Inhibitory effect of SCFA and MCFA on contaminants of liquid pig feed and intestinal bacteria

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Abstract number: 31211
EAAP congress, Ghent, Belgium
August 2019

Liquid pig feeding

- Spontaneous fermentation
- Higher number of natural micro-organisms
- Need to lower pH (pH 4.2–4.5):
  - Controlled fermentation = fermented liquid pig feed
  - Direct feeding with use of organic acids = (nonfermented) liquid pig feed

Impact on farm and pigs

- Lower costs
- Promotes animal welfare
- Improved digestibility
- Easier adaptation post-weaning from milk to liquid feed
- Hygiene very important
- Use of enzymes easier

Poor (spontaneous) fermentation in liquid pig feed

Consequences

- Increased acetic acid, butyric acid, and alcohol levels in feed
  - Lowered palatability
  - Reduced feed intake
- Potentially also diarrhea
- Growth performance is not optimal
- Gas production in feeding tubes may cause failures in feed delivery

Prevention of problems

- Regular washing of the tubes and tank
- Use of organic acids

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Mode of action of organic acids

Feed preservation

- pH reduction of feed
- Control of microorganisms
- Decreased loss of AA

Animal health and performance

- Maintenance of health
- Consistent animal performance

EASTMAN

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Synergy between SCFA and MCFA

Broader antimicrobial action in feed || High available energy source for pig

EASTMAN

Objective in-vitro study

Determine the growth-inhibitory effect of a single SCFA, blend SCFA, and SCFA+MCFA on six bacterial and two yeast strains

→ pH >5: only bacteriostatic effect tested

Materials and methods

- SCFAs and MCFAs (total 1 l/t) were added to a liquid bacterial-growth media.
- Media was inoculated with 9% v/v overnight-cultured microbial inocula.
- Growth inhibition was determined measuring culture optical density at 600nm at multiple time events over a 24-hour period.
- Growth media pH 5 was used, but some species needed higher pH to grow.
- Temperature 25°C was used for yeast and temperature 37°C for bacteria.
- Growth inhibition (%) per product was statistically analysed relative to the negative control using a two-tailed Student t-test.

Strains and types tested

Common species in liquid pig feed

Pathogens

Tested microbial strains	Microbial type
Candida humilis *(C-96244T)*	Yeast, common in sourdough
Saccharomyces cerevisiae *(DSM 70449)*	Baking yeast
Escherichia coli *(DSM 30083)*	Gram- Commensal/pathogenic
Salmonella enterica *(DSM 11320)*	Gram-
Campylobacter jejuni *(DSM 4388)*	Gram-
Clostridium perfringens *(DSM 756)*	Gram+
Streptococcus suis *(DSM 9684)*	Gram+
Staphylococcus aureus *(DSM 20231)*	Gram+

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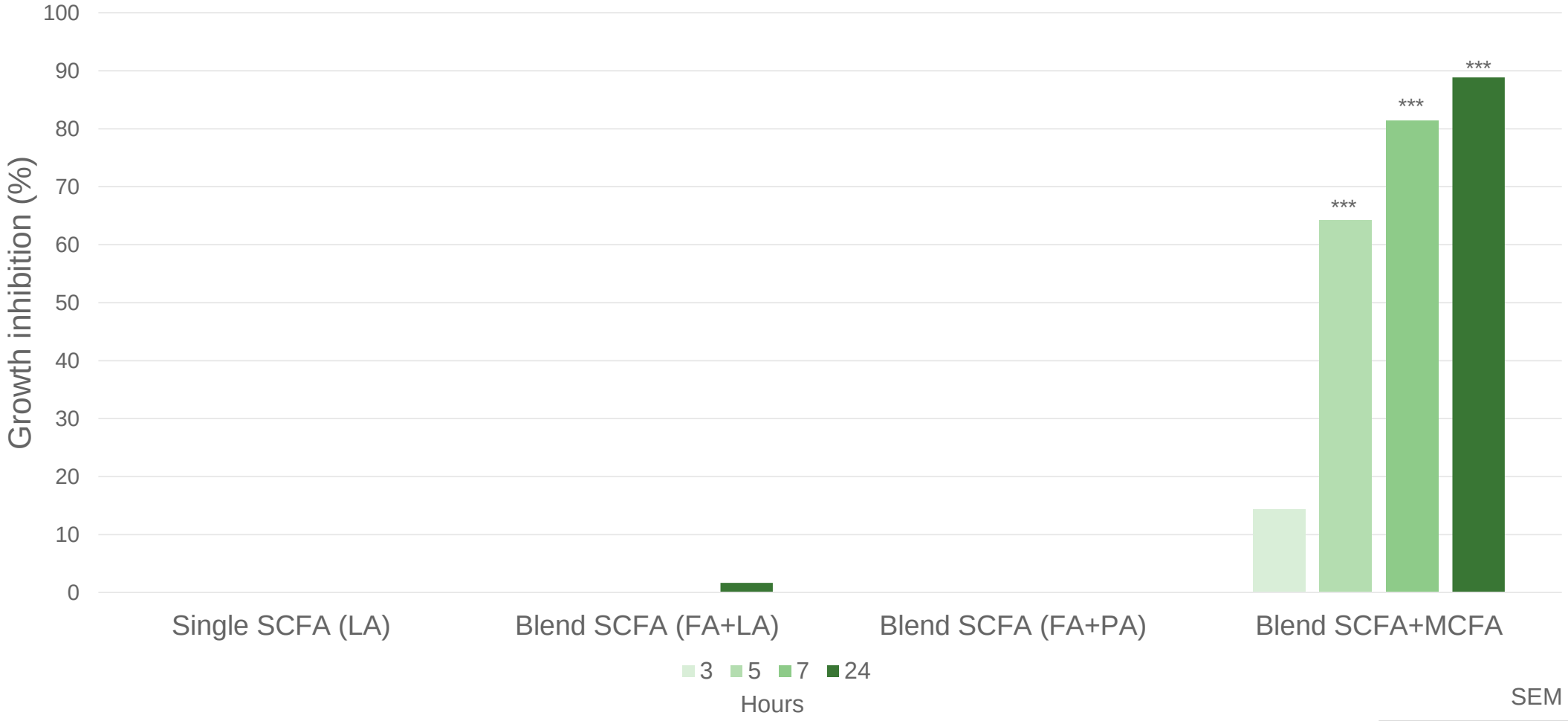
Candida humilis (milleri)

(C-96244T) Yeast; common in sourdough

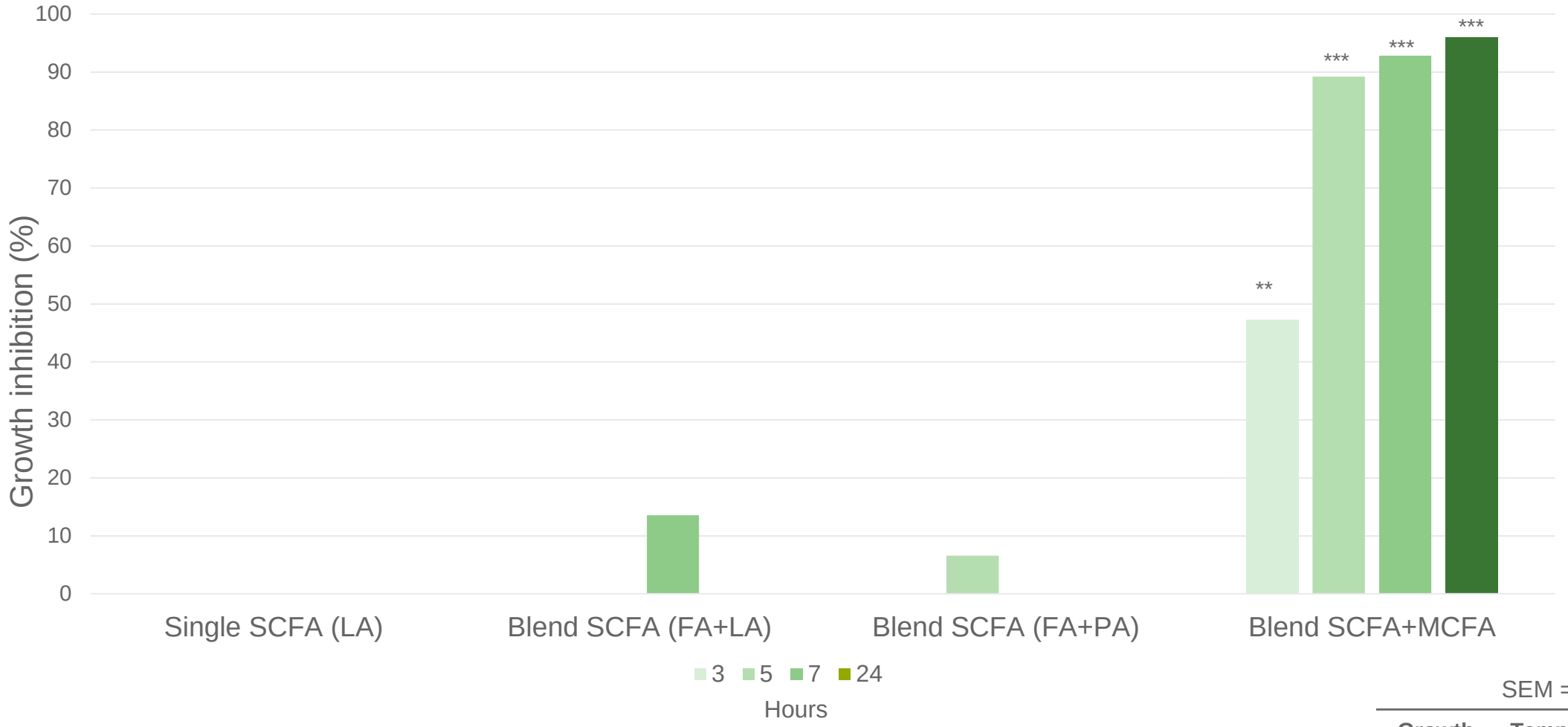


SEM = 2.45

Growth medium	Temperature (°C)	pH
YM	25	5

Saccharomyces cerevisiae

(DSM 70449) Yeast; baking yeast

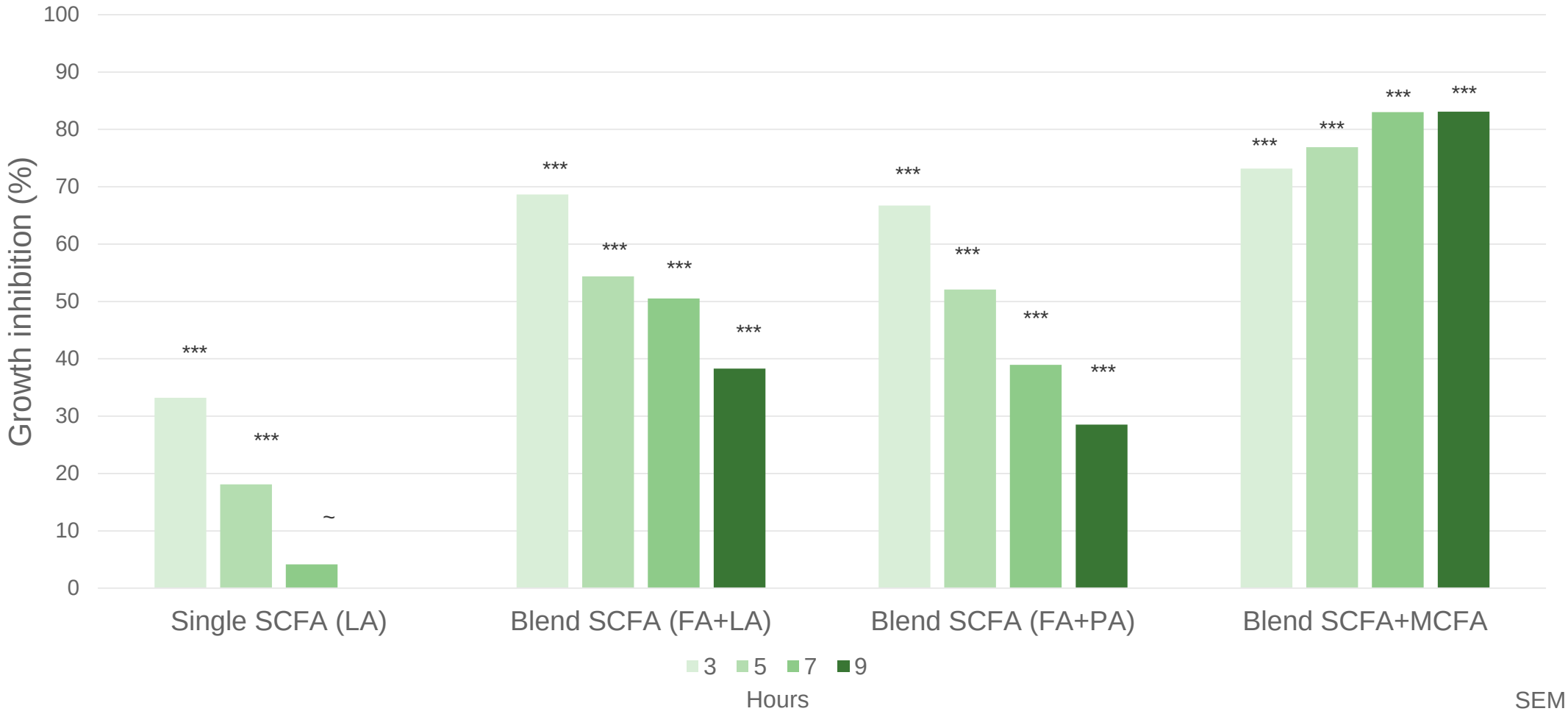


SEM = 10.46

Growth medium	Temperature (°C)	pH
YM	25	5

Escherichia coli

(DSM 30083) Gram-; pathogenic

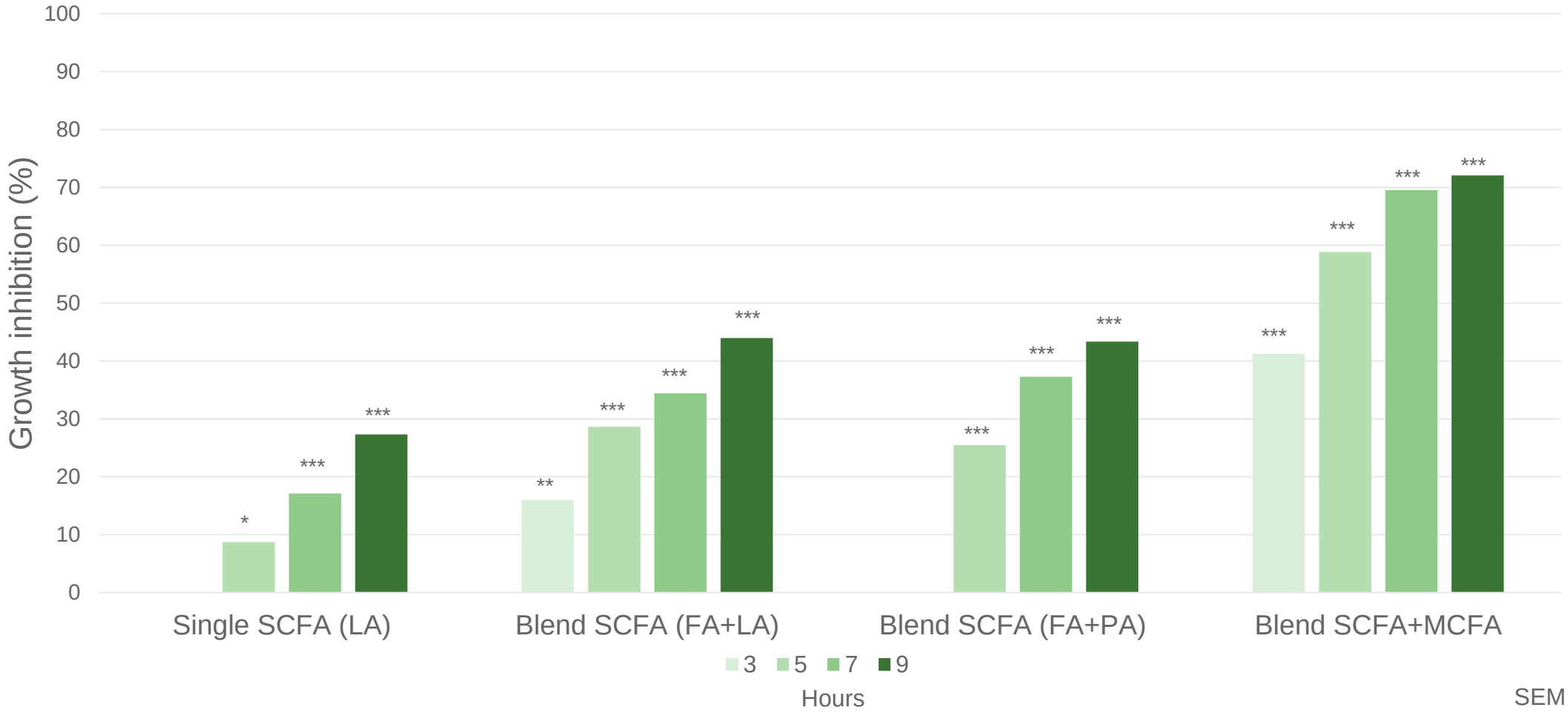


SEM = 1.01

Growth medium	Temperature (°C)	pH
TSGY	37	5

Salmonella enterica, *Serovar Typhimurium*

(DSM 11320) Gram-; pathogenic

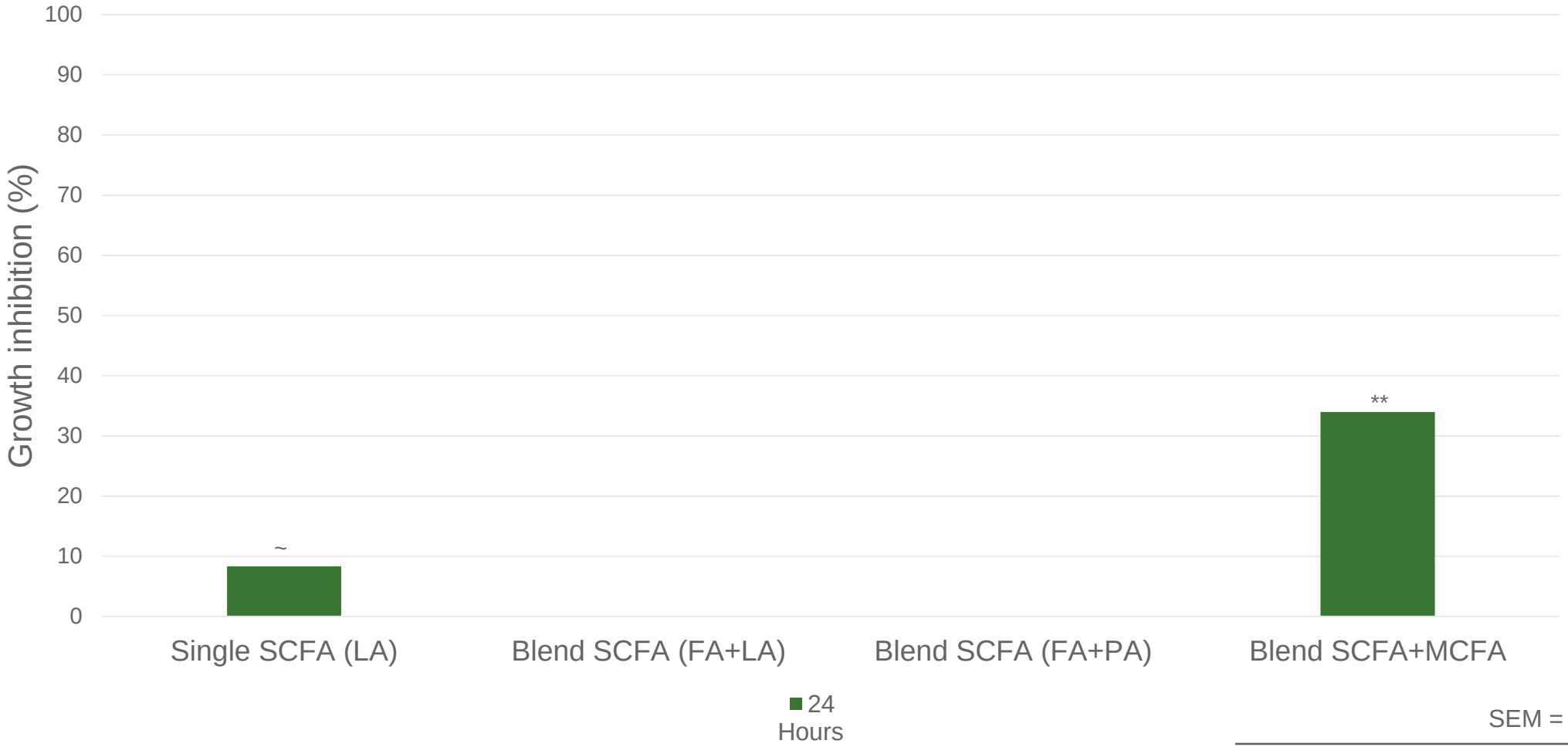


SEM = 1.63

Growth medium	Temperature (°C)	pH
TSGY	37	5

Campylobacter jejuni

(DSM 4388) Gram-; pathogenic

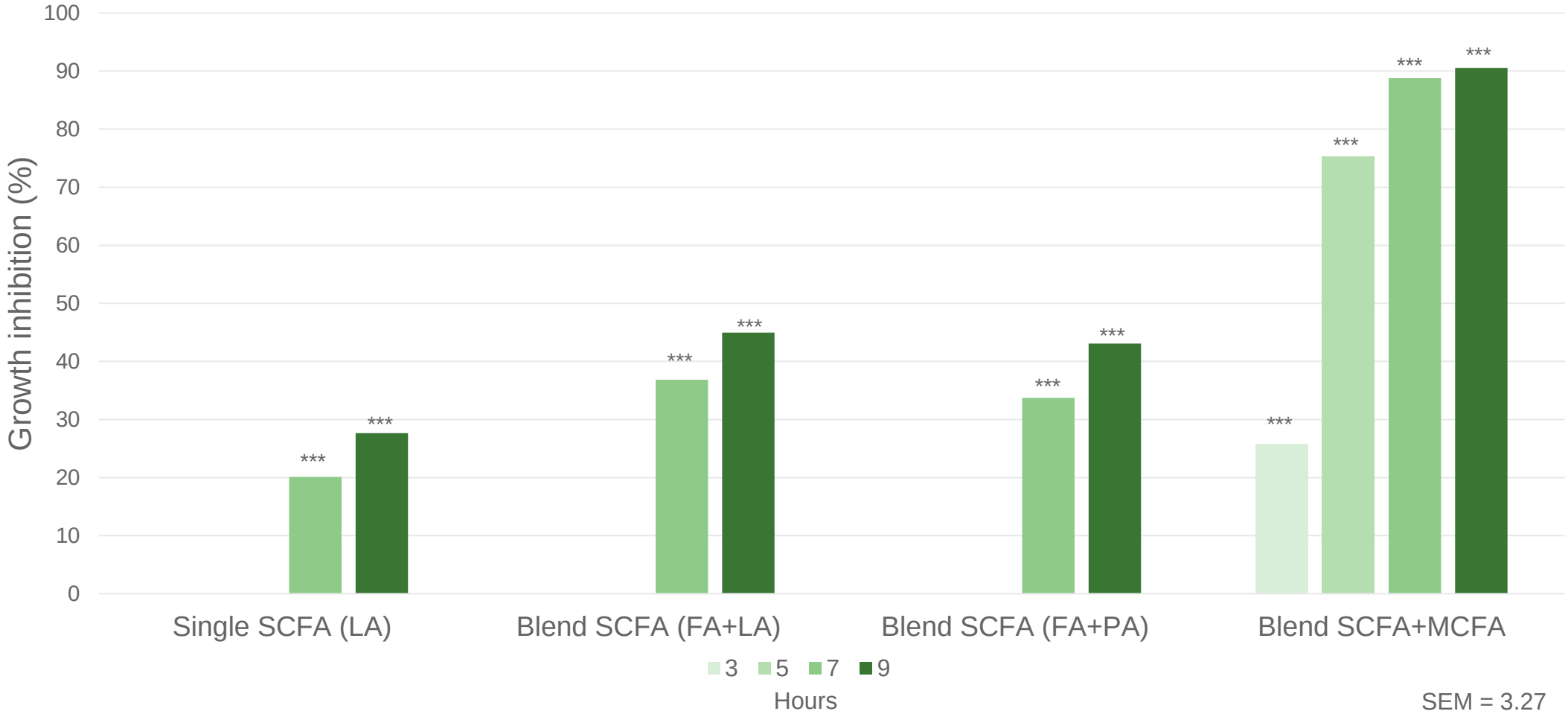


SEM = 1.62

Growth medium	Temperature (°C)	pH
BHI, microaerophilic	37	5

Clostridium perfringens

(DSM 756) Gram+; pathogenic

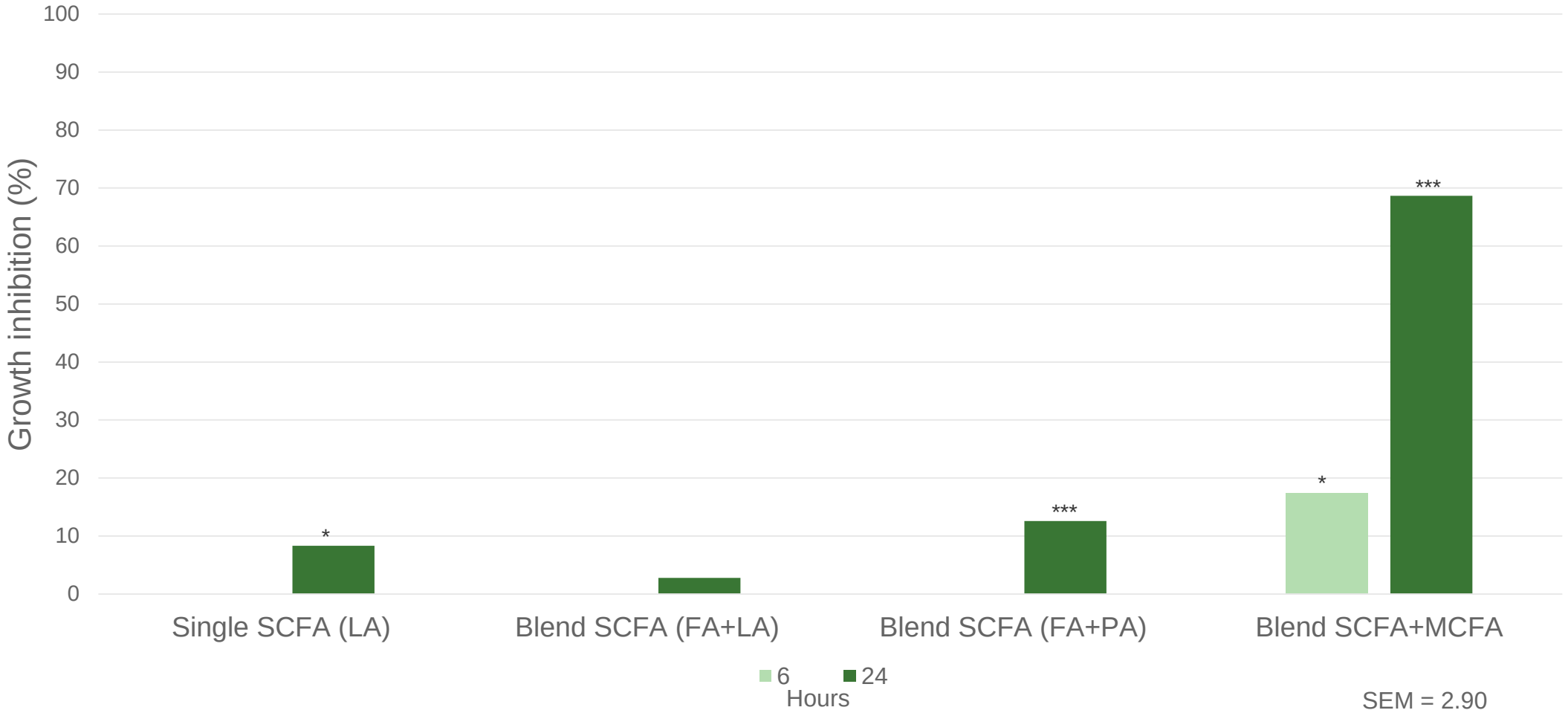


SEM = 3.27

Growth medium	Temperature (°C)	pH
TSGY, anaerobic	37	6.2

Streptococcus suis

(DSM 9684) Gram+; pathogenic

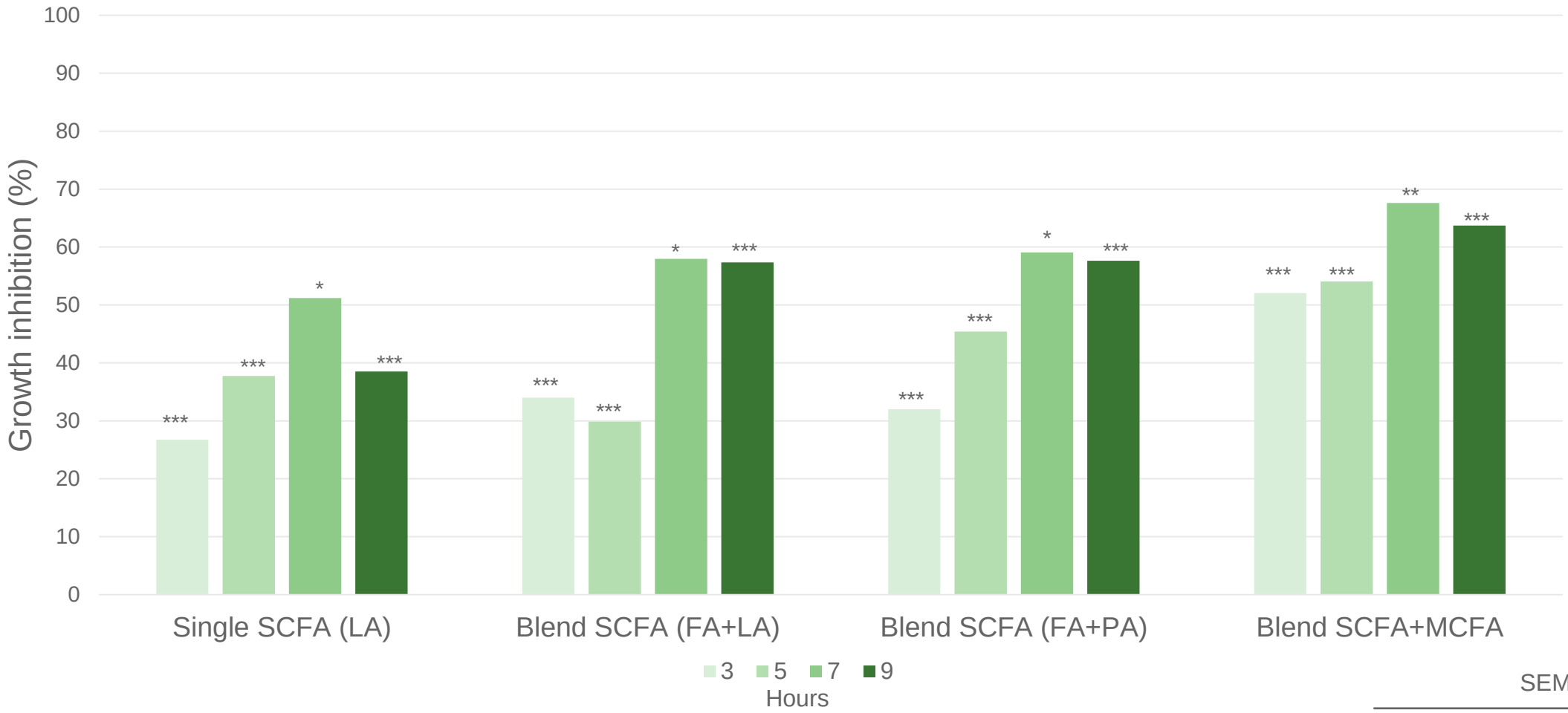


SEM = 2.90

Growth medium	Temperature (°C)	pH
TSB with 2% serum, microaerophilic	37	7

Staphylococcus aureus

(DSM 20231) Gram+; pathogenic



SEM = 3.37

Growth medium	Temperature (°C)	pH
TSGY	37	5

Conclusion

- SCFA+MCFA showed superior bacterial-growth inhibition.
- Only the SCFA+MCFA was able to inhibit the growth of yeast cells effectively.

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