

Welcome to this week's 2022 season's weekly issue of our UF/IFAS Extension Suwannee Valley Watermelon Crop Update. These updates are summarized by Bob Hochmuth with input from Suwannee Valley Extension Agents: Mark Warren (Levy), Tyler Pittman (Gilchrist), Tatiana Sanchez (Alachua), Luke Harlow (Union), Jay Capasso (Columbia), Dan Fenneman (Madison), Keith Wynn (Hamilton), Danielle Sprague (Jefferson), Emily Beach (Lafayette), Amanda Phillips (Suwannee), Kevin Athearn (RSA-Agri- business), and Sudeep Sidhu (RSA- Water Resources).

If you know someone who wants to be added to this weekly notice, contact your Extension Agent or Mark Warren (352-949-8288) if you want to be added to the regional watermelon group text app.

Thank You to the 2022 Suwannee Valley Rapid Diagnostic Watermelon Program and Its Industry Sponsors:

We have initiated a more formal way to support our watermelon growers with a rapid diagnostics system through Suwannee Valley Regional and County Extension Agents. This industry-funded program allows Extension Agents to submit and pay for watermelon grower's plant disease and other diagnostic samples. This SV Rapid Diagnostic Watermelon Program will help us to get quicker diagnostic results, helping to give early alerts to everyone, and not have to charge the growers directly. Plant disease samples are typically \$40 and leaf tissue analyses are typically \$20. **We want to thank the 2022 sponsors of this program: Syngenta Crop Protection, Glades Crop Care, TriEst Ag Group, Gowan USA, Summit Agro-USA, and Harrell's Fertilizer for sponsoring this effort. Other industry reps interested in sponsoring this effort can contact Bob Hochmuth at bobhoch@ufl.edu or 386-288-6301.**

Continued disease management after the freeze:

As a follow up to the second week after the freeze, we want to review our suggestions. Damaged plant began to show new growth and significant recovery at the end of last week. The warm sunny days at the end of the week is just what the plants needed. Our suggestion is to keep it simple and let the plants recover. Cocktail mixtures of foliar fertilizers and fungicides as well as other ingredients often do more damage (leaf burn) than good. As you monitor your fields for cold damage, scout for disease also. Following a cold/rainy period, an outbreak of the bacteria, *Pseudomonas* (angular leaf spot) could be possible. We have one sample being analyzed for bacteria now and we highly suspect it will confirm bacteria (angular leaf spot). Lesions start small and circular and become irregular in shape with a dark color as they progress. If you suspect bacterial symptoms at your fields, we recommend spraying with a low to medium rate of copper in combination with mancozeb (Manzate, Penncozeb, etc). Remember high rates of copper are toxic to watermelon plants and we don't want to use copper on recovering plants after a freeze unless absolutely needed. On the other hand, most fields in the region do not show bacterial symptoms. If bacterial diseases are not a concern in your fields, we recommend an application of chlorothalonil (Bravo, etc.) to prevent disease development. If you observe any disease symptoms, please contact your local agent for prompt identification through our "Early Detection" program. (Tatiana Sanchez and Bob Hochmuth)

Copper Sprays, Efficacy and phytotoxicity

Copper was the first known fungicide. Its benefits were discovered accidentally as a result of soaking pea seeds in a copper bowl. Still widely used, it is an important tool in our plant protection toolbox, but as most already understand, copper deserves careful understanding and conservative use.

Due to recent weather and environmental challenges, there have been several questions and conversations concerning copper products, their comparative efficacies, and potential for crop damage (phytotoxicity). These discussions deserved a closer look and hopefully a better understanding, but the answer isn't as simple as might be expected; copper isn't just copper.

There are many different forms of copper products available in the marketplace each with its own advantages and disadvantages. There are a few basic concepts that need to be understood when evaluating copper compounds.

1. Copper is a soluble metal that is toxic, at varying concentrations, to many living organisms (bacteria, fungi, watermelons, people).
2. Copper requires moisture on leaves to be active.
3. Copper is most effective on organisms that require free water to be active.
4. The pH of the water used in mixing and delivery of sprays will affect how soluble a copper product will be. Higher pH= less soluble, lower pH =more soluble. *Certain products added in a tank mix may lower pH increasing risk of injury.*
5. If the dissolved form of copper penetrates leaf or other plant tissues (fruit) it may cause damage to the tissue.
6. For this reason, no form of copper should be mixed with foliar nutrients or penetrants such as crop oils. Some insecticides can also be problematic. FOLLOW LABEL DIRECTIONS for appropriate crops, rates, surfactants, and tank mix compatibilities.

The two most common forms of copper products seen in our area are *fixed copper sulfate* (sometimes called *basic copper sulfate*) and *copper hydroxide*. Another form of copper, **that should be used with caution**, is *copper sulfate pentahydrate* (A.K.A. Bluestone). This form is highly soluble in water, releasing high concentrations of soluble copper, and is not rain fast. Some manufacturers will add lime to this material as a safener which makes it perform like a “fixed or basic” product.

Now, with that all understood, there are two basic factors that affect copper efficacy. **Percent of metallic copper** and **particle size**. The challenge is having enough copper ions available to kill the pest (fungi, bacteria) while keeping the concentrations low enough not to injure the plant. Table 1 provides a list of several copper products and their metallic copper equivalent.

Table 1. Percent Metallic Copper of Commercially Available Products

Product	Copper form	Amount of formulation	Metallic copper equivalent	Unit type	metallic copper per unit
Copper sulfate = bluestone = blue vitriol	Copper sulfate pentahydrate*	99%	25%	1 lb	0.25 lb
Kocide 101	Copper hydroxide	77.0%	50%	1 lb	0.50 lb
Kocide 3000	Copper hydroxide	46.1%	30%	1 lb	0.30 lb
Basic Copper 53	Basic copper sulfate	95%	53%	1 lb	0.53 lb

Champ 2F = Champ liquid copper = Champ Formula 2	Copper hydroxide	37.5%	24.4%	1 gal	3.00 lb
Cuprofix Ultra 40D	Basic copper sulfate= CuSO ₄ · 3Cu(OH) ₂ · H ₂ O	71.1%	40%	1 lb	0.40 lb
Basicop	Basic copper sulfate	95%	53%	1 lb	0.53 lb

The above table is not a comprehensive list of copper products, and all products may not be labeled for use in watermelons. This list is provided for reference purposes only. Consult the product label for registered crops, rates, and other use directions.

There are other formulations and types of copper available. Products such as Tenn-Cop 5E and Cueva Fungicide Concentrate are copper materials derived from copper salts of fatty acids as opposed to basic copper sulfates or copper hydroxides. These materials are also considered to behave as do safened materials, but again, be sure to consult the label for specific uses. As mentioned, particle size also contributes to efficacy and persistence of copper products. Particle size is measured in microns and cannot be measured by touch or sight. Finer ground materials provide for more uniform spray coverage, persistence in the environment, and longer residue. Coarser ground materials tend to wash and blow off dry leaf surfaces and don't release as predictably as finer ground materials. (2013, R. Lehnert, *Working with Copper*)

Table 2 lists some of the more common copper containing products with average particle sizes in the right hand column. Notice that the soluble materials have a "0" or no size specified and depending on the type of copper may have a lower percent of metallic copper to reduce risk of injury.

Table 2.

Product Name	Active Ingredient	% Active Ingredient	% Metallic Copper	Mean Particle size (microns)
Cueva	Copper octanoate	10.0	1.8	
Mastercop (soluble)	Copper sulfate pentahydrate	21.46	5.4	0
Kocide 3000	Copper hydroxide	30 DF	30	2.5 – 3.1
Champ Formula 2 Flowable	Copper hydroxide	37.5 F	24.4	1.2
Nu-Cop	Copper hydroxide	76.77	50	2.4

For more information on copper fungicides and avoiding toxicity see the following article or contact your UF IFAS County Extension Agent. <https://cvp.cce.cornell.edu/submission.php?id=140> (This article on copper was written by Mark Warren and reviewed by Mathews Paret)