

Supplementary Information

Table S1 Information of the 112 *P. sojae* isolates used in the study.

Location	Code	Coordinates	Number	EC ₅₀ range (µg/ml)	Year
Fujian	Ps1-8	24.78, 118.08	8	0.035-0.048	2008
Fujian	Ps9-27	24.37, 117.91	19	0.023-0.024	2002
Fujian	Ps28-39	24.33, 117.87	12	0.039-0.053	2004
Fujian	Ps40-49	24.77, 118.08	10	0.033-0.047	2005, 2006, 2007
Heilongjiang	LS-	45.12, 130.70	15	0.028-0.063	2010
Heilongjiang	HLYF-	46.89, 126.08	9	0.032-0.066	2010
Heilongjiang	SH-	46.65, 126.98	9	0.040-0.057	2010
Heilongjiang	CX-	46.03, 126.61	8	0.063-0.086	2010
Heilongjiang	DZT3-, JMS-	44.57, 129.63	16	0.046-0.067	2004, 2010
Anhui	AH-	32.36, 117.38	6	0.040-0.050	2010
Total			112	0.023-0.086	2002-2010

Table S2 Concentrations used to determine the sensitivities of field isolates and resistant mutants of *P. sojae* to various fungicides

Fungicide	Concentrations (µg/ml)
chlorothalonil	2.0, 4.0, 6.0, 8.0, 10.0
azoxystrobin	0.20, 0.40, 0.80, 1.0, 1.20
cymoxanil	0.10, 0.30, 0.50, 1.0, 3.0, 5.0
metalaxyl	0.15, 0.30, 0.60, 1.2, 2.4
flumorph	0.20, 0.30, 0.40, 0.50, 0.60, 0.80

Table S3 Primers used in this study.

Primer name	Sequence 5'-3'	Purpose
Ps beta forward	GACGGAGAGCCATACGAA	Amplification of the β -tubulin gene in <i>P. sojae</i>
Ps beta reverse	AGATGCCGAGCCACTAAC	Amplification of the β -tubulin gene in <i>P. sojae</i>
qRTHK-2F	CTCCAAGGGCTCGTCCAA	<i>P. sojae</i> housekeeping gene (rpS5) used as qRT-PCR reference
qRTHK-2R	GCCAGCATCCCTCCAAAG	<i>P. sojae</i> housekeeping gene (rpS5) used as qRT-PCR reference
PsACT qRT F	ACTGCACCTTCCAGACCATC	<i>P. sojae</i> actin gene used as qRT-PCR reference
PsACT qRT R	CCACCACCTTGATCTTCATG	<i>P. sojae</i> actin gene used as qRT-PCR reference
PsBeta_UTRF	GTGAGGGTATGGACGAGATGGA	qRT-PCR for validation of the endogenous β -tubulin expression patterns
PsBeta_UTRR	TGAACAAAGGCGGTCAGCAA	qRT-PCR for validation of the endogenous β -tubulin expression patterns
PsBeta_qRTF	TACCCGGACCGTATCATGTG	qRT-PCR for validation of the total β -tubulin expression patterns
PsBeta_qRTR	TCGTACAGGGCCTCGTTATC	qRT-PCR for validation of the total β -tubulin expression patterns

<i>Ovis aries</i>	MREIVHLTGCCGCGNIGAKFEWVISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Drosophila melanogaster</i>	MREIVNLGCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEASVTRSS	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	155
<i>Arabidopsis thaliana</i>	MREILHIGGCGCGNIGAKFEWVCAEHGDSGFRVQGEKDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Botrytis cinerea</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Monilinia fruticola</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Cercospora beticola</i> .seq	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Fusarium fujikuroi</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Magnaporthe oryzae</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAS.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>P. sojae</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>P. infestans</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>P. capsici</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Py. macrosporum</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	140
<i>Py. sulcatum</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	48
<i>Py. sylvaticum</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	114
<i>Py. ultimum</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
<i>Py. aphanidermatum</i>	MREIVHLTGCCGCGNIGAKFEWISDEHGDPTGSGYHGDSDLQLERINVYNEAT.....	GNKYVPRAILVDLEPGTMDSVSRGPGQIFRPDNEVFQGSAGNNW	RGHYTEGAELDGVLDVVR	E	E	E	CDCLQGQFQTHSLGGGTG	GMGTL	150
Consensus	mreivh l t g c c g c g n i g a k f e w i s d e h g d p t g s g y h g d s d l q l e r i n v y n e a t	g g r y v p r a i l m d l e p g t m d s v r a g p y q l f r p d n e v f g q s a g n n w a k g h y t e g a e l d s v l d v v r k e a e s c d c l q g f q t h s l g g g t g s g m g t l							
<i>Ovis aries</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Drosophila melanogaster</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								310
<i>Arabidopsis thaliana</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Botrytis cinerea</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Monilinia fruticola</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Cercospora beticola</i> .seq	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Fusarium fujikuroi</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Magnaporthe oryzae</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>P. sojae</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>P. infestans</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>P. capsici</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Py. macrosporum</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								295
<i>Py. sulcatum</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								203
<i>Py. sylvaticum</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								269
<i>Py. ultimum</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
<i>Py. aphanidermatum</i>	LISKIREE PDR MCT SVCPSPRVSDTVPEPNATLS HQIVEN DVMCLDNEALYDICTRLKLTTPG GDLN LVCA MSGT TGLRFPQGLN DLRLKLVN VPFR LHFFM GFAPLTSRGSQQYRAV VPELTQQQD RKNMCA D								305
Consensus	liskiree y p d r i m c t s v c p s p r v s d t v p e p n a t l s h q i v e n d v m c l d n e a l y d i c f r t l k l t t p g g d l n l v c a m s g t t g l r f p q g l n s d l r k l a v n l i p f r l h f f m g f a p l t s r g s q q y r a l t v p e l t q q q d a k n m c a a d p								
<i>Ovis aries</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								445
<i>Drosophila melanogaster</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								453
<i>Arabidopsis thaliana</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								449
<i>Botrytis cinerea</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								447
<i>Monilinia fruticola</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								398
<i>Cercospora beticola</i> .seq	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								447
<i>Fusarium fujikuroi</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
<i>Magnaporthe oryzae</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								447
<i>P. sojae</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
<i>P. infestans</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
<i>P. capsici</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
<i>Py. macrosporum</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								429
<i>Py. sulcatum</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								257
<i>Py. sylvaticum</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								363
<i>Py. ultimum</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
<i>Py. aphanidermatum</i>	R GRYLTA AAVRG RMSTKEVDEQMLNVQNRNSSFVWIPNNKIRASVCI PPGLKLMSTTFIGNSTAIQEMFRVSEQFTAMFRRAFLHWYTGEGMDEMEFTAESNNNDIVSEYQQYQDATAE...								446
Consensus	r h g r y l t a a a v r g r m s t k e v d e q m l n v q n r n s s f v w i p n n k i r a s v c i p p g l k l m s t t f i g n s t a i q e m f r v s e q f t a m f r r a f l h w y t g e g m d e m e f t a e s n n d i v s e y q q y q d a t a e e e e e e e								

Figure S1 Multiple alignment of the β -tubulin amino acid sequences in *Ovis aries* (PDB: D0VWY9-1), *Drosophila melanogaster* (GenBank: NP_001286835.1), *Arabidopsis thaliana* (GenBank: AAK96884.1), *Botrytis cinerea*, *Monilinia fruticola*, *Cercospora beticola*, *Fusarium fujikuroi*, *Magnaporthe grisea*, *P. sojae*, *P. infestans*, *P. capsici*, *Py. sulcatum* (GenBank: BAJ79093.1), *Py. sylvaticum* (GenBank: AJD08746.1), *Py. sylvaticum* (GenBank: ADJ39244.1), *Py. ultimum* and *Py. aphanidermatum*. The red asterisk (★) indicates the amino acid residue at the codon 239.