

A PROPOSAL TO  
**NORTH CAROLINA SMALL GRAIN GROWERS ASSOCIATION, INC.**

FOR RESEARCH OR EDUCATION ENTITLED:  
**Identifying Economically Beneficial Disease Management Strategies  
in North Carolina Wheat – Year 4**

COVERING THE PERIOD FROM **10/01/2023** TO **09/30/2024**

REQUESTING SUPPORT IN THE AMOUNT OF **\$9,800**

SUBMITTED BY:

Project Leader	Departmental Affiliation
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*Note: This is a fundamental research or scholarly project and, as such, the University shall be free to publish or disseminate the results of this research or otherwise treat such results as in the public domain, and it will conduct the research in an open forum consistent with the University's mission of research, instruction and public service.*

**OBJECTIVE(S):**

1. Evaluate efficacy of active ingredients and application timing on wheat yield and quality
2. Determine the overall economic benefit of the disease management options when weighing input costs against fungicidal treatments

**PROJECT DESCRIPTION AND RELEVANCE:**

Existing research shows that fungicide applications on wheat in the absence of fungal disease are not profitable. For the last three years, this study has aimed to identify the optimal fungicide approach that will achieve the widest and most reliable profit margin to the grower. We have two years of data from the Piedmont region where minimal disease was observed, and this contributes significantly to answering the research questions. We have one year of data from the Coastal Plain with moderate to high disease pressure (mainly powdery mildew and leaf rust). In order to accurately update the existing recommendations for North Carolina small grain growers, we must now repeat the experiment in an eastern location of the state where fungal disease pressure tends to be higher. This project will build on the work we conducted in 2021, 2022 and 2023 by ensuring validity of conclusions across regions in North Carolina.

Variables in the study will continue to include fungicide mode-of-action and application timings. Data to be collected include disease severity, wheat yield, quality, market price received, and fungicide application costs. The results of this project will contribute to the scientific body of work on the topic and, most importantly, update science-based disease management recommendations for North Carolina growers.

**MATERIALS AND METHODS**

Research will be conducted at the NCDA Caswell Research Station in Kinston, NC. Wheat samples will be submitted to a wheat quality testing lab.

The replicated small plot research will examine the effects of the following treatment combinations in a split-split plot design including non-treated controls:

- 1) Susceptible vs. resistant variety
- 2) Fungicide 1, Fungicide 2, Fungicides 1&2, no fungicide (check)
- 3) Application timings at top-dress, flowering and top-dress & flowering

The effects of these treatments and interactions between treatments will be compared against the economic input data on:

- 1) Yield
- 2) Quality
- 3) Input costs, including fungicide product and application costs
- 4) Market price earned at the time of harvest for both feed wheat and milling wheat

The results of this project will be presented in the project report, extension educational meetings, a scientific presentation, and a small grains portal blog post.

**RELATIONSHIP TO SIMILAR PROJECTS, IN NC AND OTHER STATES:**

- 1) Cowger, C., Read, Q.D., Clark, L., and Dong, Y. 2023. Optimal Timing of Fungicide Application to Manage Fusarium Head Blight in Winter Barley. Plant Disease, 30 Jun 2023. <https://doi.org/10.1094/PDIS-01-23-0021-RE>

This research conducted on small grains in North Carolina identifies the optimal fungicide application timing to prevent Fusarium head blight in barley. Due to the direct relationship between growth stage and the ability of FHB to infect small grain species, this study supports the importance of determining the optimal timing of fungicide applications to wheat to prevent yield loss.

- 2) Roth, M.G., Mourtzinis, S., Gaska, J.M., et al. 2021. Wheat grain and straw yield, grain quality, and disease benefits associated with disease management intensity. *Agronomy Journal*. 113:308-320. <https://doi.org/10.1002/agj2.20477>

This study was conducted in Wisconsin and revealed that in the upper Midwest a more intensive management system improved yield, test weight and net income and reduced disease prevalence. The intensive management systems tested included nitrogen management as well as foliar fertilizers and multiple mode of action fungicides. Due to the scope of that study we cannot identify which treatment may lead to a benefit to North Carolina growers. These results do indicate, however, that in a year of high disease pressure we may see increased yield, test weight and net income for growers in North Carolina from the use of fungicides.

- 3) Weisz, R., and Cowger, C. 2011. Multiple mid-Atlantic field experiments show no economic benefit to fungicide application if fungal disease pressure is low or absent in winter wheat. *Phytopathology* 101:323-333.

A total of 42 publicly sponsored tests of fungicides on soft red winter wheat in Virginia and North Carolina were analyzed for the period 1994 to 2010. All tests were replicated and had a randomized complete block, split-plot, or split-block design. Each test included 1 to 32 cultivars and one to five fungicides (two strobilurins, one triazole, and two strobilurin-triazole mixtures). To calculate profitability, data used included grain price and fungicide application costs including drive-down losses. With routine fungicide application based solely on wheat growth stage, total fungicide application costs had to be <\$10 per acre in order to average a ≥50% probability of breaking even or making a profit (compared with not spraying). By contrast, if fungicides were applied when fungal disease was present, total application costs of up to \$19 per acre for strobilurins and up to \$29 per acre for propiconazole alone were associated with a ≥50% probability of breaking even or making a profit at a wheat price of \$5 / bu. The results do not support the application of strobilurin or triazole fungicides to mid-Atlantic wheat crops for “plant health” in the absence of disease. Rather, they support basing the decision to apply fungicide on observation of disease, if an economic return for the input is desired.

- 4) Sylvester, P. N., and Kleczewski, N. M. 2018. Evaluation of foliar fungicide programs in mid-Atlantic winter wheat production systems. *Crop Protection* 103:103-110

This study also supports the idea of sticking to IPM principles and using scouting and finding a fungal disease as the trigger for application, rather than the calendar.

**FUNDS REQUESTED:**

**2023-24 ..... \$9,800**

Previous funding:

2022-23 ..... \$9,040

2021-22 ..... \$7,520

2020-21 ..... \$5,580