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Using Surfactants in Vegetative Cutting Propagation: A Review

The terms adjuvants, surfactants, spreader-stickers, and wetting agents are often confused. I clarify these terms and compare commonly-used greenhouse adjuvants.

There are many factors that contribute to the success of propagating unrooted cuttings (URC) and callused cuttings (CC) including: time to stick, light intensity, misting frequency, humidity, root-zone heating, temperature, ethylene exposure, and the use of rooting hormones. [Dr. Garrett Owen](#) covers the moisture requirements in his recent article, "[Moisture management during vegetative cutting propagation](#)" on [Michigan State University Extension's floriculture website](#). [Dr. Roberto Lopez](#) and I published e-GRO Alert 5.6 "[Increasing the Rooting Success of Challenging Vegetative Cutting Species](#)" last season listing the priority of plant species for sticking in propagation. Last week Dr. Roberto Lopez published e-GRO Alert, "[Avoid Cutting Losses by Prioritizing Sticking](#)" which shows what happens to the quality of problematic species when those guidelines are not followed.

Another tool that some greenhouse growers use to increase the rooting success of their vegetative cuttings is the use of a surfactant. Some greenhouse growers swear by using surfactants in their mist solutions during vegetative cutting propagation in order to decrease the surface tension of the water allowing it to spread uniformly over the leaves (Figure 1). Without it, the water from frequent misting may bead up on the leaves (Figure 2). Misting is used to prevent desiccation, or further water loss from the leaves of the cutting and not to re-hydrate the cuttings. The cuttings will absorb water from the propagation substrate (oasis block, peat/perlite etc.) upon root emergence.

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Before delving into the research on using surfactants in greenhouse propagation, let's clarify the definitions of terms that are often used interchangeably and may be confusing: adjuvants, surfactants, spreader-stickers, and wetting agents.

- **Adjuvants:** The broad term that is used to describe any additional products used to increase the efficacy of pesticides (insecticides, fungicides, miticides, plant growth regulators, etc.)
- **Surfactants:** Surfactants are a type of adjuvants that reduce the surface tension of water upon contact with the crop's canopy. They effectively "spread-out" the water droplets to improve coverage.
- **Spreader-stickers:** This term used to describe a surfactant, which spreads out the water droplets, with the addition to a compound that prevents the droplets from rolling off the leaves.
- **Wetting agents:** This term is sometimes used incorrectly. Wetting agents are additives often amended to substrates to allow hydrophobic components such as peat moss to "re-wet" after they have dried down and prevent "channeling" down the side of the container wall. These compounds, liquid or powder-based, have different properties than surfactants and are not compounds that you can spray directly onto plants.

For further detailed explanation of these types of compounds, check out [Bulletin 1314 "Using Surfactants, Wetting Agents, and Adjuvants in the Greenhouse"](#) from the University of Georgia Cooperative Extension.



Figure 1. When using Capsil, a common greenhouse spreader-sticker, the water on poinsettia vegetable cuttings spreads out evenly over the leaves. Photo: Dr. Roberto Lopez.



Figure 2. Beading of water on poinsettia cuttings without using an adjuvant. Photo: Dr. Roberto Lopez.

Adjuvants are widely used in your everyday life: shampoo, dish detergent, car wash, hand soap, and much more. In greenhouses, adjuvants can be used to buffer solutions of pesticides, alter the pH making a plant growth regulator more effective, or otherwise change the chemical properties of solutions.

Now, with an understanding of adjuvants and surfactants: let's return to their use in vegetative cutting propagation. There is very little published research on the use of different adjuvants for greenhouses uses. This may be in part due to the fact that in most states, adjuvants are not federally registered with the environmental protection agency (EPA) and only require a state registration. Federal EPA registration requires in-depth research-based evidence in order to develop the label requirements. State registration does not have as strict of standards, which is why there are so many adjuvants on the market for agricultural uses (400+). Therefore, growers should be somewhat critical of the claims of adjuvants because there is not as much published research about them and should only purchase their adjuvants from a reputable supplier. Table 1 lists examples of common adjuvants used in greenhouses as either surfactants, spreader-stickers, or wetting agents.

Table 1. Examples of common adjuvants* used in greenhouses.

Examples of Common Adjuvants Used in Greenhouses				
Product (Trade Name)	Adjuvant Type	Class of Product	Application Location	Purpose
CapSil™	Spreader - Sticker	organo-silicone and non-ionic surfactants	Sprayed onto leaves	Increase spray or mist application uniformity
KleenGrow™	Surfactant	DDAC Quaternary Ammonia	Sprencn or sprayed onto leaves	Disinfectant and suppressing levels of bactericide/fungicide
Uptake™	Surfactant & Wetting Agent	DDAC Quaternary Ammonia	Drenched into substrate	Helps plants to better absorb pesticide drench applications
Green Cypress Ag Aide™	Surfactant & Wetting Agent	non-ionic surfactant	Drenched into substrate	An organically-labeled product which helps plants to better absorb pesticide drench applications
AquaGro L™	Wetting Agent	non-ionic surfactant	Substrate amendment	Helps hydrophobic substrates "re-wet" upon drying down

**This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by MSU Extension or bias against those not mentioned.*

While most people tank mix surfactants with sprays, there was one study that tested directly soaking unrooted cuttings in a common spreader-sticker used in greenhouses, Capsil. This [article](#) published by GrowerTalks Magazine in June of 2017 reviews an experiment performed at Clemson University where researchers soaked wilted poinsettia cuttings in a commonly-used adjuvant, Capsil, which is a spreader-sticker containing a mixture of organo-silicone and non-ionic surfactants. Researchers tested Capsil at the following rates in fluid ounces/100 gallons: 0, 2, 4, 8, 16, 32, or 64. The cuttings were removed from the solution at either 10, 20, 30, 40, 50, or 60 minutes. The adjuvant concentrations of 8 or 16 fluid ounces/100 gallons provided full rehydration within 40 minutes. The higher adjuvant concentrations also provided rehydration but also caused plant phytotoxicity.

Growers should always read the label with considering using an adjuvant for any greenhouse application. In addition, growers should be very careful with rates of wetting agent amendments if blending their own substrates because excess amounts can cause disfigured and stunted plants. When using either surfactants or spreader-stickers to help prevent desiccation of vegetative cuttings, growers need to be careful of the rates and frequency of application because over application can also cause phytotoxicity.

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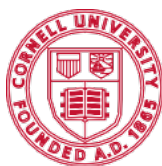
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