Australian Journal of Crop Science

AJCS 11(08):952-959 (2017) doi: 10.21475/ajcs.17.11.08.pne432 AJCS ISSN:1835-2707

Molecular identification and pathogenicity of *Rhizoctonia* spp. recovered from seed and soil samples of the main bean growing area of Argentina

Spedaletti Y, Mercado Cárdenas G, Taboada G, Aban C, Aparicio M, Rodriguero M, Vizgarra O, Sühring S, Galíndez G, Galván M^{\ast}



Supplementary Figure 1: Collection sites of *Rhizoctonia* spp. isolates recovered from seed and soil samples collected in common bean fields, showing symptoms of root and hypocotyl rot, from four locations in Salta and Tucumán provinces, northwestern Argentina. 1: Tartagal, 2: General San Martín, 3: Pichanal, 4: San Agustín,



Supplementary Figure 2: PCR amplificons of the rDNA-ITS region of three representative *Rhizoctonia solani* isolates, Rs 5 (AG4), Rs 30 (AG4 HG-I) and Rs 52 (AG4 HG-III). L: 100-1000 bp DNA ladder (Highway-Inbio, Tandil, Argentina).



Supplementary Figure 3: Alignment of the sequences of the rDNA-ITS region (5'-3'direction) of representative AG 4 *Rhizoctonia solani* isolates. The points indicate similarity to the reference sequence AF222797. The sequences of the ITS1 and ITS2 regions are found at positions 5-234 and 390-630, respectively. (*continue*...)

	410	420	430	440	450	460	470	480	490	500
1200000-10 4 NO-11										
JX294349-AG 4	TETTERANOTCAME	CITIGITAN	TCANTIGGT	TTC. A.	UTAT IGUADGA	CT.	TICACACCIT		T	CIGGA
Rs 5-AG 4				Τ-C. λ						
Rs 14-AG 4				Τ-C.λ		Т	• • • • • • • • • • •			
Rs 28-AG 4				Τ-C.λ					•••••	
Rs 18-AG 4				Τ-C. λ						
AY152703-AG 4 HG-I			c			C				
Rs 30-AG4 HG-I			C			C				
FJ480929-AG 4 HG-III				T		C			т	
Rs 52-AG 4 HG-III				T		C			T	
Rs 57-AG 4 HG-III				T		C			<u>T</u>	
RS 62-AG 4 HG-111			•••••	T		C		•••••	T	
Rs 43-AG 4 HG-III				T		C			T	
				1000						
	510	520	530	540	550	560	570	580	590	600
AF222797-AG 4 HG-11	TCTCAGTGTTATOCT	TGGTTCCACT	CACCOTGATAA	GTTATCTATC	OCTGAGGACAC	C	CTGTTAAAA	A	GGOGTGGCC	AAOGT
JX294349-AG 4						T	λ			
Rs 5-AG 4						Ţ				
Rs 28-AG 4						T	λ			
Rs 77-AG 4						T	λ ·			т.
Rs 18-AG 4						T	λ ·			
AY152703-AG 4 HG-1	••••••••		• • • • • • • • • • • • • • • •							
Rs 12-AG4 HG-I										
EJ480929-AG 4 HG-III						TTTTTCTACT	· · · · À. · · · (GAGTTTGGG .		
Rs 52-AG 4 HG-III			•••••	•••••	•••••	TTTTTTCTACT	····.λ. ····	CAGTTTGOG.		
Rs 62-AG 4 HG-III						TTTTTCTACT	λ	GAGTTTGGG.		
RS 65-AG 4 HG-III						TTTTTCTACT	λ(GAGTTTGGG .		
Rs 43-AG 4 HG-III						TTTTTCTACT	····.λ. · · · (CAGTTTGGG .	· · · · · · · · · · · ·	
	610	620	630	640	65.0	660	670	680	690	700
12000202 10 4 90 11	610	620	630	640	650	660	670	680	690	700 1
AF222797-AG 4 HG-II	610	620	630	640	650 	660 	670 CTGATCTCA	68 0	690	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4	610	620 	630 GTCCATTGACT	640 TGACAATATC .GAC. A. AJ .GAC. A. AJ	650 	660 	670 	680 	690 	700
AF222797-AG 4 HG-II JK294349-AG 4 Rs 5-AG 4 Rs 14-AG 4	61.0 	620 	620 GTCCATTGACT	640 	650 	660 	670 CTGATCTCA	680 	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 72-AG 4	610	620 CTTCTAATAA	630 	640 TGACAATATO .GAC.A.AJ .GAC.A.AJ .GAC.A.AJ .GAC.A.AJ .GAC.A.AJ	650 	660 TTATGAT	670	680 	690 	700
AF222797-AG 4 HG-11 JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 72-AG 4 Rs 77-AG 4 Rs 77-AG 4 Rs 18-AG 4	610	620 DCTTCTAATAA	620 GTCCATTGACT T T T T	640 	650 	660 TTATGAT	670 сталтстся	680 	690 	700
AF222797-AG 4 HG-11 JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 N152703-AG 4 HG-1	610	620 GCTT CTAATAA	620 	640 	650 	660 	670 CTGATCTCA	680 	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 AY152703-AG 4 HG-I Rs 30-AG 4 HG-I Rs 30-AG 4 HG-I	610 AAATGCAGAT GAACCO	620 3CTTCTAATAA 	620 GTCCATTGACT T T T T T C	640 	650 ТАА Т.А АААТ.Т.А АААТ.Т.А АААТ.Т.А АААТ.Т.А 	660 TTATGAT ATT. ATT. ATT. ATT.	670 .1	680 	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 NY152703-AG 4 HG-I Rs 30-AG4 HG-I Rs 30-AG4 HG-I Fs 12-AG4 HG-I Fs480929-AG 4 HG-III	610	620 	620 GTCCATTGACT T T T T C C	640 	650 	660 	670 IIIICTGATCTCA	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 XY152703-AG 4 HG-I Rs 10-AG 4 HG-I Rs 10-AG 4 HG-I Rs 12-AG4 HG-I Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III	610 	620 	630 GTCCATT GACT T T T C C	640 TGACAATATC .GAC. A. AJ .GAC. A. AJ .GAC. A. AJ .GAC. A. AJ .GAC. A. AJ .GAC. A. AZ .GAC. A. CZ .GAC. ATCZ	650 	660 	670 CTGATCTCA	680 .1	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 7-AG 4 Rs 18-AG 4 RS 18-AG 4 AY152703-AG 4 HG-I Rs 18-AG 4HG-I Rs 12-AG 4HG-I F2480929-AG 4 HG-III Rs 52-AG 4 HG-III Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III	610 AAATGCAOATGAACC	620 	630 GTCCATTGACT T T T C C	640 	650 	660 	670 CTGATCTCA	680 .1 1. .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 MIS270-AG 4 HG-I Rs 12-AG 4 HG-I Rs 12-AG 4 HG-III Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III	610 AAATGCAGATGAACCA	620	630 	640 	650 	660 -TTATGAT ATTT -TTTT -TTT -ATT -ATT -T -T -T -T -T	670	680 .1 I TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG .TCAGGTAG	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 17-AG 4 Rs 17-AG 4 HG-I Rs 30-AG4 HG-I Rs 30-AG4 HG-II Rs 52-AG 4 HG-III Rs 57-AG 4 HG-III Rs 62-AG 4 HG-III Rs 62-AG 4 HG-III Rs 63-AG 4 HG-III Rs 63-AG 4 HG-III	610 ************************************	620 	630 GTCA T GACT T T T C C	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JZ294349-AG 4 Rs 5-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 18-AG 4 AY152703-AG 4 HG-I Rs 10-AG 4 HG-I Rs 10-AG 4 HG-I Rs 12-AG 4 HG-III Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 43-AG 4 HG-III	610 2427 GOLOAT GAAC	620	620 	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 XY152703-AG 4 HG-I Rs 12-AG4 HG-I Rs 12-AG4 HG-I Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 62-AG 4 HG-III Rs 63-AG 4 HG-III Rs 43-AG 4 HG-III	610 ************************************	620	620 GTCCATTGACT T T C C C	640 	650 	660 	670 	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 MT52703-AG 4 HG-I Rs 30-AG4 HG-I Rs 30-AG4 HG-I Rs 52-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 43-AG 4 HG-III AF222797-AG 4 HG-II	610 	620	630 	640 	650 	660 	670 .1 	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 18-AG 4 Rs 17-AG 4 Rs 17-AG 4 Rs 10-AG 4 HG-I Rs 10-AG 4 HG-II Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III Rs 62-AG 4 HG-III Rs 63-AG 4 HG-III Rs 63-AG 4 HG-III AF222797-AG 4 HG-II JX294349-AG 4	610 xxxTacxoxTaxAcc	620	630 GTCANTOACT T T T C C	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JZ294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 10-AG 4 Rs 12-AG 4 HG-I Rs 10-AG 4 HG-I Rs 10-AG 4 HG-II Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III AF222797-AG 4 HG-III JZ294349-AG 4 Rs 14-AG 4 HG 4	610 xxxTGCXXXTGXXCX 	620	620 	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JZ294349-AG 4 Rs 5-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 XY152703-AG 4 Rs 18-AG 4 XY152703-AG 4 HG-I Rs 12-AG4 HG-I Rs 12-AG4 HG-I Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 18-AG 4	610 xxxTGCXXXTGXXCC 	620	620 GTCCATTGACT T T C C C	640 	650 	660 	670 	680 	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 Rs 18-AG 4 MTS2703-AG 4 HG-I Rs 30-AG4 HG-I Rs 30-AG4 HG-II Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 43-AG 4 HG-III AF222797-AG 4 HG-II JX294349-AG 4 Rs 14-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 71-AG 4	610 ************************************	620	630 GTCANTGAT T T T C C	640 	650 	660 	670	680 	690 	700
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 18-AG 4 Rs 17-AG 4 Rs 17-AG 4 Rs 10-AG 4 HG-I Rs 10-AG 4 HG-II Rs 57-AG 4 HG-III Rs 62-AG 4 HG-III Rs 62-AG 4 HG-III Rs 63-AG 4 HG-III MS222797-AG 4 HG-III JX294349-AG 4 Rs 14-AG 4 Rs 14-AG 4 Rs 14-AG 4 Rs 14-AG 4 Rs 18-AG 4 HG-II S 77-AG 4 HG-II JX294349-AG 4 HG-II	610 xxxTacxoxTaxAcc	620	620 GTCANTGACT T T T C C	640 	650 	660 	670	680 II AA. TCAGGTG TCAGGTA TCAGGTA TCAGGTA TCAGGTA TCAGGTA TCAGGTA TCAGGTA TCAGGTA	690 	700 I
AF222797-AG 4 HG-II JZ294349-AG 4 Rs 5-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 AY152703-AG 4 HG-I Rs 18-AG 4 HG-I Rs 18-AG 4 HG-III Rs 52-AG 4 HG-III Rs 62-AG 4 HG-III Rs 65-AG 4 HG-III JZ294349-AG 4 Rs 14-AG 4 Rs 18-AG 4	610 	620	620 	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 Rs 18-AG 4 MT52703-AG 4 HG-I Rs 12-AG 4 HG-I Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 12-AG 4 HG-III Rs 12-AG 4 HG-III Rs 64 Rs 18-AG 4 Rs 18-AG 4 Rs 18-AG 4 NF222797-AG 4 HG-II Rs 18-AG 4 NF252703-AG 4 HG-II Rs 18-AG 4 NF152703-AG 4 HG-II Rs 12-AG 4 HG-I Rs 12-AG 4 HG-I Rs 12-AG 4 HG-I	610 AAATGCAGATGAACCA 	620 	620 GTCCATTGAC T T T C C	640 	650 	660 	670	680 	690 	700 1
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 Rs 18-AG 4 AY152703-AG 4 HG-I Rs 30-AG4 HG-I Rs 52-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 43-AG 4 HG-III Rs 43-AG 4 HG-III AF222797-AG 4 HG-III AF222797-AG 4 HG-III Rs 5-AG 4 Rs 14-AG 4 Rs 12-AG 4 HG-II Rs 30-AG 4 HG-II Rs 30-AG 4 HG-II Rs 12-AG 4 HG-II F0480229-AG 4 HG-III F0480229-AG 4 HG-III F0480229-AG 4 HG-III	610 	620		640 	650 	660 	670 .1	680 	690 	700 I
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 14-AG 4 Rs 28-AG 4 Rs 18-AG 4 Rs 18-AG 4 Rs 18-AG 4 Rs 18-AG 4 Rs 18-AG 4 Rs 18-AG 4 HG-II Rs 30-AG4 HG-II Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III JX294349-AG 4 Rs 14-AG 4 Rs 18-AG 4 HG-II Rs 12-AG4 HG-II Rs 12-AG4 HG-III Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 57-AG 4 HG-III Rs 52-AG	610 XAXTGCXOXTGAACC 	620	620 	640 	650 	660 	670	680 	690 	700 I
AF222797-AG 4 HG-II JZ294349-AG 4 Rs 5-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 28-AG 4 Rs 27-AG 4 Rs 18-AG 4 AY152703-AG 4 HG-I Rs 18-AG 4 HG-I Rs 18-AG 4 HG-III Rs 52-AG 4 HG-III Rs 62-AG 4 HG-III Rs 65-AG 4 HG-III Rs 14-AG 4 Rs 18-AG 4 Rs	610 	620		640 	650 	660 	670	680 .11.AA TCAGGTG TCAGGTA TCAGGTA TCAGGTA .TCAGGTA .TCAGGTA .TCAGGTA .TCAGGTA .TCAGGTA .TCAGGTA	690 	700 I
AF222797-AG 4 HG-II JX294349-AG 4 Rs 5-AG 4 Rs 5-AG 4 Rs 28-AG 4 Rs 77-AG 4 Rs 18-AG 4 Rs 18-AG 4 NT52703-AG 4 HG-I Rs 30-AG4 HG-I Rs 57-AG 4 HG-III Rs 57-AG 4 HG-III Rs 65-AG 4 HG-III Rs 65-AG 4 HG-III Rs 28-AG 4 HG-III Rs 12-AG 4 HG-III Rs 12-AG 4 HG-III Rs 12-AG 4 HG-III Rs 12-AG 4 HG-II Rs 12-AG 4 HG-I Rs 12-AG 4 HG-II Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 52-AG 4 HG-III Rs 12-AG 4 HG-III Rs 52-AG 4 HG-III	610 	620		640 	650 	660 	670 .1	680 	690 	700 I

Supplementary Figure 3: (*continuation*...) Alignment of the sequences of the rDNA-ITS region (5'-3'direction) of representative AG 4 *Rhizoctonia solani* isolates. The points indicate similarity to the reference sequence AF222797. The sequences of the ITS1 and ITS2 regions are found at positions 5-234 and 390-630, respectively.