

Buchneri 40788 Research Summary - Haylage 1

H1. ID-DLO, Netherlands: aerobic stability trials (time [h] for silage to heat 4°F)

	Untreated	Buchneri 40788
- 50% moisture	130	>320

H2. Grub Institute, Germany: materials ensiled 61 days (Acid = propionic and benzoic acids plus sulfite salts)

	Untreated	Acid	Conventional Inoculant	Buchneri 40788
- 67% moisture				
pH at opening	4.70	4.20	3.90	4.20
pH after 3 days in air	4.75	4.58	4.34	4.30
Temperature (°F, 3 days)	102.4	101.5	102.7	85.3
Yeasts	20 million	100,000	75 million	<100
Molds	7 million	1.6 million	12 million	<100
- 56% moisture				
pH at opening	4.27	4.30	4.00	4.27
pH after 3 days in air	5.52	5.42	5.95	4.30
Temperature (°F, 3 days)	112.8	112.6	114.1	81.7
Yeasts	1 million	1 million	1 million	<100
Molds	14 million	6.5 million	10 million	<100

H3. Braunschweig, Germany: Haylage, 63% moisture, ensiled 45 days

	Untreated	Buchneri 40788
pH at opening	4.70	4.20
Yeasts	400,000	0
Molds	0	0
Aerobic stability [AS] (time for 2°F rise, days)	2.5	>7
Dry matter loss in AS trial (%)	13.6	0

H4. SLU, Uppsala, Sweden: Haylage, 60% moisture, ensiled 46 days

	Untreated	Buchneri 40788
Yeasts	10,000	<100
Molds	100	100
Clostridia	794	12
Aerobic stability [AS] (time for 2°F rise, days)	3	>15
Dry matter loss in AS trial (%)	23	15

H5. ADAS, UK: baled haylage, 54% moisture, ensiled 117 days

	Untreated	Buchneri 40788
Yeasts	77,000	33
Molds	14,000	1,200
Enterobacteria	2,000	66
Aerobic stability [AS] (time for 4°F rise, h)	12	>96
Bales with visible surface mold (%)	40	0

Buchneri 40788 Research Summary - Haylage 2

H6. DLG, Germany (Acid = propionic and benzoic acids plus sulfite salts)

- 56% moisture, ensiled 61 days	Untreated	Acid	Buchneri 40788
Yeasts	2,100	<100	<100
Molds	71,000	10,000	<100
Aerobic stability [AS] (time for 2°F rise, days)	1.5	1.8	2.3

H7. SLU, Sweden: Haylage field trials, 62 % moisture, ensiled 85 days. Aerobic stability measured by CO₂ production [time to produce 0.2% CO₂]. (Acid = 4 liters/ tonne: 45.2% formic, 20.5% propionic, 6.4% NH₃, 27.9% water).

Untreated	Molasses Treated	Conventional Inoculant	Acid	Buchneri 40788
1.2 days	1.6 days	1.95 days	3.75 days	7.4 days

H8. CEDAR, UK: haylage, 54% moisture, ensiled 50 days

	Untreated	Buchneri 40788
Aerobic stability [AS] (time for 2°F rise, days)	3	>9

H9. ID-DLO, Netherlands: baled haylage, 59% moisture, ensiled 113 days

	Untreated	Buchneri 40788
Yeasts	27 million	200,000
Molds	<10,000	<10,000
Aerobic stability [AS] (time for 4°F rise, h)	196	327
pH increase in AS trial (pH units)	2.9	0
Dry matter loss in AS trial (%)	10.3	2.1

H10. 1999 – ID-DLO, Netherlands: haylage, 70% moisture, ensiled 120 days

	Untreated	Buchneri 40788
Yeasts	2,500	250
Molds	40,000	<100
Aerobic stability [AS] (time for 4°F rise, h)	125	>450

Buchneri 40788 Research Summary - Haylage 3

H11. SAC, UK: farm silages (samples taken from bunkers for laboratory aerobic stability trials).

	Control ¹	Buchneri 40788
Barmoorhill: time to reach ambient +18°F (h)	220 ^a	423 ^b
time to reach ambient +36°F (h)	239 ^a	454 ^b
time to reach t _{max} (h)	280 ^a	505 ^b
Meinside: time to reach ambient +18°F (h)	179 ^a	288 ^b
time to reach ambient +36°F (h)	193 ^a	311 ^b
time to reach t _{max} (h)	333 ^a	428 ^b

Note: 1 - control at Barmoorhill was a conventional LAB inoculant
at Meinside control was untreated
- time to reach t_{max} is time to reach peak temperature

H12. University of Delaware: 42% moisture, bag silo, ensiled 10 months

	Untreated	Buchneri 40788
TMR stability [AS] (time for 4°F rise, h)	68 ^a	100 ^b
DMI (lb/d)	55.2	55.9
Milk (kg/d)	87.8 ^a	89.5 ^b
Milk fat (%)	3.37	3.43
Proetin (%)	3.07	3.27
3.5% FCM (lb/d)	85.6 ^a	88.0 ^b
Feed efficiency (lb milk/ lb DMI)	1.60	1.62

Buchneri 40788 Research Summary - Corn Silage 1

CS1. ID-DLO, Netherlands: aerobic stability trials (time [h] for silage to heat 4°F)

	Untreated	Buchneri 40788
- 70% moisture	43	792

CS2. Braunschweig, Germany: 75% moisture, ensiled 45 days

	Untreated	Buchneri 40788
pH at opening	3.89	3.78
Aerobic stability [AS] (time for 2°F rise, days)	5	>7
Dry matter loss in AS trial (%)	4.4	1.1

CS3. DLG, Germany:

	Untreated	Buchneri 40788
- 75% moisture, ensiled 160 days		
Aerobic stability [AS] (time for 2°F rise, days)	6.3	>15
pH at end of ensiling	4.0	4.1
pH at end of AS trial	6.6	4.1

	Untreated	Buchneri 40788
- 70% moisture, ensiled 137 days		
Aerobic stability [AS] (time for 2°F rise, days)	1	>4
pH at end of ensiling	3.9	3.9
pH at end of AS trial	6.6	3.9

	Untreated	Buchneri 40788
- 65% moisture, ensiled 50 days		
Aerobic stability [AS] (time for 2°F rise, days)	3	6
pH at end of ensiling	4.0	4.0
pH at end of AS trial	5.8	4.0

	Untreated	Buchneri 40788
- 60% moisture, ensiled 113 days		
Aerobic stability [AS] (time for 2°F rise, days)	2.8	>7
pH at end of ensiling	3.9	3.9
pH at end of AS trial	6.6	5.2

CS4. University of Delaware: effect of treated silage on TMR stability (TMR's produced using experimental silages [30% DMB], untreated alfalfa haylage [30%] and a dairy concentrate [40%]). Acid = TMR Mate (buffered prop).

- 61% moisture, ensiled 73 days

	Untreated	Acid	Buchneri 40788
pH	3.94	3.87	3.89
Yeasts	166,000	250,000	3,300
Silage AS (time for 4°F rise, h)	42	45	169
TMR AS (time for 4°F rise, h)	92	80	194

Buchneri 40788 Research Summary - Corn Silage 2

CS5. INRA, du Pin, France: bunker silos

	Untreated	Buchneri 40788
Bunker temperatures, ave. over 48 days:		
At 8 inches in from face ¹	80.1°F	71.4°F
At 31/4 feet in from face ¹	64.0°F	61.9°F

Note: 1 - 20 cm from face was estimated as 4 days exposure to air ingress
100 cm was estimated as zero exposure to air ingress

CS6. ID-DLO, Netherlands: 63% moisture, ensiled 84 days

	Untreated	Buchneri 40788
Airtight laboratory silos:		
Yeasts (log CFU/ g)	4.0 ^a	2.0 ^b
Silage AS (time for 4°F rise, h)	61 ^a	>540 ^b
Air stressed laboratory (polythene bag) silos:		
Yeasts (log CFU/ g)	5.5 ^a	2.2 ^b
Silage AS (time for 4°F rise, h)	35 ^a	>540 ^b
Farm silos, unloading at 2m per week:		
After 14 days: face 1 foot from floor (°F)	63.1 ^a	59.9 ^b
After 14 days: face 3 1/4 ft cm from floor (°F)	69.8	54.1
Silage AS (time for 4°F rise, h)	0	20
After 36 days: face 1 foot from floor (°F)	66.2	68.0
After 36 days: face 3 1/4 ft cm from floor (°F)	64.9 ^a	55.0 ^b
Silage AS (time for 4°F rise, h)	5 ^a	40 ^b
After 56 days: face 1 foot from floor (°F)	53.1	51.3
After 56 days: face 3 1/4 ft cm from floor (°F)	59.0	55.8
Silage AS (time for 4°F rise, h)	13 ^a	41 ^b

CS7. University of Delaware: farm silo, fed to sheep

	Untreated	Buchneri 40788
Yeasts (log CFU/ g)	5.11 ^a	2.96 ^b
Molds (log PFU/ g)	2.35 ^a	0.44 ^b
Silage AS (time for 4°F rise, h)	18.5 ^a	43.4 ^b
DMI (lb/d)	1.99	2.06
ADG (lb/d)	0.183 ^a	0.308 ^b
FCR (lb DMI/ lb ADG)	10.9	6.7

Buchneri 40788 Research Summary - Corn Silage 3

CS8. University of Delaware: 62% moisture, ensiled 6 months

	Untreated	Buchneri 40788
Yeasts (log CFU/ g)	5.15 ^a	0.30 ^b
Silage AS (time for 4°F rise, h)	38.0 ^a	>572 ^b

CS9. University of Delaware: product comparison

Treatment	Yeast (log CFU/g)	Aerobic stability (h) ¹
Untreated control	4.5 ^a	39 ^a
Biomax, Hansen	4.8 ^a	35 ^a
Ultra Curb (Kemin prop)	4.3 ^a	42 ^a
Pioneer LB (100, 000)	3.7 ^a	45 ^a
Buchneri 40788 (400,000)	<1.0 ^b	139 ^b
Silo Guard II	4.6 ^a	33 ^a
Sorbic acid, 2 lb/t	3.0 ^{ab}	149 ^b
Benzoic acid, 2 lb/t	3.5 ^a	165 ^b

Note: AS = time for 4°F rise, h

Buchneri 40788 Research Summary - High Moisture Corn

HM1. University of Delaware: 27% moisture, aerobic stability [AS] (time for 4°F rise, h)

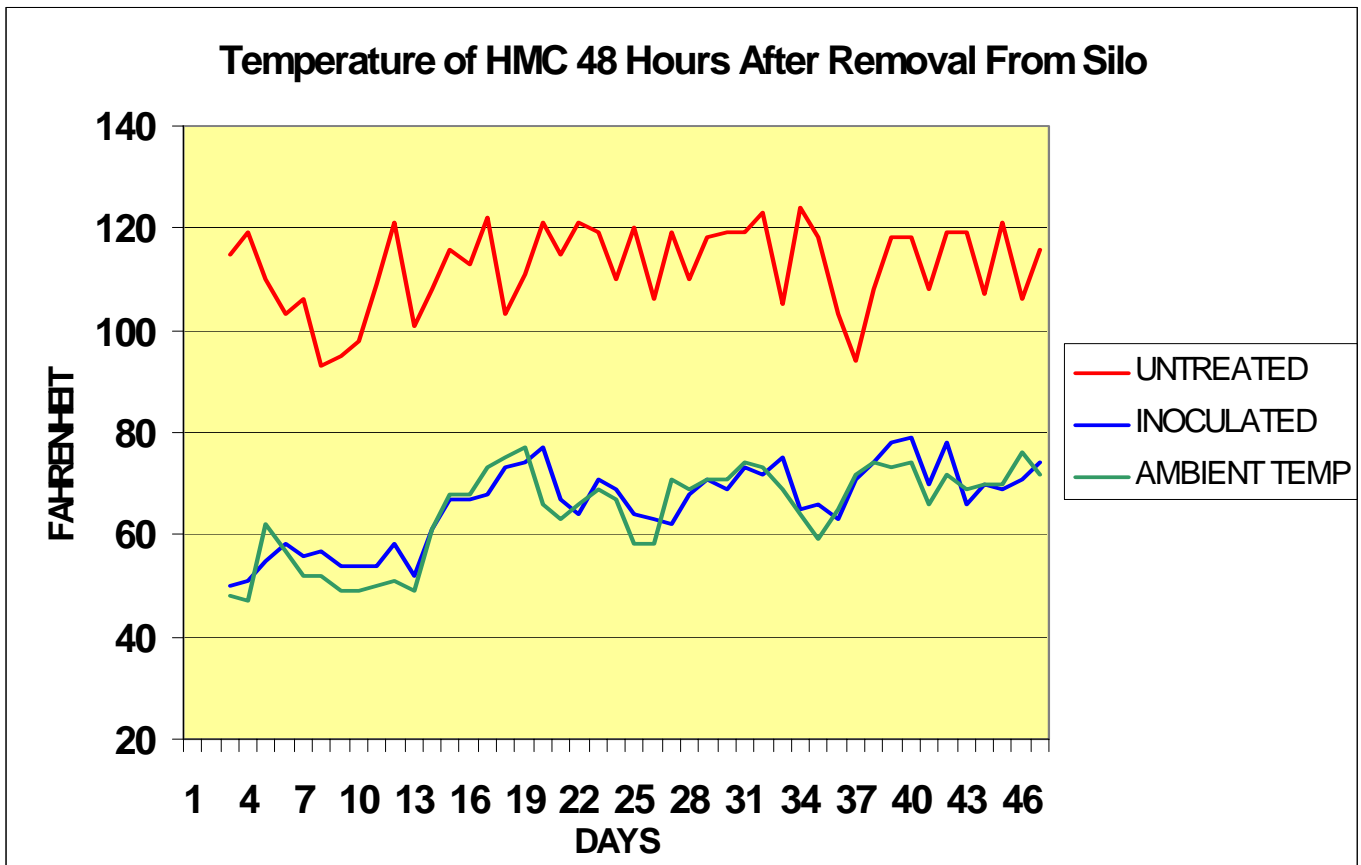
	Untreated	Buchneri 40788
After 92 days ensiling	47 ^a	400 ^b
After 166 days ensiling	84 ^a	450 ^b
Molds after 166 days (log PFU/ g)	2.23 ^a	0.47 ^b

Note: no molds were detected at 92 days in either treatment

HM2. University of Delaware: 29% moisture, ensiled 60 days

	Untreated	Buchneri 40788
Aerobic stability [AS] (time for 4°F rise, h)	30 ^a	260 ^b

HM3. University of Wisconsin, Madison: farm silos



Buchneri 40788 Research Summary - Other Silage 1

OS1. TEAGASC, Ireland: Wheatlage, 58% moisture, ensiled 122 days

	Untreated	Buchneri 40788
Yeasts	150,000	50
Molds	18	3
Aerobic stability [AS] (time for pH to rise, days)	2.5	7.5
Accumulated temperature rise over 5 days (°F)	108	27

OS2. ID-DLO, Netherlands: aerobic stability trials (time [h] for silage to heat 4°F)

- Wheatlage, 50% moisture	Untreated	Buchneri 40788
	125	250

OS3. DLG, Germany (Acid = propionic and benzoic acids plus sulfite salts)

- Wheatlage, 57% moisture, ensiled 131 days	Untreated	Acid	Buchneri 40788
Yeasts	1 million	180	400
Molds	100	50	70
Aerobic stability [AS] (time for 2°F rise, days)	0.3	5.8	5.8

OS4. 1998 – ADAS, UK: wheatlage, 66% moisture

**Buchneri 40788 treatment gave: 5.6% increase in ADG
4.4% improvement in FCE**

OS5. 1997 – SAC, UK: oatlage, 65% moisture, aerobic stability trials (samples taken from front and back of bunker for laboratory aerobic stability trials).

	Untreated	Buchneri 40788
Samples from front of bunker: temperature (°F)	77	63
mold score	3.0	1.4
Samples from back of bunker: temperature (°C)	93	64
mold score	3.8	0.8

OS6. University of Delaware: effect of silage on TMR stability (experimental TMR's produced using experimental silages [30% DMB], untreated alfalfa haylage [30%] and a dairy concentrate [40%]). Acid = TMR Mate (buffered prop).

- Barley silage, 63% moisture, ensiled 120 days

	Untreated	Acid	Buchneri 40788
pH	4.37	4.31	4.51
Yeasts	30	210	0
Molds	3	8	0
TMR Aerobic stability [AS] (time for 4°F rise, h)	95	105	120

Buchneri 40788 Research Summary - Other Silage 2

OS7. University of Delaware: effect of silage on TMR stability (experimental TMR's produced using experimental silages [30% DMB], untreated alfalfa haylage [30%] and a dairy concentrate [40%]). Acid = TMR Mate (buffered prop).

- Barley silage, 60% moisture, ensiled 69 days

	Untreated	Acid	Buchneri 40788
pH	4.70	4.32	4.46
Yeasts	775	590	102
Molds	1020	51	339
Silage AS (time for 4°F rise, h)	377 ^a	621 ^{a,b}	683 ^b
TMR AS (time for 4°F rise, h)	39	41	46

OS8. SAC, UK: farm silages - wheatlage (samples taken from bunkers for laboratory aerobic stability trials).

	Control ¹	Buchneri 40788
Smithfield: time to reach ambient +18°F (h)	41 ^a	70 ^b
time to reach ambient +36°F (h)	48 ^a	78 ^b
time to reach t _{max} (h)	65 ^a	222 ^b

Note: 1 - control was a conventional LAB inoculant

OS9. Agriculture & Agri-Food Canada, Kapuscasing Research Farm: wheatlage, 69% moisture, ensiled 120 days

	Untreated	Buchneri 40788
pH	3.92	4.22
Yeasts	4.7 million	<1000
Molds	<1000	<1000
Aerobic stability [AS] (time for 4°F rise, h)	30	>384

OS10. The Volcani Centre, Israel: wheatlage, 50% moisture

	Untreated	Buchneri 40788	Farm Silo Sample
AS (CO ₂ production after 5 days) - g/ kg DM	14.4	1.1	0.7

OS11. University of Delaware: barley silage, 60% moisture, farm scale bagged silage, ensiled 10 months, TMR produced using untreated corn silage with an AS of 60h.

	Untreated	Buchneri 40788
Yeasts (log CFU/ g)	4.89 ^a	2.63 ^b
Molds (log PFU/ g)	3.41	1.45
Barley silage AS (time for 4°F rise, h)	66 ^a	190 ^b
TMR AS (time for 4°F rise, h)	46 ^a	79 ^b

Buchneri 40788 Research Summary - Other Silage 3

OS12. University of Sao Paulo, Brazil: sugar cane silage

	pH	DM Recovery (%DM)	Ethanol (%DM)
Untreated control	3.69	80.9	3.06
Homolactic lactic bacteria (HLB) inoculant	3.58	77.7	9.81
Buchneri 40788	3.52	90.5	1.75
Urea	3.74	90.4	3.88
NaOH	5.05	88.1	2.00
Propionic acid	3.68	82.8	5.21
Benzoic acid	3.69	83.0	2.25
Sorbic acid	3.66	85.1	2.14
Urea + HLB	3.73	87.2	5.86

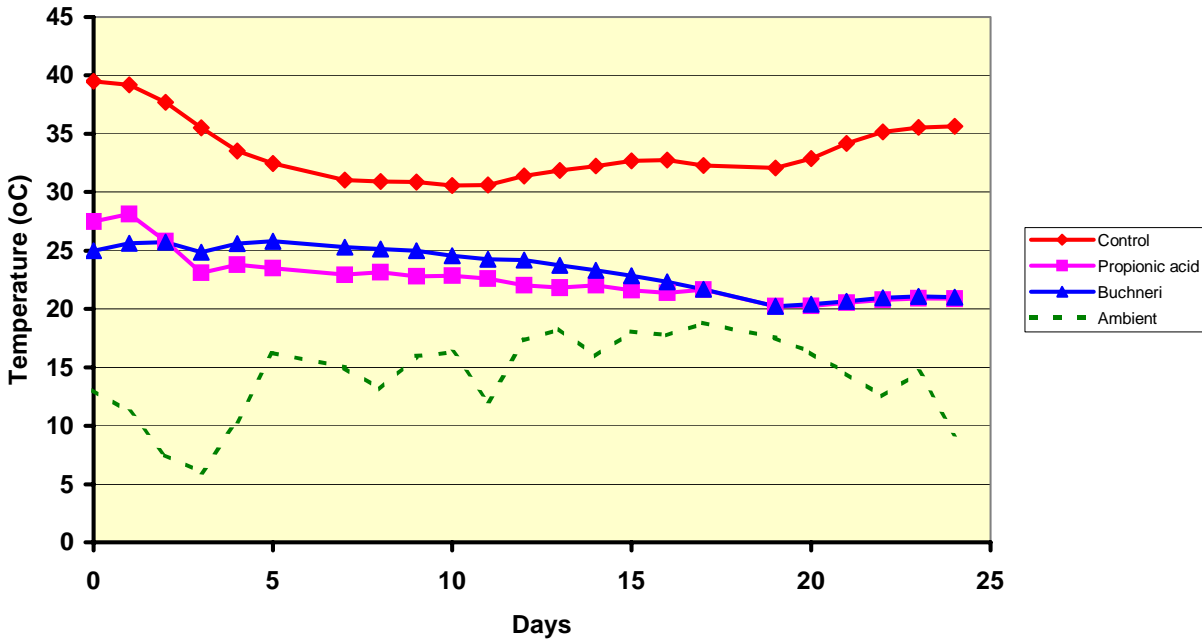
OS13. University of Delaware - poorly packed, bagged alfalfa haylage and corn silage (30% DM) (silages packed to 9 lb DM/ ft³)

	Control	Buchneri 40788
Corn silage: Yeasts (log CFU/ g)	6.44	6.34
Aerobic stability [AS] (time for 4°F rise, h)	21.9	56.8
Alfalfa haylage: Yeasts (log CFU/ g)	5.91	3.72
Aerobic stability [AS] (time for 4°F rise, h)	71.7	103.8
TMR: Yeasts (log CFU/ g)	6.58	6.58
Aerobic stability [AS] (time for 4°F rise, h)	9.9	15.0

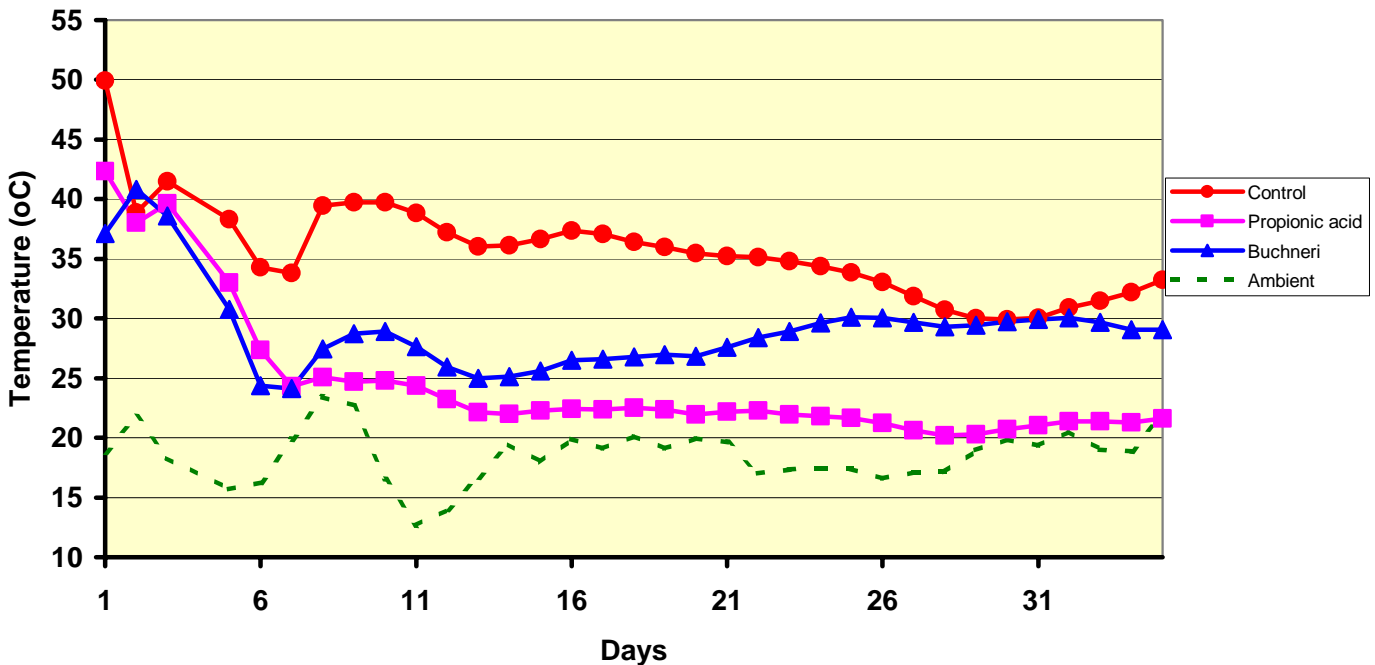
Buchneri 40788 Research Summary - Dry baled hay 1

DH1. Agriculture & Agri-Food Canada, Lethbridge Research Centre: dry baled hay
(acid = buffered propionic acid at 3 litres/ tonne)

- Alfalfa hay, 20% moisture, hard core round bales



- Timothy hay, 19% moisture, hard core round bales



Buchneri 40788 Research Summary - Dry baled hay 2

DH1. (continued)

From final report SPA # A01562-939

- At day 60 bales treated with **Buchneri 40788** Hay were greener than those treated with propionic acid, indicating reduced chlorophyll breakdown. Control bales were brownish.
- High moisture timothy hay baled with the Biotal inoculant (**Buchneri 40788**) retained higher proportions of crude protein
- Medium moisture timothy baled with Biotal (**Buchneri 40788**) maintained the most stable temperature during storage
- Excessive heating was prevented in 18 – 22% moisture timothy and alfalfa hay preserved with the Biotal (**Buchneri 40788**) Hay inoculant
- Biotal (**Buchneri 40788**) Hay inoculant was as equally effective in inhibiting mold growth as Hay Pro II in medium moisture timothy and alfalfa hay
- Biotal (**Buchneri 40788**) Hay inoculant was effective in inhibiting mold growth in high moisture timothy hay
- Dry matter intake of medium moisture timothy hay preserved with Biotal (**Buchneri 40788**) Hay inoculant was 28.6% higher than control hay, and 19.7% higher than hay preserved with Hay Pro II

Buchneri 40788 Research Summary - Buchneri 500

BF1. ID-DLO, Netherlands, Haylage, 70% moisture, 120 days ensiling

	DM loss (% DM)	Yeasts (log CFU/g)	Molds (log PFU/g)	AS (h for 4°F rise)
Untreated control	2.25 ^a	3.4 ^a	4.6 ^a	125 ^a
Conventional inoculant	2.98 ^b	2.6 ^b	2.7 ^b	>450 ^b
Buchneri 40788	5.17 ^c	2.4 ^{bc}	<2.0 ^c	>450 ^b
Buchneri 500	4.68 ^d	2.0 ^c	<2.0 ^a	>450 ^b

Note: superscripts refer to statistical differences within columns

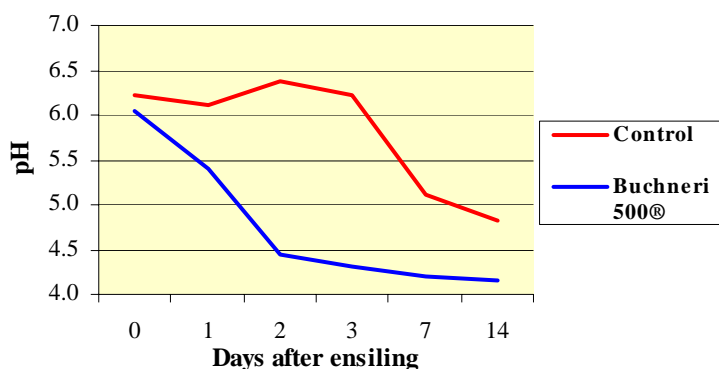
BF2. ID-DLO, Netherlands, Corn silage, 66% moisture, 85 days ensiling in silage bags

	DM loss (% DM)	Yeasts (log CFU/g)	AS (h for 4°F rise)
Untreated control	2.25 ^a	5.1 ^a	30 ^a
Conventional inoculant	2.28 ^a	4.3 ^b	41 ^b
Buchneri 40788	4.30 ^b	2.0 ^c	>458 ^c
Buchneri 500	4.02 ^c	2.1 ^c	>458 ^c

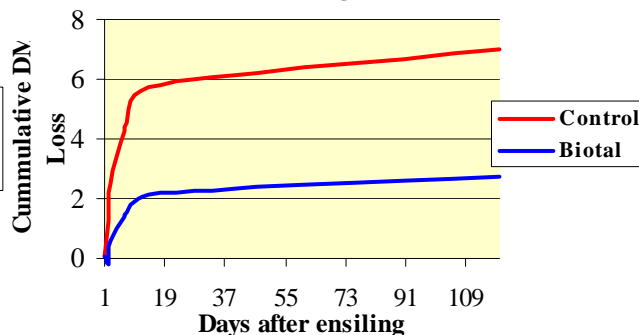
Note: superscripts refer to statistical differences within columns

BF3. Lethbridge Research Centre, AB: Barley silage

Initial pH drop with Buchneri 500® in barley silage



Effect of Buchneri 500® on DM loss in barley silage



Effect of Buchneri 500® on pH in barley silage exposed to air

