

The Acidity as a Quality Parameter of Acidophilus Milk
Enriched with Honey and Protein SupplementsMilka Stijepić¹, Nikolina Rajlić¹, Jovana Glušac², Dragica Đurđević-Milošević³¹ College of Health Sciences Prijedor, Nikole Pašića 4A, 79101 Prijedor, Bosnia and Herzegovina, milka.stijepic@vmspd.com, nikolinamalinovic.malinovic@gmail.com² Biosens Institute, University of Novi Sad, dr Zorana Đinđića 1, 21000 Novi Sad, Serbia, jovana.glusac@biosense.rs³ Institute of Chemistry, Technology and Microbiology, Prokupačka 41, 11000 Belgrade, Serbia, dragica.milosevic@yahoo.com

INTRODUCTION & AIM

- One of the most interesting fermented products with functional properties is acidophilus milk. It is well known that the nutritional value, therapeutic properties, and rheological characteristics of these products can be enhanced by incorporating various supplements.
- The objective of this study was to investigate the duration of fermentation and the change in pH value and acidity during 14 days of storage in supplemented acidophilus milk.

MATERIALS AND METHODS

- Cow's milk (labelled: fat 2.8%, protein 3.0%, lactose 4.5%)
- Cow whey protein isolates (labelled: proteins 85%, milk fat 1.6%, carbohydrates 9.7%)
- Goat whey protein concentrates (labelled: proteins 79%, milk fat 3.6%, carbohydrates 10.7%)
- Acacia honey (labelled: water 16.9%, ash 0.08%, total sugars 82.6%, reducing sugars 71.1%)
- Five different acidophilus milks were prepared (Figure 1, Table 1)

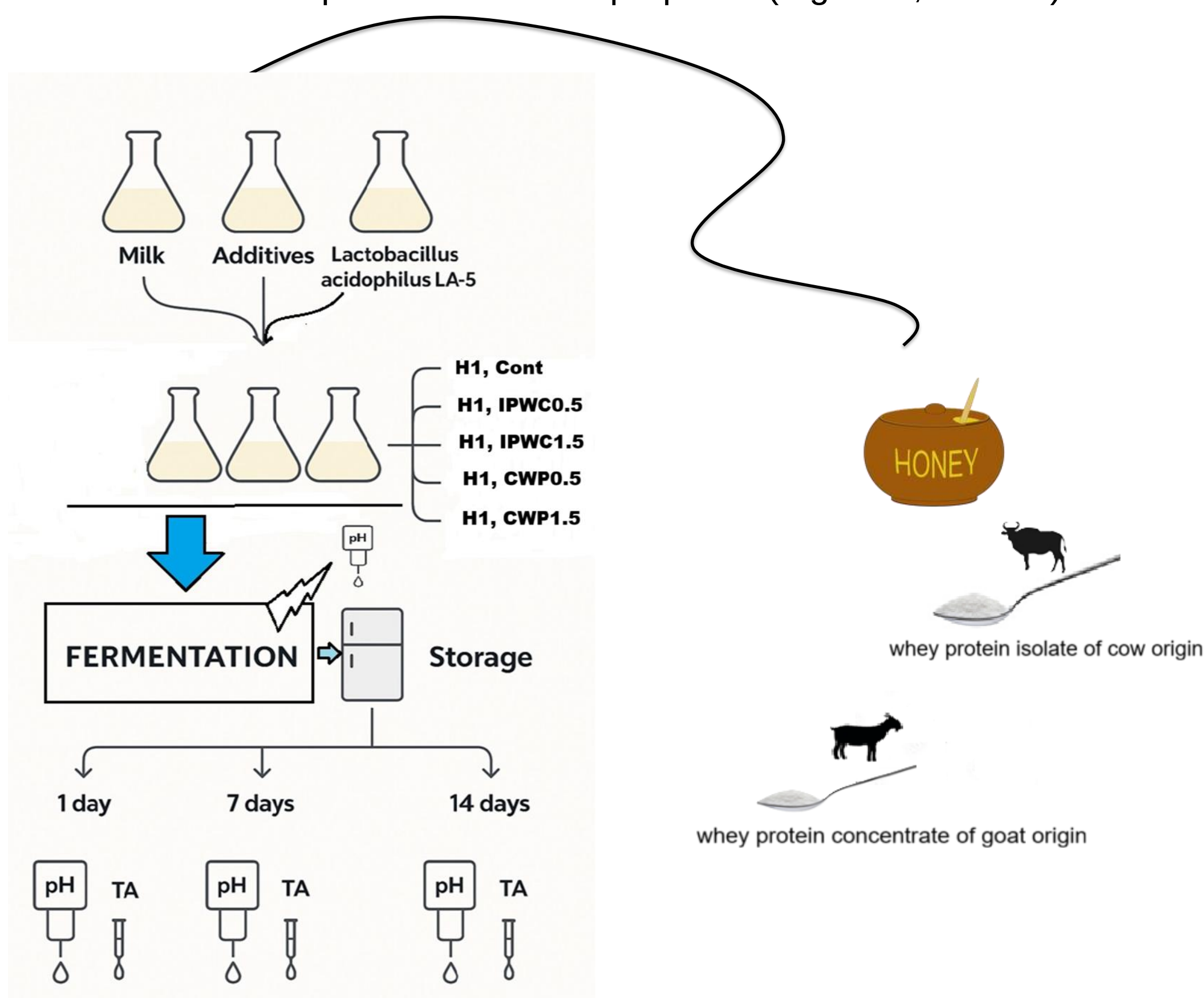


Figure 1. Schematic of experimental design

Table 1. Codes of different acidophilus milk

Code of acidophilus milk formulation	Concentration of supplements in milk
H1, Cont	Honey 1%(w/w)
H1, IPWC0.5	Honey 1% + 0.5% IPWC (10g kg ⁻¹ H + 5g kg ⁻¹ IPWC)
H1, IPWC1.5	Honey 1%+ 1.5% IPWC (10g kg ⁻¹ H + 15g kg ⁻¹ IPWC)
H1, CWP0.5	Honey 1% + 0.5% CWP (10g kg ⁻¹ H + 5g kg ⁻¹ CWP)
H1, CWP1.5	Honey 1% + 1.5% CWP (10g kg ⁻¹ H + 15g kg ⁻¹ CWP)

H- honey, IPWC- whey protein isolate of cow origin, CWP- whey protein concentrate of goat origin

- A lyophilized bacterial culture *Lactobacillus acidophilus* (LA-5; 0.02 g/l) was used for direct milk inoculation.
- End point of fermentation was at pH 4.6, followed by rapid cooling to 20 °C.
- The pH value of acidophilic milk was measured with a laboratory pH meter (pH HI2002 Meter, HANNA Instruments, USA).
- Lactic acid content was calculated according to basic titratable acidity on the 1st, 7th and 14th day of storage

RESULTS & DISCUSSION

According to the research results, the endpoint of fermentation was reached in intervals between 7 to 13 hours (Figure 2).

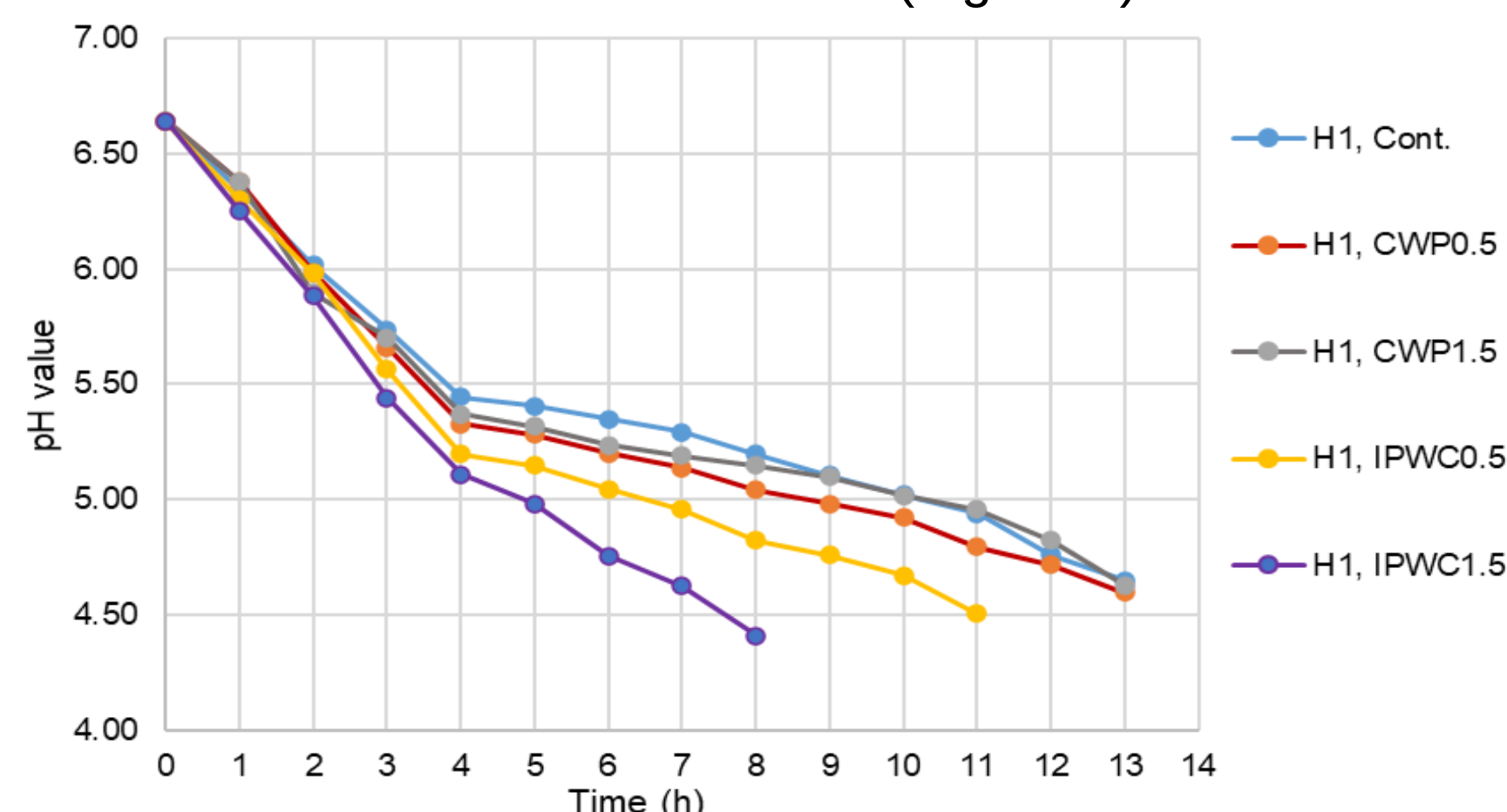


Figure 2. The change of pH values during fermentation

The times of storage and formulation are both sources of variation in pH values during storage ($p < 0.05$) (Table 2).

Table 2. pH values of acidophilus milks during storage on 1st, 7th, and 14th days with post hoc Bonferroni comparisons

Code of acidophilus milk formulation	pH value (*Xsr±SD)		
	Day 1	Day 7	Day 14
H1, Cont	4.40±0.01 ^{bBC}	4.16±0.03 ^{aBC}	4.14±0.01 ^{aBC}
H1, IPWC0.5	4.43±0.04 ^{bC}	4.28±0.05 ^{aC}	4.26±0.06 ^{aC}
H1, IPWC1.5	4.60±0.01 ^{bD}	4.36±0.13 ^{aD}	4.34±0.05 ^{aD}
H1, CWP0.5	4.37±0.06 ^{bB}	4.12±0.08 ^{aB}	4.10±0.13 ^{aB}
H1, CWP1.5	4.15±0.02 ^{bA}	4.03±0.03 ^{aA}	3.94±0.06 ^{aA}

*Xsr±SD denote average value ± standard deviation; different lowercase letters indicate significant differences between days for the same acidophilus milk (Bonferroni post hoc test, $p < 0.05$), while different uppercase letters indicate significant differences between acidophilus milk at the same time point ($p < 0.05$)

The times of storage and formulations are both sources of variation in titratable acidity during storage ($p < 0.05$) (Table 3); the interaction between treatment and storage time was significant ($p < 0.05$).

Table 3. Lactic acid content of acidophilus milks during storage on 1st, 7th, and 14th days with post hoc Bonferroni comparisons

Code of acidophilus milk formulation	Lactic acid content (% v/v) (*Xsr±SD)		
	Day 1	Day 7	Day 14
H1, Cont	0.808±0.111 ^{aA}	0.979±0.048 ^{bA}	0.963±0.178 ^{bA}
H1, IPWC0.5	0.695±0.092 ^{aA}	0.846±0.013 ^{bA}	0.833±0.241 ^{bA}
H1, IPWC1.5	0.583±0.016 ^{aA}	0.736±0.009 ^{bA}	0.668±0.009 ^{bA}
H1, CWP0.5	0.826±0.016 ^{aA}	0.862±0.194 ^{bA}	0.877±0.032 ^{bA}
H1, CWP1.5	0.999±0.076 ^{aB}	1.073±0.149 ^{bB}	1.642±0.095 ^{bB}

*Xsr±SD denote average value ± standard deviation; different lowercase letters indicate significant differences between days for the same acidophilus milk (Bonferroni post hoc test, $p < 0.05$), while different uppercase letters indicate significant differences between acidophilus milks at the same time point ($p < 0.05$)

CONCLUSION

- ✓ The prepared supplemented acidophilic milks showed fair stability of pH and lactic acid during 14 days of storage.

FUTURE WORK

- ❖ Additional analyses will be conducted after a longer storage duration to assess the product's stability over an extended period.