L	Tainung71 (<i>O. nivara</i>)	—	13.70~13.80	Major gene	Li et al. 2023
<i>qBph3</i>	3L	IR02W101 (<i>O. officinalis</i>)	t6-f3	35.63~35.47	28%	Hu et al. 2015
<i>qBph6</i>	6S	IR71033-121-15	RM469-RM568	5.64~5.71	19.6%	Van Mai et al. 2015
<i>qbph8</i>	8L	Swarnalata	RM339-RM515	17.94~20.28	6.6%	Qiu et al. 2013
<i>qbph11</i>	11L	DV85	XNpb202-C1172	17.43~19.56	68.4%	Su et al. 2010
<i>qBph4-1 (qBph4) [#]</i>	4S	IR02W101 (<i>O. officinalis</i>)	P17-xc4_27	6.70~6.90	35%	Hu et al. 2015
<i>qBph4-2 (qBph4) [#]</i>	4S	BP360e	RM16382-INDEL4-5	6.20~6.70	56%	Tao et al. 2019

<i>qBph4.2</i>	4S	IR65482-17-511 (<i>O. officinalis</i>)	RM261-XC4-27	6.58~6.89 36–	36–44%	Hu et al. 2015
<i>qBph4.3</i>	4S	Salkathi	RM551-RM335	0.177~0.688	37.02%	Mohanty et al. 2017
<i>qBph4.4</i>	4S	Salkathi	RM335-RM5633	0.688~13.07	7.1%	Mohanty et al. 2017
<i>qBph12</i>	12L	ASD7	RM28466- RM7376	22.94~23.44	28.8%	Van Mai et al. 2015
<i>Bph39(t) [bph39(t)]</i>	—	<i>O. nivara</i>	—	—	Major gene	Akanksha et al. 2019
<i>Bph40(t)-1 [bph40(t)]</i>	—	<i>O. nivara</i>	—	—	Major gene	Akanksha et al. 2019

Chr: chromosome; CC-NB-LRR: coiled-coil-nucleotide-binding-leucine-rich-repeat; LRD, leucine-rich repeat domain; LRK: lectin receptor kinase; SCR: short consensus repeat.

