



**Figure S1.** *Pericarpium Citri Reticulatae* 'Chachiensis' (PCR-Chachiensis, in Chinese *Guang Chen Pi*), is the aged pericarps of *Citri Reticulatae* Blanco cv. Chachiensis.

<i>B. licheniformis</i> N17-02	TMDFDFELNGEVLLHPRRYKWKSEADGSEHAGRYAF IGMGRRLKNALFADGVNEKGLSCA --DFDFELNGEVLLHPRRYKWKSEADGSEHAGRYAF IGMGRRLKNALFADGVNEKGLSCA *****
<i>B. licheniformis</i> N17-02	ALYFPGYAVYENEAKEQSRNLAPHEFVTWVLECGDLEDVKKAAVSLNIVEREVSLSTV ALYFPGYAVYENEAKEQSRNLAPHEFVTWVLECGDLEDVKKAAVSLNIVEREVSLSTV *****
<i>B. licheniformis</i> N17-02	TPLHWLLTDRSGASVVVEPTADGIQIHDPVGVLTNSPDFPWHLTNLRNF IGLQPGQFAA TPLHWLLTDRSGASVVVEPTADGIQIHDPVGVLTNSPDFPWHLTNLRNF IGLQPGQFAA *****
<i>B. licheniformis</i> N17-02	KKMGGLTLSAFGQGSGLSGLPGDFTPPSRFVRAAFLKEHMKP KKMGGLTLSAFGQGSGLSGLPGDFTPPSRFVRAAFLKE---- *****
<i>B. megaterium</i> N17-12	YDYHPKTYEGRFLLFPNEGYASVGFGRMIGRMDGMNE -----GDFLLFR--QGYASVGFGRMIGRMDGMNE * * * * * : :*****
<i>V. alimentarius</i> Y11-38	DKQWKIRKPRFAIDVNEAKAAIRSFAPGIWDELLGLQDALEWSMAKILQDFGGYRLEYNR --QWKIRRPRFSIDIAETKAIHFHQFAPAIWEELLGLQEALQWPLKDVLDQDFGGYRLDYVR *****:****: *:* * : : * * * : * : * * * : * : * : : * * * * * : * *
<i>V. alimentarius</i> Y11-38	SGCSILTGPDYMIRNYDYHPKTYEGRYTFFQPSDQGYAII GPSQRITGRMDGMNEKGLAL SGCSIFTGEDYLIRNYDYHPKTYEGRFTFYQPADEGYAII GPSQRVTGRMDGMNEKGLVM *****:*****:*****: *:* * : * : * * * : * * * * * : * * * * * : *
<i>V. alimentarius</i> Y11-38	GYNFMHRKKPGDGFICNMIGRMV GYNFMHRKKPGDGFICNMI---- *****
<i>B. ginsengihumi</i> X16-66	YDFGYMQQRLLNLSLVKNREQQWRVRKPRFLISTDETCRAIMKFAPGVWEELE YDFGYMQQRLLNLSLVKNREQQWRVRKPRFLISTDETCRAIMKFAPGVWEELE *****

**Figure S2.** Partial amino acid sequence alignment of the BSHs encoding by *bsh* genes detected in probiotic strains and their reference BSHs from NCBI. The protein ID of the reference BSHs in NCBI were WP\_094023840.1 (*Bacillus licheniformis*), WP\_116516373.1 (*Bacillus megaterium*), WP\_029268033.1 (*Virgibacillus alimentarius*), WP\_025726634.1 (*Bacillus ginsengihumi*). The identical amino acids are indicated by asterisks; the conservative and semi conservative amino acids are indicated by two dots and one dot respectively.

**Table S1.** Detail information of 64 isolated strains.

Strains	Hit taxon name	Identity (%)	16S rDNA accession No. of hit strain	Culture media	Hemolytic	Gastrointestinal survival	Amine production
N17-01	<i>Bacillus cereus</i>	97.97%	MK389424.1	Elliker	+	N/A	N/A
N17-02	<i>Bacillus licheniformis</i>	99.93%	KU877628.1	Elliker	-	+	-
N17-03	<i>Bacillus tequilensis</i>	100%	MF077125.1	Elliker	+	N/A	N/A
N17-04	<i>Bacillus aryabhatai</i>	99.93%	KR063195.1	Elliker	-	-	N/A
N17-05	<i>Bacillus cereus</i>	100%	MG309432.1	Elliker	+	N/A	N/A
N17-06	<i>Bacillus cereus</i>	100%	KY316446.1	Elliker	+	N/A	N/A
N16-07	<i>Bacillus pumilus</i>	100%	KF158227.1	Elliker	+	N/A	N/A
N17-08	<i>Bacillus licheniformis</i>	99.93%	MH000674.1	Elliker	-	+	+
N16-09	<i>Rummeliibacillus stabekisii</i>	100%	MT658588.1	Elliker	+	N/A	N/A

N17-10	<i>Bacillus velezensis</i>	98.95%	MH261042.1	LB	+	N/A	N/A
N17-11	<i>Bacillus aryabhatai</i>	99.79%	KR063195.1	LB	+	N/A	N/A
N17-12	<i>Bacillus megaterium</i>	99.93%	MK521052.1	LB	-	+	-
N16-13	<i>Bacillus firmus</i>	99.85%	FJ613310.1	LB	+	N/A	N/A
N16-14	<i>Bacillus aquimaris</i>	100%	EU835730.1	LB	+	N/A	N/A
N16-16	<i>Bacillus altitudinis</i>	100%	MN710447.1	LB	+	N/A	N/A
N16-17	<i>Paenibacillus illinoisensis</i>	99.58%	NR_113828.1	LB	+	N/A	N/A
N16-18	<i>Bacillus sporothermodurans</i>	100%	MN904954.1	LB	+	N/A	N/A
N15-19	<i>Bacillus amyloliquefaciens</i>	100%	GQ853414.1	LB	+	N/A	N/A
N15-20	<i>Bacillus subtilis</i>	100%	MH100679.1	LB	-	+	+
N15-21	<i>Quasibacillus thermotolerans</i>	100%	MG651240.1	Elliker	-	+	+
N15-22	<i>Lactobacillus senioris</i>	100%	MW578443.1	MRS	-	+	-
N16-23	<i>Bhargavaea cecembensis</i>	99.86%	JQ071510.1	Elliker	+	N/A	N/A
N16-24	<i>Terribacillus saccharophilus</i>	99.93%	NR_041356.1	Elliker	+	N/A	N/A
N16-25	<i>Paenibacillus lautus</i>	97.16%	MT510152.1	LB	+	N/A	N/A
Y13-26	<i>Bacillus tequilensis</i>	100%	JF411301.1	Elliker	+	N/A	N/A
Y13-27	<i>Bacillus cereus</i>	100%	MF662458.1	Elliker	+	N/A	N/A
Y13-28	<i>Bacillus kochii</i>	99.79%	MN075515.1	Elliker	+	N/A	N/A
Y13-29	<i>Bacillus licheniformis</i>	96.58%	MH261078.1	Elliker	+	N/A	N/A
Y12-30	<i>Bacillus amyloliquefaciens</i>	100%	KY685066.1	Elliker	+	N/A	N/A
Y11-31	<i>Bacillus altitudinis</i>	100%	KJ534473.1	Elliker	+	N/A	N/A
Y11-32	<i>Bacillus thuringiensis</i>	99.86%	MN594796.1	Elliker	+	N/A	N/A
Y13-33	<i>Lysinibacillus pakistanensis</i>	95.03%	MN396729.1	LB	-	+	+
Y12-34	<i>Bacillus licheniformis</i>	100%	MN746177.1	LB	+	N/A	N/A
Y12-35	<i>Bacillus pumilus</i>	99.86%	FJ237277.1	LB	+	N/A	N/A
Y11-36	<i>Bacillus safensis</i>	100%	HQ699512.1	LB	+	N/A	N/A
Y11-37	<i>Bacillus coagulans</i>	96.77%	MT509777.1	LB	+	N/A	N/A
Y11-38	<i>Virgibacillus halophilus</i>	99.59%	NR_041358.1	LB	-	+	-
Y13-39	<i>Bacillus circulans</i>	99.79%	KM349200.1	LB	-	-	N/A
Y13-40	<i>Sporosarcina contaminans</i>	99.65%	NR_116955.1	LB	-	-	N/A
Y11-41	<i>Bacillus aryabhatai</i>	99.86%	KC764988.1	Elliker	+	N/A	N/A
Y11-42	<i>Bacillus megaterium</i>	99.93%	JF683607.1	Elliker	+	N/A	N/A
Y11-43	<i>Bacillus megaterium</i>	100%	MF431758.1	Elliker	-	-	N/A
Y11-45	<i>Bacillus oleronius</i>	99.79%	LC588627.1	Elliker	+	N/A	N/A
Y12-47	<i>Bacillus cereus</i>	99.86%	JN400121.1	Elliker	+	N/A	N/A
Y12-48	<i>Bacillus coagulans</i>	99.86%	MT505650.1	Elliker	+	N/A	N/A
Y11-49	<i>Bacillus altitudinis</i>	100%	KJ534473.1	Elliker	+	N/A	N/A
Y11-50	<i>Paenibacillus lautus</i>	99.72%	LC588571.1	LB	-	+	+
Y13-51	<i>Paenibacillus chibensis</i>	98.27%	MN421017.1	LB	-	+	-
Y11-53	<i>Bacillus coagulans</i>	96.62%	MK685115.1	MRS	+	N/A	N/A
Y11-54	<i>Bacillus coagulans</i>	97.50%	MH685469.1	MRS	+	N/A	N/A
Y11-55	<i>Bacillus coagulans</i>	94.97%	MH685469.1	MRS	+	N/A	N/A
Y11-57	<i>Bacillus circulans</i>	98.89%	FJ581445.1	Elliker	+	N/A	N/A
X15-58	<i>Bacillus velezensis</i>	100%	MT611666.1	LB	-	+	+
X15-59	<i>Bacillus subtilis</i>	100%	KX960108.1	LB	+	N/A	N/A
X15-60	<i>Bacillus velezensis</i>	99.79%	MN704466.1	LB	+	N/A	N/A
X14-61	<i>Paenibacillus chitinolyticus</i>	98.47%	MN704459.1	LB	-	+	+
X14-62	<i>Bacillus licheniformis</i>	96.53%	KX784914.1	LB	-	N/A	N/A
X15-63	<i>Bacillus oleronius</i>	99.93%	KY773585.1	LB	-	+	+
X15-64	<i>Bacillus licheniformis</i>	99.65%	MH475938.1	LB	-	+	+
X14-65	<i>Bacillus tequilensis</i>	100%	MF077125.1	LB	+	N/A	N/A
X16-66	<i>Bacillus ginsengihumi</i>	99.86%	NR_041378.1	Elliker	-	+	-
X14-67	<i>Bacillus pumilus</i>	100%	MN581175.1	LB	+	N/A	N/A
X16-68	<i>Lactobacillus curieae</i>	95.40%	LC521989.1	MRS	-	+	-
X16-69	<i>Lactobacillus curieae</i>	95.49%	LC519995.1	MRS	-	+	-

The plus sign indicates that the strain has this ability, while the minus sign indicates the opposite. N/A indicated that the strain was not tested in this term.