Washington Grain Commission
Wheat and Barley Research Annual Progress Reports and Final Reports
Project #:

Progress Report Year: __2__ of __3__ (maximum of 3 year funding cycle)

Title: Assessment of soil acidity on soil-borne pathogens, weed spectrum, herbicide activity, yield, and crop quality on dryland wheat production.

Principal Investigators:
Christina Hagerty, Assistant Prof. of Cereal Pathology, OSU, CBARC, Pendleton, OR
Paul Carter, Associate Prof., Regional Extension Soil Specialist, WSU, Columbia County, WA

Cooperators:
Kurt Schroeder (U of I), *Tim Murray* (WSU), *Stephen Van Vleet* (WSU), *Judit Barroso* (OSU), *Stephen Machado* (OSU), *Don Wysocki* (OSU).

Executive summary: To initiate this long-term research effort, 24 x 50ft. plots were established in fall 2016 and treated with four ultrafine liquid calcium carbonate treatments (0, 600, 1200, and 2400 lbs/acre) with 4 replications. The plots were soil tested in April 2017 and April 2018 and successfully established different soil acidity levels ranghing from pH 4.85 to pH 6.65. Micro-nutrients were applied based on soil test results and included Zinc, Boron, and Copper. The plots were established in three distinct production zones in order to make the results of this research effort applicable to a wide audience of producers, provide a robust multi-location dataset, and understand how the effects of liming and soil acidity may differ regionally. The three locations include: CBARC Sherman Station in Sherman County, OR (11 in. annual rainfall), the CBARC Pendleton Station in Umatilla County, OR (16 in. annual rainfall), and in Whitman County, WA at the Palouse Conservation Field Station (PCFS) and in a farmer's (Clark) field (18 in. annual rainfall). The project was initiated in 2017, and our first year of yield data do not yet indicate a significant effect of lime application on yield. In 2017, plots were established in spring wheat following fallow (Oregon locations) and re-cropping following chickpeas in Whitman County. In 2018 we began the typical winter wheat-summer fallow rotaion for the Oregon plot sites, and annual cropping system in Washington.

Impact: Soils below a threshold of pH 5.2 are considered poor management and below the critical level for optimum grain production. Most dryland wheat production soils of the PNW are at or below the pH 5.2 critical threshold. This study will help quantify the impact of soil acidity to local wheat production and will serve as a foundation to develop solutions to affordably address soil acidity in the dryland PNW.
The measureable impacts in the most recent funding cycle:

1. Preliminary results indicate that modest applications of agricultural lime are effective to begin to buffer acidic soils in the dryland wheat production region.
2. This project is increasing the awareness about the issue of soil acidity in the PNW. In addition, the project has assured producers that the PNW wheat research community is addressing the soil acidity problem, and ultimately working on economical solutions to help manage soil acidity.

WGC project number:
WGC project title: Assessment of soil acidity on soil-borne pathogens, weed spectrum, herbicide activity, yield, and crop quality on dryland wheat production.
Project PI(s): Christina Hagerty and Paul Carter
Project initiation date: July 1, 2017
Project year (X of 3-yr cycle): This year 2 of 3

Objective	Deliverable	Progress	Timeline	Communication
Quantify impact of soil acidity on soil-borne pathogens	Quantify pathogens in each soil pH treatment, statistically evaluate the relationship between pathogens and pH	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience
Quantify impact of soil acidity on weed spectrum	Quantify weed spectrum in each soil pH treatment, statistically evaluate the relationship between weeds and pH	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience
Quantify impact of soil acidity on herbicide activity	Quantify herbicide activity in each soil pH treatment, statistically evaluate the relationship between herbicide activity and pH	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience
Quantify impact of soil acidity on yield	Quantify yield in each soil pH treatment, statistically evaluate the relationship between yield and pH	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience
Quantify impact of soil acidity on crop quality	Quantify crop quality in each soil pH treatment, statistically evaluate the relationship between quality and pH	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience
Understand more about the total picture of the impact of soil acidity on the dryland wheat production system	Synthesize the parameters listed above to understand more about the total impact of soil acidity on the Columbia Basin dryland wheat production region.	Replicated plots ranging from pH 4.85 - pH 6.65 were sucessfully established in three different locations	Fall 2019	Extension programming to communicate results directly to grower clientele and peer reviewed publications to communicate results to the scientific audience