

Salient Recommendations emerging from the International Conference on “Wheat Stem Rust Ug99 - A Threat to Food Security” held on November 6-8, 2008 at New Delhi, India.

The International Conference on “Wheat Stem Rust Ug99 - A Threat to Food Security” was organized by Department of Agricultural Research and Education (DARE), Government of India (GOI), Indian Council of Agricultural Research (ICAR) and Food and Agriculture Organization (FAO) of United Nations (UN) from November 6-8, 2008 at New Delhi, India. The conference was inaugurated by Shri Sharad Pawar, Union Minister of Agriculture, Consumer Affairs, Food and Public Distribution, Government of India. Dr. Mangala Rai, Secretary DARE and Director General, ICAR welcomed the delegates and dignitaries. The inaugural event was blessed by the presence of Deputy Minister of Agriculture, Government of Afghanistan and Advisor (Agriculture) Government of Bangladesh. The FAO representative also addressed the conference.

The conference was attended by 175 participants including 101 from 36 foreign countries. In the conference there was effective representation from important organizations viz., CIMMYT, ICARDA, CSIRO, FAO, ACIAR, Melinda and Bill Gates Foundation, BGRI etc.

The Technical Sessions commenced with the highly motivating and thought provoking video-address by Nobel Laureate Dr. N.E. Borlaug. He spoke “Wheat rust honours no political boundaries, and neither can our commitment to provide food for this planet. The aim of our global rust initiative is to fix the problem of rust we face today, and ensure that we never again are as vulnerable as we are today. In today’s world, this takes political will, good science, and most importantly talented young scientists backed up by a commitment to long term funding”. He was also pleased to announce that “India, represented by the Director General of ICAR will join FAO, CIMMYT, ICARDA and Cornell in the ‘permanent members’ group of the executive committee of BGRI. This reflects the commitment of India to pursue this goal..... The world needs India at the forefront of wheat research and advocacy of wheat research. He also commended the honourable minister and DG, ICAR for their acceptance of this deep responsibility”.

The deliberations of these sessions have indicated that the current situation with respect to stem rust race Ug99 (TTKSK) provides opportunity for global rust pathogen surveillance and international collaboration, which will underpin efforts to secure food production. It was further noted that whereas Ug99 was initially detected in Uganda in 1998 the race was confirmed in 1999, current surveillance information indicates that it has evolved and that Ug99 or related races are now also present in Kenya, Ethiopia, Sudan, Yemen and Iran. Country reports by delegations indicated that Ug99 is not present in India, Pakistan, China and Egypt.

The immense contributions of the Ethiopian and Kenyan NARS in support of Ug99 screening are acknowledged.

The salient recommendations of the three days conference are given as follows:

~ Recommendations ~

1. Surveillance and Management

- Survey and surveillance networks at national, regional and international levels, in view of rapidly migrating and evolving nature of Ug99 and other rust pathogens of wheat, should be strengthened.
- All countries/ regions should participate in a Global Rust Monitoring System so as to address the wheat rusts and national focal points and contact person may be designated for the purpose. This system should use the available technologies including better trap nurseries, GPS, GIS, molecular approaches etc.
- The need for study of the variability of the pathogen was emphasized. Isolates collected during surveillance should be characterised for racial identity, including *inter alia* the development of uniform standard set of near isogenic tester lines (differentials) for winter

and spring wheats; genetically pure differentials and their distribution; and an internationally accepted race nomenclature system. The virulence of the pathogen on the other species of wheat also requires to be studied on an international and regional basis. Role of *Berberis* spp., grasses and *Aegilops* spp. in epidemiology of Ug99 needs to be evaluated.

- Epidemiological studies of rust pathogens using latest tools and technologies should be documented and early warning system for short-term prediction of epidemics should be established and different strategies including varietal, chemical and cultural control should be devised and implemented. In most parts of the world, stripe and leaf rusts also pose major threats and efforts should be made to extend surveillance and control measures to include these pathogens as well.
- Countries should share their data with the international focal point at FAO/partner countries.

2. Genetic enhancement and breeding

- Emphasis should be given for identification of diverse sources of resistance in improved varieties, landraces and wild relatives; incorporation of diverse resistance sources in adapted backgrounds; cloning of important genes for preparation of multiple gene cassettes; and utilization of non-host resistance such as rice immunity to rusts.
- Major genes should be used in combinations to enhance the longevity of the resistance and genes should be strategically deployed over time and space. Marker assisted selection should be applied to develop combinations involving genes viz., *Sr22*, *Sr25*, *Sr26*, *Sr27*, *Sr32* etc. for multiple disease resistance.
- Use of non-race specific (durable) adult plant resistance conferred by minor genes should be utilized in developing high yielding wheat varieties. Adult plant resistance gene identification, marker development and cloning should be ensured for a successful breeding program. Strategies for combining minor and major genes should be devised.
- Shuttle breeding approach in order to accelerate fast multiplication of material and advancement of generation, should be followed for accumulating adequate adult plant resistance together with other necessary traits.

3. Seed production and distribution

- A system of speedy evaluation, release, fast seed multiplication and demonstration of elite Ug99 resistant materials should be devised and made operational. The information and sharing of data on international Ug99 testing need to be utilized for variety release.
- Seed production, processing and storage facilities need to be strengthened and Strategic Seed Reserves can be considered as necessary by the participating countries.
- It was also suggested that regional variety testing and release should be considered respecting the relevant laws of the participating countries.
- Use of wheat varietal mixtures with diverse sources of resistance should be explored especially in hot spots and high risk areas.

4. Capacity building and awareness

- International and regional cooperation should be enhanced to facilitate human resource development in surveillance, sharing of information and materials, online data management and access, pathology, breeding, molecular techniques, GIS, early warning system, seed production, etc. The training opportunities for all stakeholders within the CGIAR, and other systems should be enhanced.
- Realizing, recognizing and appreciating the immense contributions of Ethiopian and Kenyan NARS, their training and human resource development capabilities be enhanced.

- Every effort should be made to raise awareness of the risk of inadvertent, including human, transmission of the rust pathogen.
- Efforts should be made to raise awareness among farmers and other stakeholders about Ug99.

5. Material exchange and screening

- Two key planks for combating Ug99 are germplasm exchange and screening in east Africa, hence the modalities for sharing of materials under screening need to be developed. Data and germplasm from the CGIAR system are freely available. The germplasm from third parties may be accepted under SMTA and/or mutually agreed terms for screening through the DRRW project in east Africa with the condition that data are made freely available. Kenyan and Ethiopian NARS may have access to the tested material, as per SMTA, for research purpose. For other potential use the terms for access may be negotiated with the germplasm owners on a case to case basis.
- A quarantine network for harmonizing the application of regulations related to the movement of the material should be established.
- Countries should share their data with the partners/countries and sensitive data needs to be protected. In this endeavour, an effective modality for sharing information/data needs to be developed.
- Screening at hotspots should be continued under high disease pressure and facilities should be expanded, as needed
- Seed health testing facilities should be enhanced in Kenya and Ethiopia.

6. Implementation of rapid response and contingency plan

- Countries should develop contingency plans for dealing with Ug99 incursions as soon as possible by taking advantage of the support and guidance of FAO, CG centres, BGRI etc.

7. Funding

- Support from all sources should be made available to the national, regional and international programmes for implementing these recommendations.
- Facilities for screening at hot spot locations in Kenya and Ethiopia should be expanded and strengthened to cater to the future need of different countries.
- Additional infrastructure facilities and human resources will be necessary for shuttle breeding at available Ug99 field sites.
- Some of the countries especially Kenya, Ethiopia, Uganda, Yemen and Sudan expressed the need for assistance for containing the disease through use of appropriate chemicals/other strategies.
- Uganda, Tanzania, Rwanda and D R Congo should be involved for Ug99 management efforts as these are also potential sites of pathogen evolution.

Roadmap to face the challenge of Ug99

1. Surveillance

- All concerned countries should join in and contribute to Global Rust Monitoring System for wheat rusts. National surveillance team will be constituted and the national focal point will be officially designated.
- Field surveys should be conducted according to the standard protocol. Isolates collected should be characterised by designated laboratories using internationally accepted uniform race nomenclature system
- Survey data, trap nursery and race analyses results should be transmitted to the international focal point for incorporation into the global rust monitoring system for data to be accessed by all concerned
- In most parts of the world, stripe and leaf rusts also pose major threats and efforts should be made to extend surveillance and control measures to include these pathogens as well.

2. Breeding strategies

- Screening at hotspots should be continued under high disease pressure and facilities should be expanded as needed with adequate human resource and infrastructure
- Diverse sources of resistance in improved varieties, landraces and wild relatives should be identified and utilized including non-host resistance.
- Molecular marker development should be enhanced and utilized in marker assisted selection for pyramiding major and minor genes
- Special efforts be made to use non-race specific (durable) adult plant resistance through shuttle breeding

3. Seed production and distribution

- Put rapid variety evaluation and release system into operation
- Devise and implement a system of demonstration, rapid multiplication and distribution
- All the stake holders (the extension agencies, farmer associations and others) should be trained/deployed for quality seed production and related aspects

4. Infrastructure, capacity building and awareness

- International and regional cooperation should be enhanced to facilitate human resource development. The training opportunities within the CGIAR, NARS, ARI and other specialized institutes should be enhanced.
- Awareness about Ug99 and resistant varieties should be raised among policy makers, researchers, farmers and other stakeholders
- Strengthening of rust screening facilities at Kenya, Ethiopia, Yemen and other places as per need should be ensured. Adequate race analyses facilities and human resource upgraded at national and regional level

5. Material exchange and screening

- Germplasm exchange should be promoted, using the standard MTA and/or mutually agreed terms for research purposes. For commercialization purposes, the exchange can take place on case-by-case basis.

6. Contingency plan

- Participating countries should develop and implement contingency plans for dealing with Ug99 as soon as possible.
- Other countries that could be important sites for pathogen evolution should also be engaged in the Ug99 strategy.

7. Funding

- Support from all sources should be made available to national, regional and international programmes for implementing this roadmap