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# Experts discuss threats to wheat supply, commemorate Dr Borlaug's legacy

21 August 2013 | News | By Rahul Koul Koul

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"Just as important as developing rust-resistant varieties of wheat is getting rid of the old 'rust sucking' varieties that pose a major threat to wheat production and food security in the path of stem rust and yellow rust," said Dr Ronnie Coffman, Cornell professor of plant breeding, principal investigator, director of the Durable Rust Resistance in Wheat (DRRW) project and vice chair of
the Borlaug Global Rust Initiative (BGRI).

Dr Coffman is among the top wheat scientists from around the world who will convene in New Delhi, India, Aug. 19-22, to attend the 2013 BGRI Technical Workshop jointly convened with the ICAR at New Delhi. They will discuss progress and challenges in protecting the world's wheat supply from rust and commemorate the 50th anniversary of Norman E. Borlaug's introduction of high-yielding wheat varieties to India. Reflecting the global compass of the initiative, the workshop will be attended by over 400 delegates from major wheat growing nations from all the continents of the world. Participating nations, apart from the South Asian nations of India, Bangladesh, Pakistan, Afghanistan, Nepal and Bhutan will include the nations of the North and South Americas, Europe, Central Asia, Middle East, the Maghreb region, Africa, Australia, and East Asia. Indian has been the earliest beneficiary of the Borlaug legacy that has contributed to the country accomplishing food security and economic prosperity.

"India lies at the heart of the greatest contiguous wheat growing region in the world. As the world's largest agricultural research organization, the Indian Council of Agricultural Research has moved decisively to reduce the area planted to UG99 susceptible wheat varieties while providing our farmers with resistant varieties screened in collaboration with our BGRI partners
in Kenya and Ethiopia," said ICAR director general Dr S Ayyappan. "This global partnership has been central to our success in working with our neighboring countries to prepare for the arrival of UG99, which will relentlessly ignore political boundaries when it inevitably extends to South Asia."

"The wheat revolution in India triggered by Dr Borlaug has sustained its relevance due to the continued engagement of Indian Scientists in
enhancing wheat productivity and production with consistent focus on food self sufficiency. The Indian Council of Agriculture Research has gained from global convergence of the scientific effort in mitigating rust in wheat and has contributed to the

global effort in addressing the prevention of the rust disease in wheat", added Dr S Ayyappan.

"We are significantly closer to our goal of protecting the global wheat crop from rust diseases but the vast wheat-growing region that stretches across North Africa all the way to India and China - two of the world's largest wheat-growing nations - is still vulnerable," said Coffman.

He noted that India has made commendable progress in reducing the amount of farmland planted to susceptible varieties. An estimated 85 percent of wheat in production, including most wheat grown in the Americas, Asia and Africa, is susceptible to stem rust Ug99 and its variants. Coffman said that stem rust can act like a "biological firestorm," turning fields of wheat into blackened stubble with no grain.

"India's wheat scientists have been remarkably diligent in getting farmers to reduce the amount of land that is planted to the highly susceptible mega variety PBW343," said Dr Ayyappan. In the last five years, the number of hectares of PBW343 has shrunk from more than half the acreage to a quarter of the area of wheat cultivated. "We are more and more successful in getting new varieties into farmers' hands," he said.

Commemorating Norman E. Borlaug's Legacy Dr Borlaug, the Father of the Green Revolution, who first came to India in 1963, often said
that "rust never sleeps." In 2005, after confirming that a form of stem rust called Ug99 had overcome the resistance gene he and others had developed for wheat more than 50 years before, Dr. Borlaug began his campaign to make the world pay attention to the new threat to global food security. He launched the BGRI in 2005.

"To advance his legacy and vision to alleviate hunger in the most sustainable and nutritious way, my father would urge us to harness all the tools of biotechnology that we have before us," said Jeanie Borlaug Laube, Dr. Borlaug's daughter, who is the chairperson of the BGRI. Four farmers who worked with Dr. Borlaug in the 1960s and '70s will address workshop participants during the opening festivities at Vigyan Bhawan on August 19.

The President of India, Pranab Mukherjee made the inaugural remarks. Appreciating the continuance of work led by Dr Borlaug, he said that research on wheat continues unabated in India is a legacy of Dr. Borlaug. Since 1965, four hundred three wheat varieties have been developed and released for commercial cultivation in the six wheat growing zones of the country.
Working to Ensure Continued Food Security Stem rust can cause farmers to lose entire crops, but an equally important yellow (or stripe) rust is also causing severe losses worldwide. Like stem rust, yellow rust has become an
immediate threat with the emergence of new, highly aggressive strains that knock out genetic resistance in many popular varieties of wheat.

"The only manageable solution for farmers who cannot afford fungicides when rust hits is to replace their crop with new rust-resistant varieties," Coffman said. "Planting only five percent of a nation's wheat fields with seed from resistant varieties would allow replacement of susceptible varieties within a year, if Ug99 should appear. "We have the technology to prevent a tragedy that could destroy crops in some of the world's most important wheat-producing regions," said Coffman. "But it is difficult to get rustresistant wheat seed multiplied fast enough and into the hands of the people who need it."

It is difficult to convince farmers to change varieties until they have suffered losses or unless a new variety promises significantly increased yields.
"India has been an important partner in the BGRI since the beginning. We welcome the Indian Council of Agricultural Research (ICAR) and their proactive approach to surveillance and breeding," said Coffman. He noted that Indian scientists have been extremely vigilant in sending promising wheat lines to rust screening facilities in Ethiopia and Kenya, and that Indian wheat breeders are making good progress in developing durably resistant wheat varieties.

Working closely with technical support from Sathguru Management Consultants, Indian scientists at ICAR have developed a comprehensive surveillance data network for South Asia that is being deployed in India, Bangladesh, Nepal, Bhutan and Pakistan to track rust diseases of wheat. The deployment of Information technology solution developed by Sathguru, a BGRI partner in tracking rust pathogens, is widely deployed in the South Asia to generate reliable information for rust prevalence in key wheat growing regions.

"The use of information technology solutions has facilitated BGRI partners in generating nation-specific information that is extremely useful in tracking the rust incidence and initiate preparedness for rust mitigation" said Kannan Vijayaraghavan, director of Sathguru and regional coordinator of the DRRW project.

**India's Rust Preparedness**

"Global food security can rise and fall with the success or failure of India's wheat crop," said Coffman. "Because India is the second largest wheat producer and consumer in the world, threats to its wheat crop or any significant decline in production could have an immediate impact on global food security."

"Anticipatory contingency plans have been chalked out aiming at immediate and long term strategies to manage stripe rust along with leaf rust and stem rust," said Dr Indu Sharma, director of the Directorate of Wheat Research, speaking about India's preparedness in meeting the threat of rust.

Dr Sharma said strategies include awareness campaigns in the farming community and extension workers through press, electronic media and literature in local languages; planting of wheat disease monitoring (trap) nurseries including SAARC nurseries in all the strategic areas and regular monitoring throughout the crop season; monitoring the wheat crop from December onwards at regular intervals of 15-20 days and initiating stripe rust management activities that includes use of fungicide to manage rust in disease-prone areas by agricultural scientists, extension specialists and agricultural officers working with the Department of Agriculture; analysis of variability in samples from off season locations to identify pathotypes that infect the wheat crop during the season based on routinely used differential set and integrating molecular tools for genetic diversity.

Wheat is the second leading grain crop in India after rice, with 30 million hectares under cultivation. Annual production stands at 92.46 million tons, which is 13.2 percent of the world's production.