

Proposal to NC Small Grain Growers Association, 2023-24
Improving Small-Grain Disease Management in North Carolina -- C. Cowger, USDA-ARS

Christina Cowger, USDA-ARS Research Plant Pathologist, requests \$30,000 for small-grain disease research and education to benefit the North Carolina small-grain industry in 2022-23. Funds will be used in the following areas:

(1) Support to the North Carolina Small Grain Industry

Funds will be used for small-grain disease education, diagnostics, action alerts, and decision support. Our program will continue to provide:

- **timely, research-based information and advice** to growers, county agents, agronomists, and crop consultants;
- **talks at field days and agent/consultant trainings** on small-grain disease management; and
- **diagnosis and recommendations** to clients of the NCSU Plant Disease & Insect Clinic (PDIC)

(2) Provide growers and crop advisors with data on efficacy and timing of fungicides & insecticides for disease reduction in wheat and barley.

- Continue to lead a multi-year field experiment with Drs. Reisig, Murphy and Anders-Huseth to compare insecticides at 2 timings with genetic resistance (*Bdv2/3*) to barley yellow dwarf virus (BYDV) in winter wheat.
- Continue collaboration with Jenny Carleo on fungicide profitability experiment using wheat field plots in Coastal Plain, where fungal diseases occur more frequently than at previous research site (Salisbury).

(3) Screening advanced wheat and barley breeding materials for resistance to Fusarium head blight (FHB) and Septoria nodorum blotch (SNB).

- Provide breeders with ratings based on FHB symptoms and DON for advanced experimental wheat and barley lines. This work is done in a misted, inoculated nursery at Inwood Road in Raleigh.
- Provide SNB ratings to wheat breeding programs throughout eastern U.S. to raise the overall level of SNB resistance in commercial wheat varieties. This work is done at an irrigated nursery in Raleigh and at the TRS.
- Continue to survey *Fusarium* species that occur in wheat and barley spikes in the southeastern US and produce mycotoxins other than DON (so-called “emerging mycotoxins”).

(4) Pythium resistance/tolerance screening

Using growth chambers and greenhouse, screen wheat varieties adapted to the southeastern US for tolerance or resistance to *Pythium* root rot. This is a difficult research system, and efforts to date have not shown genetic differences among wheat genotypes. The goal remains to identify lines that show resistance or tolerance, and advise breeders on germplasm sources to use.

(5) Resistance to wheat powdery mildew

Powdery mildew was widely present in NC wheat in 2023, although not as severe as in 2022. We maintain the US powdery mildew resistance nursery of over 50 single-gene lines, including all resistance genes introgressed by Dr. Murphy, as well as lines with durable partial resistance. This allows us to monitor which resistance genes are effective in the southeastern US, and which are defeated. For example, the resistance gene *Pm1a*, which is present in DG Shirley, was overcome after several years of widespread Shirley cultivation. However, we have discovered that *Pm1a* can regain its efficacy and should be “reusable” in other wheat varieties because the mildew strains that can overcome it are not fully fit in the field. This makes *Pm1a* a valuable part of a resistance gene pyramid.

BUDGET:

Fusarium head blight

Supplies & equipment for inoculum production, harvest bags, supplies for sample collection & processing for DON testing	\$ 7,000
Irrigation equipment for FHB screening (pipe, zone controllers, risers & sprinklers).....	10,000
Lab research on <i>Pythium</i> resistance/tolerance and powdery mildew resistance	
Supplies, gene sequencing, reagents for powdery mildew.....	5,000
Equipment and supplies for growth chamber and greenhouse experiments.....	8,000

TOTAL\$ 30,000