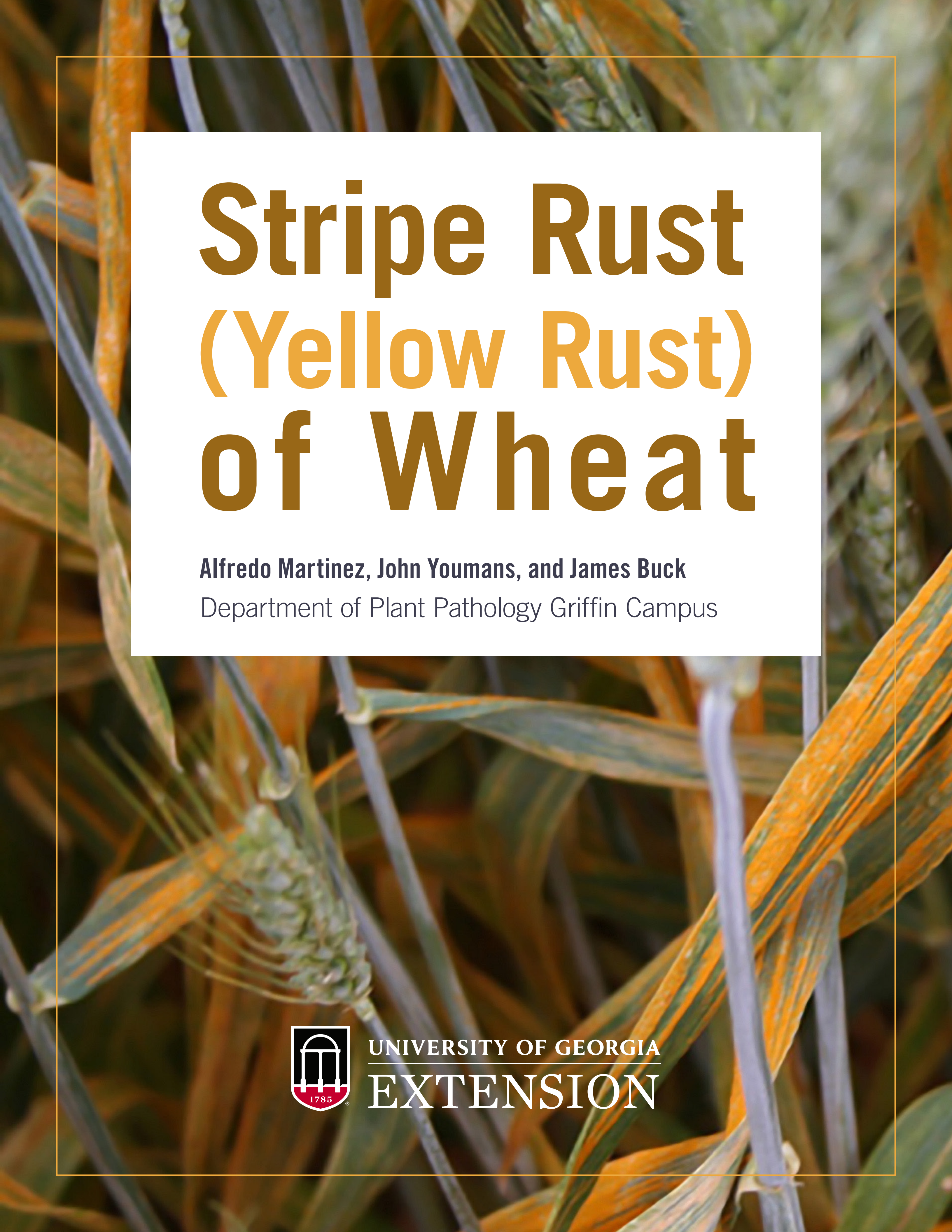

Stripe Rust (Yellow Rust) of Wheat

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EXTENSION

Introduction

Stripe rust (*Puccinia striiformis* f. sp. *tritici*) is an important disease of wheat (*Triticum aestivum* L.), especially in cool climates. Evidence of increased aggressiveness of the disease in the United States has been reported recently. Stripe rust is an emerging disease in the state of Georgia and has been more prevalent in the southern part of the state since 2003.

Rusts are the most economically important group of wheat diseases. More than $5 billion is lost to cereal rusts (leaf rust, stem rust and stripe rust) worldwide each year. The capacity of rusts to develop into widespread epidemics is well documented. Rusts have complex life cycles that involve alternate hosts and several spores stages. Adding to this complexity are the numerous "physiological races" separable by patterns of pathogenicity and virulence on differential hosts. New races continually surface due to the rusts' ability to mutate and sexually recombine.

Pathogen and Hosts

Stripe rust of wheat is caused by the basidiomycete fungus *Puccinia striiformis* Westend f. sp. *tritici* Eriks & Henn (Syn. *P. glumarum* Erik. and Henn.) in the order Uredinales. It is considered to be an obligate parasite. The fungus produces bright yellow to orange urediniospores 20 to 30 um in diameter (Figure 1a-b). These spores have thick and echinulated walls and are contained in sori or pustules on the plant (Figure 2). Urenidiospore production usually is followed by teliospore production late in the growing season. No alternate host is known. The pathogen survives in wheat as dormant mycelium in cooler climates.

Early season infections in the southeast are thought to be initiated by spores carried on wind currents from the south-central U.S. and Mexico. *P. striiformis* f. sp *tritici* primarily attacks wheat. A separate formae specialis (*P. s.* f. sp. *hordei*) attacks barley. Puccinia *striiformis* f. sp. *tritici* has numerous physiological races.

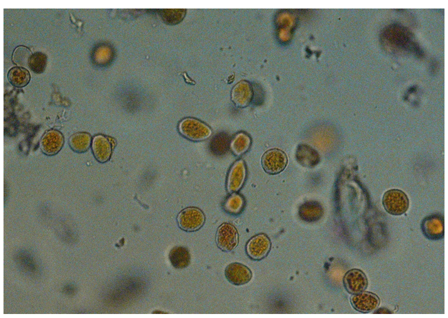

Figure 1a. Urediniospores of *P. striiformis* = 10x

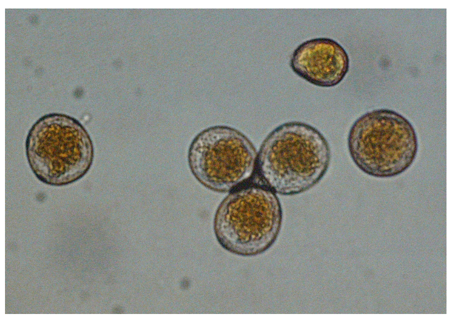

Figure 1b. Urediniospores of *P. striiformis* = 40x

Figure 2. Pustules (sori) of *P. striiformis* on wheat leaves.

Symptoms

The first sign of stripe rust is the appearance of yellow streaks (pre-pustules), followed by small, bright yellow, elongated uredial pustules arranged in conspicuous rows on the leaves, leaf sheaths, glumes and awns (Figure 3a-d). Mature pustules will break open and release yellow-orange masses of urediniospores. In some varieties, long, narrow yellow stripes will develop on leaves. The infected tissues may become brown and dry as the plant matures or becomes stressed (Figure 4a-b). Severe early infection can result in plant stunting.

Figure 3a. Stripe rust symptoms.

Figure 3b. Stripe rust symptoms.

Figure 3c. Stripe rust symptoms.

Figure 3d. Stripe rust symptoms.

Figure 4a. Mature symptoms of stripe rust. Infected plant tissue becomes brown and dry.

Figure 4b. Mature symptoms of stripe rust. Infected plant tissue becomes brown and dry.

Conditions Favoring the Disease

Puccinia striiformis f. sp. *tritici* can survive as dormant mycelium on wheat. Urediniospores can perpetuate the disease on green host tissue, such as volunteer wheat or susceptible wheat growing in other fields. Stripe rust is most common in higher elevations and cooler climates. The pathogen is best sustained when nighttime temperatures are <60°F (15°C). Stripe rust can develop on wheat at lower temperatures than other rusts. Optimum urediniospore germination occurs at 44-59°F (7-15°C). Infection and disease development is most rapid between 50-60°F (10-16°C). Urediniospores are spread via wind currents to healthy plants where they can initiate new infections. Heavy dew or intermittent rains can accelerate the spread of the disease. Infection tends to cease when temperatures consistently exceed 71-73°F (21-23°C). In Georgia, stripe rust on winter wheat is first observed in late winter or early spring (February to March).

Control

Field Monitoring

Become familiar with stripe rust symptoms and anticipate environmental conditions that are conducive for the disease. Check fields periodically and early in the season. Use a hand lens to look for symptoms on all parts of the plant and examine a number of plants throughout the field. Rub your fingers over the leaf blade and look for yellow powdery residues. Field symptoms may not be sufficient to identify the disease and a physical sample might be needed for identification. Information on how and where to submit a sample is located at plantpath.caes.uga.edu/extension/clinic.html or by calling your county Extension office.

Genetic Control

Use of resistant varieties is the best way to control wheat losses to stripe rust. Two types of genetic resistance to stripe rust are known: a) seedling resistance and b) adult plant resistance. Seedling resistance, which is controlled by a single gene, is highly effective and lasts throughout the wheat life cycle.

Puccinia striiformis f. sp. *tritici* is a highly variable pathogen and new pathotypes are continually being discovered. The development of wheat varieties resistant to stripe rust makes use of resistant genes termed Yr. There are more than 40 Yr genes designated so far.

Adult plant resistance develops as the plants mature. Expression can occur at different growth stages ranging from boot to early head emergence, depending on the variety.

Because new races of the fungus can develop, it is important to know the susceptibility of a given wheat variety. Table 1 summarizes stripe rust reactions and three-year yield averages of common wheat varieties planted in Georgia (see annual CAES Small Grains Performance Tests Research Report or the CAES Production Guide for a yearly description of varieties) (Figure 5a-b).

Figure 5a. Genetic resistance demonstrated between a severely infected susceptible variety (left) next to a non-infected resistant variety (right).

Figure 4b. Symptoms on leaves on a susceptible variety (left) and a resistant variety (right).

Chemical Control

In Georgia, several fungicides are currently labeled for stripe rust on wheat. Due to constant changes in fungicide labeling, check the entire product label and/or contact your local county Extension agent for the most up-to-date information. Guides for fungicide use can also be found in the annually-updated CAES Wheat Production Guide and the Georgia Pest Management Handbook (UGA Cooperative Extension Special Bulletin 28). Always follow product labels for recommendations, precautions and restrictions.

Cultural Control

Cultural measures can reduce the loss caused by stripe rust to some degree; however, wind dispersal of spores up to hundreds of miles can initiate seasonal epidemics of the disease. Weather systems that travel across northern Mexico and the southeastern U.S. could bring in rust spores and allow the disease to establish where environmental conditions are favorable for its development. Genetic resistance and constant monitoring when conditions are conducive for stripe rust are imperative for adequate stripe rust management.

Table 1. Stripe rust resistance on selected Georgia wheat varieties. Adapted from the UGA CAES statewide variety testing program.

Variety	Stripe Rust Resistance	Yield 3-yr average - Plains, Ga. Bu/acre
AGS 2000	Poor	N/A
AGS 2031	Good	94.8
AGS 2010	Good	89.0
AGS 2060	Good	95.1
AGS 2020	Good	102.9
AGS 2026	Good	94.4
Fleming	Good	89.8
McIntosh	Good	87.2
Panola	Good	91.5
Pioneer 26R61	Good	93.5
SS8641	Good	98.6
USG 3209	Good	97.6
USG 3592	Poor	80.7
Coker 9553	Good	93.3

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