

# The Stimulant

A bi-monthly newsletter to inform readers about the latest news in the biostimulant industry. Our purpose is to educate readers about the crop and soil health benefits of biostimulants and feature data from our research.



## BioLiNE® Gold to the Rescue

**“For farmers that are looking to get an extra boost in yield and want to grow a healthier crop, I would highly recommend using BioLiNE® Gold.”**

**- Paul Purves, Farmer, 2018**

BioLiNE® Gold Fulvic Acid had a big impact on soybean field trials this past growing season. One of these trials was carried out by Paul Purves, a farmer in Lambton County, Ontario. The farm used for the trial has silty loam soil. Paul seeded an 80 acre lot with DEKALB® Roundup Ready 2 Xtend®. To test the impact of BioLiNE Gold he used a single foliar treatment of BioLiNE Gold mixed with Roundup®. He treated **40 acres with Roundup**

**only (as control)**, 20 acres with 500 mL (17 oz) per acre of BioLiNE® Gold, and the remaining 20 acres with 1 L (34 oz) per acre of BioLiNE® Gold. The lot was seeded on May 30<sup>th</sup> and the foliar treatments were applied on July 17<sup>th</sup>.

The growing conditions were not ideal this season as there were higher temperatures and prolonged periods of little to no moisture. The high heat and dry conditions experienced this season

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caused a drop in the average yield of soybeans from 50 bu/acre in the previous season (2017) to only **40 bu/acre** this season. The 40 bu/acre was the average yield measured across the 40 acres of control with no BioLiNE® Gold treatment.

Both of the BioLiNE® Gold treated plots resulted in significant yield increases. The single foliar treatment of 500 mL (17 oz) per acre resulted in the yield of soybeans increasing by 7 bu/acre to **47 bu/acre**. The 20 acres treated with 1 L (34 oz) per acre of BioLiNE® Gold resulted in a **65 bu/acre** yield. This 65 bu/acre was the average yield across the 20 acres treated and was the highest yield that Paul has ever harvested from that field. This amounted to about 15 bu/acre more than the typical average for that field and 25 bu/acre more than the control for this season.

Beyond the yield numbers, the use of BioLiNE® Gold increased the number of pods per plant and the average pod weight per plant. We believe one potential reason for the fantastic yield response was the impact that BioLiNE® Gold had on mitigating the negative consequences of heat/drought stress.

The growing season this year consisted of long stretches of very hot weather with no precipitation. Under these conditions the plants' ability to uptake many essential nutrients like potassium (K) are adversely impacted. Nutrient deficiency at critical growth stages can impact the number of flowers that abort which ultimately never contribute to yield. About half of flower abortions occur before the flower develops into young pods, and the other half is due to pod abortion. The use of BioLiNE® Gold increased the number of

productive pods per plant from 25 to 33, as well as the average weight per pod from 12.5 g to 15.1 g. The combination of increased number of pods set and increased weight of seeds per pods resulted in the 25 bu/acre increase observed.

Aside from dramatically increasing the yield of the soy treated with foliar BioLiNE® Gold, Paul observed that "there were no problems with mixing it with my herbicide, and the BioLiNE® mixture didn't clog my sprayer". The soybean plants treated with BioLiNE® Gold were taller and healthier looking, and there was a distinct visual difference in comparison to the control. **Stay tuned for more field trial results in future editions of The Stimulant Newsletter!**



Sample soybeans from 2018 field trial with control (left), 500 mL/acre BioLiNE® application (middle), and 1 L/acre BioLiNE® application (right). Randomly selected 50 m into field from the border of the plot (2018/10/12).

# Biostimulants: Challenges and Opportunities

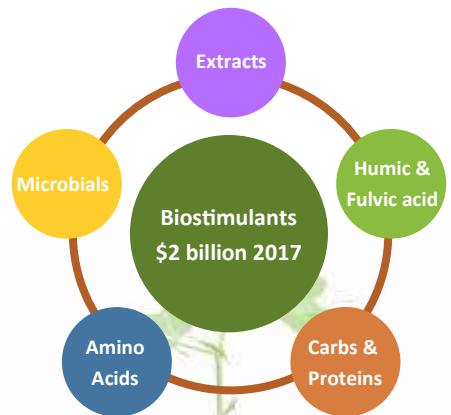
The global biostimulant market is currently estimated to be around \$2 billion, and is estimated to grow to \$3.77 billion by 2023. But what exactly is a biostimulant? From the perspective of the biostimulant industry, the U.S. recently passed a landmark Farm Bill (Agriculture Improvement Act of 2018). The Act provides the first statutory language defining biostimulants. In the Act, a plant biostimulant is defined as "a substance or micro-organism that, when applied to seeds, plants, or the rhizosphere, stimulates natural processes to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield." This definition is in line with the definition provided by E.U. Scholars who have categorized the various biostimulants into the following groups of active ingredients: 1. acids (humic and fulvic), 2. microbial inoculants, 3. protein hydrolysates, 4. amino acids, and 5. extracts.

According to David Beaudreau, senior vice president of Biostimulant Coalition, there are two main challenges when it comes to the biostimulant industry: uncertain market regulations in

some regions, and saturation of biostimulant products in other regions. The European biostimulant market is currently leading when it comes to commercialization and use (Global Biostimulants Market Research Report, 2018), with North America catching on as farmers adopt more innovative ways to increase their yields while protecting the environment. The big question for observers of this industry is what the return of investment is for the biostimulant companies. The difference in ROI between the large, established companies is quite significant compared to start-ups working to get a foot in the door in this growing industry. The companies in the biostimulant industry that will make a difference are those that are able to show the benefits of the products and have the scientific data to prove their claims.

Many scholars and industry experts predict continued upward pressure and increased demand for agricultural products. When this increased demand is coupled with anticipated reduction in arable farmland it exasperates the need for increased productivity. Innovative, affordable, and scalable bi-

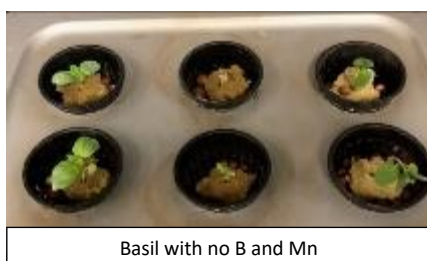
ostimulants will provide opportunities for growers to increase their productivity and cash-in on this demand. Biostimulants can increase yield, and improve soil health and the tolerance of plants to various forms of stress. Many biostimulants are derived from natural and/or organic sources, and use natural and/or biological mechanisms as the primary mode of action. The industry needs to conduct research into understanding these mechanisms, and modes of action. For our part, BioLiNE® Corp. has launched a multi-disciplinary research initiative in collaboration with multiple stakeholders. Our objective is to increase the science and understanding surrounding biostimulants and their modes of action. **Stay tuned to The Stimulant, as we release details of our project.**



# Overcoming Stress

One of the many properties of fulvic acid is its ability to protect crops against environmental stress. According to studies on the effects of fulvic acid (Yakhin et al., 2017; Xu & Geelen, 2018), the presence of fulvic acid in the soil or other growing mediums help to mitigate abiotic stresses such as pH imbalances, extreme heat and drought, nutrient deficiencies, heavy-metal toxicity, and high salinity.

In a recent study, we tested the effect BioLiNE® Gold fulvic acid has on aiding plants, specifically basil, overcome stress due to toxic levels of copper (Cu) and deficient levels of boron (B) and Manganese (Mn). We conducted these trials on basil that was grown in a hydroponic system. Hydroponic systems are a great tool for research, enabling us to isolate the impact of individual nutrient deficiencies and toxicities. Hydroponic systems provide a very high level of control over all variables, and enable the researchers to manipulate one variable by keeping others constant and consistent across the trials.



Basil with no B and Mn

The results of the trial with BioLiNE® Gold confirmed previously reported research on the ability of fulvic acid to mitigate the negative impacts of Cu toxicity. Furthermore our trials showed significant and dramatic improvement in the growth of basil in a nutrient mix deprived of Mn and B.

The basil plants grown in hydroponic solutions that contained BioLiNE® Gold had significantly greater height and yield when compared to basil plants grown under the same conditions but without BioLiNE® Gold in the hydroponic solution. For Cu toxicity, we produced a hydroponic growing solution with 20x greater Cu concentration than recommended. Comparing the results, the high levels of Cu considerably stunted the growth of basil. On the other hand for the solution that had BioLiNE® Gold, plant growth was marginally affected and the yield of basil was 185% greater.

For basil plants grown in hydroponic solutions that had no B and Mn, there was no plant established. All basil



Basil with no B and Mn with BioLiNE®

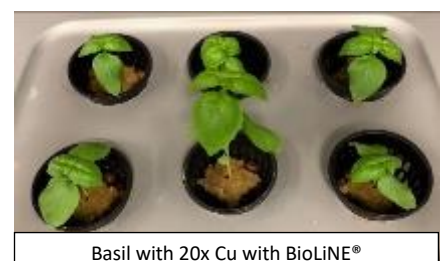
plants were severely stunted. When BioLiNE® Gold was included in the hydroponic solution, basil plants were established with decent yield. The difference in weight of the plant equated to a 1030% increase in wet weight.

Through these initial experimental trials we have observed significant response to BioLiNE® Gold, however we are still unclear on the mode of action. Further research is required to determine how BioLiNE® Gold enables the plant to thrive. The response is not isolated to basil, with similar responses observed with lettuce.

One theory for how BioLiNE® Gold overcomes heavy-metal toxicity such as Cu induced toxicity is that BioLiNE® Gold decreases excessive uptake of transitional metals. This is a phenomena observed with fulvic acid by other researchers (Pinto et al, 2004). A theory for how BioLiNE® Gold enables the plant to thrive in hydroponic solutions with no B and Mn is that there are trace concentrations of these elements in BioLiNE® Gold, and although they are very low, there is enough available to elicit growth.



Basil with 20x Cu




Basil with 20x Cu with BioLiNE®

# Industry News

“Federal government invests \$70 million in Agri-Food Canada’s (AAFC) research partners to ensure Canadian farmers become more involved and benefit from advanced agricultural research” 

“The president of Canadian Federation of Agriculture (CA), Ron Bonnett is stepping down after 8 years in his leadership position” 

“Did you know Ontario does not yet have its own organic regulations for organic producers? A 3rd attempt to pass a bill in Ontario Legislature is underway” 

## Upcoming Events

Jan 24-27	<a href="#"><u>Guelph Organic Conference &amp; Tradeshow</u></a>	Guelph, ON
Feb 20-21	<a href="#"><u>Ontario Fruit &amp; Vegetable Convention</u></a>	Niagara Falls, ON
Feb 20-21	<a href="#"><u>Innovative Farmers Conference</u></a>	London, ON
Mar 6-8	<a href="#"><u>London Farm Show</u></a>	London, ON
Apr 4-5	<a href="#"><u>Grey to Green Conference</u></a>	Toronto, ON

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