

# Ug99 Means Misery for Wheat

Virulent stem rust is on the move in Africa and Near East

With high wheat prices and already low stockpiles of wheat, another threat is becoming ominous on the radar screen. Ug99, a virulent wheat stem rust discovered in 1999, has since traveled

Northern  
U.S. Wheat



Sally Sologuk

across East Africa to Iran, according to the Food and Agriculture Organization of the United Nations (FAO). USDA-ARS scientists have determined that 80% of the HRS wheat grown in the U.S. is vulnerable to Ug99.

When Ug99 was discovered in 1999 in Uganda, it was deemed capable of destroying most previously disease-resistant wheat varieties. Shortly after that, it was found in Kenya and Ethiopia.

By early 2007, FAO scientists indicated that the wheat disease had jumped from East Africa to Yemen in the Arabian Peninsula and probably had spread into Sudan.

Scientists also reported that the Ug99

detected in Kenya had mutated from the one that originated in Uganda.

In March 2008, the FAO reported that Ug99 had been spotted in Iran, which puts it at the door of major wheat-producing regions.

The countries east of Iran, such as Afghanistan, India, Pakistan, Turkmenistan, Uzbekistan and Kazakhstan—all major wheat producers—are most threatened by the fungus, FAO says.

So, why should this concern U.S. wheat producers and processors? The speed at which stem rust multiplies may give some perspective.

A rust urediospore can germinate in less than an hour and send out a germ tube that can be inside the wheat plant in six hours or less, according to E.C. Stakman, a former University of Minnesota plant pathologist and the leading authority on wheat stem rust disease during the rust epidemics of the 1950s.

With shocking speed, the rust tubes will grow parasitically to produce a new



*Ug99 stem rust infects wheat stalks with what scientists call shocking speed.*

“The new strains of stem rust are much more dangerous than those that, 50 years ago, destroyed as much as 20% of the American wheat crop.”

*Norman Borlaug  
Nobel Peace Prize Recipient*

crop of 50,000 to 450,000 urediospores within a week to ten days.

As the scientific world came to understand the possibility of this impending calamity, the Global Rust Initiative was organized. It was later replaced by the Borlaug Global Rust Initiative (BGRI), chaired by Dr. Borlaug, Nobel Prize winner and Distinguished Professor of In-

Designing A Bright  
Future Together

 **VAA, LLC**  
Van Sickle, Allen & Associates

**30<sup>th</sup>**  
ANNIVERSARY  
1978-2008



Bringing a Depth of Industry  
Knowledge to Projects of all Sizes

[www.VAAeng.com](http://www.VAAeng.com)

Consulting Engineers

1-800-205-9691

Response No. 341

---

“We know that there are several pathways in which spores are regularly transported through the atmosphere from Africa and Asia into the U.S.

Dr. Les Szabo  
USDA ARS Cereal Disease Lab

---

ternational Agriculture, Department of Soil & Crop Sciences, Texas A&M University, College Station, TX.

“The new strains of stem rust are much more dangerous than those that, 50 years ago, destroyed as much as 20% of the American wheat crop,” states Borlaug in an Op-Ed for the New York Times, April 26, 2008.

“Today’s lush, high-yielding wheat fields on vast irrigated tracts are ideal environments for the fungus to multiply, so the potential for crop loss is greater than ever,” he writes.

The Bill and Melinda Gates Foundation gave \$26.8 million to Cornell University for a new global project to fight wheat stem rust disease. The Durable Rust Resistance in Wheat project, launched on April 2, 2008, will bring together 15 partner institutions to combat the emergence of deadly new variants of stem rust.

#### Molecular Assays

Dr. Les Szabo, Research Geneticist, USDA ARS Cereal Disease Lab in St. Paul, MN, is working on developing a series of different molecular assays for detecting Ug99.

“The first is a general assay for the rapid identification of Ug99 race cluster,” he explains. “This assay will be designed for the use of regional and state plant diagnostic clinics to test infected wheat or barley for Ug99 race cluster. The second set of assays will be to identify specific members of this race cluster. At present, we know that there are three members of this cluster.”

“The final, and the most sensitive, will be to develop an assay that is specific to Ug99 race cluster that we can use for environmental samples, such as rain,” Szabo said.

“We have developed a general assay

for wheat stem rust fungus (*Puccinia graminis*) that will detect one or two spores. However, this assay is general and what we want to know is if the spores are not only *P. graminis*, but also is it Ug99?”

Szabo continued, “This assay would be used to monitor across the wheat-growing areas to monitor wheat rust spores coming into the U.S. We know that there are several pathways in which spores are regularly transported through the atmosphere from Africa and Asia into the U.S.

“These long distant transports most


commonly deposit particulate material (like spores) through rain. We have found that by looking at rain samples we can monitor the movement of rust spores across the North American continent,” he concludes.

Efforts are underway in many wheat breeding programs to develop varieties with long-term resistant to the fungus.

“I already sent some durum material to Kenya for testing,” says Dr. Elias

---

**Sologuk continued on p. 36**



# HOT AIR. YOUR NEW INSECTICIDE.

Your non-chemical choice for  
effective Integrated Pest Management.

- Kills the entire cycle of all insects, from eggs to adults
- No toxic fumes, no residue, no prolonged downtime
- Heat treat an entire structure, or spot treat high-infestation zones while other sections of the structure remain operational.
- 100% chemical-free, safe, effective, and affordable

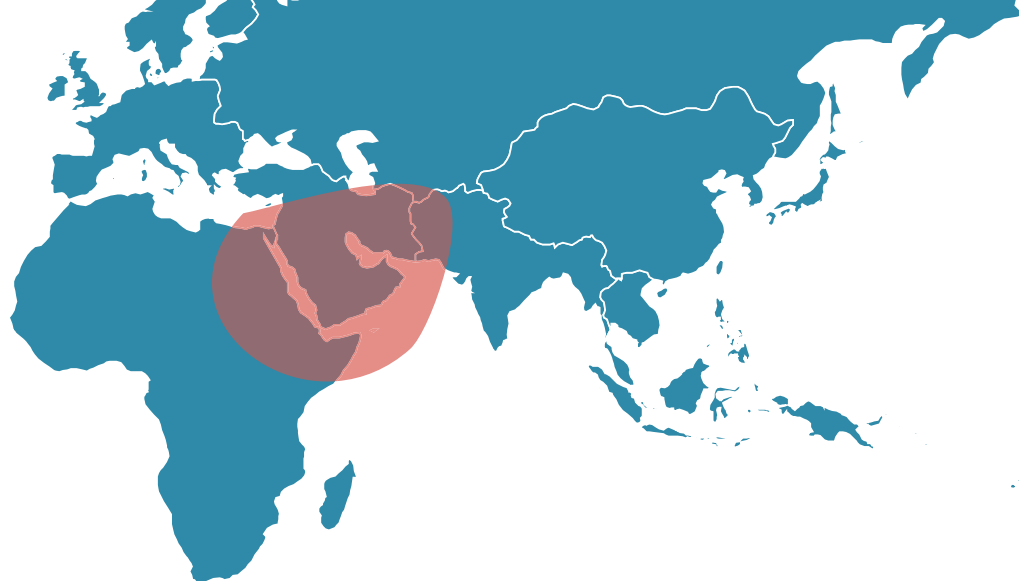


For information on this turnkey heat treatment service  
call 1-800-836-7432 or visit us online at  
[www.Thermal-Remediation.com](http://www.Thermal-Remediation.com)

“In early June, 1953, it was calculated that there were 4,000 tons of urediospores, with about 150 billion spores per pound, on four million acres of wheat in northern Oklahoma and south-central Kansas. Winds carried spores northward from this area into the Dakotas and Minnesota.”

*E.C. Stakman  
University of Minnesota*

Elias, durum breeder at North Dakota State University (NDSU), the only public durum breeding program in the U.S. “Some lines were found to be resistant to Ug99 and some are susceptible. So we have a whole range of differences. But now they are finding that some varieties in Africa that



*Ug99 stem rust has spread throughout eastern Africa and is now working its way across the Middle East to Iran and possibly India.*

were initially resistant are breaking down. The fungus is changing, so this requires continuous testing,” says Dr. Elias.

#### Head Start on Breeding

“USDA-ARS is working with U.S. wheat and barley breeders to get a head-start on breeding for genetic resistance to Ug99,” says Kay Simmons, National Program Leader, Plant Genetics & Grain Crops, USDA-ARS, Bethesda, Md.

“New sources of resistance and vari-

eties with some resistance have been identified through field screening in Eastern Africa.

“Now, USDA scientists are working with university and private sector researchers to accelerate breeding efforts to develop more resistant varieties for the U.S.”

“USDA scientists are also conducting national surveys to monitor for new and emerging strains of cereal stem rusts. USDA agencies are also sharing information and plans to facilitate chemical management using fungicides.

“Importantly, U.S. scientists are collaborating with international research centers and disease experts to try to contain the spread of Ug99,” concludes Simmons.

#### Past Losses

The U.S. experienced significant crop losses during the stem rust epidemics of the early decades of the 1900s, especially during the 1950s.

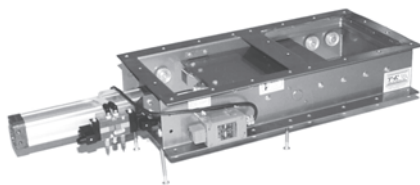
According to Dr. Stakman, “In early June, 1953, it was calculated that there were 4,000 tons of urediospores, with about 150 billion spores per pound, on four million acres of wheat in northern Oklahoma and south-central Kansas. Winds carried spores northward from this area into the Dakotas and Minnesota, where they were deposited at the rate of 3.5 million an acre in an area comprising 40 thousand square miles.”

Makes you stop and think, doesn't it?

**Tough**

**Rugged**

**Convertible Gates**



- Manual rack & pinion
- Air operated
- Electric rack & pinion



PO Box 256 • Hortonville, WI 54944  
800-343-3404 • FAX: 920-779-6980 • [www.tom-cinmetals.com](http://www.tom-cinmetals.com)

Response No. 361