

High-Output Silver Ion (Ag+) Sterilizer



ARGEN

Ag+

SILVER ION GENERATOR

 **ARGEN**

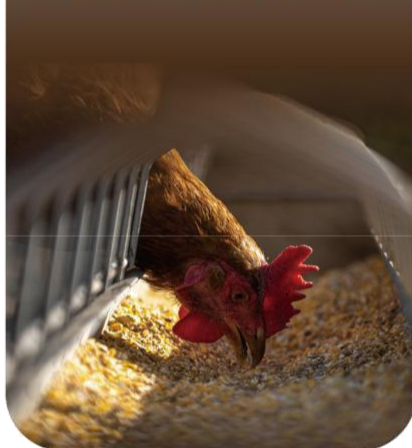
ARGEN Introduction

ARGEN, one of the world's best eco-friendly brand and well-known low-cost generator offers controlled and sustained release of silver ions in water, that produces microbial-free water, suitable for disinfection in diverse sectors.

Is farming possible without pesticides?



Is livestock possible without antibiotics?



Is strong sterilization possible without chemicals?



Agriculture that helps to sustain life is becoming a leading source of environmental pollution. Pesticides, fertilizers and other toxic farm chemicals remain in the environment (soil, water etc.) for a generation.

Global pollution is the world's largest environmental threat to humans for disease.

Economic growth, industrialization, intensive use of pesticides, antibiotics and other aqua-chemical is the leading cause of water pollution, soil degradation, and various other diseases.

As a result, mankind is paying the high cost of its indiscriminate use.

Silver ions as an antibacterial agents have been known for ages. Numerous studies have recognized silver ions as economical, and environmentally friendly, pesticides or antibiotics.

We launched Argen a device that generates high-quantity silver ion water.

Silver ion water produced from the Argen is non-toxic to human health, economical and has antibacterial/antifungal properties.

Our objective is to contribute to the global environment by creating eco-friendly technology, that generates silver ion water through continuous research and development.

Argen is the world's first unique device that generates high-quantity Ag⁺ water at one time with automatic concentration control (PPM) system.

The most important feature of the device is the absence of scale formation until the silver plate is completely exhausted. The silver ion can kill 650 bacteria, fungi and influenza viruses. Therefore, it is effective in sterilization work and safe for human health.

What is Silver Ion (Ag⁺)?

4 Silver Ion (Ag⁺)?

Almost 99.9974% silver can be converted into silver ions particles with sized ranged from 4-15 nm, which enable it to cross biological barriers. This technique enhances electron uptake by improving the circulation of silver ions in cells. This product is regarded as an alternative modern medicine that benefits primary health care and the treatment of chronic communicable diseases in particular.

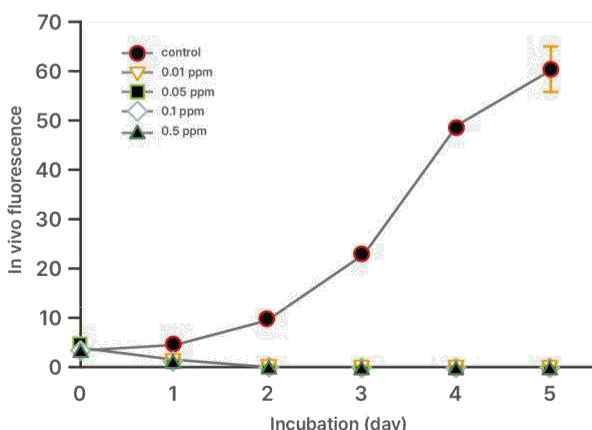
4 Strong sterilization and Enhance immunity

Ionized silver enter into the bacterial membrane by penetrating through the cell wall, where it interact with proteins and lead to the destruction of cell membrane, thereby leading to inactivation of enzymes and the production of bacteria. Silver ion is nonresistance to human being, therefore, it has no side effect of low dose consumption and nontoxic. Unlike other antibiotics, silver ion water has no side effect and has an ability to kill 650 types of disease-causing microorganisms, increased nutrient uptake, including oxygen to support metabolism and strengthen the immune system and fight off diseases.

4 Clinical Examination of Agriculture and Livestock

- The Korea Research Institute of Chemical Technology :
The silver ion water showed some good results against the control of diseases including rice blast fungus, red pepper anthracnose, wheat leaf rust, tomato gray mold rot, fruit, fire blight, cabbage bacterial soft rot, watermelon fruit black rot etc.
- Test result - Effective for prevention and treatment of diseases. - www.argenion.co.kr
- European Medicines Agency :
The silver ion water was equally effective in controlling the Avian Influenza (HPAI H5), African swine fever virus (ASFV), Porcine Reproductive and Respiratory Syndrome (PRRS), Postweaning Multisystemic Wasting Syndrome (PMWS)
- Test result - Infection prevention and treatment effect - www.argenion.co.kr

4 Effect of silver ion water on algal growth inhibition.



The silver ion was effective for inhibiting the growth of algae such as cyanobacteria (blue-green algae) in fresh water, which is a major cause of harmful blue-green algal bloom.

-Source Water Resources Corporation Patent-10-2009-0047203.

Research review on silver ionized water

Jim Powell

"Our Mightiest Germ Fighter", Science Digest, March 1978 stated that the Silver ion is emerging as a wonder of modern medicine.

An antibiotic kills perhaps a half-dozen different disease organisms, but silver kills some 650 different disease-causing pathogens. Resistant strains fail to develop. Moreover, silver is virtually non-toxic and harmless to human health.

Nasa external experiment

NASA, United State government collaborated research with United State Environmental Protection Agency and FDA (Food and Drug Administration) conducted numerous experiments, it evaluated the efficacy and antibacterial effect of silver-plated fibers.

The other study evidenced the effect of silver-coated fibers against mold and *T. Mentagrophytes*, an athlete's foot fungus.

Sir James Cantlie

Silver ion have long been recognized to possess strong inhibitory for dysentery and colic, and shown to have antiviral activity against tropical disease-causing stomatitis and diarrhea

Kopaczewski

A well dispersed colloidal solution of silver ion exhibit strong antibacterial properties.

NR.Thomposn

Colloidal silver proved to have highly effective against the *Staphylococcus, Aureus, Neisseria Gonorrhoeae bacterium, Gardnerella Vaginalis, Typhoid Fever (Salmonella Typhi)*, and gastrointestinal bacteria.

Use of Cölloidal in Health and Disease

Colloidal silver proved to have highly effective bactericidal effect against gastrointestinal bacterial.

In national level, Korea Bio Safety Institute conducted an tests for acute oral toxicity, eye irritation, corrosion and dermal toxicity of colloidal silver nanoparticles in animals in 1998 and reported that silver and its compounds are not harmful to human health and no side effect is recorded.

In particular, Argen metallurgically refined silver to meet the 99.99% purity grade (Chemical Analysis (I.C) verified by third party Daesung Metals assay with high-purity standards. According to N.R. Thompson of Runcorn Health Laboratory in England, the concentration of silver necessary to sterilize water contaminated with pathogenic bacteria is between 40-200 gamma, or 0.04 to 0.2ppm (1ppm = 1000 gamma). United State Environment Protection Agency (EPA) established an oral reference dose, or daily intake limit, which is safe to human lifetime is of 0.005~14 mg/kg/day for silver in 1991.

Silver in Health Care: antimicrobial Effects and Safety in Use.

The use of silver ion for its antimicrobial properties is increasing in numerous fields, including the medical, consumer, agricultural and industrial sectors. However, most of the laboratorial studies use high concentration of Ag⁺, which showed the adverse health effects including argyria.

According to *Robert H. Demling, Harvard Medical School 2004*, the most common causes of argyria are not from use of silver but due to the constant environmental exposure or it can be toxic in certain forms and at high doses for long period of time. Daily intake of silver ug 20-80 is not health threatening. Therefore, it is important to use caution and follow recommended dosages when using colloidal silver as a dietary supplement or for any other health purpose.

The silver ion concentration applied in agriculture or horticulture eliminates over the duration. The studies have confirmed that Ag⁺, in general, are nontoxic, and doesn't accumulate in the body, as low dose silver ions are biodegradable, and no study identified the toxicity of Ag⁺ through food.

In addition, Hou et al 2013, in their study demonstrated that, under stimulated sunlight exposure, ionic Ag⁺ is photo-reduced in the river water and precipitates out upon extended irradiation.

Agriculture / Livestock Sterilizers



Specification of Product

Product Name	LK-1000
Rated Voltage	220V / 50~60Hz
Electricity Consumption	400W
Silver (Ag+)	99.9974%
Production Rate	40 ton / per day
Size	300 × 420 × 170

ARGEN Purpose of Use

World's first large-capacity product and automatic concentration (ppm) control system
Generate 50-100 tons a day



Agriculture

Orchard, Smart Farm etc.



Horticulture

Livestock



Fisheries

Livestock odor



Restaurants

Cleaning and antibacterial effect



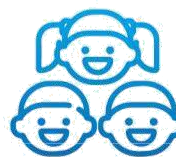
School

Food service, classroom disinfection



Military

Barracks, Kitchen disinfection, and Order control



Kindergarten

Disinfection of playground, toys etc.



Cooling Towers

Prevention of bacteria reproduction

Product Information

General and Domestic Use

Specification of Product

Product Name	SH 160
Rated Voltage	220V / 50~60Hz
Electricity Consumption	70W
Silver (Ag+)	99.9974%
Production Rate	20 ton / per day
Size	210 × 280 × 105



ARGEN Purpose of Use

High quantity silver ion output in low cost by changing filters. No scale occurs and cost-effective filter.



Kitchen

Dish washing / Disinfection



Pets

Settle skin trouble, Deodorization bathroom



Washing

Disinfection



Shower

Disinfection and Skin care



Flower, Plants

Antibiotics, Fungicide



Mist, Washing

Atopy, Disinfection, Hydrate Skin



Washing fruits and vegetables

Disinfection



Cleaning

Deodorization

Silver Ion Water Concentration by PPM



- Refine silver by eliminating nickel chromium arsenic etc. and other heavy metals.
- Filter contains 99.9974% pure silver

ARGEN LK-1000

High quantity silver ion output in low cost by changing filters

Filter cost ₩ 2,500,000 € ≈ 1807.44

The filter generates 4000 tons of water

Argen	Silver Ion (Ag+)	Total Output (In tons)	EUR € (≈ almost equal to)
1st level	0.25 ppm	4000	≈ 0.47
2nd level	0.5 ppm	2000	≈ 0.90
3rd level	1 ppm	1000	≈ 1.81
4th level	2 ppm	500	≈ 3.61
5th level	3 ppm	250	
6th level	5 ppm	200	
7th level	7 ppm	143	
8th level	8 ppm	100	
9th level	9 ppm	67	

**These figures are estimate for demonstration only.*

Customers Opinions



Park, Jeong-Hyeon | The Poultry Farm Operator/ Cheonan

After I started using Silver Ion Water Generator. My poultry are not vaccinated against Salmonella or influenza. Chicken are safe and the production is good.



"I first encountered silver ions at the time of mass chicken death. The reason for using it was salmonella infection. In the past, we used antibiotics for treatment. Nowadays, it is no longer legal to administer antibiotics in poultry. If we keep it for naturally robust habit, millions of chicken (around 30%) will die at once. Chicken die even if they get vaccinated, and the extra cost comes for vaccination. While I was looking for the solution to prevent the impact of those stress on reproduction, I came to know about silver ion sterilizer.

After using the silver ion water generator, no vaccine is needed in my farm. The device offered pH level 1 to 9. The cases of enteritis clear up within a day. After that, I took a big leap of faith on it. In last 4~5 years, I hardly ever do disinfectant, most probably once a month... it is just for formality. Chicken aren't infecting in my farm as they used to. Why should I fumigate it. If I notice the symptoms of disease in chicken, I increase the PPM of silver ions water. The infection disappear after within two three days. This doesn't mean that animal don't get infected. Undoubtedly, we work out in 3 days".



Kim Myung-Soo | Owner of Pear Farm / Cheonan

Last one years I speared silver ion water using Argen Generator. Improve the overall performance by 80~90%.



"I started using Argen silver ion sterilization because of fire-blight disease. However, the most complex disease in orchard is *Botryosphaeria ribis*. There is no proper cure for *Botryosphaeria ribis*. No registered pesticide available for this disease. I spread silver ion water using this device for one year. Though the initial infection was not fully cured, but the infection status improved by 80~90%. If we keep using for few more years, it will definitely be effective. I am doing silver ion water treatment for fire-blight disease too. This year we have had no problems in the orchard. There is no single dead branches or nothing seriously wrong. I will use this device with confident".



Kyungswoo Kim | The Poultry Farm Operator/ Inje

Major challenges of poultry industry is infectious viral disease mainly affecting chickens. Silver ion sanitizing spray reduce the spread of disease...

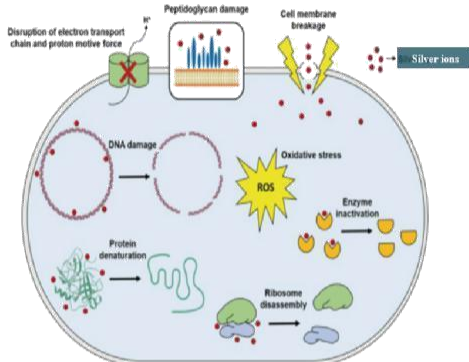


"While the prospect of chickens becoming sick is difficult in poultry farms. Among them, I constantly worry about gastroenteritis disease. The continuous use of silver ionized water significantly reduced the infections in chicken. I'm fully satisfied with it, as well as I am operating my farm without difficulties. When I was using ordinary regimens for the treatment of chronic infectious diseases in chicken, I noticed sticky mucus in water that often clogged drain. It disappeared after using silver ion water. As a result, my farm looks clean and well-maintained".

Silver Ion [Ag+] Safety Test

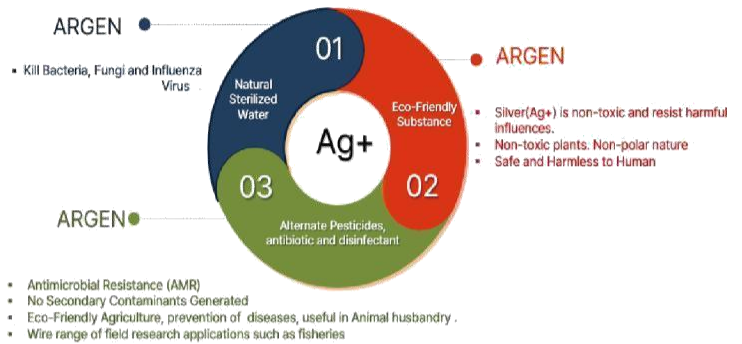
Antibacterial Mechanism

The antimicrobial properties of silver ion that kills bacteria, fungi, parasites and certain viruses



Silver Ion [Ag+]

Purpose of Argen Silver Ion Generator.



Safety Inspection . Plant Disease . Sterilization . Disinfection Test

Testing Institution	Date	Test Contents
The Korea Research Institute of Chemical Technology	2014. 09	Effective Strategy for Plant Disease Prevention & Control
Korea Center for Disease Control and Prevention	2014. 11	Sterilization test for bacterial food poisoning
The Korea Testing & Research Institute	2014. 09	Mucosal irritation test. Skin irritation test and Oral dose toxicity test
Dept. of Veterinary Medicine, Chungbuk National University	2015. 05	Potential antiviral and sterilization effect on Salmonella
Dept. of Veterinary Medicine, Chungbuk National University	2015. 12	Pig farming PRRS VIRUS and Antiseptic effect of antiseptic test - 90~100%
Dept. of Biological Resources, Kangwon National University	2018. 06 ~ 2019. 02	Dept. of Biological Resources, Kangwon National University

Safety Test Conducted by Korean and Research Institute (KTR)

3-2. Toxicity & Irritation Test

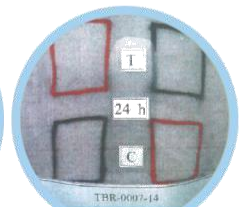
2ppm to 7ppm reported to be effective.
Depend on bacteria strength



Oral Dose Toxicity Test



Mucosal Irritation Test



Skin Irritation Test

3-3. Sterilization of bacterial food poisoning

E. coli

S. flexneri

S. aureus

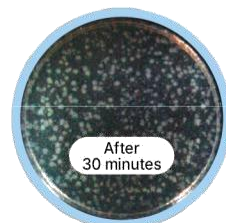
B. cereus

S. typhimurium

B. subtilis

P. aeruginosa

L. monocytogenes



After 30 minutes



Two hours later




24 hours later

99.9% Sterilization

Disease & Prevention Test

[Test conducted in collaboration with The Korea Research Institute of Chemical Technology - Daejeon Daedok Complex]




무처리, 은이온수 (농약) 무처리, 은이온수 (농약) 무처리, 은이온수 (농약)

Rice diseases Pepper Anthrax Tomato Plague

Agriculture Chemical & antibiotics Respond to some bacteria

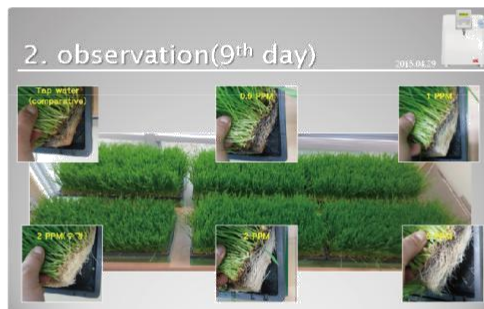
Silver Ion Water Respond to all bacteria

2ppm to 7ppm reported to be effective. Depend on bacteria strength



Buyeo Tomato Farm **Before** **After**

Experiments on the concentration of silver-ions water.





- Soaked 250g of wheat seed in tap water and Silver water (0.5ppm, 1ppm, 2ppm, 5ppm for 12hrs.
- Five models prepared with 450g soil and 250 wheat on seedbed for germination.
- Sprayed silver ion water 1 time a day during germination, for 2~3days, and later 2~3 times a day.

Experiments on food preservation using silver ions water.

3. Results (storage)

○ Preserved wheat sprouts in the refrigerator for 26 days to check the its preservative efficacy.

○ The preservation of wheat grown using silver ions water looks fresh and were not pale as grown in tap water.

- No difference recorded in silver water or tap-water while measuring the length.
- The growth rate in 5ppm is recorded low for 2 days and the growth was increased after two days.
- The weight of sprout and root cultivated in 0.5ppm, 1ppm, 2ppm is significantly higher than in tap water cultivation.
- Wheat grown using silver ion looks fresh and was not appear pale as grown in tap water.
- Silver ion (Ag+) 0.5ppm, 1ppm, 2ppm is good for wheat cultivation, In particular, 1ppm, 2ppm treatment reported to have higher sprout growth

ODA Activities / Regional Activities

Agricultural Case Study

Apples Farm at Gapyeong-Gun



- For disease prevention and high-production, the Ghyapyoung-gun Agricultural technology Center provides free silver water for irrigation.
- Prevented existing apple disease are prevented, no bag applied for organic pest management, as a result farm reduce the labor costs and material cost.
- Produces more than three times the larger as it did previous year.
- Increased yield by three times then previous years.
- Eco-friendly and pesticide-free products are supplied to provincial schools or to the region.

Chungju Apple Fire Blight Case.

Farm Name	Ko Jae-sik (Deokeun-ri, Sotae-myeong, Chungju)	
Location	Around 1000 square meter confirmed to have burials infectious disease outbreak.	
Field report	29th May (reported spread of fire blight), 2nd June (confirmed outbreak), 13th (confirmed to buried) conducted two to three weeks of Point-Of-Care testing in outbreak area.	
Area	Used 2000 square meter	
	Usage	40 ton/per day
	Duration	11th June (on-site visit), 12th (device installation), 14th (on-site spraying: government & foliar spray)
Method	Gwanju silver ion water generator disinfection as a foliar spray	
Effect	Fire blight disease prevention and eco-friendly sterilization	
National Fruit Farm	An Exemplary Model	

Field



The latest exterminator

Installation



Free installation of Argen Ag+ generator after the outbreak of Chungju fire blight disease

The potential of silver ion water (Ag+) for fire blight disease in orchard.

Field



The latest exterminator

Installation



ODA Activities / Regional Activities

Agricultural Case Study

Hongcheon Agricultural Technology Center Experiment on Red Pepper Farm



Case study of Red Pepper Farm at Hongcheon



Silver ion water effect : Pepper plant recorded to have a complete recovery from viral infection.

Current Users of Silver Ion Device



Installation of Argen Device for daily farming, greenhouse horticulture, organic vegetable farming and livestock in Regional Context



Installation of silver ion water generator : Distribution in localities with no cost (Gapyeong Agricultural Technology Institute)



To encourage eco-friendly farming and use of silver-ion water instead of pesticides and chemicals. We installed system at Gapyeong Agriculture Technology Institute and supplied silver ion water to the localities with no cost. The regional eco-friendly and pesticides free product distributed to regional elementary school students to connect schools with local farms.

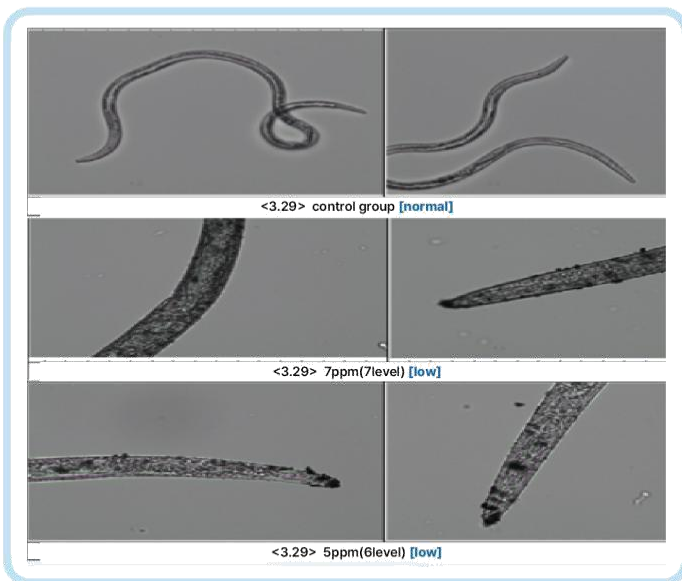
ODA Activities

Regional Activities : Lab Experiment

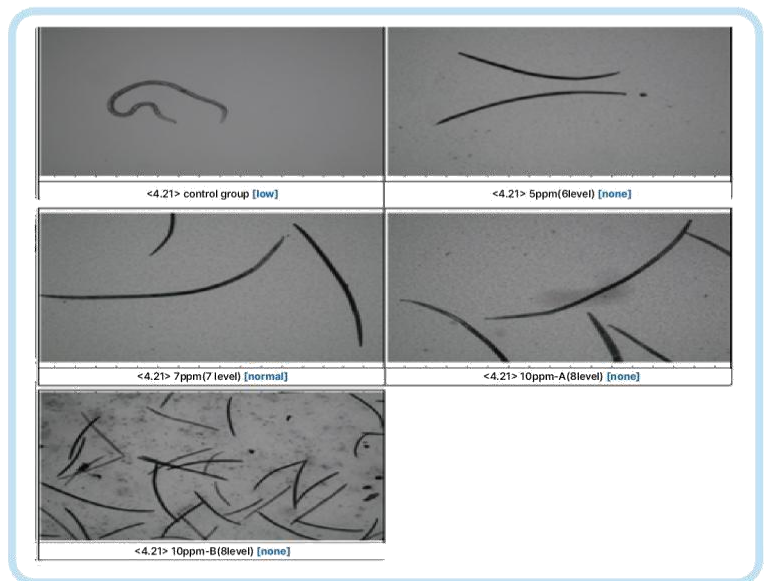
Diseases in Gangwon Province

- Pine wilt disease (PWD) caused by *Bursaphelenchus xylophilus* represents a major threat to forest ecosystems worldwide.
- Pine wilt **disease is severely affecting in the northern part of** Gangwon Province.
- **Forestry Department is controlling the disease cutting and removals of infected logs.**
- **Silver ion water may control the pine wilt disease.**

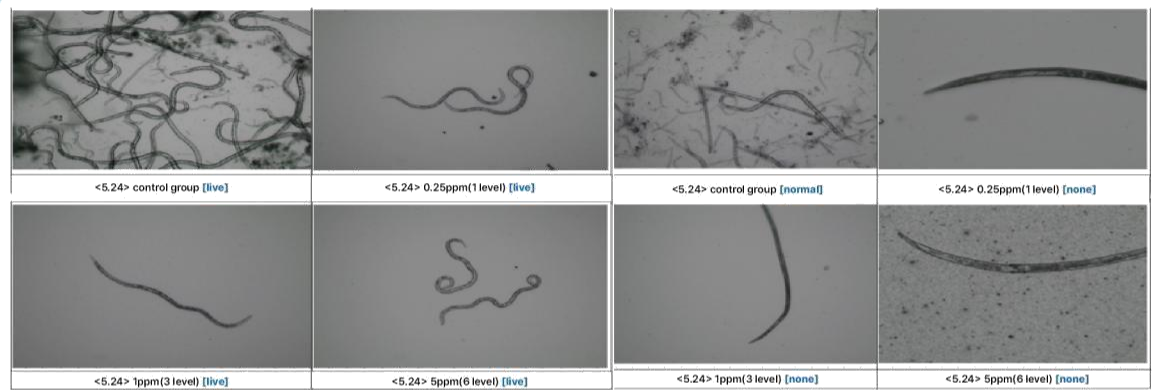
1st Monitoring



2nd Monitoring



3rd Monitoring





Field Experiment

Collaborative work with Gangwon Forestry Disease and Pest Control Team



Competitor Analysis

	Competitor	
Silver Ion Output	Less - storage 0.1-1ton/a day	High Capacity- Hydrophone 40ton/1a day
Automatized	No-control on concentration	Automatic Concentration Control System ▶ 0.1 ~ 15ppm
Cost of Production	High-cost for Silver Ion production	Low cost of generating silver ion water
Formation of Scale	Often clean scales	Non-Occurrence of Scale No need to clean until plate is completely exhausted
Source of Water	Distilled water	Source of water (river water, Tap water, Ground water, rainwater etc.)
Safety and Utility	Safety and Purity Unclaimed	Safety and Purity - 99.9974%(Pure) Remove Li . Cr . Bi etc.

- **First-stage concentration (0.25ppm)**
4000-ton water generation
(differ depending on the concentration settings)

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