

AGRICULTURE • CROP & POST-HARVEST SOLUTIONS

A Game Changer for Agriculture

DZ 9966 & DZ 9450 — a proprietary mineral-oxychloride chemistry that generates reactive oxygen species (ROS) to raise crop yield, control disease, and safeguard food from pre-harvest irrigation to post-harvest wash.



ROS-treated irrigation and foliar spray — an ecological, sustainable form of "liquid ozone" for the field.

6-log

PATHOGEN REDUCTION — 2× THE 3-LOG INDUSTRY STANDARD

<10 s

KILL TIME FOR BACTERIA & VIRUSES

2×

POST-HARVEST SHELF-LIFE EXTENSION

DZ 9966 is an aqueous chelation of minerals and oxychloride compounds that acts as a source of oxygen energy, effective against 99.9999% of bacteria and viruses. By generating a high concentration of hydroxyl-radical ions and other oxygen species, it kills microorganisms in under 10 seconds.

Independent studies confirm that DZ 9966 raises the oxidative energy (ORP) of water, lowering microbial pressure while improving harvest yield in agricultural applications worldwide. It enhances the plant's natural immune defenses, raises dissolved oxygen at the root zone for healthier aerobic respiration, and eliminates biofilm from drip-irrigation lines — all without altering the taste or characteristics of food and crops. Pathogens do not develop resistance to it.

THE TAKEAWAY

Ozone-class oxidation from a stable, pourable liquid — dosed simply by ORP — that improves yield, controls disease and extends shelf life across the entire agricultural value chain.



— An Ecological, Sustainable Form of Liquid Ozone

Mineral oxychloride generates a high concentration of hydroxyl-radical ions and other oxygen species that kill microorganisms in less than 10 seconds. Its molecules are purposely bound weakly, so on contact with inorganics, microbes and organic matter they readily give off oxygen atoms that aggressively oxidize contaminants — a continuous, self-catalyzed chain reaction driven by the transition minerals' internal vibrational energy.

In plants, that same oxidation drives more energy and nutrients through the xylem and phloem, enhancing nutrient mobility from roots to leaves. Against biofilm, ROS penetrates and etches the EPS matrix (extracellular polymeric substances), collapsing the protective film so oxidants can reach the bacterial DNA.

Simple, low-cost application — only a liquid dosing system with an automatic ORP controller is required.

**Proprietary Catalyst + NaOCl →
HOCl + OCl⁻ + OH• + M complexes**

OXIDATION POTENTIAL OF COMMON OXIDANTS

REAGENT	FORMULA	VOLTS
Fluorine	F ₂	3.06
Mineral Oxychloride	M _x O ₃ Cl _t	2.8–2.9
Hydroxyl Radical	OH•	2.80
Oxygen Ion	O ⁻	2.42
Ozone	O ₃	2.07
Hydrogen Peroxide	H ₂ O ₂	1.78
Perhydroxyl Radical	HO ₂	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 ⁻	-2.40

— ORP — The Measure of Disinfecting Power

Oxidation-Reduction Potential (ORP), measured in millivolts from a simple water sample, quantifies the energy available for disinfection. The World Health Organization considers water safe above **+750 mV**; DZ 9966 reliably holds treatment above **+700 mV**, achieving a 6-log pathogen reduction in seconds.

Its electrochemical potential of **2.8–2.9 Ev** far exceeds ozone (2.07) and sodium hypochlorite (0.94), producing a larger variety of reactive oxygen species in oxidative equilibrium — ozone-like results, faster and more stably, with hydroxyl radicals dominating.

ORP LEVEL (mV)	CFU / 100 mL WATER
+200	300
+300	36
+400	3
+600	0 — Disinfection
+800	0 — Sterilization

Confirmed by an independent pathogen laboratory: ORP above +700 mV achieves a 6-log reduction in <10 seconds.

ELECTROCHEMICAL POTENTIAL (Ev)

OXIDANT	Ev
DZ 9966 Mineral Oxychloride	2.8–2.9
Ozone (O₃)	2.07
Hydrogen Peroxide	1.78
Chlorine Gas	1.36
Sodium Hypochlorite	0.94
DZ 9966 matches ozone's 6-log kill in <10 s at a higher electronic footprint — and maintains a protective residual that ozone cannot.	

— Rescuing Florida Citrus from Greening (HLB)

A Florida field program tested a treatment for *huanglongbing* (HLB, or “citrus greening”) — a bacterial disease with no commercial cure other than removing and re-planting trees. Leaves of an infected test tree were sprayed and its roots watered with a DZ 9966 solution generating an ORP above **+700 mV**.

Within a week, a new “flush” of healthy leaves appeared. The trial expanded to 20 trees; after 60 days of foliar spray and root irrigation, **all trees began to develop marketable fruit**.

Protocol: 2% DZ 9966 foliar spray + light soil drench, applied early morning every 2 weeks for 6 weeks (3 applications).



**INFECTED HONEY-TANGERINE TREES RECOVERED
MARKETABLE FRUIT AFTER ROS TREATMENT.**

— Controlling *Xylella fastidiosa* in European Olives



**XYLELLA HAS KILLED MILLIONS OF OLIVE TREES
ACROSS SOUTHERN EUROPE.**

Xylella fastidiosa clogs the xylem of olive trees by forming a biofilm, starving them of water and nutrients — a quarantine pest with no prior cure. A DZ 9966 test solution applied by fogging and root irrigation destroyed the biofilm: hydroxyl radicals break down the protective EPS, after which oxidative species attack the bacterial DNA to halt reproduction.

Results have been very positive — leaves greening, branches and twigs recovering, and a return toward normal production. Trials have expanded to larger sites, with promising preliminary PCR results.

— Suppressing Bakanae Disease in Rice

A Southeast-Asian paddy farmer facing ~30% yield loss to Bakanae (*Fusarium fujikuroi*, a seed-borne fungus) tested DZ 9966 as an alternative to thermo-therapy and fungicide seed dressings — treatments that leave severely infected seed and to which some pathogens have grown resistant.

Drawing on its higher electronic footprint, DZ 9966 suppressed horizontal transmission of the pathogen between seedlings. Bakanae symptoms improved significantly and **yield loss fell below 10%**. Trials expanded to flower spraying and treatment of paddy flood-water.



**RICE-SEEDLING ROOT VIGOR ACROSS TREATMENT
GROUPS (A-C).**

— Post-Harvest Wash & Extended Shelf Life

Independent studies at a university post-harvest research program confirm that DZ 9966 raises ORP to **+700 mV**, inactivating *E. coli*, *Salmonella* and *Listeria* in under 10 seconds while improving shelf life up to **2×**. In a plant-pathologist trial, grocery raspberries rinsed with DZ 9966 stayed fresh and marketable while untreated fruit molded at day 12; treated fruit first showed mold only at day 18 — versus a 6-day store average.

At a farm in Minnesota, injecting DZ 9966 into ice-machine water lines raised ORP from **451 to 632**, rising to **783** once frozen — destroying *Listeria* and *Salmonella*. The residual disinfecting power carried through when the ice melted, extending shelf life for produce, seafood and meat.



DZ 9966-RINSED RASPBERRIES (LEFT) STAYED MARKETABLE TO DAY 18 VS. A 6-DAY STORE AVERAGE.

— Antimicrobial Produce Wash — Avocado Field Trial



ROS PRODUCE-WASH LINE — EVALUATED AT A UNIVERSITY PLANT-SCIENCES RESEARCH FACILITY.

A university plant-sciences research facility evaluated DZ 9966 as an antimicrobial process aid on avocados inoculated with a *Listeria monocytogenes* cocktail. A 30-second wash produced a strong dose-dependent kill — up to a **2.94-log reduction** at high dose — with **no cross-contamination** to uninoculated fruit.

TREATMENT	TRIAL 1	TRIAL 2	LOG RED.
Before (inoculated)	3.63	4.20	—
Water-only control	2.00	1.79	1.6–2.4
DZ 9966 low dose	1.67	2.12	2.0
DZ 9966 high dose	1.32	1.26	up to 2.94

log CFU / avocado, 30 s wash at 4 °C; L. monocytogenes PTVS 334+335.

— Fresh Apples — *Listeria* Control

A *Frontiers in Microbiology* study of DZ 9966 on fresh apples found a dose-dependent kill of *L. monocytogenes*: a 2-min wash at 0.25% and 0.50% reduced counts on Granny Smith apples by **~2.0 and 3.8 log**, and prevented cross-contamination to non-inoculated fruit.

— Egg Washing — Poultry

A Montana poultry farm adopted DZ 9966 for egg washing: cleaner eggs, less breakage, faster microbial kill at lower water temperature — cutting energy costs while keeping USDA Organic status and improving hatch results.

— Soil, Irrigation & Root Health

DZ 9966 raises dissolved oxygen in irrigation water — a crucial factor for healthy root and plant growth. Well-oxygenated roots respire more efficiently and selectively absorb more ions in solution, increasing yield from existing resources by lifting oxidative energy in the root system and around the leaf and stem.

It also eliminates biofilm from every surface in contact with water, including drip-irrigation systems — reducing clogging, improving efficiency and lowering maintenance cost — while leaving a residual that keeps working against bacterial regrowth in stagnant water.



**CONTROLLED RIPENING AND BIOFILM CONTROL
EXTEND FRESHNESS THROUGH STORAGE AND
DISTRIBUTION.**

— Livestock — Dairy Hoof Care

A Canadian dairy adopted DZ 9966 in its hoof-care footbath (1 gal per 50 gal water), monitored by ORP, as a safer alternative to formalin and copper sulfate. Results: better hoof hygiene, lower bacterial counts and fewer cases of digital dermatitis.



ORP-monitored hoof-care footbath.

— Applications Across the Value Chain

Pre-Harvest

Fogging, foliar spray and root irrigation for disease control and yield.

Post-Harvest Wash

Produce, egg and seafood sanitizing with rapid, residue-friendly kill.

Storage & Distribution

Biofilm control and 2x shelf life through packing and cold chain.

Irrigation Systems

Drip-line biofilm removal, higher dissolved oxygen at the root zone.

Livestock

Footbath and facility hygiene without toxic formalin or copper sulfate.

Ice & Process Water

ORP-maintained disinfection that carries through freeze and melt.

— Certifications

EPA FIFRA Registered

USDA Organic / NOP

NSF Certified

USDA-certified as a crop-production, disease & pest-control, fertilizer/soil-amendment, livestock-production and processing aid for organic operations.

CONTACT & ORDERING

D&Z Worldwide | deepak@dz-worldwide.com | www.dz-worldwide.com