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Impact inoculum dosage of lactic acid bacteria on oat and wheat silage fermentation at ambient and low temperatures

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Supplementary Materials Tables

Table S1. The viable cells counts in wheat and oat silage fermented for 7 days by QZ227

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	9.13±0.04^{A}	9.37±0.07^{a}	8.82±0.43^{A}	nd	nd	nd	nd
A-227 1	10.08±0.04^{B}	10.07±0.03^{b}	nd	nd	nd	nd	nd
A-227 2	9.84±0.02^{C}	9.61±0.08^{c}	nd	nd	nd	nd	nd
A-227 3	9.93±0.13^{C}	9.78±0.02^{d}	3.69±0.23^{B}	nd	nd	nd	nd
4℃CK	4.85±0.05^{D}	5.51±0.04^{e}	4.32±0.13^{C}	nd	nd	nd	nd
4℃227 1	9.79±0.06^{C}	7.66±0.01^{f}	nd	nd	nd	5.98±0.23	nd
4℃227 2	8.19±0.02^{E}	8.74±0.14^{g}	nd	nd	nd	nd	nd
4℃227 3	9.38±0.03^{F}	9.23±0.08^{h}	nd	nd	nd	nd	nd
SE	0.35	0.29	0.88	nd	nd	1.33	nd
Sig.	0.000	0.000	0.000	nd	nd	0.000	nd
Wheat							
A-CK	9.89±0.05^{A}	9.95±0.02^{B}	7.51±0.07^{B}	nd	nd	4.34±0.31^{a}	nd
A-227 1	9.92±0.02^{A}	9.92±0.03^{B}	5.57±0.06^{D}	nd	nd	nd	nd
A-227 2	9.72±0.03^{B}	9.74±0.04^{D}	4.39±0.04^{F}	nd	nd	nd	nd
A-227 3	10.25±0.04^{C}	10.34±0.05^{A}	4.18±0.07^{G}	nd	nd	nd	nd
4℃CK	7.51±0.03^{D}	7.17±0.15^{F}	7.55±0.06^{B}	nd	nd	nd	nd
4℃227 1	7.41±0.11^{D}	9.49±0.01^{C}	6.71±0.11^{C}	nd	nd	4.62±0.03^{a}	nd
4℃227 2	8.01±0.04^{E}	9.92±0.07^{B}	5.21±0.03^{E}	nd	nd	nd	nd
4℃227 3	9.15±0.08^{F}	8.88±0.06^{E}	8.69±0.09^{A}	nd	nd	nd	nd
SE	0.23	0.26	0.32	nd	nd	0.11	nd
Sig.	0.000	0.000	0.000	nd	nd	0.181	nd

Table S2. The viable cells counts in wheat and oat silage fermented for 7 days by FG1

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	9.13±0.04^{C}	9.37±0.07^{D}	8.82±0.43^{A}	nd	nd	nd	nd
A-FG1 1	10.14±0.02^{A}	10.09±0.01^{A}	nd	3.80±0.17	nd	nd	nd
A-FG1 2	10.19±0.01^{A}	10.22±0.02^{A}	nd	3.80±0.17	nd	nd	nd
A-FG1 3	9.87±0.01^{B}	9.83±0.05^{B}	nd	nd	nd	nd	nd
4℃CK	4.85±0.05^{E}	5.51±0.04^{F}	4.32±0.13^{C}	nd	nd	nd	nd
4℃FG1 1	7.47±0.08^{D}	7.38±0.07^{E}	4.62±0.14^{C}	nd	nd	nd	nd
4℃FG1 2	9.13±0.12^{C}	9.19±0.10^{D}	5.37±0.07^{B}	nd	nd	4.79±0.16	nd
4℃FG1 3	10.16±0.06^{A}	9.46±0.08^{C}	5.31±0.12^{B}	nd	nd	nd	nd
SE	0.36	0.32	0.43	0.06	nd	nd	nd
Sig.	0.000	0.000	0.000	1.000	nd	nd	nd
Wheat							
A-CK	9.89±0.05^{C}	9.95±0.02^{B}	7.51±0.07^{A}	nd	nd	4.34±0.30^{A}	nd
A-FG1 1	10.11±0.06^{B}	10.12±0.01^{A}	nd	nd	nd	nd	nd
A-FG1 2	10.26±0.03^{A}	10.01±0.03^{AB}	3.80±0.17^{E}	nd	nd	nd	nd
A-FG1 3	10.20±0.02^{AB}	10.08±0.04^{AB}	nd	nd	nd	nd	nd
4℃CK	7.50±0.03^{F}	7.17±0.15^{F}	7.55±0.06^{A}	nd	nd	nd	nd
4℃FG1 1	7.57±0.04^{F}	8.74±0.04^{D}	4.98±0.11^{D}	nd	nd	nd	nd
4℃FG1 2	8.21±0.04^{E}	8.25±0.07^{E}	5.61±0.07^{C}	nd	nd	3.90±0.17^{B}	nd
4℃FG1 3	9.54±0.13^{D}	9.65±0.03^{C}	7.06±0.07^{B}	nd	nd	4.20±0.17^{C}	nd
SE	0.23	0.21	0.61	nd	nd	0.09	nd
Sig.	0.000	0.000	0.000	nd	nd	0.000	nd

Table S3. The viable cells counts in wheat and oat silage fermented for 30 days by QZ227

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	9.20±0.02^{c}	8.75±0.06^{d}	8.82±0.13^{A}	nd	nd	nd	nd
A-227 1	8.88±0.01^{f}	9.26±0.01^{a}	6.96±0.09^{C}	nd	nd	nd	nd
A-227 2	9.09±0.02^{e}	8.82±0.05^{cd}	7.62±0.03^{B}	nd	nd	nd	nd
A-227 3	9.13±0.04^{d}	8.89±0.17^{c}	7.78±0.11^{B}	nd	nd	nd	nd
4℃CK	5.39±0.02^{g}	5.77±0.04^{e}	4.29±0.11^{B}	nd	nd	nd	nd
4℃227 1	9.31±0.01^{b}	9.05±0.01^{b}	4.60±0.21^{E}	nd	nd	nd	nd
4℃227 2	9.35±0.02^{a}	9.13±0.10^{ab}	nd	nd	nd	nd	nd
4℃227 3	9.27±0.02^{b}	9.17±0.03^{ab}	nd	nd	nd	nd	nd
SE	0.26	0.23	0.41	nd	nd	nd	nd
Sig.	0.000	0.000	0.000	nd	nd	nd	nd
Wheat							
A-CK	7.39±0.09c	7.39±0.09^{a}	5.12±0.12^{a}	nd	nd	nd	nd
A-227 1	5.44±0.04e	5.44±0.04^{e}	nd	nd	nd	nd	nd
A-227 2	5.86±0.02d	5.86±0.02^{d}	5.70±0.73^{b}	nd	4.05±0.11^{A}	nd	nd
A-227 3	5.76±0.02de	5.76±0.02^{de}	nd	nd	nd	nd	nd
4℃CK	8.94±0.56b	8.94±0.56^{b}	9.03±0.15^{e}	nd	nd	4.78±0.09	nd
4℃227 1	8.88±0.26b	8.88±0.26^{b}	7.89±0.25^{d}	4.06±0.10	4.99±0.12^{B}	nd	nd
4℃227 2	9.09±0.09b	9.09±0.09^{b}	7.23±0.06^{c}	nd	nd	nd	nd
4℃227 3	9.54±0.01a	9.54±0.01^{c}	8.74±0.04^{e}	nd	4.83±0.14^{B}	nd	nd
SE	0.34	0.34	0.71	nd	0.15	nd	nd
Sig.	0.000	0.000	0.000	0.620	0.000	nd	nd

Table S4. The viable cells counts in wheat and oat silage fermented for 30 days by FG1

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	9.20±0.02^{D}	8.75±0.06^{f}	8.82±0.13^{a}	nd	nd	nd	nd
A-FG1 1	9.73±0.07^{A}	8.89±0.08^{e}	7.84±0.11^{b}	nd	nd	nd	nd
A-FG1 2	9.46±0.04^{C}	9.20±0.04^{d}	7.40±0.12^{c}	nd	nd	nd	nd
A-FG1 3	8.97±0.06^{E}	9.34±0.08^{c}	9.05±0.01^{d}	nd	nd	nd	nd
4℃CK	5.39±0.02^{G}	5.77±0.04^{g}	4.29±0.11^{e}	nd	nd	nd	nd
4℃FG1 1	8.80±0.10^{F}	10.22±0.09^{a}	nd	nd	nd	nd	nd
4℃FG1 2	9.61±0.02^{A}	9.61±0.09^{b}	nd	nd	nd	nd	nd
4℃FG1 3	9.65±0.02^{A}	9.61±0.02^{b}	nd	nd	nd	nd	nd
SE	0.28	0.26	0.46	nd	nd	nd	nd
Sig.	0.000	0.000	0.000	nd	nd	nd	nd
Wheat							
A-CK	7.39±0.09^{CD}	7.69±0.04^{C}	5.12±0.17^{B}	nd	nd	6.13±0.04^{A}	nd
A-FG1 1	7.79±0.04^{C}	9.96±0.01^{A}	4.70±0.04^{C}	nd	10.11±0.09^{A}	nd	nd
A-FG1 2	7.40±0.07^{CD}	7.10±0.08^{D}	nd	nd	9.73±0.03^{B}	4.06±0.10^{C}	nd
A-FG1 3	7.29±0.03^{D}	7.19±0.08^{D}	nd	nd	4.60±0.05^{C}	4.78±0.09^{B}	nd
4℃CK	8.94±0.56^{B}	10.08±0.08^{A}	5.03±0.15^{B}	nd	nd	nd	nd
4℃FG1 1	9.05±0.04^{B}	nd	nd	nd	nd	4.06±0.10^{C}	nd
4℃FG1 2	9.54±0.05^{A}	6.41±0.02^{E}	7.21±0.03^{A}	4.54±0.06	3.80±0.17^{D}	nd	nd
4℃FG1 3	9.63±0.03^{A}	9.45±0.05^{B}	nd	nd	nd	nd	nd
SE	0.20	0.63	0.61	nd	0.87	0.57	nd
Sig.	0.000	0.000	0.000	nd	0.000	0.000	nd

Table S5. The viable cells counts in wheat and oat silage fermented for 60 days by QZ227

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	8.83±0.57^{b}	9.82±0.02^{a}	9.00±0.02^{A}	nd	nd	3.80±0.21^{a}	nd
A-227 1	8.13±0.03^{c}	9.23±0.06^{c}	7.19±0.02^{B}	nd	nd	3.69±0.18^{a}	nd
A-227 2	8.53±0.33^{bc}	9.27±0.05^{c}	7.74±0.06^{C}	nd	7.84±0.08	3.79±0.16^{a}	nd
A-227 3	8.84±0.14^{b}	9.42±0.02^{b}	nd	nd	nd	nd	nd
4℃CK	8.01±0.01^{c}	9.11±0.12^{d}	nd	nd	nd	nd	nd
4℃227 1	9.34±0.05^{a}	7.94±0.01^{f}	nd	nd	nd	nd	nd
4℃227 2	9.21±0.03^{ab}	8.09±0.04^{e}	nd	nd	nd	nd	nd
4℃227 3	9.44±0.04^{a}	7.72±0.02^{g}	nd	nd	nd	nd	nd
SE	0.11	0.15	0.27	nd	nd	0.05	nd
Sig.	0.000	0.000	0.000	nd	nd	NS	nd
Wheat							
A-CK	7.48±0.08^{A}	7.03±0.06^{C}	nd	nd	5.98±0.05	nd	nd
A-227 1	5.27±0.03^{B}	4.85±0.05^{A}	nd	nd	nd	nd	nd
A-227 2	5.01±0.05^{C}	4.87±0.06^{A}	nd	nd	nd	nd	nd
A-227 3	5.41±0.03^{D}	5.31±0.03^{B}	nd	nd	nd	nd	nd
4℃CK	7.62±0.02^{E}	9.09±0.07^{E}	5.33±0.04^{A}	nd	nd	4.06±0.10^{A}	nd
4℃227 1	9.05±0.05^{F}	8.98±0.11^{E}	nd	nd	nd	4.23±0.21^{A}	nd
4℃227 2	8.10±0.02^{G}	8.10±0.02^{D}	nd	nd	nd	4.75±0.06^{B}	nd
4℃227 3	9.55±0.01^{H}	9.53±0.02^{F}	nd	nd	nd	nd	nd
SE	0.34	0.39	0.29	nd	nd	0.11	nd
Sig.	0.000	0.000	0.000	nd	nd	0.002	nd

Table S6. The viable cells counts in wheat and oat silage fermented for 60 days by FG1

Control, Sterile water; FG1 1, QZ227 1: inoculum dosage of 6.52 log CFU/g FM; FG1 2, QZ227 2: inoculum dosage of 7.52 log CFU/g FM; FG1 3, QZ227 3, inoculum dosage of 8.52 log CFU/g FM. Data are as mean ± s.d. of three samples. Within temperature treatment and column, means followed by the same letter are not significantly different (P > 0.05). n.d., Not detected. A-, Ambient.

	Lactic Acid Bacteria	*Aerobic Bacteria*	*Escherichia Coli*	*Filamentous Fungi*	Yeast	*Bacillus*	*Clostridium*
Oat							
A-CK	8.83±0.57^{b}	9.11±0.12^{C}	9.00±0.02^{A}	nd	nd	3.80±0.21	nd
A-FG1 1	8.95±0.70^{b}	7.91±0.02^{D}	7.94±0.03^{B}	nd	nd	nd	nd
A-FG1 2	9.34±0.80^{ab}	9.72±0.02^{AB}	nd	nd	nd	nd	nd
A-FG1 3	7.92±0.02^{c}	9.44±0.04^{B}	7.57±0.03^{C}	nd	nd	nd	nd
4℃CK	9.44±0.04^{ab}	9.82±0.02^{A}	nd	nd	nd	nd	nd
4℃FG1 1	9.53±0.15^{ab}	9.58±0.22^{B}	nd	nd	nd	nd	nd
4℃FG1 2	9.63±0.03^{ab}	9.55±0.03^{B}	nd	nd	nd	nd	nd
4℃FG1 3	9.87±0.02^{a}	9.82±0.02^{A}	nd	nd	nd	nd	nd
SE	0.14	0.12	0.21	nd	nd	nd	nd
Sig.	0.001	0.000	0.000	nd	nd	nd	nd
Wheat							
A-CK	7.48±0.08^{A}	7.03±0.06^{A}	nd	nd	5.98±0.05^{A}	nd	nd
A-FG1 1	6.07±0.01^{B}	6.01±0.01^{B}	nd	nd	4.93±0.06^{B}	nd	nd
A-FG1 2	7.33±0.02^{C}	7.30±0.05^{C}	nd	nd	6.02±0.02^{A}	nd	nd
A-FG1 3	5.52±0.05^{D}	5.46±0.02^{D}	nd	nd	5.52±0.05^{C}	nd	nd
4℃CK	7.62±0.02^{E}	9.09±0.07^{E}	5.33±0.04	nd	nd	4.06±0.10	nd
4℃FG1 1	9.99±0.01^{F}	9.97±0.03^{F}	nd	nd	nd	nd	nd
4℃FG1 2	9.25±0.04^{G}	9.24±0.06^{G}	nd	nd	nd	nd	nd
4℃FG1 3	9.44±0.04^{H}	9.35±0.03^{H}	nd	nd	nd	nd	nd
SE	0.31	0.33	nd	nd	0.13	nd	nd
Sig.	0.000	0.000	nd	nd	0.000	nd	nd