



The Role of the Foreign Disease-Weed Science Research Unit in Global Surveillance of Cereal Rusts

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INTRODUCTION

The USDA ARS FDWSRU is located on the campus of Ft. Detrick, located in Frederick MD

Collaborative research on cereal rusts is conducted in a unique BSL-3 Plant Pathogen Containment Facility with 1000 square feet of laboratory and 7500 square feet of greenhouse space



COMMUNICATION WITH COLLABORATORS

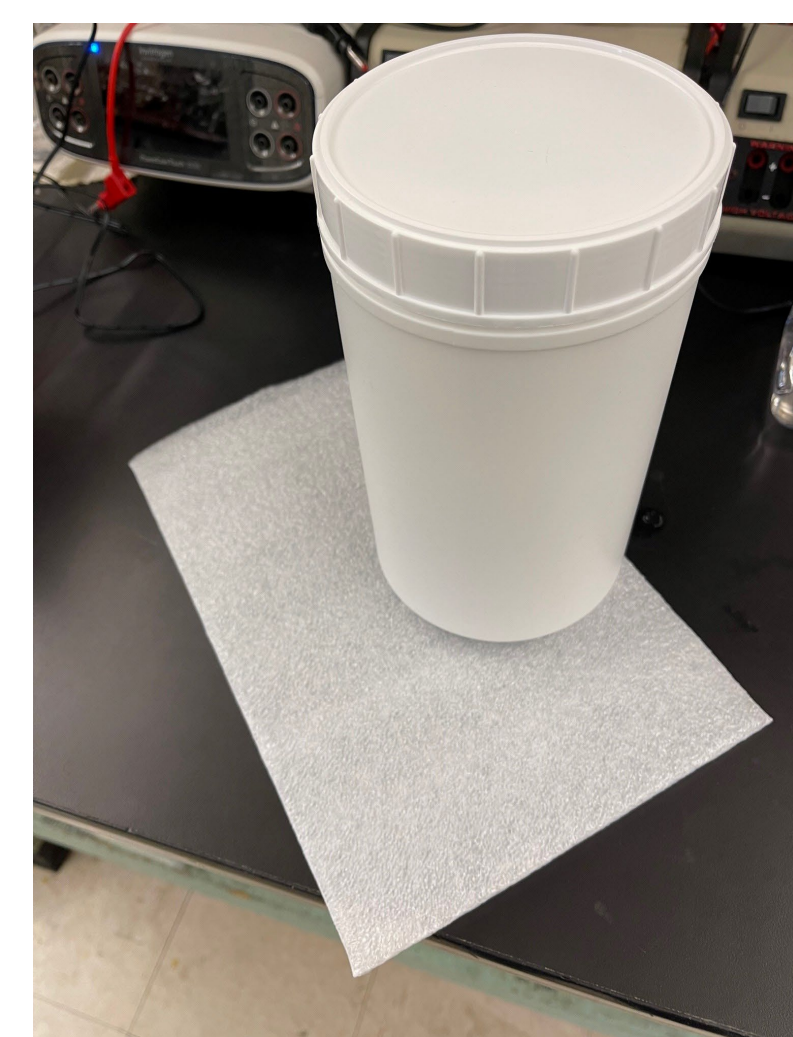
Initial contact is with USDA - ARS

Send shipment protocols, approved shipping containers and permits to collaborators

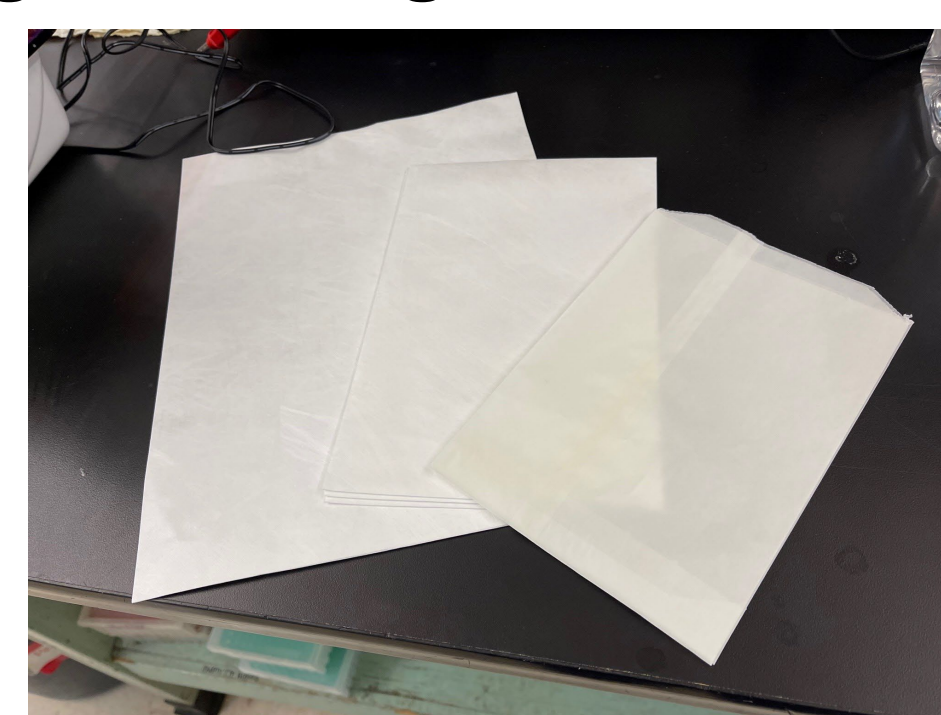
SHIPMENTS TO FT. DETRICK

Approved Shipping Containers

Containers and foam sleeves



Tyvek envelopes and glassine bags

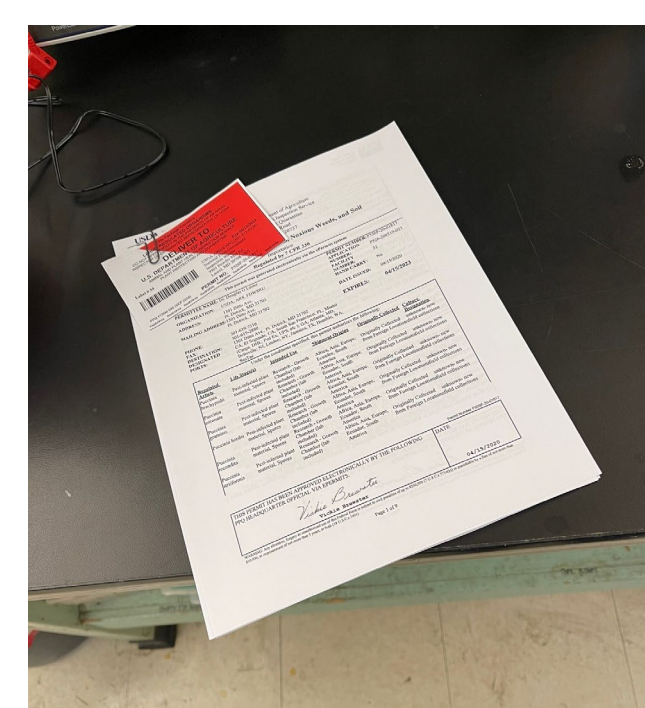


Required Documentation

APHIS permits

Red & White label

UPS shipment label (optional)



PACKING and SHIPPING

Place properly dried samples in glassine bags

Organize glassine bags in envelopes

Combine a few into larger envelope

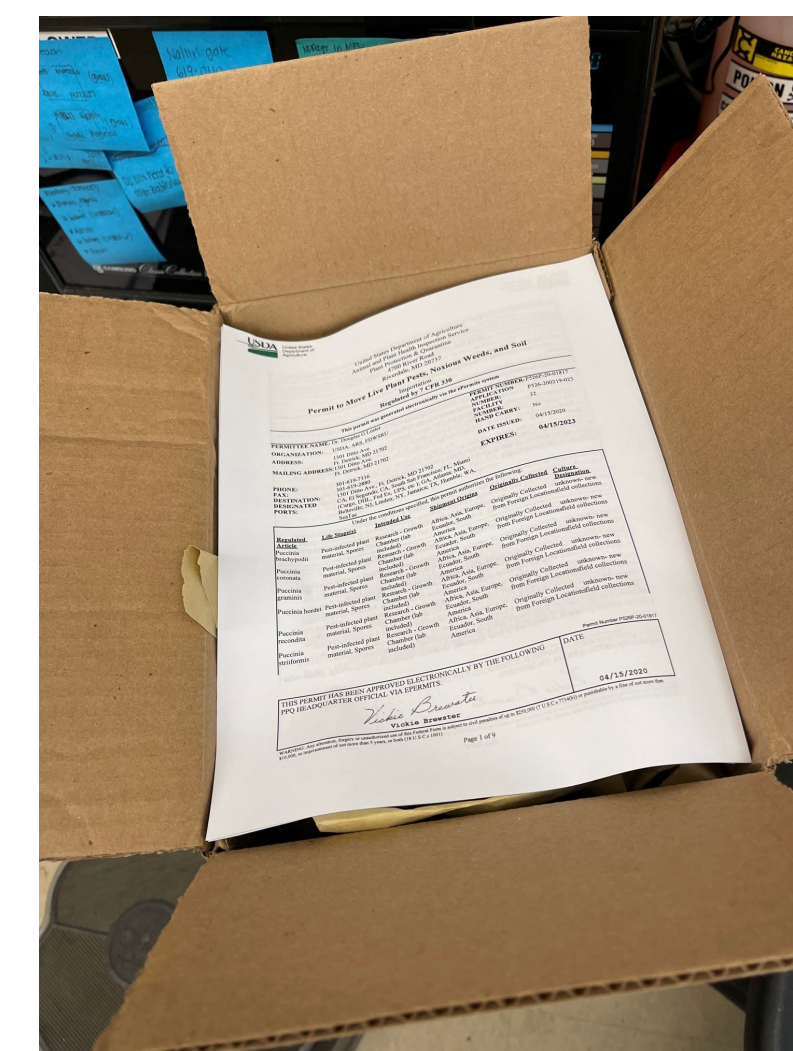
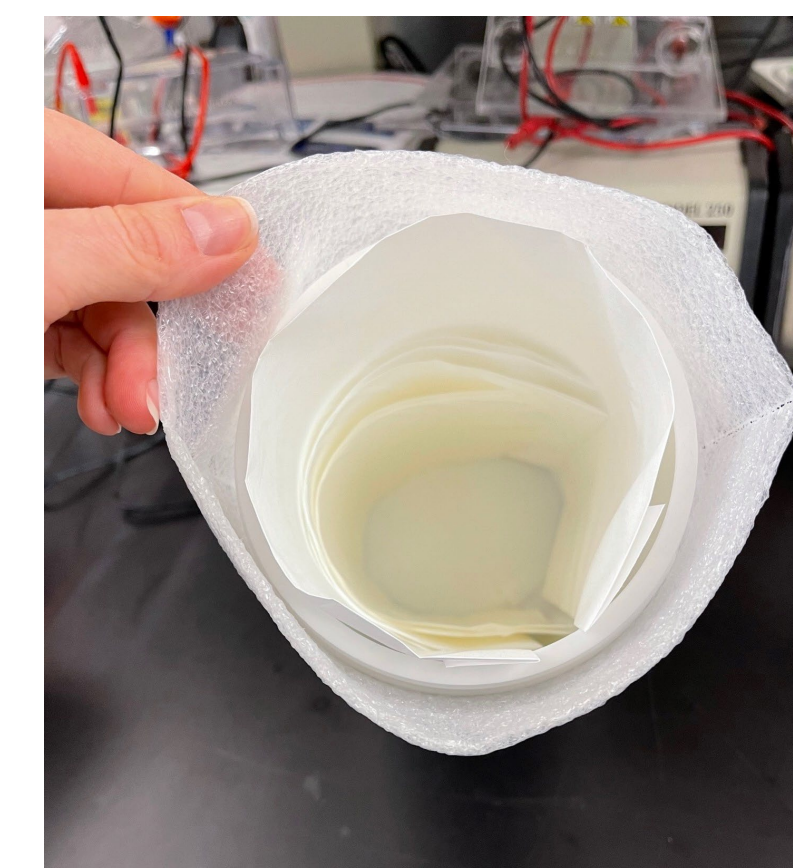
Add to shipment container

Put container into foam sleeve

Place containers into box with packing material

Include permit and red and white label on OUTSIDE of box

Ship to APHIS inspection station; forward to FDWSRU



SPORE COLLECTION



Harvest by vacuum

Collect into gelatin capsules

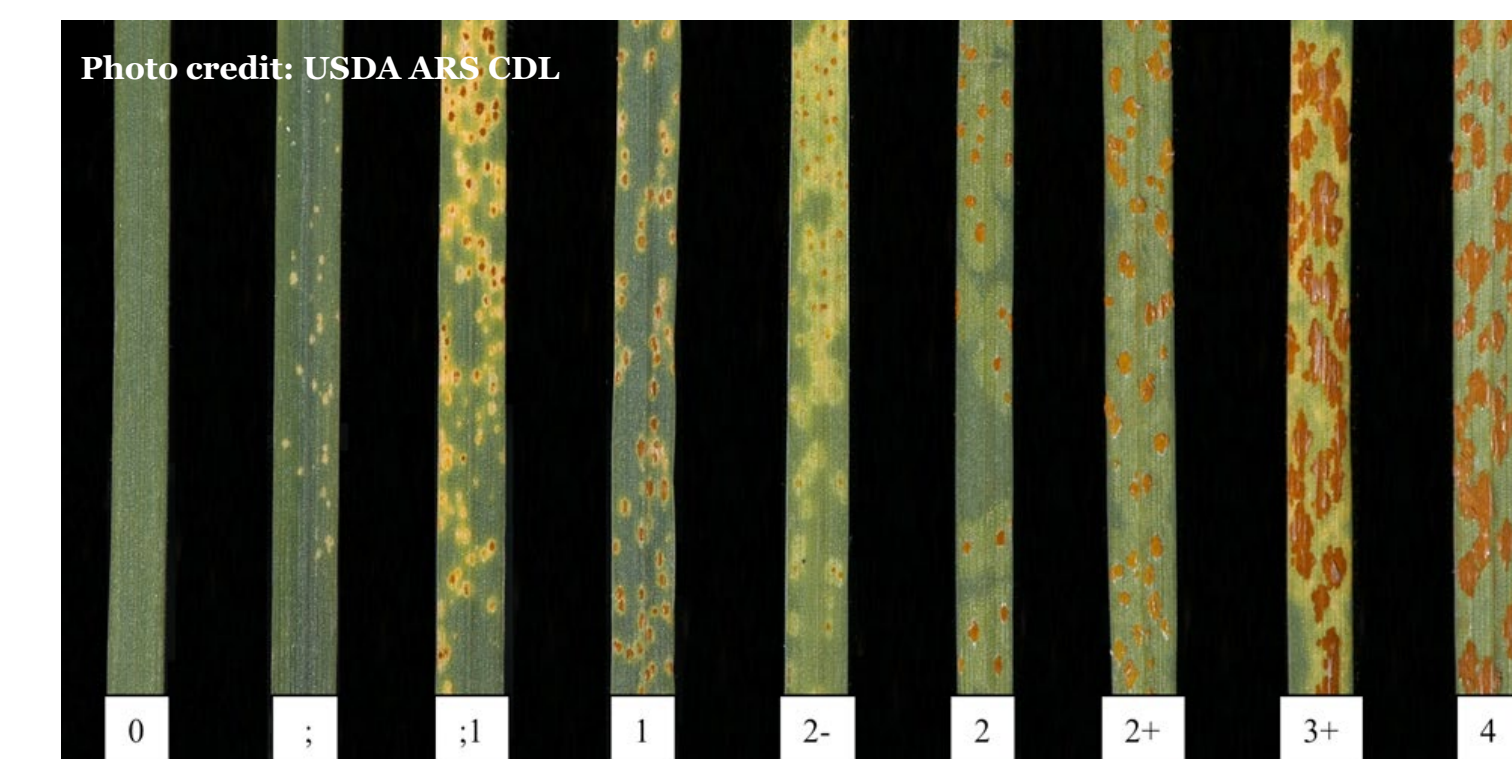
Dessicate for 3-4 days to dry



VIABILITY and INCREASE

Look for infection as early as day 7; it is more obvious by day 10

Take pictures to capture infection severity on differential lines



Harvest spores into multiple capsules for further increase or back-up storage

Collect rust-infected tissue for genotyping

PLANT PREP and INOCULATION

Select differential lines and plant 1 week prior to inoculation

Treat seedlings with maleic hydrazide solution as they emerge

Move plants into containment day of inoculation

Spray inoculation done with urediniospores; put in 20C dew chamber overnight

Cover inoculated plants with cellophane at day 7 post-inoculation



STORAGE and ARCHIVING OF SAMPLES

Dry newly harvested spores for 3-4 days in the dessicator, if not immediately used to further increase

Store short-term in -80C freezer

Archive long-term in liquid nitrogen

DOWNSTREAM ANALYSIS

Send to CDL in MN for single spore isolation



Photo credit: Adobe Stock

Genotyping with SNPs and race phenotyping

IMPACTS

Early warning of new genetic variants

Discovery of additional alternate hosts for *Puccinia*

Support global food security through breeding for durable resistance

ACKNOWLEDGMENTS

Thank you to all our wonderful collaborators who have sent samples over the course of the past 11 years!



Student Trainees:
Camille Weed, Celestin Munyaneza

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