



# COMBATTING WHEAT RUST DISEASES: STRENGTHENING NATIONAL CAPACITIES AND INTERNATIONAL COLLABORATION

Wheat is the most widely grown crop globally and a source of food and livelihoods for over 1 billion people in many developing countries.

Rust diseases are historically the most damaging diseases of wheat.

Their frequency, extent and impact has increased significantly in the last two decades causing global concerns. Their high capacity of developing new races makes most wheat varieties vulnerable to them.

Wheat rusts are caused by fungal pathogens belonging to the *Puccinia* species. The three major rusts are yellow rust (*P. striiformis* f. sp. *tritici*), stem rust (*P. graminis* f.sp. *tritici*) and leaf rust (*P. tritici-na*). They are airborne fungi whose spores can spread rapidly over large distances by wind.

These fungi infect leaves, stems or ears of plants resulting in shrivelled grains and yield losses of up to 80 percent or more, depending on local conditions.

Rusts affect almost all wheat producing regions. However, East and North Africa, the Near East, West, Central and South Asia, accounting for more than 37 percent of global wheat production areas, are more vulnerable to wheat rust epidemics.

Considering these challenges, FAO is continuously re-enforcing its collaboration with partners to enhance countries' capacities in prevention and preparedness to rust diseases.

## NEW RUST RACES EMERGING AND SPREADING

Wheat rust fungi produce frequently new races which can spread quickly over borders into new environments affecting large areas.

Since 1990s, stem rust became an important challenge due to new races which devastated wheats in several countries in Eastern Africa. The stem rust Ug99 race is now present in 13 countries, as well as the Digalu race. Similarly, the aggressive Yr27 virulent strain of yellow rust has been causing

severe outbreaks and losses in many countries in a wide geography from North Africa to South Asia within the last decade.

In 2016, new races of both yellow and stem rusts have emerged in various regions. The detection of TTTTF race of stem rust in Sicily, Italy, where stem rust was not previously a challenge, raises concerns for the Mediterranean basin. Similarly, while yellow rust race "Warrior" was spreading from Europe towards West Asia, another race detected in Afghanistan, was found in Ethiopia in 2016.

# KEY FACTS

## WHEAT RUST DISEASES

RUST DISEASES THREATEN WHEAT PRODUCTION AROUND THE WORLD PARTICULARLY IN AFRICA, THE NEAR EAST AND ASIA

UP TO 80 PERCENT OR MORE OF A FARMER'S YIELD CAN BE LOST DUE TO RUST

THE CAUSAL FUNGI ARE AIR BORNE AND THEIR SPORES CAN SPREAD LONG DISTANCES RAPIDLY BY WIND

IN RECENT YEARS, YELLOW AND STEM RUSTS HAVE PRODUCED NEW RACES CAUSING SIGNIFICANT LOSSES PARTICULARLY IN EASTERN AFRICA AND THE NEAR EAST

THE GLOBAL WHEAT RUST PROGRAMME TARGETS 40 COUNTRIES IN AFRICA, THE NEAR EAST, EASTERN EUROPE AND ASIA

FAO SUPPORTS THE GLOBAL RUST MONITORING SYSTEM AND COUNTRIES TO IMPROVE THEIR CAPACITIES IN SURVEILLANCE, CONTINGENCY PLANNING AND DISEASE MANAGEMENT

## WHEAT RUST DISEASES

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### INTEGRATED DISEASE MANAGEMENT, CAPACITY BUILDING AND INTERNATIONAL COLLABORATION

To combat wheat rust diseases effectively, integrated management approaches are essential due to the complex nature of the pathogen. For long term prevention, single control methods are not adequate but rather integrated strategies and practices.

Using resistant varieties is the primary tool for disease prevention but contingency plans should also be developed to control possible outbreaks with proper use of fungicides. Other agronomic measures such as removing green bridges between crop cycles, mixed varieties, appropriate irrigation and fertilization should also be considered.

FAO has been running a global wheat rust programme since 2008 to provide policy and technical support to concerned countries in collaboration with its national and international partners including, among others, the International Center for Agricultural Research in the Dry Areas (ICARDA), International Maize and Wheat Improvement Center (CIMMYT), the International Fund for Agricultural Development (IFAD), Cornell University and Aarhus University in the context of the Borlaug Global Rust Initiative (BGRI).

Targeting 40 countries in Africa, the Near East and Asia, the programme focuses on supporting national surveillance and disease management and facilitating regional and international collaboration and information sharing. The programme provides technical assistance to strengthen national capacities in seed multiplication, distribution of quality seeds of resistant varieties, farmers training through Farmer Field Schools,

as well as improving research facilities in some countries such as Ethiopia, Egypt, Iran and Turkey.

Special efforts are also made to support countries in Eastern Africa, such as Ethiopia and Eritrea, in surveillance, rapid seed production, farmer training and rapid response, where new strains of stem and yellow rusts threaten wheats.

### GLOBAL MONITORING AND EARLY DETECTION

Frequent evolution of new rust races requires continuous global monitoring and national surveillance. The Global Rust Monitoring System, coordinated by CIMMYT, and supported by FAO and other partners, promotes international collaboration and information sharing. FAO, ICARDA, CIMMYT, BGRI and Aarhus University collaboration facilitated detecting new stem and yellow rust races in 2016. National experts on training at the Regional Cereal Rust Research Center, Turkey, surveyed wheat fields. Samples were sent to Aarhus University for analysis and races were identified.

### PROSPECTS FOR IMPROVED PREVENTION

The risks posed on wheat production by the emerging rust races capable of spreading quickly over continents, necessitate intensified international collaboration and coordination. Strengthening national capacities is particularly critical to enable countries develop and implement in an effective manner their contingency plans for prevention of rust outbreaks. The global wheat rust programme will be re-focusing on re-enforcing national capacities and international collaboration for improved prevention and rapid response. These national and international efforts need adequate resources to be effective.

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