

Article

Identification of New Biocontrol Agent against Charcoal Rot Disease Caused by *Macrophomina Phaseolina* in Soybean (*Glycine Max* L.)

Humaira Yasmin ^{1,*}, Rabia Naz ¹, Asia Nosheen ¹, Muhammad Nadeem Hassan ¹, Noshin Ilyas ², Muhammad Sajjad ¹, Seemab Anjum ¹, Xiangkuo Gao ³ and Zhide Geng ^{3,*}

¹ Department of Biosciences, COMSATS University (CUI), Islamabad, 45550 Islamabad, Pakistan; rabia.naz@comsats.edu.pk (R.N.); asia.nosheen@comsats.edu.pk (A.N.); nadeem_hassan@comsats.edu.pk (M.N.H.); muhammad.sajjad@comsats.edu.pk (M.S.); seemabanjum786@yahoo.com (S.A.)

² Department of Botany, PMAS-Arid University Rawalpindi, 46300, Rawalpindi, Pakistan; noshinilyas@yahoo.com

³ Institute of Food Crops, Yunnan Academy of Agricultural Sciences, Kunming, 650205, Yunnan, China; gaoxk2020@163.com

* Correspondence: humaira.yasmin@comsats.edu.pk (H.Y.); gengzd2002@163.com (Z.G.)

Received: 03 August 2020; Accepted: 21 August 2020; Published: date

Supplementary Data

Table S1. Details of sampling sites for bacterial isolation.

S. No.	Sample Type	Location	Hot Spring	pH	Temperature
1	Water	Ghanche	Kondus	9.21	90 °C
2	Soil	Ghanche	Kondus	7.8	90 °C
3	Water	Chitral	Garam Chashma	8.8	85 °C
4	Soil	Chitral	Garam Chashma	8.3	85 °C

Table S2. Characteristics of bacterial isolates.

Serial No.	Strain	Shape	Size (mm)	Margin	Color	Opacity	Elevation	Consistency	Surface	Gram Reaction
1	GM1	Circular	3	Entire	Cream	Opaque	Raised	Mucoid	Smooth	Positive
2	GM2	Circular	1	Entire	Yellow	Opaque	Flat	Butyrous	Glistening	Positive
3	GM3	Oval	2	Curled	Cream	Opaque	Flat	Butyrous	Smooth	Positive
4	GM4	Circular	1	Entire	Off white	Translucent	Flat	Butyrous	Glistening	Positive
5	GM5	Circular	3	Entire	Cream	Opaque	Raised	Butyrous	Smooth	Positive
6	GM6	Circular	1	Entire	Off white	Opaque	Raised	Butyrous	Glistening	Positive
7	GW1	Circular	1	Entire	Cream	Opaque	Raised	Butyrous	Smooth	Negative
8	GW2	Circular	2	Entire	Cream	Opaque	Raised	Butyrous	Glistening	Positive
9	GW3	Circular	2	Entire	Cream	Opaque	Flat	Viscid	Rugose	Positive
10	CM1	Circular	Punctiform	Entire	Red	Opaque	Raised	Butyrous	Dull	Positive
11	CM2	Circular	2	Entire	Cream	Opaque	Raised	Mucoid	Dull	Positive
12	CM3	Circular	3	Undulate	Cream	Opaque	Raised	Brittle	Rough	Positive
13	CM4	Filamentous	3	Filiform	Cream	Opaque	Raised	Brittle	Rough	Positive
14	CM5	Circular	1	Entire	Cream	Opaque	Flat	Butyrous	Smooth	Negative
15	CM6	Circular	3	Curled	Cream	Opaque	Crateriform	Butyrous	Dull	Positive
16	CW1	Irregular	2	Undulate	Off white	Opaque	Flat	Brittle	Rough	Positive
17	CW2	Circular	4	Entire	Cream	Opaque	Raised	Mucoid	Glistening	Negative
18	CW3	Circular	5.08	Entire	Cream	Opaque	Crateriform	Mucoid	Dull	Positive
19	CW4	Circular	Punctiform	Entire	Yellow	Opaque	Flat	Butyrous	Glistening	Positive
20	CW5	Circular	2.54	Entire	Cream	Opaque	Raised	Butyrous	Glistening	Positive