

Developing, Optimizing, and Commercializing a Silver Ion-Based Wash Process for Whole Cantaloupe Using a Cloth-Based Aggregated Sampling Tool

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BACKGROUND & PURPOSE

Whole cantaloupe remains challenging because the netted rind can provide harborage sites for pathogens that may contaminate the edible portion during fresh-cut processing. Previous approaches described in the source presentation, including steam and nisin-based sanitizers, have not gained

Purpose:
Characterize operating parameters and verify commercial-scale performance of SmartWash® Fruit Boost™ for whole cantaloupe.

Target operating parameters

Silver ions	25–30 ppm
Residence time	~30 seconds
pH	≤2.5 for melons
Coverage	Complete surface coverage
Presentation	Single layer of melons
Light exposure	Protect silver solution from light



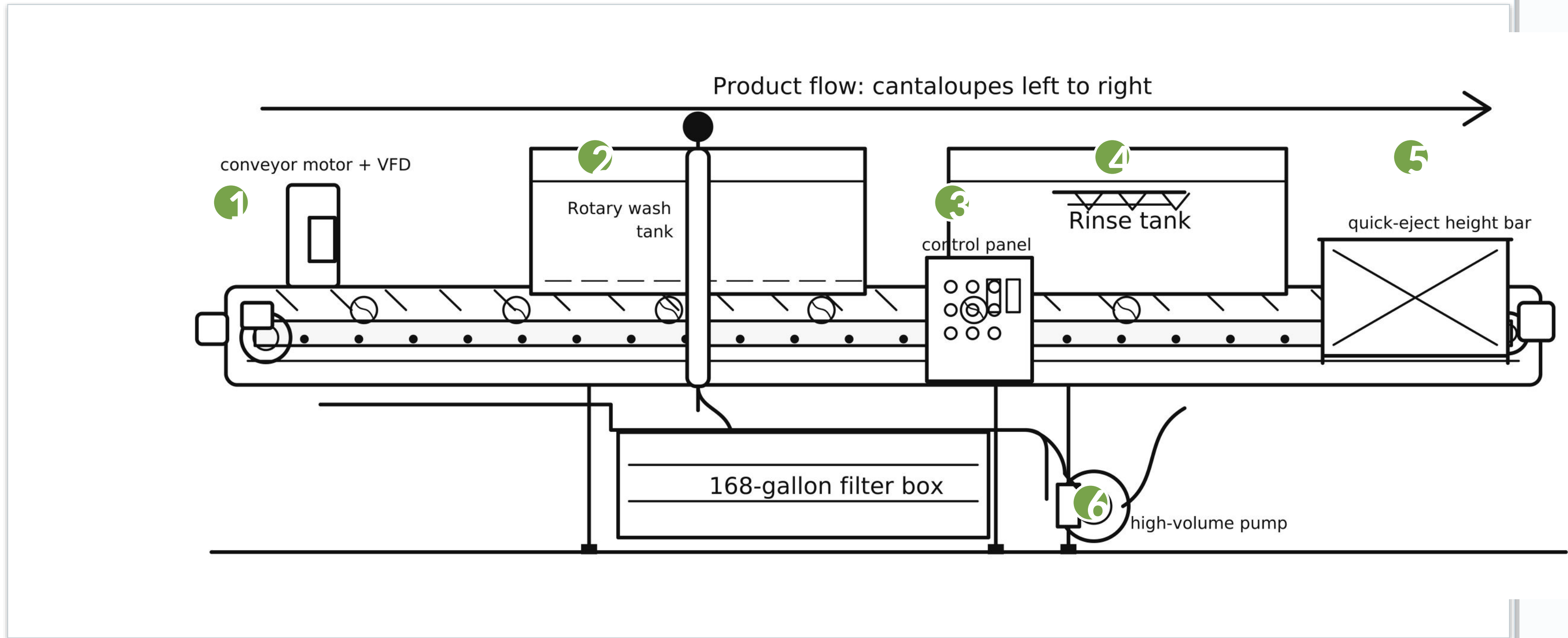
Figure 1. MicroTally® Mitt sampling provides a non-destructive, cloth-based aggregated microbial assessment.

Sampling approach

- One mitt sample represents 5 melons
- LAB reported as CFU/mitt
- Aggregated population analysis addresses natural variability

COMMERCIAL PROCESS LINE

SmartWash Solutions® Fruit Boost™ line



Process Features

- 1 Raw whole cantaloupe
- 2 Single-layer presentation
- 3 Fruit Boost™ treatment
- 4 Protected contact zone
- 5 Post-treatment wash
- 6 MicroTally® verification

Design objective:
Maintain silver-ion concentration, contact time, surface coverage, and light protection while implementing the process on commercial equipment.

VALIDATION RESULTS

Commercial LAB probability plot

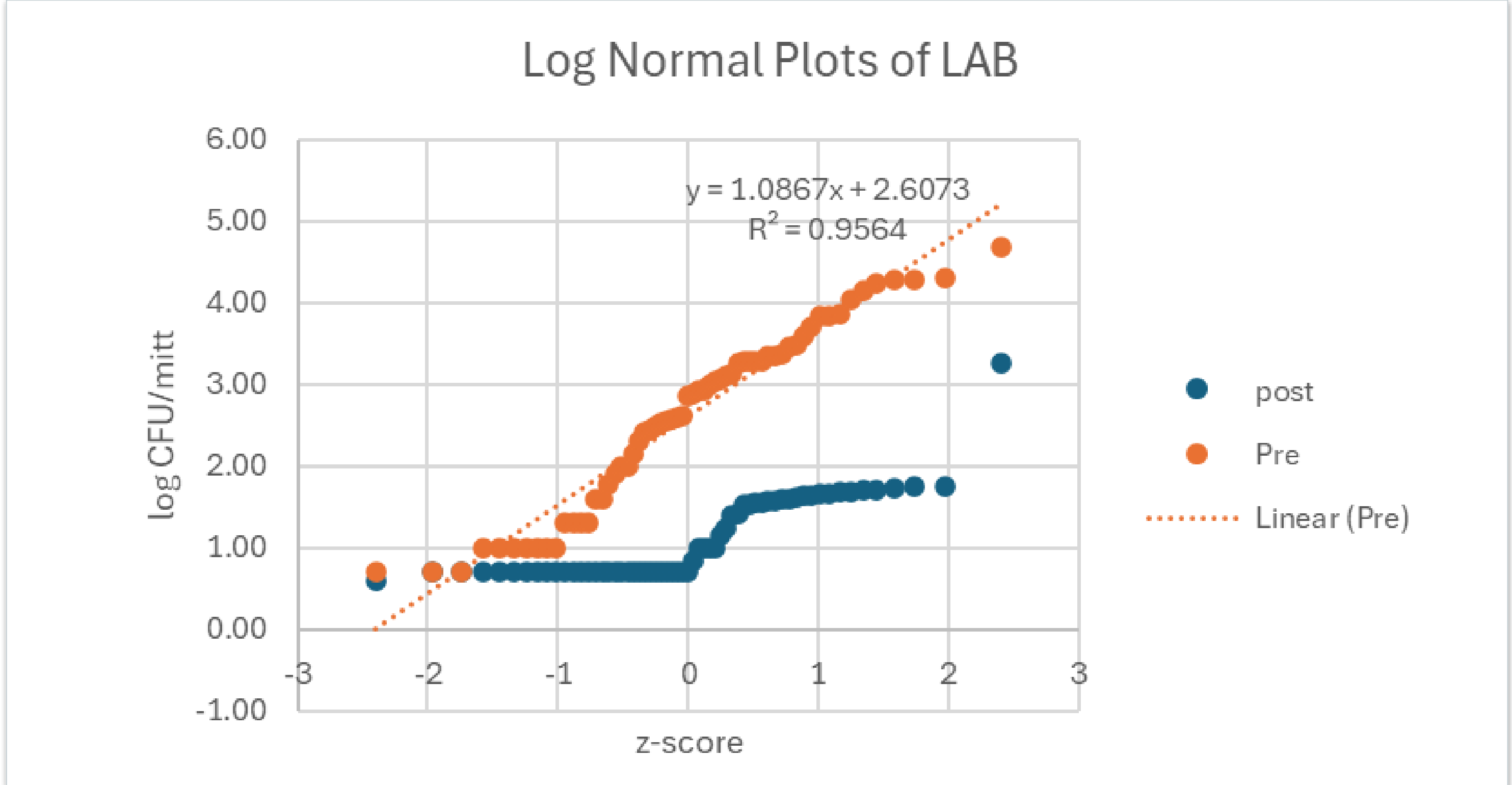


Figure 3. Population-level comparison shows the expected lactic acid bacteria (LAB) reduction across commercial validation samples and supports statistical aggregation rather than simple pairwise pre/post comparison.

Commercial validation metrics

61	paired pre/post samples	21	sampling days
5	melons per mitt	~1.5	LAB reduction observed
>3 log	sample generic <i>E. coli</i> reduction in pilot		

Interpretation:
Natural LAB variability makes individual pre/post pairs difficult to interpret; population-level aggregation is the stronger verification metric.

KEY CONCLUSIONS

1. Silver ion washing can help control cantaloupe pathogens.
2. Cloth-based aggregated sampling improves supply-chain microbial assessments.
3. LAB is a valid process indicator if sufficient result aggregation addresses variability.

ABSTRACT

Introduction: Building on success with silver ions for leafy greens, this study assessed their effectiveness for washing whole cantaloupe—a fruit frequently linked to outbreaks due to its netted surface harboring pathogens. Previous USDA methods like steam and nisin have not seen industry adoption.

Purpose: Characterize the key operating parameters and evaluate the effectiveness at commercial scale of a silver ion-based wash process (SmartWash® Fruit Boost™) for washing the exterior of cantaloupes.

Methods: Using cloth-based aggregated sampling (MicroTally® Mitt samplers) to reduce sample count and facilitate microbial assessments, pilot plant experiments were done to characterize the key operating parameters for a silver ion wash process for cantaloup. These parameters were used to design and install a wash line in a commercial fresh-cut facility for a verification trial.

Results: Experiments indicate that a 30 second residence time at 25-30 ppm silver ion concentration in a system that provides light protection and ensures complete coverage without wasting chemistry can deliver significant lethality (3+ log for inoculated generic *E. coli* and ~1.5 log for lactic acid bacteria (LAB), a natural more resistant surrogate for in plant verification). During commercial operation over several months on 21 sampling days, 61 pairs of pre and post process samples of 5 melons each were non-destructively sampled with mitt samplers to measure the LAB recovery. These results confirmed the expected lethality of LAB under commercial conditions. The results also indicate that simple pair wise comparison of pre- and post-process LAB is not a suitable metric for process verification due to the natural variation.

Significance: 1. Silver ion washing can help control cantaloupe pathogens. 2. Cloth-based aggregated sampling improves supply chain microbial assessments. 3. LAB is a valid process indicator if sufficient result aggregation addresses variability.