Supplementary Materials

Table S1. Calibration performances for winter cereal crop (WCC) fresh whole plant and silage for a FOSS NIRSystem 5000 scanning monochromator.

Fresh harvested WCC							
Constituent	n	mean	sd	SE_C	R^2_c	SE_{CV}	R^2cv
Dry matter (%)	136	32.28	5.86	1.26	0.95	1.49	0.93
Ash (% of as-is)	138	2.06	0.51	0.19	0.85	0.28	0.68
Crude proteins (% of as-is)	136	2.47	0.60	0.21	0.88	0.27	0.80
Ether extract (% of as-is)	138	0.62	0.18	0.08	0.81	0.10	0.71
aNDF (% of as-is)	135	18.50	3.87	0.82	0.96	0.96	0.94
ADF (% of as-is)	134	10.91	2.21	0.57	0.93	0.63	0.92
Lignin (% of as-is)	140	1.18	0.34	0.15	0.80	0.20	0.66
Water soluble-charbohidrates (% of as-is)	137	2.86	2.04	0.79	0.85	1.04	0.74
Starch (% of as-is)	135	3.36	2.05	0.73	0.87	0.84	0.83
WCC silage							
Constituent	n	mean	sd	SE_C	R^2_c	SE_{CV}	R^2cv
Dry matter (%)	192	27.02	7.14	1.11	0.98	1.25	0.97
Ash (% of as-is)	184	1.96	0.69	0.32	0.79	0.35	0.74
Crude proteins (% of as-is)	188	2.06	0.82	0.25	0.91	0.36	0.81
Ether extract (% of as-is)	145	0.60	0.18	0.10	0.69	0.11	0.61
aNDF (% of as-is)	190	15.76	3.95	1.09	0.92	1.29	0.89
ADF (% of as-is)	185	9.37	2.31	0.76	0.89	0.87	0.86
Lignin (% of as-is)	157	1.45	0.76	0.39	0.73	0.43	0.62
Starch (% of as-is)	200	1.75	1.78	0.67	0.86	0.78	0.80
pH (pure number)	86	4.17	0.49	0.12	0.95	0.18	0.86
Ammonia (% of total N)	102	2.76	1.69	0.96	0.68	1.09	0.62
Ethanol (% of as-is)	58	0.09	0.01	0.02	0.70	0.03	0.63
Lactic acid (% of as-is)	112	1.46	0.94	0.22	0.95	0.45	0.78
Acetic acid (% of as-is)	116	0.72	0.36	0.12	0.90	0.21	0.66
Propionic acid (% of as-is)	74	0.15	0.07	0.02	0.60	0.03	0.57
Buthiryc acid (% of as-is)	62	0.09	0.01	0.01	0.68	0.01	0.63

WCC = Winter cereal crops; sd = standard deviation; SE_C = standard error in calibration; R^2_c = the coefficient of determination in calibration; SE_{CV} = standard error in cross-validation; R^2_{cv} = the coefficient of determination in cross-validation; aNDF = Alfa-amylase neutral detergent fiber; ADF = acid detergent fiber.

Table S2. The main effect of the DM at harvest on the pH and ammonia patterns at d 2 (T2), 3 (T3), 6 (T6), and 10 (T10) from the day of sealing the minisilos.

Variable	Day	DML	DMH	SEM	*p*
pH	T2	4.12	4.02	0.03	0.041
Ammonia (% of total N)	T2	4.27	4.63	0.13	0.066
pH	T3	4.14	3.95	0.02	<0.0001
Ammonia (% of total N)	T3	4.34	5.29	0.17	0.001
pH	T6	3.96	3.84	0.01	<0.0001
Ammonia (% of total N)	T6	8.39	6.39	0.73	0.070
pH	T10	3.85	3.82	0.02	0.213
Ammonia (% of total N)	T10	10.6	6.38	0.93	0.006

DML: Low dry matter at harvest = 312 g/kg; DMH: High dry matter at harvest = 348 g/kg; SEM = standard error of the means.

Table S3. The main effect of the use of inoculants (control, heterofermentative, and homo fermentative) on the pH and ammonia patterns at d 2 (T2), 3 (T3), 6 (T6), and 10 (T10) from the day of sealing the minisilos.

variable	Day	Control	Hetero	Homo	SEM	*p*
pH	T2	4.07	4.07	4.07	0.04	0.997
Ammonia (% of total N)	T2	4.41	4.40	4.55	0.18	0.807
pH	T3	4.06	4.04	4.04	0.05	0.897
Ammonia (% of total N)	T3	5.11	4.60	4.75	0.28	0.456
pH	T6	3.91	3.91	3.88	0.03	0.719
Ammonia (% of total N)	T6	6.01	7.27	8.90	0.88	0.097
pH	T10	3.83	3.84	3.83	0.03	0.966
Ammonia (% of total N)	T10	7.71	8.63	9.10	1.49	0.801

Table S4. The main effect of 0 (0 h), 6 (6 h), and 20 h (20 h) of sealing delaying on the pH and ammonia patterns at d 2 (T2), 3 (T3), 6 (T6), and 10 (T10) from the day of sealing the minisilos.

variable	Day	0 h	6 h	20 h	SEM	*p*
pH	T2	4.08 ab	3.99 b	4.13 a	0.04	0.046
Ammonia (% of total N)	T2	4.39	4.62	4.35	0.18	0.513
pH	T3	4.09	4.00	4.06	0.04	0.356
Ammonia (% of total N)	T3	4.94	4.77	4.74	0.30	0.874
pH	T6	3.89	3.89	3.92	0.03	0.805
Ammonia (% of total N)	T6	7.96	6.57	7.65	0.99	0.590
pH	T10	3.83	3.88	3.80	0.02	0.127

Table S5. The main effect of the DM at harvest on the silage quality after seven d (T67) of aerobic exposure.

	DM at harvest (g/kg of the DM)			
	DML [1]	DMH [2]	SEM	*p*
Dry matter (DM, g/kg)	339	283	3.35	<0.0001
pH	4.33	4.13	0.06	0.024
Ammonia (% of total N)	10.3	9.43	0.65	0.341
Lactic acid (g/kg of the DM)	4.77	16.8	2.75	0.005
Acetic acid (g/kg of the DM)	4.69	8.44	0.83	0.004
Propionic acid (g/kg of the DM)	8.78	10.9	0.44	0.002
Butyric acid (g/kg of the DM)	3.96	4.86	0.09	<0.0001
Etanol (g/kg of the DM)	0.34	0.86	0.17	0.046
FQI [3]	28.9	37.2	2.30	0.018
FZs [4]	20.4	29.6	2.61	0.022
DM loss (%)	5.22	9.85	0.88	0.001

[1] DML: Low dry matter at harvest = 312g/kg =; [2] DMH: High dry matter at harvest = 348 g/kg; [3] FQI = fermentative quality index; [4] FZs = Flieg-Zimmer score

Table S6. The main effect of the use of inoculants on the silage quality after seven d (T67) of aerobic exposure.

	Inoculant type				
	Control	Heterofermentative	Homofermentative	SEM	*p*
Dry matter (DM, g/kg)	316	306	311	4.10	0.244
pH	4.34	4.17	4.18	0.07	0.179
Ammonia (% of total N)	11.1	8.73	9.81	0.80	0.138
Lactic acid (g/kg of the DM)	8.37	11.5	12.5	3.36	0.667
Acetic acid (g/kg of the DM)	5.63	8.24	5.83	1.01	0.150
Propionic acid (g/kg of the DM)	9.6	10.3	9.8	0.54	0.639
Butyric acid (g/kg of the DM)	4.31	4.48	4.43	0.11	0.498
Etanol (g/kg of the DM)	0.31	0.72	0.77	0.21	0.266
FQI [1]	29.8	34.9	34.4	2.82	0.393

FZs [2]	23.1	23.8	28.1	3.19	0.501
DM loss (%)	9.88a	7.21ab	5.52b	1.08	0.030

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

Table S7. The main effect of sealing delays in the silage quality after seven d (T67) of aerobic exposure.

	Sealing delay (h)				
	0 h	6 h	20 h	SEM	*p*
Dry matter (DM, g/kg)	319	306	307	4.10	0.056
pH	4.38	4.14	4.18	0.07	0.043
Ammonia (% of total N)	10.7	9.19	9.70	0.80	0.391
Lactic acid (g/kg of the DM)	5.45	15.9	11.0	3.36	0.113
Acetic acid (g/kg of the DM)	4.27b	8.26a	7.18ab	1.01	0.029
Propionic acid (g/kg of the DM)	8.98	10.3	10.3	0.54	0.155
Butyric acid (g/kg of the DM)	4.36	4.38	4.48	0.11	0.714
Etanol (g/kg of the DM)	0.34	0.82	0.63	0.21	0.298
FQI [1]	29.0	35.9	34.2	2.82	0.223
FZs [2]	21.9	28.8	24.3	3.19	0.316
DM loss (%)	8.77	6.63	7.20	1.08	0.369

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

Table S8. The interactions of the DM at harvest, the use of inoculants, and the sealing delays on the silage quality after seven d (T67) of aerobic exposure.

	DM at harvest × Inoculant	DM at harvest × Sealing delay	Inoculant × Sealing delay
	p	p	*p*
Dry matter (DM, g/kg)	0.52	0.86	0.80
pH	0.86	0.18	0.42
Ammonia (% of total N)	0.69	0.01	0.79
Lactic acid (g/kg of the DM)	0.65	0.45	0.90
Acetic acid (g/kg of the DM)	0.72	0.52	0.39
Propionic acid (g/kg of the DM)	0.72	0.08	0.76
Butyric acid (g/kg of the DM)	0.46	0.79	0.94
Etanol (g/kg of the DM)	0.37	0.35	0.88
FQI [1]	0.45	0.11	0.90
FZs [2]	0.56	0.54	0.97
DM loss (%)	0.97	0.15	0.52

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

Table S9. The main effect of the DM at harvest on the silage quality after 14 d (T74) of aerobic exposure.

	DM at harvest (g/kg of the DM)			
	DML [1]	DMH [2]	SEM	*p*
Dry matter (DM, g/kg)	347	289	22.6	0.082
pH	4.54	4.56	0.09	0.857
Ammonia (% of total N)	4.37	4.44	0.84	0.948
Lactic acid (g/kg of the DM)	3.06	4.03	1.05	0.518
Acetic acid (g/kg of the DM)	6.53	3.73	1.13	0.095
Propionic acid (g/kg of the DM)	8.83	8.77	0.65	0.948
Butyric acid (g/kg of the DM)	4.42	6.09	0.51	0.031
Etanol (g/kg of the DM)	1.21	1.49	0.48	0.677
FQI [3]	28.9	37.21	2.30	0.018
FZs [4]	14.1	15.3	1.71	0.635
DM loss (%)	27.4	37.0	4.12	0.112

[1] DML: Low dry matter at harvest = 312g/kg =; [2] DMH: High dry matter at harvest = 348 g/kg; [3] FQI = fermentative quality index; [4] FZs = Flieg-Zimmer score.

Table S10. The main effect of the use of inoculants on the silage quality after 14 d (T74) of aerobic exposure.

	Inoculant type				
	Control	Heterofermentative	Homofermentative	SEM	*p*
Dry matter (DM, g/kg)	357	318	280	27.7	0.168
pH	4.72	4.54	4.39	0.11	0.133
Ammonia (% of total N)	3.93	4.82	4.46	1.03	0.830
Lactic acid (g/kg of the DM)	3.45	3.26	3.93	1.29	0.932
Acetic acid (g/kg of the DM)	8.53a	4.68ab	2.18b	1.39	0.013
Propionic acid (g/kg of the DM)	8.73	8.77	8.90	0.80	0.987
Butyric acid (g/kg of the DM)	4.70	5.48	5.59	0.63	0.561
Etanol (g/kg of the DM)	1.16	1.86	1.03	0.59	0.577
FQI [1]	41.5	40.9	44.1	2.36	0.598
FZs [2]	12.4	14.0	17.7	2.10	0.215
DM loss (%)	28.7	30.9	37.1	5.05	0.490

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

Table S11. The main effect of the sealing delays on the silage quality after s14 d (T74) of aerobic exposure.

	Sealing delay (h)				
	0 h	6 h	20 h	SEM	*p*
Dry matter (DM, g/kg)	289	332	333	27.65	0.454
pH	4.53	4.56	4.57	0.11	0.968
Ammonia (% of total N)	4.15	5.79	3.27	1.03	0.240
Lactic acid (g/kg of the DM)	3.76	3.08	3.79	1.29	0.909
Acetic acid (g/kg of the DM)	5.27	5.03	5.08	1.39	0.992
Propionic acid (g/kg of the DM)	9.35	8.73	8.32	0.80	0.661
Butyric acid (g/kg of the DM)	5.90	5.18	4.68	0.63	0.403
Etanol (g/kg of the DM)	1.69	1.62	0.74	0.59	0.464
FQI[1]	42.6	38.0	46.0	2.36	0.075
FZs[2]	13.3	13.1	17.7	2.10	0.243
DM loss (%)	40.5	28.3	27.9	5.05	0.157

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

Table S12. The interactions of the DM at harvest, the use of inoculants, and the sealing delays on the silage quality after 14 d of aerobic exposure.

	DM at harvest × Inoculant	DM at harvest × Sealing delay	Inoculant × Sealing delay
	p	*p*	*p*
Dry matter (DM, g/kg)	0.494	0.191	0.739
pH	0.681	0.642	0.969
Ammonia (% of total N)	0.592	0.785	0.835
Lactic acid (g/kg of the DM)	0.565	0.080	0.614
Acetic acid (g/kg of the DM)	0.537	0.221	0.822
Propionic acid (g/kg of the DM)	0.864	0.568	0.913
Butyric acid (g/kg of the DM)	0.529	0.434	0.816
Etanol (g/kg of the DM)	0.053	0.997	0.805
FQI [1]	0.097	0.756	0.992
FZs [2]	0.435	0.361	0.487
DM loss (%)	0.482	0.253	0.450

[1] FQI = fermentative quality index; [2] FZs = Flieg-Zimmer score.

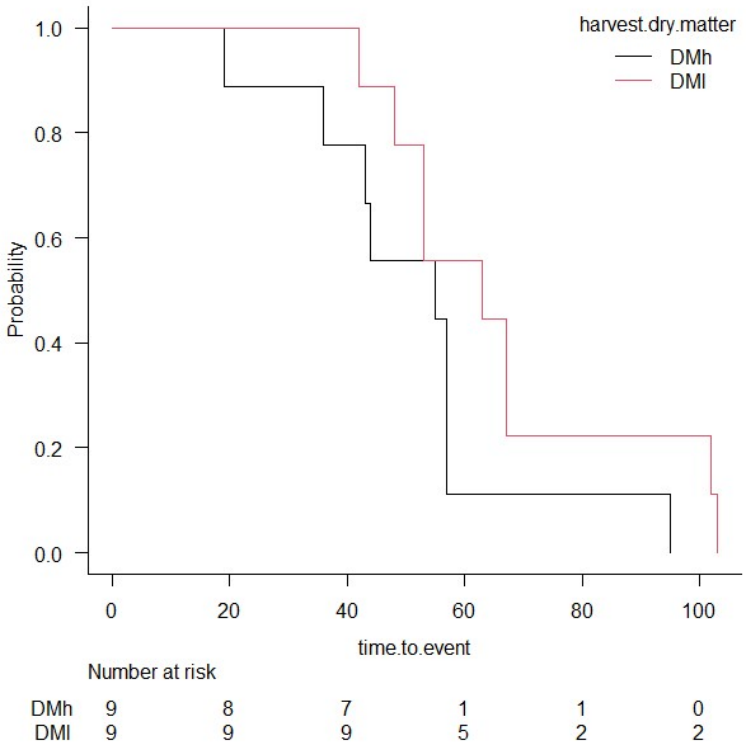


Figure S1. The Kaplan-Meier survival curve for the wheat harvested at different dry matter (DM, g/kg), P=0.132. DML: Low dry matter at harvest = 312g/kg =; 2 DMH: High dry matter at harvest = 348 g/kg.

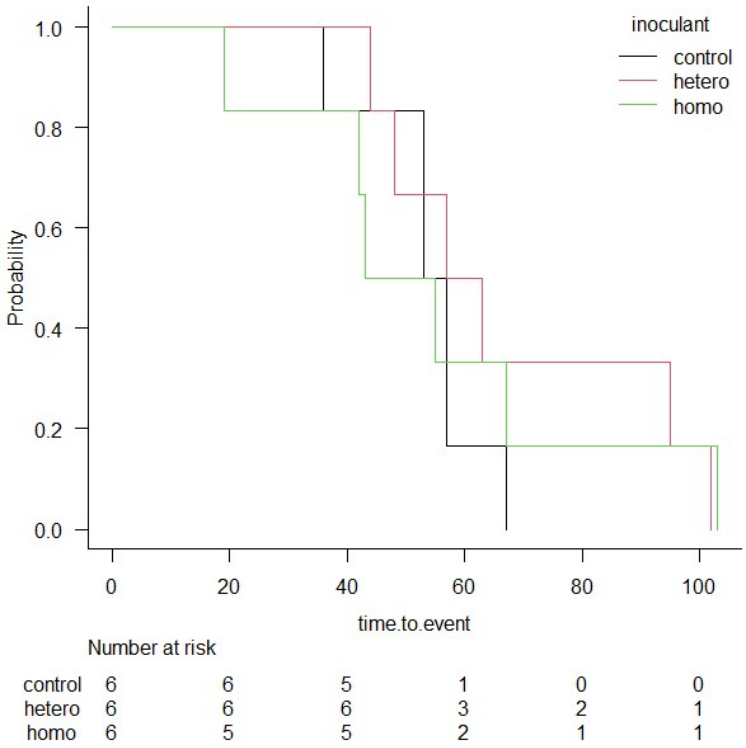


Figure S2. The Kaplan-Meier survival curve for the samples underwent different inoculations, P = 0.746. Control: pure water; Hetero: Heterofermentative; Homo: Homofermentative.

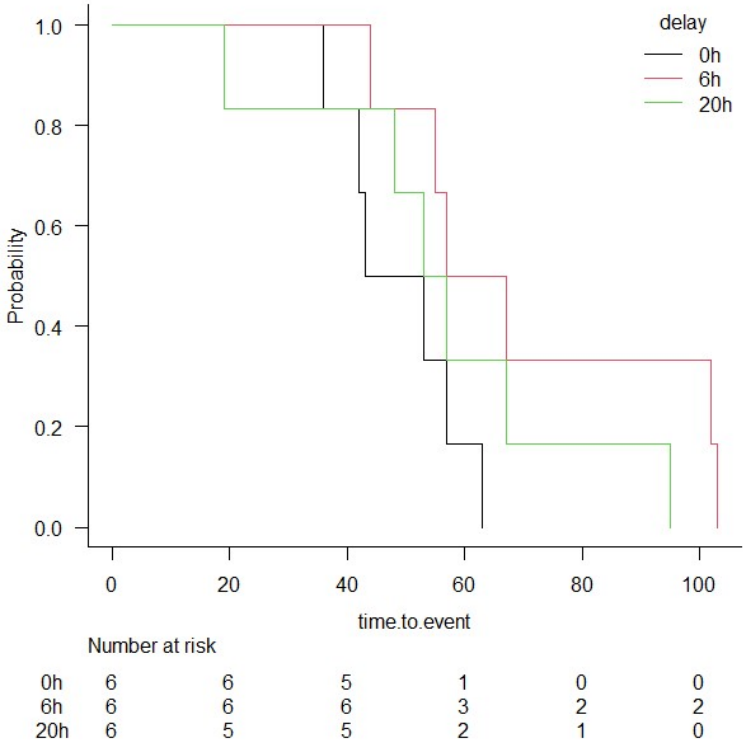
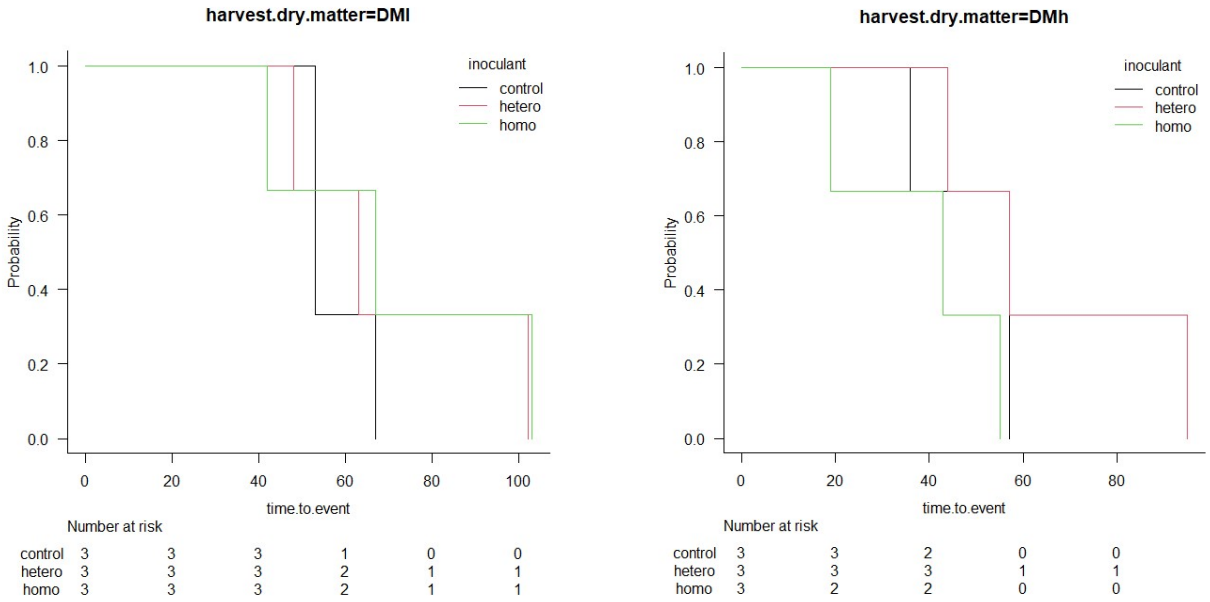


Figure S3. The Kaplan-Meier survival curve for the samples underwent delays at sealing (h), P = 0.104. 0h: zero h of dealing; 6 h: six h of dealing; 20 h: 20 h of dealing.



Panel A Panel B

Figure S4. The Kaplan-Meier survival curve for the samples underwent different inoculations stratified for the dry matter (DM, g/kg) at harvest. Control: pure water; Hetero: Heterofermentative; Homo: Homofermentative. DML: Low dry matter at harvest = 312g/kg =; 2 DMH: High dry matter at harvest = 348 g/kg. Panel A DMl, P = 0.672; Panel B DMh, P = 0.157.

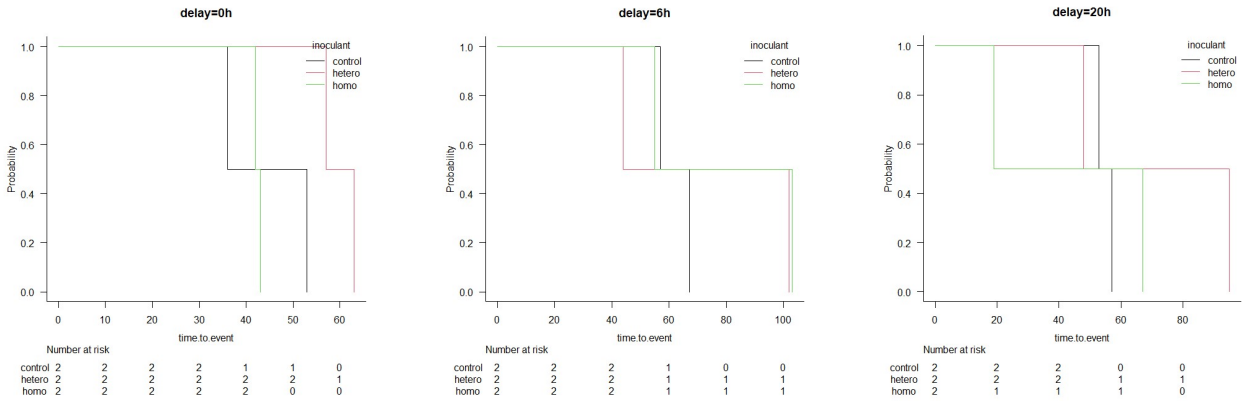


Figure S5. The Kaplan-Meier survival curve for the samples underwent different inoculations stratified for the delays at sealing (h). Control: pure water; Hetero: Heterofermentative; Homo: Homofermentative. 0h: zero h of dealing; 6h: six h of dealing; 20h: 20 h of dealing. Panel A: 0h, P = 0.138; Panel B: 6h, P = 0.741; Panel C: 20h, P = 0.741.

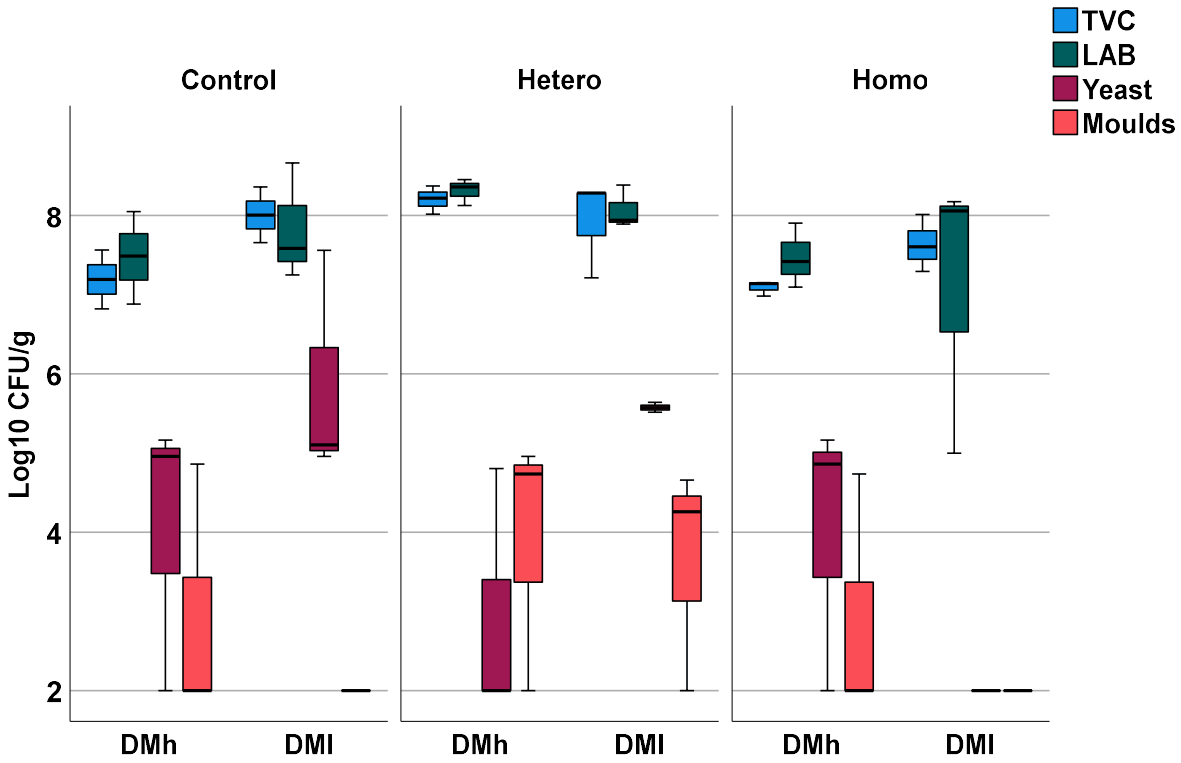


Figure S6. The microbiological features of samples were analyzed after 60 d of fermentation. The box plot represents the minimum, first quartile, median, third quartile, and maximum. TVC = total viable count; LAB = lactic acid bacteria.

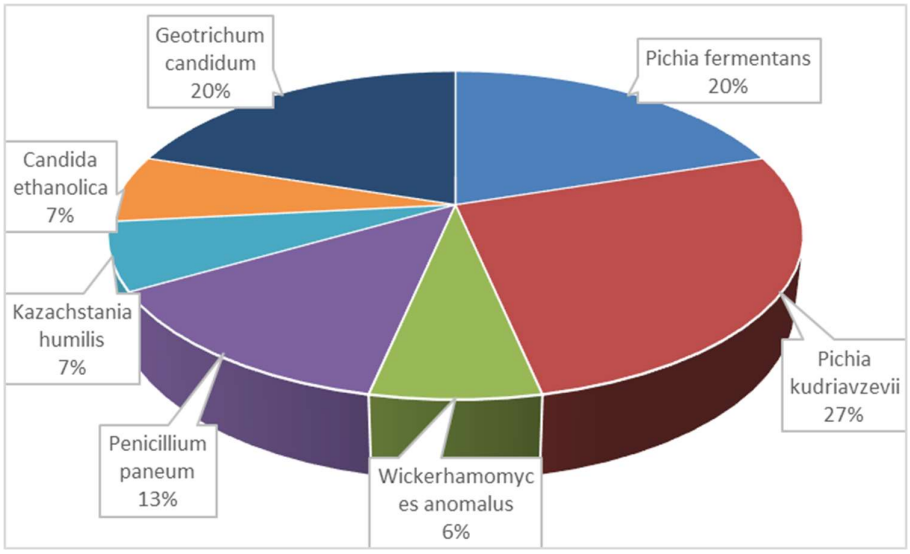


Figure S7. Moleuclar identification of the yeasts and mould strains collected afhter 60 d of fermentation.