Calibration of Nitrogen Requirement of Oats Grown for Grain in South Dakota

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Background

The fertilizer recommendations guide for South Dakota (SD) crops was last updated in 2005 (EC750, 2005), and the nitrogen (N) recommendations for the oat grain crop are higher than guidelines recommended by other public institutions. The SD guideline uses expected yield goal to be multiplied by 1.3 (minus soil test N and legume credit) to estimate total N requirement by the oat crop. Perhaps, due to improved genetics and other management tools, producers in productive environments have consistently grown oat crop with yield of more than 100 bu/a with significantly lower levels of nitrogen than recommended in the EC750 guide. The proposed study aims at developing an up-to-date nitrogen fertilizer recommendation for oats grown for grain production in SD. This will help narrow the knowledge gap among oat growers in terms of applying the correct amount of nitrogen fertilizer on oat crops to maximize production and profitability, and avoid lodging. Sharing results from each growing season in the form of web articles (igrow.org), fact sheets/publications, summer field days, winter crop meetings, and events organized by other education groups such as USDA-NRCS will effectively impact the decision making for oats producers in SD and surrounding regions. Application of fertilizer N as required by the crops will benefit growers to obtain highest yield potential without negative impact on environment.

Goal and Objectives:
The goal of the proposed study is to develop a revised nitrogen fertilizer recommendation for oat grown for grain production in SD environments. The objective of this study is to determine oat yield response to varying levels of applied nitrogen fertilizer. Some SD growers have shown interest in using plant growth regulators (PGR) to shorten plant height as a mean to prevent lodging. In one or more location, we used both growth regulator and nitrogen levels as treatments. This will allow us to see if there is any financial benefit of using growth regulator to increase grain yield by applying higher N rates without potential crop lodging.

2020 Growing Season- Covid19 Updates

The project is in progress as usual. This year, we have three SDSU Research Farms (Aurora, Northeast, and Southeast) and two farmer cooperators fields in Buffalo and Minnehaha County. Due to travel restrictions, initial fertilizer treatments (at planting) were applied by the Research Farms and farmer cooperators. In addition to nitrogen fertilizer, plant growth regulator is being tested at SDSU NE and SE farms this year.

2019 Growing Season

Effects of N Rates on Oat Performance in 2018 Growing Season

The average grain yields were inferior to previous test years. At SE farm, the yield ranged from 30 bu/a (60 lbs N) to 55 bu/a (100 lbs N) whereas, at Aurora and Garretson the yields ranged from 87 bu/a (control) to 113 bu/a (20 lbs N) and 67 bu/a (control) to 94 bu/a (60 lbs N) respectively. The rates did not show significant effects on lodging and plant height.

Effects of N Rates and Plant Growth Regulator on Oat Performance in 2018 Growing Season

In 2019 the Palisade treatment was only tested at NE farm. It was applied at 14 oz/a with at least 15 gallon of water at Feekes 6 growth stage (1st node visible). The label states for 10.5 to 14.4 oz per acre from Feekes 4 (leaf sheath strengthening) to Feekes 7 (2nd node visible) growth stages. The total available N (legume credit + soil test N) prior to the application was 80 lbs/a.

The average yields ranged from 75 bu/a (control plot with Palisade) to 113 bu/a (140 lbs N with no Palisade). Due to weather factors and comparatively lower yields than in usual year, we did not notice much lodging at the site, however, the PGR showed significant effects on plant height.

Grain Quality Parameters

Sub-samples taken from each plot from all test sites were run for several grain quality parameters at the General Mills laboratory. Among the sites tested for nitrogen rates (i.e. Aurora, SE Farm, and Garretson), only grain protein content from Garretson samples showed significant positive response to applied nitrogen. Other quality measures such as plump grain, thin grain percent, groat percent, beta glucan, and fatty acid content did not show significant response to applied nitrogen at these sites.

At NE farm, we added plant growth regulator as a variable in addition to nitrogen rates. Plant growth regulator (PGR) showed significant response to protein content and grain plumpness while, nitrogen rate showed significant effects on protein content and percent groat.

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