

PROJECT NO: BJKX60, BJKT07

TITLE: Efficacy trials of biostimulant products

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Dr. Kurt Schroeder, Ext. Cropping Systems Agronomist (Moscow)
Staff: Program staff
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JUSTIFICATION: Biostimulants are a new category of products aimed to promote root health and stimulate beneficial microbial activity in the soil. These products are often a complex mix of multiple components. The abundance of products on the market claiming to improve yields is mind boggling. Although some products (organic certified fungicides, biocontrol agents, microbial biostimulants, organic teas) marketed to agricultural producers are beneficial, some of these products purported to stimulate plant health and improve yield in fact do neither. Unbiased research testing is required to validate efficacy of product claims and to test the feasibility of using biostimulant products in wheat production.

HYPOTHESIS & OBJECTIVES: Our hypothesis is that improvements in soil health and plant growth can be achieved by application of biostimulant products, and that multiple years of application to the same sites will have a cumulative benefit to plant health. Our specific objectives are to:

- 1) Determine the efficacy of biostimulant products after three cumulative years of application.
- 2) Develop recommendations for biostimulants application in winter wheat.

PROCEDURES: Biostimulant products were applied to the seed at planting as well as to the foliage during 2013. These plots were reseeded in the fall of 2014 using the same seed treatment prescription and seeding into the same plot locations used in 2013. The two locations include a field in Aberdeen that had been fallowed for three years prior to initiating this study and a research site on the Kambitsch Farm near Genesee. For the current growing season, the seed treatments were applied as described in the table below and two topdress applications will be made in the spring of 2015. This is a reduction from the three treatments proposed in 2014 and is intended to reduce the overall costs for the biostimulants applications in wheat systems. The products include two Agri-Gro products, IgniteS² applied to the seed at planting and FoliarBlend applied in the spring to the growing crop. A 30 ft buffer with no biostimulants product was seeded between each of the treatments to prevent carryover.

Treatment	Seed Treatment		Foliar Blend Protocol	
	Fungicide/ Insecticide	Ignite ^x	Tillering	Flag Leaf Emergence
1	Yes	No	-	-
2	Yes	Yes	-	-
3	Yes	No	FoliarBlend ^y	FoliarBlend
4	Yes	Yes	FoliarBlend	FoliarBlend
5	No	Yes	FoliarBlend	FoliarBlend
6	Yes	No	Micro + N-P-K ^z	Micro + N-P-K

^xIgniteS² applied at 16 oz/cwt. This is an increase over the 2013 rate of 8 oz/cwt.

^yFoliarBlend will be applied at a rate of 24 oz/A at tillering and flag leaf emergence, and at 16 oz/A at boot stage.

^zThe Micro + N-P-K will be a foliar spray of similar concentration of micronutrients and macronutrients that are found in the FoliarBlend product. The micronutrient blend applied for this control will be Bioburst Concentrate (J.R. Simplot Company).

Each of the above treatments was applied in a randomized complete block design with six replicate blocks. For the 2015-2016 crop season, additional applications of the same products to the same sites within each plot locations will be made as described above. This will make three consecutive years of biostimulants application to the same portions of the fields. Parameters to be measured will include plant stand, root mass (biomass), date of active spring growth, plant height, heading date and maturation date. Any obvious disease will also be assessed at each locations. Measurements of active soil carbon will also be made to assess soil health and microbial activity. Plots will be monitored for disease and pest issues and differences between treatments will be documented. At harvest, yield, test weight and grain protein data will be collected.

DURATION: Third of three years. FY2014 was initiated in the fall of 2013 in Aberdeen and Genesee. Funding was obtained in an off-year cycle in order to initiate the research. The project will be completed in the fall of 2016.

COOPERATION: Ross Nielson, Business Development with Agri-Gro, is providing product for testing.

ANTICIPATED BENEFITS/EXPECTED OUTCOMES/INFORMATION TRANSFER: Multiple applications of biostimulants are expected to have a cumulative effect and benefits of these applications may be more likely in the second and/or third year of application. Testing of biostimulant products will provide growers and the wheat industry with objective, replicated research results that will highlight the potential benefits of biostimulant products. The results of this research may be presented at field days or cereal schools and will be made available through published material and the extension websites.

LITERATURE REVIEW: Biostimulant products have been used for many years on a variety of crops. The traditional biostimulants consisted of live microorganisms applied to seed or in furrow (plant growth-promoting rhizobacteria). Although these types of treatments were beneficial in suppressing pathogens and improving plant vigor, they were difficult to formulate, often had poor shelf lives and required care when applying to seed or soil. Seed meals, such as those from canola

were used to stimulate microbial activity for the purpose of disease suppression and improvement in plant vigor; however, large quantities of these materials are required, making this method uneconomical for wheat production. More recently, many new biostimulant products have come onto the market, spurred by the expanding organic industry and public demand for safer food. These are often quite complex formulations that may consist of ingredients such as humic acid, amino acids, seaweed extracts, micronutrient and many other substances. The majority of use for these products is in the organic production markets. There may be benefits to using some of these products as seed treatments or foliar sprays in non-organic farming systems. However, very little information exists for the benefits of these products on wheat.

Chen, S.-K., Edwards, C.A, and Subler, S. The influence of two agricultural biostimulants on nitrogen transformation, microbial activity, and plant growth in soil microcosms. *Soil Biology and Biochemistry* 35:9-19.

Mazzola, M., Granatstein, D.M., Elfving, D.C., Mullinix, K. 2001. Suppression of specific apple root pathogens by *Brassica napus* seed meal amendment regardless of glucosinolate content. *Phytopathology* 91:673-679.

Weller, D.M. 1988. Biological control of soilborne plant pathogens in the rhizosphere with bacteria. *Ann. Rev. Phytopathol.* 26:379-407.

IDAHO WHEAT COMMISSION - BUDGET FORM

Allocated by	Idaho Wheat Commission	during FY 2014	\$	14,000
Allocated by	Idaho Wheat Commission	during FY 2015	\$	14,000

REQUESTED FY 2016 SUPPORT:

	Salary	Temporary Help	Fringe	Travel	OE	Grad Fees	TOTALS
Idaho Wheat Commission	\$ -	\$ 5,404	\$ 1,596	\$ 1,000	\$ 6,000	\$ -	14,000

OTHER RESOURCES (not considered cost sharing or match):

TOTAL OTHER RESOURCES \$ -

TOTAL PROJECT ESTIMATE FOR FY 2016:	\$ 14,000 (Requested)	\$ - (Other)	\$ 14,000 (Total)
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BREAKDOWN FOR MULTIPLE SUB-BUDGETS:

	<i>Marshall</i>	<i>Schroeder</i>	<i>(PI name)</i>	<i>(PI name)</i>
Salary	\$ -	\$ -	\$ -	\$ -
Temporary Help	\$ 2,702	\$ 2,702	\$ -	\$ -
Fringe Benefits	\$ 798	\$ 798	\$ -	\$ -
Travel	\$ 500	\$ 500	\$ -	\$ -
Operating Expenses	\$ 3,000	\$ 3,000	\$ -	\$ -
Graduate Student Fees	\$ -	\$ -	\$ -	\$ -
TOTALS	\$ 7,000	\$ 7,000	\$ -	\$ -
Total Sub-budgets \$				14,000