

FIELD STUDY • AGRICULTURE / POST-HARVEST

DZ 9450 / DZ 9966 as an Antimicrobial Process Aid for Produce Wash Water

Phase 1 interim evaluation of the DZ 9450 / DZ 9966 mineral oxychloride formulation for pathogen reduction and cross-contamination control on rough-surface fruit (avocado) and melon.

0%

CROSS-CONTAMINATION WITH
DZ 9450/9966 — EVERY CROP &
CHALLENGE

3.21

MAX LOG REDUCTION ON AVOCADO
SURFACES

99.99%

SALMONELLA DECREASE ON MELON
(ISOLATE D)

— Study Setup

Objective. Evaluate DZ 9450/9966 as an antimicrobial process aid in RAC (raw agricultural commodity) produce wash water — measuring surface pathogen reduction and, critically, its ability to prevent pathogen cross-contamination between fruit within a shared wash bath.

Crops. Rough-surface fruit — avocado (Trials 1 & 2, total $n = 505$) — and cantaloupe-type melon rind circles.

Treatment. DZ 9450 / DZ 9966 mineral oxychloride dosed to 100 PPM, holding an oxidation-reduction potential (ORP) near the 690–714 mV working target at alkaline pH. Benchmarked against HOCl (10–15 PPM), peracetic acid / PAA (12.5–37.5 PPM) and an experimental Exp-10 formulation.

Challenge. Fruit inoculated with attenuated *Salmonella* (PTVS 337) and a pathogenic *Salmonella* cocktail (PTVS 26, 42, 45, 73), dried, then held 4 days at 15 °C before a 4 °C immersion wash of 30 and 60 seconds.

OXIDATION POTENTIAL OF COMMON OXIDANTS

REAGENT	FORMULA	VOLTS
Fluorine	F_2	3.06
Mineral Oxychloride	$M_xO_yCl_z$	2.8–2.9
Hydroxyl Radical	$OH^\bullet$	2.80
Oxygen Ion	O^-	2.42
Ozone	O_3	2.07
Hydrogen Peroxide	H_2O_2	1.78
Perhydroxyl Radical	$HO_2^\bullet$	1.70
Chlorine Dioxide	ClO_2	1.57
Hypochlorous Acid	HOCl	1.49
Chlorine Gas	Cl_2	1.36
Oxygen (Molecule)	O_2	1.23
Hypochlorite Ion	OCl^-	0.94
Sodium Hypochlorite	NaOCl	0.94
Hydroperoxide Anion	HO_2^-	–0.88
Superoxide Radical	$O_2^\bullet$	–2.40

WHY OXIDATION POTENTIAL MATTERS

DZ 9450/9966 mineral oxychloride oxidizes at 2.8–2.9 V — far above chlorine (1.36 V) and hypochlorite (0.94 V) — enabling rapid pathogen kill while keeping enough residual to neutralize organisms shed into the shared wash water.

— Trial 1 — Avocado Surface Disinfection

Across rough-surface avocado, every chemistry cut starting *Salmonella* loads by roughly 2–3 logs. The decisive difference appeared in the shared wash bath: DZ 9450/9966 was the only treatment to reach near-total enrichment clearance while holding cross-contamination at zero.

DISINFECTANT	CONC.	LOG REDUCTION (60 S)	ENRICHMENT POSITIVES	CROSS-CONTAMINATION
HOCl	10 PPM	2.70	80%	0%
HOCl	15 PPM	2.67	90%	0%
PAA	12.5 PPM	2.26	80%	0%
PAA	37.5 PPM	3.00	80%	0%
Exp-10	ATTN 100	2.50	70%	0%
Exp-10	PATH 100	2.70	80%	0%
DZ 9450/9966	ATTN 100	3.17	10%	0%
DZ 9450/9966	PATH 100	3.21	0%	0%

Starting challenge 4.33–4.60 log CFU/avocado; 60-second immersion at 4 °C. Enrichment positives and cross-contamination measured n = 20 per time point. PAA at 12.5 PPM was the only benchmark to log cross-contamination (13% at the 30-second point).

— Wash-Water Conditions

DISINFECTANT	ACTUAL CONC. (PPM)	ORP (mV)	pH	TEMP (°C)
HOCl	11–15	881–943	6.7	4.2–4.4
PAA	13–38	287–304	5.7–6.4	4.0–4.2
Exp-10	90	440–457	6.1–6.3	4.1–4.6
DZ 9450/9966	100	700–714	11.6–11.9	3.5–4.0

Post-wash ("After") values. DZ 9450/9966 maintained the target 700 mV oxidation potential at full 100 PPM dose throughout the run.

TRIAL 1 TAKEAWAY — AVOCADO

DZ 9450/9966 delivered the study's largest surface log reduction (3.21) against the pathogenic cocktail and was the sole disinfectant to drive enrichment positives to 0% with no measurable cross-contamination.

— Melon Disinfection & Cross-Contamination

On melon rind, the attenuated *Salmonella* strains proved harder to remove — chlorine and Exp-10 left populations essentially unchanged. DZ 9450/9966 was the only chemistry to reduce all three challenge organisms, cutting the resilient PTVS 337 strain by nearly three logs.

RESIDUAL LOG CFU / MELON CIRCLE	PATH COCKTAIL	ATTN SAL (337)	ATTN SAL (ISOLATE D)
Before	5.36 ± 0.18	5.97 ± 0.18	5.57 ± 0.37
HOCl	2.36 ± 1.04	5.73 ± 0.23	3.22 ± 0.45
PAA	2.06 ± 1.05	4.19 ± 0.66	2.66 ± 0.71
Exp-10	2.54 ± 1.20	5.83 ± 0.32	3.11 ± 0.78
DZ 9450/9966	2.64 ± 1.13	3.08 ± 0.73	1.67 ± 0.56
Control	4.14 ± 0.30	5.91 ± 0.21	3.32 ± 0.26

Lower residual = better removal. n = 10 per treatment. PATH = pathogenic *Salmonella* cocktail (PTVS 26, 42, 45, 73).

— Percentage Decrease After Disinfection

DISINFECTANT	PATH COCKTAIL	ATTN SAL (337)	ATTN SAL (ISOLATE D)
HOCl	99.90%	42.46%	99.55%
PAA	99.95%	98.34%	99.88%
Exp-10	99.85%	27.56%	99.65%
DZ 9450/9966	99.81%	99.87%	99.99%
Control	93.97%	12.90%	99.44%

DZ 9450/9966 alone exceeded 99.8% reduction across all three *Salmonella* challenges; HOCl and Exp-10 fell to 27–42% against strain PTVS 337.

THE CROSS-CONTAMINATION STORY

In the melon bath, HOCl, PAA, Exp-10 and the untreated control all transferred pathogen to clean fruit at 77–100%. DZ 9450/9966 alone held cross-contamination at 0% against every organism tested — the core requirement of a produce-wash process aid.



— Trial 2 — Avocado Confirmation Run

A second avocado trial repeated the challenge, this time dosing the Exp-10 formulation at an elevated 450 PPM while DZ 9450/9966 held its standard 100 PPM. Even at more than four times the concentration, Exp-10 could not match DZ 9450/9966 on residual clearance, and DZ 9450/9966 again recorded zero cross-contamination.

DISINFECTANT	CONC. (PPM)	LOG REDUCTION (60 S)	ENRICHMENT POSITIVES	CROSS-CONTAMINATION
HOCl	12.5–15	2.43–2.88	60–100%	0–5%
PAA	12.5–37.5	2.58–2.66	60–100%	0%
Exp-10 (DZ 9450)	450	1.89–2.74	30–50%	0%
DZ 9450/9966	100	2.86–2.94	80–100%	0%

Ranges span 30- and 60-second immersion across attenuated and pathogenic challenges; starting load 4.06–4.30 log CFU/avocado. DZ 9450/9966 wash water held 954–1025 mV ORP at 100 PPM. Trial 2 melon data collection was in progress at the time of this interim report.

— Conclusion

Across two avocado trials and the melon study, the finding was consistent: several chemistries can lower surface pathogen counts, but only DZ 9450/9966 mineral oxychloride combined strong log reduction with **complete prevention of cross-contamination** in the shared wash bath — at a modest 100 PPM dose held near 700 mV ORP.

This positions DZ 9450/9966 as an effective antimicrobial process aid for rough-surface fruit and melon, where a single contaminated item can otherwise seed an entire wash line. Trial 2 melon results will extend this Phase 1 dataset.

[Phase 1 Interim Data](#)
[RAC Produce Wash](#)
[Salmonella Control](#)
[Zero Cross-Contamination](#)

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