

# Improving crop performance with WakeUP *Spring* and *Summer*

Here's how to use our two new formulations of WakeUP! These new products replace — and enhance — older WakeUP versions we've proven in the past five years.



**WakeUP Spring** accelerates leaf sugar flow to young roots, stimulating early root growth. Use in liquid row support, or spray at two-leaf stage.

**WakeUP Summer** is a highly effective surfactant to increase leaf absorption and translocation of foliar-applied nutrients. Tank-mix with any foliar fertilizer needed by your crops, all summer.



Let's start with basic physics: WakeUP contains tiny colloids which *increase the mobility of natural sugars and foliar-applied nutrient solutions* in crop circulation.

It does this by *reducing surface tension* of spray solutions and plant sap. In water solution, WakeUP builds "micelles" — tiny lubricants which make sugars and other nutrients easier to pump through the plant's phloem tubes which feed crop growth.

**Surface tension is measured in "dynes."** Water has a surface tension of about 72 dynes. That's fairly "sticky." It's the reason dewdrops form on leaves. The surface of water adheres to itself, rather than the leaf, creating a droplet which can readily slide off the leaf.

If you add a half-ounce of WakeUP *Spring* to a gallon of water, water's surface tension drops to about 33 dynes. Most leaves have a surface tension above 33, so a WakeUP spray solution "clear coats" the leaf for immediate absorption.

A liquid with a surface tension below 40 dynes is easily absorbed through cell walls. Thus, WakeUP's tiny micelles absorb *directly into leaf cells*, carrying with them any nutrients or other products tank-mixed with WakeUP. If you add a half-ounce of WakeUP *Summer* to a gallon of water, the water's surface tension drops below 30 dynes. This makes our new WakeUP *Summer* a highly effective surfactant and internal transporter of foliar-applied nutrients.

There's an *optimum* surface tension that's best for nutrient absorption *and* plant moisture uptake.

If surface tension inside a plant falls too far, the plant loses some ability to extract soil moisture by capillary action in its xylem tubes. *All* nutrient pathways in the plant must work effectively, with less energy consumed for moving nutrients and moisture.

**Big roots are the main reason for WakeUP Spring.** It helps the sugar-making palisade cells pump sugars more easily to roots and other growth points. WakeUP *Spring* improves mobility of sugar-rich plant sap. The rooting response is easy to see. Here is how this happens: Roots exude into the soil about a third of the sugar flow from leaf chlorophyll.

The sugars are food which stimulates growth of

beneficial soil bacteria and fibrous mycorrhiza.

When healthy soil organisms are fed those extra sugars, they multiply exponentially all around the roots — the "rhizosphere." Under warm, moist conditions, microbe numbers double every hour.

Their billions of healthy bodies release soil nutrients which build 20% to 50% bigger, deeper roots. The organisms such as mycorrhiza become extensions of the roots, sponging up more moisture and more nutrients.

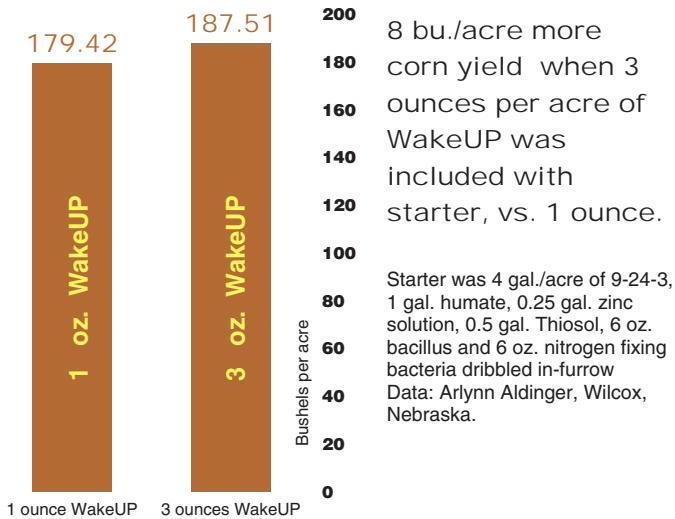
**Enhanced rooting is why it's important to apply WakeUP Spring at the two-leaf stage.** A larger, healthier and more fibrous root can extract more moisture and nutrients for a high-yielding crop. That deep root with abundant root hairs *preserves more yield under dry-weather stress.*

**You can easily confirm more vigorous rooting with WakeUP Spring:** About four weeks after application, dig 10 or 20 roots in treated strips. Compare those with roots dug from untreated strips. We want deep, fibrous crop roots like those corn roots in the photo below!



Here are three proven opportunities for lifting yields and crop quality with WakeUP.

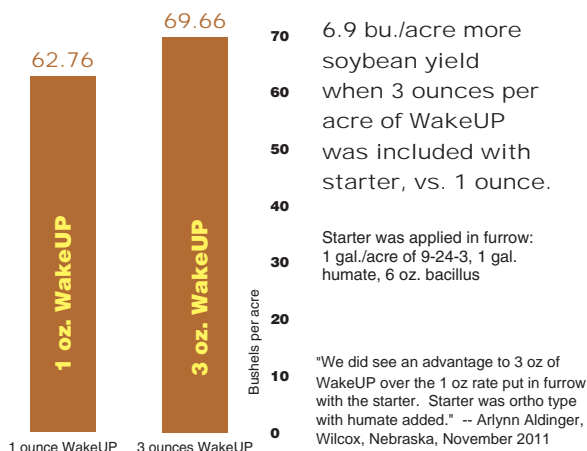
**1. Tank-mix WakeUP Spring with starter fertilizer** applied with your planter beside the row or in-furrow under the seed. Farmers showed us that just three ounces of WakeUP per acre applied in the seed furrow mobilizes “pop-up” fertilizer and lifts corn yields 2 to 6 bu. per acre. (The data in these two charts is based on an earlier formulation of WakeUP, which is available as *Soysoap* from Biobased USA of North Carolina. See [www.biobased.us](http://www.biobased.us)) We have changed the formulation, but retained the principles of creating colloidal micelles by reacting special-



ized alcohols and oils. The new formulation uses the highest quality tech grade or food grade ingredients available. We’ve also optimized the degree of surface tension reduction in corn and soybeans with extensive tests.

**A special caution on row support for soybeans:** *Be gentle with row support for soybeans!* The soybean seed has a thin outer shell called the *testa* which is sensitive to fertilizer or biological products placed in the furrow where it directly wets the seed coat. WakeUP *intensifies the wetting action of water or nutrient solutions* on this thin outer hull of soybeans.

If WakeUP Spring is used in a starter or pop-up solution for soybeans, we encourage applying it at least two inches



beside the seed row, or over the top of the row after the seed furrow is closed.

Some farmers say they get along fine with their pop-up liquids containing WakeUP when placed in the *bottom* of the seed furrow ahead of the seed, not over the seed.

Others use a “Y” drop on both sides of the seed furrow, so very little solution directly wets the seed.

Freddie Doub of East Bend, NC strongly cautions placing WakeUP solutions where the blend of water, starter and WakeUP can directly splash on the seed. He uses a higher rate of his own product similar to WakeUP called EverGreen. He applies 8 ounces per acre and places his starter and WakeUP 2x2 with his planter.

Doub points out that row support fertilizer rates can be higher by placement beside the row rather than in-furrow. Early root uptake is still very efficient, and you may be able to provide most of the needed soil-applied nutrients 2x2.

**In-furrow application on corn:** We recommend placement of nutrient, biological and WakeUP solutions under the seed, so emerging roots immediately absorb the nutrient blend and WakeUP Spring.

Corn is more tolerant of WakeUP on the seed. One of our earliest experiments with WakeUP several years ago was to wet seed corn with a 50-50 solution of water and WakeUP, place the seed in a planter and plant it alongside dry seed. Seed corn “primed” this way yielded an extra four bushels in our test at ACRES research farm here in Cedar Falls.

Of course, you’ll need to follow label instructions on your liquid fertilizer or other products for safe placement near the seed.

**Starter fertilizer tank-mixing instructions**

**Growers get creative with starter nutrient blends!** They tank-mix NPK starters, trace elements, sugar, “biological” products like microbial mixes and mycorrhiza.

WakeUP is compatible with some liquid fertilizers in concentrated form. But we strongly recommend diluting each ounce of WakeUP *with at least 10 ounces of water* before mixing it with nutrients and other products.

WakeUP is made to react with water, forming “micelles” with water molecules. Water enhances WakeUP’s ability to link up with other elements such as plant nutrients. These colloidal micelles — all from plant-based ingredients — are what make WakeUP different from other kinds of surfactants. The basic guide: Diluting WakeUP with water helps ease blending with your starter fertilizer. Water also makes an in-furrow starter blend safer on the seed.

Load the water and WakeUP base solution in the starter fertilizer tank first. Then add liquid NPK fertilizers, sugars and biologicals. *Always* test an unfamiliar starter mix, at your intended ratios, in a clean jar or pail before you make an entire tankful. Allow your jar test batch to react a few hours, and look for any jelling, separation or precipitation.

**2. Why it’s critical to spray WakeUP Spring at the two-leaf stage.**

For years, this has been the primary opportunity for



**Time to spray corn with WakeUP Spring.** The V2 stage of corn has two fully extended leaves. WakeUP which hits the ground is also picked up by fast-growing roots, so it's not wasted. We're seeing some evidence that WakeUP in the top inch of soil reduces evaporation, as it slightly slows down capillary action near the surface.

**Time to spray soybeans with WakeUP Spring.** The V2 stage of soybeans has two trifoliate leaves. They appear above the two single "true leaves." In these soybeans, the second trifoliate leaf is just unfolding. The root-building benefit of WakeUP Spring fades after the third trifoliate leaf emerges on soybeans.

using the sugar-mobilizing principles of WakeUP Spring to enhance early root growth in corn, soybeans, wheat and other crops.

In the three weeks after the two-leaf (V2) stage, young crops are sending photosynthetic sugars to their roots, establishing a foundation for season-long growth and reproduction. Corn is determining the number of kernel rows it will set. Some agronomists and plant physiologists say that a crop is, in effect, determining its maximum yield potential.

Getting this timing right, at the two-leaf stage, has been our toughest educational challenge with corn and soybean growers. They're typically accustomed to waiting to spray emerged crops with a herbicide around V5 to V7, when weeds have emerged.

*That's too late to trigger vigorous early root growth!*

**Corn:** Spray WakeUP Spring in the window of early V2 to early V3, when corn is less than "pop can" high.

Five ounces per acre in 10 to 12 gallons of water is a standard rate. You can apply WakeUP via a pivot system at this stage, too, if you have a sprinkler-type system that doesn't damage young corn.

Some growers, particularly in the South, apply up to 8 ounces at V2. We don't have yield data indicating that rates above 5 ounces per acre are more effective.

A good guide is to use a dilution in water that provides a wet clear-coat of water on corn. Heavily mineralized water may require a somewhat higher rate.

We recommend non-chlorinated water. Also, using water that's "structured" by a Pursanova or Ultimate Water system helps create a smooth, glossy coat on leaves.

If possible, spray in the early morning. Don't hesitate to spray WakeUP if you see dew on young leaves.

WakeUP will disperse dewdrops, soften the leaf cuticle and help leaves become a "sponge" to absorb moisture and WakeUP Spring micelles.

**Soybeans:** Spray WakeUP Spring at V2 to early V3.

Spraying during this important window is essential for vigorous early root development. Your application window starts when the second trifoliate leaf is unfurling, as in the photo above. The window closes when most soybean plants have a fully developed third trifoliate leaf.

That's a timing challenge, we know. But timing is essential to reach an objective of two to five extra bushels of soybeans — or more, if it's a dry season.

**If you see the fourth soybean trifoliate leaf emerge —** and you have not sprayed WakeUP Spring — it's becoming too late for substantial early root growth benefits.

At that point, your next opportunity becomes applying WakeUP Summer with foliar nutrients, or a late herbicide, to improve absorption and translocation of those products.

If all you have on hand is WakeUP Spring, it will also work well as a surfactant and mobilizer for foliar nutrients, but WakeUP Summer is designed for that purpose.

**Grain sorghum:** Spray *WakeUP Spring* at V2. Grain sorghum has a very fibrous root, which is enhanced by *WakeUP Spring*. Since grain sorghum typically encounters dry-weather stress where it's grown, *WakeUP Spring* treated grain sorghum often shows significant yield gains over untreated grain sorghum.

**Wheat:** First, let's look at winter wheat, drilled in the fall. Since the primary purpose of *WakeUP Spring* is root development, we recommend spraying 5 ounces per acre of *WakeUP Spring* after wheat has emerged two to three inches. This encourages deeper rooting, helps resist winterkill and provides a foundation for more tillering.

When winter wheat breaks dormancy in spring, spray another 5 ounces of *WakeUP Spring*. You can also include micronutrients tank-mixed with this application, if your early tissue tests indicate they're needed.

If you can only make one application of *WakeUP Spring* on wheat, go for the opportunity when wheat is breaking dormancy and greening up in Spring.

In southern states where freezing temperatures may not occur, omit the Fall spray on winter wheat. Farmers have reported that fall-treated wheat may continue growing through a warm winter without entering a dormant cycle. We don't have enough Southern experience to evaluate that observation, so we encourage caution.

**For spring wheat, spray *WakeUP Spring* when wheat has emerged two to four inches.** This is Feekes stage 1, before tillering begins. Wheat with 5 ounces per acre of *WakeUP Spring* in 10 gal. of water should look like this:

**Alfalfa; other hay crops:** Spray 5 oz. of *WakeUP Spring* per acre when about 2 in. of new growth has emerged.

After each cutting, spray *WakeUP Spring* when you see 2 in. of regrowth. Tank-mix nutrients with *WakeUP Spring* as needed by crop conditions.

**Fruit, vegetables and flowers:** You can foliar-

spray *WakeUP Spring* on garden vegetables and fruit throughout the growing season. Your objective with most of these crops is to mobilize sugars from leaves to the edible parts of the plant, and that's what *WakeUP Spring* is formulated to do.

We've found that *WakeUP Spring's* ability to mobilize



sugars is especially helpful in winter greenhouse conditions, where light isn't as intensive. Our potatoes in the photo above were sprayed three times, and they started blooming. Most of the leaves register a chlorophyll reading of 60 or higher, which is a deep, rich green.

Spraying garden crops once a week with a solution of 1 ounce of *WakeUP Spring* in 2 gallons of water is our standard recommendation. You can add soluble nutrients to this spray solution including NPK and trace elements.

**Caution:** *WakeUP solutions more concentrated than 1 ounce of WakeUP in 2 gallons of water are NOT better for your garden or produce crops!* You can scorch leaves or constrain capillary action from roots if you use a "hotter" dilution than 1 part *WakeUP* to 256 parts water.

If you have a 1-liter spray bottle and think in metrics, add 4 milliliters of *WakeUP Spring* in the 1 liter of water for a 1 to 250 dilution. This is our lab and greenhouse standard dilution when we test *WakeUP* on plants.

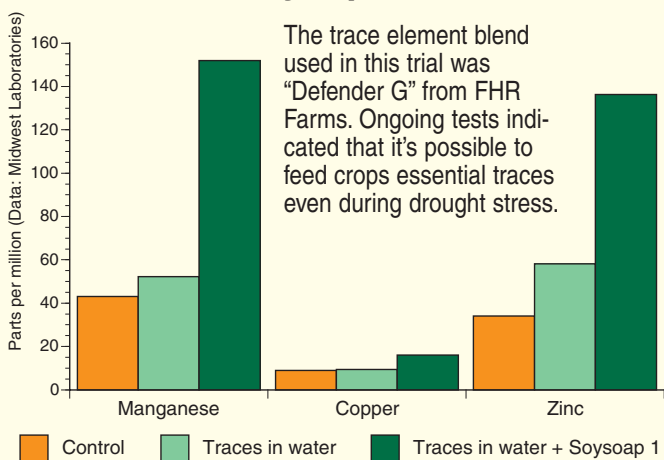
Your objective for delicious vegetables with good fertility and *WakeUP* is to achieve at least 12 brix (12% sugars) in the edible veggie. For example, green beans should test 12% to 16% dissolved sugars and other solids when checked with a refractometer or brix meter.

**3. Use *WakeUP Summer* as a surfactant and carrier when tank-mixing foliar sprays.**

Since 2009, we've focused our field research on a huge opportunity: Multiplying the effectiveness of foliar nutrients by using colloidal micelle technology as a surfactant and internal carrier. We formulated our new *WakeUP*

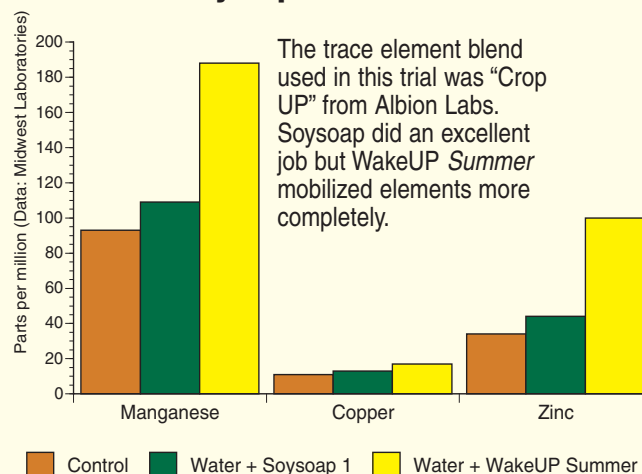


**Trace element content of soybean pods and beans with foliar-applied trace element blend, with and without Soysoap 1 in our 2010 tests**



In 2010, Renewable Farming LLC was the first to tissue-test foliar sprayed crops to learn how colloidal micelle technology can increase absorption and translocation of foliar nutrients. Then, the original "Soysoap" made by Biobased USA was the most effective surfactant/mobilizer we found. Results varied by type of nutrient, but typically a 1:256 solution of Soysoap increased nutrient transfer 50% to 300%. We labeled this product "WakeUP 1" through 2012, and have now replaced it with our own WakeUP Summer.

**Trace element content of corn at V3, 48 hours after spraying with trace elements in colloidal surfactants: Soysoap 1 and WakeUP Summer**



Based on three years of field trials, we began working with colloidal researchers in several U.S. companies in December 2012. Testing our unique formulations, we learned how to fine-tune WakeUP Summer specifically for maximum leaf absorption and phloem transport. We'll continue refinements with field trials, but current data indicate that WakeUP Summer is now the most effective surfactant/mobilizer we've found so far. It's also gentle on all crops we've tested, including tender herbs.

Summer specifically for this job: Increasing *absorption* of foliar nutrients, and *mobilization* of those elements from leaves to growth points.

We recommend adding 5 oz. per acre of WakeUP Summer to your tank mix when you apply foliar nutrients such as trace elements or NPK. The objective is basic physics of water using colloidal micelles: *Increase leaf absorption and internal translocation of the nutrient.*

We've done many tissue tests after foliar spraying since 2009. We consistently saw 20% to 80% greater translocation of foliar-applied nutrients into new growth or seed with use of several blends of colloidal micelle products, compared to spraying the foliar nutrient with water alone.

Now, tissue tests in 2013 indicate our new formulation, WakeUP Summer, is the most effective surfactant and transporter we've found so far. (We'll keep trying!)

Yield results in 2013 will tell us a lot more. But we're confident that yields will correlate well to the greater nutrient absorption and translocation we're measuring.

**Doubling foliar nutrient absorption** doesn't double the yield increase from that nutrient. But our general finding is that WakeUP will add about 80% to the benefit of the foliar nutrient alone *if the crop needs the applied nutrient.* For example, our average yield improvement was about 2 bu. per acre when we tested four foliar-applied micronutrients in 2011. That's compared to yield benefits when the micros were foliar-applied in water *without* WakeUP.

By tank-mixing WakeUP with the foliar micronutrient mix, yield benefit rose to 3.6 bu., or 80% more.

That yield gain was achieved with the formulation we used from 2008 through 2012. (It is still available from

Biobased USA of North Carolina, trademarked as "Soysoap.")

**Our new WakeUP Summer formulation** applies proven colloidal micelle principles, but is especially designed as a very active surfactant and transporter. Tissue tests show it's very effective at three jobs it's designed to do:

1. *Reduces surface tension* of the spray solution, so spray droplets clear-coat the crop leaf.
2. *Temporarily softens the waxy leaf cuticle*, enabling the leaf to sponge in the nutrient mix. If you spray WakeUP Summer on a cool, high-humidity morning, you can watch leaves absorb the spray in 10 to 20 minutes. The leaf appears dry, but the spray hasn't evaporated: It has *penetrated* quickly, carrying crucial micronutrients and NPK into the leaf with it.
3. *WakeUP Summer quickly metabolizes*, along with the nutrients it has carried into the crop.

Don't "over-apply" higher rates of WakeUP Summer. We recommend using the minimum amount needed to achieve a smooth, glossy "clear coat" with your water and combination of spray materials.

If you encounter dry summer weather, foliar feeding nutrients with WakeUP Summer could help provide critical nutrients which the crop can't take up from a dry soil.

**In the drought of 2012, one of our field trials focused on foliar-fed "rescue"** of a neighbor's soybean field (photo at right) which showed severe chlorosis on July 16. Dry soil had intensified potassium deficiency, and two applications of glyphosate had intensified chelation of micronutrients.

A long-presumed agronomic rule is that spraying foliar nutrients during dry-weather stress is futile because thirsty crops can't effectively absorb or translocate nutrients applied on leaves.

**WakeUP Summer** helps relieve this drought constraint. Using the previous version of WakeUP, we demonstrated that foliar feeding, properly managed, can salvage yield that would otherwise be lost in dry spells. We provided the crop with nutrients was not able to extract from the soil.

By July 27, in just 11 days, the second photo at right shows how we had supplied micronutrients, sugars, humates and potassium to restore new green leaf growth.

**Result: Greater new leaf growth, more pods, better pod fill and 27% higher yield on strips sprayed three times, compared with unsprayed strips.**

On some treated strips, the combine yield monitor kicked up to almost 50 bu. per acre. The unsprayed check strips remained chlorotic with low chlorophyll levels of around 19 on a SPAD meter (inset photo). Treated beans had SPAD readings in the 50s.

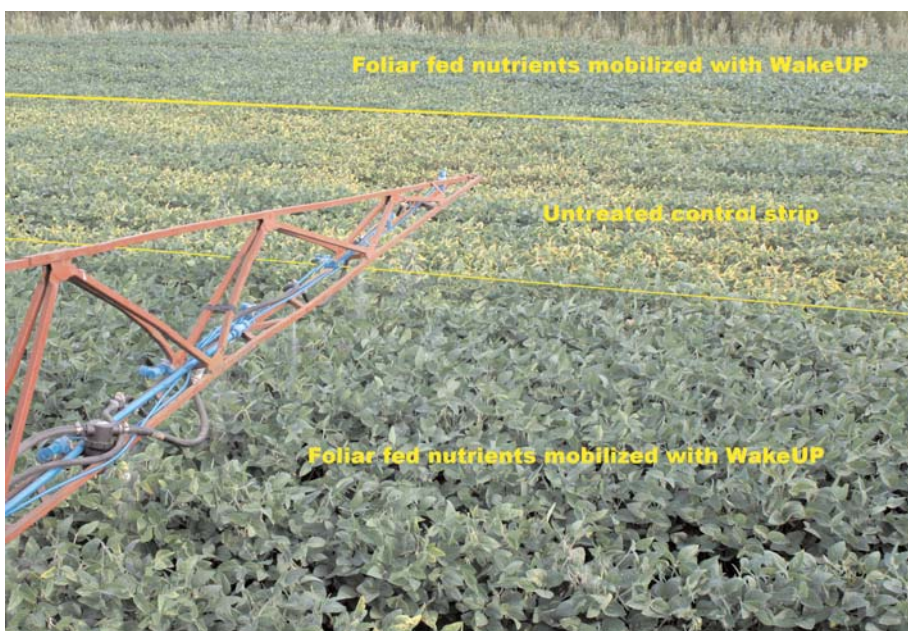
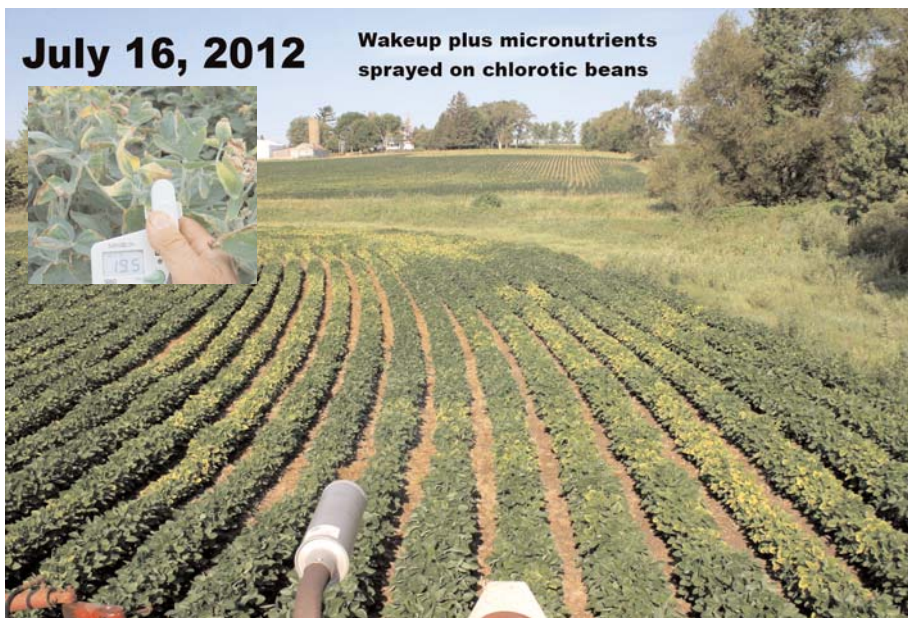
Sprayed soybeans kept pushing new top growth until frost hit. The photo at bottom right shows side by side treated strips, versus untreated strips.

This is evidence of what you can do to preserve yield if weather turns dry. We believe part of the benefit in this experiment was "capturing" the early dew by helping thirsty soybeans absorb it.

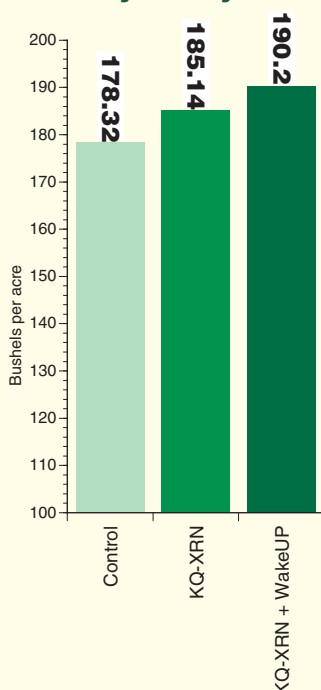
The report on this 2012 trial is on our website, and available by request.

Another point this little trial makes is that having your own high-clearance spray rig opens up opportunities for more intensive nutrient management with foliar feeding — on your schedule, not that of the custom spray operator. You don't need the latest GPS sprayer to do a good job with foliar feeding!

**Keep in mind that WakeUP is made from plant-source, food grade ingredients** including alcohols, fatty acids and oils. These are "saponified" with heat-producing reactions which create tiny colloids, not a dissolved solution. The colloidal micelles link water molecules with crop nutrients in your spray solution, and carry them into crop cells.



### Corn, 2010 Grundy County IA



**WakeUP Summer** tank-mixed with slow-release, low-salt liquid nitrogen or similar NPK nutrients gives high-quality nutrients more potential yield response.

We often use an extended release liquid nitrogen called KQXRN made by the Kugler Company, along with several other NPK and micro formulations from Verity Corp. and International Ag Labs.

The chart at left shows data from a replicated strip trial in Iowa with KQXRN and WakeUP in 2010. A calibrated combine monitor showed almost a 12-bu. gain by foliar spraying a tank-mix of WakeUP with a gallon of KQXRN nitrogen. The photo at right above was taken while spraying the half-mile rows. (This trial was done with formula we used to market as WakeUP 1, and is now known as Soyoap 1 made by Biobased USA).



In 2012, field trials on corn in northwest Iowa showed an average 15.9 bu. yield gain using 1 gallon of Kugler's KQXRN, a quart of Kugler's Micro Max trace blend, and 5 ounces of our former WakeUP 1. The job WakeUP Summer does for those nutrients is simply to *carry them into the leaf and the crop's metabolism system*. If you have only one opportunity to try a WakeUP product, we suggest that you use WakeUP Summer to enhance performance of a good foliar NPK fertilizer, or a micronutrient blend.

## Other benefits of WakeUP Summer in foliar sprays

### Reduces spray drift and evaporation.

We suggest spraying a moderately coarse droplet, with enough pressure to create turbulence in foliage so both sides of the leaf are clear-coated.

By using larger droplets instead of a mist, your spray pattern has less drift and evaporation. Farmers tell us, "It just sprays out nice."

When a spray droplet laced with WakeUP hits a leaf, it spreads out and hugs the leaf. We prefer spray nozzles that incorporate air into each droplet, so the droplets "explode" on hitting the leaf. However, flat fan patterns work well, too, especially if you angle them forward or backward to churn the canopy more vigorously.



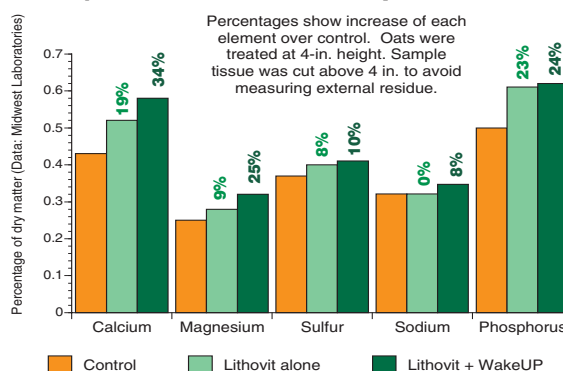
often enough to keep these powders suspended in a WakeUP and water mix.

We've tested this with several dry suspended powder products like Lithovit, a finely ground form of calcium.

Once bonded in the tank mix, WakeUP Summer also helps carry the tiny particles into leaves. Lithovit showed a 34% increase in plant tissue calcium when foliar-sprayed in a solution with WakeUP, compared to a 19% increase with Lithovit foliar-sprayed in

water alone. In the chart below showing this test on oats, note that other nutrients such as phosphorus rose in leaf tissue when we mobilized calcium.

**Percent increase in tissue nutrient content of oats 11 days after foliar spray with Lithovit (nanotech calcium) with and without WakeUP in tank mix**



### Helps suspend non-soluble foliar nutrients in your sprayer system

More farmers are spraying finely micronized rock powders, humates, microbial mixes and other products which can settle to the bottom of your spray tank.

Since WakeUP is a micelle, not a dissolved solution, the bipolar charges of its micelles adsorb to fine particles and help keep them suspended for easier spraying.

Even if you don't have a recirculation system in your sprayer tank, just field-motion turbulence in the tank is

We've foliar-sprayed various humate suspensions and rock powders as coarse as 60 mesh by suspending them in a solution of WakeUP and water.

This includes zeolite rock powder. It's called *clinoptililite* when finely micronized. Several Midwest agronomic researchers are interested in testing clinoptililite sprayed on corn for any benefit it may have in abating the goss's wilt bacterium. Our 2012 field study to mobilize clinoptililite looked promising, but we'll do more research.

Spraying crops with a powder suspended in water and WakeUP *Summer* dramatizes the smooth, glossy leaf coverage you can get with WakeUP. As moisture is absorbed into the leaf cuticle, some of the finer particles of the nutrient material are pulled past the leaf cuticle and into the palisade cells. Larger particles of the powder residue coat the leaf evenly, so beneficial bacteria on the leaf surface can feast on them and carry the minerals into the plant.

At right is a photo of a corn leaf sprayed with clinoptililite powder suspended in a tank mix of WakeUP *Summer*. This photo was taken about three minutes after spraying, and the moisture is already partially absorbed. Near the top of the leaf, it has been totally absorbed; the leaf is dry, and the coat of powder is so thin and uniform it can hardly be seen.

A few growers foliar-feed corn and soybeans five times. That includes feeding during the seed-bulking season, to increase nutrient density and test weight.

### **Keeps sprayer systems cleaner.**

There are at least five colloidal micelle products on the ag market. Their origins trace back to environmentally safe *cleansers*; thus names like "Soysoap" and "BioWash."

All variations of WakeUP help clean out spray systems including tanks, hoses, filters and pumps. We recommend a thorough spray system cleansing, using WakeUP *Summer* if you have it, before you use WakeUP in your spray solutions for the first time.

Our latest research formulation, WakeUP *Fresh*, is especially designed as our leading household and all-around farm cleaner — as well as a flower and garden foliar spray. We use either WakeUP *Summer* or WakeUP *Fresh* to cleanse our fresh vegetables for juicing. We use it to wash clothes, dishes, and as a hand soap that cuts grease.

Our competitors who make or market similar products are ecologically minded. We know them personally and consider them friends with a similar mission.

### **Slightly constrains evaporation loss.**

Water with lower surface tension also moves slower by capillary action. Thus, water with low surface tension "wicks" slower through fibrous or granular material — including soil. In lab trials where we sprayed WakeUP on bare soil, we found that WakeUP reduces the surface tension in the top inch of soil moisture, the film around soil granules. This top inch becomes a "slower capillary action zone" which restrains water migration to the surface. It's a little like a dust mulch of loose, granular soil on the surface, following cultivation. Early indications are that moisture



conservation can retain 5% to 10% more subsoil moisture.

We're studying this "soil mulch" effect further. Reduced capillary action isn't a factor in transferring nutrients from plant leaves to roots and growth points. Plants *pump* sap out of leaves with ion exchange through phloem tubes. WakeUP makes nutrient-rich solutions easier to pump through phloem.

However, capillary action is partially involved in lifting soil moisture up via xylem tubes. Thus, high concentrations of *any* colloidal micelle product can constrain moisture uptake. The physics are very real. That's why we stress that "more is not better" when you're applying any version of WakeUP.

### **Available: fast analysis of crop 'hunger.'**

International Ag Labs of Fairmont, MN is offering quick-turnaround plant tissue tests, so you can discern which nutrients your growing crop needs. They have a new automated ICP instrument that's very precise, and can e-mail you results fast.

We suggest sampling older, lower leaves for tissue analysis. If growing crops are not pulling up enough fertility from roots, they transfer nutrients from older, lower leaves. Thus, low levels of Mn, Zn and other traces will show up first in lower leaves, giving you a little more lead time to foliar-apply what your crop needs before growth stalls out. (And before lower pods on soybeans or bolls on cotton are aborted by the crop.)

#### **Contacts for questions on making the most profit with WakeUP**

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Click the "User Guide" link on our website: [www.renewablefarming.com](http://www.renewablefarming.com)