

agrohalc+

**portable
electrostatic device for
crop sprayers**

A brand new spraying method



agrolife⁺

the issue:

can we achieve more effective, efficient, faster
and environmental-friendly way
to spray and protect crops?



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agrohalc and electrostatic spraying

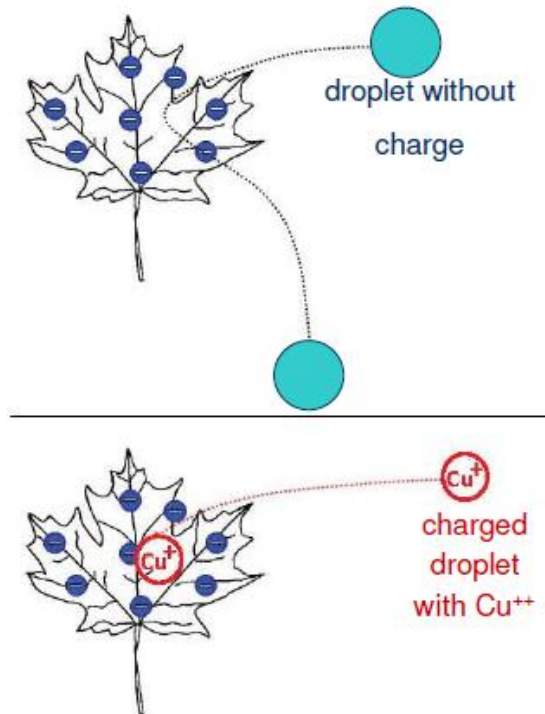
- using ordinary sprayers (even high pressure mist blowers), a major amount of pesticide is wasted (more than 60%), as it falls down on the ground with the falling droplets
- this is a waste of money, but also contaminates soil (and finally the production) with toxic substances
- Spaying with electrolyzed copper ions is an efficient way to use pesticides in maximum performance, but also reduces toxification of soil and plants, as it considerably reduces falling droplets and therefore increases coverage on leaves (or fruits) surface with pesticide
- **agrohalc** is a small portable device which can be fitted on any ordinary sprayer
- Consequently by using **agrohalc**, someone can boost pesticides' performance and increase protection of the plant



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agrohalc how it works

- **agrohalc** is a portable and handy device which can be easily fitted on any ordinary speayer, major spraying system or irrigation systems
- **agrohalc** produces free positive copper ions Cu^{++} , through an electrolysis technique. Copper ions are driven to sprayer's tank and charge the water (ionization)
- The water ionization technique needs extremely low copper ions concentration, below the EU safety standards for drinking water (<2ppm)
- After we add the pesticide in the water tank, the droplets as they come out of nozzles, contain small charged copper ions together with the pesticide
- Positively droplets are attracted by plant parts (leaves, flowers, fruits, pathogens and algae and uniformly cover the whole area, even the back sides
- The attraction, keeps droplets on the surface of the leaf, preventing from falling down



what you gain by using **agrohalc** electrostatic spraying device?



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spraying with **agrohalc** :

- Multiplies the effectiveness of spraying with pesticides
- Considerably increases the defense of the crop against numerous pathogen organisms like fungi, bacteria, viruses which are negative charged by nature
- Decreases the extensive use of pesticides
- Maximizes the quality and quantity of harvest
- Keeps products healthier, with better appearance for longer time until consumption



agrohalc, a new spraying method and the double effect of it

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In fact **agrohalc** is a brand new method for an effective spraying, due to two parallel actions:

- 1st action:
electrolytic Cu⁺⁺ ions spraying and the benefits of it (better pesticide coverage of leaves, lower loss of pesticide down to the ground, faster spraying)
- 2nd action:
continuous but discreet presence of Cu⁺⁺ (below 2ppm), in all the scheduled sprayings within the year (together with various pesticides), fortifies the protection of the crop against a wider range of fungi, bacteria and viruses

agrohalc
and the double effect



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UNIFORM DISPERSION
ON VERTICAL LEAF WITH NO DRIFT



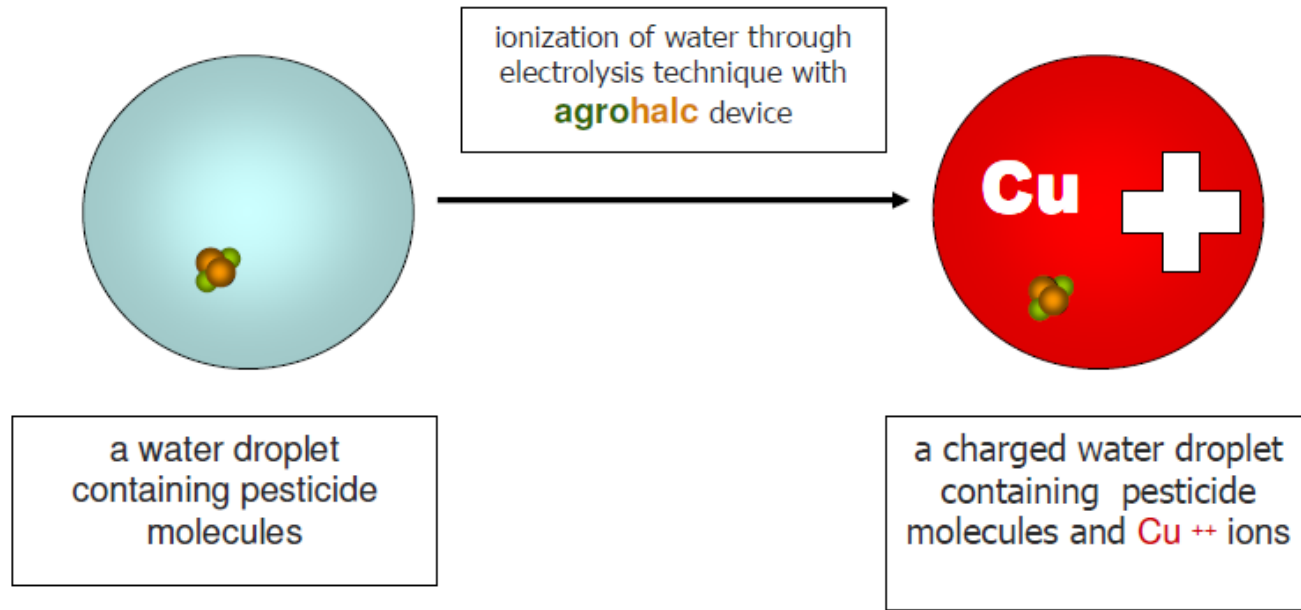
Drops with Cu^{++} ions on leaf,
from Agrohalc

No drift
Uniform dispersion
Higher protection
Quality products



agrohalc : water ionization with Cu^{++}

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agrohalc : electrolyzed copper ions effect

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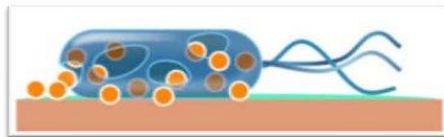
Copper ions droplets (containing the pesticide and Cu^{++}) remain on the surface of leaves, even on the backside. Electrostatic forces keeps droplets from falling down on the ground



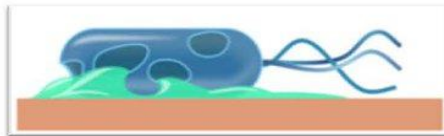


Cu⁺⁺ ions inside cell pathogen

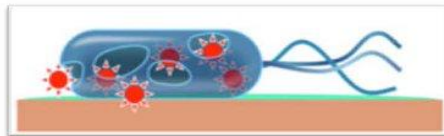
How does copper kill bacteria?



1) Copper ions on the surface are recognized as an essential nutrient, and enter the cell



2) A lethal dose of copper ions interferes with normal cell functions and membrane integrity



3) Copper ions impede cell respiration/metabolism, sometimes causing DNA damage

Grass, G, Rensing C, Solioz M. (2011). Metallic copper as an antimicrobial surface. *Appl. Environ. Microbiol.* 77(5): 1541 -1547.

agrohalc
and the double effect



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Continuous presence
of Cu^{++} in sprayings



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Continuous presence of Cu^{++} increases defence of plants against pathogens

- copper is a drastic and powerful pesticide which acts against a wide range of pathogens
- **agrohalc** produces free copper ions (Cu^{++}), the most drastic form of copper
- using this form of copper in very low concentrations, below the EU safety standards for drinking water (<2ppm), in the scheduled annual sprayings, multiplies the defense of plants against a wide range of pathogens
- due to such a low concentration of copper ions, we do not toxicate plants and soil
- and at the same time, we dramatically increase healthiness, quality and quantity of harvest



agrohalc and its uses

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- Appropriate for any kind of cultivations (vegetables, fruits, vineyards, flowers, etc)
- Highly recommended and appropriate for organic cultivations
- Appropriate for any kind of spraying (against weeds, microorganisms, algae)
- Compatible for irrigation systems (disinfects water and protects roots of plants against pathogens)

agrohalc must always be used under the advice and supervision of an agriculturalist



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agrohalc installations and references

- The last 5 years, **agrohalc** has been used in numerous cultivations (vineyards, fruit trees, vegetables, olives trees, flowers etc) with a great success
- Farmers they use **agrohalc**, admit that improvement in healthiness of their crops, and appearance of products, are also obvious, they could see with their own eyes





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Technical description and installation

- An **agrohalc** device is consisted of:
 - the control panel (in small dimensions 20x30x12cm, IP56), which is powered by a 12Volts battery. The control panel feeds a new inox chamber (ionization chamber)
 - the ionization chamber which contains special bars of metallic copper (electrodes)
- Ionization chamber is fitted in the low-pressure water circulation of the sprayer. Within the chamber takes place the electrolysis, which produces **Cu⁺⁺** and through the water circulation are driven in the water tank
- Adjusting the time of water ionization, we control the copper ions concentration. We can achieve from 0.10ppm up to desirable 2ppm or any concentration of **Cu⁺⁺**
- **agrohalc** can be easily fitted on any ordinary or special sprayer, or on irrigation systems
- **agrohalc** fulfills EN 12761 EU norm for crop sprayers, is patented and CE marked
- **agrohalc** has 1 years guarantee



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The Company

AFS SA manufactures agricultural copper generator systems for installation on agricultural sprayers and greenhouses

General

The copper ions generators systems, is the most advanced method to protect the environment

It has higher capabilities compared with the conventional electrostatics



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General

The copper ions sprayers systems, increase adhesion on the surfaces with uniform dispersion as result increasing pesticides effectiveness with no drift

Theory

The positive copper Cu^{++} ions are attracted to negatively charged particles of fungi and algae and create an electrostatic bond

Copper ions penetrate into the shell of fungi and then penetrate pesticides and kill pathogens



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Verification

- It has been verified from Italian, Greek Agricultural Institutes and the pesticide company SYNGENTA with USDA (United States Department of Agriculture)
- The copper ions generator systems, have easy installation on all types and sizes of sprayers, trailed, self propelled, suspended, etc.

Description



AGROHALC



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NEW Controller 2019





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Open Window





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Sturdy and Durable Chamber





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INOX Chambers





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Cylindrical Chambers





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Rectangular Chambers





INOX Chamber with Valves

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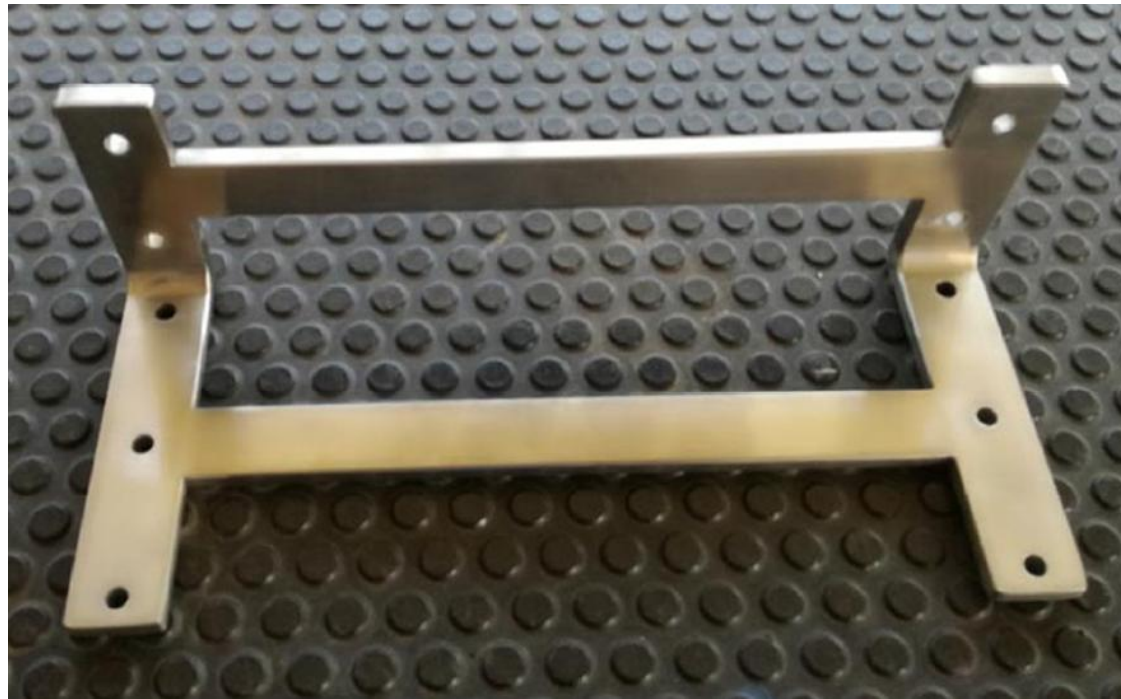


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COPPER IONS TEST KIT



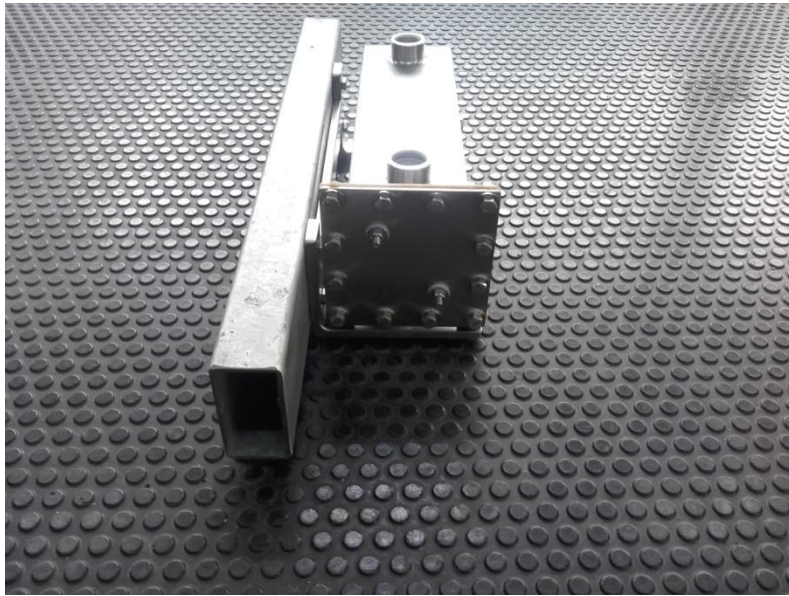
Chamber Fitting (Option)





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Installation with Fitting





Chamber with PVC Parts

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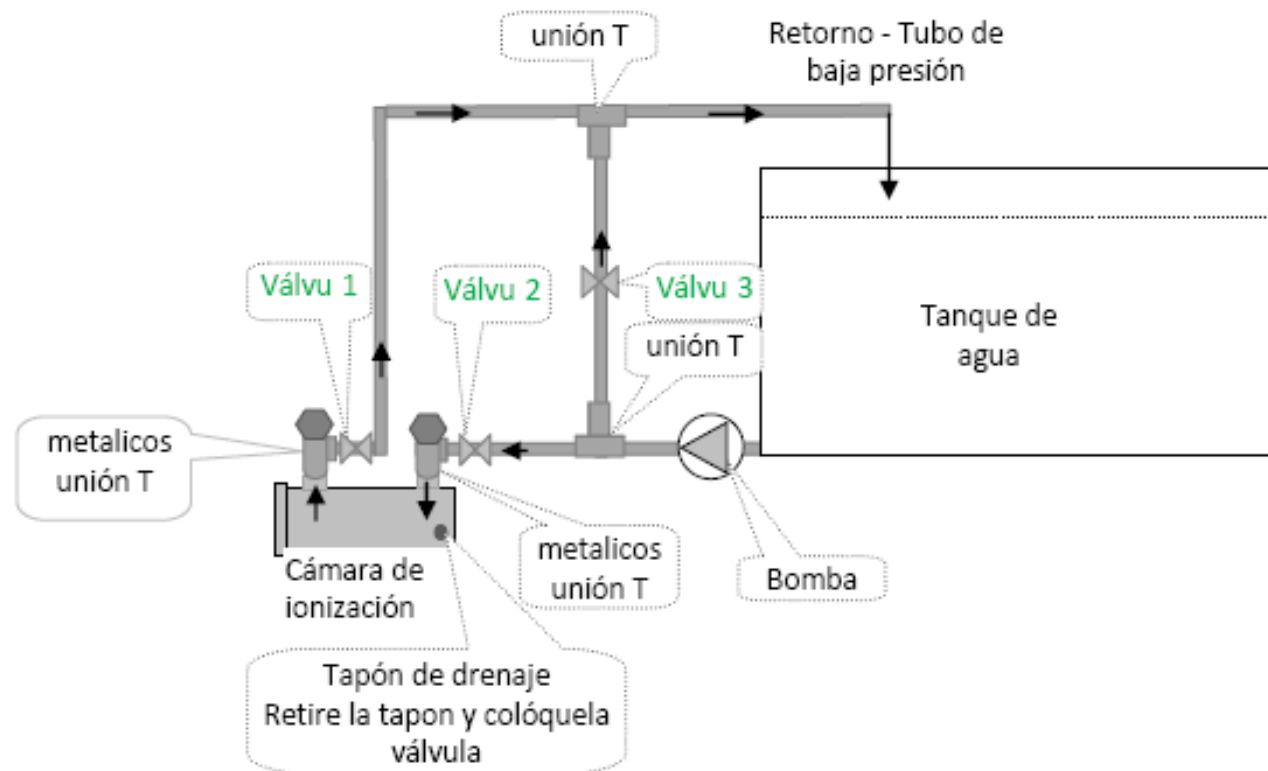
Packages to Dispatch





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Installation drawing





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VIDEO (Press to start)



Agrosales- ΣΥΡΟΜΕΝΟ ΨΕΚΑΣΤΙΚΟ 2000LT ΜΕ ΗΛΕΚΤΡΟΣΤΑΤΙΚΟ ΨΕΚΑΣΜΟ.mp4



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Controller Installation





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Chamber Installation





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Installation



Installation



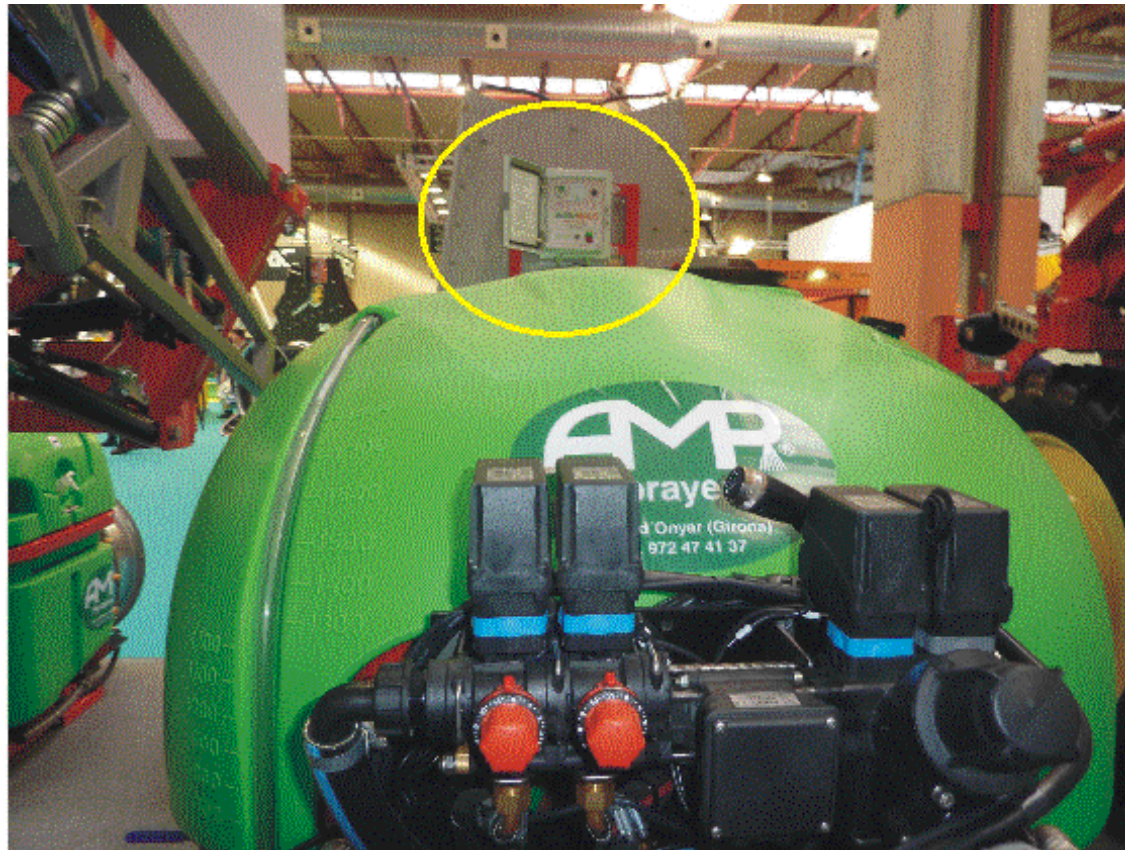
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Installation





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Installation Chamber





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Installation





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Installation with support





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Installation





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Installation





Installation

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Installation





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Installation





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Installation





Results from the Italian Institute of Lonigo Italy

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Results from the Italian Institute of Lonigo Italy

Production 280 kg / row (100 % dose + Agrohalc)

Production 234 kg / row (50 % dose + Agrohalc)

Production 40 kg / row (Only water + Agrohalc)

Peacock Spot
*(N.AG.RE.F.- Institute of Subtropical Plants
and Olive Tree of Chania)*



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Abstract

In the treatment where the fungicide was applied in **1/2** and **1/4** of the recommended dose in combination with ionized water, the pathogen was controlled with an effectiveness 82,85-98,45% and 80,03-96,07% respectively.

Botrytis cinerea Pers.
**(N.AG.RE.F.- Institute of Subtropical Plants
and Olive Tree of Chania)**



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Abstract

However, the fungi was controlled at 97,4-100, 82,5-83,5 and 72,9-75,9%, for the doses of **100**, **50** and **25** g/hl respectively in the treatments sprayed with the reference product in combination with ionized water.

It seems that, under the conditions of this experiment, the use of ionized water in the spraying solution increase the fungicide effectiveness.

Particularly, the possibility of reducing at 50% the fungicide recommended dose obtain practical interest.

***Phytophthora infestans* (Mont.) de Bary
(N.AG.RE.F.- Institute of Subtropical Plants
and Olive Tree of Chania) Peronosporaceae**



The effectiveness ranged among 93,76 (fruits) - 93,94 (leaflets) and 100% when the cooper fungicide was applied at the recommended dose with natural or ionized water respectively.

The application of the cooper fungicide with ionized water at the half of the recommended dose controlled the disease at 93,01 (leaflets) to 95,49 (fruits) without statistically significant difference from the reference product applied with natural water.

Conclusions

The results show that, under the conditions of the experiment, the use of the ionized water in the spraying solution can increase the fungicide's effectiveness.

Furthermore, practical interest obtains the possibility to reduce the fungicide at 50% of the recommended dose.

USDA (United States Department of Agriculture) & SYNGENTA



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Management of Transplant House Spread of *Acidovorax avenae* subsp. *citrulli* on Cucurbits with Bactericidal Chemicals in Irrigation Water

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Corresponding author: D. L. Hopkins. dhop@ufl.edu

Hopkins, D. L., Thompson, C. M., and Lovic, B. 2009. Management of transplant house spread of *Acidovorax avenae* subsp. *citrulli* on cucurbits with bactericidal chemicals in irrigation water. Online. Plant Health Progress doi:10.1094/PHIP-2009-0129-01-R5.

Abstract

Bacterial fruit blotch (BFB), caused by *Acidovorax avenae* subsp. *citrulli*, is a seed-borne disease of cucurbits that spreads rapidly in the warm, humid environment of the transplant house, often resulting in high numbers of infected plants going into the field. The only control options for BFB once it gets into a transplant house are crop destruction or multiple applications of a copper-containing bactericide/fungicide. In this study, various treatments were compared with the standard foliar spray application of cupric hydroxide for BFB control under transplant house conditions. Peroxyacetic acid at 80 µg/ml and ionized copper at 1.0 and 1.5 µg/ml applied through the daily irrigation water were more effective than cupric hydroxide in reducing spread of *A. avenae* subsp. *citrulli*. Combining ionized copper or peroxyacetic acid in the irrigation water with a weekly foliar application of acibenzolar-S-methyl was most effective in reducing spread. The utilization of these transplant house treatments along with the elimination of all transplants with symptoms or near plants with symptoms should greatly reduce the chances of introducing BFB into fields on transplants.

Introduction

Bacterial fruit blotch (BFB) of cucurbits, caused by *Acidovorax avenae* subsp. *citrulli* (Willens et al.) (Schaad et al.) (12,15), can be a devastating disease. BFB on watermelon has occurred in one or more watermelon-producing states in the eastern United States every year since it first occurred in 1989 (9,11,12) (D. L. Hopkins, unpublished data). In some fields, losses have been more than 90% of the total marketable fruit (11). The characteristic symptom of BFB that renders the fruit unmarketable is the water-soaked, dark, olive-green stain, or blotch, that develops on the upper surface of infected fruit (8). Eventually, the lesions turn brown, crack, and ooze a sticky, amber substance. Secondary organisms invade and rot the fruit.

Currently, the most effective control of BFB is the exclusion of the bacterium (7). The intensive efforts of the watermelon seed and transplant industries to produce seeds and transplants free of *A. avenae* subsp. *citrulli* have reduced the incidence of BFB significantly over the last 5 to 6 seasons. These efforts include improved production practices by the seed producer, fermentation, and acid treatment of diploid seeds (2,4), use of seeds from lots that have assayed negative for *A. avenae* subsp. *citrulli* by grow-out of at least 10,000 seedlings and/or PCR assay (14), and careful inspection of seedlings by transplant producers. In spite of these efforts, the bacterium still appears in a few fields every year.

Most of the severe losses from BFB that have occurred since 1989 have involved infected transplants (3). Contaminated cucurbit seed lots is one way in which the bacterium may be introduced into a transplant house (3). *A. avenae* subsp. *citrulli* has been reported to cause disease on cucurbit crop hosts other than watermelon including muskmelon (*Cucumis melo* L.) (8), honeydew (*Cucumis melo* L.) (5), and pumpkin (*Cucurbita pepo* L.) (6). Seed transmission



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Discussion USDA & SYNGENTA

Discussion

- Application of PA in the daily irrigation water provided better control of *A.avenae subsp. citrulli* spread than the standard weekly spray with cupric hydroxide (1).
- While PA was very effective in the young seedlings, the level of control declined as the seedlings grew and reached transplanting size
- Perhaps the coverage was not as good with overhead irrigation in larger plants.
- Ionized copper in the irrigation water maintained a high level of control of BFB even as the seedlings grew larger.
- Ionized copper easily provided control at a copper concentration that was 800-fold lower than with the cupric hydroxide.
- This was probably because of the high solubility of the ionized copper and the positive charge of the ion that attracted the bacteria.
- With the ionized copper, there also is much less copper applied, which should reduce run-off of copper onto the soil.
- could be incorporated into the overhead irrigation systems used by many transplant growers.

Acknowledgments

- This research was supported by USDA-CSREES T-STAR award number 2003-34135-14077. Thanks to Syngenta Seeds for financial support for this research.

Cu⁺⁺



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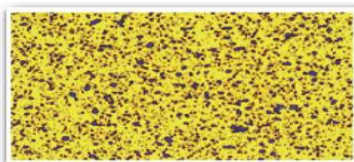
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Excellent Dispersion On SYNGENTA Sensitive Paper

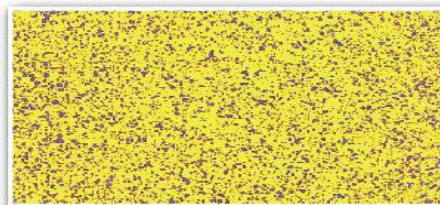


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TEST ΨΕΚΑΣΜΟΥ 1/12/2016



ΨΕΚΑΣΜΟΣ ΜΕ ΤΕΕJET



ΨΕΚΑΣΜΟΣ ΜΕ ΤΕΕJET
+AGROHALC



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**TEST AND MEASUREMENT
REPORT
ELECTROMAGNETIC COMPATIBILITY,
IMMUNITY**

Equipment under Test (EUT):

POWER SUPPLY

Model: "AgroHalc Plus M" of "AquaCare" series

Manufacturing name: «AFS Ltd»

Customer: "AFS Ltd"

Athens, 20.09.2012

Approved by

(Ioannis A. Stathopoulos)
NTUA Professor

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Olive Trees

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Citrus Trees





Wineyards

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Peach Trees





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EXHIBITIONS 2018

- VERONA 31-3/2/2018 ITALY
- SALONICA 2-4/2/2018 GREECE
- ZARAGOZA 20-24/2/2018 SPAIN
- BOLOGNA 7-11/11/2018 ITALY



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WITH COPPER IONS Cu^{++}



We Care for People & the Planet