Roam Technology

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Technical Support Agro Solutions APAC

Virba-San

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Virba-San

Characteristic	
Form	Pink powder
pH	1.6-3.6 (at 1%)
Density	1.741
Type of product	Biocide
Composition	53.5% Oxone + surfactant, catalysts and acids
Type of application	Surface disinfection
Packages	2, 5 & 10 kg

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Virba-San

- Virba-San (Horti)
- Own formula!
- Surface disinfection

Figure 1: Dipslide with 2 sides, on side 1 NUT agar can be found and on side 2 RB agar.

Proven antimicrobial efficacy against bacteria, viruses and fungi

High reactivity, fast action

No harmful residuals

For sustainable biosecurity

Mode of action

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Antimicrobial activity – 3 mechanisms

1. Oxidation
2. Acidification
3. Surfactant action

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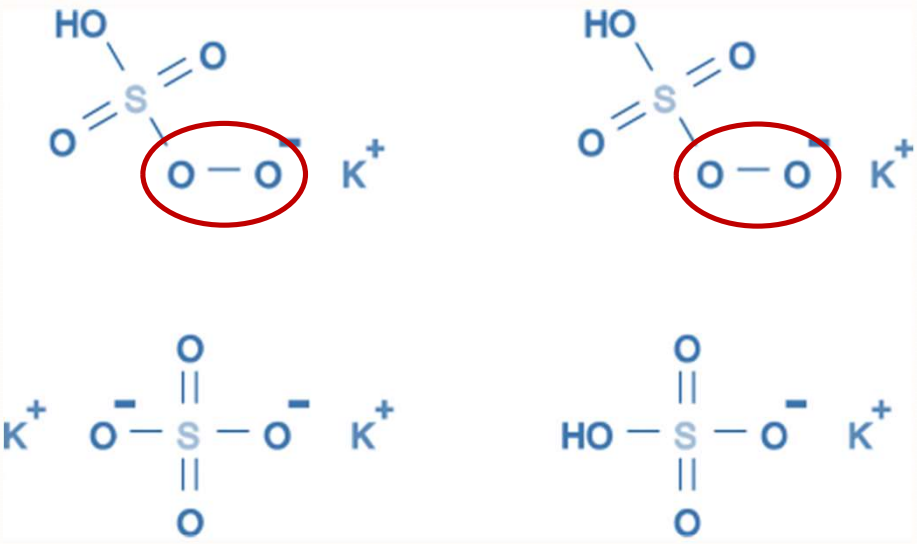
1a. Oxidation



Peroxide bond
*Highly unstable
*Tendency to break down & release reactive radicals
➔ Reaction with organic structures (membranes, proteins, nucleic acids, …)

$$2\ KHSO_5 * KHSO_4 * K_2SO_4$$

= KMPS (**trivial name**)= Trihydrogen pentapotassium di(peroxomonosulfate) di(sulfate) (**official name**) = oxone (**brand name**)

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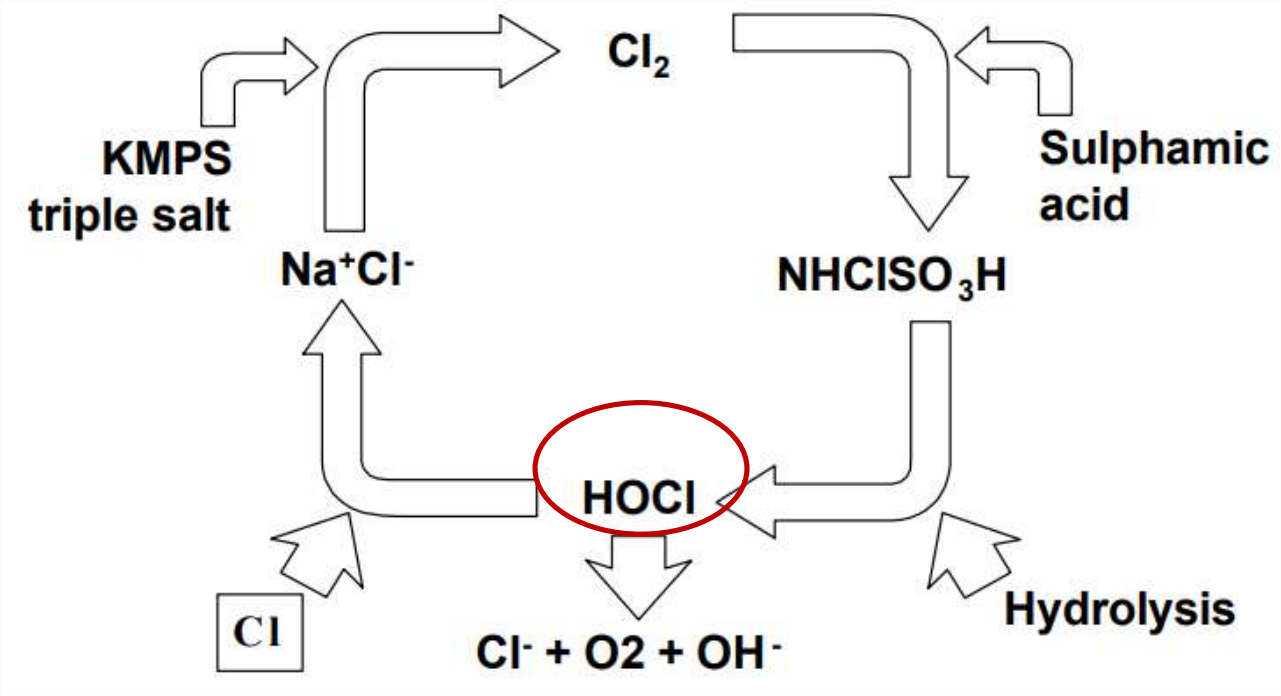
1b. Oxidation

Hypochlorous acid
*Formed by reaction of KMPS, NaCl & sulfamic acid
*Strong oxidiser

Haber-Will-Statter reaction



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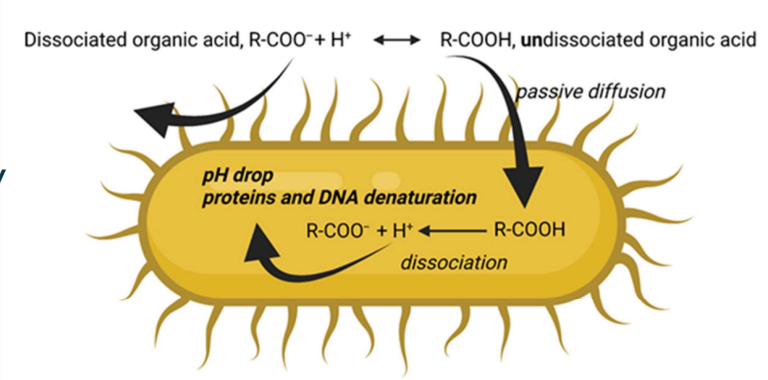
2. Acidification

1. Lower pH for optimal working of KMPS
2. Antimicrobial activity



3. Descaling

Acids + limescale ➔ dissolved metals which can be removed

$$2\ H_3NSO_3(aq) + CaCO_3(s) = Ca(SO_3NH_2)_2(aq) + H_2O(l) + CO_2(g)$$

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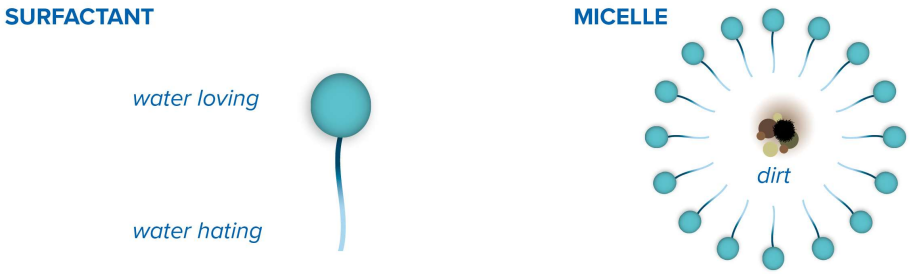
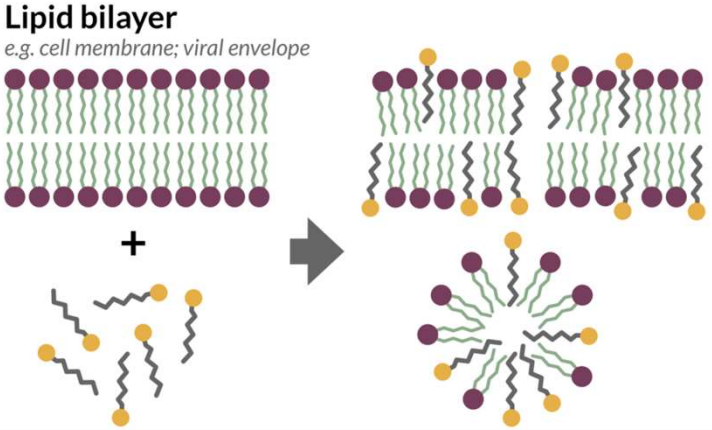
3. Surfactants

1. Dissolves dirt

Cleaning agent

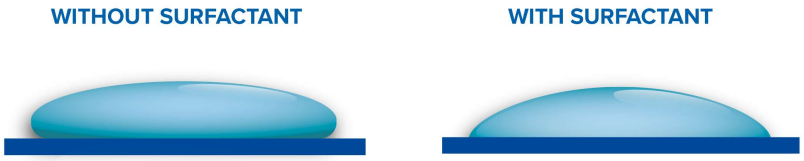


2. Disrupts cell membranes



3. Wetting agent

Wetting agent



Trials

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Efficacy – EN tests Virba-San

Pathogen/ EN test	Virba-San
Aspergillus	6%, 15 min
EN1276 (suspension test bacteria)	0.2%, 5 min
EN13697 (surface test bacteria)	0.5%, 5 min
EN1650 (suspension test yeast)	1%, 15 min
EN13697 (surface test yeast)	0.5%, 15 min
EN1650 (suspension test fungi)	6%, 15 min
EN13697 (surface test fungi)	8%, 15 min
EN14476 (suspension test viruses)	0.5%, 5 min
EN16777 (surface tests viruses)	0.5%, 5 min

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1a. Efficacy – EN tests Virba-San vs Virkon

Pathogen/ EN test	Virba-San	Virkon
Aspergillus	6%, 15 min	NO fungicidal activity of 6% after 15 min
EN1276 (suspension test bacteria)	0.2%, 5 min	1%, 10 min
EN13697 (surface test bacteria)	0.5%, 5 min	1%, 5 min
EN1650 (suspension test yeast)	1%, 15 min	1%, 10 min
EN13697 (surface test yeast)	0.5%, 15 min	1.5%, 15 min
EN1650 (suspension test fungi)	6%, 15 min	NO fungicidal claim in NL for Horti
EN13697 (surface test fungi)	8%, 15 min	NO fungicidal claim in NL for Horti
EN14476 (suspension test viruses)	0.5%, 5 min	0.5%, 5 min
EN16777 (surface tests viruses)	0.5%, 5 min	1%, 10 min

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Efficacy – Plant pathogens (bacteria & fungi)

Cell culture | Virba-San | Incubate | Plate the cell suspension & incubate for 24h | Count the colonies

- Bacteria
  - 0.5 & 1%, 15min
  - *A. rhizogenes* (cat+ & cat-)
  - *Clavibacter michiganensis*
- Fungi/oomycetes
  - 1 & 3%, 15 min
  - *Botrytis cinerea*
  - *Fusarium oxysporum*
  - *Phytophtora sp.*
  - *Pythium sp.* (*Globisporangium*)

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1b. Efficacy – Plant pathogens (bacteria & fungi)

	Control	Virba-San 0.5% 15 min
Agrobacterium rizogenes, catalase – strain ST15.13/064	3,5 x10^8 CFU/ml	<5,0 CFU/ml
Agrobacterium rizogenes, catalase + strain ST07.23/011	3,0 x10^8 CFU/ml	<5,0 CFU/ml
Clavibacter michiganensis subsp. michiganensis strain ST04.18/020	4,5 x10^8 CFU/ml	<5,0 CFU/ml

	Control	Virba-San 1% 15 min
Fusarium oxysporum f. sp. radicis-lycopersici strain ST04.23/004	2,8 x10^6 CFU/ml	<7.5 CFU/ml
Botrytis cinerea	3,8 x10^4 CFU/ml	<2.5 CFU/ml
Pythium aphanidermatum strain ST05.24/002	2,5 x 10^2 CFU/ml	<2.5 CFU/ml

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Efficacy – Plant pathogens (viruses)

- ToBRFV – water
  - » Infected water with ToBRFV + 1% Virba-San
  - » Contact time: 1 and 5 min
  - » Sample before & after treatment
    - » Nfg-PCR: is the virus still active?
- ToBRFV - surface
  - » Inox plate + ToBRFV from infected plant juice
  - » Spray 2% Virba-San
  - » Incubate for 10 and 30 min
  - » Sample before & after treatment
    - » Nfg-PCR: is the virus still active?

Sample	Nfg PCR
ToBRFV Positive control	Virus intact
ToBRFV + 1% Virba-San 1 min	No intact virus detected
ToBRFV + 1% Virba-San 5 min	No intact virus detected

Sample	Nfg PCR
ToBRFV Positive control	Virus intact
ToBRFV + 2% Virba-San 10 min	No intact virus detected
ToBRFV + 2% Virba-San 30 min	No intact virus detected

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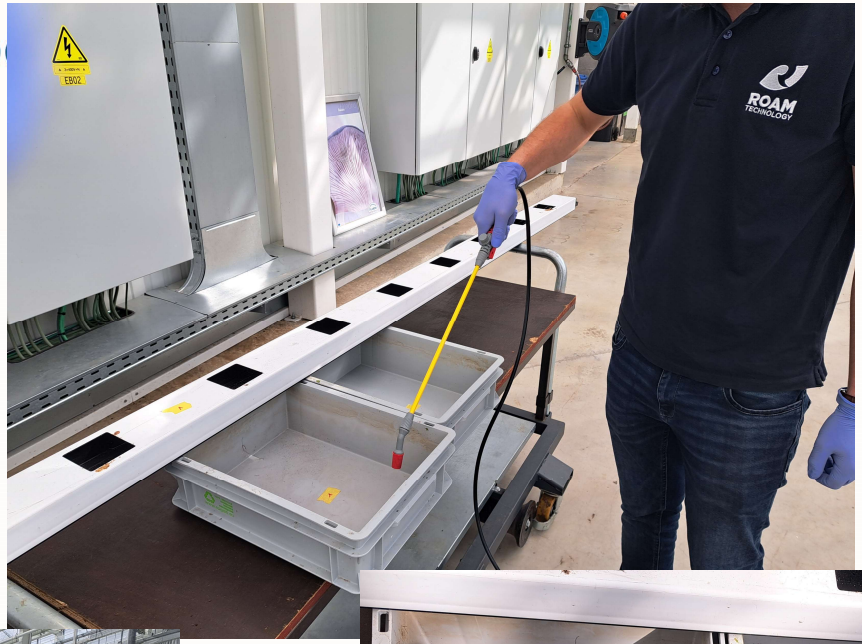
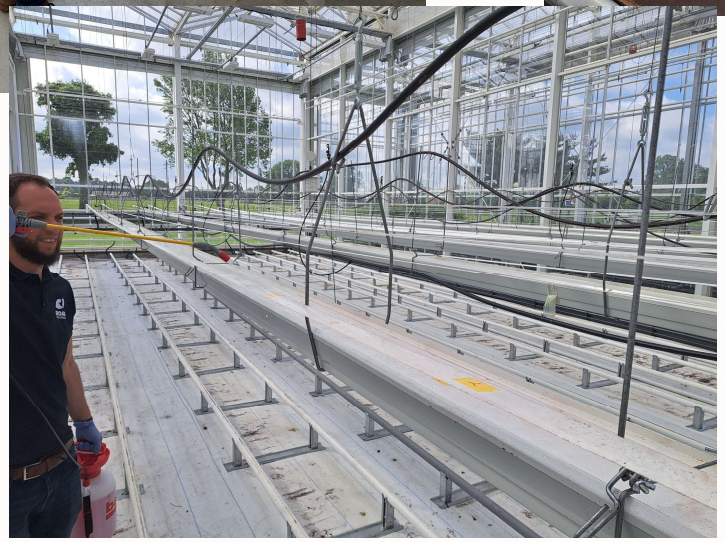
2. Field trial

- Greenhouse @ Thomas More
- 1% Virba-San
- Contact time: 30 min
- Sampling: total germ count + yeasts & fungi
- Application: Knap sack sprayer
- Surfaces
  - Plant tables
  - Planter
  - Gutters (lettuce)
  - Gutters (strawberry)
  - Support ribbon
  - Glass
  - Concrete

OLO





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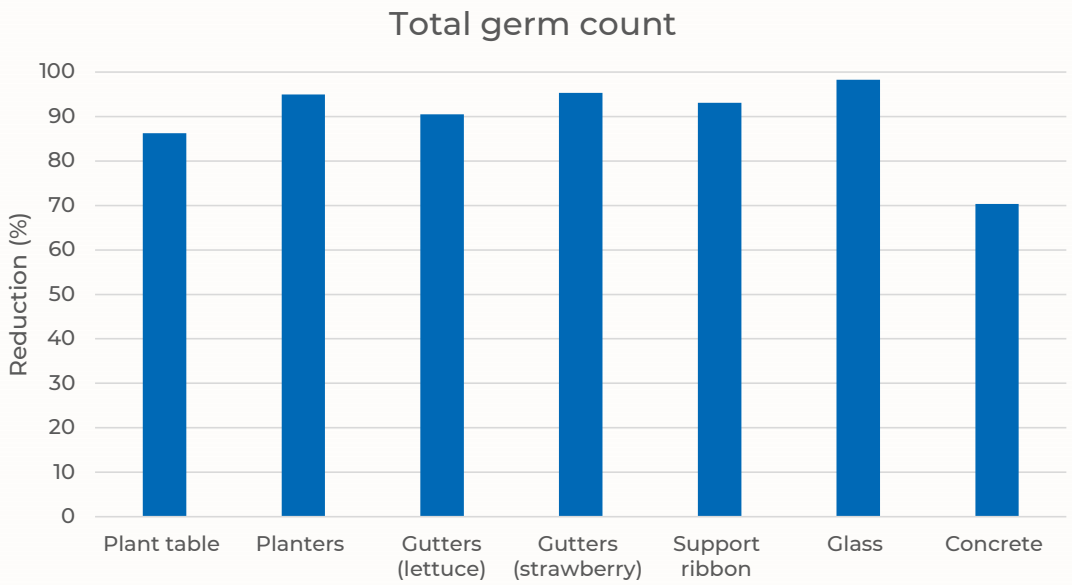
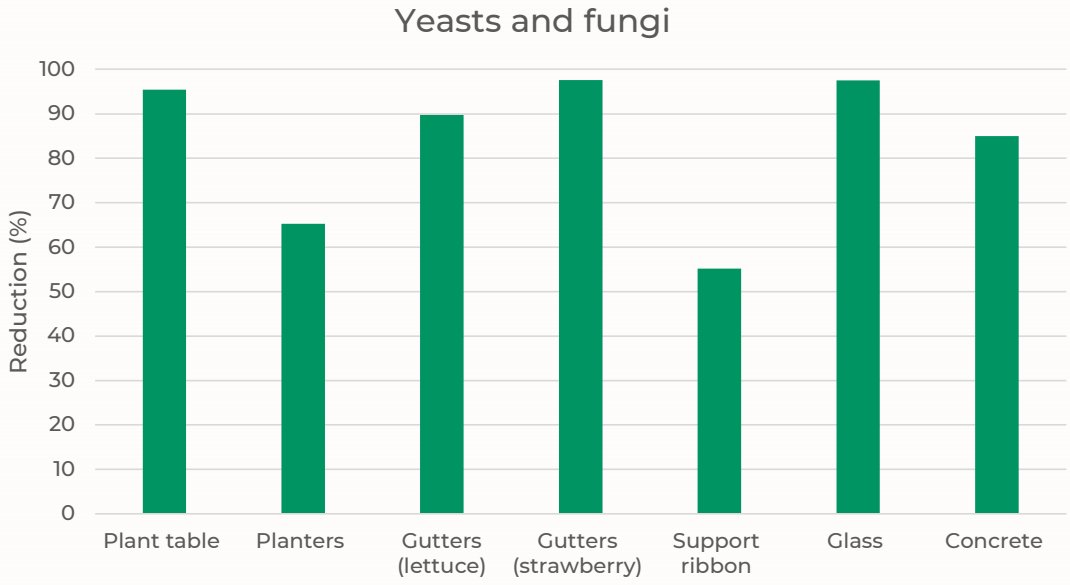
2. Field trial





- >85% reduction in total germ count (ex. concrete) ➔ **Virba-San is highly effective against bacteria (and viruses)**
- 60-99% reduction in yeasts & fungi ➔ **Virba-San is effective against yeast & fungi**
- **No corrosion**

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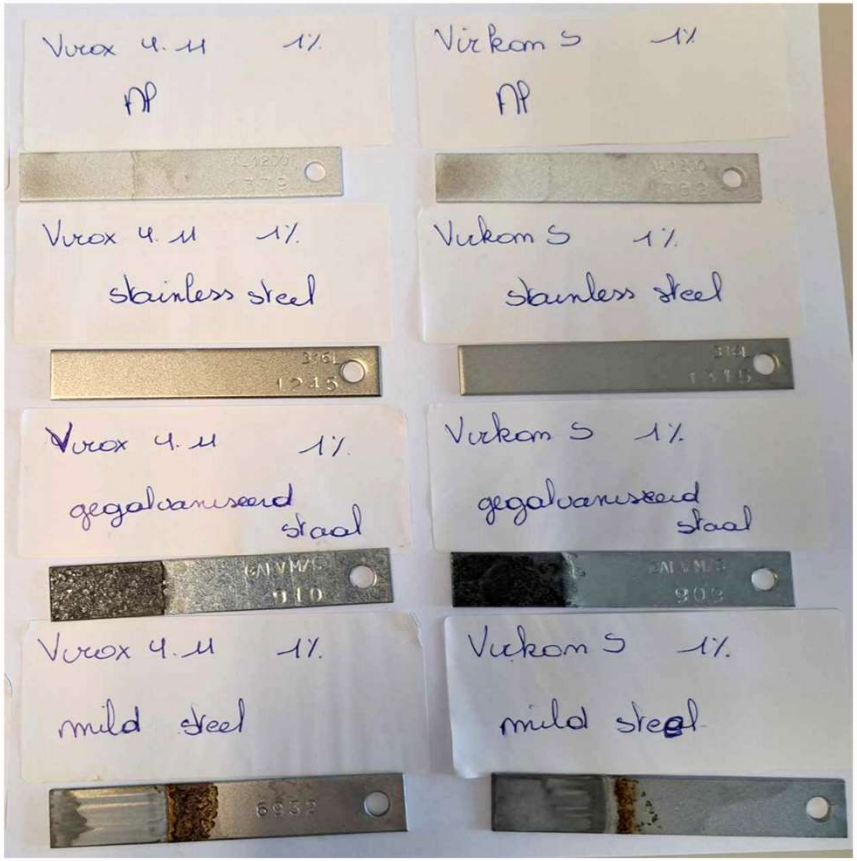
3. Corrosion test

		Virox	Virkon S
T=30min	**Aluminium**	/	/
	Stainless steel	/	/
	Galvanised steel	foam+corrosion	foam+corrosion
	Mild steel	corrosion	corrosion

T=24h	**Aluminium**	corrosion	Corrosion
	Stainless steel	/	/
	Galvanised steel	foam+corrosion	foam+corrosion
	Mild steel	corrosion	Corrosion

Virba-San performs equal to Virkon S

Immersion in 1% Virba-San / Virkon S



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4. Compatibility - horti materials

Spray – Rinse – Repeat (4x)

Material	0.5%, 30 min (4x)	1%, 30 min (4x)	2% , 30 min (4x)
Colled rolled steel	Sprays are visible from the first application (soapy shine)	Sprays are visible from the first application (soapy shine)	Sprays are visible from the first application (soapy shine)
Anodised aluminium	No damage	No damage	No damage
Galvanized steel type 1	No damage	No damage	No damage
Gutter (polyurethaan coating)	No damage	No damage	No damage
Gutter (polyethyleen coating)	No damage	No damage	No damage
Aluminium rough	No damage	No damage	No damage
Aluminium	No damage	No damage	No damage
Glass Albarino low haze	No damage	No damage	No damage
Glass Albarino mid haze	No damage	No damage	No damage
Glass Albarino high haze	No damage	No damage	No damage
Rubber	No damage	No damage	No damage

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5a. Phytotoxicity – Through irrigation water

Addition of Virba-San in the nutrient solution in a realistic concentration (mimicking concentration in drainwater)

	Control	1% 1/100	1% 1/1000
8D	Strong vegetative growth	Strong vegetative growth, little less compared to control – **fuller plants**	Strong vegetative growth, little less compared to control – **fuller plants**
14D	Strong vegetative growth	Strong vegetative growth, little less compared to control – **fuller plants**	Strong vegetative growth, little less compared to control – **fuller plants**

Advice remains: avoid contact with plants!

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5b. Phytotoxicity – Through foliar application

Foliar application of 1% Virba-San

	0		7D		14D	
	0h	3h	0h	3h	0h	3h
Effect	Start	No leaf damage	No leaf damage	No leaf damage	No leaf damage	No leaf damage

Advice remains: avoid contact with plants!

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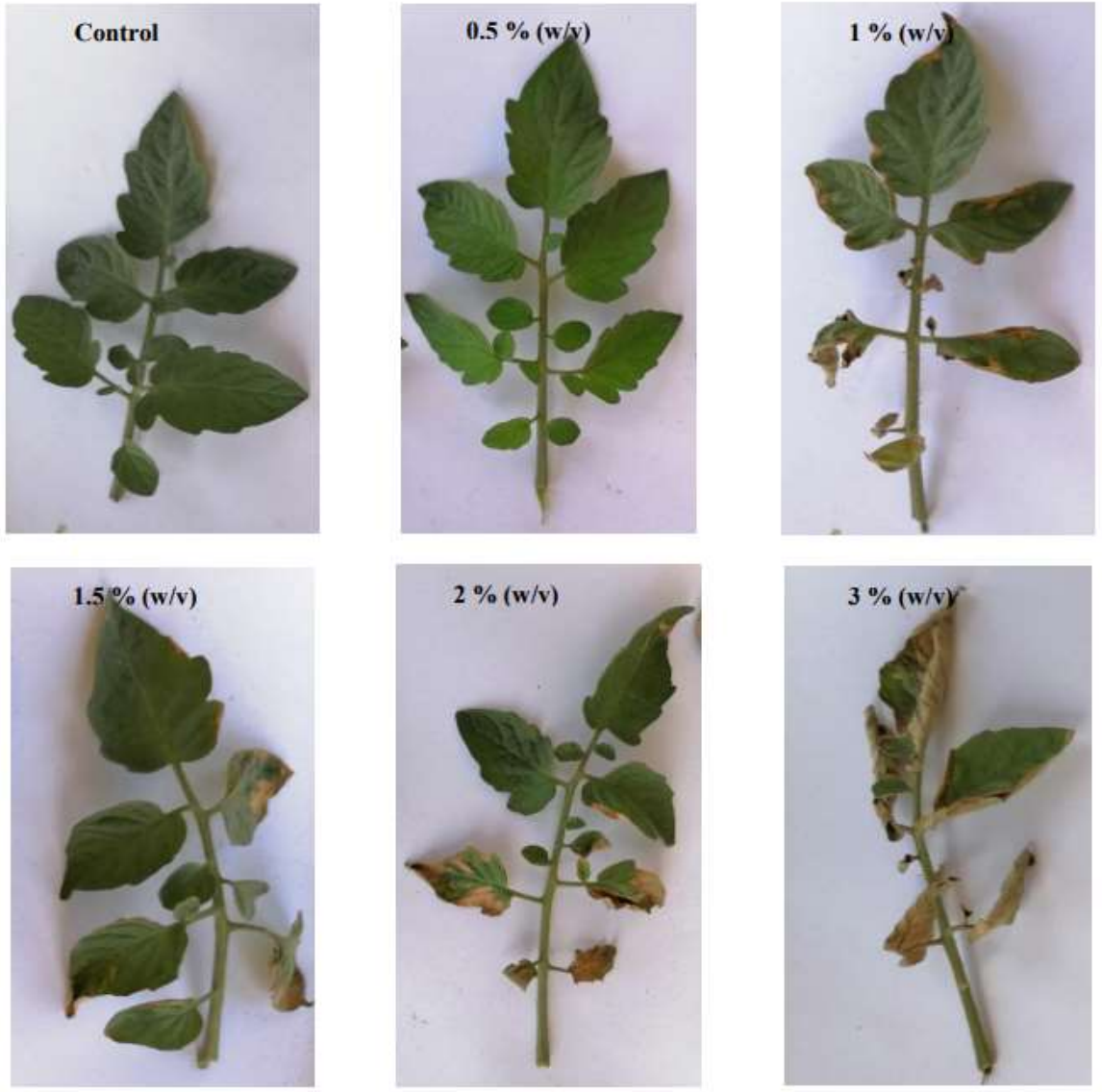
Foliar application of Virkon S
Monitoring after 6D



Benchmarking

Virba-San vs Virkon

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Summary

Characteristic	Comparison
Appearance	Better smell & particle distribution
Solubility	Equal
Intensity of pink color	Better
EN testing	Better
Corrosion	Equal
Phytotoxicity	Less

In practice

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Dosages

Application	Dosage	Contact time
Equipment & surfaces	0.5% to 1% dependent on the contamination level	5 min – 30 min, dependent on contamination level
Foot baths	1%, place 2 in a row if boots are very dirty	Replace at least every 1-2 days/ check intensity of pink color
Wheel wash	1%	5 min – 30 min, dependent on contamination level
Vehicle wash (drive through disinfection)	0.5% to 1% dependent on the contamination level	5 min – 30 min, dependent on contamination level

More detailed info in the IFU

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Positioning

Huwa-San

- Liquid

1. Water disinfection
   - » Focus on continuous dosing or shock treatment with long contact times
   - » Stable in solution
2. Nebulisation

Virba-San

- Powder

1. Surface disinfection and material disinfection with short contact times
   - » **high reactivity**
   - » Less stable in solution
2. Foot baths/mats

Advantages of positioning Virba-San for surface disinfection

1. KMPS **more reactive** than H_2O_2 = lower concentrations, shorter contact times
2. Lower cost/ha

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Usage per surface area

- Volume of ready to use solution
  - » 10-20 L per 100 m^2
  - » 1000-2000 L per ha
- Consumption of Virba-San
  - » 100-200 g per m^2
  - » 10-20 kg per ha

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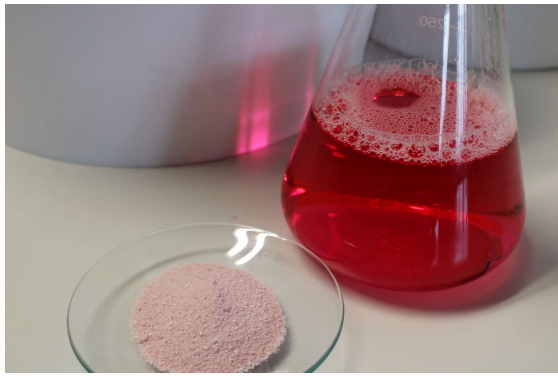
Application – Best practice

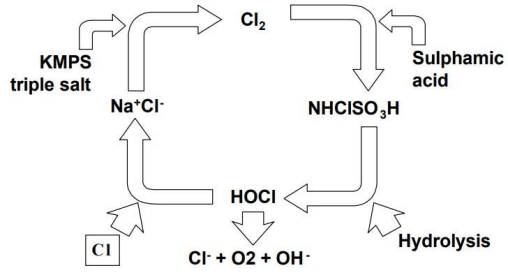


Dilute the product

Leave the suspension for 4h

Allow the active substances to be formed

Use the solution to disinfect



Thank you

For more information, please contact

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